An Economic and Sectoral Study of the South African Fishing Industry

Volume 2. Fishery profiles





Prepared by:

RHODES UNIVERSITY
Where leaders learn

For:
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PREPARED FOR:

Marine and Coastal Management
Department of Environmental Affairs and Tourism
Private Bag X2
Roggebaai
8012

PREPARED BY:

Department of Ichthyology & Fisheries Science and Department of Economics and Economic History
Rhodes University
PO Box 94, Grahamstown
6140, South Africa
Telephone +27 046 6228241
Fax +27 046 6224827
Email: efa@ru.ac.za

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Editors: Sauer, W.H.H., Hecht, T. Britz, P.J. & Mather, D.

Contributors: Ntobeko Bacela, John Bolton, Peter Britz, Roy Bross, Barry Clarke, Loni Dräger, Shaun Fennessy, Mafaniso Hara, Charlotte Heijnis, Chris Heineken, Bruce Hepburn, Monieba Issacs, Dave Japp, Bruce Mann, Dinty Mather, Larry Oellermann, Ané Oosthuizen, Andrew Penney, Andrea Pulfrich, Tom Hecht, Anton Roelofse, Warwick Sauer, Rudi Van.der Elst, Deborah Vromans, Jan Wissema, Tremaine Wesson.

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www.envirofishafrica.co.za/projects/ess.html

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BACKGROUND TO THE ESS AND METHODOLOGY

1. Introduction

The introduction of constitutional democracy in South Africa required the redrafting of most Acts of parliament to promote goals of social equity and redress of the consequences of past racial discrimination. The introduction of the Marine Living Resources Act of 1998 required the State to "restructure the fishing industry to address historical imbalances and to achieve equity within all branches of the fishing industry". The initial burden of implementing this social agenda fell on Government fisheries biologists, and a series of interventions with profound economic, legal and political consequences were embarked upon without any proper framework for understanding the expected outcomes. The focus of "restructuring" was a series of annual fishing rights allocation processes whereby fishing quota was redistributed away from historically white, larger, companies to smaller new, mostly black, entrants into the industry. This process was far from smooth and resulted in a number legal challenges of Government decisions, instability within many fisheries, and a tremendous strain on the under-equipped manpower resources within the Department of Environment Affairs and Tourism's Marine and Coastal Management Branch (MCM).

Under the leadership of the newly appointed Minister Valli Moosa in 2000, the problems were acknowledged and steps were taken to stabilise the fishing industry while still promoting transformation. Interventions included the creation of a Deputy Director General post responsible for Marine and Coastal Management, a moratorium of rights allocations for one year to allow for proper administrative process, the establishment of a contracted out Rights Verification Unit, and the appointment of a private legal team of adjudicate the 2001 rights allocation process. The moratorium on rights allocations in 2001 aimed at stabilising the fishing industry was supported by a position paper entitled "Draft Discussion Document For The Fisheries Management Plan To Improve The Process of Allocating Fishing Rights" (http://www.environment.gov.za/docs/2000/fishing_rights/index.html#Appendix8), which identified the need for an economic and sectoral study of the fishing industry. This need arose from a lack of basic information on the economics and socio-economics of the fishing industry, which was critical to informing realistic policy and decision making around rights allocation, industry restructuring and general fishery management issues.

The Department of Environment Affairs and Tourism asked the South African Network for Coastal and Oceanic Research (SANCOR) to assist in putting a team together to undertake the study and this resulted in a multi-disciplinary team led by Rhodes University being contracted via the National Research Foundation (NRF). The main objectives of the study were to:

- Provide a synoptic report on each fishery.
- Provide a description of the micro-economy of the fishing industry.
- Provide baseline economic and socio-economic data.
- Provide precise definitions of scale-groupings of vessels within each fishery.

- Quantify the allocating rights in minimum economic units (minimum viable quota) by scale-grouping of vessels operating in each particular fishery.
- Analyse realistic options regarding fee structures – charges and/or levies and/or royalty taxes – that MCM can use to capture economic rent.
- Provide a measurable estimate of the level of transformation (as defined), including the distribution of the wage bill to previously disadvantaged individuals.

It was intended that the ESS would inform the 2001 rights allocation process, and establish a database which could be kept up to date to provide ongoing information and analyses for policy, management and research processes. The original Terms of Reference of the ESS are included in Appendix 1.1.

2. Data Collection and Databasing

In order to compile the required holistic profile of the fishing industry, the gathering of information and subsequent databasing was undertaken in the following ways:

2.1 Industry Survey and Information Gathering

A questionnaire of the required information was compiled and tailored to each fishery sector. A list of the generic information that was required from each fishery is presented in Appendix 1.2. The survey aimed to capture a 100% sample of rights holders and processing establishments. An expert familiar with the fishery concerned was appointed to execute the survey and each rights holder was approached either personally, by phone or by post. The proportion of rights holders and vessels captured in the survey was high:- 1 483 returns, which was equivalent to 87% of rights holders (Table 1). Meetings were held with industry associations and representatives to discuss the ESS objectives and methodology and very good cooperation from industry was obtained.

In addition to the questionnaire survey, representative cost data on different classes of fishing vessels was obtained by Business Partners and individuals with an in-depth knowledge of particular types of fishing operations. MCM databases were used to obtain information on rights holders and vessels, but these proved to be of very little value as the databases were poorly maintained and often out of date or inaccurate. Thus, the survey had to rely primarily on the questionnaire survey data. Socio-economic data on employment and income of coastal commuities was obtained from the 1996 census data in order to contextualise the contribution of the fishing industry to the coastal economy.

Table 1. ESS Survey returns from the fisheries covered and percentage coverage of rights holders, quota or catch and vessels.

Fishery	Coverage by:			Returns
	Rightsholders	Quota/Catch	Vessels	
Abalone	100%	100%	100%	47
Deepsea	93%	99%	98%	52
Hake HL	100%	97%	100%	43
Hake LL	-	70%	32%	105
Inshore	100%	98%	98%	11
Linefish	-	-	69%	586
MidWater	100%	100%	30%	14
Pelagic	78%	83%	89%	125
Prawn	100%	-	88%	5
SCRL	58%	69%	69%	11
Seaweed	79%	-	-	11
Shark LL	52%	-	100%	12
Squid	100%	98%	100%	160
Tuna BB	85%	-	100%	85
Tuna LL	73%	-	100%	19
WCRL	98%	100%	75%	197
AVG/TOTAL:	**86.8%**	**91.4%**	**83.2%**	**1483**

2.2 ESS Database

The questionnaire survey data was entered into a Microsoft access database and summary reports extracted for the ESS economic and socio economic analyses.

3. Fishery Profile Reports

The synoptic overview report on each fishery was written by the sub-consultant responsible for the questionnaire survey and summary data extracted from the ESS database was added to these reports. These reports were forwarded to the rights allocation teams appointed by MCM to make recommendations to the Minister on the allocation of fishing rights. The fishery profile reports form Volume 2 of the ESS reports.

4. ESS Economic, Socio-economic and Analyses

The above information and additional literature and secondary sources was used generate the various analyses and perspectives which form the basis of the chapters in the volume. These include:

- A contextualisation of the principles underlying the microeconomy of the South African fishing industry and the form and structure of fishing rights rights.
- A legal perspective examining of the constitutional compatibility of the regulatory system with respect to fisheries.

- Analysis of the ESS survey results in terms of employment, skills, income.
- A classification of the size and shape of the fishing fleets.
- Definition and measurement of transformation.
- An analysis of options for user charges and revenue collection.
- The socio-economic contribution of the fisheries sector to coastal towns.

5. ESS Project Team

The ESS project team comprised of a large multi-disciplinary and multi-institutional team which was coordinated by the lead agent team at Rhodes University. The project would not have been possible without substantial inputs from MCM staff who willingly gave up their time to assist in providing information and access to databases.

Contribution	Responsible Institutions and Individuals	
ESS Fishery Survey and Fishery Profiles	Anchor Environmental Consultants	Barry Clarke, John Bolton, Deborah Vromans, Charlotte Heijnis
	Capfish	Chris Heineken
	Fisheries and Oceanographic Support Services	Dave Japp, Jan Wissema
	Oceanographic Research Institute	Bruce Mann, Rudi vd Elst, Shaun Fennessy
	Pisces Research and Management Consultants	Andrew Penney, Andrea Pulfrich
	Policy Centre for Land and Agrarian Reform (PLAAS), University of the Western Cape	Monieba Issacs and Mafaniso Hara
	Rhodes University, Department of Ichthyology and Fisheries Science	Peter Britz, Ntobeko Bacela, Tom Hecht, Ané Oosthuizen, Loni Dräger and Warwick Sauer
	SA Deep Sea Trawling Industry Association	Roy Bross
	Business Partners	Tremaine Wesson and Anton Roelofse
ESS database management	Rhodes University	Larry Oellerman and Jan Wissema
Economic and socio economic analysis	Rhodes University, Department of Economics and Economic History	Dinty Mather, Peter Kimemia, Faith Mlumbi, N Notyawa, Lindsay Martin, Sue Murray and Philip Ndimande
	Policy Centre for Land and Agrarian Reform (PLAAS), University of the Western Cape	Monieba Issacs and Mafaniso Hara
	SA Deep Sea Trawling Industry Association	Roy Bross
Legal Analysis	Rhodes University, Faculty of Law	Clive Plasket
ESS report editing and production	Rhodes University	Dinty Mather, Peter Britz, Tom Hecht, Larry Oellerman, Warwick Sauer and Lisl Griffioen

APPENDIX 1.1: ESS TERMS OF REFERENCE

1. Background

Marine and Coastal Management (MCM) is currently in the process of implementing the provisions of the Marine Living Resources Act (MLRA) with regard to allocation of long term rights. In so doing, it will endeavour to promote the over-arching objectives and principles set out in section 2 of the MLRA, which states that:

The Minister and any organ of State shall in exercising any power under this Act, have regard to:

- The need to utilise marine living resources to achieve economic growth, human resource development, capacity building within fisheries and mariculture branches, employment creation and a sound ecological balance consistent with the development objectives of the national government.

- The need to restructure the fishing industry to address historical imbalances and to achieve equity within all branches of the fishing industry.

This necessitates an upgrading of knowledge at Departmental (MCM) level in respect of the economics of fishing in South Africa. The Department needs to obtain a sound understanding of the overall economic benefits of each fishery as well as reliable estimates of microeconomic parameters such as values of production, costs, profits, employment etc. Such data are essential in order to ensure the implementation of an appropriate fee structure to recover costs associated with management, compliance and research, to improve on the process of allocating fishing rights, to develop an adequate decision making framework for the various commercial fisheries and to enable the formulation of a coherent policy on transformation. To achieve this, a study is urgently required to establish a sound analytical framework for economic decision-making and which can be undertaken on a recurrent, regular basis.

2. Fishing industry classification: definitions and terminology

For purposes related to the allocation of rights, the application of a fee structure and generally for the economic and sectoral study contemplated in this document, there is a need to establish a coherent set of definitions regarding the terminology associated with the classification of South African commercial fishing.

- Each commercial fishery will be stratified according to the functional characteristics of the various classes of vessel used in that fishery. This will serve as a scale-grouping vessel definition system useful for managerial and analytical purposes.

- The classes of fishing enterprise (big, medium, small and micro), or sectors will be carefully defined with respect to the levels of vertical and horizontal integration in each fishery and for the South African commercial fishing as a whole.

- The process of transformation in the SA fishing sub-sector will be defined as political transformation, economic transformation and structural transformation. The definitions may differ between fisheries.

3. Economic and sectoral study (ESS)

Economic and sectoral analyses of the SA fishing sub-sector should begin by firstly, identifying the various fisheries that exist, secondly, establishing the number and the characteristics of all fishing vessels operating in that fishery, thirdly, (where possible) stratifying each fishery into groups by scale, function and ownership of vessels, and lastly by separating the fishery into sectors (class of enterprise).

A discrete economic analysis, using representative cost data, will be undertaken for the purpose of:

- Providing precise definitions of scale-groupings of vessels within each fishery, thus enabling a division into sectors.

- Quantifying the concept of allocating rights in minimum economic units (viable quota) by scale-grouping of vessel operating in each particular fishery.

- Similarly, quantifying the minimum viable quotas needed per sector.

- Analysing realistic options regarding fee structures – charges and/or levies and/or royalty taxes – that MCM can use to capture economic rent from fishing activities.

- Determining options regarding the rate at which fees can be levied and thus also the amount of income that MCM can raise from each scale-group and each sector.

- Measuring the relative shares of TAC/TAE by sector.

- Providing a measurable estimate of the level of transformation (as defined), including the distribution of the wage bill to previously disadvantaged individuals.

The above necessitates the collection and compilation of a number of databases:

- A complete database of the functional characteristics of all vessels used for commercial fishing in South Africa, including their distribution of rights, ownership (where possible) and employment characteristics.

- A representative cost database for each scale-group of vessel in each fishery.

- Historic catch statistics (where possible).

- Historic price/quantity data (where possible).

- A database that links fishing activities to processing operations. This database should include processing capacity, ownership structures and employment characteristics.

The compilation of the databases, and in particular the representative data, should be undertaken in consultation with industry and MCM. Data will be linked algorithmically and summatively to produce a series of decision tables.

4. Outputs

Fishing industry classification: In the light of relevant provisions in the MLRA, the study contemplated in this document will:

- Revise the classification of fisheries within the SA fishing sub-sector as currently used by the Department, including the terminology associated therewith.

- Where possible to determine and describe the parameters to be considered in order to classify vessels into scale-groups (e.g. size and/or function) within each fishery.

- Classify each fishery by sector similar to the DTI's big and SMME grouping system.

- Suggest a precise and functional definition of transformation within the SA fishing sub sector.

Economics and sectoral study (ESS): The study contemplated in this document will also provide a functional analytical framework, which can be used to generate decision tables, to enable decision makers to determine the economic impact of options available to them. The decision table will contain the following:

FEES (due regard will be given to the viability of the vessels engaged in commercial fishing activities).

- An analysis of the current fee structure of MCM and a study of the distribution of revenue collected between levies, leases and other fees that the MLRA makes provision for.

- Realistic options regarding different fee structures and rates that the MLRA makes provision for, and an indication of the distribution of revenue collected from the various instruments.

- With regard to the above, determining the amount of income that MCM can raise from each sector.

VIABLE QUOTAS (consideration will be given to the scarcity of the resource and the overall objective of accommodating new entrants to the industry).

- Realistic options regarding the minimum viable quota allocation required for vessels in a scale-group, in its respective fishery, to operate viably.

- Realistic options regarding minimum viable quotas to sectors.

VERTICAL AND HORIZONTAL INTEGRATION (due regard will be given to the fact that vertically integrated enterprises add value to the product by branding and efficient fishing practice).

- Measuring concentration of ownership from a vertically and a horizontally integrated point of view.

- At the bottom end of the scale, highlighting the inefficiencies that result from sub-economic short term quota allocations, particularly to Black new entrants.

TRANSFORMATION (transformation objectives will be analysed with selected potential socio-economic, socio-political and legal implications along with the necessary development interventions required to achieve policy option goals).

- Socio-political, socio-economic and legal indicators with respect to options and alternatives for redistributing different proportions of TAC/TAE between sectors.

- Socio-political, socio-economic and legal indicators with respect to options and alternatives for redistributing different proportions of TAC/TAE from White individuals to Black individuals.

The decision tables contemplated above will specify the input data (parameters) needed, data sources and data accessibility. It will also address the constraints in terms of insufficient data existence, data quality, or data accessibility, as well as proposals on resolving such problems.

The results of the fishing industry classification study will be presented in a written report and a tabulated form.

The results of the economic and sectoral study will be:

- Consistent with the terminology and classification scheme devised in the fishing industry classification study.
- Presented in the form of a series of decision tables.
- Attached to the decision tables will be appendices providing more detailed explanations of the indicators and measures used.
- A written report dealing with the methodology employed to derive the indicators and measures used in formulating the decision tables.

The researchers will attempt to integrate the relevant MCM staff during the process of the study. The purpose of this is to enable key MCM staff to completely understand, and make inputs into, the process, methodology and analytics of the study. The aim of this output is to maximise the value the study to MCM and to enable a continued use, adaptation and sophistication of the decision tables by MCM.

Finally, the study will inform a future process for further data acquisition, data refinement and an increasingly complex, but more complete and sophisticated, analytical approach.

APPENDIX 1.2: DATA REQUIREMENTS

To achieve the outputs required by the Terms of Reference the following instructions were given to the sub-consultants:-

There are four tasks that needed to be completed:

- A report on the fishery including a scale distribution arrangement of the fleet.
- A vessel database that captures certain characteristics of ALL the vessels in the fleet.
- Time series data that plots landed prices to quantities sold of directed catch and by-catch since 1994. The entry and exit of vessels into the fishery since 1994 is also included.
- A database on certain characteristics of the shore based activities.

As the information required is general, please attempt to provide as much additional detail and data as possible that brings out the special circumstances of the fishery you are dealing with. <u>However, it is imperative that all data requested be provided for a 100% sample of vessels in the fishery and a 100% sample of shore based activities</u>.

1. Report on the fishery

This should be a comprehensive report on the fishery and should include all aspects that might capture its special circumstances. All additional information that the consultant deems important should be included with as much data as possible. For example:

- An historical perspective
- The importance of shore based activities to the well-being of the fishing activities
- Perceptions on transformation

Once the vessel data has been collected, the consultants have to use their experience in the fishery. You must divide the fleet (for the specific fishery) into broad categories based on vessel characteristics in order to determine the scale distribution of the fleet. Please provide a detailed justification/argument why you (the consultant) believe that the fleet can be sub-categorised the way you have recommended. Also, arrange the vessel database according to this scheme, namely, the group of larger vessels first followed by progressively smaller groups – please demarcate your grouping on the spreadsheet.

2. Vessel data

This data should be collected for every fishing vessel (i.e. a 100% sample of all commercial fishing vessels) and arranged per fishery (it must also be possible to cross tab between fisheries). It must be for the current period, that is, January 2000- January 2001.

The data should be collected on a vessel by vessel basis. It should be arranged in electronic format with vessels in rows and the information pertaining to each vessel along columns – as demonstrated below. Please ensure that all information below is captured for every vessel in the fleet (you can provide additional data/information and this would be appreciated, but don't leave any of the required data out).

Please provide the data in electronic format to Larry Oellermann and to Dinty Mather (d.mather@ru.ac.za). It can be in Excel or Quatro-pro. A web based data input site is available at venus.sabex.com/mcm. This site is application dependent and requires Internet Explorer to access it. Please send a hard copy of your database to Larry Oellermann.

1. Vessel information								2. Specific information		
1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.1	2.2	2.3

Key:

1. Vessel information

1.1 Vessel number
1.2 Vessel name
1.3 Construction year
1.4 Vessel length
1.5 Call sign
1.6 Mass of rights
1.7 Classification: [if multipurpose must state the fisheries involved and proportionate uses (see section on access rights)]
1.8 GRT

If any other general vessel information is necessary or appropriate to the specific fishery add it here under sub-section data fields 1.9, 1.10 and so on. The consultant must point out, in a separate report, why they have added the field/s.

2. Specific information

2.1 Deck type
2.2 Trawler type
2.3 Hull material
2.4 Hull type
2.5 Power type
2.6 Horse power
2.7 Winch power
2.8 Lights kilowatt
2.9 Propellor type
2.10 Engine type (inboard/outboard)

2.11 Onboard storage
2.12 Processing and cooling

Any data fields that are deemed unnecessary for this specific fishery must still appear under their codes and filled with a 00. The consultant must justify, in a separate report, why these fields are not necessary.

Extra specific information regarding the vessels in the fleet that the consultant thinks an important consideration should be added under fields 2.13, 2.14 and so on. The consultant must point out, in a separate report, why they have added the specific field/s.

3. <u>Harbour</u>

3.1 Harbour registration
3.2 Harbour where landings occur

4. <u>Crew</u>

4.1 Officers:	4.1.1 designation (S - skipper, M - mate, etc) 4.1.2 race (B - Black, W - White) 4.1.3 sex (M - male, F - female) 4.1.4 education (licences, etc) 4.1.5 type of employment (F- full-time, P - part-time, C - commission based) 4.1.6 income (weekly)
4.2 Fishing crew:	4.2.1 race (B - Black, W - White) 4.2.2 sex (M - male, F - female) 4.2.3 education () 4.2.4 type of employment (F- full-time, P - part-time, C - commission based) 4.2.5 income (weekly) race
4.3 Non-fishing crew:	4.3.1 designation (C - cook, Q - quality control, E - engineer) 4.3.2 race (B - Black, W - White) 4.3.3 sex (M - male, F - female) 4.3.4 education () 4.3.5 type of employment (F- full-time, P - part-time, C - commission based) 4.3.6 income (weekly)
4.4 Shore based crew:	4.4.1 designation (O - off-loader, W - waalskipper, M - maintenance crew) 4.4.2 race (B - Black, W - White) 4.4.3 sex (M - male, F - female) 4.4.4 type of employment 4.4.5 duration of employment per cycle 4.4.6 income (daily for O, weekly for W and M)

For the shore skipper and maintenance crew be careful of double counting as these employees often are shared between a number of vessels. <u>All other shore based employment will be dealt with under vertical integration.</u> Place the casual labour, or off-loaders, fields before the shore skipper and maintenance crew.

5. <u>Ownership of vessel</u>

5.1 Individual:	5.1.1 Name of individual 5.1.2 Contact details 5.1.3 Race (B - Black, W - White) 5.1.4 Sex (M - male, F - female) 5.1.5 Percentage of ownership

5.2 Trust:
5.2.1 Name of trust
5.2.2 Contact details
5.2.3 Race of trustees (B - Black, W - White)
5.2.4 Sex of trustees (M - male, F - female)
5.2.5 Percentage of ownership

For ownership by many individuals or trustees, list as follows: The example shows two vessels, one owned by two individuals and the other owned by a trust with three trustees.

5. Ownership of vessel								
5.1 Individual					5.2 Trust			
5.1.1	5.1.2	5.1.3	5.1.4	5.1.5	5.2.1	5.2.2	5.2.3	5.2.4
Joe	Box 11	W	M	80				
Mary	Box 12	B	M	20				
					FF	Box 1	B	M
							B	F
							W	F

5.3 Company:
5.3.1 Name of company
5.3.2 Contact details
5.3.3 Mames of shareholders (for small companies name the individual shareholders, for larger companies name parent company - look up in annual reports)
5.3.4 Percentage shareholding
5.3.5 Race of shareholder (B - Black, W - white – see example below)
5.3.6 Sex (M - male, F - female)

An example of company ownership data is shown below. For a small company, e.g. FishCo, there are 3 shareholders of different races who own the vessel. For a larger company, e.g., PJ's, 40% is owned by B. Rand (a Black empowerment listed company) and 60% owned by other shareholders, sex distribution unknown (00 in data field).

5. Ownership of vessel					
5.3 Company					
5.3.1	5.3.2	5.3.3	5.3.4	5.3.4	5.3.4
FishCo	PE	Mr A	10	B	M
		Mrs C	30	W	M
		Mr M	60	B	M
PJ's	CT	B. Rand	40	B	00
			60	W/B	00

At times it will be important to provide additional information of ownership structures. Please provide as much detail as possible in written form.

If more than one vessel is owned by the individual, trust or company, and with different fisheries, then this should be captured by a database organising system (measuring horizontal integration)

6. <u>Access rights</u>

6.1 Name of holder of rights
6.2 Contact details
6.3 Race of right holder (B - Black, W - White)

6.4 Sex of right holder (M - male, F - female)
6.5 Type of right (e.g. hake, squid)
6.6 Quantity (500 tons, 8 fishers)
6.7 Prices paid per Kg of quota/catch leased

List the names of all rights holders for whom the vessel fishes. This should include all types of rights held by multi-species fishing vessels. The important thing here is that all allocated rights are accounted for and can be cross tabbed back to MCM's lists.

7. By-catch and discards

7.1 By-catch	7.1.1 type (e.g. kingklip) 7.1.2 proportion to allowable catch (20%)
7.2 Discards	7.2.1 type 7.2.2 proportion to allowable catch

Where there are different types of by-catch and discards, list these beneath each other similarly to the scheme shown under ownership.

8. Vessel value

8.1 Market value of vessel
8.2 Replacement value of vessel

9. Harvesting capacity

9.1 Cycle length (days)
9.2 Max onboard storage (kg's)
9.3 Cycles per year — 9.3.1 maximum cycles per year; 9.3.2 average number of cycles per year

10. Product distribution

10.1 Name of company who buys the vessel's catch (if sold to the general public,enter GP in this field and 00 in the following fields under section 10)
10.2 Proportion of catch sold to this company
10.3 Address of company
10.4 Does the company process the product? (Y - yes, N - no)
10.5 Does the company market the product? (Y - yes, N - no)
10.6 Does the company own the vessel? (Y - yes, N - no)

11. Nature of fishing and gear type

As this is probably specific to each fishery, provide a classification for the database using the scheme above.

Based on your knowledge of fishery please give a score between 1 and 10 (10 is the best) on the principles of sound ecological balance and environmental impact based on, among other things, gear type, fishing practice and an evaluation of by-catch and discard practice.

3. Time series data

1. A time series beginning 1994 to current should be compiled. This time series should be a brief summary of the *detailed vessel characteristics*. Important data points are

   - name of vessel

   - distribution of access rights used on the vessel on a year to year basis

   - harvesting capacity of each vessel (see point 9 above).

As the entry and exit of vessels in a fishery should have not changed significantly this is simply a matter of checking changes in the fleet. Where changes have occurred, it is important to place a date on removal or addition to the fleet. Where a vessel has been removed please try to get the vessel data outlined in section A (also give a reason why the vessel has been removed from the fleet - if transferred to another fishery should be able to cross tab this information).

2. Attempt to gather as detailed a time series, as far back as is reasonable, on prices for the product (beach prices). It is important to link the prices to quantities at the time of sale. It would be useful if this could also be linked to the quality of the product. While doing this please also compile similar time series of consumer prices (if possible), export prices and any other commodity prices that you feel are important for this specific fishery.

Here again the consultant's knowledge of the industry is very important. Please try to give a well argued and carefully reasoned opinion on the link, if any, between the scale of distribution classification (section D) and the quality of the product. Also give a backed up opinion on the possible link between quality and horizontal integration (where the processing/marketing company owns the vessel/s).

3. As above for by-catch prices

4. Shore based activities

The task is to attempt to link the on-shore activities (packing, processing and marketing) to the off-shore activities (rights allocations). Please provide, in a similar manner to the vessel database, a spreadsheet in electronic format to Dinty Mather and to Larry Oellermann. Also include a hard-copy to Larry.

1. For each company directly involved in on-shore activities, the consultant must determine the current capacity (how much fish, and what species, do they need to remain viable) – should be able to cross tab this back to the vessel database.

    1.1 Company name
    1.2 Geographical location
    1.3 Capacity
        1.3.1 species
        1.3.2 tons

For some large companies there may be a number of different plants, please provide separate information on each plant. For each species, provide separate entries.

2. How many people does the company employ

    2.1 Total number (proportion full-time and casual workers)
    2.2 Percentage Black employees
    2.4 Percentage female employees
    2.3 Percentage of Black managerial employees to White managerial employees

Continue to separate out the data per plant.

3. Proportion of Black shareholding (if a listed company, find out if any other company has a major shareholding and attempt to determine the racial mix of that company's ownership - usually published in annual company reports).

4. To what extent does each of the processing facilities add value to the product (pack, prepare and pack, can, market and so on), that is, what is the ratio of value added to the landed price (e.g. R1 beach price, R5 sale price = 5:1). If the company owns the vessels, attempt to find out the internal pricing policy.

5. Percentage sold in local markets (inverse of exports)

6. Market value of plant and replacement value of plant.

5. Representative cost data

The representative cost data is to be collected from appropriate financial institutions and industry bodies. The costs should be in form of income statements, or cash flow statements, of a representative vessel for each scale group in each fishery.

1. THE ABALONE FISHERY

1.1 Introduction

The abalone fishery is based on subtidal stocks of a single species *Haliotis midae*. The fishery extends along 580km of coastline between Cape Columbine and Quoin Point. Due to unsuitable sandy areas, marine protected areas or closures to the commercial fishery, not all of this area is fished. In 1986 the Sea Fisheries Research Institute (SFRI) (now Marine & Coastal Management, MCM) divided the coastline into seven commercial abalone fishing zones (Figure 1.1). In an attempt to balance fishing effort between the zones, each zone is assigned an annual total allowable catch (TAC) determined by annual fishery-independent stock assessments conducted by researchers from MCM. The total annual allocated quota is the sum of TACs in all seven areas (Table 1.1). The fishery is further managed by a minimum legal size of 138mm shell length (114mm shell breadth), and a fishing season from 1 November to 31 July.

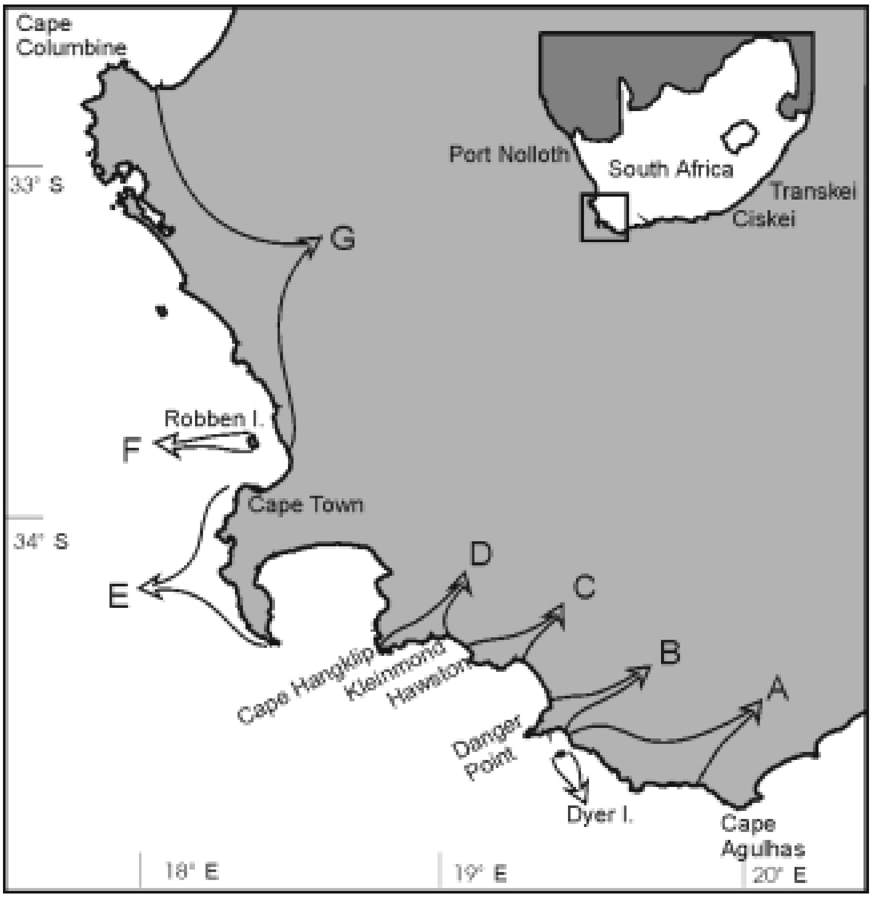


Figure 1.1. The commercial *Haliotis midae* fishing zones A-G on the southwestern Cape coast (from Tarr 2000).

The traditional fishing grounds that have consistently yielded over 90% of the TAC are spread between Quoin Point and Cape Hangklip (Zones A-D). In recent years, however, the combined effects of ecological changes and escalations in poaching have contributed to a resource decline in this area, leading to serial reductions in the TAC since 1994, and final closure of Zone C to the fishery in the 2000/2001 season (Tarr *et al*. 1996; Day and Branch 2000).

The West Coast areas (Zones E and G) supported small TACs for a few years before fishing was stopped due to unsustainable levels of commercial harvest. The area was reserved for recreational use only until 1997, when fishers and quota holders were again granted low experimental TACs in these zones.

The partially protected area of Dyer Island (Zone A) and Robben Island (Zone F) are fished over a short pre-arranged period. Abalone fishing on Robben Island was permitted for the first time in 1985. Since that time the stock has been gradually fished down, with appropriate reductions in TAC aimed at arriving at a sustainable level. Today the number of vessels permitted to fish Robben Island is limited to 20. Harvesting of abalone at Dyer Island, on the other hand, is limited to a restricted fishing period. Consequently those fishers permitted to harvest around the islands, exchange the quotas allocated to other rights holders for these areas, with a portion of their own quota for other fishing zones.

1.2 History of the Fishery

The abalone fishery began in Gansbaai in 1949, soon expanding to cover the coastline between Cape Columbine and Quoin Point. Licences to commercially harvest abalone became freely available in early 1954, and by 1964 the number of licensed divers had increased to 104. Due to stricter enforcement of licence conditions applicable to divers, numbers were reduced to 68 by 1970, and to 47 by 1989.

Until 1968 catches were unlimited, and divers delivered freely to the various processing factories according to their individual fishing efforts. At the peak of the industry in 1965, there were 14 processing plants and 112 divers. Because of declining catches, the first conservative production quota of 386 t (meat mass) was set in 1968, and 341 t the following year, with each factory being granted the processing rights to a fixed percentage of the overall quota. The allocations were granted to six factories then in production, on the basis of their past performance in the industry. These quotas were not filled, however, and only in 1970 were catches limited for the first time by a quota of 227 t. Production quotas were further reduced to 163 t between 1979 and 1982, following concern that falling catch rates reflected declining stocks. In 1982 one of the processing factories had a large proportion of their production quota permanently confiscated, and this was subsequently issued to the newly formed Abalone Divers Association. As a loophole in the existing control system enabled the factories to cut abalone into pieces without declaring them against the existing production quota, the whole-mass allocation was introduced in 1983 at 660 t, and remained at this level for a further two years. In 1986, area closures resulted in an effective 3% drop in the TAC to 640 t.

The whole mass TACs for the seven areas from 1985 to 2000/2001 is shown in Table 1.1.
With the formation of the Abalone Divers Association, the divers were able to improve their income as they were granted equal shares of an export concession. Two years later in 1984, the divers became legally obligated to deliver their catches to specified factories and, on the basis of past performance, were granted fishing rights to a fixed percentage of the existing quota, giving them a fixed 'investment' in the industry. The 'entitlements' were fully transferable, heritable and saleable, a condition of sale,

however, being that individual members or groups of divers of the Abalone Divers Association had first rights to a quota offered for sale. Whereas this increased the individuals' total investment in the fishery, it also had the effect of preventing new entrants from joining the fishery.

Table 1.1. Annual total allowable catch (TAC) in tons for the commercial Zones A to G including Dyer Island (adapted from Tarr 2000).

	ZONE								
Fishing season (years)	**A**	**B**	**Dyer Island**	**C**	**D**	**E**	**F**	**G**	**Total**
	Buffelsjag	Gans-baai		Mudge Point	Klein-mond	Cape Point	Robben Island	West Coast	
1985/86	-	-	-	-	-	-	50	-	-
1986/87	180	160	0	160	40	20	50	30	640
1987/88	190	140	0	160	50	20	50	30	640
1988/89	190	140	0	160	50	20	50	30	640
1989/90	195	140	0	170	50	20	50	0	625
1990/91	195	140	0	170	50	10	30	0	595
1991/92	195	145	25	150	55	0	30	0	600
1992/93	195	150	25	150	55	0	30	0	605
1993/94	195	150	25	140	90	0	15	0	615
1994/95	205	150	25	130	90	0	15	0	615
1995/96	205	150	25	130	90	0	15	0	615
1996/97	205	150	25	65	90	0	15	0	550
1997/98	185	150	25	30	105	5	15	15	530
1998/99	185	150	25	15	105	5	15	15	515
1999/2000	185	145	25	5	105	5	15	15	500
2000/01	158	113	25	0	35	5	20	15	371

By the early 1990s, the commercial fishery thus consisted of two components:

- ~50 licenced divers who owned the right to harvest and deliver a fixed, yet small percentage of the annual TAC, and
- about six "packers" (quota holders) who owned the receiving, processing and marketing rights to the bulk of the annual TAC.

In the 1993-1994 season a 10 t community trust quota was allocated for the first time, which is still active today. Up to the early 1990s, the management measures in place appeared effective in minimising illegal harvesting practices and ensuring sustainable catches. Divers reported improved catch rates, and new divers bought into the fishery as there was a strong possibility of increased TACs in the future. During 1995-1996, 10% of the TAC was allocated to 10 new entitlement holders, ranging from 2 to 10 t. However, this was not paralleled by a concurrent increase in the TAC. As many of the original 'large' quota holders either held long term rights originally allocated to them by the government, or had purchased rights from the government, the resultant decreases in the proportion of the quota under their jurisdiction met with some resistance. The following season saw a further decrease in the TAC to 550 t, with a concomitant establishment of a further six new rights holders (Table 1.2).

Changes were also evident amongst the harvesters. During 1991-1992, divers were for the first time permitted to employ assistant divers, thereby enabling older divers to remain active in the fishery. Five new divers joined the fishery in the 1992-1993 season, and 11 of the rights holders employed assistant divers. In December 1994 the three abalone divers associations amalgamated into one: the Overberg Commercial Abalone Divers Association (OCADA). By the 1996-1997 season, a further 12 new entrants had joined the fishery, and 26 of the 62 rights holders were employing assistant divers.

The Marine Living Resources Act (No. 18 of 1998) (MLRA), gazetted during the 1998-1999 fishing season, initiated major transformations for the abalone fishery. A cornerstone of the MLRA was to allow more equitable access to marine resources for all South Africans. Consequently, the allocation of TAC during the 1998-1999 season was expanded to cater for all participants in the fishery. Whereas TAC was previously applicable only to the commercial sector, the subsistence and recreational sectors were now also included. The TAC for 1998-1999 totalled 820 t, which was calculated as the sum of a "traditional" commercial TAC of 515 t (a reduction of 15 t from the previous season), a recreational take of 220 t, and a subsistence allocation of 85 t. Reallocation of the commercial TAC between the divers and the previous "large" quota holders was achieved on the basis of a 3:1 ratio in published product prices (Stuttaford 1997) obtained by the quota holders relative to that paid to the divers.

Table 1.2. Abalone Processing Quotas (kg whole mass) between 1991 and 1998.

	91/92	92/93	93/94	94/95	95/96	96/97	97/98
Abalone Processors				35999	32399	26249	27931
Abalone Packers (Pty) Ltd							
Aquafarm Development						3947	
Atlantic Fishing Enterprises						3947	
Blue Star Holdings (Pty) Ltd				60742	54668	44291	47117
De Wit LL					5000	6579	4293
Enkalweni Fishing					5000	6579	4293
Hawston Abalone Divers					2000	2632	1749
Hawston Fishers Co.					10000	13158	8639
Hermanus Community Trust				10000	9500	12500	8162
Impala Fishing						3947	
Kapiera N					2000	2632	1749
Komicx Productions					5000	6579	4293
Nexus Commercial Boatowners					5000	6579	4293
Nowers M					2000	2632	1749
Overberg Perlemoen					5000		
SA Vissersgemeenskap						3947	
Sea Plant Products	191699		196871	193296	173966	140942	149884
Southern Boat Association						6579	4293
Tuna Marine				171699	169529	137347	146121
Van Ster LL						3947	
Waenhuiskrans Vissers						3947	
Walker Bay Canners				143264	128860	104461	111141
Zwelihle Jugamini					5000	6579	4293
Established Industry					568922	465790	490356
New entrants					46000	53949	35351

The new allocations between the various sectors for the period are shown in Table 1.3. However, due to the difficulties of administering these changes, commercial abalone fishing during the 1998-1999 season did not commence until January 1999.

Table 1.3. Allocation of the new TAC (tons) for 1998-1999 was broadened to include the recreational and subsistence fisheries, previous participants, as well as new entrants (from Tarr 2000).

DETAILS	TAC 1998/1999
Recreational fishery	158.5
Subsistence fishery	158.5
New entrants, allocations by the fisheries Transformation Council, and legal appeals	133
Previous "large" quota holders	280
Divers	90
Total	820

The re-distribution of the commercial TAC had two major obectives:

1. To give greater stability to the commercial fishery by consolidating the previous two-part structure (entitlement holders and quota holders) into one category: the rights holders. Divers and "producers" would now hold the right to dive, process and market their percentage of the

annual TAC. Furthermore, rights holders who do not harvest their own abalone can employ qualified divers of their choice to fish their quota on their own terms.

2. To introduce new entrants to the fishery from previously politically and socio-economically disadvantaged backgrounds.

There are presently 47 quota holders who hold fishing rights to a fixed percentage of the annual TAC, of which seven have rights to also process the catch (Table 1.4). Also, the divers now have sole rights to 90 t, which they can harvest and market. The quota holders are, however, legally obliged to deliver to specific factories, ensuring reliable deliveries, and increasing the control of overland transport of abalone.

As a result of these transformations, there was a tendency for individually held rights to be transferred into a company. Consequently, the current rights holders are all companies or closed corporations with, on average, over 85% of shareholders or partners being previously disadvantaged persons. Subsequent to the MLRA, some of the new entrants into the abalone industry sold their entire quota and the corresponding export permits to the larger processing establishments who subsequently fished, processed and marketed the product for them. The quota holder was either paid upfront for his quota, or paid pro rata at the end of the season when the quota had been filled. In some cases, the quotas were sold to foreign buyers whose prices per kg are substantially higher than those offered by local buyers. As the relevant export permits accompany the sold quota, it is claimed that these are subsequently used in the export of illegally caught abalone.

Only about 50% of the current rights holders own their own vessels, or have shares in a vessel to fish their quota. Where a vessel has been purchased in a joint venture agreement between rights holders, ownership of the vessel is usually split between one of the larger processing companies and three or four smaller quota holders. All administering (fishing, processing, marketing and exporting) of the smaller quota holders' catch is then undertaken by the large processing company. Such joint ownerships of vessels can be interpreted in two ways: it is either an attempt by the smaller quota holders to avoid being considered as "paper quota" holders, or a means by the processing establishments of ensuring a reliable supply of abalone in the event of future quota cuts. Those rights holding companies that do not own vessels, use either the vessels owned by their shareholders, or contract the divers and vessels of OCADA or South African Commercial Fishermen's Corporation (SACFC) to fish their quota. The individual vessels (and associated divers) are leased by the companies to catch a pre-arranged proportion of the assigned quota.

Table 1.4. The allowable catch in kilograms granted to the Abalone Rights Holders for the 1999-2000 and 2000-2001 fishing seasons. Those rights holders with processing rights are also indicated.

RIGHTS HOLDER	PROCESSING RIGHTS	1999/2000	2000/2001
Air Fresh Fisheries cc		3000	2226
Any Name 155 (Pty) Ltd		2700	2003
Arrowline Fourteen cc		2000	1484
Biz Africa 655 (Pty) Ltd		5000	3710
Blue Point Fishing cc		2000	1484
Bato Star Fishing (Pty) Ltd	X		
-Blue Star Holdings (Pty) Ltd		24104	17885
-Combined Abalone Processors (Pty) Ltd		14289	10603
-Enkalweni Fishing (Pty) Ltd		4000	2968
Blue Waters Fisheries cc		2000	1484
Boat Rock Fishing cc		4000	2968
Buffelsjag Abalone cc		2000	1484
Cape Fish Processors cc		8810	6537
Captain Fishing cc		2000	1484
Eyabantu Fisheries cc		2000	1484
Flexivest Sixteen (Pty) Ltd / Gansbaai Ko-op Visserye Bpk		10000	7420
Hawston Abalone Divers (Pty) Ltd		4000	2968
Hawston Vissersmaatskappy		9614	7134
Hermanus Community Development Co.		3000	2226
High Wave Fishing cc		2000	1484
Ichtus Fisheries	X	2000	1484
Komicx Products (Pty) Ltd	X	4000	2968
Kwekwana Fishing Co-op (Pty) Ltd		4000	2968
Latief Albertyn Fisheries cc		4000	2968
Louw's Fishing cc		4000	2968
Moneyline 1781 cc		2700	2003
Moneyline 1788 cc		2700	2003
Mudge Point Fishing		3000	2226
Mzamo Fishing cc		4000	2968
Nama Khoi Fishing (Pty) Ltd		4000	2968
Nexus Commercial Boatowners (Pty) Ltd		4000	2968
Overberg Commercial Abalone Divers Ltd		87290	64770
RJA Enterprises cc		4000	2968
SA Commercial Fishermen's Corporation		17620	13074
Sea Plant Products Ltd	X	75678	56154
Sea Point Fishing cc		4000	2968
Seasonal Fishing cc		2000	1484

RIGHTS HOLDER	PROCESSING RIGHTS	1999/2000	2000/2001
Sidloyi Fishing cc		2000	1484
Sikho Nathi Fishing		4000	2968
Sizabantu Fishing Corporation cc		2000	1484
Southern Point Oceanic Fresh Procurers (Pty) Ltd		3000	2226
Suidelike Bootassistente Maatskappy Pty Ltd		13086	9708
Thembani Fisheries cc		2000	1484
Tivica Eleven (Pty) Ltd		2000	1484
Tuna Marine (Pty) Ltd	X	73752	54724
Walker Bay Canners Ltd	X	55857	41446
York Point Fisheries cc		4000	2968
Zwemini Fishing (Pty) Ltd.	X	2800	2078
TOTAL		500 000	371 000

1.3 Nature of Fishing and Gear Type

The fishery is conducted by divers working from small boats in <10m water depth. The divers are all registered (Department of Labour) commercial Class III or Class IV divers. Divers collect the abalone individually by prising them from the rocks with a flat, blunt blade. A regulation exists governing the collecting tool used in the harvest of abalone. The abalone are collected in an open-necked bag, whose cumulative weight is counteracted by an airlift attached to the collecting bag. This is partially inflated during collection and fully inflated when surfacing. Once on board, the catch is checked immediately by the diver-tenders for undersized animals, which are subsequently returned to the water on site.

The divers operate from 4-6m fibre-glass ski-boats with twin-outboards and licensed to carry a crew of 4-6 persons. Smaller fibre-glass dinghies or inflatable boats with single outboard motors are occasionally used by some divers in shallow areas inaccessible to the larger craft. Abalone boats usually operate with a crew of four persons: a diver, who is assisted by a boat handler and two boat assistants (one of whom is an assistant diver) who tend the compressor and air-lines, and check the catch for undersized animals.

The boats are fitted with an onboard surface-supply compressor, capable of supplying two divers with compressed air. These ‘hookah’ systems allow the divers greater mobility underwater in the dense kelp forests. In many cases the compressors are home-built using 5-20kW Honda motors, although some commercially available models are also used. The catch is usually stored in onboard compartments (laaitjies) or crates, and kept moist with wet sacks. However, with the change towards live marketing (see below), there has been an increased emphasis on product quality, and some vessels have invested in onboard sea-water tanks to keep the catch alive and fresh. Divers can operate only during calm weather and sea conditions, and consequently fishing occurs an average of only 3-5 days a month during the fishing season. A diving day consists of numerous short dives with a combined duration of 3-5 hours. Only one diver may operate on the fishing vessel per day. There are currently 76 divers employed in the fishery, with a further 46 assistant divers.

The boats used in the fishery are trailered, towed, launched and retrieved by four-wheel drive vehicles or small pick-up trucks. The vessels operate independently from the harbours and slipways specified in the abalone fishing permit conditions. Damage to beaches and sensitive intertidal habitats by traffic from tow-vehicles and trailers is therefore negligible.

The stipulated launch sites are:

Buffeljagsbaai	Gansekraal
Gansbaai Harbour	Yzerfontein
Hermanus Harbour	Buffelsbaai
Kleinbaai	Witsands
Kleinmond	Cape Town Harbour
Maasbaai	Hout Bay Harbour
Saldanha Bay Harbour	Oceana Power Boat Club (Granger Bay)

The fishery is currently conducted from some 90 vessels registered to catch abalone. The vessels are owned directly by the holders of abalone fishing rights, or (in most cases) are owned by shareholders of the company holding the fishing rights, and leased to catch a pre-arranged proportion of the assigned quota. In a few cases, the boats are privately owned by independent divers, who are contracted by the rights holder to catch their quota in a particular fishing zone. The majority of vessels also held a linefish B-licence in the past, enabling the vessel owners to maximise the use of their boats throughout the year, targeting linefish during the abalone closed season.

For each vessel contracted/leased, the rights holder is theoretically required to obtain a fishing permit. The contracted/leased vessel may, however, be requested by a processing establishment to ‘over fish’ the assigned proportion of that rights holder’s quota in a particular fishing zone. The ‘over fished’ tonnage is subsequently split amongst the smaller rights holders, whose quotas for that zone are administered by the processing establishment. In this way, a single fishing permit may be used to catch the quota for a number of rights holders. This also implies, however, that a particular vessel, although contracted by a single rights holder, is in effect also fishing for other rights holders. Such details are difficult to trace without direct communications with the individual divers and/or boat owners, and thus do not appear in the database provided. This must be kept in mind when analysing the tonnages caught by vessels contracted to fish for the rights holders.

It is generally felt by rights holders, that the abalone fleet is severely overcapitalised at present due to consistent decreases in the TAC. Transformation of the industry has resulted in a 30% increase in the number of vessels partaking in the fishery over the past five years. This is primarily because new entrants are pressurised, or feel obliged, to invest in a vessel in order not to be seen as a “paper quota” holder. As individual quotas have been dropped, one would expect the majority of the new vessels to have smaller carrying capacities, and spend fewer days at sea per season. Of the 32 new vessels entering the fishery since 1999, however, 56% are 6m or more in length, thereby tending to be larger than average for the fishery. Most of these vessels carry other licences besides that for abalone, and are used for a variety of other commercial activities including handlining, hoop-netting for West Coast rock lobster and whale watching.

The day’s catch is landed at the nearest stipulated launch site, where it is weighed on specially provided scales, and recorded by fisheries control officers. It is then loaded onto the transport vehicle where it is sealed and documented by the fisheries control officer in such a way that it cannot be tampered with, before transport to the processing factories stipulated in the abalone permit. The seal is only broken at the processing facility, and the documentation cross-checked to reduce possible loss of quota abalone during transportation. The catch may be delivered to the factory by the contracted diver, or collected at the landing site by the processing rights holder. In either case, a permit is required for the transport of the abalone. As is the case with the fishing permits described above, a single transport permit may be used to convey the catch of numerous rights holders. During transport, the catch may lose 2-4% in mass, due to loss of slime and liquid. This is referred to as “drip loss” and the rights holders are generally of the opinion that their quotas should be extended to compensate for this loss in catch weight.

Despite the unspecialised nature of the fishing gear, the fishery targets a specific species only, which is hand-selected. There is thus no by-catch, and provided the animals are carefully removed from the rocks, and not damaged, the discard mortality of the undersized catch is low. A score of 8 or 9 would thus apply to the principles of sound ecological balance and environmental impact of the commercial abalone fishery. This does not apply to the illegal fishery, however, where indiscriminate harvesting of juvenile abalone is having a severe impact on the stocks.

1.4 Scale distribution of the fleet

With few exceptions, the vessels operational in the abalone fishery are all 4-6m fibre-glass ski-boats of between 1-2 GRT, with twin-outboards. Although the few larger vessels are licenced to carry a crew of up to 8-10 persons, the personnel employed for the harvesting of abalone is limited to 5 people, regardless of vessel size. The full crew-carrying potential for the larger vessels in the fleet are is thus only met when these are used for linefishing. Furthermore, with the change towards live marketing, there has been an increased emphasis on product quality and divers are encouraged to deliver smaller quantities of abalone spread over a longer period. The maximum nominal carrying capacity of the vessels is thus also not realised, and daily landings of abalone per vessel range between 500-900kg. Scale distribution is therefore considered to be constant across the fleet.

1.5 Production and Marketing

The price received for the F.O.B product in 1991-1992 was R44/kg, increasing to around R90/kg in the mid-90s. The first major increase in the price paid to the divers for the landed product occurred in 1996-1997, when prices rose to R148/kg (Table 1.5).

Since transformation of the fishery in 1998, the quota holders are all legally required to deliver their catches to one or more of the seven factories holding processing rights. This is contractually pre-arranged each season between the rights holder and the processing facility. Although the price paid for the catch may vary between R0.50 and R1.00/kg between the factories, current prices paid to the rights holders for the catch average around R180/kg for the whole, live product.

Prior to 1991 the abalone industry primarily processed and marketed value-added products (canned products, frozen pieces and frozen shucked). Canned abalone products were the most important export product. The estimated industry average is that 28-29kg whole weight abalone make up a case of 12 cans (minimum of 340g abalone flesh per 425g can). The abalone are shucked, cleaned and soaked in brine. They are then cleaned again before being trimmed and packed by hand into cans. The cans are filled with fresh water, sealed and pressure-cooked. Processing costs run at between R18 - R22/kg. Freight costs per case of canned product range between R140 and R170. Between 1995 and 2000 the price attained for canned products on the overseas market varied from US$520 - US$910 per case.

Table 1.5. Abalone commodities produced between 1991 and 1995 (from South African Commercial Fisheries Review 1995).

COMMODITY (KG)	1991/92	1992/93	1993/94	1994/95
Canned products	128 534	128 322	118 959	64 949
Frozen pieces	19 223	24 023	15 599	14 290
Frozen whole	4 817	4 220	1 913	1 691
Fresh/live (in shell)	1 618	12 239	25 211	81 423
Dried				33
Total	154 192	168 804	161 682	162 386
Catches (MT)	605	599	613	613
F.O.B wholesale value (R'000)	26 847	32 777	53 884	54 054

During the 1991-1992 season live abalone were exported to the Far East for the first time. The amount exported has since increased annually, to the extent that during the 1994-1995 season live exports exceeded that of canned products for the first time. The abalone are selected from normal diver deliveries and kept in holding facilities (sometimes on the vessels themselves). The abalone are then packed in oxygen-filled polystyrene containers and air-freighted to the East. The yield is estimated as 86-91% of the landed product, with those abalone damaged during harvesting or with cracked shells being shucked and frozen. A further 5% loss can be expected due to weight loss and mortality during export. The marketing development towards export of live abalone resulted in the regulation, introduced during the 1992-1993 season, that catches be sealed at the slipway, to prevent possible illegal sale of abalone before delivery to the factory. Processing costs for live abalone range between R19 - R24 per kg, and freight costs are quoted at R20 - R30 per kg. The prices for the live product have fluctuated between US$30 and US$40 per kg since 1996. As value adding no longer applies, the live product fetches the highest price of all abalone commodities.

Frozen abalone products are processed and marketed as frozen-in-shell or, more commonly, frozen without the shell (shucked). The abalone are cleaned, and in some cases the shucked product may be further processed by removing the proboscis and radula, although this product fetches $2-$3 less per kilogram. The yield of the frozen flesh is about 33% of the live weight, and processing costs range between R6 - R9 per kg. Freight costs for the frozen, shucked product are around R15 per kg. Frozen, shucked abalone currently fetch US$80-US$86 per kg, whereas in-shell prices are around US$26/kg.

Rights holders dealing in live and frozen abalone attempt to export their products before the Chinese New Year (January/February) as prices can be as much as $10/kg higher between November and January. Quota fished later in the season and processed as frozen product is often held as frozen stock until the end of the year when prices on the foreign markets again improve.

A further diversification in the abalone commodity is the processing and export of dried abalone. Currently only three of the quota holders with processing rights offer processing to a dried end product (Tuna Marine, Walker Bay and Zwemini), although there are reports of countless small- and medium-scale, illegal abalone drying facilities in both the Western and Eastern Cape. The yield for the dried product is only 10% of the whole live weight, and although processing costs are comparatively high (R165/kg), freight costs average at around R15/kg. Over the past five years, the price for the dried product has risen steadily from US$200 in 1996, to US$300 in 2000.

In 1984, in response to complaints that abalone were not available on the local market, and in an effort to reduce the black-market trade of abalone within South Africa, it was made compulsory to market 10% of production within the country. This regulation no longer applies, and 100% of the product is now exported as abalone fetch the highest unit prices of any South African fishery resource on the export market. Local restaurants depend solely on abalone supplied by recreational and subsistence fishers.

Due to the infrastructure required for the canning and drying process, this is undertaken by those rights holders with processing rights and factory facilities only. Although most of the smaller quota holders also process and market their live and frozen product through the processing factories, some have established independent market links with the East.

Since 1998, the rights holders have had an influence over what proportion of their product is processed and marketed as live, frozen, canned or dried by the processing facility they deliver to. The quality of the product delivered will thus largely be influenced by the choice of the commodity to be exported. Those rights holders who export primarily live abalone, thus place a greater emphasis on product quality, and vessels fishing their quota have been fitted with crates or onboard sea-water tanks to keep the catch alive. To avoid unnecessary mortality during export, divers will also take greater care not to injure the animals when prising them off the rocks. Injured animals, or those with damaged shells are processed as frozen or canned products.

1.6 Economics and Levies

From 1953 to 1955, a commercial abalone licence was obtainable for £1, or the equivalent of about 2.5kg of exported product. The licence fee was raised to R40 in 1966, and to R60 in 1986-1987. The export price at this time was estimated at around R110/kg. The cost of a licence for a diver therefore decreased from the equivalent of 2.5kg to 0.6kg export product.

By 1994 levies had increased to R118.30 per ton, and by 1997 to R180.00 per ton. The most dramatic increase in levies occurred with the transformation associated with the MLRA in 1998, when the price was increased to R1 305 per ton.

In the past, divers were considerably underpaid by the factories for their catch. In 1973 a diver received R0.15/kg whole mass. By 1989 this had increased to R9/kg, partly as a result of the formation of abalone divers associations. Together with their export concession, by virtue of their early entry into the fishery, divers attained a position of financial security for a relatively low capital investment. By the mid-90s divers from OCADA were paid over R30/kg by the factories, and received an added R6/kg bonus from the Association. Positive predictions about the state of the stock and possibilities of increased TACs therefore resulted in new divers buying into the fishery.

During the current season (2000-2001), the divers (boat owners) receive between R12-R20/kg, depending on which rights holder he has been contracted by. For example, the divers associated with OCADA or SACFC, receive R20/kg when diving the quota for their own association, but only R13-R17/kg when fishing the quota for a processing rights holder (Tuna Marine and Walker Bay Canners). However, for every 1kg a SACFC diver delivers to Tuna Marine for processing, he gets contracted to fish 1.5kgs of Tuna Marine's quota. In contrast, OCADA divers contracted to fish for Walker Bay Canners (at R17/kg) are granted an additional 60-65% of their delivery weight to catch on behalf of the processing rights holder. Some smaller rights holders using boats not allied with either association have a similar agreement with the processing companies, although the ratio is increased to 1:2.

The price per kg received by the divers for the catch is split between the diver himself (~R8/kg), the skipper (~R3/kg) and two boat assistants (R2/kg each). The ~R8/kg which goes to the diver, however, covers not only his time, but also the running and maintenance costs of his vessel, as well as the purchase of diving equipment such as wetsuits and compressor. Depending on the zone fished, running costs for the boat and tow vehicle can amount to over R800 per day, including transport of the catch to the specified processing facility. Overnight accommodation costs for remaining in the more remote areas are also included. Some vessel owners have established a fixed fee structure for their crew. Daily rates for divers/assistant divers range from R500-R1 000 depending on whether the diver spends time in the water. Skippers receive between R350 and R400 a day, and boat assistants between R100 and R300 per day at sea. In some cases these rates are seen as minimum daily rates, and if more than a certain weight of abalone is caught, the wage changes to a *pro rata* basis.

Marketing costs range from R12-R20/kg, if the rights holder has his quota marketed by the processing establishment he delivers to. The factory also charges an additional 3-6% commission of processing and marketing costs. If the rights holder has established his own marketing links, he is able to market his product at between R3-15/kg, thereby potentially attaining much higher profits per kilogram. He does, however, run a greater risk of not receiving guaranteed payment for their product. A rights holder should therefore be able to clear a profit of between R140/kg and R165/kg for his quota before administrative and sundry expenses. In the 1998-1999 season, Tuna Marine introduced the idea of providing their suppliers with the opportunity of taking part in marketing courses. It is not known, however, whether this venture went ahead.

Table 1.6 lists the various permit fees, levies and licencing fees payable annually by the rights holders. Not included are the insurance fees for vessels and tow vehicles, as many boat owners do not insure their vessels. The rights holders are also required to finance the scales used at the slipways by the fisheries control officers to weigh the catch.

Table 1.6. Permit fees, levies and licencing fees payable annually by abalone rights holders.

LEVY/PERMIT	1999/2000 SEASON	2000/2001 SEASON
MCM Levy (per ton)	R1305	R4800
Fishing permit (per boat)	R600	R600
Permit to fish Dyer Island (per vessel)	R600	R600
Transport permit (per vehicle)	R100	R100
Export permit (per export)	R100	R100
Abalone Rights Holders Association fee (per kg)	R0.52	R2.41
Boat Licence fee: <5m 5-8m	 R150 R210	 R150 R210
Vehicle Licence fee: 4x4 single cab 4x4 double cab Landcruiser	 R395 R440 R750	
Trailer Licence fee (depends on trailer weight)	R150-R250	
SAMSA certificates 4m 5m 6m	 R148.66 R151.62 R154.56	 R148.66 R151.62 R154.56
MITB fees	R220	R220
SABS Levy (per ton frozen product)	R215	Not set yet
SABS Inspection and documentation for live export (per shipment)	Levy payer: R80 Non-levy payer: R215	Not set yet
Launching fees (per boat per launch)	R15-R25	R15-R25
Annual Harbour fees (per boat)	R200	R200

Most of the abalone rights holders are members of the Abalone Rights Holders Association. Some, however, feel that the levies charged per kg by the association are too high and that small companies should rather invest this money more wisely. Apparently these non-conformers have been pressurised by processing rights holders to join the association. Rumours also abound that the Association has suggested that non-members have their quotas reduced or withheld.

The lack of stability due to ever-decreasing TACs is of concern to many of the small quota-holding companies who would like to invest further in boats, divers and staff. Many expressed a need for more transparent interaction with MCM to discuss problems associated with quotas, levies and redistribution of access rights.

1.7 The Recreational Fishery

The recreational fishery began as open access with the only limitation being the daily bag limit of 5 abalone per person (reduced to 4 abalone per person in 1991) and the size limit of 114mm shell breadth (138mm shell length, SL). The requirement to purchase abalone permits was introduced in 1983 and two years later, a 3-month closed season was introduced. Administrative problems resulted in the sale of recreational permits being stopped in 1986, although it was subsequently reintroduced in 1988. Steady increases in annual permit sales indicated an expanding effort base.

The recreational fishery peaked at an estimated 750 t in 1993-1994, which amounted to 122% of the current commercial TAC. Thereafter, the recreational take fluctuated around 630 t caught by some 34 000 permit holders (Table 1.7), prompting the implementation of management measures to curtail further expansion of this sector.

Table 1.7. Recreational catches of abalone between 1993 and 2001 (from Moloney and MacKenzie 2001).

SEASON	NUMBER OF PERMITS	CATCH (MT)
1991/92	27 311	487
1992/93	34 532	664
1993/94	33 088	753
1994/95	34 307	616
1995/96	33 205	595
1996/97	35 215	680
1997/98	22 315	302
1998/99	14 368	123
1999/2000	22 127	212
2000/2001	16 995	107

In 1997-1998, when one third of the season had elapsed, the Minister, due to concern over the effects of poaching on the resource, stopped the sale of further recreational permits, and changed the fishing time to weekends and public holidays only. Although the weekends-only ruling was soon overturned in court, the stoppage of permit sales remained, and only 64% of the permit numbers of the previous season were sold. This resulted in a drop in estimated recreational landings during the 1997-1998 season to 302 t. For the 1998-1999 season, the Minister again changed the season to weekends only and reduced the season length to four months. This reduced the recreational take to 123 t, and in terms of the MLRA, the "saving" of tonnage was reallocated to other sectors of the fishery.

Whereas many recreational permits are used occasionally during the holiday periods only, a percentage of the recreational permit holders dive regularly throughout the season. A large proportion of these catches are sold to the restaurant trade as shucked and cleaned, or frozen-in-shell. The fishers receive between R120 and R150 per kilogram for the shucked product.

1.8 The Subsistence Fishery

In the past there has been a measure of indigenous fishing in South Africa (Tarr 1989), but abalone was apparently not a strong cultural or food component. Consequently, there have until recently been no claims for access based on historic rights. What had been denied during the early stages of the fishery (1950s-1970s), however, were some of the rights of commercial access, although this occurred only with regard to obtaining processing quotas. Diving rights were freely available to all races, the only criterion being that the participant had to be a bona fide fisher, with no additional source of income.

In 1998, in accordance with the MLRA, a new category, subsistence fishers, was defined, and these were included in the abalone fishery by the Minister. Non-commercial fishers were invited to apply for a subsistence permit, in terms of which they can sell their daily bag limit of four abalone to end users only (not to the industry). A tag system was developed to prevent multiple sales of daily bags. This newly created category, also referred to as the small-scale commercial fishery, is a potentially valuable one that can satisfy the needs of many coastal inhabitants, who might otherwise have started or continued poaching.

Almost 160 t was set aside by the Minister for allocation to subsistence fishers in the 1998-1999 season, and 236 permits to fish this quota were issued. During the 1999-2000 season 45 applicants (of 154) were granted permits to fish 45 t of abalone on a small-scale commercial basis during the eight-month fishing season. A further eight unsuccessful applicants appealed, and were also granted fishing rights later in the season. Of interest is that over 50% of the successful applicants for subsistence permits are, or were employed in the commercial fishery (and in some cases the informal fishery) as divers or assistant divers, are owners of boats holding abalone fishing permits, or are shareholders of rights-holding companies.

Subsistence divers resident around the Cape Peninsula are able to dive a maximum of between 20-25 days a month. The Eastern Cape permit holders are more restricted by weather and sea conditions, however, and dive 14-17 days per month during summer, and only 4-5 days per month during winter. As the average size of abalone on the East Coast is also smaller than in the Western Cape, the catch per unit effort is lower. It is alleged that these two contributing factors cause most subsistence divers in the Eastern Cape to exceed their daily bag limit.

The divers spend 1-1.5 hours in the water per diving day, keeping only the largest four abalone of their catch. The abalone are shucked, cleaned and individually packed together with their tags, before being frozen. As the local restaurants are supplied with abalone by recreational fishers (who accept a lower price for their product), the subsistence catch is sold to local fish dealers or “runners” for the black-market at ~R220/kg. These, however, all have official links with a few Chinese restaurants in Johannesburg, and have permits to transport the product. As the conditions of the subsistence permit stipulate that the permit holder may only transport abalone in a whole state, the dealers collect the product directly from the subsistence fishers, paying cash on hand.

The average live weight of the Western Cape abalone is ~1kg. As the yield for the shucked and cleaned product is around 33%, a daily catch of four abalone will generate ~1.3kg for which the diver receives ~R290. Once expenses (e.g. fuel, entry fees into Cape Point Nature Reserve) have been subtracted, the daily net income for divers operating around the Cape Peninsula is 72-80% (R210-R230) of this. The potential income for a good diver with a subsistence permit can thus be between R42 000 and R46 000 per season.

Substantial restructuring of the subsistence fishery is currently taking place and over 850 applicants have been received for the 208 subsistence permits to be issued for the 2001-2002 season. A total tonnage of 62.5 t has been set aside for the small-scale commercial fishery for the forthcoming season. The perceptions of the applicants for subsistence permits is that the quotas held by the "large" quota holders should be more evenly distributed amongst the small-scale commercial sector. There is also a strong opinion that the allocation criteria for the permits need to be urgently revised. It is felt that permits should be issued to persons with a past history in the abalone fishery (whether legal or informal), and capable of successfully harvesting the resource on a small-scale commercial basis (i.e. with diving experience and qualifications, suitable vessels etc.), rather than to any apllicant from a previously disadvantaged and underprivileged background.

The future of this sector will depend on the successful implementation of measures that ensure that useable fishery data are obtained. If effective management measures (such as the tag system, daily bag limits and minimum legal size restrictions) cannot be implemented, the future of the subsistence fishery is questionable.

1.9 The Illegal Fishery

The illegal or "informal fishery" has always been a factor in management of the abalone resource. In the mid-1990s poaching increased dramatically, particularly between Hawston and Hermanus in Zone C. Historically one of the highest yielding fishery zones, this area houses a community with strong links to the traditional abalone fishery. The coastline in the Mudge Point area is, however, difficult to access by enforcement staff, and thus became the centre of the poaching expansion. However, as a result of nearly five years of intensive poaching, the resource in this area has been so severely denuded that the poachers have moved their efforts farther east to Zone A.

The upsurge in poaching can be attributed to a number of factors. The primary cause appears to have been related to political changes and the establishment of a new government in April 1994. With new emphasis being placed on the constitutional rights of every individual, expectations were raised among the residents of previously disadvantaged coastal communities, who demanded formalised access to the abalone resource previously denied them. However, transformation of the country's fisheries was too slow and abalone poaching boomed.

Many coastal communities exist in conditions of high unemployment and extreme poverty, predisposing them to the benefits of short term gains. Sharply declining ZAR : US$ exchange rate made the export price of abalone attractive, fuelling demand and raising awareness of the potential gains from abalone poaching. With enforcement services unable to contain the poaching, it was permitted to expand and consolidate, resulting in the formation of sophisticated marketing networks, reportedly with connections to the drug trade and Chinese triads (Hauck and Sweijd 1999).

Changing priorities within the new government had, however, concurrently resulted in severe funding cuts for enforcement services. Continued lack of financial support led to reduced morale among enforcement staff, with allegations of corruption further weakening the effectiveness of this branch. Furthermore, political opportunism resulted in the legitimacy of the regulations being publicly questioned, and consequently, a degree of acceptance and support for poaching developed within the coastal communities, further hampering effective control.

As a result of connections with the illegal drug trade, and the ever increasing demand for abalone by illegal dealers, there are reports that many abalone divers are being pressurised into partaking in poaching activities on behalf of these syndicates. Should they not wish to co-operate, their lives and families may be threatened. Also, with quota allocations continually being cut, and the profits of individual shareholders (divers) of rights-holding companies declining, some of these have resorted to supplementing their quotas with additional illegal catches. In both cases, whilst fishing the legal quota in an area, a proportion of the divers' time underwater is spent collecting and shucking abalone. These are stored in a mesh bag which may be buoyed with a small float (empty soft-drink bottle), and the GPS position is recorded by the boat when the diver surfaces. The catch is collected by divers from the shore later during the day, or by boat at night. It is carried to a pre-arranged point, and transferred to a waiting vehicle for further transport.

The more organised and dynamic poachers work exclusively off vessels, and can harvest as much as 50-80kg (shucked weight) per day. They work whenever weather and sea conditions permit. Those diving from the shore are largely limited by how much they can carry. Boat-based operations are conducted primarily at night, with some 15-20 vessels being involved. The majority of these (75%) are illegal vessels that carry no form of fishing permits or licences. After paying off risk-takers (look-outs, drivers, runners etc.) the net price attained for the catch, however, only averages around R170/kg. Furthermore, as the diver shucks the catch underwater, the flesh yield is slightly lower (28-30%) than for abalone landed live prior to shucking. Nonetheless, the investment into the illegal fishery is reputedly substantial, with poachers purchasing inflatable boats to access shallow water areas and sophisticated technological equipment to permit working in darkness and re-locating the catch (e.g. night-sights, GPS).

The tag system developed to prevent multiple sales of daily bags collected by subsistence permit holders, is proving a useful tool for legalising the transport of illegally caught abalone. Fish dealers and black-market "runners" purchasing abalone from subsistence fishers are provided with a regular supply of tags, which are subsequently passed on to the poachers. It has also been reported that large quantities of tags have been printed by illegal dealers, for use by "runners" transporting poached abalone.

There are reputedly currently about ten illegal factories processing abalone in the Western Cape, as well as couple in the Eastern Cape. These establishments are primarily set up to dry the abalone, although canning facilities do occur. These reproduce product labels of legally canned stock, for export. Today it is estimated that 1600-1750 t of illegally caught abalone are exported annually to various countries in the Far East.

Unfortunately, the poaching take is not confined to abalone above the fishery size limit. Shallow waters (<4m depth) support exposed aggregations of abalone that are mature yet undersized, and these are easily collected by indiscriminate shore-based poachers. With an estimated 55% of the illegal catch being below the minimum legal size, poaching has the potential to cause the total collapse of the commercial and recreational fisheries. The unexpected increase in poaching, and high proportion of undersized abalone in the catch is the major cause of a change in the prognosis for the fishery from positive in 1989 to negative in 2000. With the allocation of fishing rights to many new entrants, a more effective management approach (be it the traditional or co-management option) needs to be implemented to reduce poaching. Effective control measures are imperative if the abalone resource is to remain sustainable. Should they continue to fail, however, the South African abalone resource will inevitably face commercial extinction.

1.10 Eastern Cape Resource

The traditional commercially harvested populations of *H. midae* occur primarily in the southwestern Cape. However, the species is also found east of Cape Agulhas in a discontinuous distribution pattern that extends as far as the former Transkei region. Although there has always been strong recreational activity in the area, with average annual landings estimated at 13 t, this resource has never been commercially fished. The mean size of abalone in the region is smaller than in the Western Cape. They also occur close inshore in the surf zone and are thus accessible only during spring low tides or extremely calm sea conditions.

Nonetheless, in recent years interest has been expressed in commercial harvesting of this resource, and in 1992 a small experimental fishery was initiated in the former Ciskei. Despite a reduced size limit of 100mm shell breadth (122mm SL), 3 t have been successfully landed annually since then. This experimental fishery is unique in South Africa in that fishing is carried out by unskilled shore pickers from the local community as well as commercial snorkel divers.

Additional experimental quotas were proposed for the entire Eastern Cape coast, totalling 30 t, but in recent years poaching in the area has escalated on a scale comparable to that in Zone C. Although much interest was shown in the proposed experimental fishery, it has not as yet been implemented, as the Eastern Cape abalone resource may now be denuded to the point where neither experimental nor commercial fishing will prove viable.

1.11 Minimum Viable Quotas

A minimum viable quota (MVQ) is the amount of a specific species required in order for a business to just break even. The discount rate is supposed to capture the return on capital, including a return on risk and uncertainty, thus also profit. Total revenue to the MCM from levies for the year 2000, accounting only for Total Allowable Catch (TAC) is R482 850.

It is important to note that because the abalone fishery does not have any substantial returns to scale [for example, a capital cost of R43.24 per kilogram of quota for ocean going activities with an average of 6 year turn around (around R7.21 per kilogram per year capital cost), and a high value, of for example R135 per kilogram accruing to ocean based activities], the idea of applying a minimum viable quota can lead to serious overcapacity. However, based on a simple model, the following table is constructed. Please note that this applies to a typical harvesting vessel. If more than one rights holder were to make use of the same capital equipment, individual allocations could be lower. These values could serve as a starting point in deciding on an economic allocation for the Small Scale Fishing Sector.

Table 1.8. MVQ for a typical abalone-harvesting vessel

VARIABLE	VALUE	MVQ	MVQ WITH A 10% CHANGE IN VARIABLE	% CHANGE IN MVQ
Capital (K)	5 00 000	1 446kg	1 532kg	5.9%
Discount rate (r)	20% per annum	1 446kg	1 532kg	5.9%
Fixed cost (a)	66 050	1 446kg	1 503kg	3.9%
Variable cost (b)	592.50	1 446kg	1 447kg	0.06%
Wage cost (wL)	1 500	1 446kg	1 464kg	1.2%
Fee (f)				
Levy (v)	1.305 per kg	1 446kg	1 447kg	0.06%
Charge (u)				
Other charges (ol)	36.65	1 446kg		
Price	R 135.00 R 121.50	1 446kg	1 637kg	13.2%

If one were to introduce this type of allocation across the existing commercial sector, in reality making the entire fishery Small Scale Commercial, a MVQ of, for example, 1 637kg per vessel, would introduce 194 new vessels into the abalone fishery. If each vessel harvests on average 1 200 kilograms per day (see average hold capacity), the fishing season would have to be reduced to just over 1 day. This obviously does not make sense.

1.12 Opportunity costs of recreational and illegal harvesting to the recognised commercial sector

The recreational fishery harvests an estimated 158.5 tons of abalone. In this study the economic value of recreational abalone diving to the economy has not been attempted. One can, however, estimate the value 'lost' to the commercial sector. The opportunity cost in terms of commercial harvesting (that is, the amounts forgone) would equate to:

- 14 vessels harvesting for 12 days per year.
- 84 ocean going jobs.
- A value of R21 397 500 to ocean based activities.
- A value of R83 846 500 to value adding activities.
- A total of R105 244 000.

Of major concern is the illegal sector. An estimated 1600 tons of abalone are poached per year (Pulfrich, 2001 – see report) creating a total loss in value (ocean based and value adding activities) of ***R51.2 million per year.***

2. DEEP-SEA AND INSHORE HAKE TRAWL FISHERIES

2.1 Overview

The purpose of this introductory overview is an attempt to contextualise the information and data presented in the report. Overall, this report on the South African ground fisheries attempts to provide a snapshot overview of the structure and function of the deep-sea hake fishery and its associated by-catch as well as the dual quota, inshore hake and sole trawl fishery in 2000.

Collectively the trawl fisheries are the largest, the most valuable and in some instances the most sophisticated of all commercial fishing sectors in South Africa. Not surprisingly they are also operationally and structurally the most complex of all South African fisheries. The industry is characterised by a diverse range of business models from “catch and sell” operations to highly sophisticated, internationally competitive, vertically integrated food companies. To capture the full diversity of and within the industry is an extremely complex task. This report therefore only provides the most pertinent indicators of its current structure. Although the report was meant to provide a snapshot overview of the industry in 2000, it was fundamental to reflect on its origins and development over time to understand its current structure.

The deep-sea and the inshore trawl fisheries share a common history and several companies are operational in both sectors in terms of fishing, processing and marketing of product. Perhaps one of the most pertinent observations, in contrast to all other fishing sectors in South Africa, was that the trawl fisheries did not develop along the normal trajectory from subsistence to small scale to a large-scale industrial fishery. Instead, from its early beginnings in the 1890s the trawl industry has operated as a “modern” fishery. Messrs. G.D. Irvin and C.O. Johnson pioneered trawling in South Africa and the history of trawling, processing, distribution and marketing of fish in South Africa up until around 1960 is reflected largely in the history of Irvin & Johnson (Pty) Ltd.

The historical development of the industry, exploitation patterns, management strategies and rights allocations can be broadly categorised into three major epochs: the pre-1977 era; the 1977–1992 era and the post-1992 (new dispensation) era. From its inception until 1977, despite certain checks and balances and restrictions, the industry operated largely as an open access fishery. Trawl fisheries are notoriously capital intensive and though many companies and individuals entered the fishery, not many were able to survive. During the 1960s and 1970s catches by South African and in particular foreign vessels escalated to peak at over 1 million tons and in 1977 South Africa declared its Exclusive Economic Zone (EEZ), whereupon foreign vessels were excluded. A conservative stock rebuilding strategy was adopted and in 1979 individual quotas were introduced. These strategies had a stabilising effect on the industry and this contributed towards the development of custodianship and co-management. In 1985 the Minister introduced policy to broaden access and this saw the number of participants increasing from the 7 in 1986 to 21 in 1992. The period 1992 to 2000 saw immense changes in the industry, brought about mainly by the development of the new fisheries policy that ultimately culminated in the promulgation of the Marine Living Resources Act (Act 18 of 1998). In particular, the post-1992 period is marked by the change over from quota allocation by the Quota Board to the Ministry, the short lived Fisheries Transformation Council, disruption of operations, loss of quota by the established trawling companies and the rapid entry of new participants from previously disadvantaged communities. During this period the number of participants in the deep-sea sector increased from 21 in 1992 to 56 in 2000. By contrast the changes in the inshore industry have been relatively minor and this sector experienced an overall decrease in the number of participants over the last 10 years.

Though there are several relatively "new" vessels in the deep-sea and inshore trawling fleets, the average age of the vessels in both fisheries is 24 years. By international standards this is an old fleet. The reasons for this are attributed, in the main, to the short term and therefore insecure one-year allocation of fishing rights. In 2000 there were 61 deep-sea trawlers, ranging from ice vessels to freezer vessels to modern factory freezers, with a total capacity of 47 978 GRT, total onboard hold capacity of 29 480 tons, and a market and replacement value of R754 million and R2 380 million, respectively. The majority of the deep-sea fleet (66%) consisted of vessels between 40 and 50m in length. In 2000 there were 29 inshore trawlers composed of smaller ice fish vessels, with a total capacity of 2 390 GRT, total hold capacity of 710 tons, and a market and replacement value of R55 million and R183 million, respectively. Given the many and diverse operational business models in the industry and the international quality demand driven nature of the larger and the vertically integrated companies, it was not possible to comment on whether there is over-capacity or not. Stratification of the deep-sea trawling fleet into vessel categories is not possible because of the overlap in size of vessels (by length and GRT) with operational activities. The available data revealed that many vessels in the deep-sea fleet operate at 27% below full catching capacity in order to ensure and maintain product quality, and trip duration of ice vessels has been cut by up to 50% in order to maintain fish quality.

As mentioned above, the broadening of access has been an objective of the Department since 1985 and which has been pursued more vigorously since 1992. Though information is provided on the increase in the number of participants (3 in 1978 to 56 in 2000), this study did not track racial changes in quota or vessel ownership over that time but merely assessed the current situation. In 2000, 30% of the deep-sea GRT and 33% of the deep-sea proportion of the TAC was under control of previously disadvantaged entities (companies and/or individuals), while the figures for the inshore trawl industry were 32% and 34%, respectively. It is important to note that three of the largest companies are subsidiaries of JSE listed companies (AngloVaal, Tiger Brand and FoodCorp). Therefore, the overall percent black ownership is expected to be greater than the figures provided above. An analysis of the percent of TAC held by the three founding companies between 1978 and 2000 has revealed that these companies have forfeited 42% of the TAC over this time period. This quantum was used to accommodate new entrants as well as the longline and handline hake fisheries.

With the exception of some independent small inshore trawler owners, employment in the industry is formal and in most instances is based on employment equity plans that are negotiated annually. Salaries are based on rank and years of experience. The trawling industry is the only South African fishing sector that provides formal employment, making it unique both in the local sense as well as internationally. All seagoing staff are paid commission, which is determined by quality and quantity and based on rank and years of experience. In 2000 the trawling industry employed 8 838 persons, of which 92% were previously disadvantaged individuals (PDI) and 40% female, on a payroll of around R428 million. The following table provides a summary.

Table 2.1. The percent PDI employed and the percent of payroll received per division for the combined deep-sea and inshore trawling industries.

DIVISION	%PDI	% OF PAYROLL TO PDI
Seagoing	97	93
Shore based	86	76
Processing	96	82
Marketing	43	21
Admin&Management	59	55

Largely because of the vertically integrated nature of the two largest companies, the South African trawling industry has a very high ratio of seagoing to onshore employment of 1:3. This is significantly higher than the FAO figure for international trawl fisheries of 1:1. Overall the demersal industry also has a high jobs per hake ton quota ratio of 14.6 jobs per ton.

Strategically, demersal trawling is the most important fishing industry in the country. It is also the largest and accounts for approximately 50% of the wealth generated from South African marine living resources, with annual sales in the region of R1.5 billion, which earns the country approximately R0.70 billion in foreign exchange. The industry is characterised by significant capital assets (ca. R3.2 billion at current values with a replacement cost of around R5.4 billion). Moreover, hake alone contributes approximately 50% of all fish consumed in South Africa at present. By implication therefore the trawling industry plays an important and strategic role in South African food supply and security.

The composition of the catch varies between companies. To a great extent this mirrors the quantum of hake allocations per company; the greater the hake allocation the lower the percent by-catch. The percent by-catch of the 3 largest quota holders is <10% while the average of all others is around 38% (with some as high as 86%). This clearly indicates the different business models that companies have had to develop and adopt to remain competitive and viable. The bulk of the trawl hake catch (84%) is landed as fresh fish and in frozen H&G blocks, which undergoes onshore processing. The rest (16%) is landed as skinned and frozen fillets. Despite hake not being a superior fish (e.g. in comparison to cod), South African companies have developed a wide range of internationally competitive quality products.

The South African hake industry is also characterised by a unique and high degree of vertical integration. The reasons for this become evident when one examines the history of trawl fisheries in South Africa. As early as 1905 G.D. Irvine realised that the survival of the industry in the Cape would be entirely dependent on an efficient cold storage, distribution and marketing network to the Witwatersrand, which led him to acquire a cold storage company and scheduling the famous fish train to Johannesburg. Clearly this was a successful formula but required that the company be in full control of the supply of fish in order to deliver quality products to its customers on a consistent basis. This led to the future of vertical integration of fishing, processing, marketing and distribution operations. The ESS has found that the operation of the larger fishing companies is entirely market driven, meaning that processing of a particular line of product is determined by demand, which in turn dictates the catch rate of the trawling division and gearing of processing infrastructure. Because of the integrated nature of their operations, these companies deploy their fleets in a balanced way to provide a controlled flow of the correct size of fish to onshore factories for steady year round output of a wide range of value-added, branded and packaged goods. To retain their internationally competitive status and contractual credibility requires exceptional quality control, to the point that it now involves meticulous organisation of catching, handling and processing operations. This further promotes vertical integration. Analysis of the flow of product has also shown that the majority of the small quota holders and new entrants are reliant on the pioneer companies for the processing and marketing of product and benefit from this relationship.

The concept of a Minimum Viable Quota has been examined carefully and for several economic reasons was found not to be a viable option for the deep-sea and inshore hake trawling industry. Moreover, scrutiny of the concept has revealed that MVQs could overload the system and produce the very instability that the Rights Allocation process wishes to avoid. A detailed discussion is provided in the report below.

One of the key issues of the study was to consider options for an equitable levy structure. From the outset it was assumed that the levy base would be restricted to the primary sector (up to the quayside). Given that fleet operations are integrated into different business models with varying emphasis on different markets, end products and intervening processes, no quay level operational standard for the industry as a whole was found. The solution to the problem was to develop a realistic notional standard and it was agreed that this entailed an opportunity cost approach to the problem. A standard model for a notional H&G freezer trawler was developed, using verified calculated inputs and outputs. This required detailed information on vessel costs and revenues. For the most part the outputs of the model were governed by three important variables:- (a) conventional rate of return employed, (b) the valuation of capital, and (c) hypothetical earnings. Sensitivity tables were developed to capital employed (depending on the age of the vessel at acquisition) and to catch rate. The findings and options are presented in the section on levy options in the overall ESS report.

2.2 Summary Key Facts about Trawling

Regional Factors

- activity related to spatial distribution of hake
- 95% of deep-sea hake landed in Western Cape
- 95% of inshore hake landed in Western Cape
- 5% of inshore hake landed in Eastern Cape
- hake trawling industry represents 0.75 % of Gross Regional Product of the Western Cape
- hake contributes a sixth as much as agriculture and forestry combined
- purchase of goods and services from local suppliers = R237 million per annum

The Fleet

- deep-sea trawling fleet in 2000 – 61 ships – 47 978 GRT
- inshore trawling fleet in 2000 – 29 ships – 2 390 GRT
- 84% of fish processed ashore
- Market value of deep-sea fleet – R754.1 million
- Market value of inshore fleet – R54.7 million
- Replacement value of deep-sea fleet – R2.4 billion
- Replacement value of inshore fleet – R183 million

Size and Scope

- demersal trawling accounts for ca. 50% of the wealth generated from RSA living marine resources
- annual catches of 166 700 tons from a trawler fleet of 61 offshore and 29 inshore vessels

Generation of Wealth

- annual sales of over R1.5 billion
- total foreign exchange earned – R0.70 billion
- revenue generated for Government – R0.29 billion p.a. (all sources)

Investment

- significant fixed capital assets
- R3.2 billion at current values
- full replacement cost – R5.4 billion
- 45% of replacement value comes in the form of ships

Employment

- 8 838 employed (distribution excluded)
- total wage bill R428 million per annum – labour value added equal 40% of output
- 100% of fulltime employees on fixed salaries plus commission and incentive bonuses for some

- fixed wage component makes up ca. 72% of seamen's remuneration
- Centralised bargaining structures introduced
- 3:1 ratio of shorebased to seagoing employment (consequence of processing and ship maintenance)
- very high by international standards – FAO standard 1:1; employment/hake quota ton = 14.6 jobs / ton

Human Resource Development

- trawling provides highest quality employment of all RSA fishing sectors
- trawling is the only sector providing formal employment for workers, land and sea alike
- 96.7% of all jobs in deep-sea industry are permanent and non-seasonal
- union negotiated remuneration, pension/provident funds, group life assurance, medical assistance, regular paid shore leave and annual holiday for all workers in deep-sea industry, including trawlermen
- fringe benefits of R35 million
- highly skilled labour force – 21% fully skilled and 45% semi-skilled
- training and development expenditure – R7.5 million per annum
- support for community projects – R2.7 million p.a.

Products and Markets

- domestic market fully supplied – industry provides 75% of fresh and frozen seafood consumed by South Africans
- Approximately 60% of landing destined for local market
- 45% hake exported mainly to Europe, USA and Australia
- industry is main RSA exporter of perishable frozen products
- high degree of product innovation
- hake industry internationally recognised for innovation in processing, marketing and distribution
- exceptionally broad product range (∂100 packs locally available)
- marketing focus on adding value to landed hake (H&G)

Adding Value

- optimal added values means branding – effective branding implies scale
- all SADSTIA members have HACCP approval, permitting exports to USA and EU
- investment in HACCP and product quality assets of deep-sea and inshore industry over R110 million
- labour content of processed products linked to market prices

Transformation

- industry has reconstructed significantly in terms of the White Paper
- equity ownership of major deep-sea trawling companies reconstructed
- "quota value" of affirmative investment 34%

- affirmative ownership of GRT 31%
- employee share participation schemes
- Black participation rising at all levels – 92% PDI
- unskilled 99.5% - semi-skilled 94% - fully skilled 80% - professional/managerial 65%
- affirmative action by way of regional outsourcing – R34.5 million.
- PDI make up 92% of total industry staff
- 86% of total industry payroll goes to PDI

Associations

- two demersal trawling associations
  - SADSTIA – 92% of RSA registered demersal trawling fleet
  - SECIFA – 100% of inshore quota holders and 6% of SA registered demersal trawling fleet
- representative bodies for trawler owners and operators
- emphasis on employment, efficiency and adding value to raw material
- recognised as representative industrial bodies by DEA&T

2.3 History of Hake Fisheries

Demersal trawling in South Africa started in the 1890s and has developed into the country's most important and mature fishing industry. From its early and modest beginnings, the hake trawl fishery started as a "modern" and to an extent vertically integrated industry with trawlers, processing infrastructure and a well organised distribution network. Overall the industry is highly capital intensive and is further characterised by the high rate of employment per ton of fish landed, the high degree of value adding to products, the development of globally competitive brand names and the well organised local and international marketing and distribution networks. The demersal hake fishery is traditionally split, according to various factors (species, geographical area, method, gear and vessel size), into four sub-sectors: deep-sea trawl, inshore trawl and more recently, hake-directed longline and hake-directed handline. The deep-sea trawling industry is concentrated in the Western Cape and operates mainly out of Cape Town and Saldanha Bay, while the inshore trawl fishery is concentrated mainly in Mossel Bay and Port Elizabeth. The longline fishery operates around the coast, though most longline vessels are located in Cape Town. The handline fishery is concentrated in Mossel Bay and Plettenberg Bay. To understand the interaction between these fisheries it is important to be aware of the historical origins and development of each.

Deep-sea Trawling

The demersal trawl fishery in South Africa started in the 1890s. At the turn of the century the fishery was targeting mainly Agulhas sole. Hake was only targeted when sole requirements were met and essentially landed as an incidental catch. For a period of about two decades Agulhas and West Coast sole remained the major target species (Payne 1995). To a great extent the founder of the hake trawl industry was G.D. Irvine, who launched into fishing (African Fishing and Trading Co.) with considerable financial family backing. However, within two years the company was insolvent. Irvine then went into a loose business arrangement with new capital provided by C.O. Johnson in 1907 but by 1908 they were again insolvent. This forced the two pioneers into a formal relationship and by 1910 their operation consisted of four vessels, a cold storage facility and a smokery. The widely published insolvencies discouraged others from entering the industry. By 1922 Irvine and Johnson registered as a public company with a fleet of 27 trawlers with additional interests in whaling and sealing. As early as 1905 Irvine realised that the survival of the industry in the Cape would be entirely dependent on an efficient distribution and marketing network to the populated hinterland. This led him to purchase Kalk Bay Fishing and Cold Storage Company. Later, I&J scheduled a regular fish train to Johannesburg, allowing for the systematisation of inland marketing. These strategic moves and the persistent and single-minded concentration on distribution and accessing outside markets was the key to the success of the company and its enduring dominance until around 1960. Several other fishing companies were established during these “formative” years but they too ultimately failed because of a reluctance to invest in processing and distribution. Very few fortunes have ever been made in fishing by merely catching the fish, and it is puzzling why others did not follow the example set by I&J.

It was not until 1961 that large new entrants appeared on the scene. Amalgamated Fisheries were the first, followed by Kaap Kunene in 1963. Both were absorbed into larger companies between 1967 and 1983. Sea Harvest was founded in 1963 and soon emerged as a major force by virtue of the capital resource base, as well as its marketing and catching capabilities, but most importantly through its access to the distribution network of Imperial Cold Storage (ICS). Sea Harvest was the only new entrant that managed to establish itself permanently at that time. However, it took Sea Harvest about 10 years and substantial inputs into processing, branding and packaging to gain recognition for its products and to firmly establish itself on the local and later on the international market.

During the early 1960s the deep-sea hake fishery experienced unprecedented growth when foreign fleets discovered the rich grounds of the south-east Atlantic. Catches were uncontrolled and escalated rapidly, peaking at over 1 million tons per annum. Within a period of 15 years the stocks were decimated and in 1977 the fleet was landing primarily juvenile fish. South Africa declared its 200nm Exclusive Economic Zone (EEZ) in 1977, which finally resulted in the South Africanisation of the fishery. During the virtually open access “boom” period, the emergence of other South African deep-sea companies diluted the dominance of Irvin & Johnson. In 1979 the Government in association with industry decided on a rebuilding strategy and introduced individual quotas. A conservative harvesting strategy was agreed upon, which saw a 22% reduction in the TAC over a 5-year period. At this stage Sea Harvest purchased the third largest company (Atlantic Fishing) so that the two largest companies (Irvin & Johnson and Sea Harvest) held 92% of the TAC.

In 1985 the Minister introduced a policy to broaden access and to de-concentrate the trawling industry as it then existed. Essentially this was achieved by defining a quota as a quantum rather than as a proportion of the TAC. Anticipating stock recovery, the Minister decided that 20% of all TAC increases were to be reserved for distribution to new entrants. These measures resulted in the erosion of the quota holdings of the founding companies by 42% over the period 1978 to 2000 (see Figure 2.1 below).

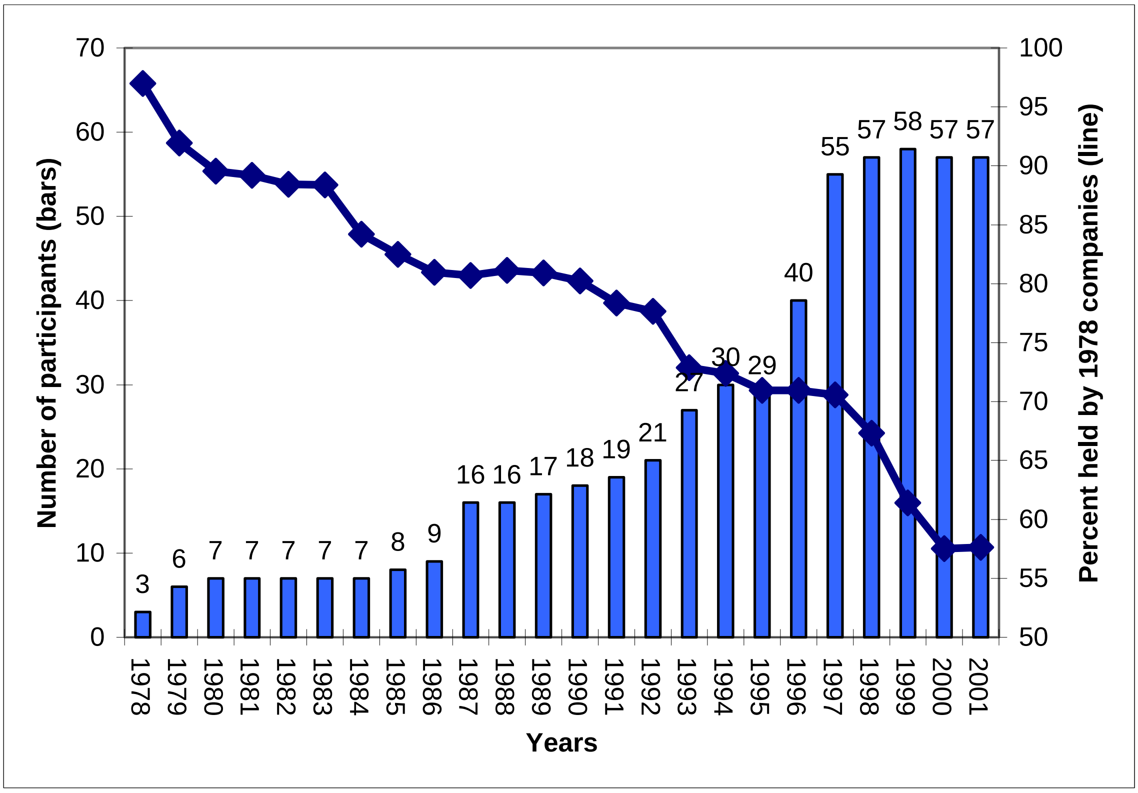


Figure 2.1. The percent change in the quota held by the three founding companies between 1978 and 2000.

The graph also shows how the number of deep-sea quota holders has increased during this period (from 3 in 1978 to 56 in 2000).

The industry challenged the legality of the Minister's definition of the quota and this resulted in the appointment of the Diemont Commission in 1986. The Commission ultimately recommend that quotas be made freely transferable, that the process of quota allocation be removed from the political arena through the establishment of an independent Quota Board, and that long term rights be granted. Although the government subsequently introduced 15-year exploitation rights, in reality, the establishment of the Quota Board resulted in the perpetuation of quotas on an annual basis, thereby contradicting the Commission's stated objective of promoting the emergence of a true market-driven fishery via ongoing, transactable rights. Another paradox was that although the Sea Fishery Act of 1988 endorsed the conditional marketability of quotas, it failed to allow for divisibility of rights. This meant that while small companies could be bought up, the larger companies were not able to downsize and diversify (Bross 1999).

Property rights in the hake fishery were introduced at a time when stocks were in need of rebuilding. After establishing the EEZ in 1977 and given the small number of role players, agreement between government and industry was easily reached, enabling a high degree of co-management with respect to stock assessment and management. The recovery after the "rape" period was remarkable and served to promote industry stability. Another major contributing factor was the government establishment of a competent research organisation, backed by modern research and patrol vessels, and large and well organised compliance and administrative sections.

In spite of the reluctance on part of government to introduce long term rights, the oligopoly was entrenched, so that for all intents and purposes the companies enjoyed a high degree of security of tenure. This promoted a culture of custodianship over the resource, which has largely survived to the present. **It is of pivotal and fundamental importance for the sustainability of the resource that any new allocations policy does not erode the culture of custodianship.**

Since 1973 the Deep-sea Trawlers Association of South Africa has represented trawler owners and operators who hold a deep-sea quota. The association is an industry service body and is recognised as an industrial body in terms of the Marine Living Resources Act, 1998. It serves the joint interests of all owners and operators of ocean going class trawlers. Given the need for co-management, the Association interfaces with MCM as envisaged in Section 8 of the Marine Living Resources Act of 1998. However, as a body representing fleet owners, the Association also spends a considerable portion of its resources interfacing with other sectors of Government, such as:

- Establishing a Bargaining Council for the fishing industry in terms of the new Labour Relations Act and co-ordinating centralised bargaining for annual wage and conditions of employment negotiations with organised labour.
- Combining the Basic Conditions of Employment Act with Chapter 4 of the Merchant Shipping Act to create a new Bill (Dept of Labour).
- Liasing with SABS (and other bodies) to facilitate the practical and economic implementation of local and international products standards (e.g. HACCP criteria, *codex alimentarius*).
- Liasing with Department of Finance on economic and historical research into the fuel taxation anomaly in the SA Fishing Industry.
- Financing, leading and participating in the activities of the Maritime Industry Training Board (budget R420 000 p.a.). The Association employs a consultant to manage the fishing chamber of the Board and to integrate into the new structures under the Manpower Training Act (Transport SETA April 1999).
- Providing commercial sector advice to SAMSA and Department of Transport on various Maritime matters such as radio and safety regulations.

On reflection it is clear that much can still be learnt from the early history of the industry. It is characterised by high risk, high capital requirements and, given the high number of companies that have come and gone, is not an easy business. Moreover, it is clear that success in this industry ultimately pivots around the efficiency of distribution and marketing.

Inshore Trawling

The inshore trawl fishery is a dual quota mixed species fishery, and fishing effort is directed mainly at shallow-water hake (*Merluccius capensis)* and Agulhas sole (*Austroglossus pectoralis*). The inshore industry is based mainly in Mossel Bay and Port Elizabeth, where it makes a significant contribution to the local economies.

The “inshore area” is generally described as the area between Cape Agulhas (20^{o} E) in the west, and the Great Kei River in the east, and extending seawards to the 110m depth contour. The inshore trawl permit describes the area as “waters between imaginary lines drawn due east from the mouth of the Great Kei River and due south from Cape Hangklip”. The bay areas on the south/east coast have been closed to inshore trawling for over 20 years. Moreover, since 1978 deep-sea trawlers have been excluded from the inshore area, by condition of permit, from operating in waters shallower than 110 metres, east of Cape Agulhas (20^{o} E).

Until the 1940s, the inshore demersal resources were fished by a small number of I&J trawlers based at East London, Port Elizabeth and Mossel Bay. In the 1950s some private entrepreneurs converted small boats for sole trawling, and entered the fishery. By the early 1970s the inshore fleet of small trawlers had increased to approximately 60 vessels, based at Hermanus, Gansbaai, Mossel Bay, Port Elizabeth and East London.

During the early 1980s the fishery entered a period of effort rationalisation and quota amalgamation. In the period 1982 to 1989, economic and market forces resulted in some of the smaller operators leaving the fishery and by 1995 the sector had consolidated itself into 11 quota holders and 35 trawlers. The quota holding structure remained virtually constant until 2000, when two new entrants were granted rights through a process of <u>internal</u> reallocation. Currently there are about 30 trawlers operating in the industry. It is important to mention here the pivotal role played by the South East Coast Inshore Fishing Association (SECIFA). This association has continued to play a major supporting role in the management of all aspects of the fishery, particularly as regards mesh size (75mm) restrictions, multi-species and by-catch controls as well as output (quota) control. Compliance, monitoring and control of the inshore hake and sole fishery are generally considered to be good. This is due to regional limitations (port controls, landing point restrictions) and the restricted areas including closed bays and reserves, the exclusion of deep-sea trawlers in areas <100m, and limited effort (specifically with regard to vessel size and capacity). Recently SECIFA has also expressed its concern surrounding compliance within the emerging, and until now un-regulated, hake-directed handline fishery.

All inshore trawling rights holders are represented by the South East Coast Inshore Fishing Association (SECIFA). The Association was formed in 1966, reconstituted in 1978, and is recognised as an industrial body in terms of the Marine Living Resources Act, 1998.

<u>Hake Longline fishery</u>

Longlining for demersal (deep-water) species was introduced in South Africa in 1982 with the aim to target hakes (*Merluccius paradoxus* and *Merluccius capensis).* In 1983, nine “experimental” longline permits were issued to established trawl companies that held hake quotas. In 1984-1995 a unique double line technique was developed to cope with the hazards of strong currents, hard grounds, line breakage and harsh sea conditions. During this period effort moved to the South Coast where it was discovered that longlining was very effective for the catching of kingklip, *Genypterus capensis*. Kingklip catches were not restricted, while hake catches were offset against the quotas of rights holders. In 1985 an additional six longline permits (kingklip-directed) were issued to non-hake quota holders. Longline catches for 1985 totalled around 5 000 t kingklip and 1 500 t hake. The kingklip catches peaked at 11 370 t in 1986 and thereafter showed a steep decline. By 1989 the experimental permits were replaced with permits that were limited to a kingklip TAC of 5 000 t and the imposition of a closed season. This TAC was further reduced for the 1990 season, and by the end of 1990, the Department of Sea Fisheries stopped all demersal longlining. However, some operators continued with hake longlining on the south coast using a loophole in the legislation. These operators were both handlining, using lines with many hooks, and also longlining under the shark longline loophole. Subsequent tightening up of legislation has now adequately addressed the problem. The hake-directed experimental longline fishery was established in 1994. Initially a total of 4 000 t was allocated for an experimental fishery. On completion of the 1994 pilot study, 4 400 t was allocated for the 1996 and 1997 seasons, with the only change being an additional 400 t allocated to the inshore group. Since then (1998 and 1999) the longline allocation has been contested several times (see later). In the 2000 allocation year, 5 250 t was allocated initially and the balance of 4 750 t was allocated on appeal as smaller quotas (33.8 t) to new entrants.

The longline fleet operates from a number of harbours, extending from Port Nolloth in the northern Cape to Port Elizabeth in the Eastern Cape. By year 2000, vessels were required to land catches in “home ports” and this reduced the number of South Coast landings significantly. Since 1998 the longline fleet has been issued either with “offshore” or “inshore” permits. The offshore permits allow for the deployment of a greater numbers of hooks, but vessels are limited to fishing in water deeper than 110 metres only.

Inshore vessels are allowed to fish in water shallower and deeper than 110 metres, but may only deploy a maximum of 4 000 hooks per day. Most of the permits issued are offshore. The inshore longline vessels are typically <15m that had previously deployed < 4 000 hooks per day. However, from 2000 onwards only a small number of South Coast operators chose to activate rights on inshore permits. All the companies that returned ESS forms had rights issued in the offshore sector. In 2000 the longline vessels used their right to longline for between 1 and 7 months. The average duration of a trip in 2000 was around three days, largely as a consequence of the high quality demand of the PQ (“Portuguese Quality”) market.

To summarise: The longline hake fishery commenced as an experimental fishery between 1994 and 1997. Commercial-scale hake longlining started in 1998 with the allocation of individual rights, and fishing occurred on both the South and West coasts. The fishery is currently apportioned 10 800 t of hake from the global TAC per annum. The sector is unstable and characterised by legal interdicts against the allocation process and intermittent stoppages. The fishery is highly reliant on a seasonal export market to Europe and is vulnerable to extreme price fluctuations. Longlining is a labour intensive fishing method but little land-based value-adding occurs. Most of the hake is exported in gutted form, on ice, and kingklip remains a valuable by-catch component of the fishery.

Hake Handline fishery

The origins of the handline hake fishery can be traced back to the late 1980s. There were many reasons for its development. Vessel owners and fishers who had traditionally targeted squid and linefish commercially explored the potential for alternative resources on the South Cape Coast as a “filler-in” activity when other species were scarce. There was and still is a desperate need to keep vessels and crew economically active for as much of the year as possible.

Historically hake has always been caught by (traditional) handline fishers, but no real commercial value was attached to the species, due primarily to the value of other species. The development of a viable but risky market for PQ hake (fresh whole product on ice) predominantly to Spain changed the perception that commercial line fishermen had of hake. This led to a shift in emphasis to quality, packing, freighting and marketing of the species. Handline hake was also historically caught in small quantities around the coast – mostly at times when cold water moved up the shelf bringing fish closer to the coast. The fishery developed, and for while was concentrated, in the Plettenberg Bay area where fish availability is good and the distance to the fishing grounds suited deck boat operation. In recent years ski-boat operations have increased dramatically, with both Knysna and Stillbaai becoming sizeable operational areas. Ski-boats operating out of Mossel Bay have also increased sharply. Operations are dynamic and mobile, with boats moving to areas where fish availability is high e.g. from Mossel Bay to Stillbaai. Handline hake operations have also developed in the Eastern Cape in Port St Francis, Jeffreys Bay and Port Elizabeth, with small amounts also being landed in Port Alfred.

The fish are caught by handline or rod and Scarborough reels and, as with any line fishery, it is labour intensive. Linked to the development of the fishery was an increase in the associated infrastructure. Development of the hake handline fishery resulted in logical extensions and growth of land-based primary processing / packaging facilities. Included in the necessary changes for fresh hake was the upgrading of factories and vessels to EU-approved standards (HACCP). An important offshoot of these developments was the increase in local employment and the knock-on effect to the regional economy.

Currently a total of 5 500 t of hake per annum is held in reserve from the global TAC to account for catches made by this sub-sector. Since the origin of the fishery in 1980 it has grown without much control and verifiable landings now approximate 4 500 t. The amount that is unreported probably exceeds 500 t. Effort limitations will have to be introduced to ensure that the handline reserve is not exceeded. Alternatively a greater allocation to this sector will have to be made, but this would obviously have implications for the other hake-directed fisheries.

The fishery was started at a time when the old Sea Fisheries Act of 1988 was in force. The growth of the fishery was well known to Sea Fisheries from its onset, and although operating legally under the 1988 Act, concern was expressed by industry, scientists and managers as far back as 1990 regarding its development and stock implications. Because of permit extensions and the expiry of the transition period between the 1988 and 1998 Acts, the fishery is currently operating in a legal vacuum. This uncertainty has resulted in the following:

- Continued growth and development of the handline hake fishery
- A reluctance by enforcement officers to control the fishery – with regard to both the commercial and recreational components in terms of the old and new Acts
- An unprecedented increase in the number of ski- and deck-boats targeting hake with subsequent difficulty in estimating the actual catch
- Increasing concern by other hake fisheries about stock implications and the consequences of uncontrolled growth of handlining.

A peculiarity of the fishery is that many operators are retrenched or displaced whites, mostly through affirmative action, and who have now invested their packages in fishing. There are few Previously Disadvantaged (Coloured and Black) boat owners, but the involvement of PDI is mostly through employment on boats in which irregular incomes are made (weather and fish availability dependent). Many PDI fishers are from the local communities, but most of them are from the former homelands or the Western Cape.

Conclusion

The hake fisheries are to a large extent interlinked by way of catch and processing agreements, shareholding and quota exchange, amongst others. It has, however, become clear from the ESS that the deep-sea sector, followed closely by the inshore trawl sector, provides far greater social and economic security and benefit than do the longline and the handline fisheries. Essentially this is a consequence of the formal and permanent employment offered by the trawling sector. By contrast, the longline and handline fisheries are seasonal, catches are erratic, employment is temporary and crew and skippers (if not the boat owner) are paid for what they catch. From its origins the deep-sea sector has been a “modern” fishery (catching, processing, marketing and distribution) and the pioneer companies, particularly the two largest quota holders, provide the backbone of the South African fishing industry. Secondary processing and branding is to a large extent restricted to the pioneer companies. Any major shift in allocations policy within the deep-sea sector must analyse and seriously consider possible social and economic knock-on effects from a local, regional and national perspective. The current structure and TAC allocations per sector, quota holders per sector and the species breakdown are illustrated in Figure 2.2 (acknowledgements to Dave Japp).

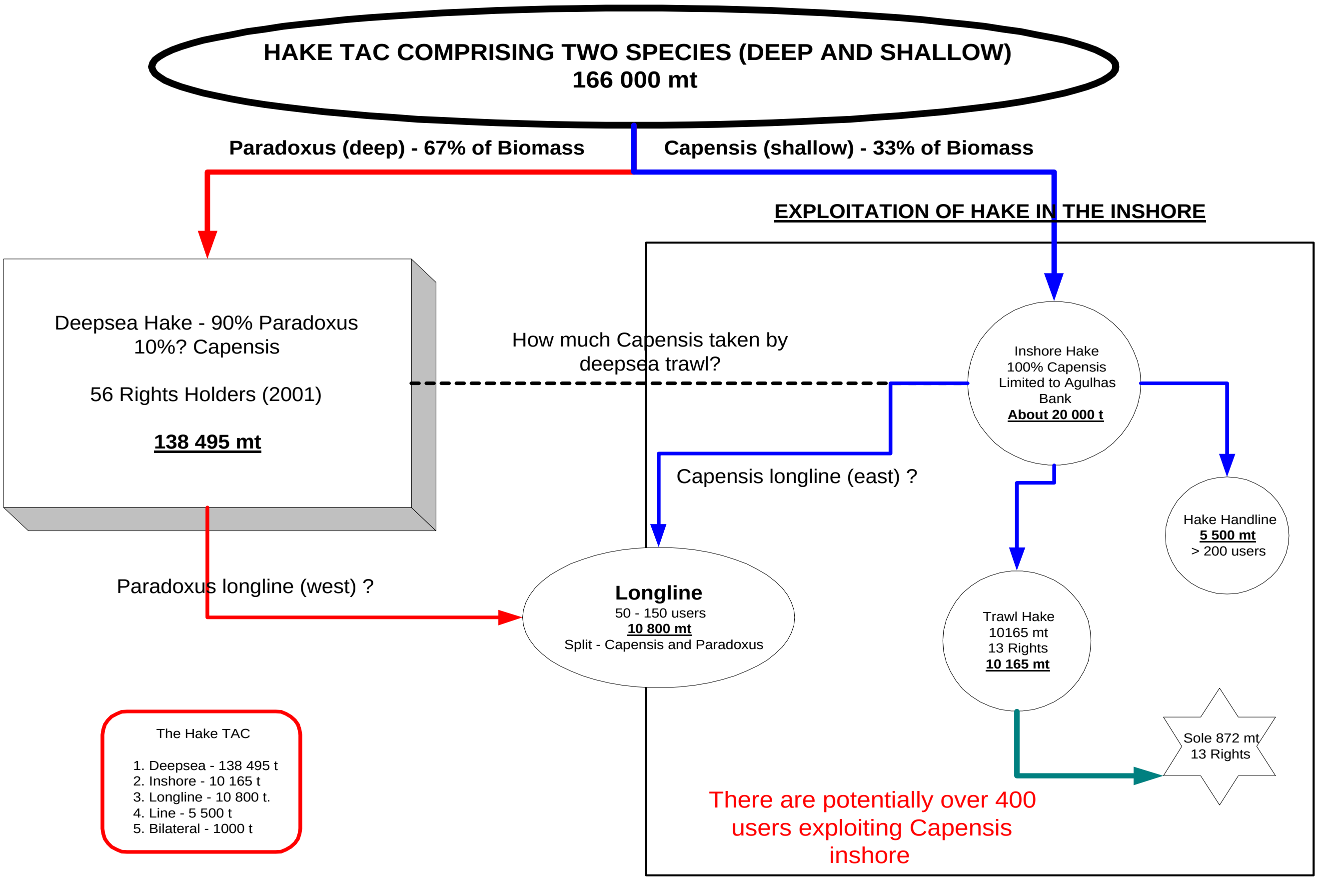


Figure 2.2. The structure, allocations per sector, quota holders per sector and the species breakdown of the hake fisheries.

2.4 Management of the Resources

As mentioned previously, the hake fishery is the largest and most valuable of our fisheries. It is also recognised that the South African hake fishery is one of the best managed fisheries in the world. Through good compliance, a sense of ownership and a conservative co-management strategy in the past, the resource is being rebuilt after the “rape” in the 1960s and the 1970s. The fishery is based on two hake species, the shallow-water (*Merluccius capensis*) and deep-water (*M. paradoxus*) Cape hakes. At this stage catch statistics are not species-disaggregated. Consequently, the assessment methods applied in the past have, of necessity, treated the two hakes as a single species.

The hake resources on the west and south coasts are assessed separately, but a global TAC is set. The allocations to smaller, inshore operators are generally taken close to their base of operations, and the offshore operators are requested to manage their fishing activities such that the global TAC is apportioned between the west and south coasts in a 2:1 ratio. This arrangement is as effective as area specific TACs, but easier to manage.

The hake fishery has been managed by an Operational Management Plan (OMP) since 1990. In 1998 the OMP had to be revised, partly because:

i. the observed catch per unit effort (CPUE) on the west coast had not increased as much as predicted and there was some evidence of model miss-specification. In addition the observed CPUE from the commercial fleet was showing a lower and near-discrepant trend compared to surveys; and
ii. the CPUE time-series for the commercial fleet was standardised by applying power factors. This is a fairly crude way of standardising CPUE data and, in keeping with the modern trend internationally, the CPUE time-series needed to be improved by applying modern general linear modelling (GLM) standardisation techniques. This process also brought to light the necessity for adjusting for a change in the age-specific selectivity of the fleet over recent years, probably as a result of phasing out the illegal practice of using small-mesh net-liners.

The key data on which current assessments are based are:

1. Annual nominal catch for 1957-1998 on the West Coast (fig 2.3a) and 1967-1997 on the South Coast (fig. 2.3b)
2. Historical CPUE standardised by power factors pre-1978 (fig. 2.4).
3. GLM-standardised CPUE data post-1978 (fig 2.4a and 2.4b). For the West Coast this is split into two series (1978-1986 and 1993-1998) to account for changes in fishing selectivity.
4. Relative biomass indices with the associated standard errors. Summer (1985-1999) and winter surveys (1985-1990) on the West Coast, and spring (1986-1995) and autumn (1988-1997) on the South Coast.

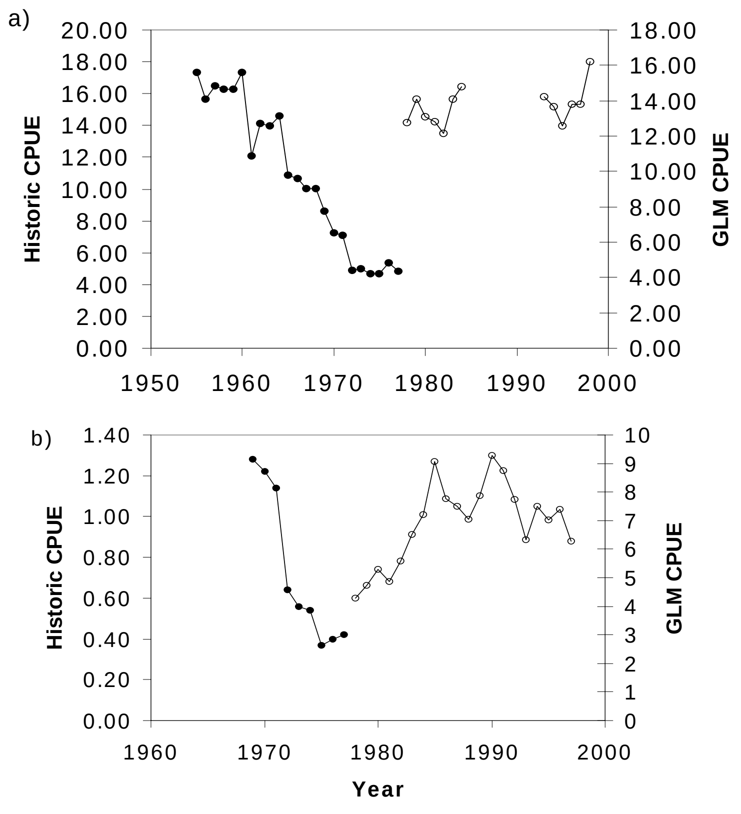


Figure 2.3. Annual landings of Cape hakes on the (a) West Coast and (b) South Coast.

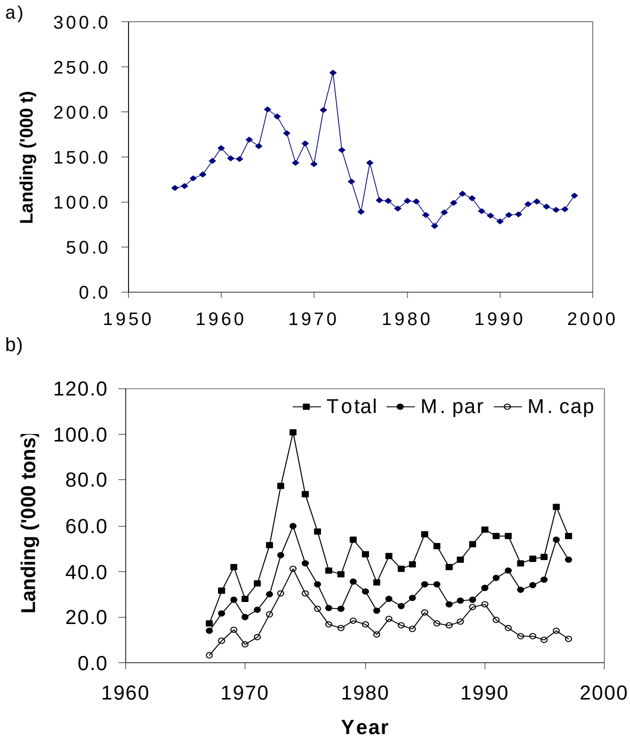


Figure 2.4. Historic CPUE series standardised by power factors (solid circles) and GLM-standardised CPUE (open circles) for the (a) West Coast and (b) South Coast. Note the historic and GLM CPUE series do not have the same units and are not directly comparable.

The new OMP adopted for the West Coast is based on a Fox form of the surplus production model with an $f_{0.75}$ harvesting strategy. For the year 2000, the OMP indicated a 3% increase in the West Coast component of the TAC (103 000 tons). Provisional results from the revision of the South Coast OMP indicated similarly that the hake stocks on that coast could also accommodate an increase of 3% (52 500 tons). Consequently, a combined TAC of 155 500 tons was set for the year 2000, with the recommendation that it be caught on the West and South coasts in the approximate ratio of 2:1.

It is important to stress that the approach underlying the west coast OMP, which accounts for the greater part of the overall hake TAC, is a constant fishing effort strategy. This means that when the resource size increases or decreases, the TAC is moved up or down in proportion, with the aim that the same number of vessel fishing hours as the previous year will be required to take the catch. In other words, a change in abundance is accompanied by a proportional change in catch rate and TAC so that the adjusted TAC will be taken without adjusting the amount of fishing effort. Thus the recommended 3% increase in the hake TAC for 2000 does NOT mean that there is scope for a 3% increase in the number of vessels active in the fishery – on the contrary, MCM scientists have indicated that there is currently no scope for an increase in trawling effort.

Moreover, the introduction of the formal longline hake fishery and the presently uncontrolled and rapidly increasing hake handline fishery further complicate the setting of a TAC for the South Coast, and also highlights the need for:

(i) separate assessments for the two hake species.

(ii) assessing the differential effects of trawling, longlining and handlining on inshore hake, *M. capensis*, to develop an allocation strategy for the three hake fisheries for the continued sustainable management of the resource.

In the 1970s, after a scientific assessment of the sole resource, scientists raised concerns about the increase in inshore trawling fishing effort. A global sole quota of 700 tons was introduced in 1978, linked to the introduction of the 110m depth limitation, which separated the inshore fishery from the deep-sea fishery. Also, in 1978 the inshore hake catch was controlled for the first time with the introduction of an allocation of 7 000 tons (approximately 6% of the TAC). The allocation and enforcement of both a sole TAC and a sector hake allocation created problems. There were simply too many boats competing for a fixed quantity of sole, which resulted in the TAC being filled in five months. Negotiations between government and industry from 1979 to 1981 led to the introduction of the individual quota system. Over the period 1982 to 2000 the number of trawlers in the inshore industry was reduced from 54 to 30 trawlers.

There are several unique intra-inshore industry management measures that have evolved since the introduction of the sole TAC and a hake allocation in 1978. One of the important measures was the temporary within and across sector exchange of quota between quota holders, within a calendar year. The within sector exchange allowed for a better use of the sector hake and sole allocations, and simultaneously achieved a balance in the catching of the two quota species in a dual quota fishery. The between sector exchange was instituted because of annual variability of catches by the deep-sea and inshore fisheries and allowed for the full utilisation of quotas. Moreover, quota holders are also permitted to assist each other to smooth out factors such as vessel breakdown, industrial action and insufficient quota. MCM Mossel Bay and Cape Town administer these processes. The measures allow relatively “unrestricted” fishing for a full “quota year” to maintain industry stability, to maintain viable catch rates, to reduce trawler impact on the inshore demersal resources and nursery areas, and overall to support fishing effort control and to ensure good fishing practice. This has contributed enormously to establishing one of the most stable fisheries in the country.

The sole resource, as mentioned above, is also managed by TAC. The resource has been assessed since 1989 using an ad hoc tuned Virtual Population Analysis (VPA). The reliability of the model has been in doubt for many years since it fits poorly to the CPUE and to the survey data. Since 1992 a constant TAC of 872 tons has been recommended, and the VPA has been applied simply as a monitoring tool. The 1999 and 2000 assessments continue to show a declining trend in the estimated biomass of fish 3 years and older, but the rate of decline is slowing down. Processors have also dropped the price of “slips” to such a level that trawler skipper avoid the nursery areas.

<u>Conclusions</u>

- The demersal fishery, and in particular hake, is the largest and most valuable in South Africa.
- As a consequence of severe over exploitation of the hake resource in the 1960s and 1970s the industry and MCM have committed themselves to a conservative rebuilding strategy.

- This strategy has led to the recognition that the South African hake fishery is one of the best managed fisheries in the world.
- The recommended increases in the TAC are based on a constant fishing effort strategy.
- The introduction of the longline fishery and the recent uncontrolled development of the handline fishery requires careful consideration of the allocation procedure per fishing sector and has highlighted the need for separate assessments of the *M. paradoxus* and *M. capensis* stocks.

2.5 Allocation and Distribution of Hake Rights: Fishing Seasons 1991-2001

Allocating Bodies 1991 – 2001

Shifts in allocating authority has complicated the allocation of rights in the period under review. The Sea Fishery Act of 1988 tasked the Quota Board with the responsibility for allocating quotas[i]. The Board functioned for nine seasons under four different chairmen. The Marine Living Resources Act (18 of 1998) abolished the Board and placed the responsibility for allocation directly on the Ministry. The Act gave another agency, the Fisheries Transformation Council (FTC), a subsidiary role in allocating fishing rights[ii]. The transition to the MLRA regime was subject to hiatus in that, in effect, the 1999 allocation had to be conducted as if the Board undertook it. This meant that the Department was only able to allocate long term rights independently for the first time in the 2000 season. The task proved to be more complicated than expected and, in the event, rights were actually allocated short term. The next year, 2001, was governed by an amendment to the Act that temporarily abolished the power to redistribute fishing rights.

Sectoral Division in the Hake Fishery in the 1990s

It is difficult to understand redistribution of rights in the trawling industry without considering the simultaneous inter-sectoral redistribution of the hake resources. From the very inception of the Quota Management System (1979), hake trawl fisheries consisted of distinct deep-sea and inshore subdivisions. Their relative size has been basically fixed at approximately 92.5 to 7.5 since 1983.

Since 1979 “bilateral” (foreign) allocations made up the remainder of the TAC. Bilateral hake quotas were in effect amounts that the RSA Government made available for foreign fishing nations, usually as a *quid pro quo* for favours during isolation. They were quite substantial at one stage but were phased out by 1992, except the newly created Mozambique quota of 1 000 tons, which has remained on the books.

The longlining that occurred between 1983 and 1990 never constituted a clear subdivision of the hake fishery within the existing Quota Management System. The Minister, who had effectively declared an emergency with respect to kingklip, terminated hake longlining in the course of 1989-1990 [iii]. A spate of illegal longlining took off during 1991-1992. This can be interpreted in several ways but to a certain extent this phase amounted to a campaign of defiance largely on the part of established tuna fishermen who were aggrieved because they were unable to catch hake when tuna fishing was slack.

The Authorities failed to exert any realistic control of the situation and instead decided to conduct a "hake longline" experiment (1994-1996). In effect this led to the re-introduction of hake longlining, mainly at the lower end of the scale. Upon its successful conclusion the Department set aside an amount of 4 400 tons within the TAC for allocation to a formal hake longlining industry in 1998[(iv)].

A limited amount of hake handlining, generally considered to be of the order of 1 500 tons, has taken place in the south-east coastal region as far back as anyone remembers, but took some shape in the late 1980s. The catch was thought to have grown to almost 2 000 tons by 1993-1994 and to around 4 500 tons in 2000. At first, handlining was not recognised as a formal subdivision of the hake fishery, although provision for the catch was included in the calculations determining the TAC, right up to the establishment of a formal fishery in 1998. Despite the fact that the handlined estimate was traditionally taken into account each year, the actual catch fell <u>outside of the official hake TAC</u>. The fishery, which was formally established 1998, was unique in another way in that it still appears to be subject to a kind of "global quota" [(v)]. Currently a total of 5 500 t of hake per annum is held in reserve from the global TAC. Table 2.2 summarises the present day South African hake fisheries, which can be subdivided into five sectors.

Table 2.2. A summary of the present-day hake fisheries.

HAKE SECTORAL ALLOCATIONS	YEAR ESTABLISHED	% OF TAC IN 1991	% OF TAC IN 1994	% OF TAC IN 2000
DEEP-SEA TRAWLING	1979***	89.5%	91.3%*	83.3%
INSHORE TRAWLING	1979	7.0%	6.6%	6.1%
FOREIGN TRAWLING	1980	3.5%	0.7%	0.6%
LONGLINE	1998	0%	1.4%**	6.4%
SET ASIDE FOR HANDLINING	1998	0%	0.0%	3.5%

* The apparent reversal of the long term trend is attributable to the fall in foreign allocations
** Experiment

*** Establishment dates refer to the year in which quotas were introduced

Hake Trawling Allocation in the 1990s: the Quota Board Era

The chronicle set out under this heading is best read in conjunction with Table 2.3. SECIFA is omitted from the discussion mainly because the allocating authorities customarily left the relative position of the inshore trawl fishery and its constituent quota holders (almost) entirely alone throughout the period [vi].

1991 – There were 18 deep-sea rights holders when the Quota Board first sat and some 3 000 tons were available for redistribution [vii]. The State applied 1 300 tons to new "bilateral" or foreign allocations and the Quota Board restricted itself to "addressing existing anomalies". It awarded 1 200 tons to the smallest of the established trawling companies [viii] and allocated 100 tons each to four small existing holders and a new entrant.

1992 – The Board undertook an investigation of "the basis for allocating quotas" and failed to make a full and timely allocation. Two very small entrants were allocated [ix]. The Board was left with approximately 5 000 tons available for distribution at year-end together with the possibility that it would not be caught [x]. Having failed to act in time, the Board instructed the Department to let this mass go to existing quota holders as a "temporary allocation" [xi].

1993 – The 1993 season provided the first real opportunity for the Board to implement any kind of transformational policy because for the first time applicants with historically disadvantaged credentials coincided with a distributable surplus. Using 1991 as the base year, the Board allocated 7 350 additional tons for the 1993 season, of which 2 900 were derived from the final exclusion of foreigners from the hake trawl fishery [xii, xiii]. Besides relatively minor adjustments to new entrants introduced by the Board, four 1 000-ton quotas were allocated to four nominally Black enterprises. 3 000 tons were allocated to Community Trusts [xiv].

1994 – The TAC increased by 3 000 tons. The Minster held 2 000 t in reserve for a hake longlining fishing experiment. The Board made a technical adjustment to an existing quota holder and applied the remaining 951 tons to the Community Trusts. Later it issued another 2 000 tons for community trusts (carried forward from the previous year?), with the result that the 1994 TAC was nominally oversubscribed.

1995 – Again the TAC increased by 3 000 tons but it was withdrawn from the ambit of the board [xv]. In terms of the Guidelines nothing was available for redistribution in 1995, for which reason the Board Chairman (Judge Levy) dispensed with hearings and re-issued existing quotas.

1996 – The TAC was unchanged. The annulment of Community Trust allocations freed up 4 463 tons, which the Board allocated to 13 new quota holders, the majority transformational in nature [xvi].

1997 – This season marked the start of a controversial and rancorous phase for all stakeholders involved in the hake rights allocation process. The TAC had remained unchanged at 151 000 tons for two years and, crucially, was to remain so for another two years.[xvii]. A poorly considered action on the part of the Quota Board provided the trigger for the kind of disputes that came to characterise hake allocations for some years to come. The Board deducted 4% from all 1996 hake quotas and distributed the 5 724 tons "freed up" in this way to selected small quota holders and 15 new entrants. This action violated the Guidelines and appeared *ultra vires*. The industry considered an interdict to prevent the new holders from exercising their rights with a view to testing legality later. A high court judgement in an entirely different fishery appeared to vindicate the industry and induced the Authorities to settle virtually at the courtroom steps. The Minister provided the Board with another 5 000 tons and this amount was distributed proportionately to all existing holders compensating for almost all the initial losses [xviii].

1998 – Both the Board and the Minister withheld substantial quantities of fish from the trawling industry, 14 000 tons and 10 000 tons respectively, each with a view to making supplementary allocations later. However, at this juncture the Board was being steadily overwhelmed by actual and potential lawsuits emanating from other sectors of the fishing industry [xix]. After being pressed with the prospect of more litigation in circumstances under which it failed in one case after another, the Board retracted and decided to allocate the full 140 000 tons available to it in accordance with its Guidelines. In respect of the 10 000 tons blocked by the Minister, the industry conceded that he could rightfully withhold 7 900 tons. The Board then distributed the balance largely in accordance with its Guidelines [xx]. The upshot was that quotas were allocated in three tranches and in the end an effective 4.6% of the TAC had passed from hake trawling to hake lining.

<u>An Anomalous Allocation</u>

1999 – The MLRA was promulgated in October 1998. Initially the Minister determined that in terms of #14 of the Act, the allocation to the trawling industry would be reduced by 25% [xxi]. In the event the mechanisms needed to implement the new policy were unready by the start of the season and no rights were issued by year-end. An exemption intended to maintain fishing was withdrawn on 6 January 2000 and trawler fleets were recalled from sea. Events conspired to idle a workforce of more than 10 000. Within ten days the Department had implemented a makeshift bridging arrangement aimed at keeping the larger processors only fishing until May or June; other participants continued to lie up while hake rights issues continued to addressed.

A benchmark rock lobster case (*Langklip; 10 May 1999*) fundamentally affected the way in which the new Act could be applied. The Ministry was obliged to effect the transitional arrangements enshrined in the Act, which meant adhering scrupulously to the procedure under the old Act. The significance of this decision was that the work carried out up to that stage was set aside and the allocation would have to proceed on the same principles and procedures as the Quota Board would have applied sitting with an unchanged TAC. Nevertheless, the Department was adamant that redistribution would occur. It also appeared that Government had reservations about the import of the Langklip ruling.

The deep-sea trawling industry decided to make a conciliatory gesture notwithstanding the legal position of former quota holders. Parties previously holding in excess of 1 000 tons collectively offered 10 000, with the intention that the mass of fish be used to effect Transformation as envisaged in the MLRA. Access rights distribution for 1999 fell under a formal settlement between various stakeholders and Government – an additional 4 000 tons went to longlining, 3 000 tons to smaller deep-sea rights holders and 3 000 tons to new trawling participants [(xxii)].

<u>Hake Allocations under the MLRA dispensation</u>

2000 – The first allocation implemented purely under the MLRA occurred during a year in which the overall TAC also increased. The actual process that took place was difficult to understand. The first allocation (13 January) was withdrawn, softened quite significantly and re-published (28 February). It can be inferred from the final results that the relevant committee set the events of 1999 aside and used 1998 as a base year. It is apparent that the three largest quota holdings were reduced by 12% and quantum was redistributed largely to a wide spectrum of smaller enterprises.

Analysed in this way, the following general picture emerged:-

source	reduction in large trawl rights holders	12 500 t
	increase in TAC	4 500 t
application	increases for smaller trawl rights holders	7 250 t
	one new entrant	750 t
	increase for longlining	5 500 t
	increase for handlining	3 000 t

Compared with the year immediately past, the losers seemed to consider the losses unbearable. A minor change also occurred in respect to inshore trawling rights in that two small entrants were sanctioned.

2001 – The TAC increased substantially. Subsequent to the allocations for 2000, the Department found itself at a point at which an unavoidably time consuming re-assessment of the access rights allocation process was necessary. The Act was consequently amended so as to permit a one-year rollover of all rights [(xxiii)]. In effect access rights, properly defined with reference to any given TAC, remained entirely unchanged.

Table 2.3. Summary of the Trawling Rights in 1991, 1995 and 2000.

TRAWLING RIGHTS	**1991**		**1995**		**2000**	
	no.	**%TAC**	**no.**	**%TAC**	**no.**	**%TAC**
ESTABLISHED TRAWLING COMPANIES	5	84.3	5	78.7	5	64.8
PRE QUOTA BOARD ENTRANTS 1984-1990	13	5.13	12	5.17	12	4.85
QUOTA BOARD ENTRANTS	1	0.07	8	3.03	26	11.2
MLRA ENTRANTS					5	2.36
ESTABLISHED SECIFA MEMBERS	11	6.97	11	6.51	11	5.88
SECIFA MLRA ENTRANTS					2	0.23

Footnotes:

(i) Technically, quotas were a form of output (as opposed to effort) control defined as a specific quantum. The definition necessitated that quotas have the same effective life as a TAC – strictly, the right was for one year only. On the other hand, the Quota Board Guidelines established a form of continuity for rights in that they bound the Board to recognition of the rights of pre-existing Quota Holders. In addition the Sea Fishery Act provided for "exploitation" rights that were valid for longer periods.

(ii) During its brief life the FTC was effectively confined to longlining insofar as hake allocations were concerned. In general, the Council's decisions were bitterly contested and it was abolished within the year.

(iii) The first hake longlining fishery started in 1983 and rapidly switched to targeting of kingklip, which would have been an unavoidable by-catch in any event. Kingklip longlining ultimately became established as a permanent (no longer experimental) fishery with individual kingklip quotas in 1989, while hake longlining was allowed to continue as a subsidiary activity, under the aegis of conventional trawl hake quotas. At that stage it became evident that the kingklip resource was devastated in the first longlining episode, and government shut down all longlining activity within the year.

(iv) The amount of 4 400 tons was the outcome of a complex wrangle. Authorities initially set aside 5 400 tons designated for longline experimental purposes. This action was disputed by SADSTIA on the grounds that, if it stood, the Quota Board would be effectively prevented from adhering to its own Guidelines. The dispute was settled by reducing the allocation by 1 000 tons (ultimately longlined by converting an equivalent amount of deep-sea trawling hake allocation to longlining).

(v) It is doubtful that global allocations accord with the MLRA.

(vi) In the 1998 season the Board effected a relatively insignificant change within SECIFA – the only occasion when it intervened in respect of inshore hake rights.

(vii) From the beginning the Quota Board found itself severely hamstrung by its own Guidelines. The Guidelines restricted the Board's redistributive role to annual increases in the TAC. It is moot whether the initial Board included transformation amongst its objectives.

(viii) This was done on the basis of evidence that a misallocation had occurred in 1980 and was the only occasion on which the Quota Board ever permanently increased the quota rights of an original hake quota holder.

(ix) The two small new quotas were essentially awarded as by-catch for maasbanker operations because midwater trawling entailed an unavoidable hake by-catch.

(x) The circumstance raised a tricky legal problem because it was widely accepted that the Board had to allocate all fish provided into its jurisdiction.

(xi) The allocation was conducted on a pre-arranged basis known as the 80/20 agreement (1984). The Board later withdrew its recognition of the agreement.

(xii) The balance was made up of 4 395 tons of temporary allocation in 1992. In the meantime the Minister had withheld 2 000 tons of the TAC from the Board, probably with a view to the longlining experiment. In the event the fish was never allocated to any purpose and appears *ex post facto* to have been included in the community trust allocation for the next year.

(xiii) Foreign participation continued, much reduced and different, in the form of a reciprocal arrangement with Mozambique. It is understood that this arrangement will be abrogated.

(xiv) Community trusts were still in the pre-incorporation stage at the time, which led to inordinate complications afterwards. It is not the intention to discuss the Community Trust debacle in the present context. The scheme spanned three quota seasons, led to considerable rancour, if not unrest, within certain coastal communities, implementation was flawed and contentious, its legality was doubtful and it was summarily ended when the Trawler and Linefishermen's Union brought the Quota Board to court.

(xv) The data that cover 1993 – 1997 display unexplainable allocational balances and anomalies (not detailed in context). It needs merely to be borne in mind that apparent under- or over- allocations of the TAC during the period may be safely ascribed to complications that arose with the re-introduction of an experimental longline fishery, together with complexities that accompanied the community trust episode.

(xvi) Not entirely so – beneficiaries of the (cancelled) Port Nolloth Community Trust were included in the 1996 new allocations to "new entrants".

(xvii) That the TAC was static for fully five years must have contributed to a feeling of frustration on the part of the Authorities. The Quota Board was hamstrung unless the TAC grew from year to year.

(xviii) This action appeared to be legal under the old Act, but could have been beyond the Minister's powers under the MLRA.

(xix) The Gillion judgement, setting aside an attempted revision of the Guidelines, was decisive in bringing the Board to settle the dispute

(xx) Even then the Board failed to observe its Guidelines to the letter when it awarded the so-called Ciskei quota. It was at this stage that the FTC came into the picture. It "leased" access rights to seventy five new longlining participants but the transformational effect was arguably disappointing.

(xxi) For the record, the Minister's determination was:

trawling	107 500 tons commercial and 30500 tons for the FTC,
longlining	10 000 tons also referred to the FTC,
handlining	3 000 tons and
recreational	500 tons.

The Foreign allocation was actually overlooked. It emerged that the 25% reduction for trawling was not as clear cut as it might first have seemed because the role to be played by the FTC was unclear. It became apparent that the FTC was meant to adjudicate on many of the so called paper quota holders, in which case something less than 25% would have been at stake.

(xxii) In the event the intention was largely lost in the execution. The transformational potential of the industry gesture was diluted, in respect of both the existing rights holders that gained from the agreement and the subsequent entrants.

(xxiii) The amendment was intriguing for another reason. The rollover put into practice the common sense approach of looking at rights as a percentage of a TAC or TAE. It is perhaps worth observing that the Act actually predicates the practice.

The proportional allocation (%) per sector of the 2000 TAC is illustrated in the pie diagram below.

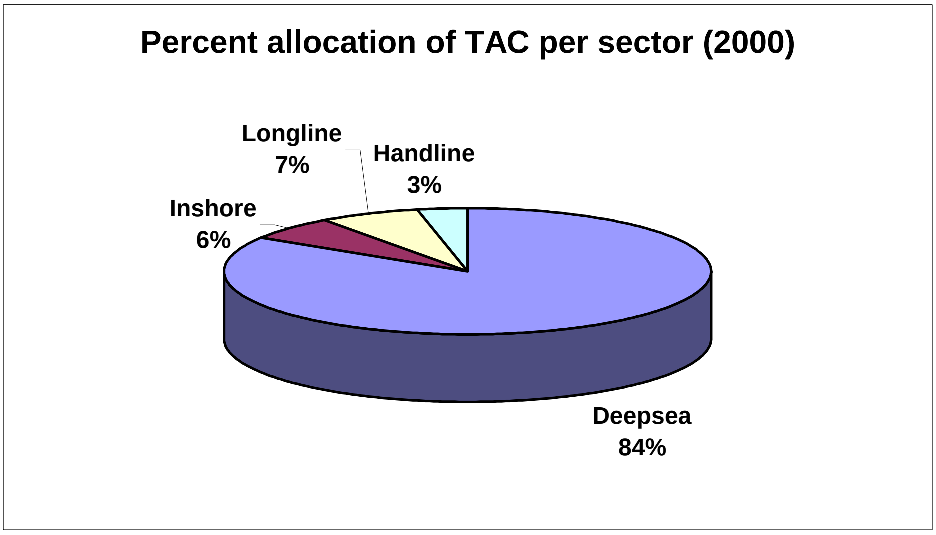


Figure 2.5. Allocations of Hake Total Allowable Catch per fishing sector in 2000.

As mentioned previously, the number of hake trawl quota holding entities has increased from 3 in 1978 to 57 (56 plus SECIFA) in 2000. Moreover, as described elsewhere, certain proportions of the TAC have been set aside for the longline and handline hake fisheries. The results of the analysis of change in the proportion of the TAC held by the three founding companies (I&J, Sea Harvest and

Atlantic Fishing) (Figure 2.6) shows that they have forfeited approximately 42% to accommodate new entrants and the new fisheries (longline and handline).

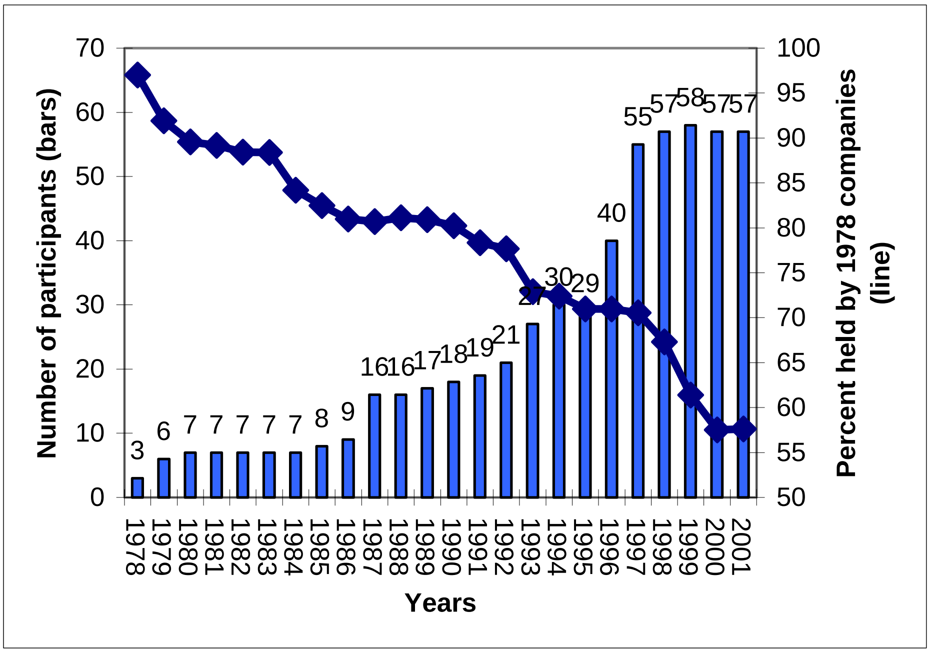


Figure 2.6. Increase in quota holding entities and fall in TAC controlled by founding companies (1978-2001)

2.6 Control of Quota 2000

Deep-sea quota

Analysis of the current quota holdings has been undertaken in two ways. Firstly, where control of the quota resides outside of the designated rights holder, the quota holders have been consolidated with the controlling entity, **irrespective of the racial composition of the companies**. This analysis (shown in the table below) reveals that 89.3% of the deep-sea proportion of the TAC (129 520 tons) is controlled by "historical participants", and 10.7% is controlled by "new participants". In this analysis we divided the quota holders into four categories on the basis of the size of their allocation.

Table 2.4. Distribution of domestic allocation of deep-sea TAC in 2000.

HISTORICAL PARTICIPANTS	Number	Tons	Percent of TAC (2000)	NEW PARTICIPANTS	Number	Tons	Percent of TAC (2000)
Category A 1*	2	89451.0	69.1	Category A 2	0	0	0
Category B 1	6	18748.1	14.5	Category B 2	1	1500.0	1.16
Category C 1	3	2778.0	2.1	Category C 2	3	2750.0	2.12
Category D 1	10	4629.6	3.6	Category D 2	23	9663.0	7.46
TOTAL	21	115606.7	89.3		27	13913.0	10.7

* = Majority share in I&J and Sea Harvest held by listed companies, viz. Anglovaal and Tiger Brands, respectively

Categories
A *> 10,000 mt*
B *1500 to 10,000 mt*
C *750 to 1500 mt*
D *< 750 mt*
Note: Where effective control resides outside of the designated rights holder the quota holders have been consolidated with the controlling entity.

<u>Notes</u>:

1. Coverage:

Total number quota holding entities in 2000 = 56

Total number for which ownership data was available = 52

Total deep-sea TAC for 2000 = 129 520 tons

Total deep-sea TAC for which "ownership" was known = 127 852 tons (= 98.7%)

PD individual or company "owned" quota in 2000 = 42 732.7 tons

2. The holding companies and majority shareholders of the two largest quota holders, I&J and Sea Harvest Corporation, are listed companies that hold 80% and 72% respectively. It is therefore not possible to accurately calculate the percent of the deep-sea hake quota controlled by previously disadvantaged individuals or companies. If anything, the proportion of quota controlled by PD entities will be higher than illustrated here. Secondly, the deep-sea quota holdings were analysed on the basis of percent ownership of companies or shareholding in historical fishing companies by previously disadvantaged entities (companies or individuals). This analysis (see Fig. 2.7) shows that 33% of the deep-sea proportion of the hake TAC is held by PD individuals or companies.

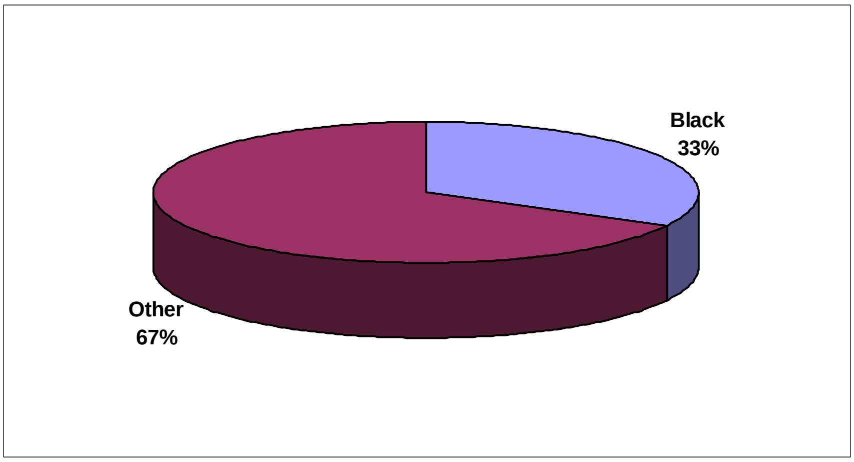


Figure 2.7. Percent of deep-sea TAC controlled by PD companies through direct quota allocation or cross shareholding in 2000.

Inshore quota

The inshore hake and sole quotas have been analysed on the same basis and this shows that 33 and 35% percent of the hake and the sole quota was controlled by PD companies or individuals in 2000. As for the deep-sea quota, the proportional share of the quota controlled by PD entities will in reality also be higher given that the majority shareholders of I&J and Seavuna are JSE listed companies.

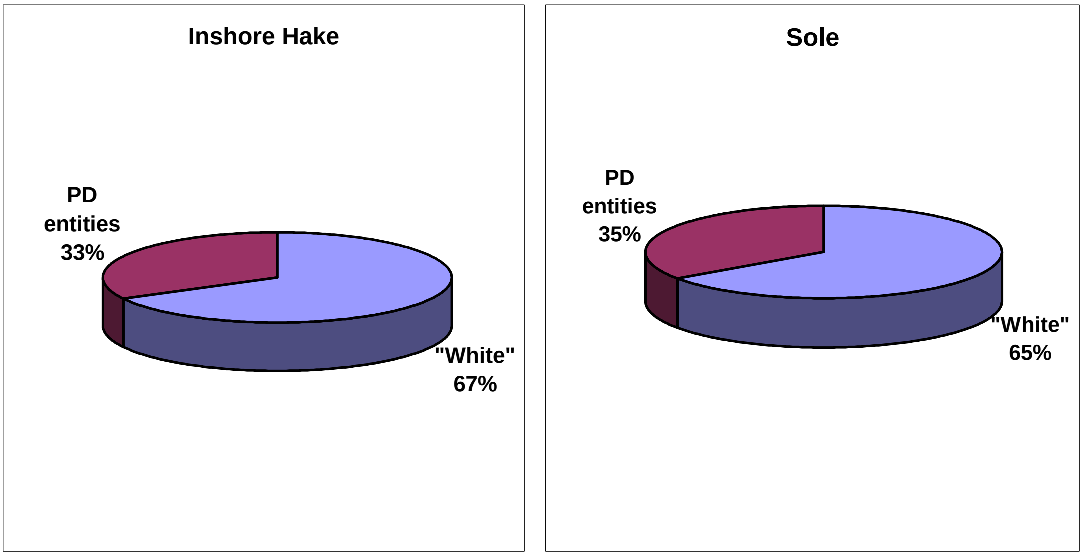


Figure 2.8. Percent of inshore hake and sole TAC controlled by PD companies through direct quota allocation or cross shareholding in 2000.

2.7 Vessel ownership

Given the different types and legalities of holding shares in a vessel or a company makes the issue of vessel ownership extremely difficult. To overcome the problem, the assumption was held that vessels are either wholly owned by a fishing company, or alternatively that the share held by part owners is proportional to the shareholdings in the company that owns the vessel. The proportional "ownership" of GRT of fishing trawlers was therefore calculated on the basis of percent ownership of vessel owning companies and/or shareholding of black companies in historical fishing companies that own and operate trawlers. The graphs below show that in 2000 previously disadvantaged entities (companies or individuals) owned 30% of the deep-sea GRT and 32% of the inshore GRT.

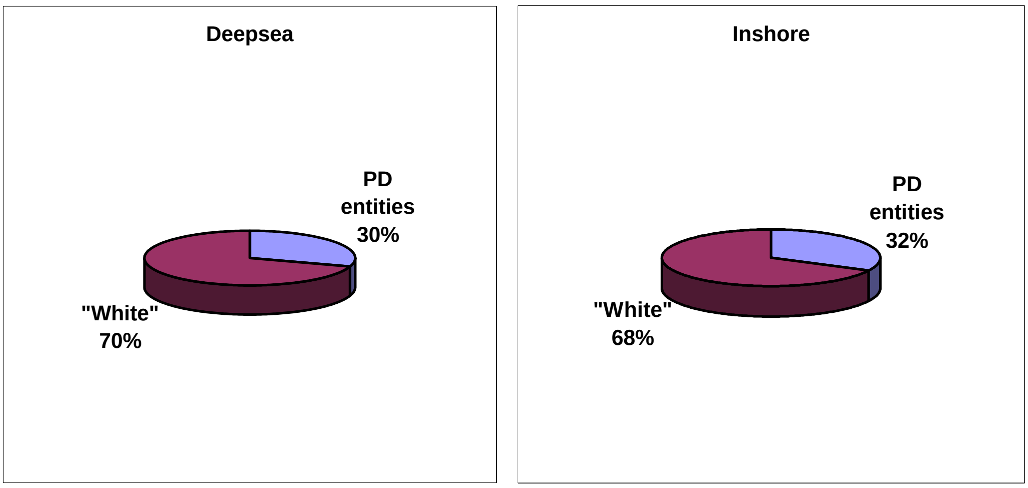


Figure 2.9. "Ownership" of deep-sea and inshore GRT in 2000.

2.8 Characterisation of the Deep-sea and Inshore Trawling Fleets

In year 2000 there were 61 operational deep-sea trawlers and 29 inshore trawlers. The deep-sea trawler fleet is concentrated in the Western Cape (93%), with 60% of the vessels operating out of Cape Town, 33% out of Saldanha Bay, 5% out of Port Elizabeth and 2% out of Mossel Bay. The concentration of the fleet in the Western Cape is also reflected in the landings (95% of the catch was landed in the Western Cape). The inshore fleet operates out of Mossel Bay (90%) and Port Elizabeth (10%). To a great extent the concentration of the inshore trawling fleet in the Mossel Bay area is related to the abundance of sole. Overall the 2000 landings of the trawling industry (deep-sea and inshore) were distributed as follows: Western Cape 95% and Eastern Cape 5%.

The following table provides the most pertinent statistics of the two fleets.

Table 2.5. Characteristics of the deep-sea and inshore trawling fleets operational in 2000.

CHARACTERISTIC	DEEP-SEA	INSHORE
Number of vessels operational in 2000	61	29
Freezer (Fr), Combined (Com) and Ice vessels (Ice)	21 Fr, 4 Com, 36 Ice	29 Ice
Average age in years – see graphs	24.5	23.8
Total GRT (tons)	47,978	2390
Average (range) length in m – see graphs	49(20.7 - 90.6)	20.5(14 - 31.2)
Average (range) power in kW (range)	1464 (582 – 3600)	351 (140 – 920)
Total onboard storage capacity (tons)	29,480	710
Total market value	R754.1 million	R54.7 million
Replacement value	R2380.5 million	R182.7 million
Average (range) number of sea days	191.2(11 – 291)	187 (3 – 290)
Average (range) catch per sea day (nominal tons)	13.3 (4.2 – 25.4)	2.1 (0.9 – 6.9)

The average age of trawlers in the deep-sea fleet in 2000 was 24.5 years, although over 73% of the vessels are between 25 and 40 years old. 50% of the vessels are between 25 and 30 years old. The average age of vessels in the inshore fleet in 2000 was 24 years, although there are some relatively new trawlers in the fleet. However, the majority of the inshore trawlers are over 30 years old. Figure 2.10 illustrates the age of the two trawling fleets.

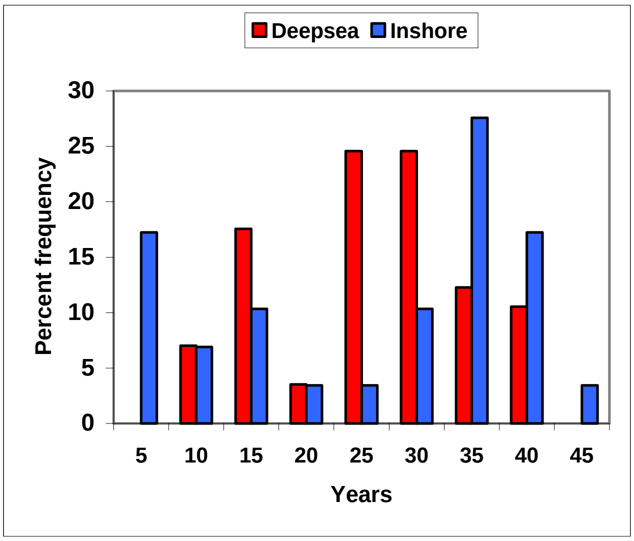


Figure 2.10. Age of the vessels in the deep-sea (n=61) and the inshore (n=29) trawler fleets in 2000.

The majority of the 61 vessels in the deep-sea trawling fleet that were operational in 2000 were less than 1 000 GRT and ranged between 40 and 50 metres in length. Figures 2.11 and 2.12 show the distribution by GRT and length of the deep-sea trawling fleet.

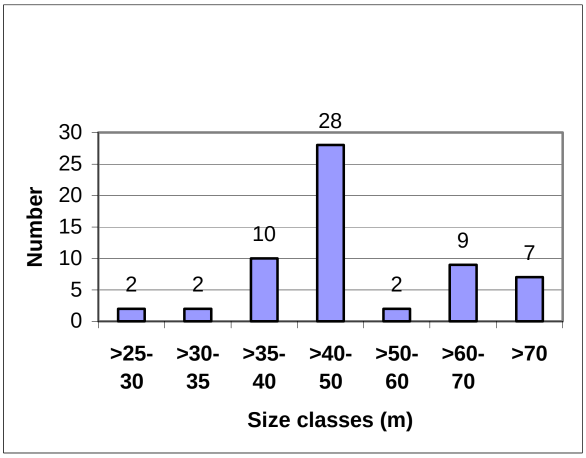


Figure 2.11. Size distribution of deep-sea trawlers by length (m) in 2000.

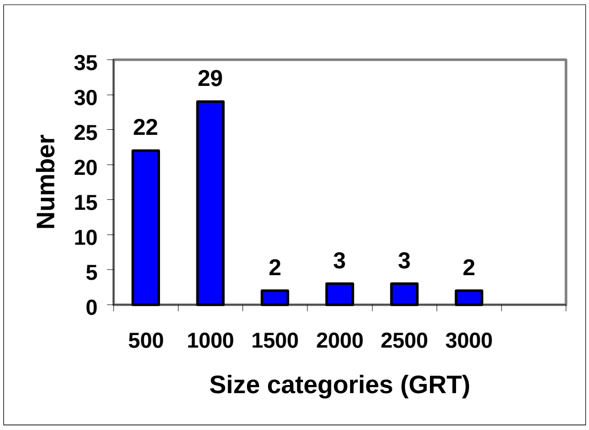


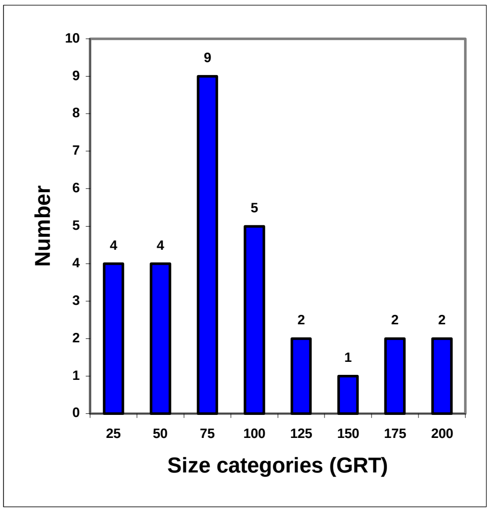
Figure 2.12. Size distribution of deep-sea trawlers by GRT in 2000.

Stratification of the deep-sea trawling fleet into vessel categories is not possible because of the overlap in size of vessels (by length and GRT) with operational activities. The only two evident categories are those smaller or larger than 1 000 GRT and ranging in length between 32 and 61m. However, some of these are freezers while others are ice-boats and these operate on different business strategies / models. Any kind of stratification would therefore be artificial and quite meaningless. Table 2.6 shows the most pertinent statistics of the deep-sea trawling fleet per size class.

Table 2.6. Summary statistics for the Deep-sea Fleet in 2000, per size class.

DEEP-SEA FLEET VESSEL SIZE CLASSES	25-30M	>30-35M	>35-40M	>40-50M	>50-60M	>60-70M	>70 M
Number	2	2	10	28	2	9	7
Avg. age	26	13	23	26	20	25	26
Avg.# sea days/year	141	202	185	198	277	183	195
Avg. annual catch	567	2306	1786	2510	3664	3215	3087
Market value (m)	5.5	12	9.6	12.8	17.5	14	18.1
Replacement value (m)	16.8	30	40.6	45	44.5	48.7	69.3

The majority of the trawlers (n = 24) in the inshore fleet (n = 29) are less than 25m in length and less than 100 GRT (see Fig. 2.13). From the catch data it would appear that the “more dedicated” sole trawlers are those < 20 metres, while the large vessels target more on hake.



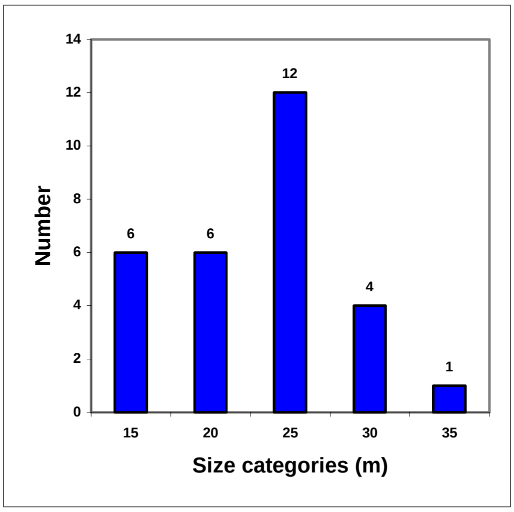


Figure 2.13. Size distribution of inshore trawlers by GRT in 2000.

The following table shows the most pertinent statistics of the inshore trawling fleet per size class.

Table 2.7. Summary statistics for the inshore fleet in 2000, per size class.

INSHORE FLEET VESSEL SIZE CLASSES	**>12-14M**	**>14-18M**	**>18-20M**	**>20-25M**	**>25-30M**	**>30-35M**
Number	2	8	2	12	4	1
Avg. age	4	13	26	32	30	24
Avg.# sea days/year	224	180	151	185	167	290
Avg. annual catch	219	270	249	430	513	1987
Market value (mill)	1	1.8	2	1.6	2.6	4.5
Replacement value (mill)	1.8	2.9	3	3.4	5.8	18.4

2.9 The Catch and Vessel Performance

The table below shows the total landings of the major demersal species for the period 1996 to 1999. All figures in metric tons nominal weight.

Table 2.8. Total landings for demersal species, 1996 – 1999.

SPECIES	**1996**	**1997**	**1998**	**1999**
Hake	158785	147569	149116	131439
Sole	959	860	890	768
Kingklip	3372	3927	3409	3920
Monk	6161	7639	7902	6949
Horse mackerel	15307	22922	19264	11641
Other by-catch	19925	19387	20917	13452
TOTAL	206505	202304	201498	168169

Note: As at 18/7/01, landings for 2000 were not yet available from MCM.

Overall the demersal trawling industry in terms of capital investment, expenditure and product value is the largest and most valuable sector in the South African fishing industry. The quayside value of the hake catch in 1999, in H&G frozen equivalent, was estimated at R907 million[1]. The market value of the deep-sea and the inshore fleet has been estimated at R754.1 million and R54.7 million, and the replacement value at R2 380.5 million and R182.7 million, respectively.

The percent by-catch within the trawling industry varies between companies (Fig. 2.14). To a large extent this reflects the business models that companies have had to develop and adopt in order to remain viable on the basis of the quantum of hake allocated.

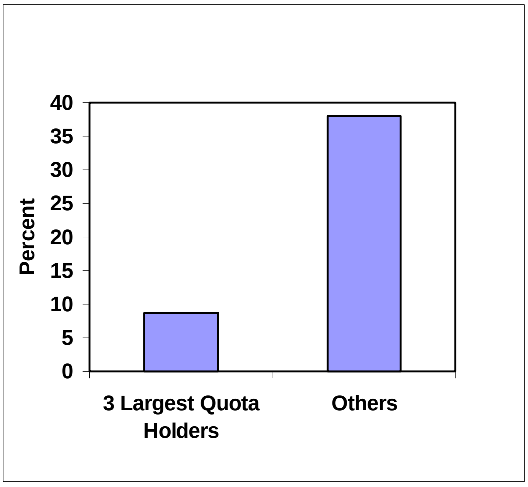


Figure 2.14. Percent by-catch of quota holders in 2000.

The composition of the by-catch in 2000 is based on 98% coverage of all deep-sea vessels. The four most important species were monk (30%), kingklip (15%), ribbonfish (15%) and snoek (15%). Figure 2.15 clearly indicates that monk is targeted by several companies and that it may be an option to consider the imposition of a TAC for monkfish.

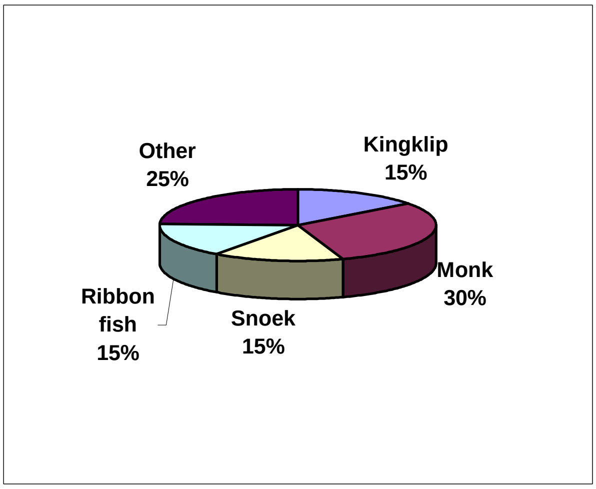


Figure 2.15. Percent composition of by-catch (17 518 tons) in 2000.

[1] The landed quayside value in frozen H&G equivalent was calculated from industry questionnaire returns at an average of R6 900.70 per ton. The industry and the ESS team agreed that the "frozen H&G equivalent" value would be taken as an industry average, as this is the first product to which a "standard" value can be assigned.

The performance of the vessels in the two fleets is shown in the graphs below. The average catch per day of deep-sea trawlers is highly variable. On average, factory freezer vessels are able to handle a higher catch rate than ice vessels. The high variability of catch rates per trawler size and or type is largely thought to be a consequence of the market demand driven nature of the industry and the different operational business models in the deep-sea trawling industry. This is also reflected by the by-catch proportions (see above).

The average daily catch rate of the inshore trawlers is proportional to the size of the vessel and is probably a reflection of fewer business models available to inshore trawler operators (Figure 2.16).

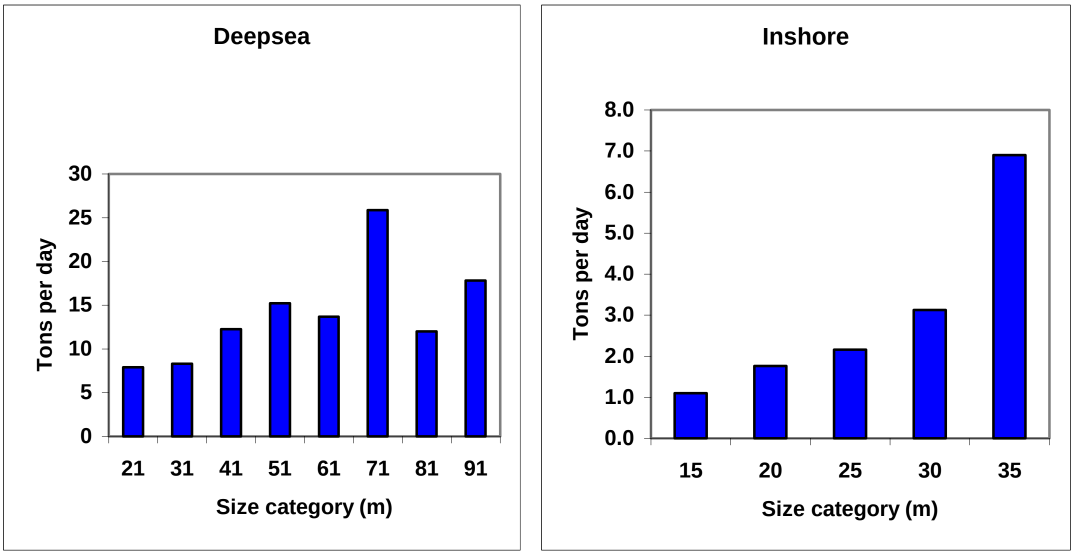


Figure 2.16. Average catch (tons/day) by deep-sea trawlers per length size category in 2000.

In recent times deep-sea trawler operators have become more quality conscious. From data returns for 19 of the 61 trawlers operating in 2000 (i.e. 31%), it was possible to calculate that the average trawler operated at 27% below the maximum catch rate. Moreover, the trip duration of ice trawlers have in many instances been reduced by over 50% to ensure fish quality.

2.10 Employment in the Industry

The deep-sea and the inshore trawling industries are the only fisheries in South Africa that provide formal employment for all sea and land staff (except for unskilled workers in the inshore industry). Staff in all scale groups (except part-time staff) receive benefits such a medical assistance, pension and housing allowances in some categories. Moreover, the majority of quota holding companies have social responsibility programmes and in particular the “pioneer” companies. Training and retraining is a significant feature of the industry. Our estimates show that the industry as a whole spends in the region of R7.5 million per annum on training. A high proportion of the workers in the industry are skilled (21% fully skilled and 45% semi-skilled). The deep-sea sector is unionised and salaries, which are based on rank and years of experience, are negotiated annually on the basis of employment equity plans. Many of the companies operating in the inshore sector have similar employment models as the deep-sea sector.

The set of tables and graphs on the following pages show the employment figures by race and sex, and provide insight into employment / income ratios per scale group.

Table 2.9. Trawling industry summary.

Note: The following sumary tables are based only on returns that provided detailed employment figures. The data covers 81% of the total industry payroll and 80% of industry employment figures for 2000

EMPLOYMENT	**Total**	**PDI**	**Female**
Deepsea	**7667**	**7051 (92%)**	**3034 (40%)**
Inshore	**1171**	**1055 (90%)**	**496 (42%)**
Whole industry	**8838**	**8106 (92%)**	**3530 (40%)**

PAYROLL	
Deepsea	R368.3 million
Inshore	R47.2 million
Whole industry	R415.5 million

Note: All staff in deepsea sector are on fixed salaries and benefits and seagoing staff are paid commission on top of salary.

JOB RATIO	**Seagoing**	**Ashore**
Deepsea	1	3.10
Inshore	1	2.20
Whole industry	1	3.00

SUMMARY TABLES OF EMPLOYMENT

TOTAL EMPLOYMENT (NUMBERS)

	Seagoing	**Shorebased**	**Process**	**Marketing**	**Ad&Man**	**TOTALS**
Deepsea	1880	1449	3889	133	316	7667
Inshore	361	182	544	34	50	1171
Industry	2241	1631	4433	167	366	8838

PDI EMPLOYMENT (NUMBERS)

	Seagoing	**Shorebased**	**Process**	**Marketing**	**Ad&Man**	**TOTALS**
Deepsea	1830	1261	3745	50	190	7076
Inshore	346	147	531	22	26	1072
Industry	2176	1408	4276	72	216	8148

FEMALE EMPLOYMENT (NUMBERS)

	Seagoing	**Shorebas**	**Process**	**Market**	**Ad&Man**	**TOTALS**
Deepsea	0	62	2903	45	147	3157
Inshore	0	13	436	15	32	496
Industry	0	75	3339	60	179	3653

Table 2.9 (cont'd). Trawling industry summary.

TOTAL EMPLOYMENT (PERCENT)

	Seagoing	Shorebased	Process	Marketing	Ad&Man
Deepsea	25	18	51	2	4
Inshore	31	16	46	3	4
Industry	25	18	51	2	4

SUMMARY TABLE OF PDI EMPLOYMENT (PERCENT)

Percent PDI	Seagoing	Shorebased	Process	Marketing	Ad&Man
Deepsea	97	87	96	38	60
Inshore	96	81	98	65	52
Industry	97	86	96	43	59

SUMMARY TABLE OF FEMALE EMPLOYMENT (PERCENT)

Percent Female	Seagoing	Shorebased	Process	Marketing	Ad&Man
Deepsea	0	4	75	34	47
Inshore	0	7	80	44	64
Whole Industry	0	5	75	36	49

SUMMARY TABLES: DISTRIBUTION OF INCOME

SUMMARY TABLE

	%PDI of total staff Mean	% of payroll to PDI Mean	% females total staff Mean	% of payroll to females Mean
DEEPSEA	89 (71-94)	79 (75-91)	29 (4-64	21 (5-41)
INSHORE	96 (88-100)	92 (82-100)	30 (0-55)	26 (5-40)
WHOLE INDUSTRY	92 (71-100)	86 (75-100)	29 (0-64)	23 (5-41)

PERCENT OF PAYROLL TO PDI PER EMPLOYMENT DIVISION

% of payroll to PDI	Seagoing	Shorebased	Process	Marketing	Ad&Man
Deepsea	90	84	72	23	45
Inshore	96	70	97	18	64
Whole Industry	93	76	82	21	55

PERCENT OF PAYROLL TO FEMALE STAFF PER EMPLOYMENT DIVISION

% of payroll to female	Seagoing	Shorebased	Process	Marketing	Ad&Man
Deepsea	0	2	59	16	32
Inshore	0	6	71	35	55
Whole Industry	0	4	65	23	45

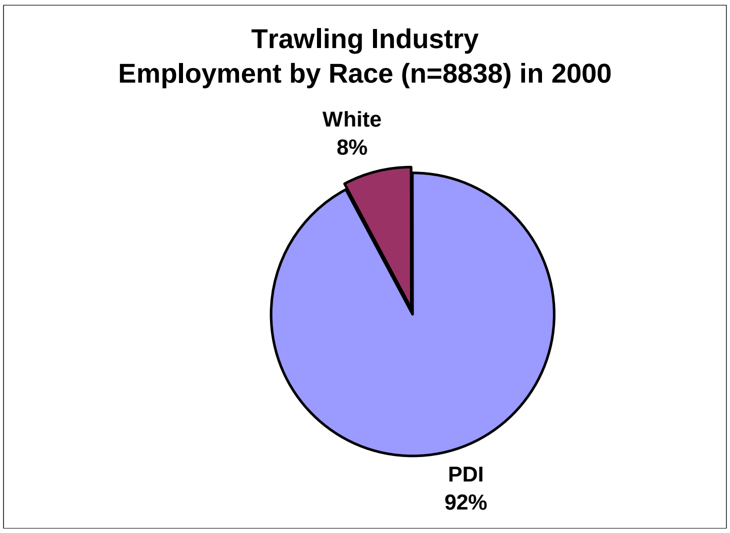


Figure 2.17. Employment in the entire trawling industry (deep-sea and inshore) by race and by employment category.

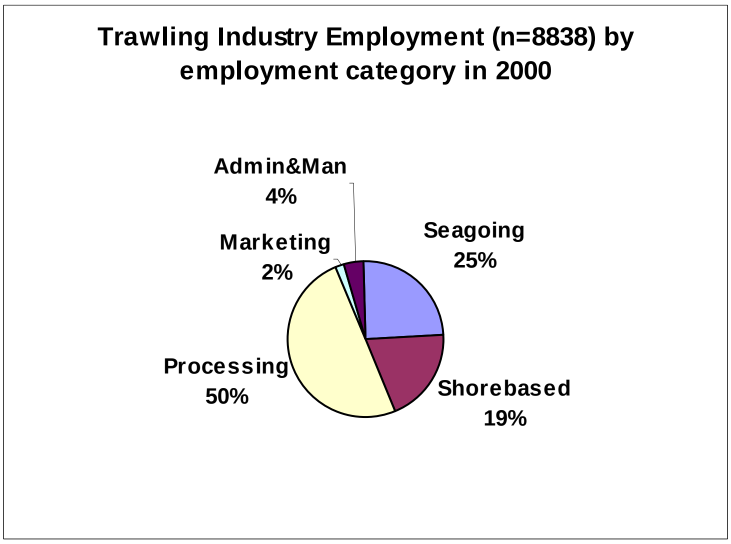


Figure 2.18. Total number of people employed by the deep-sea and the inshore trawling industries.

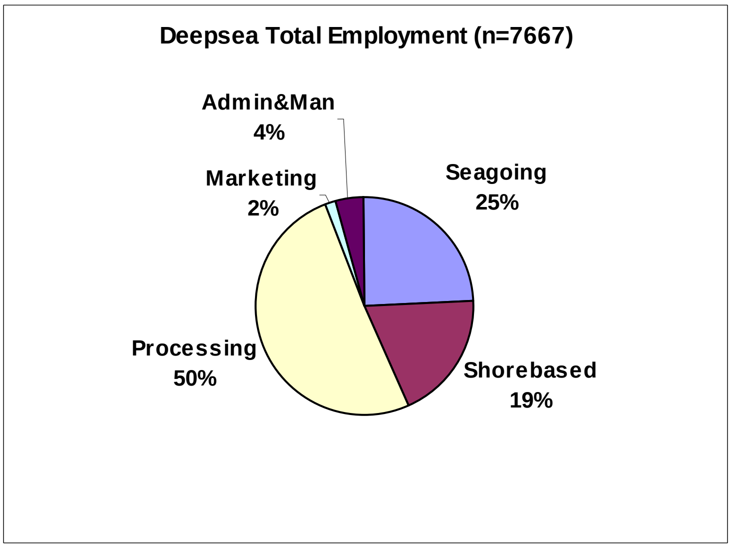


Figure 2.19. Total employment in the deep-sea fishery.

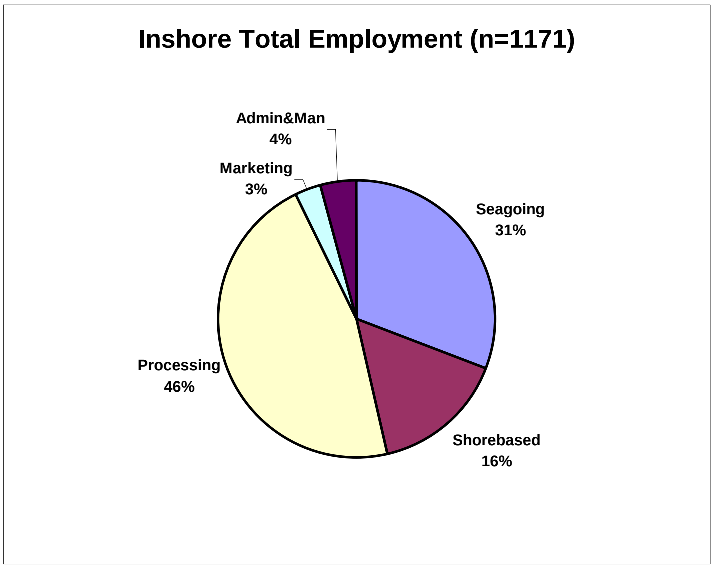


Figure 2.20. Total employment in the inshore fishery.

<u>Employment and income per operational division and per scale group</u>
Data is presented for the deep-sea industry in three divisions, viz. vessels, company and factory. The inshore trawling industry has data for vessels only. It is important to note that income and commission in the deep-sea and the inshore seagoing divisions is based on rank and years of experience.

DEEP-SEA (Vessels, Company and Factory)
<u>Vessels</u>
The employment scale groups on deep-sea trawlers have been divided into professional / managerial, skilled and semi-skilled. The income figures per scale group for the deep-sea fleet have been calculated exclusive and inclusive of the most sophisticated factory vessel in the fleet in 2000. This was done because the high commission rates paid on this vessel significantly distort the overall averages.

Table 2.10. Vessel employment statistics.

EXCLUSIVE		**AVERAGE**	**AVERAGE**
Prof/Man	Number	Income / yr	Income / seaday
White	27	183418	950
Black	248	139314	722
% black	90.2		
Skilled			
White	8	53262	276
Black	274	51817	268
% black	97.2		
Semi-skilled			
White	4	48305	250
Black	1018	49508	257
% black	99.6		
INCLUSIVE		**AVERAGE**	**AVERAGE**
Prof/Man	Number	Income / yr	Income / seaday
White	29	219172	1136
Black	251	141005	731
% black	89.6		
Skilled			
White	8	53262	276
Black	280	53644	278
% black	97.2		
Semi-skilled			
White	4	49844	258
Black	1070	51199	265
% black	99.6		

Company

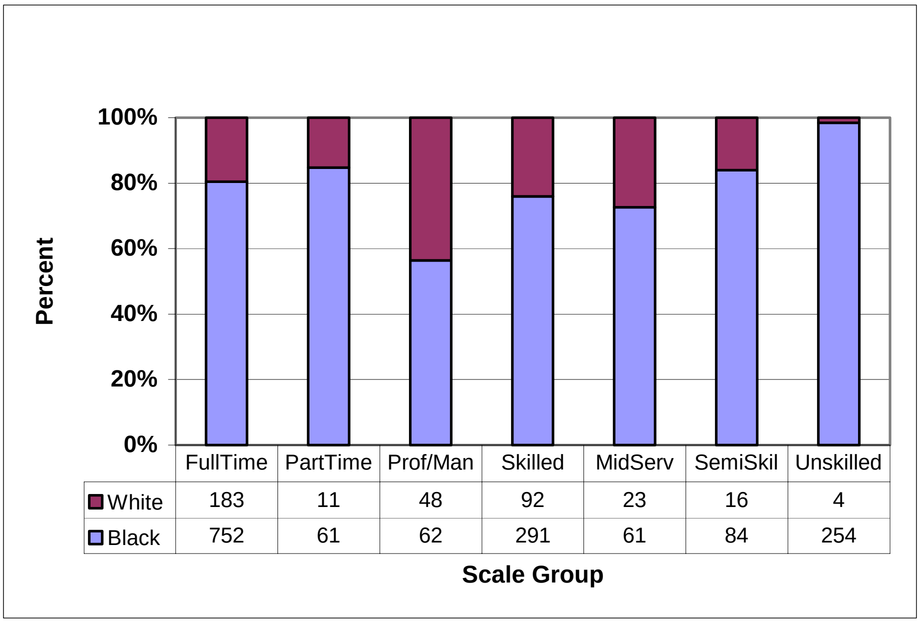
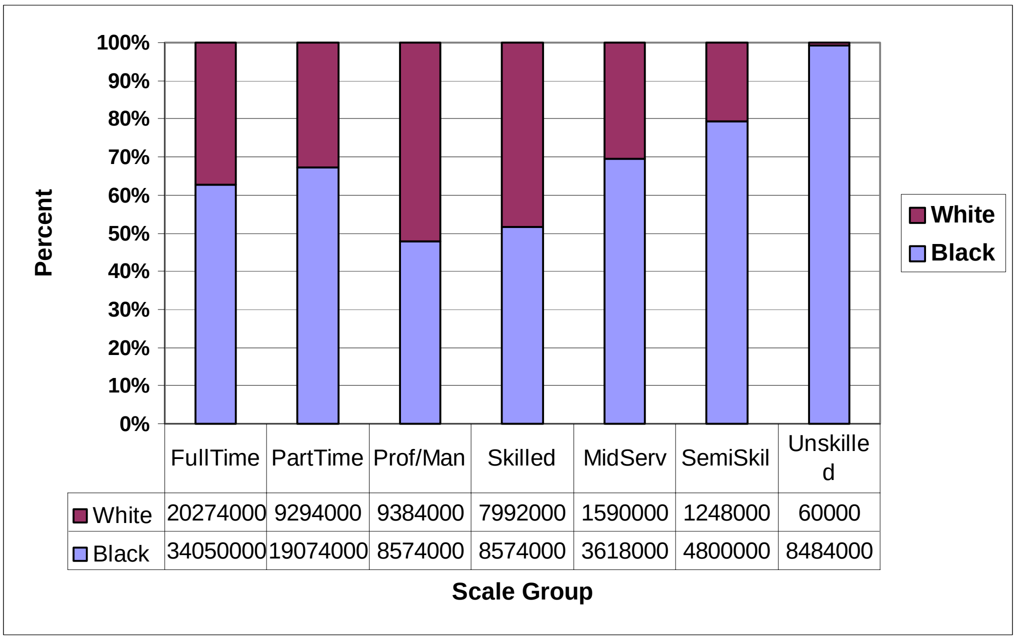


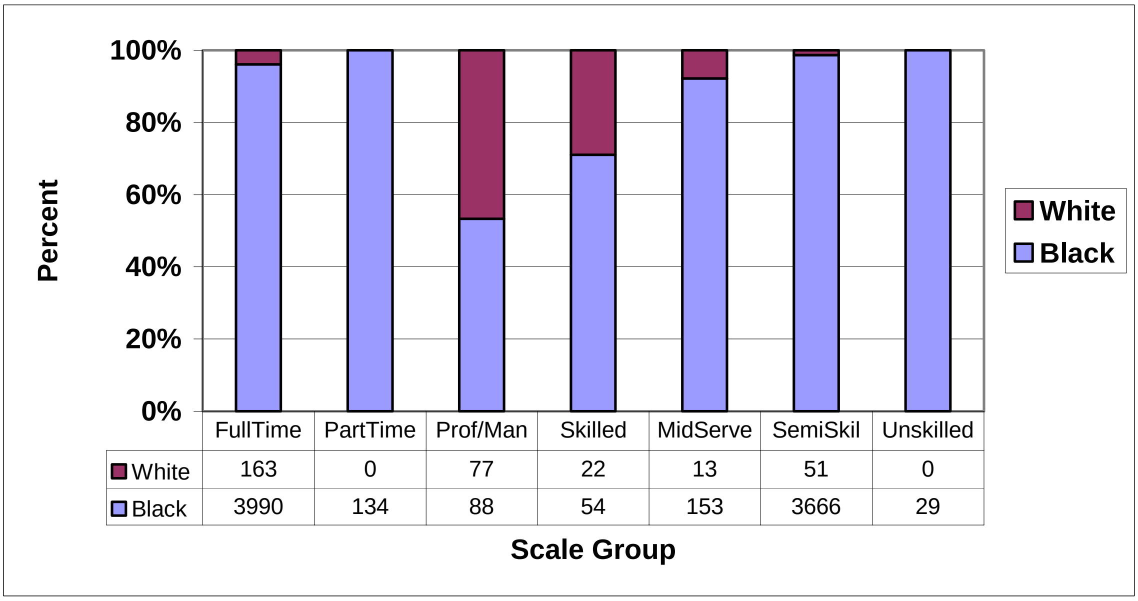
Figure 2.21. Deep-sea company employment per scale group.



	FullTime	PartTime	Prof/Man	Skilled	MidServ	SemiSkil	Unskilled
White	20274000	9294000	9384000	7992000	1590000	1248000	60000
Black	34050000	19074000	8574000	8574000	3618000	4800000	8484000

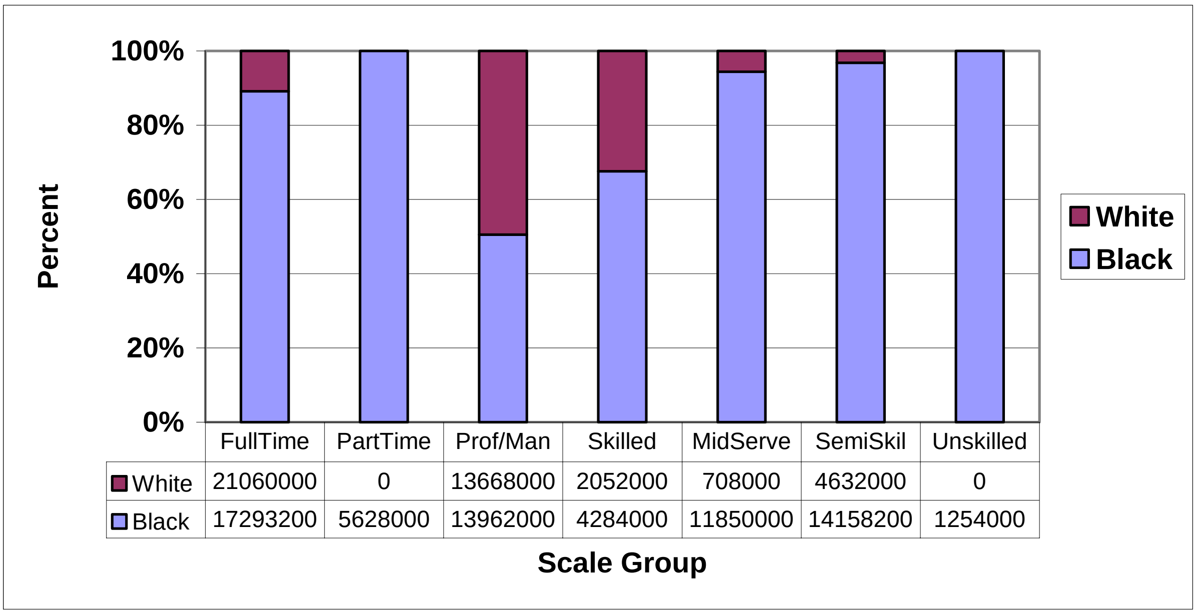
Figure 2.22. Deep-sea company income per scale group.

<u>Factory</u>



	FullTime	PartTime	Prof/Man	Skilled	MidServe	SemiSkil	Unskilled
White	163	0	77	22	13	51	0
Black	3990	134	88	54	153	3666	29

Figure 2.23. Deep-sea factory employment per scale group.



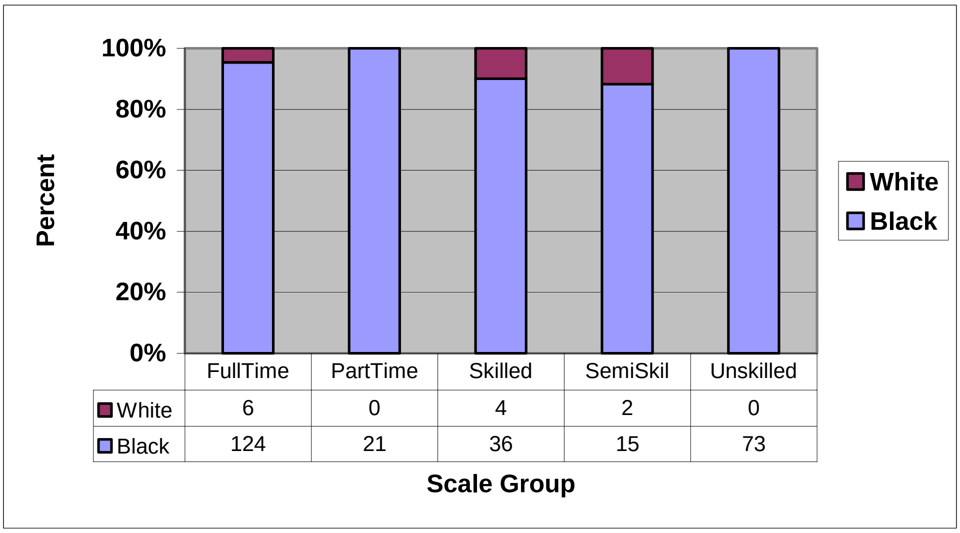
	FullTime	PartTime	Prof/Man	Skilled	MidServe	SemiSkil	Unskilled
White	21060000	0	13668000	2052000	708000	4632000	0
Black	17293200	5628000	13962000	4284000	11850000	14158200	1254000

Figure 2.24. Deep-sea factory income per scale group.

The analysis shows that the vast majority of jobs in the deep-sea sector are permanent (96.7%). The present ESS coverage shows that only 251 out of 7 667 jobs in the deep-sea industry are part-time (3.3%). The percent distribution of the 251 temporary jobs in the industry per division is as follows. Over 60% of the part-time jobs are held by persons in the unskilled job category, followed by middle services, skilled and artisan categories. Per division, 53% of the 251 part-time jobs are in processing, 29% in shorebased operations and 18% in the seagoing division.

INSHORE

Vessels



	FullTime	PartTime	Skilled	SemiSkil	Unskilled
White	6	0	4	2	0
Black	124	21	36	15	73

Figure 2.25. Inshore vessels employment per scale group.

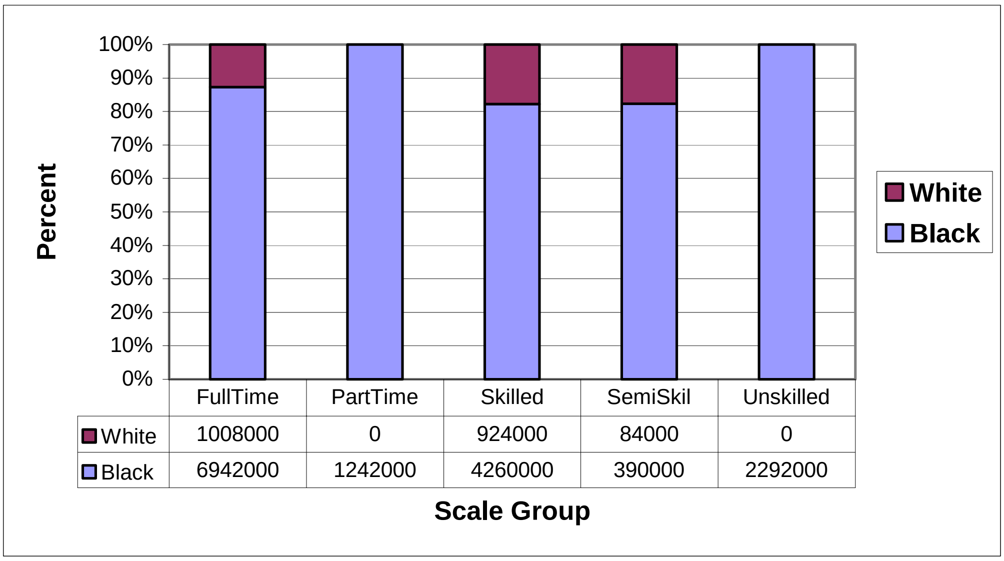


Figure 2.26. Inshore vessels income per scale group.

2.11 Processing

The deep-sea fleet lands product in three different categories, viz. fresh fish, frozen H&G and market ready, frozen skinned fillets (see below). The greater proportion (65%) or approximately 84 188 tons was landed as fresh fish, which undergoes either primary or secondary processing in factories. A small proportion of this fish is sold as PQ. (PQ, abbreviated from Portugese Quality hake, is a term for gutted head on fresh hake). Frozen H&G (headed & gutted) is generally landed in 20kg blocks and undergoes further processing in factories. Frozen skinned fillets are produced on five vessels and most of this product is sold directly into the export market (Europe, USA and Australia).

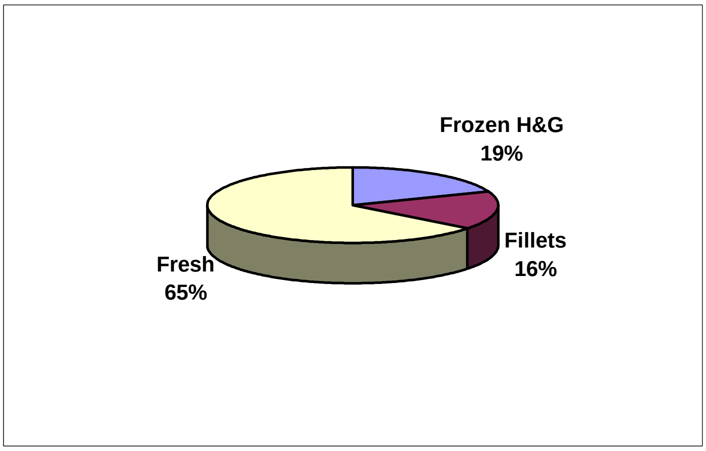


Figure 2.27. Percent deep-sea hake landings per product in 2000.

Analysis of the quanta of fish caught and processed (primary and secondary processing) revealed that a significant amount of transfer takes place between the “pioneer” companies, small quota holders and new entrants. These findings are summarised in Table 2.11.

Table 2.11. The amount of fish caught and processed by pioneer, small and new-entrant companies in 2000.

	NO. OF COMPANIES*	TONS	% OF TAC	INTRA-INDUSTRY TRANSFERS
CATCHING				
Pioneers	5 (29)	111863	88	- 3440
Hist. Small	6 (13)	8680	7	3540
New Entrants	7	5834	5	- 346
PROCESSING				
Pioneers	5 (13)	108422	85	
Hist. Small	4 (15)	13220	10	
New Entrants	10	5488	5	

Notes:

1. Pioneer companies = 5 + 5 subsidiaries, Historically Small Co's = 13, New entrants = 34
2. * Numbers in parentheses are quota holders who had their allocations caught or processed entirely or in-part by Pioneer or Historically Small companies.
3. ESS coverage = 89% of quota holders (No returns from 6 quota holders)

Of the 20 032 tons allocated to 32 new entrants since 1993, 5 832 tons were caught by 7 (or 21%) new entrant companies. On the other hand, 29% (10 new entrants) were actively engaged in primary processing (PQ export, fish shops, fillets for the local market and other local niche products).

The cost of processing 77% of the deep-sea catch in 2000 (ESS processing cost data coverage) was in the order of R336.8 million. The breakdown of processing costs is shown in Figure 2.28. The factories of the 6 major processors have a replacement value of **R775** million. In 2000 they were used at 72% of maximum capacity.

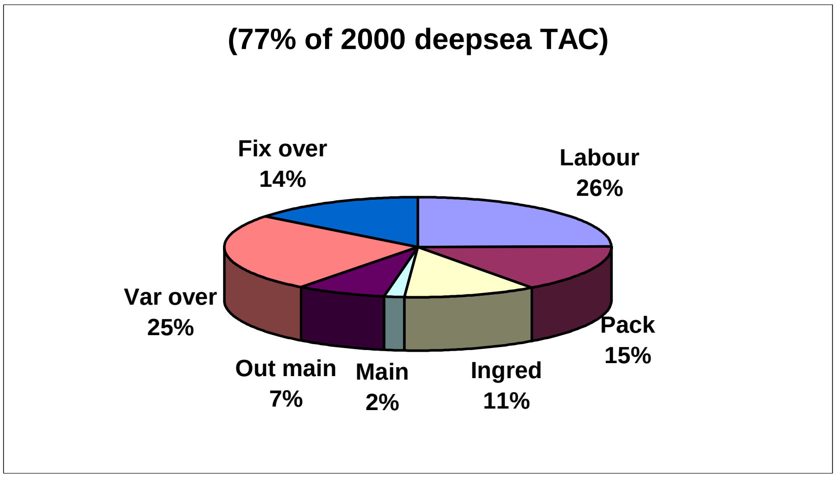


Figure 2.28. Processing costs in the deep-sea fishing industry in 2000 (Fix over = Fixed overheads, Pack = Packaging, Var over = Variable overheads, Out main = Outsourced maintenance, Main = Maintenance, Ingred = Ingredients, Labour = Labour cost).

Given the volume limitations of the South African market, the hake industry has established itself as a world leader in processing (in terms of the number and diversity of products) and international marketing of fish products. To a large extent the majority of small quota holders and new entrants are reliant on the pioneer companies for the processing and marketing of product (see table 2.11 above).

The entire inshore trawl hake catch is landed as ice fish. The bulk of the catch is processed in various ways and sold into the domestic market. A small proportion is exported. Approximately 95% of the catch is processed by four of the pioneer companies. The greater proportion of longline and handline caught hake is exported as PQ to southern Europe.

2.12 Trawling and Minimum Viable Quotas

It is not at all easy to get to grips with the concept of a Minimum Viable Quota (MVQ). Though the idea seems right at a superficial level, it comes as a disappointment that it is lacking in positive and useful properties when examined in more depth. This is largely because the underlying assumptions do not bear rigorous economic scrutiny, which unexamined, may easily pass for assured truth.

Retracing the history of the concept helps to show why the idea is questionable. Two related strands ran through the MVQ debate as the rights allocation policy developed. One arose from the institutional framework within which the fishing industry has operated since the Quota Board and the other came along with the paper quota controversy.

Much of the impetus for MVQs arose from the fishing rights turmoil between 1991 and 1998. Substantial technical over investment in fishing effort [(i)] came about as actual (and prospective) rights holders positioned themselves. [(ii)] Under the prevailing conditions, the administrative establishment was subjected to intensive lobbying for an “equitable distribution of access rights” on the part of “rent seeking” individuals who usually complained that their quotas did not fit their vessels or their plans.
Paper quota is probably the more important factor to have informed the MVQ debate. Simply put, paper quota is generally perceived to be a “bad thing”, largely for emotional and moralistic reasons associated with the idea that fishing rights are in the gift of the State. The “guilty parties” had a response, that they would be good if only they could, but to do so they needed more quota to validate the scale of investment they envisaged. [(iii)]

The patent undesirability of paper quotas (PQs) and the turmoil they create meant in effect that it was imperative to eradicate them. It being almost impossible to abolish them by taking the rights of existing holders away entirely, the only alternative would be to enlarge the PQs already in existence, and ensure that any new allocations measured up to the PQ threshold. If rights holders failed to realise their existing quotas because the amount allocated was too small to support an economically viable operation, as was almost invariably claimed, there must be a greater amount where the “paper rights ” could be transformed into something real and viable. This boundary is the MVQ for any given fishery. Enlargement thus becomes a seductive means to wash the “paper” out of the system. Things are never so simple, as the real boundary is a constantly moving target.

MVQs make reallocation unavoidable in mature fisheries, that is fisheries where all the investment that the resource can bear is already subscribed. Augmentation of one right implies at least some dispossession [(iv)] of the other rights holders if **responsible** fishing is to be maintained. Depending on the “minimum viable business model” actually chosen, the quota structure of the trawl fishery, with its more than 31 or so allocations that are not currently caught by the nominal quota holder, could be such that widespread dispossession will prevail. This will bring many problems in train; problems that can be avoided by taking a more relaxed attitude to Paper Quotas. Deprecating the holders of paper quotas serves no good purpose. Do not create them, but should they have been brought into existence, then it is best to let them work their way through the system without hindrance or artificial assistance.

The theory behind Minimum Viable Quotas may well be valid for smaller-scale, relatively low tech, homogenous fisheries and or artisanal fisheries. A salient characteristic of these activities is that they provide participants with extremely limited options in any event.(v) However, MVQs as conceptualised in the ESS turn out to be of very limited value in the more complex, heterogeneous, capital-intensive industries. (vi)

As visualised, the MVQ makes no allowance for entrepreneurship, the real complexity of the economic system, technology choices, vertical integration and returns to scale. More advanced industries allow for a larger number of strategic options, commonly called business plans.

One of the findings of the ESS for the deep-sea trawling sector was that there were almost as many different ways of doing business as there are businesses themselves. Another is that classes of disparities in business approach were not necessarily closely correlated with size. It can hardly be reiterated too often that different business strategies entail different MVQs. For instance, an exporter of packaged branded goods (vii) would need a much larger volume of raw fish than would say a catcher who channels product through self-owned neighbourhood fish shops. (viii) The kind of market being accessed appears to be one of the chief determinants of operational scale. In other cases the scaling options relate to input cost control. (ix)

The general approach to MVQs is postulated on the idea that there is a justifiable or threshold ROI in the trawling business and, given any particular sunk investment, that threshold return fixes the viable minimum volume of fish. In other words the MVQ for any given size of vessel is that quantum of rights that justifies the investment. (x) There is no unique viable size. It is for this reason that the ESS methodology compromises by proposing different vessel classes for calculating layered MVQs. All said and done, the idea is based on a justification of existing sunk investment. The reasoning is both circular and sterile. It overlooks the fact that it would, in many cases, reward rent seeking and/or bad investment choices.

Generally speaking, the idea of an allotted MVQ entails certain administrative risks. At a practical level, MVQs would be subject to some unresolved questions:-

Being the minimum, a MVQ must be set at the margin of viability. Once quotas are allocated, what happens if the CPUE falls so that the MVQ is no longer viable in terms of the reduced quantum? If quotas are divisible, saleable and inheritable, what does it imply for MVQs? How will MVQs mesh with multiple rights (i.e. the holding of more than one form of access right by a nominal holder)? (xi) To what degree does non-marine investment in the fishing industry mesh with the MVQ? Depending on how allocation plans actually play out, MVQs could overload the system and produce the very instability that the Rights Allocation Directorate wishes to avoid.

Purely as a practical approach, is the answer to the question of "what is an appropriate MVQ in any fishery?" not revealed by the smallest viable vessel operating enterprise (xii) within that fishery? The non-theoretical answer is 306 tons in the case of deep-sea trawling (E F H Walters – MFV Libra). (xiii)

Footnotes:

(i) It is very important to make the distinction between technical and financial over investment, even though they often look like much the same thing. The first amounts to surplus effort and may well rebound on the status of marine resources. It is eminently right for the Authorities to intervene in the interests of conservation in such cases. The excessive capitalisation just means that somebody envisages spending too much money. There is never a reason for the Authorities to step in wherever it is just about money. The parties that put up the money should be allowed to enjoy the financial consequences, whatever they might be. A flaw of the MVQ is that it increases technical over investment, while merely trying to address a financial problem. It cannot be good for the resource and it takes the Authorities into places where one should fear to tread.

(ii) The "offending" parties were generally people who perceived themselves to be actual or potential "small quota holders". The impression that over investment is peculiar to South Africa is to be avoided. The STG document gives implicit recognition to what is practically a universal fact when it states that over capitalisation is an endemic problem in the fishing industry. Nor is it true that quota systems do away with the need for (biological) over investment in fisheries. ITQ systems may reduce the problem in the long term by orders of magnitude but over investment is present in all fisheries even the best run. The uncertainties and exigencies of marine fishing mean that there will always be some residual excess. Artificial reduction in the cost of second hand vessels (another endemic problem world-wide) reinforces the tendency to use too much by way of boats, especially at smaller scales. Over capitalisation will be at its worst in a climate that encourages systematic rent seeking through an administered allocation process. Some systematic over investment will always be present and there are additional reasons for it to occur world wide (fortunately South Africa has no subsidies). The point is that, since 1992, domestic institutions and policies artificially promoted surplus effort. The investment in question arose partly as a rent-seeking ploy. It would be odd to address distortions that arose directly from poor policy options in the past by settling for poor ones in the future.

(iii) Operational costs associated with investment were something else that confused the debate about viable size. Some parties with small quotas acquired large trawlers from foreign sources partly because they were "very cheap" (low financial but high technical investment). However, running costs were far too high for the quota involved. In other words, provided that there was indeed some scale at which breakeven could have occurred, the specific vessel had its own MVQ. Such parties arrived at the conclusion that there was indeed an MVQ in the trawl fishery and it was somewhere in the region of three thousand tons. The logic is impeccable given the belief that the original investment decision was unimpeachable. It did not help that such vessels were generally pretty old in the first place.

(iv) Reallocation in the fully subscribed fishery poses a moral problem, the apparent resolution of which is to strip all existing rights out of the system with a view to re-addressing "original acquisition" of economic rights. Working from such a basis it then becomes possible to apply the theory that all applicants are equal in status and that rights are purely in the gift of the State. Such "solutions" amount largely to sophistry.

(v) The realisation of MVQs implies the creation of business units constrained at the margin. A true minimum suggests an optionless environment. Minimum quotas that are not paper quotas cannot be viable in a dynamic business and resource environment. They automatically revert if subjected to negative shift, usually by way of liquidation.

(vi) It is not maintained that there never is a smallest viable quota – common sense says that there is always one appropriate to every technology and resource *in a given business environment.* What is contended is that there is a wide range of feasible scales at the lower end of the trawling spectrum but the wise Administrator should not go there.

(vii) The argument that such enterprises can access their raw material in an open market populated by a large number of small scale independent primary producers has been disposed of elsewhere.

(viii) This is not speculative. Both examples exist and the quota ratio of the two is approximately 300:1 (100:1 in another instance).

(ix) Some business models function on the basis of interdependence between units in the industry (a variation on the outsourcing theme). Others stand relatively on their own. As general rule the interdependent firm can be successful at lower scales while the independent would tend to be larger, if only because more vertically integrated.

(x) As conceived by the ESS the MVQ concept could amount to rewarding over investment in terms of rights held. Other than those traditional participants who have scaled investment carefully over an extensive period but who may now find themselves over capitalised because of loss of rights, there is little excuse for mismatching capital. For new and recent entrants it is almost always a matter of employing appropriate technology. For example, a South African operative has prospered for over thirty years trawling what is essentially a >100 ton hake quota employing a relatively unambitious but well conceived business plan which includes operating localised fish shops. Meanwhile others with much larger quotas have failed to invest at all, claiming technological impossibility of scale.

(xi) Multiple rights is another matter to which more thinking may have to be applied, but it is not the intention to go into the matter now. Suffice to say that they do contribute to solving widely recognised, endemic economic deficiencies of the fishery sector.

(xii) The reference to the smallest vessel operating business is unambiguous – to be of practical use, a paper quota must be designated so that the non-investment in question has to be restricted to the fishing sphere. The very idea of a paper quota has been confused by the peculiarly domestic contention that a fishing right may be properly exploited through an investment in fish processing, without "getting hands wet" as the saying goes. This idea simply takes the eye off the ball with the result that all sorts of allocation anomalies may ensue. Moving beyond the catching environment would complicate the MVQ notion and leads to conceptual anomalies and policy contortions even under the best of conditions.

(xiii) There seems to be nothing particularly notable about the business model employed in this case.

2.13 Vertical integration

Vertical integration arises from scale and organisational economies and may be defined as the degree to which a single firm undertakes the successive stages in the production process of a good. The comments made here are largely qualitative, but nonetheless illustrate the technical advantages and its impact on market structure. Moreover, it must also be born in mind that events that occurred 95 years ago contributed heavily to explaining the modern structure of the trawling industry. The pioneers recognised the importance of distribution from the start and the major companies became closely allied to cold chain food distributors. Once achieved, networked distribution led to a competitive imperative to access more species to complement the product range, and companies moved on to setting up infrastructure to buy-in "secondary" species from other fisheries. The dynamics of this linkage promoted integration as buyers needed to secure regular supplies. Of interest in a discussion on vertical integration was the attempt by AngloVaal to outsource I&J's engineering functions to Globe Engineering, another company in its group holdings. This attempt at vertical disintegration failed badly and the policy was abandoned. The same lesson was also learnt by later participants in the trawling business – maintaining an effective in-house engineering facility was vital to sustained success in the deep-sea sector.

The deep-sea trawling industry is capital and labour intensive measured in terms of the physical catch. This dual intensity comes about by integrating advanced technology and production systems to optimise the beneficiation of what is universally acknowledged to be problematical raw material. The industry deploys fleets in a balanced way to provide a controlled flow of quality sized fish to onshore factories for steady year round output of a wide range of value-added, branded, packaged goods. This system is made possible by relatively large scales of operation, opening the way for integrated control of distant water fishing and onshore processing. Product quality that would otherwise be extremely difficult to attain makes it possible to access international markets at acceptable prices. In short South African trawling entities have evolved into food companies by way of innovative organisation and integration. History shows that the deep-sea trawling industry in fact laid the foundation for the nation-wide frozen food industry. Applied food technology, intensive branding and exploitation of the established distribution infrastructure enabled the industry to introduce a full range of fish products in the form of branded packaged hake goods. Frozen whole fish also became more widely available as the bulk of sales moved away from traditional outlets towards supermarket fish counters and catering establishments. These developments tended to reinforce the importance of branding and distribution and consequently influenced the tendency to integrate. More entrants to the trawling industry also promoted heavier investment in branding. Initial branding of hake product occurred in the 1930s but intensive branding in the modern sense started with the development of quick frozen products at the start of the 1960s. Branding provides an effective means to optimise the economic and social benefit derived from the fishery, as customers will pay more for the added value and quality assurance that it entails. Branding also carries important structural implications largely connected to the high overhead costs of brand maintenance. Modern trading practice raises further structural considerations in regard to branding, namely a need to maintain exceptional quality control, to the point that it involves meticulous organisation of catching and handling operations at a basic level, and a need to attain "critical mass" in order to maintain international trading and contractual credibility. Branding thus promotes vertical integration.

Both of the two vertically integrated companies consist of a trawling division, a processing division and a marketing division. Both are entirely market driven, meaning that processing of a particular line of product is dictated by demand, which in turn dictates the catch rate of the trawling division. Both companies are expanding their market share in the international arena, whilst maintaining market share in the domestic market. The international market has extremely stringent requirements in terms of both volume and quality, therefore in order to compete effectively requires (i) Consistency and guarantee of supply, and (ii) Consistency and guarantee of quality.

i. <u>Consistency and guarantee of supply</u>

The operations of the processing factories and the fishing fleets are managed by planning divisions. Based on market demand and requirements, the planning divisions regulate the number of vessels at sea, the duration of fishing trips, the landing dates of vessels, the tonnage to be landed, the size mix and by-catch requirements. This in turn is linked to the production process in terms of staffing, operational shifts, operational lines, cutting patterns based on market demand, overtime requirements and balancing this with the welfare of the workforce, viz. continuity of work. The underlying concept is that the factories are not producing product for stock, but to meet customer demand. In fact stock levels of both companies are kept at minimum levels to meet the stringent quality requirements. This can only be achieved if the company is vertically integrated and not dependent on catching of fish alone.

ii. <u>Consistency and guarantee of quality</u>

In the international arena, South African hake competes directly with species such as cod. This in itself is a considerable achievement as hake is generally regarded as an inferior fish. Through the development of high quality products, the two vertically integrated companies have managed to elevate considerably the international demand for South African hake and hake products. Because of the vertically integrated nature of the companies they can ensure quality standards through uniform documented quality standards applicable to both the fishing fleets and the factories, the personnel of both units of the company being trained identically and adhering to identical quality standards. Where there is non-compliance of quality standards, either within the fleet or the factory, vertically integrated companies can remedy the situation rapidly as it is not hampered by company boundaries and conflicting needs.

<u>Conclusion</u>

Vertical integration allows for product development and international competition and market share, and is one of the principal reasons for the high seagoing to land based staff ratio (1:3). Other South African companies also export fish but to a large extent these exports are limited to smaller niche markets. From a historical perspective the success of the modern South African deep-sea fishery can be directly attributed to the successful integration of catching, processing, marketing and in particular the distribution of product, first to the South African hinterland and latterly the world. To a large extent the success of the medium and small hake quota holders (old and new) is based on the achievements of the vertically integrated companies, many of which are also entirely or partly dependent on them.

2.14 Levies

In accordance with the TORs of the ESS, the options for an equitable levy structure for the deep-sea hake trawling industry were examined.

From the outset it was assumed that the levy base would be restricted to the primary sector (up to the quayside). Given that fleet operations are integrated into different business models with varying emphasis on different markets, end products and intervening processes, no quay level operational standard for the industry as a whole was found. The solution to the problem was to develop a realistic notional standard and it was agreed that this entailed an opportunity cost approach to the problem. A standard model for a notional H&G freezer trawler was developed using verified calculated inputs and outputs. This required detailed information on vessel costs and revenues. For the most part the outputs of the model were governed by three important variables:- (a) conventional rate of return employed, (b) the valuation of capital and (c) hypothetical earnings. Sensitivity tables to capital employed (depending on the age of the vessel at acquisition) and to catch rate were developed. The findings and options are presented in the section on levy options in the overall ESS report.

A disk copy of the operational model will be provided with the final report.

Acknowledgements:

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3. THE HAKE HANDLINE FISHERY

3.1 Origin and Development of the Handline Hake Industry

The origins of the handline hake fishery can be traced back to the late 1980s. There were many reasons for its development. Vessel owners and fishers who had traditionally targeted squid and linefish commercially, explored the potential for alternative resources on the South Cape Coast as a "filler-in" activity when the other species were not targeted. There was a desperate need to keep vessels and crew economically active for as much of the year as possible.

Historically, hake has always been caught by commercial (traditional) handline fishers, but no real commercial value was attached to the species, due primarily to the value of other species. The development of a viable but risky market for PQ hake (fresh whole product on ice) predominantly to Spain, changed the perception commercial line fishers had of hake. Emphasis moved to quality, packing, freighting and marketing of the species. Handline-hake was also historically caught in small quantities around the coast – mostly at times when cold water moved up the shelf inshore, bringing fish closer to the coast. Generally the species was difficult to catch as it was mostly found too far offshore for the traditional line fisher. The exception to this rule was found to be the Plettenberg Bay – Knysna – Mossel Bay area where colder bottom water was more common and frequent catches of hake could be made by handline, but without any predetermined certainty.

As the fishery grew, methods were developed for catching the species – although labour-intensive, hake could be caught using handlines or large "scarborough-type" reels. Success is largely dependent on fish availability, fisher skill, current strength, depth, and sea and weather conditions. Associated with the development of the fishery was an increase in the associated infrastructure. The development of the hake handline fishery resulted in logical extensions and growth of the land-based processing facilities for linefish and squid. Included in the necessary changes for fresh hake was the upgrading of factories and vessels to EU-approved HACCP standards. An important offshoot of these developments was the increase in local employment and a natural knock-on effect to the regional economy.

3.2 The Catch and Stock Concerns

The Cape Hake *Merluccius capensis* has been caught on the Agulhas Bank since the beginning of the last century. Traditionally the scientific assessment has focused on data submitted from the deep-sea trawl sector. These assessments are based almost entirely on the deep-water stock of *M. paradoxus* and are a poor reflection of the state of the *M. capensis* resource. Historically only the trawl hake catches have fallen within the hake TAC, with the trawling companies (inshore and offshore) adjusting catches of hake to accommodate the 2:1 ratio for the west:south coast and also moving quota from inshore to offshore or vice versa to balance effort throughout the year. The result of this is that actual estimation of the *M. capensis* component taken on the South Coast is uncertain. If one assumes that the largest component of the trawl effort is attributed to the deep-sea trawl sector (mostly Browns Bank), then the 50 000 t of hake taken is predominantly *M. paradoxus* (10% might be a reasonable proportion assumed for *M. capensis*). Conservatively, if the "inshore trawl" hake, and the hake caught in the Blues is taken into consideration, the actual *M. capensis* catch attributed to trawl east of Cape Agulhas will probably approximate 20 000 t. Figure 3.1 illustrates the different components of the South African hake fishery and shows the handline fishery relative to the other hake sectors. The important point, however, is that relative to this amount (20 000 t), the longline and handline sector is taking on increasing significance, with one sector (handline) effectively outside of the TAC.

From Figure 3.1 it is clear that the fishery has developed quickly since 1989, particularly in 1991 and 1992 when the resource was more available (and also because of the legal loophole). The slump in 1994 can be attributed to the longline experiment, when much of the effort used on handline was redirected to longlining. Conservative estimates put the 1998 handline catch at 2 500–3 000 tons per annum. However, since then the sector has continued to grow without control from the authorities and verifiable landings now approximate 4 500 t. The amount that is also unreported probably exceeds 500 t. Catches now approximate the amount set aside in the TAC for this sector (5 500 t).

Effort levels in the handline fishery are also disproportionate by area. The fishery developed, and was concentrated in the Plettenberg Bay area where availability is good and the distance fished offshore is suited to deck boat operation (overnight fishing with boats able to stay at sea for 2-3 days). The ski-boat operations have increased dramatically in recent years, with both Knysna and Stillbaai becoming sizeable operational areas. Ski-boats operating out of Mossel Bay have also increased sharply and also operate at night when weather is good. Operations are also highly mobile, with boats moving to areas where fish availability is high, e.g. from Mossel Bay to Stilbaai.

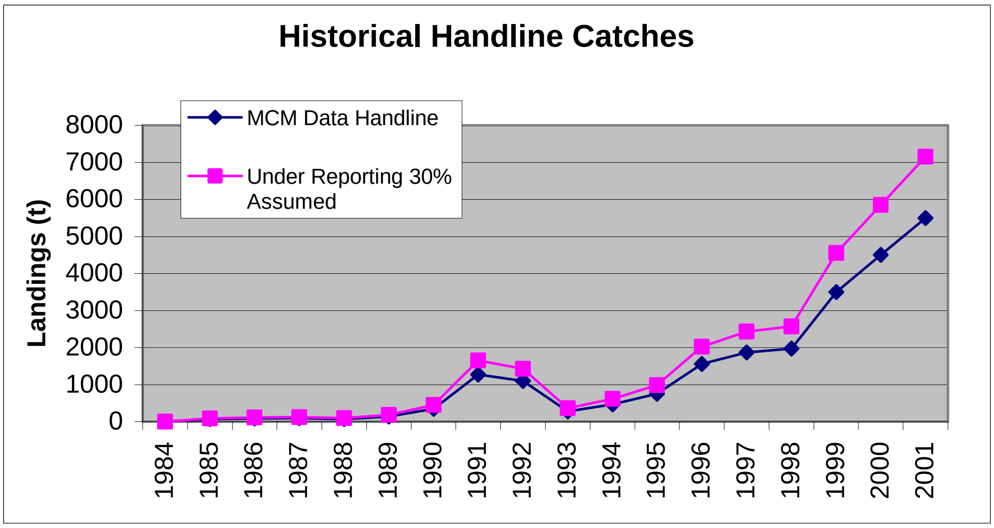

Figure 3.1. Historical handline catches. Data for 1998-1999 are estimates and for 2000 catches are based on available catch data submitted by the industry. Date for 2001 is a predicted figure extrapolated from present catch rates.

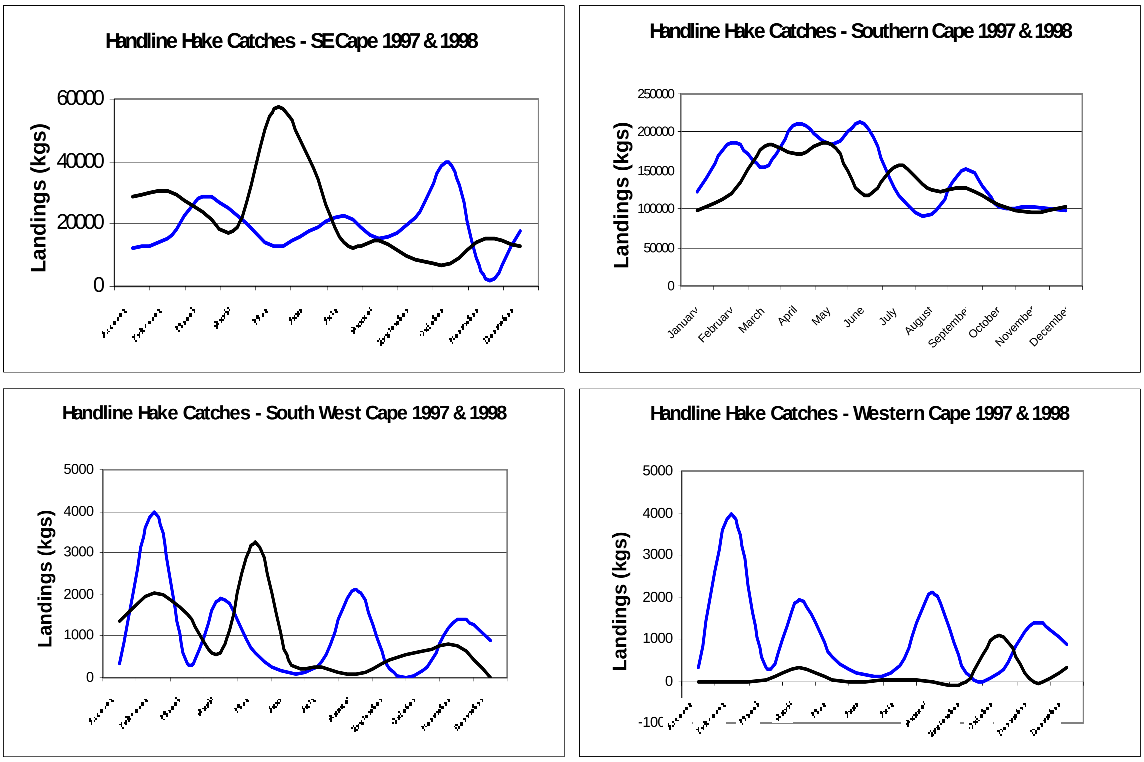

Figure 3.2. Handline catches of hake by region.

Please Note: These figures are based on information available for the 1997-1998 period. Subsequent to this period a sizeable handline hake operation has developed in the Eastern Cape operating from Port St Francis, Jeffreys Bay and Port Elizabeth. Small amounts are also landed in Port Alfred.

3.3 Seasonality of the Fishery

The fishery in the Southern Cape has a strong seasonal signal with catches peaking in autumn and spring. This seasonality is most likely associated with the following:

- A migration inshore at these times of the year of the shallow-water hake, probably linked to feeding, reproduction or favorable environmental conditions (cold water inshore);
- Favourable weather conditions facilitating fishing operations, resulting in increased effort at this time (autumn and spring);
- Reduced activity in other sectors such as traditional linefish and squid i.e. redeployment of effort on hake;
- Favorable market conditions for the sale of hake – most demand from Europe occurs in our summer and is particularly strong over Easter;

SEASONALITY is therefore a major factor in the fishery and will in the long term be an effective natural effort-controlling mechanism that will work in synergy with other seasonal fisheries (squid, snoek, kob, geelbek etc.).

3.4 Markets, Economics, Employment and Infrastructure

Spain is the predominant market for line-caught hake. Generally the size class of fish sold by the handliners is smaller than both the trawl and longline PQs. Size classes are split into one kg units. Handline dominates the < 1kg and 1-2kg market. Quality is excellent and South African "white hake" (*M. capensis*) is the product with the highest demand. It commands a higher price than hake from other countries and has a higher value than "black" (*M. paradoxus*) hake. The market is volatile and fluctuates sharply on the demand / supply situation – a case in point is the flooding of the market at the beginning of 1999 when South African longliners were forced to catch their allocation within a month. These circumstances are highly unsatisfactory and do no credit to the local industry and does not maximise the benefits accrued to the country. Export prices are variable and range from R20-R40 per kg. In a reasonably stable economic climate with normal supply and demand, R30 per kg is a fair approximation of the price paid.

3.5 Value to the Fisher

The actual value to the fisher should not be underestimated. Presently in terms of employment, at least 2 400 persons are directly or partly employed in handlining.

Fishers, depending on the nature of the vessel, presently get an average of R3.50 per kg. Crew on deck-boats receive slightly less per kg than the smaller ski-boats due to the supply of food and accommodation on the vessels concerned.

Therefore on an individual fisher R-per-kg basis, potential benefits accrued to the individual vastly outweigh other sectors of the industry (this does not take into consideration benefits that may accrue to fishers in other more established sectors where there is perhaps greater stability and security of tenure). An approximation of the present total value (infrastructure mostly) of the handline industry is R86 million. In terms of total value (catching, processing, freight etc.), assuming a 5 500 t catch, the combined value (present annual turnover) to all concerned would be in excess of R110 million. Note that handlining for hake has also become an important component of the fisheries sector in the Eastern Cape, where operators target hake seasonally in conjunction with their squid operations. Similarly on the Southern Cape Coast, seasonal mulit-permit operators are also an important part of the structure of the fishery. Gouritz River, for example, has a core group of ski-boat operators who have traditionally fished seasonally for kob and geelbek.

The value to the region economically and for employment is clearly substantial.

3.6 Management Considerations

The marketing of PQ (fresh) hake operates at different levels, all supplying a similar market but with slightly different niches, viz:

Handline	–	smaller size class premium quality (white hake)
Longline	–	broader size range – high quality both white and black hake
Trawl	–	variable sizes and quality – both hake species

Clearly the impact of exploitation on the *M. capensis* resource cannot be differentiated by fishery; however, exploitation of both the deep and shallow-water hakes should be viewed as separate stocks and the fisheries impacting each component of the two stocks integrated into the total management of hake.

The main problems in managing such a fishery relates to the following:
- Recognition of handlining for hake as an economically viable and legitimate fishery;
- Management within the known stock dynamics and within the best estimated TAC for hake. This should preferably include separate assessments for both species;
- Ability to monitor and control the catching, processing and marketing to obtain reliable mortality estimates;
- Effort control and the method of licensing.

3.7 Legislation and Control

The fishery was started at a time when the old Sea Fisheries Act of 1988 was enforced. The growth of the fishery was well known to Sea Fisheries from its onset and concern was expressed by industry, scientists and managers as far back as 1990 regarding its development and stock implications.

With direct regard to the "Linefish Bag Limits" in terms of the old Act, both species of hake fell within the "Exploitable" list thereby enabling holders of commercial (A) or semi-commercial (B) linefish permits the right to catch an unlimited quantity of species on the list (provided they did not exceed the limit of 10 hooks on a single line). Further, recreational fishers were also permitted to catch 10 fish per day (in total) of any species defined as "exploitable". This ruling has effectively remained in force, even though the promulgation of the Marine Living Resources Act of 1998 (MLRA) effectively replaced the old Act and placed hake on the "restricted" list, limiting all line fishers (commercial and recreational) to a maximum of 5 hake per day.

Significantly, however, the new regulations do not differentiate between "commercial' and "semi-commercial" linefish operators, but do specify "recreational". As MCM were not in a position to reassess the status of the fishery when permits expired in mid-1998, extensions to permits were granted, and these were still valid in 2000. There is further confusion regarding the status of linefish permits – one interpretation being that until such time as the applications are processed in terms of the MLRA, fishers continue to operate in terms of the Old Act. A second interpretation is that from a strictly legal point of view, the transition period from the Old to the New Acts (6 months) expired (Section 85) on 1 March 1999 leaving the linefish operations in a legal void. Permits have therefore been extended to accommodate the time taken to process applications, but in the mean time the transition period set aside by the Minister has also expired – where does this leave the line fishery?

This uncertainty has resulted in the following:

- Continued development of the handline fishery for hake;
- A reluctance by enforcement officers to control the fishery, with regard to both the commercial and recreational components in terms of the old and new Acts;
- A burgeoning of the fleet of ski- and deck-boats targeting hake, with subsequent difficulty in estimating the actual catch taken;
- Uncertainty with regard to future rights, the protracted delay in resolving the linefish permit issue, as well as the arbitrary extensions of permits to accommodate the delays, has given fishers, processors and all sectors involved in the fishery little confidence in the management process.

3.8 The Handline Fleet and its Specific Characteristics

The most recent assessment of the fishery estimates that there are at least 350 boats active in the sector and that most of these operate in a broad area on the South Coast between Stilbaai and Plettenberg Bay. The fishery has, however, expanded in recent years with increased activity in the Port Elizabeth and Jeffreys Bay areas (Port Alfred is the eastern-most limit of the fishery). The fishery does not exist in the Western Cape yet, primarily because the grounds are too far away from the ports, the water deeper (for hake catches) and the abundance of the preferred “White Hake” less.

In the data collected for the ESS study, information has been provided by vessels, which at some time in the history of the fishery might have fished for handline hake. These returns include most of the larger monohull wooden boats traditionally used to pole for tuna or to longline. These vessels are not handline hake-directed.

Four basic categories can be assumed for the sector. These are:

- Small ski-boats with five or less on board – 4m;
- Larger ski-boats >4m with more than five on board;
- Deck-boats (mono-hull and catamaran) > 10m and < 15m – most were or are freezer type vessels used in the squid and linefish sectors; and
- Large mono-hull boats > 15m – generally only active intermittently in the fishery and not directed.

In addition to the above, the operators can also be split as follows:

- Those who have historically been involved in the sector from the outset (since about 1992) and who initiated the fishery and have consistently fished with ski and deck-boats every year;

- More recent operators who have been introduced to the fishery and have led to the systematic increase in the capacity since 1994. These include many West Coast snoek and other linefish operators who now target hake handline full-time. Most of these had either “A” or “B” permits. These fishers are generally transient and mobile, moving to areas with the highest availability of hake;
- Many recreational (no commercial permits) and part-time fishers – these include many weekend fishers and retired folk fishing not as a livelihood but only to augment existing incomes; and
- Typically “traditional” linefish operators based in fixed areas or harbours – these include fishers in areas such as Gouritz River mouth, Port Alfred, Plettenberg Bay and others. These fishers do not generally move and only target the available species seasonally including hake, kob and geelbek.

3.9 Economics of the Fishery

The fishery is essentially a “small-boat” operation although, as pointed out, boats of almost any size have participated. The fishery is most likely to be effort controlled in form of restrictions to the number of men on a boat (normally limited to the number of men permitted on the safety certificate).

The fishery is very simple, requiring only open ski- or deck-boats. Fishing takes place in relatively deep water (for handlining), up to 100m depth. Gear and bait requirements are simple – heavy weighted lines, large reels and pilchard mostly. The largest operational costs are fuel and boat maintenance and the largest variable cost is payment to crew.

Boat crews (fishers) are paid between R2.50 and R3.50 per kg. The former amount is generally paid by the larger deck-boats who provide accommodation and food. The smaller ski-boats only operate on a day-to-day basis and consequently pay a higher Rand-per-kg for fish caught.

3.10 Transformation in the Hake Handline Industry

Transformation in the sector is difficult to assess, as the fishery has not been formalised. Generally few operators work through companies or close corporations. Most operate as individual boat owners. Most boats are owned by historically advantaged (white) persons, many of who have invested heavily in boats and equipment. A peculiarity of the fishery is that many operators are retrenched or displaced whites (mostly through affirmative action) and who have now invested their packages in fishing.

There are PDI fishers, but these are few. The involvement of black people is mostly through employment on boats and their income is irregular (weather and fish availability dependent). Some PDI fishers are from the local communities, although most are from the former homelands or the Western Cape (coloured fishers).

An important factor in the transformation potential of the fishery is that capital input is relatively low. However, the majority of fishers on the boats do not have the entrepreneurial skills or capacity to own and or operate their own vessels. Furthermore, most of the PDI fishers are transient, choosing to move between operators and apparently providing inconsistent performance. For this reason commission rates between boat owners are similar and basic conditions of employment difficult to maintain. Social responsibility of most operators is low; pensions, medical and disability allowances, and housing subsidies are generally not paid. In a fishery that has to date had an uncertain future this is not surprising. However, with the pending introduction of rights in the sector, operators are quickly becoming aware of their social responsibility and compliance with the basic conditions of employment, equity and profit-sharing.

The formation of a strong industrial body, the South Coast Hake Handline Industrial Association (SCHHIA), is a positive move in this regard.

3.11 Key Indicators

The following indicators are summarised from the Economic and Sectoral Study Database. ESS datasheet returns were received from about 100 operators active in the hake handline fishery in 2000, representing 67% of the deck-boats and 17% of the ski-boats in the fleet (30% of the total number of active vessels).

Ownership

As this is not a quota-controlled fishery, PDI rights ownership is not applicable. The hake handline fishing operations are generally small scale, with most of the vessels belonging to sole owners (62%) or small Closed Corporations (24%). These ownership percentages are based on a sample size of 22% of the total fleet of approximately 330 vessels. Figure 3.3 shows the low PDI ownership (5%) of the hake handline fleet. The ownership of a substantial portion of the hake handline fleet was not declared (40%).

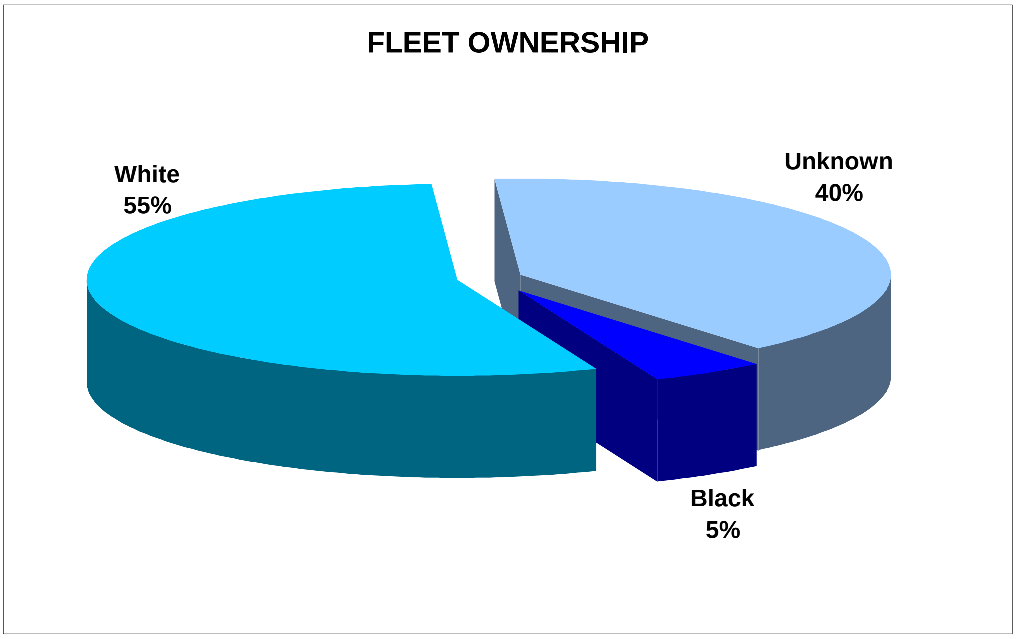

Figure 3.3. Percent ownership of the hake handline fishing fleet in 2000.

Employment

Hake caught in the handline fishery is processed and packed by processing operations active in the deep-sea, inshore and longline hake fisheries, as well as by a number of smaller scale operations. Only employment data from the small-scale operations have been included in the following labour summary. The summary is derived from the employment information supplied by 8 processing companies and 27% of the vessels in the hake handline fleet. Approximately 76% of the work force is made up of PDI, earning 67% of the total income (Fig. 3.4 and 3.5). PDI employment and income for the major skills categories are shown in Figures 3.6 and 3.7.

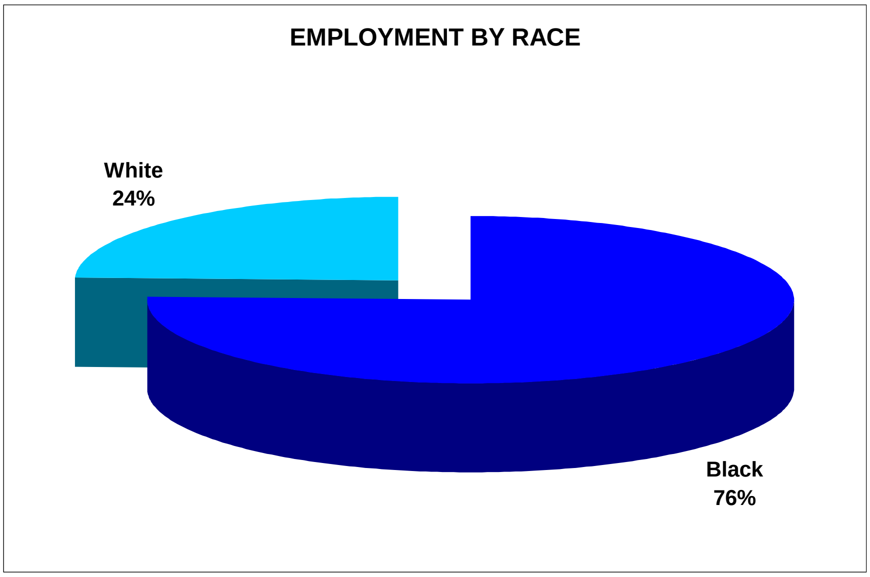

Figure 3.4. The percentage of Previously Disadvantaged Individuals (PDIs) employed in the hake handline fishery.

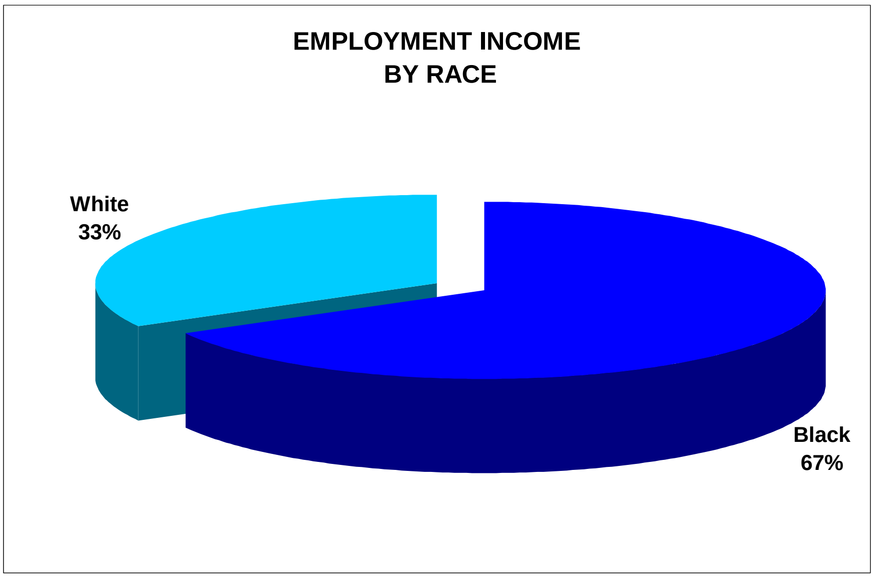

Figure 3.5. The percentage income earned by the PDI employees in the hake handline fishery.

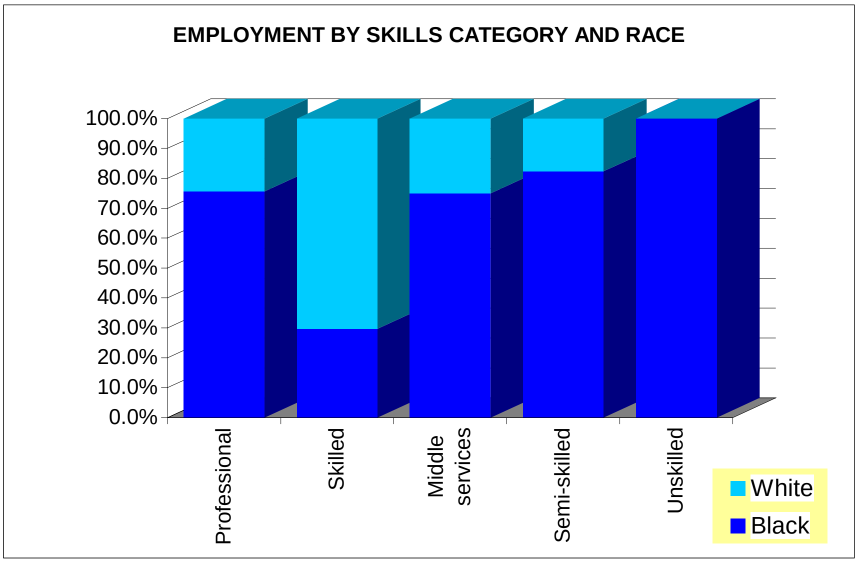

Figure 3.6. The percent PDI employment in the hake handline fishery, by skills category.

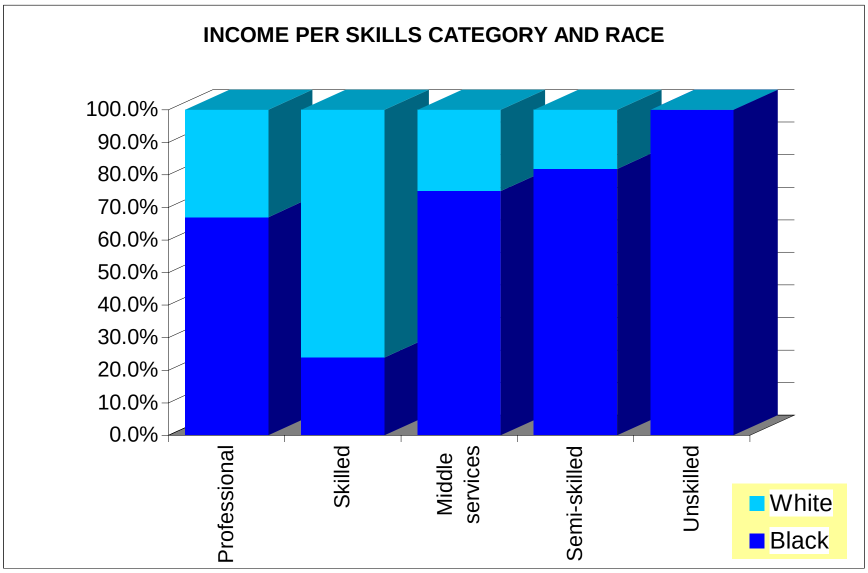

Figure 3.7. The percentage PDI income earned in the hake handline fishery, by skills category.

The average annual income for the different skills categories in the hake handline fishery is represented in Figure 3.8. The labour structure of the fishery is shown in Figure 3.9, where the number of individuals in each labour category is represented as a percentage of the total number of employees in the hake handline fishery.

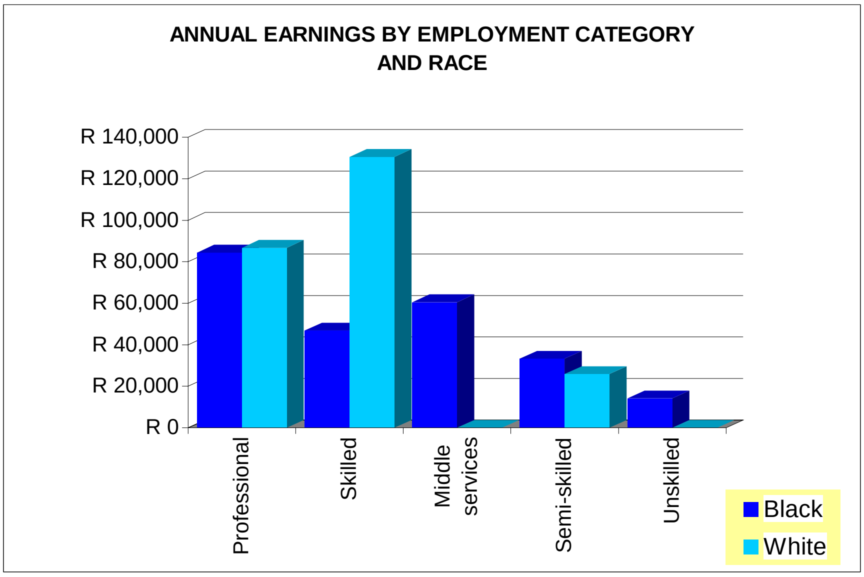

Figure 3.8. Average annual income per skills category for employees in the hake handline fishery.

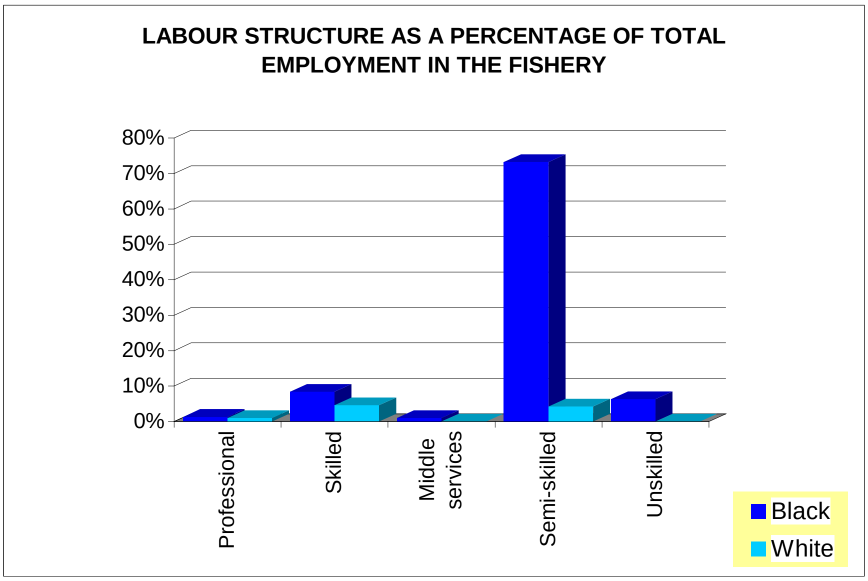

Figure 3.9. The number of employees in each of the skills categories, as a percent of the total employment in the hake handline fishery.

Most of the employment generated by the hake handline fishery occurs in the Western Cape Province (59%) and the Eastern Cape Province (29%, Figure 3.10).

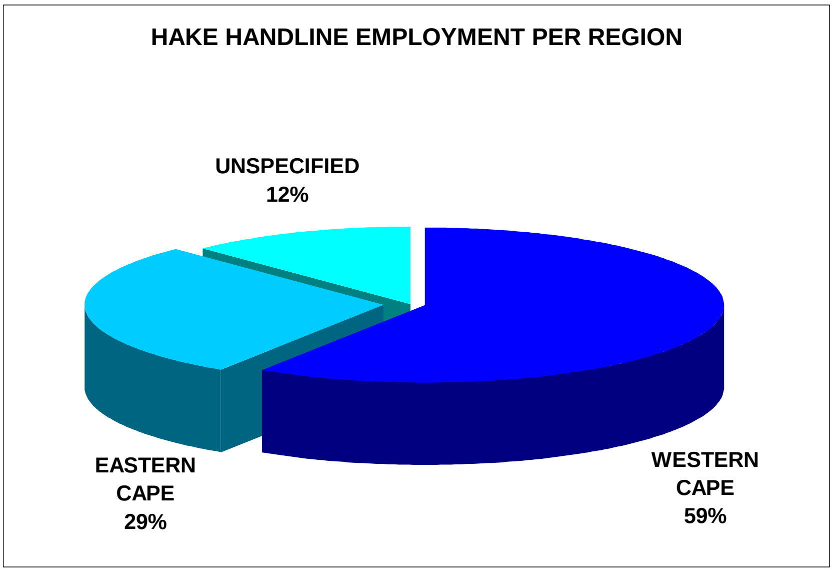

Figure 3.10. Employment in the hake handline fishery, by region.

4. THE HAKE LONGLINE FISHERY

4.1 Historical Overview of Longlining in South Africa

Longline fishing is one of the oldest known fishing methods and has its origins in countries such as Norway, Portugal and Spain. In South Africa longlining for demersal (deep-water) species such as hake and kingklip was only introduced as recently as 1982, when the first applications for demersal longline permits were made. The intended target species at that stage were hake (*Merluccius paradoxus* and *Merluccius capensis*). In 1983, nine “experimental” longline permits were issued to established trawl companies that held hake quota. These permits were renewed for the 1984 season and some initial effort was shown on the west coast after importing mainly Spanish and Portuguese crew for their expertise.

In 1984-1995 the unique double line technique was developed locally, to cope with the hazards of strong currents, hard grounds, line breakage due to predators and harsh weather conditions. It was also during this period that the effort moved to the South Coast where it was quickly discovered that the then hake-directed longlines were very effective for catching kingklip, *Genypterus capensis*.

At this stage kingklip catches were not restricted, and the hake catches were offset on the quotas held by hake quota holders at the time. This, together with the good kingklip catches, prompted a change in target species and the gear was optimised for kingklip by using sinking bottom lines and weights.

During 1985, effort and catches increased and an additional six longline permits (kingklip-directed) were issued to non-hake quota holders. Longline catches for 1985 was almost 5 000 t for kingklip and 1 500 t for hake. The kingklip catches peaked at 11 370 t in 1986 and showed a steep decline thereafter. By 1989 the experimental permits were replaced with permits that were limited to a TAC of 5 000 t and a closed season. This TAC was further reduced for the 1990 season, and by the end of 1990, the Department of Sea Fisheries stopped all demersal-directed longlining.

However, some longlining (mainly targeting hake) continued on the south coast, with some operators using a loophole in legislation, as longlining was legally not sufficiently defined. These operators were both handlining, using lines with many hooks, and also longlining under the shark longline loophole.

Subsequent tightening up of legislation has addressed the targeting of hake with such gear as well as the use of shark longline permits for the targeting of hake.

It was not until 1994 that any hake-directed longlining was allowed again, this time as a controlled experimental fishery. Initially a total of 4 000 t was allocated to the experimental fishery, with a one-year pilot study commencing in May 1994 and ending in May 1995. The one-year pilot study was to be followed by a two-year medium term experimental hake-directed longline fishery.
This experimental allocation was issued to accommodate three distinct sectors.

1. “Offshore Sector” – 2 000 tons: Participants consisted of existing hake quota (trawl) holders being allowed to fish a portion of their hake quotas with longlines.

2. “Inshore Sector” – 800 tons: The intention was to use this allocation to encourage smaller local fishermen to participate launching from smaller ports and to test the viability thereof.

3. “Tuna Association” – 1 200 tons: The Tuna Association had many members that had previously longlined and already had the expertise, boats and gear.

At the end of the 1994 pilot study it was recommended that the fishery continue to an intermediate medium term experimental fishery phase. Therefore, on completion of the 1994 pilot study, 4 400 t was allocated for the 1996 and 1997 seasons, with the only change being an additional 400 t allocated to the inshore group.

For 1998 the minister set aside 10 000 t of hake to be issued as interim longline allocations for the experimental fishery only. Permits for 6 400 t were issued and approximately 6 192 t of hake was recorded as landed in that year.

During 1999, 1 600 t was allocated initially, with the balance only being allocated very late in the year. The late allocation resulted in only 3 071 t being recorded as landed (fishing of allocations was allowed to be carried over into year 2000). A number of vessel operators stopped fishing when the PQ hake prices plunged to below profitable levels as a result of market oversupply.

In the 2000 allocation year, 5 250 t was allocated initially and the balance (4 750 t) was allocated as smaller quotas (33.8 t quanta based on appeals) later in that year, with many of these quotas going to new entrants.

Of the initial 5 250 t allocated, 5 256 t was recorded as landed. Of the permits for the balance of the smaller rights holders (fish obtained on “Appeal”), only 2 874 t was activated and only 1 774 t of the appeal fish were actually landed.

Allocations made for the year 2000 were “rolled over” for the year 2001 – this is the 108 t allocation and does not include the appeal fish, which has to date not been formally issued due to litigation and further review of the “appeal” fish. Note that all those entities granted the larger amounts of fish (100 t in 2000 and 108 t in 2001) have been active in these years.

Synopsis:

The "Kingklip" period 1983 - 1989

1. Longlining was first motivated for hake-directed effort in early 1983. It is important to note that hake was initially the target;
2. The basis for the fishery was the hake fisheries in the North-East Atlantic i.e. predominantly Portuguese and Spanish fishers. Foreign crews were "imported" to teach local fishers how to longline;
3. Primarily because hake was quota-controlled, effort shifted on to kingklip;
4. The kingklip stock declined sharply from 1984 to 1989 with very high initial catch rates (seasonal and temporal) i.e. best catches in spring and on the south coast;
5. Initially only the deep-sea sector was interested and up to 10 permits were issued. As the fishery developed interest gathered, particularly from the smaller boat owners;
6. Entry to the fishery was kept "experimental" and restricted. Six new "smaller" entrants were allowed into the fishery in 1985. These fishers were local small-boat owners;
7. A longline kingklip quota was introduced for two years before the fishery was stopped altogether due to concerns for the kingklip stock;
8. As the kingklip catch rates declined, effort shifted on to the original target species – hake;
9. To compensate the smaller operators for loss of quota (kingklip), they were given small hake quotas (about 400 t each), which could not be longlined but had to be trawled. This is the origin today of the hake quotas of Pimenta Fishing and the Sistro Consortium.

The "Illegal" period 1990 - 1993

1. The kingklip fishery resulted in growing interest in longlining as well as the realisation that hake could be caught in shallower water with handlines and longlines;
2. A "Fresh Fish" market developed – the target country was Spain and to a lesser extent Portugal and other smaller European countries;
3. Interest in the fishery was abetted by an increasingly favourable exchange rate and declines in the availability of other stocks such as squid and linefish, i.e. looking for alternative activities in "off seasons" and during periods of low availability of their target species;
4. An "illegal" fishery developed based on the interpretation of a longline (using the shark longline definition) as well as outright illegal fishing, which was difficult to monitor and control;
5. A handline fishery (distinct from longline) for hake using deck and ski-boats developed in the Plettenberg Bay area;
6. MCM eventually closed the gaps in the legislation and the "illegal" longline fishery was stopped, but not before a large (mostly undetermined) amount of fish was caught. Combined with the increasing handline catch, the total (handline and longline) catch increased significantly, adding to the exploitation of the "inshore" hake stock (white hake – *Merluccius capensis*).

<u>The Experimental hake fishery 1994 - 1998:</u>

1. The furore over the illegal longline fishing resulted in calls to test hake-directed longlining in a controlled experiment;
2. In the following four years, a difficult but successful experiment was followed and adhered to by the participants; up to 80 boats participated including many new entrants.

4.2 Vessel Stratification in the Hake Longline Sector

Since 1998 the hake directed longline fleet has been issued with "offshore" and "inshore" permits. The offshore permits allow operators to deploy larger numbers of hooks, but the offshore vessels are limited to fishing in water deeper than 110 metres only.

Inshore vessels are allowed to fish in water shallower and deeper than 110 metres, but may only deploy a maximum of 4 000 hooks per day. Effectively the permit holders had to choose whether they were to become offshore or inshore operators, with most of the permits being issued as offshore. Only a few, mostly the south coast operators from the Mossel Bay to Plettenberg Bay areas, decided on the inshore option.

The inshore longline vessels are typically vessels smaller than 15 metres that had previously deployed < 4 000 hooks per day. However, for the years 2000 onwards, only a small number of South Coast operators chose to activate rights on inshore permits. All the companies that returned ESS forms had rights issued in the offshore sector.

4.3 Costs Related to Hake-Directed Longline fishing

Participants were asked to supply cost data for the period from 1998 to end of 2000. Costs were given in the pre- determined categories. The value of the vessel, both market and replacement, was recorded as well as the replacement value of the fishing gear. The average replacement value of the vessels was R3 689 296 and the replacement value of the gear was R202 724.

The relatively low (compared to that of a trawler) cost of outfitting a longliner makes this an attractive sector for the introduction of new entrants.

4.4 Factors Affecting Market Prices

This section mainly addresses the prices received for PQ hake "off the vessel" (landed prices). This will clearly be driven by market prices that are in turn driven by a number of factors, including:

- International supply of product (to the demand countries such as Spain) from other countries such as Chile and Argentina;
- Local supply. The local supply of longline-caught hake has been erratic since 1998, creating both over- and under supply to the market. The longline fleet has been laid up for long periods

of time without fishing rights, giving the industry insufficient time to properly prepare and fish the allocations;

- Seasonality. The demand on the market may increase during our summer when the fishing fleet in the northern hemisphere land smaller catches. Peak period for good prices are typically over Christmas and Easter when the demand for hake increases in Spain;
- Quality. The buyers may identify (through experience) companies that supply good or poor quality fish and adjust prices accordingly. Product that does not meet HACCP / SABS minimum standards will not be certified and may not be exported;
- Species. The market for hake pays more for “white hake” (*Merluccius capensis*) than “black hake” (*Merluccius paradoxus*). The price difference fluctuates, depending on the market supply. In 2001 *Merluccius capensis* commanded approximately R3-R4 per kg more than *M. paradoxus*. As a result the two species are now packed and sold separately. The price difference in the hake species is a relatively new occurrence that started during the 1998 season. By mid-1999 this was standard practice;
- Fish size. Larger fish command higher prices. Fish are therefore packed in size classes;
- Fishing method. Longline hake commands better prices than trawl caught fish and although the quality of handline-caught fish may be good, the average hake size in this sector is smaller than longline and commands a lower price; and
- The exchange rate of the Rand/US$ and Rand to Spanish Peseta has a significant effect on the landed prices.

4.5 Voyage Duration and Vessel Capacity

Due to hold capacity and the need to provide a quality “fresh” product, the hake longline fleet in South Africa undertake relatively short voyages.

Table 4.1. Average voyage duration and number of fishing days per voyage (hake longline).

YEAR	DAYS AT SEA	DAYS FISHING
1995	3.11	2.20
1996	3.14	2.25
1997	3.07	2.35
1998	4.06	2.73
1999	3.25	2.58
2000	3.34	2.41
2001	3.57	2.59

The booking of cargo space (air freight) is also a major factor on voyage length, as vessels have to land in time for the fish to be packed and shipped. Landings are usually planned for the start and end of the week. Most of the vessels in the hake longline fleet are only active for a few months of the year. Vessels during the year 2000 fished from one to seven months of the year, depending on vessel size and amount of allocation.

The average landed nominal weight of hake per trip was 8 107kg, and the average number of hooks deployed per voyage was 19 275 (*NB:* spread out over 2-3 days). Vessel size ranged from 12m squid (deck-boats) to a 44.65m steel "crayfish vessel" that has been converted for longlining.

During the 2000 fishing year the permitted hake longline vessels fished for between 1 and 7 months. Note that some vessels fish in other sectors when not hake longlining – tuna pole or longline; shark longline; West Coast rock lobster; B licences or squid.

Boat length compared to average hake catch rates has a poor correlation (Fig 4.1). Vessels in the fleet approximate a catch of 300-400kg hake per 1 000 hooks (recent indications are that this catch rate may be dropping although erratic fishing and seasonality do not permit a reliable assessment).

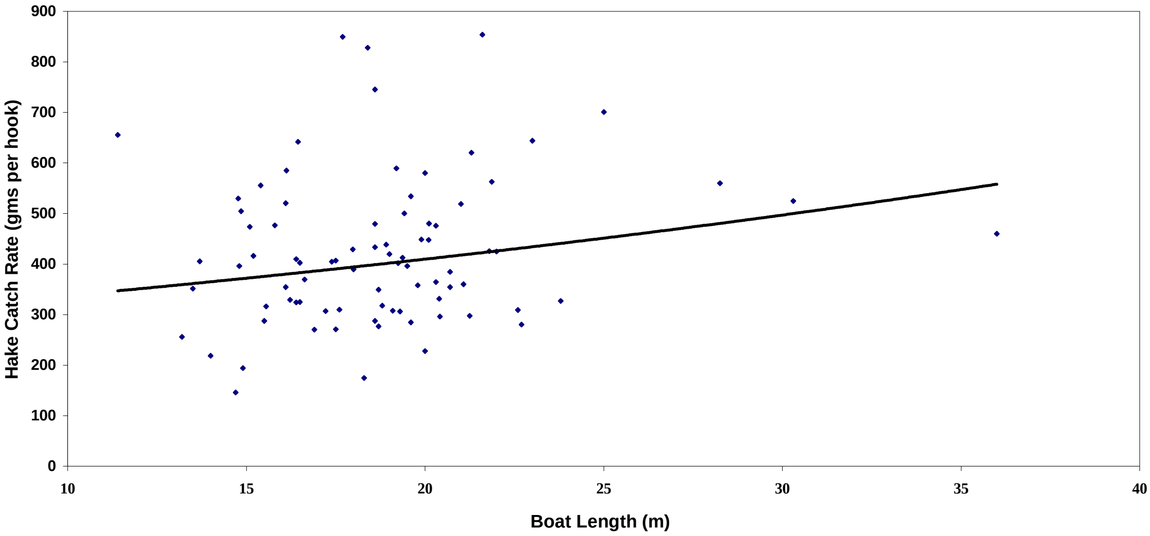

Figure 4.1. Correlation of boat length with average catch rate.

Daily catch rates compared with boat length (Fig 4.2) suggest there is a good relationship between the two, i.e. bigger boats catch more fish per day. This is a logical but important economic consideration as hake longline boats are likely to maximise their effort potential in the future employing the maximum number of crew possible on a vessel as well as the maximum number of hooks / pots per day.

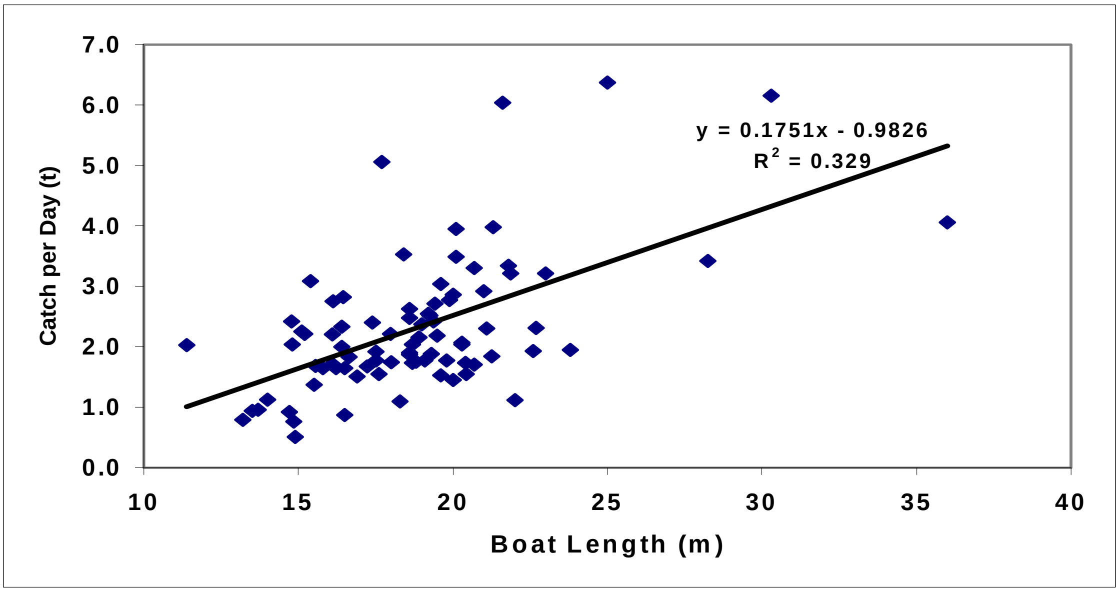

Figure 4.2. Daily catch rate correlated with vessel length.

Two further considerations are:

1. Effort creep and capacity build-up in the sector may become a major concern as catch rates decline with increased fishing effort.
2. By-catch (e.g. kingklip) is an important contributing factor to the long term viability of the sector.

4.6 Geographical Distribution of Fishery

The longline fleet operates from a number of harbours, extending from Port Nolloth on the West Coast to Port Elizabeth on the South East Coast. With the increased demand for *M. capensis* during 1998, the longline fleet showed an increase in effort on the South coast, with Mossel Bay and Port Elizabeth recording higher percentages of landings to previous years. By year 2000, vessels were required to land catches in “home ports”, reducing the number of South Coast landings significantly.

Table 4.2. Number of hake longline landings by location since 1994.

PORT	1994	1995	1996	1997	1998	1999	2000	2001
Cape Town	135	71	252	401	75	178	186	70
Mossel Bay	58	28	129	60	46	261	84	28
Hout Bay	29	4	73	114	25	116	214	96
Port Elizabeth	9	0	65	73	105	179	117	39
Plettenberg Bay	46	41	126	198	1	71	90	5
St Helena	16	8	22	26	2	51	156	42
Not Specified	31	65	4	56	8	7	0	0
Port Nolloth	8	0	20	15	24	16	4	1
Gansbaai	27	20	0	0	0	3	0	12
Kalk Baai	0	0	29	3	0	0	0	0
Knysna	0	0	0	15	1	7	0	0
Hermanus	0	10	9	0	0	1	0	0
Jeffreys Bay	3	15	0	0	0	0	0	0
Port St Francis	0	0	0	0	0	1	11	5
Laaiplek	0	0	5	0	0	0	0	0
Saldanha	1	0	1	0	0	0	0	0
Lamberts Bay	0	0	0	1	0	0	0	0

4.7 General fishing operation of fleet

Vessels set lines in the early hours of the morning (permit conditions require setting to be complete before nautical dawn to minimise incidental bird catches). Hauling commences some time after sunrise, depending on the fishing master's strategy.

The catch is processed as the fish are landed and the repair and preparation of pots (these are containers which store lines with baited hooks) will commence during the haul. The fishing master may deploy more than one line per day. When hauling is complete, the crew will complete processing and preparation of the pots for the next set. Lines are baited shortly before shooting again.

Hake directed longline vessels are essentially "wet-fish" vessels with the fish being iced away after minimal processing, mainly for the PQ export market. The on-board processing can be summarised as follows:

- PQ (prime quality)
  Species: Hake. *M. capensis* and *M. paradoxus*
  This is the primary processing method on hake – usually all fish of suitable quality will be processed for PQ to be exported.
  Method: Minimal, consisting of a "bikini cut" from the anal forward to roughly between the

pelvic fins. Fish is then gutted, removing abdominal cavity contents, but not the gills. Hooks are usually left in the fish.

- H&G (headed and gutted)
  Species: Hake, Kingklip and Monk
  Hake will be headed and gutted when damaged (i.e. not suitable quality for PQ), when PQ fish prices are low, making export unprofitable. The H&G fish is marketed locally, often to small vendors/fish shops.
  Kingklip is mostly headed and gutted.
  Method: Head cut off and viscera removed. Sometimes the tails are removed.

- Not processed
  Usually non-target species such as Jacopever, Mackerel (usually cut for bait) are not processed and iced away in whole state.

Catches are packed in plastic bins with a layer of ice in the bottom of the bin and a covering layer of ice over the fish. PQ fish will be separated from the ice with a layer of plastic and the fish are packed with the stomach openings downwards to enhance drainage of unwanted fluids.

Few vessels are equipped with freezing facilities. By-catch and H&G hake may be frozen in small quantities.

4.8 Key Indicators

The following indicators for the longline fishery are summarised from the Economic and Sectoral Study Database. Information was received from almost 100% of the “large quota” fishers active in the hake longline fishery in 2000 (Table 4.3). However, the datasheets were filled in to varying degrees of completion.

Table 4.3. Summary of the ESS database coverage of the hake longline fishery.

	TOTAL FOR FISHERY (2000)	RECORDED IN ESS	% COVERAGE
Rights holders	43	43	100%
Quota (tons)	5690	5500	97%
Vessels	46	46	100%

Ownership

Company ownership refers to the percentage of shares owned by PDI shareholders in companies holding fishing rights in the hake longline fishery (Figure 4.3). Rights ownership was calculated as the number of PDI shareholders in a company multiplied by the amount of quota held by the company (Figure 4.4). Vessel ownership was calculated as the percentage PDI shareholding in legal entities owning vessels active in the hake longline fishery (Figure 4.5). According to the information supplied by the fishing companies to the ESS, PDI shareholders owned approximately 46% of the companies, 42% of the rights and 31% of the fishing fleet. However, it must be noted that 33% of the company and rights shareholding information and 22% of the vessel shareholding data was not supplied to the ESS.

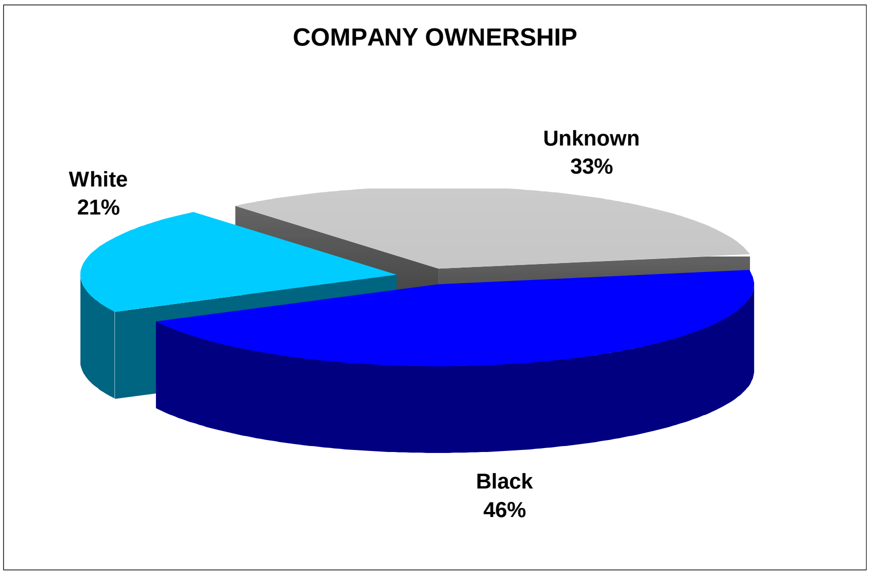

Figure 4.3. Percentage ownership of the companies longline fishing for hake in 2000.

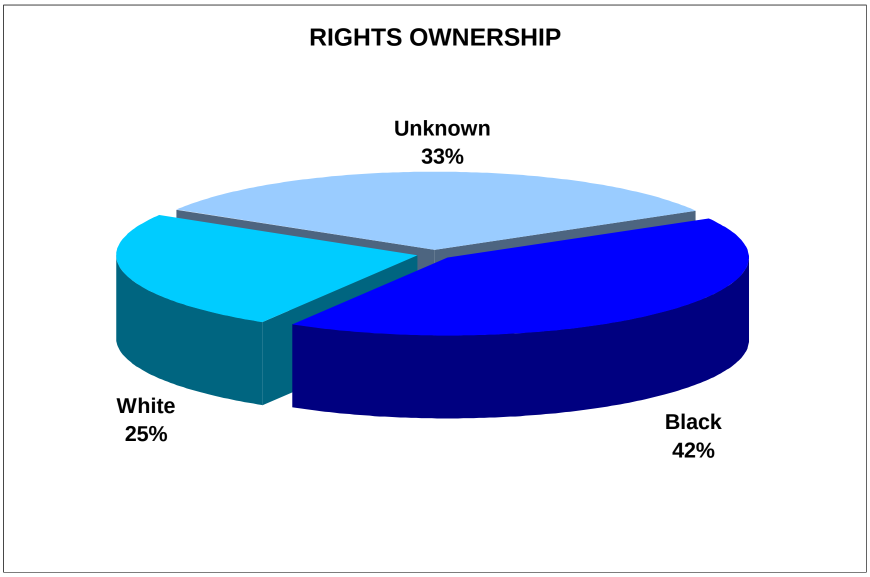

Figure 4.4. Percentage ownership of the right to fish for hake using longlines in 2000.

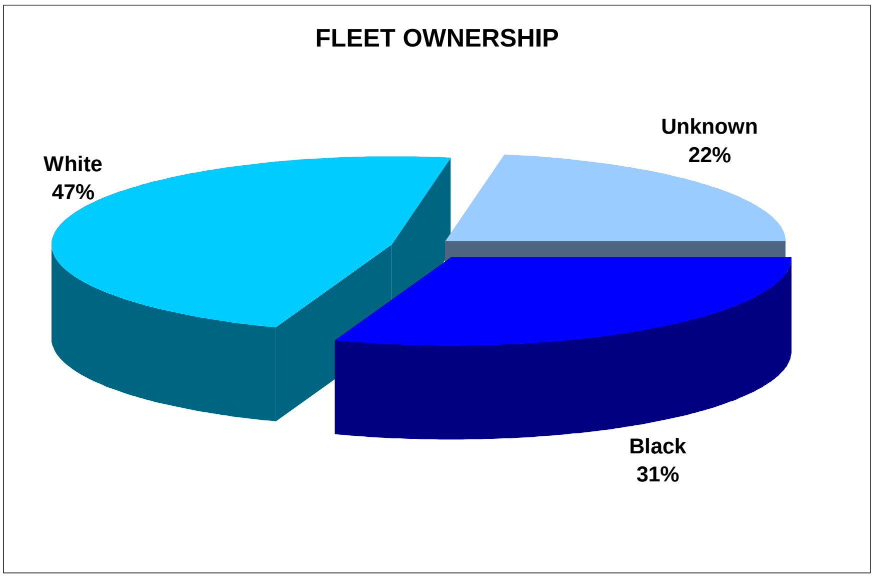

Figure 4.5. Percentage ownership of the hake longline fishing fleet in 2000.

Employment

Hake caught in the longline fishery is processed and/or packed by processing operations active in the deep-sea and inshore hake fisheries, as well as by a number of smaller scale operations. Only employment data from the small-scale operations have been included in the following labour summary. The summary is derived from the employment information supplied by 12 processing companies and 78% of the vessels in the hake longline fleet. Approximately 90% of the work force is made up of PDI, earning 80% of the total income (Fig. 4.6 and 4.7). PDI employment representation and income for the major skills categories are shown in Figures 4.8 and 4.9.

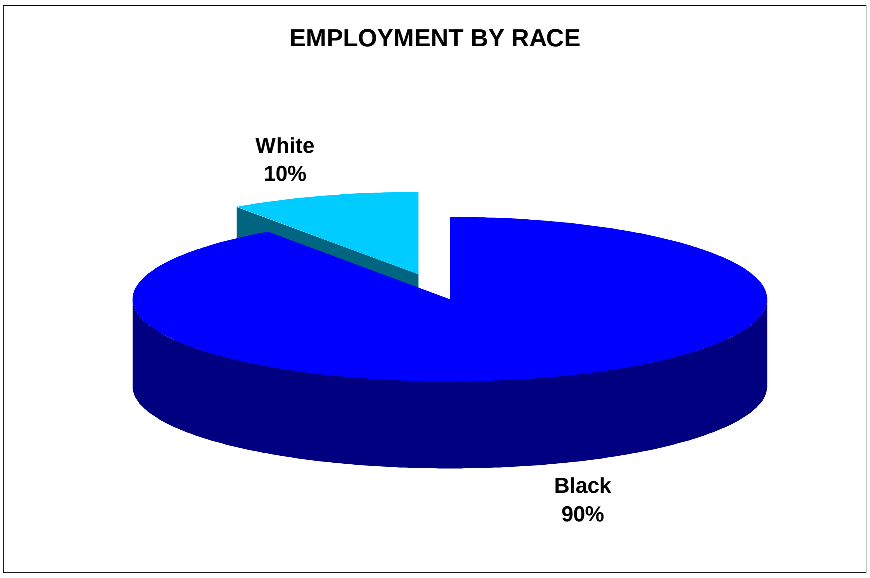

Figure 4.6. The percentage of Previously Disadvantaged Individuals employed in the hake longline fishery.

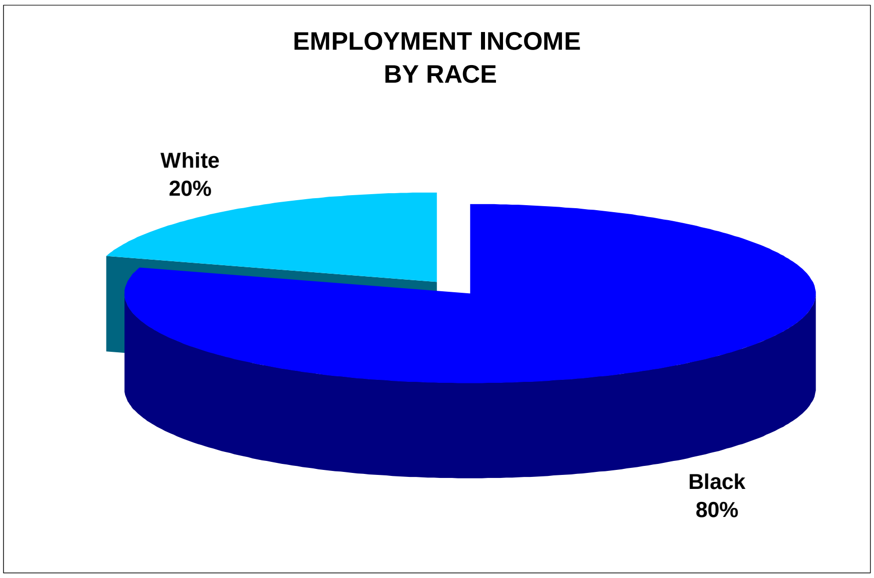

Figure 4.7. The percentage income earned by the PDI employees in the hake longline fishery.

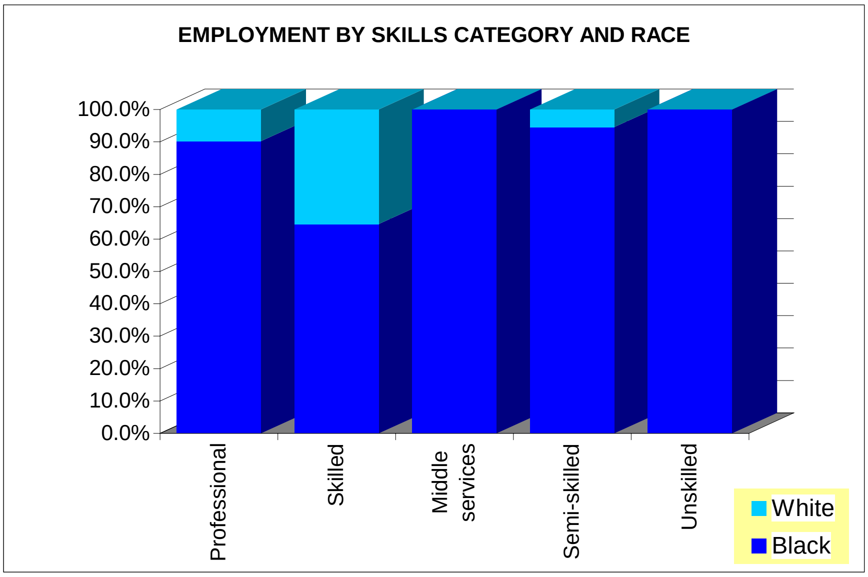

Figure 4.8. The percentage PDI employment in the hake longline fishery, by skills category.

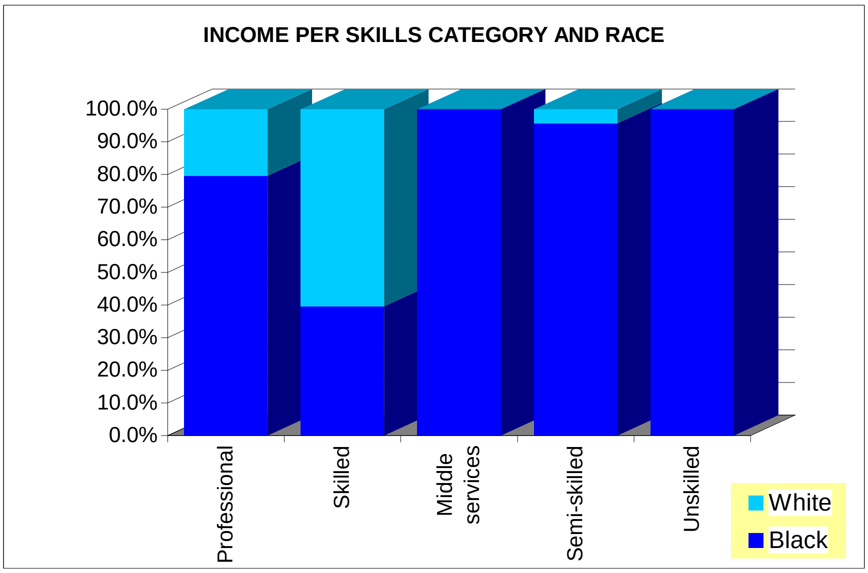

Figure 4.9. The percentage PDI income earned in the hake longline fishery, by skills category.

The average annual income for the different skills categories in the hake longline fishery is represented in Figure 4.10. The labour structure of the fishery is shown in Figure 4.11, where the number of individuals in each labour category is represented as a percentage of the total number of employees in the hake longline fishery.

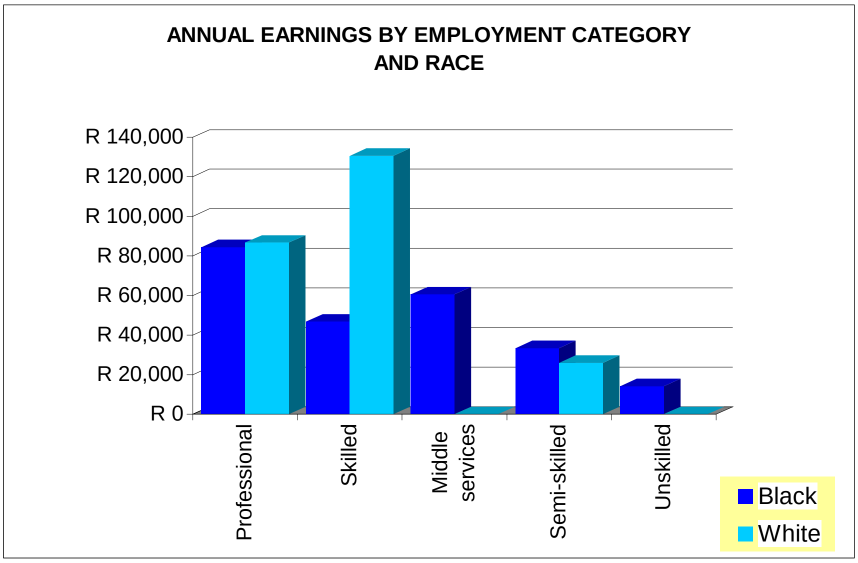

Figure 4.10. Average annual income per skills category for employees in the hake longline fishery.

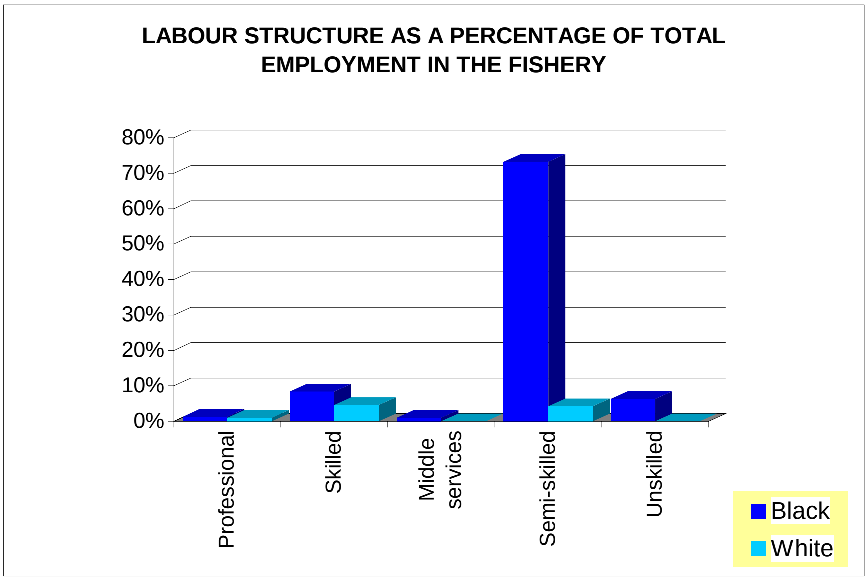

Figure 4.11. The number of employees in each of the skills categories, as a percentage of the total employment in the hake longline fishery.

The hake longline fishery provides employment mostly in the Western Cape Province (86%) and the more southerly regions of the Eastern Cape (14%, Figure 4.12).

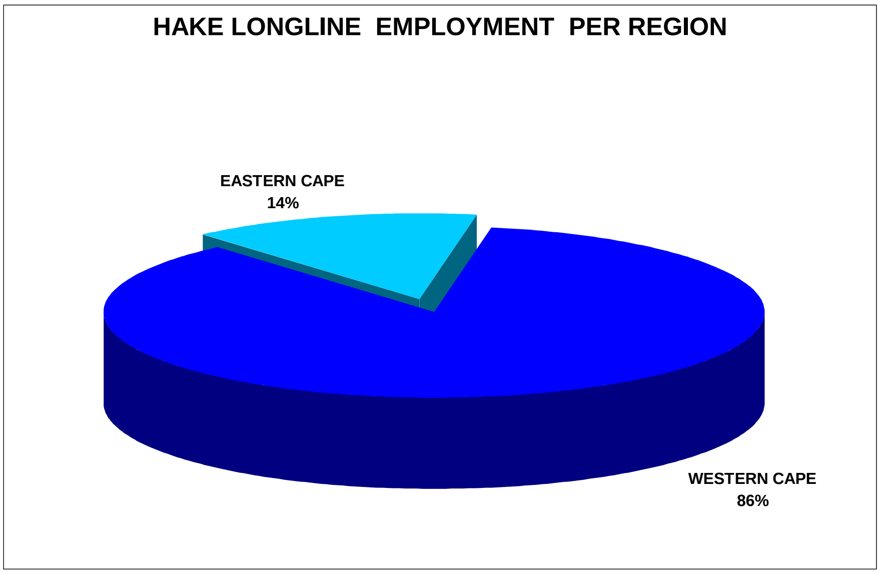

Figure 4.12. Employment in the hake longline fishery, by region.

5. THE TRADITIONAL COMMERCIAL LINE FISHERY

The traditional line fishery originally developed in the Cape region. Some time later it developed in the KwaZulu-Natal region. Each region is unique in its own right and it is for this reason that the report is divided into three sections, viz: 5.1 The Cape region; 5.2 The KwaZulu Natal region; and 5.3 Key Indicators for the South African linefishery.

5.1 THE CAPE REGION

5.1.1 Introduction

The Cape commercial line fishery – responsible for 95% of the South African linefish catch – consists of about 2 500 vessels (3-15m long), which operate on the continental shelf (5-130m depth) between the Orange River in the Northern Cape and the Kei River in the Eastern Cape (coastline length of 2 500km), using handline or rod-and-reel. The origins of the Cape boat-based line fishery can be traced back to the fishing activities of European seafarers in the 1500s.

In 1652 the Dutch began colonising the Cape but, due to various factors and restrictions, the fishery was slow to develop, despite an abundance of fish. All fishing restrictions were removed when the British captured the Cape Colony in 1795. By the mid-1800s the boat-based line fishery had become a thriving industry, established initially with row and or sailboats. The construction of small boat harbours (1932-1950) facilitated a spurt in the growth of the fishery, as well as the transition to motorised vessels. Prior to the early 1970s, when the trailable ski-boat was introduced from the KwaZulu-Natal region, the dominant vessel type was the deck-boat or *chukkie*. Large freezer vessels, subsidised by the squid and tuna industries, were not introduced until the mid-1980s.

Characteristics of the dominant commercial vessel types used in the Cape line fishery are provided in Table 5.1 below.

Table 5.1. Characteristics of commercial vessels used in the line fishery.

VESSEL	LENGTH	AVERAGE CREW	PROPULSION	OPERATIONAL RANGE	REPLACEMENT COST (R)	DAILY* RUNNING (R)
Dingy	3-5 m	2	Single outboard or oars	10 km	16 000 4 000	110
Ski-boat	5-8 m	6	Twin outboard engine	35 km	130 - 300 000	350-500
Deck-boat (Chukkie)	6-13 m	10	Single diesel screw	20-80 km	280 - 350 000	350-500
Freezer Boat	15–20 m	20	Diesel engine	2 000 km	1.5 - 3 million	1 750

Ð Daily running costs comprise fuel, bait and launching fees, but do not include wear and tear, licensing, safety equipment or fishing tackle.

Ð Replacement costs = value of new rig (but with secondhand tow vehicle for ski-boat).

Approximately 40 teleost species are targeted by the Cape commercial line fishery, of which about 20 may be regarded as economically important. Given that the area of operation includes both cool-temperate (west coast) and warm-temperate (east coast) bio-geographic zones, key target species vary by region (Table 5.2). Traditionally, coastal species were targeted by the commercial sector but, as a result of technological advances, declining catch rates and the development of overseas markets, two additional sectors were recently established: the tuna handline/pole sector in the 1980s, and the hake handline sector in the 1990s. All three sectors currently operate with the same permit type, but are soon to be formally recognised through sector specific permits (see below).

The remainder of this section focuses on the General Cape Linefish Sector (targeting traditional species); the other two sectors are dealt with in separate reports.

Table 5.2. Annual commercial catches (metric tons) of the most important species (>20t) reported by commercial lineboats (National Marine Linefish System) operating in each of the four Cape regions (1985-1999). Numbers in parenthesis are the price (R/kg) obtained by commercial fishers in each region (2001 survey). The average price per kilogram (bottom of table) accounts for catch composition, but excludes tuna and hake. Total catches are substantially under-reported (Sauer *et al*. 1997), but catch composition should not have been affected. Fish prices were obtained from dealers in Port Alfred, Port Elizabeth (SEC), Plettenberg Bay, Stilbaai, Struisbaai (SC), Gaansbaai, Hermanus, Strand, Kalk Bay (SWC), Cape Town, Saldanha Bay and Lamberts Bay (WC) in June 2001. Snoek prices were the average daily price per fish obtained throughout its distribution over a 12-month period ending in June 2001.

SPECIES	WESTERN CAPE	SOUTH WESTERN CAPE	SOUTHERN CAPE	SOUTH EASTERN CAPE
Carangidae				
Yellowtail	110 (11)	172 (10.50)	391 (10)	
Gempylidae				
Snoek	6000 (5)	519 (5)	230 (5)	
Merlucciidae				
Hake	25(5)		561 (9)	141 (7.5)
Pomatomidae				
Elf		32 (5)		
Sciaenidae				
Silver kob		168 (12)	456 (11)	192 (12)
Geelbek		154 (12.5)	164 (9.5)	84 (12)
Scombridae				
Longfin tuna	2885 (13)			
Yellowfin tuna	74 (5)			
Mackerel		92 (3)	39 (3)	
Sparidae				
Hottentot	457 (6)	132 (4)		
Carpenter		226 (5.5)	285 (6)	308 (9.5)
Panga		26 (6)		133 (8.5)
White stumpnose	76 (6)	83 (6)		
Roman		46 (12.5)	24 (11)	
Red steenbras			24 (12)	21 (16)
Red stumpnose				
Daggeraad				20 (16)
Average Price (R/kg)	**5.20**	**7.10**	**8.80**	**10.50**

5.1.2 Management

Owing to the large number of users, launch sites, species targeted, and the wide operational range, the line fishery is managed on an effort basis, rather than on a catch basis (i.e. TAC). The underlying philosophy is to control fishing effort within the commercial and recreational sectors by input (number of participants) and output (e.g. bag and size limits) controls, respectively. Nevertheless, bag limits for critical species also apply to the commercial component.

Past

In spite of the 200-year history of the fishery, the level of funding and effort historically channeled into linefish research and management has been inadequate. The basic life histories of important species have only recently been understood, but for many other species life histories remain unknown. The main reason for this being that commercial landed value has been used as the main criterion for prioritising resources for research, as such, socio-economic factors have largely been ignored.

Historically, the first attempts at managing linefish resources were marked by the introduction of minimum size limits for selected species in 1940. However, in the absence of life-history information, these regulations were determined on a fairly arbitrary basis. In the 1960s, due to growing concern for the linefish resource, biological studies on a few important species (e.g. seventy-four, hottentot, carpenter) were initiated. With the exception of a closed season for elf in KwaZulu-Natal, and snoek in the Cape, no other restrictions were promulgated, until a comprehensive management framework was introduced for the line fishery in early 1985.

The 1985 management framework included: revised minimum size limits, daily bag limits, closed seasons, commercial ban (for some species), and the capping of the commercial effort at the 1984 level. Owing to a lack of both biological and fisheries data, the level of protection afforded to each species depended largely on subjective perceptions of its vulnerability to exploitation, rather than on quantitative evaluations. Furthermore, the absence of clear management guidelines and the existence of strong lobby groups, resulted in considerable compromise between managers and fishers, with regard to the implementation of management action for certain species.

Present

Stock assessments conducted since the mid-1990s have revealed that, with the exception of snoek and yellowtail, most commercially exploited traditional linefishes appear to have been depleted to dangerously low levels (Table 5.3). The risk of stock collapse and the commercial extinction of species is extremely high – as has occurred with seventy-four for example. Stock declines are clearly the result of excess commercial effort, inadequate regulations and poor enforcement.

Table 5.3. Summary of the species-specific management regulations to be implemented for the Cape boat-based line fishery. SB/R = spawner biomass per recruit, APM = age structured production model, VPA = Virtual Population Analysis, CPUE = Catch per unit effort (a status indicator). Numbers in parentheses in the "Assessment Method" column indicate maximum age of the species in years.cmCoastal Migrant, [R]Resident with home range and [N]Nomadic. Daily Bag limits were generally determined for recreational anglers, but those with an asterisk will apply to commercial fishers as well.

SPECIES	STOCK STATUS	ASSESSMENT METHOD	DAILY BAG	MINIMUM SIZE (CM)
Silver kob [R]	Collapsed	SB/R + CPUE (25)	5⇓ 5	40⇓ 50
Dusky kobcm[&R]	Collapsed	SB/R (42)	5⇓ *1	40⇓ 60
Geelbekcm	Collapsed	SB/R + VPA +CPUE (9)	10⇓ 2	60⇓ 60
Dageraad [R]	Collapsed	SB/R (23)	5⇓ *1	30⇓ 40
Seventy-fourcm	Collapsed	SB/R + CPUE (20)	0⇓ 0	Moratorium
R. Steenbras [R]	Collapsed	CPUE (33)	2⇓ *1	40⇓ 60
W. Steenbrascm	Collapsed	SB/R + CPUE (25)	5⇓ *1	60⇓ 60
Yellow Belly RC [R]	Collapsed	SB/R (24)	5⇓ 1	40⇓ 60
R. Stumpnose [R]	Collapsed	CPUE(?)	5⇓ 1	30⇓ 30
R. Roman [R]	Collapsed	CPUE (17)	5⇓ 2	30⇓ 30
Scotsman [R]	Collapsed	CPUE (?)	5⇓ 1	30⇓ 40
Poenskop [R]	Collapsed	CPUE (45)	2⇓ *1	50⇓ 50
W. Stumpnose [R]	Under review		Stat. quo	Stat. Quo
Carpenter [R]	Under review	(33)	Stat. quo	Stat. Quo
Hottentot	Under review		Stat. quo	Stat. Quo
Elf/shadcm	Over exploited	SB/R (10)	5⇓ 4	30⇓ 30
Snoek [N]	Under review	(12)	Stat. quo	Stat. Quo
Yellowtail [N]	Opt. Exploited	VPA (12)	10⇓ 10	None
Panga	Underexploited	SB/R + APM (16)	10⇓ 10	None
Hake	Opt. Exploited	SB/R + APM	5⇓ 5	None
Longfin Tuna	Opt. Exploited	APM	10⇓ 5	None

Commercial permits were issued for the South African line fishery for the first time in 1985. Virtually all applicants were successful, and included as either part-time (*B permits*) or full-time (*A permits*) operators. Prior to this it had been essentially an open access fishery. Although the intention was to freeze effort at the 1984 level, most of the damage to the reef-fish populations had already occurred, i.e. with a smaller and technologically less advanced fleet. What is perhaps equally important is the means by which heavily depleted stocks have maintained a commercial fishery of more than 2 000 vessels. The answer lies in effort subsidisation, which has taken the following three forms:

1. *Part-time commercials*

   Fishers in this category have commercial access to the line fishery, but generate most of their income from other sources. Part-time commercials range from a large component of essentially recreational fishers, who subsidise their sport by selling their catch, through to those commercials who subsidise their income from fishing to varying degrees. The extent of this type of activity is illustrated by the fact that <20% of the boats active between 1994 and 1997 caught more than 80% of the reported catch (NMLS). Only 26% of vessels caught more than 5 tons per year. Combining the price of fish (Table 5.2) and operational costs, such a catch would not be sufficient to support a permit-holder if it were their sole source of income.

2. *Participants with multiple access*

   This category of participants has access to both traditional linefish, as well as other resources e.g. tuna, rock lobster and squid. As a result, large freezer vessels focus on linefish stocks when their other target species are unavailable (including closed seasons), or during periods of increased linefish availability. Tuna and squid boats are currently responsible for some 15% of the reported traditional linefish catch (NMLS).

3. *New entrants*

   Combining the low cost of smaller vessels (ski-boats) and transferability of commercial permits, means it has been relatively easy to buy into the fishery. However, owing to the marginal rate of return for small vessels, and perhaps a lack of experience, such new entrants often fail. The cycle is therefore completed and perpetuated when the vessel and permit are sold to the next new entrant. As many as one third of all linefish commercial permits changed hands each year during the period 1986-1997 (Griffiths 2000); indicating the frequent occurrence of this scenario.

In all three of these categories, effort is subsidised by external sources, thereby precluding the economic regulation of commercial effort, which is inherent to fisheries worldwide. Members of the first two categories mentioned (part-time commercials and participants with multiple access), besides impacting directly upon the resource, also have a substantial impact on the market of the *bona fide* commercial line fisher. The Marine Living Resources Act does not accommodate/allow for part-time commercial activity.

A new Linefish Management Protocol (LMP) was developed for the line fishery in 1999, in which regulations are based on clearly defined objectives and quantifiable reference points. The LMP was developed both in response to the considerable failure of the previous management framework to generate realistic regulations, and also to fulfill the requirements of the new Marine Living Resources Act (No. 18 of 1998). This protocol – accepted by both the Consultative Advisory Forum and the South African Marine Linefish Management Association – requires management plans for all linefish species, with stock status evaluated using biologically based stock assessments and historical trends in catch and effort.

Future

The Minister of Environmental Affairs and Tourism, taking cognisance of the critical status of traditional linefish stocks, declared the linefish resource to be in a state of crisis, in terms of Section 16 of the Marine Living Resources Act (Act 18 of 1998), in December 2000. As a direct consequence, the number of commercial vessels will be dramatically reduced when linefish rights are allocated. It has been proposed that to maximise the number of commercial participants while simultaneously minimising the impact on traditional linefishes, the South African line fishery may be divided into three sub-sectors in future: handline hake, handline tuna and traditional linefishes. The effort levels to be allocated in each sector would be: 450 vessels (3 450 crew) for traditional linefish, 130 vessels (785 crew) for hake handline, and 200 vessels (3 600 crew) for tuna handline/pole. The overall total of 780 vessels represents a substantial reduction from the 2 600 commercial licenses which are currently active.

Table 5.4. The number of linefish vessels per 100km of coastline in each of five Cape regions (number of non-motorised vessels indicated with an asterix) and the number of commercial vessels anticipated to retain rights to traditional linefishes after the allocation process.

REGION	COMMERCIAL	FUTURE COMMERCIAL
Western Cape (856km)	166 8*	14 ?
South-western Cape (213km)	373	81
Southern Cape (549km)	45	6
South-eastern Cape (413km)	78	16
Transkei (275km)	2	1.5

Where: Western Cape: Port Nolloth to Cape Point
South-western Cape: Cape Point to Cape Agulhas
Southern Cape: Cape Agulhas to Cape St Francis
South-eastern Cape: Cape St Francis to Kei River
Transkei: Kei River to Port Edward

The general philosophy proposed for the future (2002) allocation of traditional linefish rights, is to reserve them for those who are dependent on traditional linefish stocks for more than 75% of their income. To avoid the destructive consequences of effort subsidisation, it has been proposed that those holding other rights (including hake handline and tuna handline/pole) will be excluded from commercial access to traditional linefishes, with the exception of snoek. Application of the LMP to stocks for which sufficient biological data exists, has resulted in considerable revision to current regulations for linefishes, including commercial bag limits for certain species (Table 5.3). These revisions have been accepted by the South African Marine Linefish Management Association and the Consultative Advisory Forum, and will be promulgated in tandem with the allocation of commercial linefish rights.

APPENDIX 1 FOR CAPE REGION: DEVELOPMENT OF THE TUNA HANDLINE/POLE SECTOR

The yellowfin and longfin tuna resources occurring between 10 and 80 nautical miles off the South African west coast have attracted both commercial and recreational interest. The handline/pole tuna industry developed during the 1980s as a sub-sector of the commercial line fishery. Commercial permit holders may currently be divided into two categories: the ***bona fide*** **commercial fisher** who operates with vessels larger than 10m, is equipped with cold storage facilities, spends approximately 10 days at sea; and **part-time operators** who use smaller craft, put to sea on a daily basis, and who essentially sell fish to subsidise their sport. The primary target species (around 90% of catch) is longfin tuna (albacore), with bigeye and yellowfin tuna comprising a small component of the catch.

Almost the entire catch is exported to overseas canning factories. But despite this fact, high operating costs and low international prices mean that profit margins are low.

As longfin tuna is an oceanic migrant, it is managed internationally, with the total allowable catch (TAC) for the Southern Atlantic stock being set by the International Commission for Conservation of Atlantic Tunas (ICCAT), of which South Africa is a member. Owing to the nature of South Africa's commercial line fishery (large number of species, participants and operational sites), it is managed on a Total Allowable Effort (TAE) rather than on a TAC basis. With the future allocation of country quotas by ICCAT, a switch to Individual Quotas may become necessary.

APPENDIX 2 FOR CAPE REGION: DEVELOPMENT OF THE HAKE HANDLINE SECTOR

Hake have been caught as a by-catch of the commercial handline fishery for more than 100 years, but due to low market prices and sporadic inshore availability, hake were never an important component of the catch. The establishment of overseas markets for prime quality fresh hake, coupled with the decline of traditional linefish species, resulted in the rapid establishment of a hake directed commercial line fishery in the early 1990s. Access to the resource was attained through commercial linefish permits. These include large deck-boats (15-20 crew) that target squid but catch hake part-time, and ski-boats (5-8 crew) that operate daily and target hake on a full-time basis. This industry is primarily focused between Mossel Bay and Plettenberg Bay as owing to a semi-permanent cold water intrusion, hake are frequently found in this area, at depths shallow enough (<100m) for linefishing.

Two species of hake are found in South African waters, but only one – the shallow water hake *Merluccius capensis* – is targeted by the line fishery. This species is targeted by two other sectors on the south coast, namely inshore trawlers and hake longliners. The hake resource is managed according to an assessment based TAC, which is allocated as individual quotas. Owing to the number of participants and launching sites, as well as the frequency of landings (daily trips), individual quotas are not practical for lineboats. A reserve of 5 500 tons per annum has therefore been allocated for linefishing (1999-2001), but with the rapidly growing nature of the fishery (including illegal operators), it is thought to have been exceeded in recent years. The number of vessels targeting hake is believed to have grown from around 130 in 1999 to approximately 250 in 2001.

Socio-economic advantages of the new handline hake industry include the following:

1. Provision of a high quality product that generates foreign revenue.
2. Much needed employment and income for the poor eastern and southern Cape area.
3. Small-scale nature of the operation means that capital investment is relatively small (allowing easy entrance) and that a larger number of participants can be accommodated per unit of catch/quota.
4. Minimum ecosystem effects through unwanted catch and discards.

APPENDIX 3 FOR CAPE REGION: SNOEK

An important objective of the Marine Living Resources Act is to transform South Africa's fishing industry by, *inter alia*, providing access to new entrants from previously disadvantaged communities. Snoek is by far the largest South African linefish resource; it currently constitutes around 40% of the total teleost catch, including tunas. CPUE for snoek, unlike that for most other linefishes, has not declined dramatically, thereby suggesting that the resource has not been severely impacted upon. It is therefore tempting to advocate the creation of a permit specifically for snoek, which could be allocated to new entrants. However, there are several disadvantages associated with this option. First, owing to nomadic movement patterns, snoek availability fluctuates widely on daily, monthly and annual bases. It is therefore envisaged that access to other over-exploited linefish or rock lobster resources will be gained (legally or illegally) during the inevitable lean periods. Second, a precedent would be created for specific permits for other species, and in both cases problems associated with "by-catches" will arise. The allocation of snoek permits to fishers who do not have access to other resources will, in all probability, result in increased effort on over-exploited species, and for this reason should be avoided. However, in order to maximise utilisation of the snoek stock, the allocation of snoek permits to fishers who already have access to other resources, e.g. tuna and hake will be considered. Nevertheless, until a stock assessment has been completed, effort on snoek should not be allowed to increase above current levels.

5.2 KWAZULU-NATAL REGION

5.2.1 The KwaZulu-Natal coast

The 564km coastline of KwaZulu-Natal (KZN) stretches from Ponto do Ouro in the north to Port Edward in the south. The continental shelf is narrow (3-11km) north of St Lucia and south of Durban. Between these areas the shelf widens to 45km opposite the Tugela River. The relatively straight coastline has few protected bays and is generally a high-energy coast. Shelf circulation varies in close association with the topography of the continental shelf. The Agulhas Current transports warm, tropical water in a southwesterly direction along the shelf edge and has a major influence on the oceanography of the region.

Two major fishing areas are exploited by the boat-based line fishery off this coast. The first consists of a narrow zone of scattered reefs that extends along much of the coast, roughly following the 50m isobath. The second important fishing area consists of deeper reefs to the south of Durban and to the north of the Tugela River in a depth of 100-200m. A relatively small proportion of the KZN coastal shelf thus consists of areas suitable for reef-dwelling species. The area from Cape Vidal to Ponto do Ouro is not accessible to commercial fishing as it falls within the St Lucia and Maputaland marine reserves where no reef fishing is allowed.

5.2.2 The Fish

The fish fauna off the east coast of South Africa is largely Indo-Pacific in nature. Although less abundant than more temperate resources off the south and west coasts, it is more species diverse. Over 120 different fish species are caught in the KZN line fishery, half of which are regarded as target species, broadly divided into two groups: resident reef fish (Sparidae, Serranidae etc.) and seasonal migrants. The migrants can, in turn, be divided into pelagic migrants from the north and south (mainly Carangidae and Scombridae) and demersal migrants from the south (Sciaenidae and Sparidae).

5.2.3 Development of the Commercial Linefishery

Boat-based commercial linefishing in KZN commenced in the late 1800s, in the form of steam-powered deck-boats that operated out of Durban harbour. Over time, these were replaced by diesel-powered vessels that carried up to 20 crew, ranged in length from 10 to 35m, and extended their operational range to 1 000 nautical miles. Initially, most boats fished the shallower reefs along the central KZN coast but effort increasingly extended southwards to the Transkei coast as the catch rates in the central region declined. The catch was kept on ice, and was discharged either in Durban or East London where reasonably good catch data were recorded by the fishery officers of the time. The absence of other suitable harbours along the KZN coast besides Durban, restricted development of the commercial line fishery. The type and number of vessels active in the fishery remained relatively constant between 1905 and 1945, fluctuating between 6 and 16 vessels (Table 5.5).

After the Second World War a number of factors contributed to marked changes in the nature of the commercial linefishing sector in KZN. The most important was the development of the ski-boat, a compact, affordable, trailable, beach-launched vessel 4-6m long, powered by one or two outboard engines. This freed fishers from the constraints imposed by the lack of harbours, allowing boats to launch from beaches and river mouths along the entire coast. This facilitated a rapid expansion of effort and, although there are still a few deck-boats operating out of Durban harbour, the commercial line fishery in the region has since largely relied on these small craft. It also significantly lowered input costs to the fishery so that a greater number of individuals were able to enter the fishery. Clearly this has an implication for the bio-economic equilibrium of this fishery. Concomitant with the development of ski-boats was the introduction of rods, reels, nylon line and eyed hooks to replace the natural fibre handlines originally used throughout the South African line fishery. The first commercial echo-sounders became available in the 1950s, which made the location of deeper and lesser known reefs possible. KZN had an excellent system of radio beacon positioning that virtually all vessels used between the 1960s to the early 1990s. Technological developments have continued to contribute towards increasing effective effort in the line fishery, particularly the development of colour echo-sounders and electronic navigation systems such the Global Positioning System (GPS) in the 1990s.

5.2.4 Trends in Commercial Effort

Following the introduction of ski-boats in 1945, the number of commercial vessels increased rapidly. The earlier part of this increase is not well documented, but by 1975 there were 90 registered commercial vessels, mostly ski-boats carrying from 6 to 8 crew, fishing for 4 000 boat-days.year^{-1}. By 1985, when commercial linefish permits were first introduced, there were 110 commercial vessels operating off KZN, fishing for more than 5 000 boat-days.year^{-1} (Table 5.5). As a result of the increase in total effort, there was also a steady spread of effort along the entire KZN coast (with the exception of in the marine reserves north of Cape Vidal). By 1987, some 49 ski-boat launch sites, spread between Port Edward in the south and Sodwana Bay in the north, had been registered by the Natal Town and Regional Planning Commission.

Although the number of commercial linefishing vessels was not limited by any fisheries management measures prior to 1985, there were two important factors that limited the extent to which fishers chose to become commercially registered in KZN. The first was the direct result of delegation of coastal control to KZN province when the Sea Fisheries Act was promulgated in 1940. The Natal Provincial Administration, in turn, delegated authority for control over activities on beaches to the various coastal municipalities. As recreational participation in the line fishery increased, and ski-boat clubs proliferated along the coast, these municipalities, in turn, delegated control over launching of ski-boats to these ski-boat clubs (recommendation of the Reynicke commission of inquiry into small craft). Many of these clubs discouraged use by any registered commercial vessel (e.g. at Shelley Beach). This took place at a time when recreationals continued to sell their catch – which for many years was not illegal. This poorly managed system prevailed for a number of years at several sites and resulted in several Supreme Court actions. At a time when most boat fishers in the Cape were registering their vessels as commercial in order to qualify for the use of the increasing number of fishing harbours, and to sell their catches, most fishers in KZN opted to retain their “recreational” status in order to secure continued access to club controlled launch sites. A large percentage of these vessels did, however, continue to sell their catches.

The second factor which discouraged commercial registration in KZN stemmed from the safety requirements of the Department of Transport, which introduced a compulsory safety certificate for all vessels participating in commercial fishing after promulgation of the Sea Fisheries Act. In KZN 5.5m (18 feet) was considered by local Chief Inspectors to be the minimum safe length for a ski-boat launching through the surf. However, with the rapid development of the ski-boat industry, cheaper 4.9m (16 ft) ski-boats became increasingly popular. Fishers operating these smaller craft could not obtain safety certificates, and so could not register their vessels as commercial, even if permitted to launch by their clubs. As a result of the combination of these two factors, the number of commercially registered linefishing vessels in KZN increased slowly in comparison with the situation in the Cape.

After commercial linefish permits were introduced in 1985 and the total number of permits was capped at 110, KZN ski-boat clubs rescinded their prohibition on commercial activities and many participants in the "recreational-commercial" sector in KZN requested permission to register their vessels. Although these requests were not granted, linefish permits could be freely traded and there was a steady movement of previously inactive permits from the Cape to KZN between 1985 and 1993. Furthermore, the capping of effort in 1985 was actually based on the total number of crew and not on the actual number of fishing vessels. This meant that one large vessel with many fishers could “split” into two operations with two smaller vessels and the same total number of crew. This has resulted in over-subscription in the KZN commercial line fishery. Other reasons for over-subscription in the fishery include;

- Allowing Cape permits to be transferred to KZN waters;
- Misadministration which allowed an individual to purchase several permits for re-sale;
- Splitting of multi-crew permits issued in the Cape for use in KZN; and
- Non-enforcement of earlier permit conditions that stipulated that fishing had to be the sole source of income for a commercial linefish permit holder.

Thus, despite the intended capping of effort, the number of active commercial vessels in KZN actually increased to a maximum of 165 ski-boats, fishing for up to 10 000 boat-days in 1993 (Table 5.5). After 1994, further transfer of permits from the Cape to KZN was prohibited, but transfer within KZN continues to this day. Another activity that helped to sustain the KZN commercial line fishery during the early 1990s was the fact that a number of Durban-based lineboats started fishing in the largely under-exploited waters of southern Mozambique.

High fishing effort has been sustained as repeated cycles of new entrants attempt to recoup the costs of their newly purchased permits and vessels. Spurred on by high market prices for fresh fish, new entrants continue to exert heavy pressure on dwindling linefish resources in the region despite unprofitably low catch rates. To an extent, the relatively low entry costs to this fishery has circumvented normal bio-economic considerations and hence effort is not economically limited.

5.2.5 Trends in Total Catch, CPUE and Catch Composition

Earliest estimates of total commercial catches are uncertain but available data suggests they were in the region of 1700mt/annum at the start of the century. Certainly catches between 1910 and 1920 exceeded 1000mt (Table 5.5). Despite the introduction of the ski-boat in 1945, and the resultant increase and geographic spread in effort, total commercial catches initially remained at about 800mt/annum. With the implementation of specific commercial linefish permits in 1985, compulsory monthly catch returns were instituted for the first time. After the very low catches in 1985, there was a progressive increase in landings reaching a maximum of 1041mt in 1993 – the first time in nearly 60 years.

Table 5.5. A summary of catch and effort data for the KZN commercial line fishery during the 20th Century (from various sources summarised by Mann-Lang *et al*. (1997) and Penney *et al*. (1999)).

YEAR	CREW	VESSELS	TOTAL CATCH (MT)	CPUE (MT/MAN/YR)
1910	169	7	1100	6.5
1911	175	8	1000	5.7
1912	149	8	1000	6.7
1913	135	7	1100	7.4
1914	133	6	1100	8.3
1915	133	7	1000	7.5
1916	162	7	1100	6.8
1917	172	10	1100	6.4
1923	178	8	1200	7.3
1924	207	10	1300	5.8
1925	205	10	1200	4.4
1928	218	11	1200	5.5
1929	174	9	800	4.6
1930	200	12	900	4.5
1931	204	16	1000	4.9
1932	208	14	1000	4.8
1933	216	16	800	3.7
1939	90	9	-	-
1940	90	9	1131	12.57
1941	90	9	900	10.4
1942	68	-	383	4.24
1943	48	-	949	10.54
1944	44	-	300	6.8
1945	33	-	400	12.2
1946	31	-	400	12.9
1947	38	-	600	15.7
1948	49	-	800	16.4
1949	48	-	600	12.6
1950	70	-	700	10
1975	540	90	-	-
1985	743	110	510	0.7
1986	913	126	850	0.82
1987	711	103	740	1
1988	774	106	640	0.82
1989	734	102	670	0.9
1990	826	118	980	1.19
1991	959	134	960	0.9
1992	1122	162	1000	0.98
1993	1040	165	1041	1
1994	870	138	631	0.73
1995	818	132	517	0.63

This increase closely reflects the increase in the number of commercial vessels operating off KZN over that period, and is clearly the result of the influx of permits into the KZN region. However, with a few exceptions, these were not actually new entrants to the fishery, but existing KZN "recreational" fishers, who had refrained from registering their craft as commercial in the past, but who purchased linefish permits from the Cape after promulgation of the new linefish management measures in 1985.

Despite continued improvements in vessel efficiency and fishing technology, the current catch rate of 0.7-0.8mt/fisher/yr is 10% of that at the start of the fishery, and only 5% of the post-war catch rate. In the face of these low catch rates, it is only effort subsidisation (fishermen with other sources of income), rapid turnover of new entrants and the high and steadily increasing market prices for fresh linefish that have sustained the commercial line fishery off KZN.

Dramatic changes in species composition of KZN commercial linefish catches have caused concern regarding the state of the fishery and has prompted calls for the revision of linefish management measures in the region, particularly for reef-dwelling sparids. Catches have been sustained by sequential target switching from large endemic reef fish such as seventy-four, red steenbras and rockcods to smaller sparids such as slinger, santer and trawl soldier. Shoaling migrants such as geelbek, dusky kob and king mackerel have also become increasingly important in sustaining the fishery. As a result, years of good catches, such as the period from 1990 to 1993, are characterised by strong migrations of these fish species, rather than increased catches of resident reef fish. These periodic strong year classes of migrants have “artificially” sustained the overall line fishery by providing occasional peaks of income in an otherwise declining fishery.

Recent per recruit stock assessments have shown that the majority of important species captured in the KZN commercial line fishery (both resident reef fish species and demersal migrant species) are now over-exploited. Both commercial and recreational effort will therefore have to be substantially reduced in order to rebuild stocks to sustainable levels. However, given the problems of slow growth rate, sex change, barotrauma, strong inter-sector competition, difficulty in achieving substantial reductions in effort and ineffectiveness of current bag limits, it is likely that the maintenance of a number of adequately large, well situated marine reserves offers one of the few practicable chances of conserving the endemic fish stocks off KZN.

5.2.6 Marketing

In contrast with the changes in vessels and fishing equipment, fish processing and marketing methods have remained largely unchanged, and unsophisticated, throughout the history of the commercial line fishery in KZN. Fish are gutted at sea, kept unchilled on small vessels or on ice in larger vessels and generally marketed whole, at least at time of first sale. Fish are distributed rapidly through a comprehensive network of small, formal and informal fish buyers and outlets to a virtually insatiable local fresh fish market. The large Indian population in KZN is one of the highest consumers per capita of fresh fish and other seafood products (Robertson 2000). There has thus been little reason to market fish further afield, and in fact the local demand is such that KZN now absorbs substantial quantities of linefish and other seafood products caught elsewhere in South Africa and imports linefish from Mozambique. Despite this, a fair proportion of KZN linefish is sent to Johannesburg, probably because of the high price paid for fresh seafood by inland consumers.

5.2.7 Past Management

Although the Sea Fisheries Act of 1940 and its subsequent revisions in 1973 and 1988 were nationally applicable to both inshore and offshore fisheries, control over the coastal fisheries of Natal was delegated to the then Natal Fisheries Ordinance. A dichotomy in control over harvesting of KZN marine resources resulted, with the KZN provincial authorities being responsible for management of organisms caught in estuaries and on or from the shore, whereas the Sea Fisheries authorities based in Cape Town were responsible for control of boat-based, offshore fisheries. Sea Fisheries understandably focused on large commercial trawl and purse-seine fisheries in the Cape, paying little attention to linefishing in either the Cape or KZN. So, whereas the shore fisheries of KZN received considerable local management attention, management of the offshore fisheries was largely neglected. In fact, up until 1985, the only national management measures applicable to linefish were minimum size limits for a few species.

In response to increasing national concern at the state of linefish resources, the Minister of Environment Affairs appointed a National Marine Linefish Committee (NMLC) in 1984 to develop management proposals for the entire South African line fishery. The draft management proposals developed for the KZN deep-reef fishery by van der Elst and Garratt (1984) were submitted to the NMLC, and formed the nucleus of a comprehensive suite of linefish management measures, promulgated in December 1984. These management measures have formed the basis for management of South African linefish resources to date. The principal control measure for commercial linefishing was a two-tiered permit system with provision for full-time (A-permit) and part-time (B-permit) vessels, and the capping of the number of permits at the number of commercial vessels registered in January 1985. Linefish species were divided into management categories based on perceived exploitation status, with associated category-specific bag limits for the various line fishery sectors. Commercial linefishing is therefore primarily controlled by limiting the number of participants (Total Allowable Effort – TAE), with no limitations on the catch of exploitable species, whereas recreational fishing is controlled by means of individual bag limits, with no limitation on effort. Standard minimum size limits, based on sizes at 50% maturity, were introduced for many species, and closed seasons were established for certain species that were considered to be over-exploited. Finally, a prohibition was placed on the sale of any fish by recreational fishers, and on the sale of those species designated as recreational species by any sector.

Although representatives from commercial and recreational line fishery sectors participated in the NMLC, these management measures generated widespread and ongoing controversy, because of the perceived disparity between controls placed on commercial and recreational line fishers. On dissolution of the NMLC in 1985, the participants agreed to establish the independent South African Marine Linefish Management Association (SAMLMA), to provide a continued representative negotiating forum for review of linefish management measures. SAMLMA was formally established in 1990 and includes representatives from scientific institutions, conservation agencies, recreational angling clubs and commercial fishing associations. SAMLMA has proposed amendments to the linefish management measures on a number of occasions in response to improved information on the status of particular linefish species, or motivations from one of the represented sectors. Inevitably, recommendations that are implemented are a compromise between conflicting views of the represented sectors. As a result there continues to be widespread dissatisfaction among many fishers from all linefishing sectors concerning the existing linefish management measures.

A new Linefish Management Protocol (LMP) was developed for the line fishery in 1999 (Griffiths *et al*. 1999). In this protocol regulations are based on clearly defined management objectives and quantifiable biological reference points. The LMP, which has been accepted by the Consultative Advisory Forum (CAF) and SAMLMA, requires management plans for all linefish species, with stock status evaluated using biologically based stock assessments and historical trends in catch and effort.

5.2.8 Description of the Current KZN Commercial Linefishery

Effort distribution

Based on the last available list of commercial linefish permit holders from MCM (received in September 2000 but based on 1998 permit issues), there are 134 permitted commercial vessels in KZN. These include 110 A-licenses, 23 B-licenses and 16 T-licenses (all except one T-license are for vessels also carrying A or B licenses). During the current survey conducted by ORI in June 2001, 86 vessel questionnaires were completed representing 64% of the total number of commercial permits issued in 1998. In order to establish the current distribution of commercial effort along the KZN coast, an attempt was made to determine the number of commercial boats operating from each launch site. This includes both full-time and part-time commercial operators. However, it was impossible to achieve 100% accuracy, as, being trailable and highly mobile, some boats are launched from more than one launch site. The best estimate of the current distribution of commercial effort is shown in Table 5.6. Based on these estimates there are about 108 commercial vessels currently active in the KZN commercial line fishery (June 2001).

Vessel data

The majority of vessels used in the KZN commercial line fishery are fibreglass, monohull or catamaran ski-boats ranging in length from 5 to 10m and powered by two outboard motors. The average market value (resale value) of these vessels is about R130 000, which includes the hull, motors, trailer and onboard navigational and safety equipment. Virtually all vessels are now using colour echo-sounders and a GPS to locate reefs and fish. Most of these vessels are launched through the surf and there are only a few larger, harbour-based vessels, which operate from Durban or Richards Bay. It was apparent from the questionnaire that commercial vessels do not last very long, being subjected to harsh environmental conditions with regular use. A large number of vessels were therefore relatively new or had undergone some sort of rebuild in the last 10 years.

Table 5.6. The numbers of commercial vessels (i.e. A, B or T licenses) in regular use at the various KZN launch sites as determined during the current survey conducted by ORI in May and June 2001.

LAUNCH SITE	NO. OF ACTIVE COMMERCIAL VESSELS	NO. INTERVIEWED
St Lucia	2	2
Richards Bay	18	12
Mtunzini	6	5
Tugela	3	2
Blythdale/Mvoti	6	4
Tinley Manor/Mhlali	4	2
Tongaat/Westbrooke	3	2
Durban harbour	14	9
Reunion/Isipingo	4	2
Warner Beach	1	1
Umkomaas	4	4
Rocky Bay	12	11
Hibberdene	1	1
Pumula	2	2
Umzimkulu	5	5
Shelley Beach	10	10
Ramsgate	4	4
Glenmore	2	2
Port Edward	6	6
Port St Johns	1	0
Total	**108**	**86**

Most fishing trips are relatively short in duration, with few vessels remaining at sea for longer than 24 hours. Again it is only the few larger harbour-based vessels that can remain at sea for longer periods. Fish are generally stored in fish hatches and a number of skippers will take blocks of ice or crushed ice to keep the catch cool on board, especially during the warmer summer months. Only the larger vessels have freezing facilities or iceboxes on board. Onboard storage capacity is usually between 0.5 and 1.5mt. The distance traveled by commercial ski-boats is seldom more than 15 nautical miles from the launch site as trips of longer distances tend to be uneconomical with the high price of petrol. As there are currently only two deck-boats with inboard diesel motors licensed in the KZN commercial line fishery (based in Durban), it is probably not necessary to sub-categorise the commercial fleet based on vessel characteristics.

<u>Catches</u>

As submission of monthly catch returns is a legal requirement of all commercial fishing vessels, this data is captured and stored on the National Marine Linefish System (NMLS) by MCM. No attempt was made to analyse commercial catch data for the purposes of this report. Most full-time commercial vessels operating from surf launches are able to get out to sea on 8-15 days a month, with an average of 130 fishing days per annum. The rather low annual number of launches by commercial boats in KZN has to therefore be interpreted in this light. Furthermore, the potential number of launches per year is launch-site specific, as some sites are more sheltered than others, permitting more frequent launching. Harbour-based vessels generally have a higher launch frequency. Catches vary enormously depending on availability of fish but, based on an access point survey conducted between 1994 and 1996, the average commercial catch is about 88kg/outing (Mann *et al.* 1997). Full-time commercial permit holders interviewed during the current study claimed to catch between 4 and 20mt of fish per annum. Catches vary by area and season but most commercial boats rely heavily on redfish (e.g. slinger, santer, trawl soldier, englishman etc.) and other reef fish such as rockcod for a large percentage of their catch. Many boats are seasonally dependent on migratory geelbek and to a lesser extent dusky kob during the winter and spring months. “Bream” (e.g. blue hottentot, protea bream, german etc.) make up an important component of catches on the lower south coast during the winter months. Summer gamefish (e.g. king mackerel, dorado, tuna etc.) are also occasionally targeted when they are abundant.

Observations made during the current survey suggest that most commercial fishers tend to fish the deeper reefs more often in an attempt to obtain better catches. Although restricted by strong current on many days, new technology is being used by some operators in the form of “spider line” which, although expensive, is extremely thin and strong and allows one to fish at great depth even in strong current (i.e. in depths of over 200m). Deepwater species such as trawl soldier can therefore be expected to make up an increasingly important component of the linefish catch. Significantly, a number of operators along the south coast reported increasing catches of seventy-four. This is a good sign, as it appears that there is some active stock rebuilding taking place in this commercially extinct sparid. Although most fishers claimed to release any seventy-four caught and then move away from the area, the high black market price being paid for seventy-four (R40/kg) is good incentive for crew to catch this species illegally.

Fish are generally gutted at sea, landed whole and then distributed via a network of formal and informal fish buyers. Most of the fish is sold locally (especially within the Greater Durban Metropolitan Area) as fresh fish. However, a few of the larger fish wholesalers market fish in other provinces, particularly Gauteng. The prices of fish are fairly standard being sold by size class throughout KZN (Table 5.7). It is important to note that fish in the “small” category makes up approximately two thirds of the current total catch. Some available time series data for variation in fish prices is shown by species in Table 5.8. Despite the observed increase in fish prices, complaints were received from a number of commercial fishers during the survey that there has been relatively little change in the local price of fish relative to other fresh meats. Furthermore, the importing of fresh fish from Mozambique and the Cape was allegedly lowering the price of locally caught fish.

Table 5.7. Current fresh fish prices (R/kg) in KZN (June 2001) as obtained from the various fish shop owners that were interviewed during the survey.

FISH SIZE CLASS	PAID TO FISHER	SOLD DIRECT TO PUBLIC	WHOLESALE PRICE	RETAIL PRICE
Small	11.00	13.00	14.50	17.00
Medium	14.50	16.50	18.20	23.00
Line	17.00	19.00	20.80	29.00

Table 5.8. A time series of market (retail) fish prices (R/kg) in KZN for various species between 1920 and 2001 (ORI unpublished data).

SPECIES/CATEGORY	1920	1976	1981	1990	2001
Small linefish	-	1.20	2.00	6.00	17.00
Large linefish	0.15	1.80	3.75	10.00	29.00
Geelbek	-	-	-	-	22.00
Dusky kob	-	1.20	3.00	9.50	22.00
Black musselcracker	-	1.80	-	-	40.00
Red steenbras	0.15	1.80	3.90	17.00	40.00
King mackerel	-	1.80	3.25	11.00	30.00
Tuna	-	0.80	-	6.50	20.00
Cape yellowtail	-	1.20	-	-	-
Rockcod	-	-	-	-	29.00
Seventy-four	0.15	2.20	-	-	*40.00

* Being sold illegally at this price

Vessel ownership and crew

Most of the commercial vessels operating in KZN are individually owned, although a few owners have formed closed corporations, as they believed that this would increase their chances of retaining their permits. The majority of owners are white males and in many cases the owner of the vessel also acts as the skipper. In some cases a skipper is employed to operate the vessel on behalf of the owner. Income of most commercial skippers ranged between R2 000 and R5 000 per month and was termed “profit after expenses” unless the skipper was employed, in which case they were generally paid on a commission basis. Most crew employed in the commercial line fishery are black males with limited education but many had substantial (10 years plus) fishing experience. Crew members are generally employed on a casual basis, although some boat owners claimed to employ their crew full-time. Most crew members are paid daily or weekly on a commission basis per kg of fish caught, with payment ranging between R2.50 and R4/kg. There appeared to be some competition for crew in the industry, with some operators offering a better rate than others. However, most crew members generally earn less than R1 000/month from fishing (except during geelbek season when large catches are occasionally taken). Crew members generally receive few employee benefits although some receive free housing and medical expenses. There is therefore little indication of serious transformation in the KZN commercial line fishery.

A number of boat owners indicated that they had tried to offer their crew a share of the business but most crew had apparently declined when they realised the responsibility of running a profit making business with the high risks involved. Another observation made during the survey is that a number of boat owners admitted to struggling to find suitable experienced black crew as many had died in recent years (AIDS, TB etc.). For this reason some commercial boats were now being forced to take unemployed or retired white crew. Others were taking on young black crew and training them as competent fishermen.

<u>Access rights</u>

There has been considerable interchange and transfer of licenses during the past 15 years and the licenses themselves have developed a market price of approximately R5 000 per crew member for A-licenses and R3 000 per crew member for B-licenses. Most boat owners had bought their licenses and only 18 of the interviewees still had their original licenses, which they had received historically by applying directly to Sea Fisheries prior to 1985. The high price paid for licenses reflects a considerable demand for access into the commercial fishery and represents a high individual investment for the right to sell fish, especially when one considers the value of the boat, motors and other equipment required. However, the turnover in licenses is very high with new entrants coming into the fishery, investing in the required licenses and equipment and then selling up after a few years, as they could not make a profit. Splitting of licenses was also evident with a number of the smaller boats having only two or three crew member licenses. These had clearly been purchased from larger vessels, which had not been economical, had left the fishery and had legally split the license in order to sell to smaller, more viable operations.

One of the biggest threats to commercial ski-boat fishing along the KZN coast was seen to be the large number of recreational ski-boats that operate along the coast using similar gear and often targeting the same species. A large percentage of recreational ski-boat owners will sell their catch to try and recover at least part of their costs and this often results in decreased market prices of fish, as well as impacting on the fish stocks themselves. The best example of this type of inter-sectoral competition is evident during the annual geelbek runs when large numbers of recreational ski-boats target aggregations of this species at night, many purely for financial gain. This results in a temporary flooding of the market and recreationals will often undercut the current commercial price, with the result that genuine commercial operators lose out at a time when fish is plentiful.

Unlike in the Eastern and Western Cape, there are very few alternative marine resources in KZN that commercial linefish permit holders can harvest to subsidise their income from linefishing. An exception to this is the seasonal migration of large shoals of sardines to KZN during May to July each year. A number of commercial linefish permit holders on the KZN south coast also hold beach seine net permits (currently about 30), which they use to net shoals of sardines that come close inshore. Normally a smaller vessel than their commercial ski-boat is used to deploy the net (such as a small inflatable), which is then pulled ashore by 10 or more assistants. This is a relatively small (approximately 600mt per annum), extremely seasonal fishery, which commercial fishermen use to replenish their bait supplies and to sell sardines to the public. During the current ORI survey, a number of commercial fishermen interviewed, who held beach seine netting permits, expressed their concern about the possibility of not being able to hold another right besides a traditional linefish permit. They explained their reliance on this seasonal fishery and requested whether this could not be considered as a permit exemption in the case of KZN commercial linefish permit holders.

5.2.9 Conclusion and Recommendations

In conclusion it is important to point out the unique nature of the KZN commercial line fishery:

- The lack of harbours and the spread of effort along the entire coast being largely based on surf-launched vessels.
- The high species composition of the catch, which consists primarily of over-exploited reef fish species but with increasing dependence on fluxes of migratory and deepwater species.
- The narrow continental shelf and limited availability of reef habitat, which is exploited along the entire length of the KZN coast (except in the marine reserves to the north).
- The existence of a large recreational sector (including ski-boat angling, spearfishing, shore angling and estuarine angling) competing for the same linefish resources.
- Unlike commercial fishers in the Cape, there are few alternative resources for KZN linefish permit holders to exploit.
- There is no other local source of fresh fish in KZN other than a small amount of fish landed as a by-catch by the prawn trawling industry.
- There is a large human population resident in KZN with a high local demand for fresh fish.

Area-based linefish permits

An idea that has been accepted by SAMLMA in principle and has received some support from participants in the KZN commercial line fishery (Jack Walsh, past chairman of the KZN Small Marine Business Association, pers. comm.) is that commercial rights should become area-based. In other words commercial linefishing permits in KZN should be issued for specific zones or areas along the coast. This would allow the development of a cohesive group of commercial fishers that supply specific markets in each zone. Management of the fishery would therefore set targets and effort limitation per zone rather than for the entire coast. This would enable effort levels to be set according to the availability of fish (or reef area) in that region and prevent the seasonal inundation of a particular area by commercial boats from elsewhere when migrating fish stocks are abundant. The primary reason behind this idea is to improve the ability to control and monitor the commercial fishery. This is closely tied into the idea of reducing the current number of ski-boat launch sites along the KZN coast so that those that remain are better controlled from a safety point of view and in terms of catch and effort monitoring (e.g. for the shore-based observer programme).

At this stage it is not possible to suggest which zones or launch sites are most appropriate and what levels of commercial effort should be set for each zone, as a detailed study would need to be conducted on this aspect. Furthermore, establishment of a network of marine protected areas along the KZN coast could be integrated with this process to ensure the long term sustainability of the linefish resources.

Charter-boat industry

Apart from the more formalised charter boat fishery operating out of Durban harbour and to a lesser extent from Richards Bay harbour, an increasing number of commercial operators (A, B and T permit-holders) are conducting fishing charters during peak holiday periods as this can be more profitable than fishing. During the current survey, 33 (38%) of commercial boat owners indicated that they occasionally took charters, which normally contributed between 5-10% of their income derived from fishing. However, there appears to have been a major shift in some areas (especially St Lucia and Shelley Beach) away from commercial fishing to charter fishing. Many of the original commercial operators have sold their permits and/or bought additional vessels, which they are now operating as charter boats under Department of Transport registration numbers. The large number of tourist “crew” on these vessels still allows for reasonably high daily catches – most of which continues to be disposed of in a commercial manner (i.e. sold to fish buyers). This is an important development in the KZN line fishery, which needs to be taken into consideration.

Clearly, taking paying customers on board a commercial vessel is subsidising the income derived from fishing alone and will ultimately allow stocks to be fished beyond the bio-economic equilibrium (as is the situation if additional rights to other fisheries are held). For this reason it is suggested that charter boats should become formally recognised and licensed specifically for taking charters. Fishing on these vessels should then operate only under the recreational regulations (i.e. individual charter boat anglers should be governed by recreational bag and size limits and at the end of the trip, fish caught belongs to the angler that caught them and may not be sold). Boat owners must therefore decide whether they want to operate as charter boats (in which case they become licensed through the charter boat industry which allows them to advertise etc.) or they choose to operate as full-time commercial fishing vessels, which may not take charters. (Note that project proposals on this matter were previously submitted to MCM but this initiative has not received support).

APPENDIX 1 FOR KZN REGION: ANNUAL COST/REVENUE OF A TYPICAL KWAZULU-NATAL COMMERCIAL SKI-BOAT

(Note: no scale distribution is required)

INCOME	**Rand/year**	
Average catch (mt)	11.4	(based on 2001 survey - NMLS data for 1998 was 4.8mt)
Landed price per ton	12900	(at an average of R12.90/kg - 60% small, 20% medium, 20% line)
Total	**147060**	
VARIABLE COSTS		
Boat fuel	36972	(79l/day x R3.90/l x 120 days)
Boat maintenance	5200	(based on 1996 survey, includes safety gear)
Bait	9720	(based on 1996 survey, R81/day x 120 days)
Tackle	4661	(based on 1996 survey)
Wages	30514	(5.2 crew x 16.3kg/day x R3/kg x 120 days)
Boat licence	200	
SAMSA certificate	150	
Vehicle maintenance	3500	
Vehicle fuel	1404	(R11.70/day x 120 days)
Vehicle licence	250	
Trailer licence	130	
Industry association fee	100	(KZNSMBA)
Total	**92801**	
FIXED COSTS		
Loan repayments	n/a	(only 12.8% of vessels owed money, average owed was R34636)
Insurance	n/a	(only 33.7% of vessels were insured for an average value of R226483)
Depreciation	?	(unknown)
Capital value		
Boat and trailer	136471	
Vehicle	38962	
Fishing equipment	6752	(based on 1996 survey)
Total	**182185**	

Notes:
1) Average number of boat outings was based on 10 outings/month from 1996 survey (i.e. 120)
2) Average petrol consumption per outing was based on 1996 survey
3) Average tackle costs were R3780/year terminal tackle plus R881/year for rods and reels)
4) Average number of crew (5.2) and average catch per crew member (16.3kg) were from the NMLS
5) Vehicle fuel was based on an average distance of 20km/day from 1996 survey at 15km/l

5.3 KEY INDICATORS FOR THE SOUTH AFRICAN LINE FISHERY

The following is a summary of the key economic indicators for the total traditional linefish fishery in South Africa, based on data from the Economic and Sectoral Study Database. ESS datasheet returns were received from 86 commercial linefish vessels in KwaZulu-Natal, representing about 65% of the participants in the local fishery. About five hundred questionnaires were returned for the Eastern and Western Cape provinces. Although approximately 2 500 commercial linefish permits have been activated in these regions, only an estimated 720 vessels were commercially active in 2000, thus the ESS coverage represented about 69% of the active commercial line fishers.

<u>Ownership</u>

The rights or permit holders in the traditional linefish fishery are mostly white, male and sole boat owners. About 68% of the permit holders recorded in the ESS database were White, while 26% were Previously or Historically Disadvantaged Individuals (PDI or HDI) and 6% were not known (Fig. 5.1). Of the 586 vessels recorded in the ESS as actively participating in the commercial linefish fishery, 82% were solely owned and 11% belonged to Closed Corporations (Fig. 5.2).

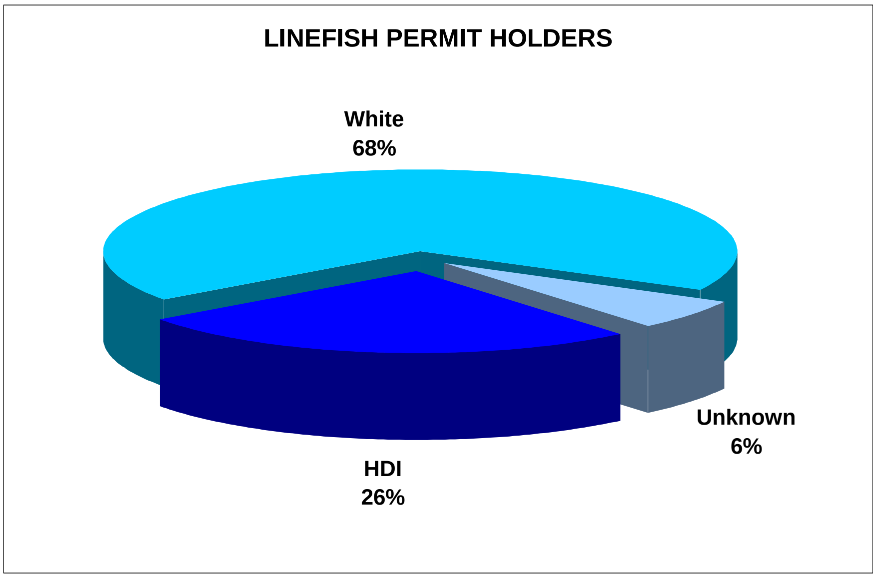

Figure 5.1. The racial makeup of the commercial linefish permit holders recorded in the ESS database.

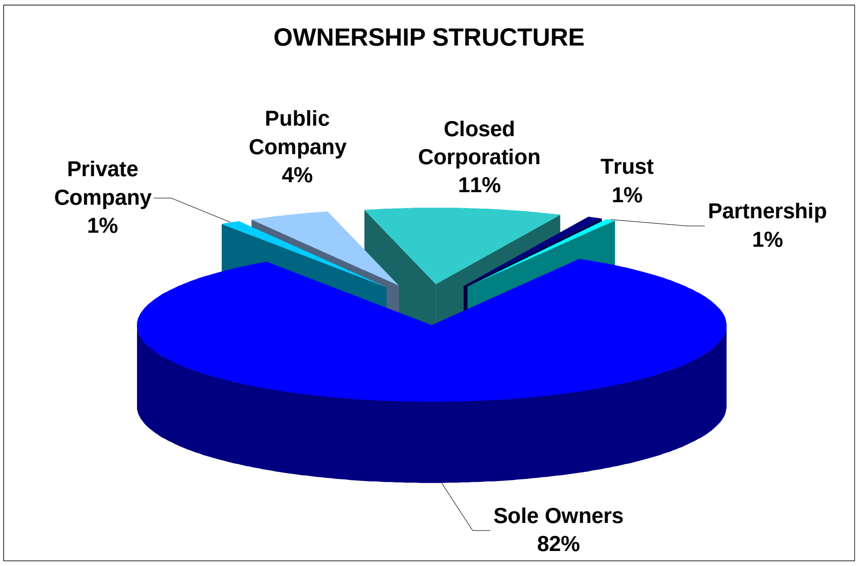

Figure 5.2. The ownership structure of the commercial linefish vessels recorded in the ESS database.

<u>Employment</u>

The employment data recorded for the more than 580 commercial linefish vessels captured in the ESS database was good, with 100% coverage. Total employment for the recorded vessels was in excess of 4 100 individuals, of which 18% were white and 82% were PDI (Fig. 5.3), although 25% of the wages were paid to whites, and 75% went to PDI (Fig. 5.4).

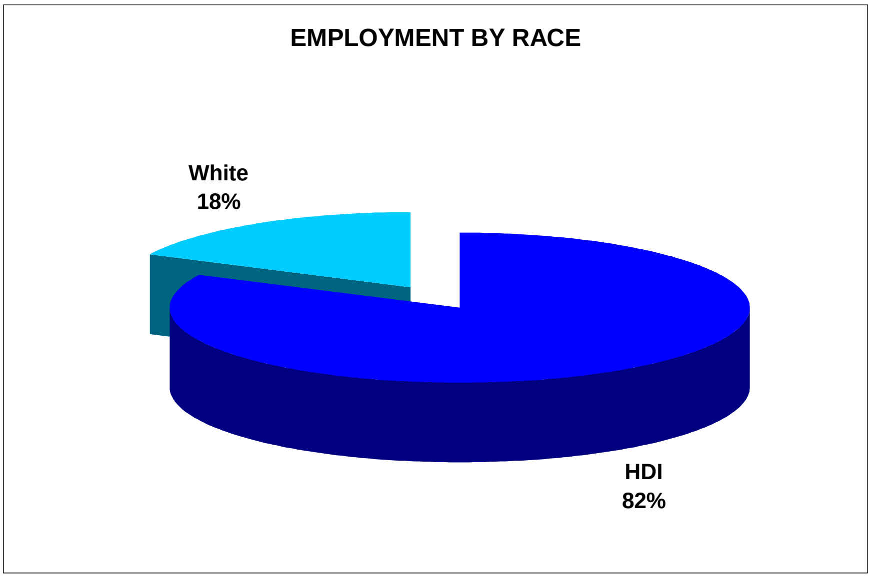

Figure 5.3. The percentage of White and PDI employees recorded in the ESS database for the commercial linefish fishery in 2000.

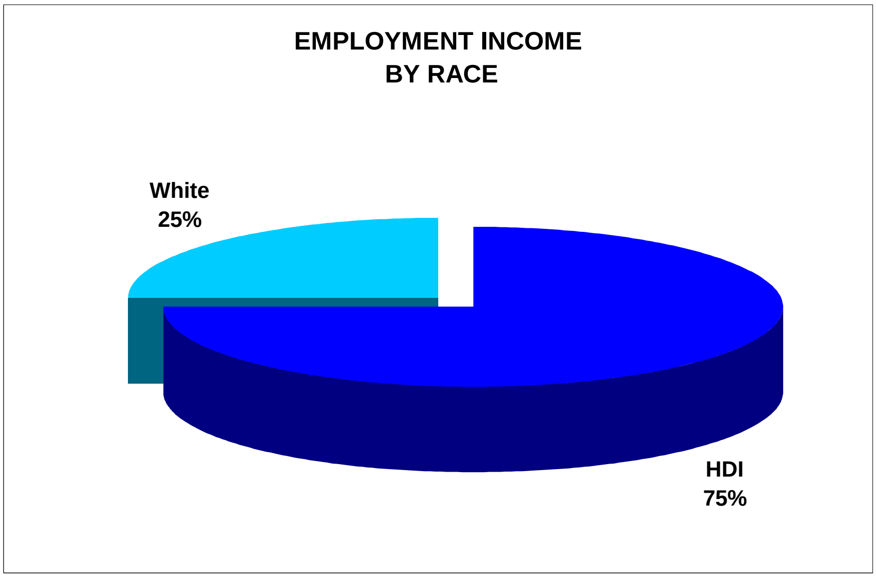

Figure 5.4. The percentage income earned by White and PDI employees of the commercial linefish vessels recorded in the ESS database, during 2000.

Most of the employment in the commercial linefish fishery fell within two skills categories; the vessel skippers (classed as Skilled Labour), and the fishers (Semi-skilled Labour) (Fig. 5.5). The higher number of white skippers recorded in the fishery is consistent with a fleet of sole-owned, owner operated vessels (Fig.5.6).

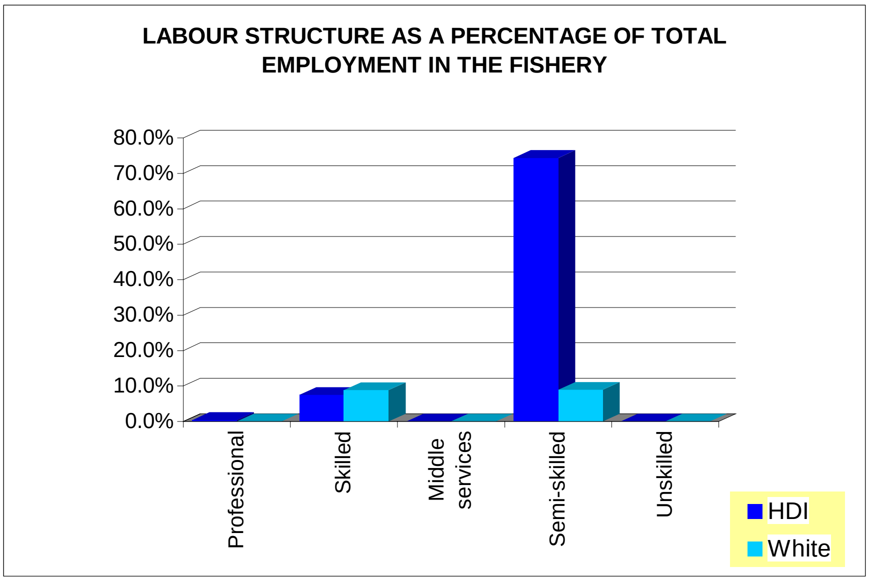

Figure 5.5. The number of employees per skills category, as a percentage of the total employment recorded in the ESS database for the commercial linefish fishery in 2000.

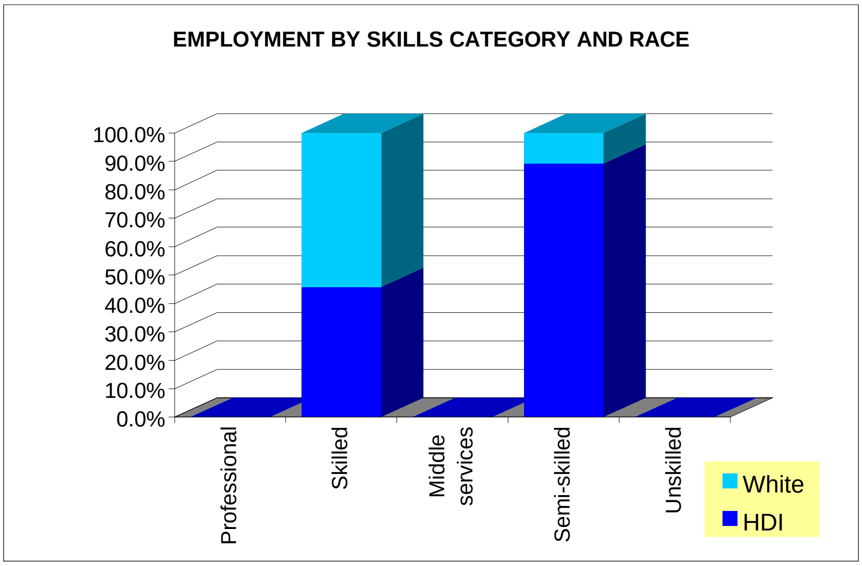

Figure 5.6. The percentage White and PDI employment by skills category for the commercial linefish vessels recorded in the ESS database.

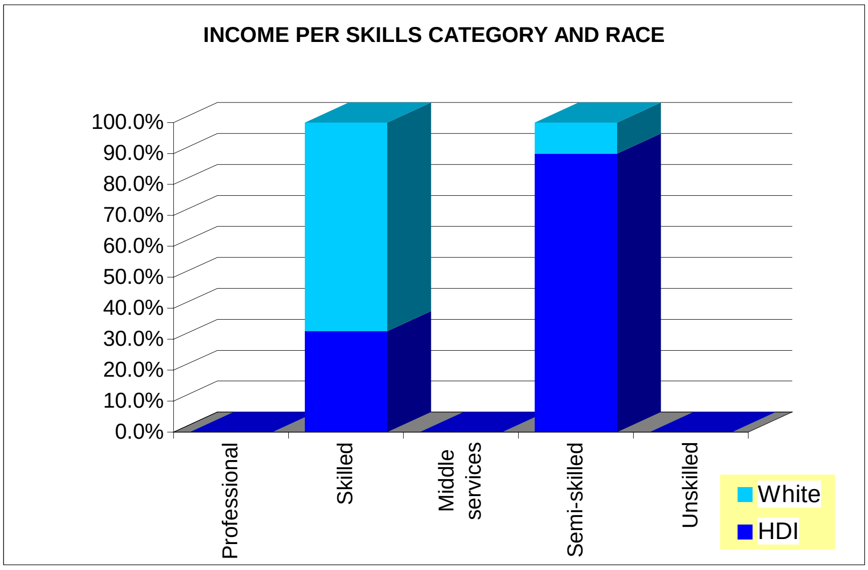

Figure 5.7. The percentage White and PDI income per skills category for the commercial linefish vessels recorded in the ESS database.

The average annual wage earnings in the commercial linefish fishery for 2000 for the different skills categories are represented in Figure 5.8. A substantial difference in the wages earned by white and PDI skippers (skilled labour) was apparent.

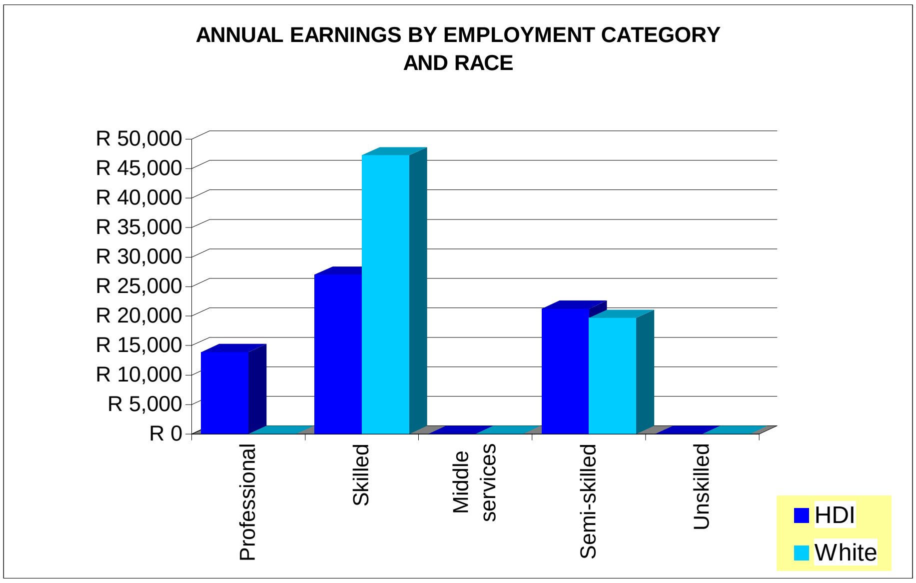

Figure 5.8. Average annual income per skills category for employees in the commercial linefish fishery in 2000.

Regional Employment

The commercial linefish fishery provides employment to individuals in all of the provinces that have a coastline. Thirty-eight percent of the participants in the commercial linefish fishery were employed in the Western Cape Province, while 19% were from the Eastern Cape, and only 5% were from KwaZulu-Natal. It is likely that some employment in this fishery also occurs in the Northern Cape Province, but the regional data for a substantial number of employees (37%) was not recorded on the ESS questionnaires (Fig. 5.9).

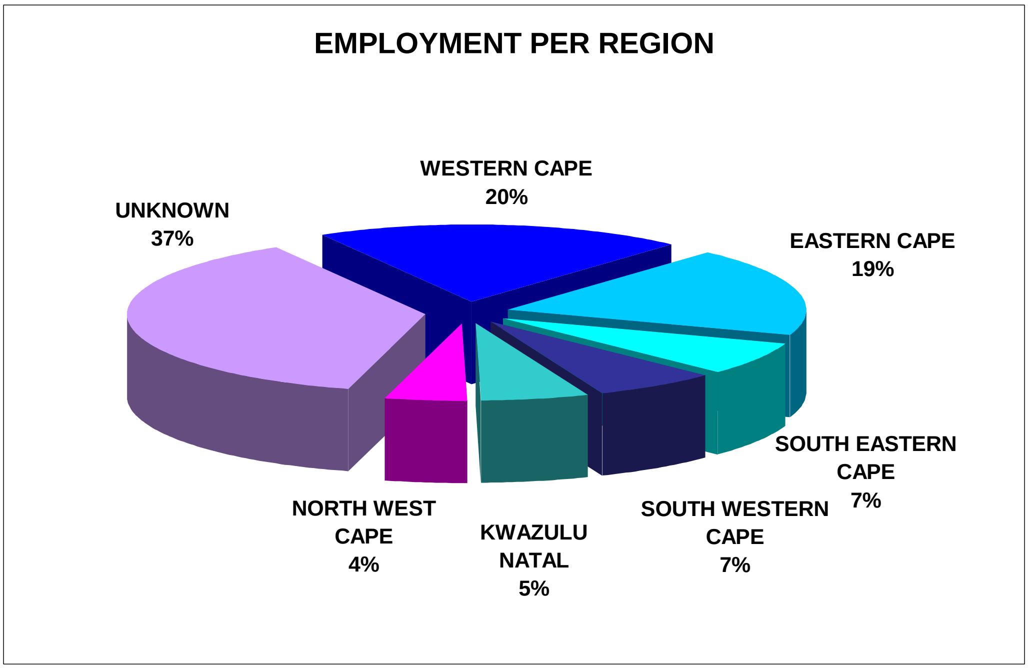

Figure 5.9. Employment by region in the commercial linefish fishery for 2000, as recorded in the ESS database.

6. THE MIDWATER TRAWL FISHERY

6.1 Definition

Midwater trawling is defined in the regulations pertaining to the MLRA as:

> "*any net, which can be dragged by a fishing vessel along any depth between the bed and the surface of the sea without continuously touching the bottom".*

6.2 Target species and By-catch

Horse mackerel (maasbanker) *Trachurus trachurus capensis* is the target species. By-catch includes the commonly found demersal species but primarily includes other meso-pelagic species that migrate extensively both vertically in the water column and horizontally around the South African coast, such as the chub mackerel *Scomber japonicus* and ribbon fish *Lepidopus caudatus*. Hake (*Merluccius sp.)* are also caught, frequently presenting a difficult management problem, as it is a quota-controlled species.

6.3 Horse Mackerel Stock Status and Research

Horse mackerel is commonly found in the waters of both the Benguela and Agulhas systems. There is some evidence as to the existence of sub species between, for example, the Namibian, South African "west coast" and "south coast" stocks. Nevertheless the dynamics of the South African stocks are relatively poorly known. It is uncertain for example if the large juvenile shoals often caught in the pelagic (purse-seine) fishery on the West Coast recruit to the Agulhas Bank or elsewhere. Whatever the case, the mainstay of the midwater fishery is the stock on the Agulhas Bank, particularly on the shelf edge on the south and east coasts. It is only in these areas that (to date) viable exploitable quantities are caught. The availability of fish is not believed to be extensive and is limited in space and time, i.e. shoals are normally in a small area and migrate seasonally. Biomass has not been determined with a high degree of confidence and TAC estimates are such that only "Upper Precautionary Catch Limits" have in recent years been set. Horse mackerel is also considered a low-priority research species, with little directed research effort.

6.4 Management Issues and Rules

No clearly defined management plan exists for the South African midwater fishery. Historically the fishery has been controlled by means of permit condition whereby midwater nets with a minimum 75mm stretched mesh are permitted, and fishing east of Danger Point only i.e. effort exclusively on the East Coast. Historically 85mm mesh nets have been used in the fishery and vessels carry both midwater and bottom trawl gear giving operators the option to target using both gears, depending on the availability of fish (recently midwater trawling permits have been issued for west of Danger Point).

A management plan is clearly needed as management issues will dictate the nature of the fishery and the behaviour of participants in the future. For the fishery to operate effectively, a clear set of simple, enforceable rules needs to be formulated. Some helpful suggestions are to be found in the rule book, for example:

- Horse mackerel are caught under three main fishing regimes: pelagic (purse-seine targeting juveniles), midwater-directed (adult stock) and as a by-catch in the hake-directed trawl where operators, depending on the availability of stocks, may target horse mackerel.

- A limit of 3% (of the horse mackerel catch) by-catch of hake be reserved for horse mackerel-directed operations. Any catches exceeding this allowance shall be deducted from the rights holders' hake quota. Further if a midwater (horse mackerel) right holder has no hake then he shall be limited to a 3% by-catch (as for the directed operation). These conditions to be applied on a trip-by-trip basis.

- All midwater-directed operators carry observers to verify the 3% catch condition.

- In bottom trawl operations, if operators choose to carry midwater nets or to target horse mackerel, all hake caught shall be deducted from the operators' hake quota. If bottom trawl operators choose to switch to horse mackerel targeting for the whole of any one trip then the same rules apply as in (2) above and an observer must be carried i.e. the operator is deemed midwater directed and carries an observer to verify the 3% condition.

- All vessels in the fishery must be South African registered and owned or as approved by the Minister under section 39 (2) of the Marine Living Resources Act No. 18 of 1998.

The rationale for a hake by-catch rule has important consequences for the economics of the sector. When quotas were first granted for midwater trawling, a hake "by-catch" allocation was granted in certain instances to accommodate incidental hake catches by those rights holders who were not in possession of hake quotas. This, however, is no longer the case as these hake by-catch concessions are now a directed right.

The development of the midwater trawl fishery has, however, shown that incidental hake by-catch can be limited to say 3% of the horse mackerel caught (measured on a trip-by-trip basis). Assuming a Global Precautionary Catch Limit for horse mackerel of 36 000 mt (of which about 23 000 mt is midwater directed), a 3% incidental by-catch limit equates to approximately 700 mt of hake. If one considers further that a large proportion of the directed horse mackerel catch is taken when conducting mixed fishing then 50% of this amount (350 mt estimate) is likely to be deducted from the operators' hake quota.

6.5 Historical Exploitation and Quota Allocations

Historically the horse mackerel fishery in South Africa is not a significant directed fishery, although it has always formed an important by-catch component in the hake trawl sector. Time series of data are only available from 1950 and in the period 1950 to 1969, pelagic catches were as high as 118 000 tons. From 1969 trawl catches (Figure 6.1) increased and pelagic catches remained low (influenced by environmental perturbations).

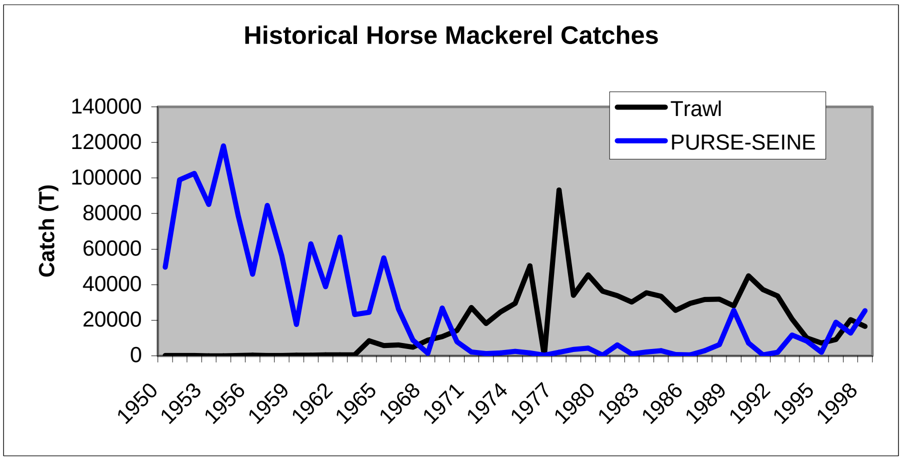

Figure 6.1. Historical catch of horse mackerel in trawls and purse-seines.

Directed trawl effort using midwater trawl gear was permitted by the foreign trawl fleet, particularly by Japanese vessels. Catches peaked at almost 94 000 tons in 1977 and declined thereafter (predominantly Polish boats were responsible for these catches in this period). In 1978 the foreign fleets were withdrawn from South African waters (although the Japanese fished until 1992) and initiatives to start a local midwater industry was started. The groups primarily involved in the development of the midwater sector at the time were the main hake-directed trawl companies.

At the time of the formation of the *South African Midwater Trawling Association*, the first quotas in the directed midwater trawl sector were issued. The entrants to the fishery (in 1990) comprised nine companies who were granted 2000 t per vessel assigned to the fishery by each company (Fig. 6.2 and Table 6.1).

Table 6.1. Midwater (horse mackerel) rights and quota allocations from the inception of the sector.

QUOTA YEAR	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Viking	4000	3273	4315	4315	4315	4315	4315	4315	3352.8	3778	3778
Atlantic	4000	3273	3613	3613	3613	3613	3613	3613	2809.4	0	0
Trachurus	2000	1636	2269	2269	2269	2269	2269	2269	1762.2	1986	1986
SACO	2000	1636	1807	1807	1807	1807	1807	1807	1720.4	1938	1938
I&J	2000	1636	2125	2125	2125	2125	2125	2125	1652.2	1862	1862
Marpro / Food Corp.	2000	1636	1807	1807	1807	1807	1807	1807	1405.8	1584	1584
Sea Harvest	2000	1636	1807	1807	1807	1807	1807	1807	1405.8	1584	1584
Lusitania	2000	1636	319	319	319	319	319	319	248.6	280	280
Pat-Dro	2000	1636	1807	1807	1807	1807	1807	1807	1405.8	0	0
CIC Int.			1807	1807	1807	1807	1807	1807	1405.8	0	0
Visko			324	324	1000	1000	1000	1000	776.6	875	875
Elandia				1000	1000	1000	1000	1000	776.6	875	875
Lambertbaai				500	1000	1000	1000	1000	776.6	875	875
Weskus Vissers				1500	1500	1500	1500	1500	1166	1314	0
Barbican					1000	1000	1000	1000	776.6	875	875
Moreson					418	418	418	418	325.6	0	560
Eigelaar					300	300	300	300	233.2	0	0
BCP										1600	3114
Tirade Props											1314
Total MW Allocation	22000	17998	22000	25000	27894	27894	27894	27894	22000	19426	21500
No. of Rights Holders	9	9	11	14	17	17	17	17	18	18	14

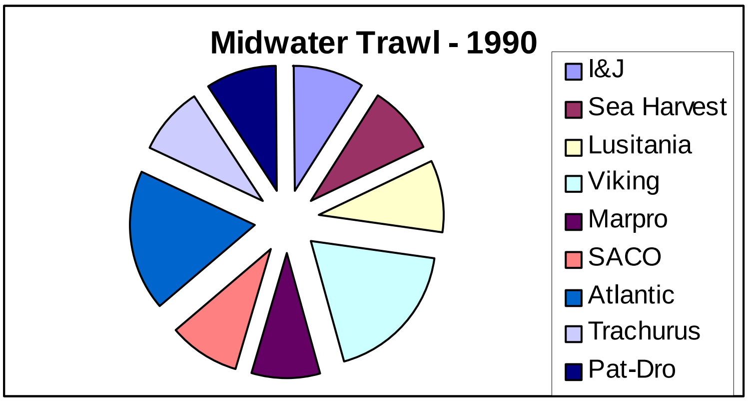

Figure 6.2. Midwater trawl (horse mackerel allocation) issued in 1990 (9 rights).

In 1992 the allocations were made by the Quota Board. The basis for their allocations was: Investment Risk, Time of Entry into the Fishery and Catch Performance. The rights allocated in that year are shown in Figure 6.3.

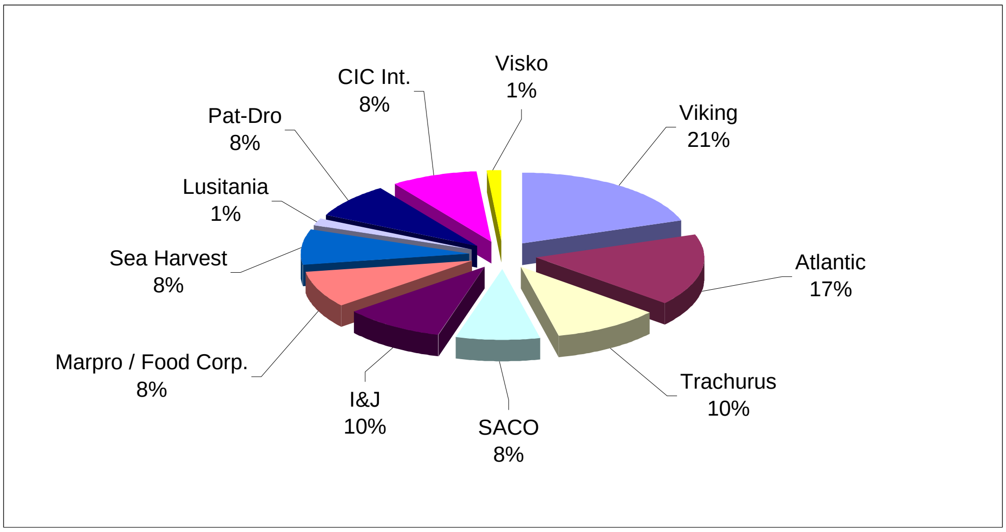

Figure 6.3. Midwater trawl allocations of horse mackerel in 1992 (11 rights).

The number of entrants in the sector peaked between 1994-1998 at 18 and presently (2001) comprises 14 rights holders (Table 6.1).

This sequence of historical allocations clearly shows:

- The systematic increase in midwater rights holders and the introduction of new entrants to the sector in recent years
- The allocation of rights were from the outset allocated in amounts that were deemed economically viable
- The introduction of impractical allocation amounts that due to reduced economic viability, has supported the non-utilisation of allocations and the selling of quota (paper quotas)
- The rationalisation of the number of rights holders in recent years

Note: When allocations were first granted, the dried/salted fish industry (for which there were good markets in Africa) was active and the smaller quotas were justified. As the fishery developed, rising fuel costs and a declining dried fish market reduced the viability of the fishery in general – specifically the dried fish option. The potential for dried or salted fish still exists however and is dependent on market demand and stability in African countries.

6.6 Quota Board Allocations

The initial allocations by the Quota Board strongly influenced the subsequent development of the sector. It is essential to recognise that the motivation for the development of a directed midwater sector was a result of industry pressure during the late 1980s to remove the foreign fishing fleets.

The quota board therefore accorded midwater trawling "discrete" status separate from other trawling sectors, by issuing in 1992, individual catch quotas for directed midwater trawling. Precedents were set at the time by allocating horse mackerel in proportions to each trawl sector (deep-sea, inshore and midwater). Rights holders were evaluated and scored on three fundamental criteria, viz.

- Investment
- Time of entry into the fishery
- Performance (historical involvement)

6.7 Economic Viability and Capacity

With regard to the definitions of fisheries sectors in the MLRA it is clear that midwater trawling is defined as a large scale “Commercial Fishing” operation and that considerable capital is required (a freezer trawler and/or land-based processing infrastructure are prerequisites). The fishery has, however, proved to be viable, utilising low cost specialised Eastern–Block midwater trawlers, processing large volumes on board, subject to keeping the catching costs to an absolute minimum. Further, there can be no question that the fishery is economically marginal.

Approximate catching costs and landed prices are:

Catching Cost:	R2-00 to R2-50 per kg
Landed Price:	R2-50 to R3-20 per kg
Returns (Profit):	R0 to 70c per kg

The low profitability limits the options for developing viable business models. The two currently operational business models, described below, may in fact be the only viable scenarios.

a) Large scale directed midwater trawling such as is presently conducted by the FV Admiral Golovko (foreign flagged). It is only under the Joint Venture arrangements with this vessel that economic viable harvesting of the resource has been possible. To achieve this the following is required:
   - A large vessel capable of sustained deep-sea operation of up to two months
   - Freezer capacity of 50-120 tons per day
   - Winch hauling power capability to haul upwards of 100 t bags of horse mackerel
   - Vessel power capability to tow large midwater nets at speeds of up to 5 kts in adverse current and sea conditions
   - Quota allocation of at least 1 000 t a month

Few vessels in South Africa fall within this category. Apart from the Admiral Golovko (this is not an RSA-flagged vessel), only the larger trawling companies have vessels that are physically able to participate.

b) Seasonal directed targeting of horse mackerel. An operation of this nature for smaller vessels such as a medium-sized freezer (40-50m) or wetfish trawler (30-50m in length) is only practical if the operator mixes fishing with the directed targeting of hake. In this manner a hake trawler can target horse mackerel when availability is conducive for the catching and processing of viable quantities within the hake fishing regime. Further, market fluctuations will also affect operations and a small increase in landed price can, for example, make it economically viable to catch horse mackerel.

Allocations for such an operation can obviously have a broad distribution but amounts of 200-400 t per month seem practical.

In this survey only two operators responded positively to the data requests.

6.8 Processing and Marketing of Horse Mackerel

Horse mackerel is a difficult species to process. Most processing is done onboard although some wetfish product is handled in factories in Mossel Bay. Rights holders therefore land horse mackerel whole and frozen, and in the case of the Admiral Golovko, small amounts are processed in the Headed and Gutted form. Markets are directed at the large volume low value African markets including Central and West Africa. There is very little local demand. In the past horse mackerel have also been canned and dried (the latter is apparently still viable if prices increase marginally above present levels).

6.9 Transformation and Employment in the Midwater Sector

The midwater rights holders comprise numerous new entrants (refer to Table 6.1). However, these entrants have not activated their rights through utilisation of their own capacity and as indicated in one company's returns, their allocations have been purchased each year for between 50c (1997) and R1-20 (2001) per kg.

Traditional rights holders in the historical deep-sea group have mostly utilised their allocation indirectly through mixed fishing as indicated in (b) above. Transformation in these companies is set out in the deep-sea trawl overview.

Horse mackerel fishing in its present form does not contribute significantly to employment. The few vessels targeting the resource ("a" and "b" categories) employ up to 70 people. In the case of the RSA-flagged operators, all crew are PDIs. The Admiral Golovko employs predominantly Russian crew with a small contingent of black South Africans (up to 20).

Horse mackerel does contribute (though very difficult to determine exactly) to employment in a small but varying degree in the numerous shore processing facilities that handle other products.

7. THE PELAGIC INDUSTRY

7.1 Introduction

The South African Inshore Pelagic Industry is based on a short-lived multi-species resource, which is characterised by large inter-annual fluctuations (20% to 90%) in the Total Allowable Catch (TAC). Currently most of the catch is processed before being marketed.

- Pilchard is canned for human consumption.
- Anchovy and round-herring are converted to fishmeal.

About 10% of the pilchard catch is packed whole for the bait market or as cutlets for human consumption.

7.2 Infrastructure of the Pelagic Industry

The Pelagic Industry supports

- 8 fishmeal plants
- 6 canning factories
- More than 40 bait packing facilities
- 65 to 68 purse-seine vessels

Together with an estimated

- 4 500 full-time employees
- 2 500 seasonal workers
- 700 fishermen
- 2 400 indirect jobs via support services

7.3 Historical Review of the Pelagic Fishery

Catches

The Pelagic Industry in South Africa was established off the Western Cape after the Second World War, targeting pilchard and maasbanker. In 1954 the fishery expanded to include chub mackerel, followed by anchovy and red-eye in 1964 and 1966 respectively. Pilchard landings from 1951 to 1957 averaged between 102 000 to130 000 tons with a few exceptions. From 1958 landings increased from 194 000 tons to peak at 410 000 tons in 1962. Thereafter catches started to decrease and after 1966 effectively collapsed to below 100 000 tons. Except for a few peak catches over 100 000 tons in 1968, 1972 and 1976, catches of pilchard remained below this figure until 1995.

To compensate for the decline in pilchard catches, small mesh nets (12.7mm) were introduced in 1965 to allow exploitation of anchovy. Anchovy landings subsequently increased to between 240 000 and 322 000 tons until 1987 and 1988 when catches reached almost 600 000 tons, contributing over

80% of the total pelagic landings. A large percentage of these fish (more than 60%) were juveniles. It was believed that the high fecundity and rapid growth to maturity suggested that the pelagic stocks could sustain a fishing mortality of up to 70% of the estimated biomass. However, it was recognised that a recruitment failure could lead to the collapse of the stocks. This fear was realised in 1989 when landings fell by 50% compared to those of the previous year (less than 300 000 tons), and with the exception of 347 000 tons caught in 1992, landings decreased to reach a low of only 40 000 tons in 1996.

The only other pelagic species caught in significant quantities were round herring (red-eye). Since 1981 landings have increased gradually from 24 000 tons to a peak of 92 000 tons in 1997 with relatively large annual fluctuations, though averaging 50 thousand tons per year.

Historical management restrictions

Historically several management strategies have been followed. In 1951 a closed season was imposed over the spring months, based more, one suspects, on the low oil content of the fish during this period, than scientific merit. From 1953 to 1960 a quota was imposed on pilchard and maasbanker of approximately 270 000 tons. However, no attempts were made to enforce the restriction and it fell away after 1961 as catches consistently exceeded the quota.

In 1971 a global quota was introduced but was apparently adjusted to suit catches. The introduction of small mesh nets in 1965 and increased catches of anchovy resulted in overall landings being maintained at a level of over 350 000 tons. Quantitative assessments to determine a maximum sustainable yield were first made in 1974 and initially were set at 360000 to 380 000 tons. Up until 1974 no individual quotas were allocated to companies and the TAC was fished on the basis of "*the more you caught the more you got*".

In 1950 a restriction on the fleet hold capacity was set to 4 400 tons. In 1975 this was raised to 13 000 tons and in 1980 reduced to 10 400 tons. The fishmeal plant capacity was limited to 117 000 tons per month for a nine-month season and a maximum canning capacity was set at 50 050 tons per year. However, these restrictions had no effect at reducing fishing pressure, as they were set abnormally high to allow optimum processing during peak catch periods.

The pelagic fishing fleet

From the onset of the fishery in the mid 1940s all the pelagic boats were privately owned (PBOs). By 1955 there were 140 boats in the industry, 134 privately owned. With the collapse of the pilchard in the early 1960s and early 1970s, the shift to fishing for anchovy and using small mesh nets resulted in a major restructuring in boat ownership. The new nets were inordinately expensive and in addition required extensive modifications to the boats in the form of new purse-wire cable winches, hydraulic net haulers and fish pumps. Many of the PBOs could not afford these changes and either fell out of the industry or sold out to the factories. Through to 1974, as no individual quotas were allocated and the TAC was fished on a "free for all" basis, the factories were induced to invest in their own, new and larger purpose built vessels to compensate for the private boats leaving the industry and to secure maximum catches.

After 1974, and based on the historical catch data, fixed quotas were allocated to the different factories but were not extended to the PBOs. The private boats were in turn allocated entrenched catching rights, which were bound to the factories. The owners were paid on a negotiated formula for the “*raw fish price*”. In 1984 the minimum catch rights of the boats was decided on at government level and allocated to the 20 operating PBOs. By 1990 the average catch right allocated to each boat was in the region of 4 000 tons based on a 300 thousand ton TAC. With the move to transformation in the early 1990s the status of the private boat owners with entrenched catch-rights started to change. Initially three of the new rights holders purchased boats from the existing fleet to catch their own quotas and after 1995 a number of the new rights holders have had new boats built to fish their own quotas. A summary of the current status of the remaining privately owned boats (as supplied by the industry) is given in Appendix 1.

7.4 Summary of the Life History of Anchovy and Pilchard

The adult fish of both species aggregate on the Agulhas Bank during the summer months. Both species are serial spawners and will spawn throughout the spring and summer. The eggs and larva are transported up the West Coast. The developing larva and juvenile fish move into the productive inshore regions and from late summer migrate southwards down the coast to reach the Agulhas region again as adults by spring and early summer. There is one major difference between the two species affecting the stock management. The anchovy reach their adult stage and are ready to spawn after one year and can be targeted during their juvenile phase. In contrast, pilchards only reach their adult stage during the second year and cannot be exploited during their first year. A management problem occurs when juveniles of both species are found together in the same shoals. Unrestrained targeting of these shoals can easily result in over-exploitation of pilchard while limited fishing can result in the under-exploitation of anchovy.

7.5 Current Stock Assessment and TAC Recommendations

The South African pelagic industry is managed as a multi-species fishery taking into consideration the differences in the biology of each of the species.

Pilchard and anchovy form the basis of the South African pelagic resource and account for between 60 – 90% of the TAC. The biology and life history of both these species has been relatively well researched and from 1983 acoustic surveys have been used annually to assess the strength of the pelagic stocks. The advantage of these surveys are that they give a direct (absolute) estimate of the recruitment and total biomass of fish stocks at the time of the survey, making it possible to determine a preliminary quota for the coming year. It also gives timely warning of the possibility of a potential recruitment failure, thereby reducing the chance of the stocks being over fished.

Several acoustic surveys are conducted annually to estimate the biomass and length composition of the pelagic stocks and recruitment into the fishery. A survey in November-December is used to estimate the strength of the adult fish stocks (spawner biomass). These results are used to make a recommendation for the following year's TAC for the pilchard-directed fisheries and a preliminary recommendation for the initial anchovy TAC and pilchard by-catch. In May-June another survey is undertaken to estimate the new recruitment into the fishery and these results are used to revise the anchovy and pilchard by-catch TAC. Note that the pilchard TAC is not revised as this fishery targets only the adult fish.

From 1986 the industry has made some effort to build up the pilchard stocks through self-regulation, by closing areas for anchovy when the by-catch of juvenile pilchards reached unacceptable levels. This has contributed to the anchovy TAC being under caught by almost 330 000 tons over the last 8 years.

7.6 Specific Characteristics of the Pelagic Fishery

<u>Dynamic nature of the pelagic fishery</u>

The pelagic fishery is a dynamic industry that has fundamental differences to the other fishing sectors. With the exception of bait and cutlets, all the fish landed have to be processed into another form, i.e. pilchards are canned and anchovy, red-eye and miscellaneous by-catch species are processed into fishmeal. The industry operates on a "high volume / low profit basis. *One of the major influencing factors that the industry has to contend with is the large possible fluctuation in annual TAC.* These fluctuations are due primarily to the population dynamics of the stocks and also to the prevailing environmental factors".

Annual changes in the quotas have a significant impact on the participants within the industry, especially with respect to annual profits and planned capital expenditure. A 50% reduction in pilchard and/or anchovy landings will not result in any significant drop in annual running costs but will result in most of the factories and boat owners having to operate at a loss.

Most of the traditional companies are over 50 years old and above their normal operating costs have relatively high annual maintenance and capitalisation costs. Some of the estimated budgets for the year 2001 are between 7 and 30 million Rand. In addition they have established infrastructures to maintain, which include training, medical clinics, social services, housing subsidies, and school and academic bursaries.

Small to medium companies have developed over the last five years and are especially vulnerable to changes in the TAC, as most of these entities have new capital investments in the form of vessels and factories. The uncertainty of the future regarding long term rights has made it difficult to secure loans.

The least vulnerable are rights holders who have written agreements with established companies and have no capital outlay in catching and / or processing ("paper quota holders").

The larger traditional companies have their own fleets, which secures the catching ability of their own rights. At the same time they are in a position to receive fish from PBOs and the smaller companies.

Purpose built vessels have the advantage of operating more effectively with respect to loading anchovy and non-quota species, and the handling, storage and delivering a higher quality fish for canning. The crew are paid a basic salary with commission on their catch, or on a commission basis only. Private boats delivering to the company are paid on a landed catch basis according to an agreed price.

In the past most of the larger companies supported their own maintenance workshops and support systems. However, these were not cost effective and over the last ten year a large proportion of this work has been outsourced to private workshops and supply companies. A limited amount of these services are, however, still retained by the larger processing companies to ensure smooth running of their fleets and plants. The private boat owners and boats belonging to smaller companies depend entirely on other companies or have to pay the factories for these services. These requirements by the industry as a whole are responsible for supporting micro industries within the local communities surrounding the major factory sites.

Purse-seine nets: costs and maintenance

The purchase of *purse-seine nets* and annual maintenance are a major cost factor in the pelagic industry. A new anchovy net can cost upward of R1.5 million and annual repair costs up to R800 000. In addition many of the larger vessels have two nets, one small and one large meshed, to be able to target anchovy, red-eye and pilchard. Private boat owners and small companies are especially vulnerable to these costs, which form a significant part of their annual budgets. A single accident can turn a profit into a loss and bankrupt the company. Most of the new companies that have become established over the last five years have invested in vessels having multi-purpose capabilities to fish both pelagic and in other sectors. These vessels have predominantly gone into bait packing and have equipped themselves with larger mesh pilchard nets, which are less expensive to purchase and maintain than anchovy nets. It is important to note that, with the present allocations, the dual capabilities of a vessel and securing rights in other sectors are the only means that some of the smaller companies can remain viable. A summary of the average capital and annual running costs is given in Appendix 2.

7.7 Transformation in the Industry

Over the last eight years there has been significant transformation within the pelagic fishery with the allocation of rights to new entrants and restructuring of ownership within the traditional companies (see economic indicators).

<u>Pilchard right holders</u>
Where traditionally, prior to 1990, the pilchard allocations were given to only 12 companies, by the year 2000 the allocations were awarded to a total of 107 rights holders. The continued growth of the pilchard stocks over the last four years and a reduction of almost 50% in the allocations to traditional companies has made it possible for 48% of the 2000 allocations to be awarded to new entrants from the previously disadvantaged sector. The transfer of these rights to new entrants has resulted in the establishment of a number of new medium and small enterprises.

New entrants had several options.

1. The lowest risk option and majority of new entrants have opted to sell their tonnage to one of the major canning or processing companies at an agreed “price per ton”.
2. In a higher risk option, a percentage have negotiated with their rights to enter into joint ventures with established companies, which include shares in the company or the company assets.
3. In medium to high-risk approach, approximately 25% of the new entrants have established themselves into small to medium enterprises. Through joint ventures in a boat they catch and process their own fish into either bait or cutlets. These products are marketed both locally and destined for export. In most of these ventures the vessels and processing facilities are shared with rights held in other sectors.
4. In a few cases the companies catch their own fish and pay a “processing fee” to one of the larger processing companies. They then market the fish under their own label.
5. A small percentage have formed empowerment companies and acquired substantial share holdings in some of the larger traditional companies.

<u>Anchovy rights</u>
Despite the reduction in the anchovy TAC in 1996, there was a significant transfer of rights to new applicants. Over the last three years, as these stocks have recovered, up to 45% of the anchovy have been given to new entrants. From the 10 traditional rights holders before 1990, there now exist 51 anchovy rights holders, a total of 41 new entrants, the majority of which are PDIs.

In contrast to pilchard, all anchovy landed has to be processed at one of the existing 8 fishmeal plants. The new rights allocations has, however, made it possible for a number of new small to medium companies to become established and cost effective.

The larger corporations comprising most of the traditional rights holders own all the existing fishmeal processing capacity within the industry. Due to their large infrastructure, these companies require a relatively large percentage of the catch allowance to remain viable. The fishmeal industry is a high volume industry with a relatively low profit margin. This creates a complex scenario as the rights issued to these industries are critical in absorbing most of the major running costs of the plants. To reach economies of scales and run profitably, they are also dependent on obtaining a percentage of the tonnages allocated to the smaller rights holders. Over the last 10 years two processing plants have closed down and the overall capacity to produce fishmeal has decreased by 20%. Several reasons account for this:

- Decline in the anchovy stocks and reduced TAC.
- Compliance to new environmental regulations to reduce pollution, which has significantly increased operating costs.
- Uncertainty in the future with respect to long term tenure of rights.
- Decline in the fishmeal price caused by competition from alternative vegetable products.

Similar to pilchard, a number of scenarios have evolved amongst the new entrants.

Scenario 1: Low risk “paper quota holders” fall into three basic risk categories:

- The majority of the new rights holders are paid out for their fish by one of the fishmeal plants at a negotiated price. The larger companies then catch, process and market the product together with their own fish.
- In a higher risk option, four companies have negotiated, in lieu of being paid a “raw fish price”, being paid a percentage of the final selling price of the fishmeal. This carries a higher risk due to the fluctuations in fishmeal prices but has the potential for a greater profit. Notably there has been an overall reduction in fishmeal prices over the last few years.
- Three rights holders have gone for the option whereby they pay a processing fee and market their own product. This option carries the highest risk factor but can potentially lead to the greatest returns.

Scenario 2: A number of the new rights holders have entered into joint ventures with one of the larger companies in one of their boats, to catch and subsequently sell their fish to the factory.

Scenario 3: A small percentage have become major equity shareholders in a number of the major companies.

7.8 Key Indicators for the Pelagic Fishery

The following indicators are summarised from the Economic and Sectoral Study Database. ESS datasheet returns were received from 125 pelagic rights holders (Table 7.1), representing 78% of the active participants in the fishery in 2000.

Table 7.1. ESS coverage of the pelagic fishery rights holders in 2000.

SUB-SECTOR	*RIGHTS HOLDERS*	*R.H. RECORDED IN ESS*	*COVERAGE (%)*
Anchovy	52	52	100%
Pilchard	77	60	78%
Pilchard Bait	32	13	41%
Total	125	161	78%

<u>Ownership</u>

The ownership of the entities (companies, trusts, etc.) holding fishing rights for pelagic fish was made up of 28% PDI and 19% white individuals, while 53% could not be determined (Fig. 7.1). This translated into 26% PDI and 21% white ownership of the rights fished by these entities (Fig. 7.2). About 65 vessels were active in the pelagic fishery in 2000. Ownership details were supplied for 59% of the vessels, in the ESS questionnaires. Of these vessels, 29% were owned by PDI (Fig. 7.3), while white individuals owned 30%.

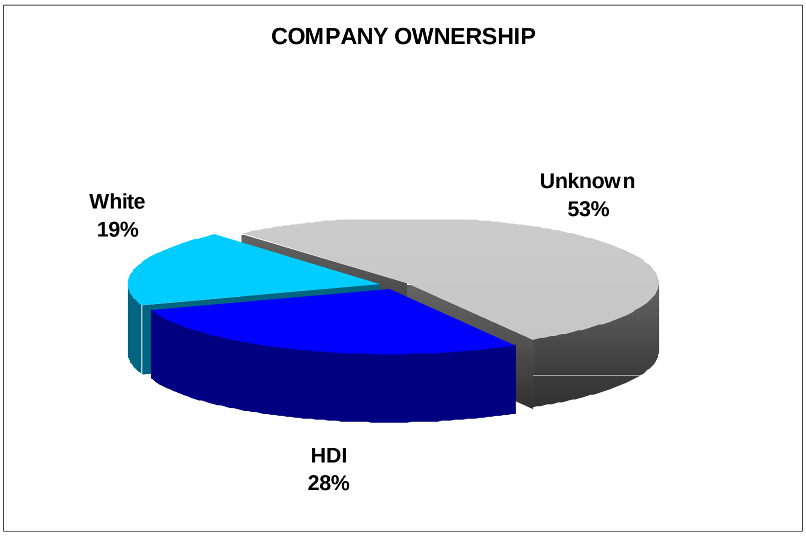

Figure 7.1. Percentage ownership of the pelagic rights holding companies in 2000.

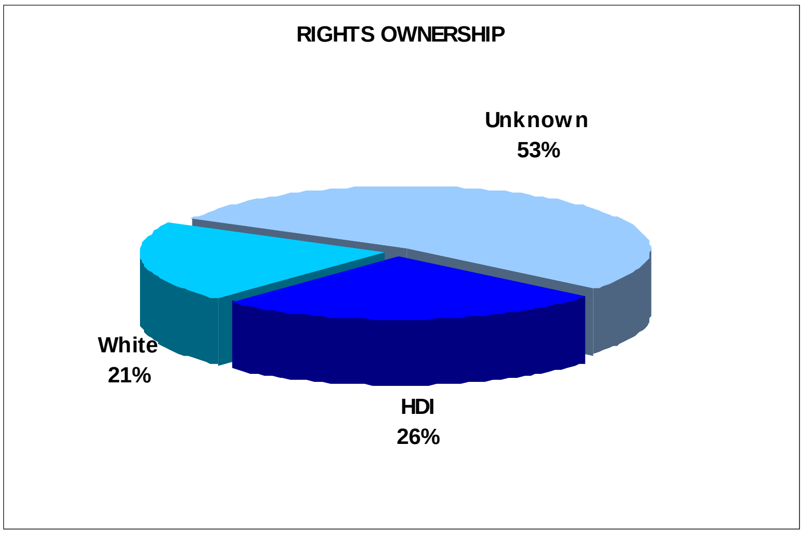

Figure 7.2. Percentage ownership of pelagic fishing rights in 2000.

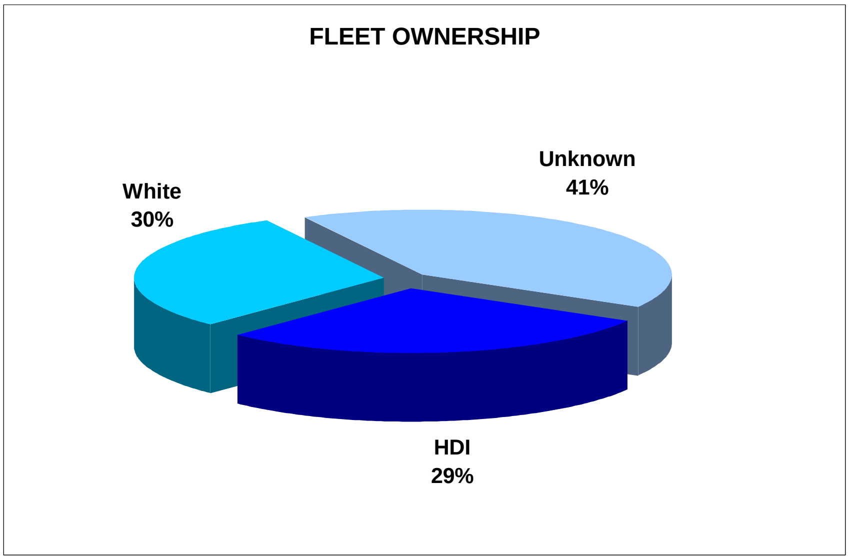

Figure 7.3. Percentage ownership of the vessels in the pelagic fishery during 2000.

Employment

The ESS received employment data for 84.5% of the vessels active in the pelagic fishing industry in 2000 (55 vessels), and 21 processing/packing facilities. Total full-time employment in the industry was estimated at approximately 5 275 individuals, of which 92% were PDI, earning approximately 76% of the annual wages (Fig. 7.4 and 7.5).

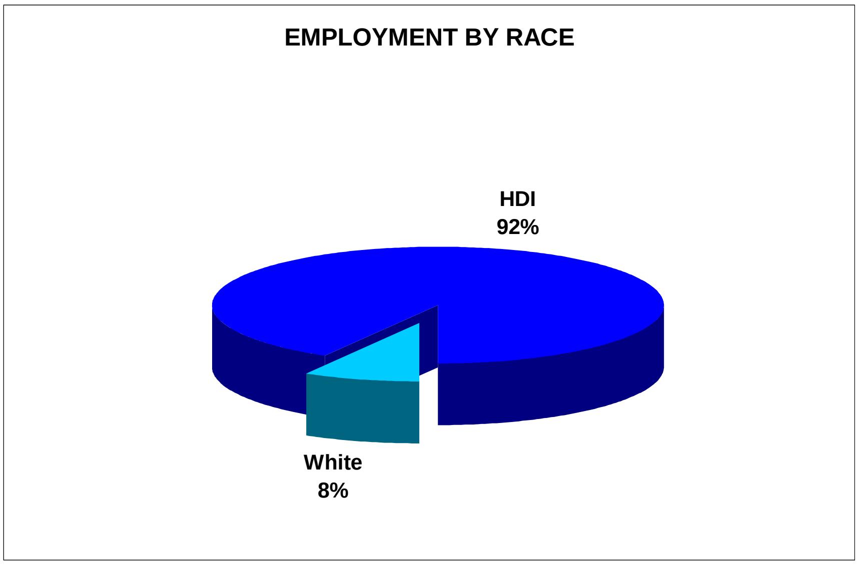

Figure 7.4. The percentage of White and Previously (or Historically) Disadvantaged Individuals employed in the pelagic fishery in 2000.

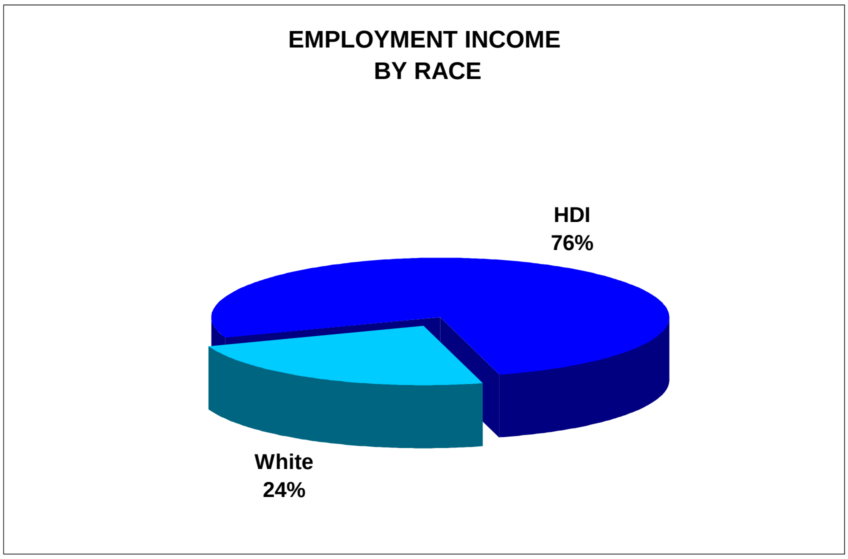

Figure 7.5. The percentage income earned by White and PDI employees in the pelagic fishery in 2000.

The number and annual wage earnings of White and PDI employees in the pelagic fishing industry in 2000 was compared for skills category in Figures 7.6 and 7.7.

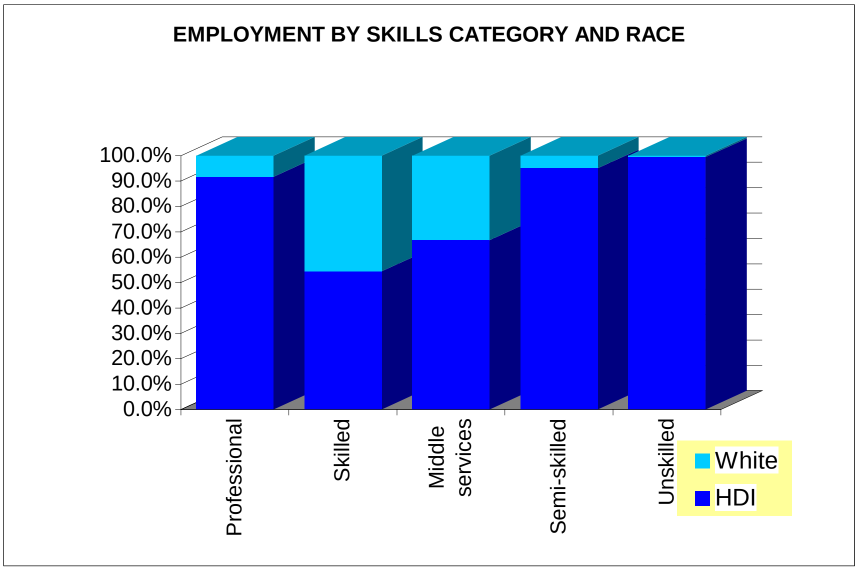

Figure 7.6. The percentage White and PDI employment in the pelagic fishery, by skills category.

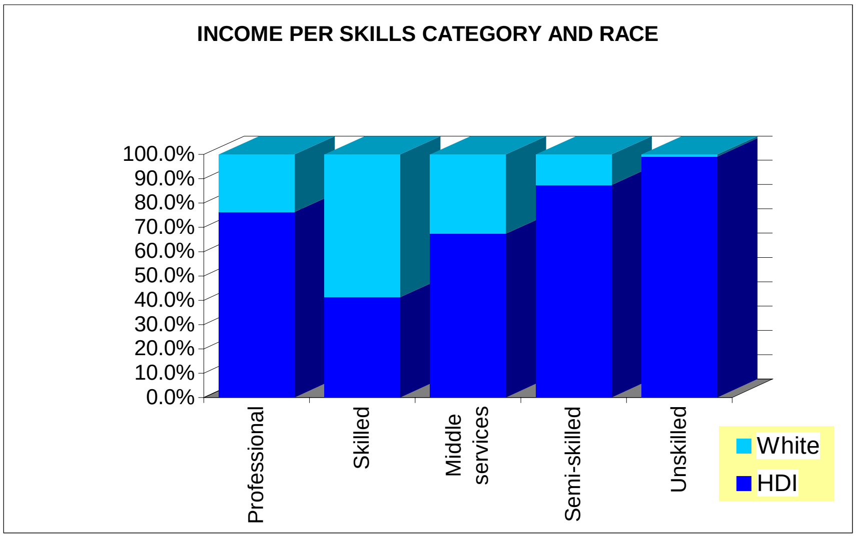

Figure 7.7. The percentage White and PDI income earned in the pelagic fishery, by skills category.

The average annual wage earnings for the different skills categories in the pelagic fishery for 2000 is represented in Figure 7.8. The labour structure of the fishery is shown in Figure 7.9, where the number of individuals in each labour category is represented as a percentage of the total number of full-time employees in the pelagic fishery at the time.

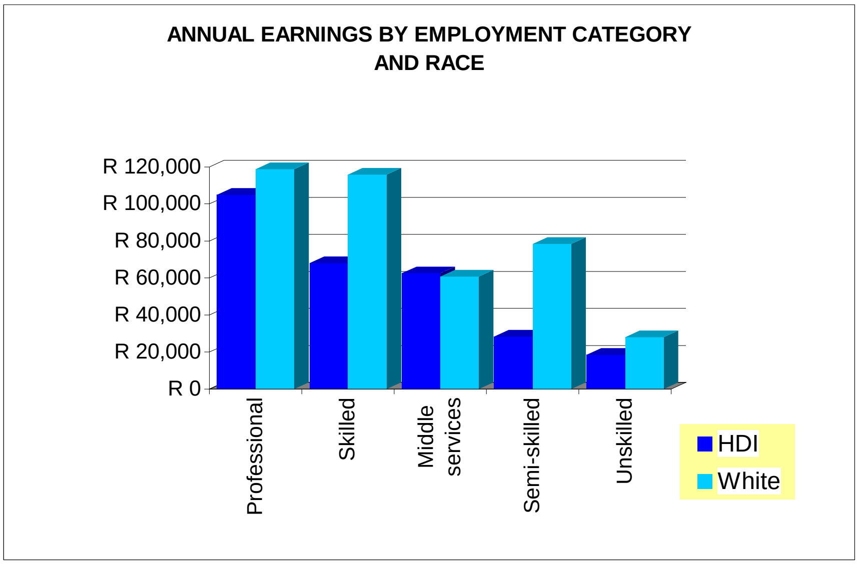

Figure 7.8. Average annual income per skills category for full-time employees in the pelagic fishery in 2000.

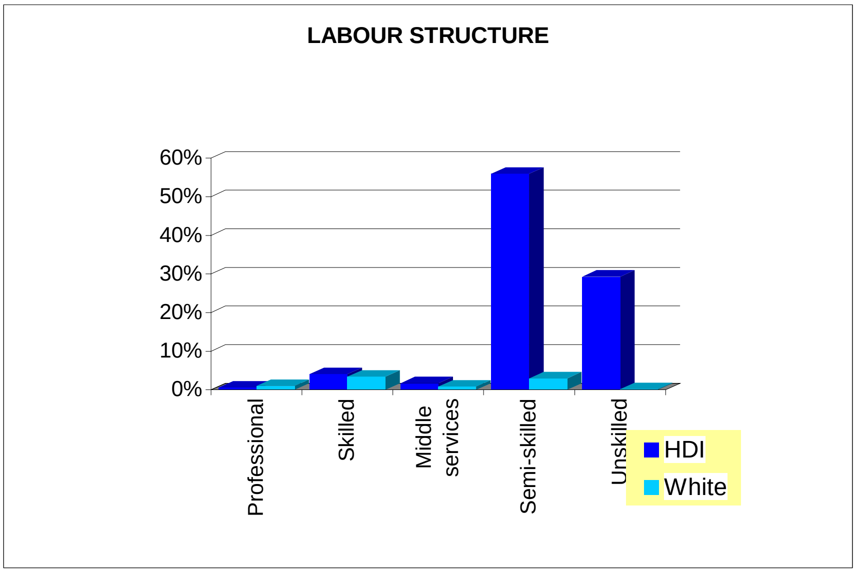

Figure 7.9. The number of employees in each of the skills categories, as a percentage of the total full-time employment in the pelagic fishery in 2000.

Region

Most of the full-time employment generated by the pelagic fishery in 2000 occurred in the Western Cape Province (78%), with some employment reported from the Eastern Cape Province (4%, Figure 7.10).

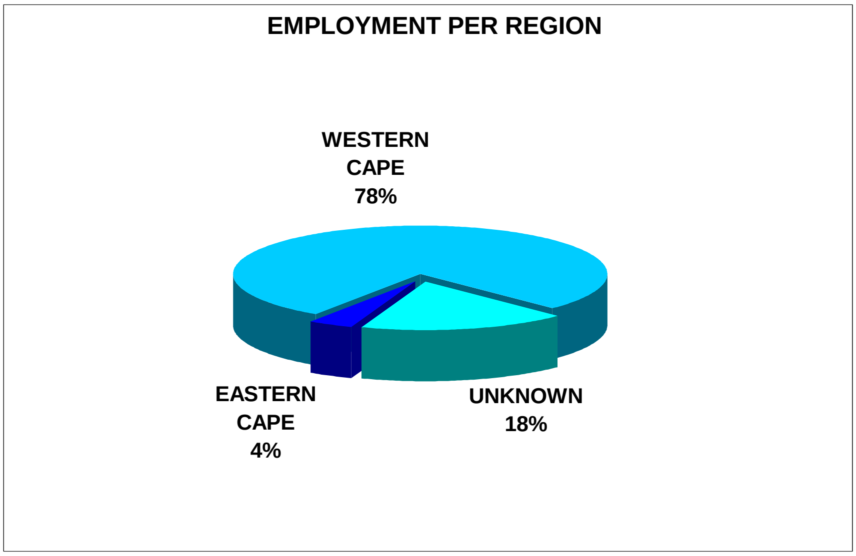

Figure 7.10. Employment in the pelagic fishery in 2000, by region.

<u>APPENDIX 1:</u> This section is included to give an indication of the current status of the private boat owners in the pelagic industry.

A. SINGLE BOAT OWNER operating under an entrenched catch right entitlement and involved in the catching of pilchard, anchovy and non-quota species and <u>have no direct or indirect</u> share in existing quotas.

1. *Weskus Vissers Kooperasie* — *MFV Barracuda (catch right bought in 1990)*

B. CONTRACTING BOAT OWNERS IN THE PELAGIC INDUSTRY (without catch right entitlement). These boat owners are contracted by Weskus Vissers Kooperasie to catch and land the Weskus Vissers quota in conjunction with MFV Barracuda, i.e. pilchard, anchovy and non-quota species, and these boat owners <u>have no direct or indirect share in existing quotas</u>.

1. *Atlantic Enterprise Fishing (Pty) Ltd* — *MFV Atlantic Enterprise*
2. *Jakob Rose Beleggings (Edms) Bpk* — *MFV Jakob Rose*

C. GANSBAAI MARINE BOAT OWNERS IN THE PELAGIC INDUSTRY (with catch right entitlements). These boat owners are direct shareholders in Gansbaai Marine and although they are boat owners, they benefit directly and indirectly from the quota of Gansbaai Marine and therefore are not included in the category of boat owners as in A) and B) above.

1. *MFV Arno Louis*
2. *MFV Merlene*
3. *MFV Silver Snapper*
4. *MFV Caprivi*
5. *MFV Oom Piet*
6. *MFV Runtu*
7. *MFV Kolgans*
8. *MFV Bosbok*

D. EIGERLAAR GROUP IN THE PELAGIC INDUSTRY (with catch right entitlement). These boat owners are the majority shareholders in Paternoster Visserye as well as the holders of a 294-ton pilchard quota.

1. *MFV Ankoveld*
2. *MFV Groenveld*
3. *MFV Roseveld*

E. QUOTA HOLDER BOAT OWNER IN THE PELAGIC INDUSTRY (without catch right entitlement). These boat owners are new entrants and are actively involved in the catching and landing of their own respective quota of pilchard, anchovy and non-quota species.

1.	*Manetrade 2094*	*MFV Stormkop*	*500 ton pilchard (1997)* *1 077 ton anchovy (1998)*
2.	*B.J. Engelbrecht and Venote*	*MFV Kavalier*	*500 ton pilchard (1997* *1 077 ton anchovy (1998)*
3.	*Fishermans Development Coop* *Reiger Visserye (Edms) Bpk.*	*MFV Kranzberg*	*1 182 ton pilchard (1994)* *3524 ton anchovy (1994)*

APPENDIX 2: Evaluation of average capital outlay and running costs per vessel across the fleet.

VESSEL CATEGORY	AVERAGE VESSEL REPLACEMENT COST	AVERAGE COST OF REPLACEMENT OF NETS	ANNUAL RUNNING COSTS (*)
50 to 100 tons	R2.4 million	R378 000	R1.20 million#
100 to 200 tons	R5.5 million	R1.0 million	R1.06 million
200 to 300 tons	R10.0 million	R1.8 million	R1.80 million
300 to 450 tons	R20 to R30 million	R2.9 million	R3.10 million

(*) Basic annual running costs include:

- Annual insurance
- Fuel
- Survey
- Ice
- General vessel and mechanical maintenance
- Net repair and maintenance

Annual running costs are relatively standard and are not affected by fluctuations of the TAC.

Note there is a significant difference in the running costs between vessels carrying ice (pilchard canning and bait-fish operations). Ice is a significant cost factor for the smaller pelagic boats, predominantly in the 50-100 t displacement category.

8. THE PRAWN FISHERY

8.1 Introduction

Prawns and other marine crustaceans are much in demand by South African consumers, particularly those in the higher income brackets. For example, a recent survey conducted in Durban supermarkets showed that 67% of respondents (all races, n = 812) ate prawns, 56% ate crayfish and 53% ate crab (Robertson 2000). The KwaZulu-Natal crustacean trawl fishery is based in Durban and it is the only crustacean trawl fishery in South Africa. Although the fishery is small in terms of numbers of vessels (eight) and total retained catch (~350 tons), it is of considerable local importance both economically and socially.

8.2 Development of the Fishery

The existence of trawlable crustacean stocks was established in KwaZulu-Natal (KZN) as early as 1921, during the Fisheries and Marine Biological Survey by the *S.S. Pickle*, commissioned by the Fisheries Survey Committee of the Department of Mines and Industries (Gilchrist 1922). Few other references to surveys in the area can be found until 1964, when the Fisheries Development Corporation commissioned an investigation, subsequent to which commercial trawling for crustaceans began. First reports of landings of trawled crustaceans in KZN appeared in 1965.

Commercial trawling for crustaceans in KZN coincided with the development of prawn trawling in Mozambique. The early efforts in KZN were initially sporadic, with most of the Durban-based vessels preferring to fish in Mozambican waters, as the trawl grounds were more extensive and catch rates were higher. First mention of permits for the trawling of crustaceans can be found in reports of the then Department of Sea Fisheries in 1972, although there was no distinction made between vessels which fished in Mozambique or KZN. Initial trawling efforts in KZN appeared to focus on deep water rock lobsters (*Palinurus delagoae*), as reports of landings of prawns only appeared in 1970. Anecdotal reports indicate that during the early years of the fishery, only rock lobsters were retained, with the remainder of the catch being discarded (Tomalin 1998). During the 1970s, several companies had trawlers based in Durban, some, if not all, of which fished in KZN waters at least occasionally. Up to 1976, a 12 nautical mile inshore trawling limit had been imposed by the Mozambican authorities, and KZN-based vessels had to fish beyond this limit. In 1976, the Mozambicans extended their territorial waters to 200nm, and the number of KZN-based vessels operating there declined sharply. At this time, regular trawling by two vessels began on the inshore, Tugela Bank grounds north of Durban. By 1982, there were 20 permitted vessels based in Durban, 4 of which could operate in KZN waters, while the rest operated in Mozambique.

This situation of mixed permitting (i.e. with boats fishing both locally and in Mozambique) continued until 1983, when there was a moratorium on South African vessels fishing in Mozambique. This followed the impounding of a South African vessel that was operating there illegally. In the face of a potential massive increase in local trawling effort, the Department of Sea Fisheries proposed that the total number of trawlers operating in KZN be reduced to 10, with only 4 vessels allowed within 7nm between Green Point and Cape St Lucia. However, many of the larger vessels that had been operating in Mozambique could not operate viably in KZN waters, and some vessels were laid up or were utilised in other sectors. Also, following representations from the industry, the maximum number of trawlers permitted to operate in inshore waters in KZN, i.e. within the 7nm limit, was increased to 8 to accommodate vessels that had previously operated in Mozambique. Following the Nkomati Accord between Mozambique and South Africa in November 1984, South African vessels were again allowed to fish in Mozambique. Consequently, of the 8 inshore permits for KZN available in 1985, only 4 were utilised. Also in 1985, 11 other Durban-based vessels were engaged in offshore trawling (> 7nm), but it is not clear how many of these were regularly operating in KZN. In 1987, only 6 permits were utilised in KZN waters, with another 9 permits being utilised mainly in Mozambique. In 1989 and 1990, 8 inshore and 7 offshore permits were issued for KZN.

In 1991, the Mozambican authorities stipulated that catches made in their country under joint venture agreements would have to be discharged there. As of that year, Sea Fisheries restricted the issuing of permits to those vessels that were actively trawling prawns in KZN, resulting in 5 inshore permits and 3 offshore permits. The 1991 permit allocation has been maintained until the present, and is an upper limit for total allowable effort (TAE). A list of companies currently in possession of crustacean trawling permits is provided in Table 8.1. The actual number of trawlers active in the fishery has varied, as permits are often interchanged between vessels, e.g. when a vessel is laid up for refitting. Catches made in Mozambique are now allowed to be discharged in Durban, providing that they are first cleared through customs in Maputo. Some of the companies with trawlers permitted for use in KZN waters also use these trawlers for considerable periods of the year in Mozambique.

Table 8.1: Companies in possession of crustacean trawling permits in 2001.

COMPANY	PERMIT TYPE
KwaZulu-Fishing	1 inshore, 1 offshore (both utilised by Spray Fishing)
Spray Fishing	1 inshore, 1 offshore
Polana Fishing	1 offshore
Viking Fishing	1 inshore
Sterling Fisheries	1 inshore, 1 offshore

This summary of the development of the crustacean trawling industry in KZN is largely based on a review of Annual Reports and Commercial Fisheries Reviews produced by the Department of Sea Fisheries/ Marine and Coastal Management (MCM). The annual South African Fishing Industry Handbook was also consulted, as well as the department at MCM in charge of permit administration. At times, this process provided contradictory information as to the number of permits and the number of operational vessels. In these cases, the actual situation was verified by obtaining information from people in the industry at the time.

8.3 Description of the Fishery

<u>Description of vessels, operations and scale distribution</u>

All KZN prawn trawlers are steel vessels with overall lengths ranging from about 25 to 35m and main engines that generate 300-600 kW. All are equipped with echo sounders, global positioning systems and track plotters, radar, VHF/SSB radios and cell phones. The trawlers mostly use single otter trawls deployed from the stern, although one vessel uses two beams to deploy two nets. Trawl sizes range from 25 to 60m footrope lengths, with stretched mesh size tapering from 70mm in the wings to 38mm in the codend. “Tickler” chains, attached to the footrope, may be utilised to disturb the prawns when trawling, causing them to leave the substratum, thereby increasing catchability. Trawl speeds are between two and three knots and drag duration averages four hours. The trawlers carry in the region of 15 crew and can remain at sea for up to three weeks. Trawling takes place on a 24-hour basis, and a skipper and a mate alternate 6-hour watches. Retained catches are sorted, graded, packed and blast frozen on board, while unwanted by-catch is discarded. A small proportion of the prawn catch has the heads removed before packing, depending on demand. Retained crustacean catches are dipped in sodium metabisulphite prior to processing, in order to prevent blackening (oxidation) of the product.

Although there are two distinct and different trawl grounds (inshore and offshore), the current fleet of trawlers is capable of operating on either ground. There is one less powerful, twin-net boom trawler that would probably not be able to trawl as efficiently on the deep water grounds as the standard stern trawlers. However, this trawler could be easily converted. Hence there is no need for a scale distribution of the fleet.

<u>Trawl grounds and general catches</u>

Trawling is only possible over soft sediments (sand/mud), as even low-profile reefs can damage trawl gear. The trawl grounds can be broadly divided into inshore (shallow water) and offshore (deep water) sectors, and will be dealt with separately as they constitute very different fisheries. It should be noted, though, that a trawler with an inshore permit is entitled to also trawl in the offshore grounds, but not visa versa. Hence, the inshore permit is effectively an inshore/offshore permit.

The main inshore trawl grounds are known as the Tugela Bank, and cover an area of approximately 300km^2, extending from close inshore (about 500m) to 16km offshore. The continental shelf is up to 50km wide at this point, forming the Natal Bight. The seaward boundary for trawling on the Tugela Bank is poorly defined, probably being restricted by the preference of penaeid prawns for depths of less than 50m, with actual trawled depths ranging from 10 to 45m. The trawl grounds coincide closely with a depocentre of mud and sand originating from the fluvial discharge of the numerous rivers in the area. There is also a much smaller, shallow water trawl ground situated off the St Lucia Estuary mouth to the north. The extent of this ground is not known, although it commences in very shallow water (< 10m) and extends out into water depths of about 40m.Trawling on the shallow grounds is seasonal, being reliant on the migration of prawns from estuarine nurseries during months with high rainfall. Trawling on the St Lucia ground mainly occurs from January to March, and occurs on the Tugela ground from March to about September. Trawlers which possess inshore permits, and which are powerful enough, will generally leave the inshore grounds to fish on the offshore grounds when inshore catches are not economically viable.

Targeted catches on the Tugela Bank are dominated by the white prawn (*Penaeus indicus*), which contributes in excess of 80% of the prawn catch. The balance is mostly made up by the brown prawn (*Metapenaeus monoceros*) and the tiger prawn (*P. monodon*). Catches on the St Lucia ground are dominated by white prawns and the bamboo prawn (*P. japonicus*), with the latter only featuring in nocturnal catches. Apart from tiger prawns, the prawns are not separated by species when they are packed, hence the category “white” prawns in fact refers to a complex of up to five species.

The trawl grounds are located in subtropical latitudes, and the relatively indiscriminate nature of bottom trawling, together with the small mesh size used, results in a high diversity of by-catch species associated with the prawns. In the Tugela Bank fishery, 108 teleost species, 23 elasmobranch species and 37 crustacean species have been identified (Fennessy 1994a). Most of the retained by-catch from the shallow trawl component comprises fishes, with two sciaenids, snapper kob (*Otolithes ruber*) and longfin kob (*Atrobucca nibe*), dominating. Spotted grunter (*Pomadasys commersonnii*) and javelin grunter (*P. kaakan*) are also important at times. Fishes larger than 20cm in length are generally retained. The Tugela crab (*Portunus sanguinolentus*) and the Indian squid (*Loligo duvauceli*) are also retained.

The discarded component of catches generally comprises organisms that are of low commercial value, being unmarketable, inedible or too small. Discards comprise almost 75% of total catch (Fennessy and Groeneveld 1997). Owing to barotrauma and crushing in the trawls, most of the organisms are dead when they are returned to the water, although some elasmobranchs and crustaceans do survive shallow-water trawls (Fennessy 1994b, Fennessy 1995). The discarded catch comprises mainly fishes, with lesser quantities of small, commercially unimportant crustaceans, echinoids and molluscs. Most of the fishes are demersal, shoaling, slow-swimming species.

Little is known about the shallow water St Lucia fishery, although preliminary studies indicate that the by-catch is substantially different from the Tugela Bank by-catch (Oceanographic Research Institute, unpubl. data).

The offshore deep water trawl grounds comprise an area of approximately 1 000km^2, ranging in depth from 100 to 600m, with most fishing effort concentrated in the 300 to 600m range towards the edge of the continental shelf. The substrate is varied, ranging from mud to hardened accretions of sediment, Foraminifera and spicules (Berry 1969). The Agulhas Current meanders over the trawl grounds at rates of up to three knots, and often hampers trawling because of the strength of the flow.

The offshore fishery targets several species of crustaceans. Pink prawns (*Haliporoides triarthrus*) comprise over half the targeted catch, and the red prawn (*Aristaemorpha foliacea*) is also of importance. Several other prawn species contribute small amounts to total catch, and, as in the inshore fishery, the category “pink” prawns refers to a complex of several species. Two species of langoustine, *Metanephrops mozambicus* and *Nephropsis stewarti*, are also caught, with the former occurring more commonly. The deep water rock lobster is also targeted, and the east coast red crab (*Chaceon macphersoni*) is also caught in considerable quantities. The habitats of these organisms overlap, with pink prawns, red crab and langoustine mainly occurring at depths greater than 300m, while rock lobsters mainly occur from 100 to 300m (Groeneveld and Melville-Smith 1995).

By-catch includes small quantities of slipper lobsters (*Ibacus novemdentatus* and *Scyllarides elizabethae*) which are also retained. Fishes retained by offshore trawlers mostly comprise longfin kob, deep water hake (*Merluccius paradoxus*), greeneyes (*Chlorophthalmus punctatus*) and John Dory (*Zeus* spp). Small quantities of jacopever (*Helicolenus dactylopterus*) and bluefin gurnard (*Cheilidonichthys kumu*) are retained. Deep-water octopus (*Veladona togata*) and cuttlefish (*Sepia officianalis*) are also kept.

The discards of the offshore fishery have not been formally investigated, but are thought to comprise about 70% of total catch (Fennessy and Groeneveld 1997). Fishes that are currently not marketable, such as grenadiers (rat-tails), predominate in the discards, followed by commercially unimportant crustaceans, asteroids and molluscs.

8.4 Catches and Levies

Skippers are required to complete drag sheets on which retained catch per drag is estimated, based on the number of full cartons containing retained catch categories after each trawl. A landing sheet is also completed when the catch is discharged in Durban, based on weights per catch category. Although landings are available from the beginning of the fishery in the 1960s, catches in KZN cannot be separated from those made in Mozambique up until 1988 (see 8.2, Development of the Fishery). Landed catches for the past 10 years, based on landing sheets received from the companies and extracted from the MCM database, are presented in Table 8.2. These figures are known to be underestimates, although the degree of error is not certain. From 1990 to 1994, the degree of error probably did not exceed 30%. This estimate is based on the premise that only one company (Natal Ocean Trawling) was operating in KZN waters, and information on catch quantities made by that company was made available to ORI. After 1994, though, several companies were operating trawlers in KZN, and the degree of discrepancy between actual total catches and those given in Table 8.2 cannot be estimated. The discrepancy mostly arises from the non-submission of landing sheets, which is in turn largely due to poor administration of the data submission and collection process. Data from 2000 are not available as the MCM database is not able to accept post-1999 data yet.

Table 8.2. Landed catches (to the nearest ton) by the KZN crustacean trawl fishery, based on landing sheets received from the trawling companies and extracted from the MCM database. Fishes and cephalopods have been combined for inshore and offshore sectors owing to the lumping of these categories on landing sheets.

CATCHES	SECTOR	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
White prawns	Inshore	82	99	85	50	43	20	55	12	103	72
Tiger prawns	Inshore	4	-	2	2	-	1	6	2	3	1
Pink prawns	Offshore	311	246	112	166	65	96	76	77	69	121
Langoustines	Offshore	52	51	70	83	46	55	58	78	49	50
Rock lobster	Offshore	14	18	31	33	10	12	10	10	6	8
Crabs	Offshore	74	186	187	138	80	98	82	113	100	73
Fishes	In/offshore	47	66	58	45	18	49	63	71	79	35
Cephalopods	In/offshore	28	28	32	24	9	26	22	21	16	32

Despite uncertainty over actual catch quantities, there is considerable inter-annual variability in the sizes of the various catch categories. This is a function of a combination of variable effort, caused partly by the liquidation of one of the major companies during this period, as well as losses of trawlers in accidents. Drought, which is particularly relevant to inshore prawn catches, as well as variability in abundance and catchability of target organisms, also contributed to inter-annual variability. In addition, catch rates in the offshore fishery are negatively correlated with fishing effort, implying that as effort increases, catches decline (Tomalin 1998).

Ex-vessel prices were only available from 1997, and catches were only available up until 1999, so the time series is very short. Based on catch figures for 1999 and prices and levies for 2001, the crustacean trawl fishery has an annual ex-vessel catch value of about R11 million, with a retail value of about R21 million, and generates annual levies of about R38 000 and R58 000 to the Marine Living Resources Fund and the Department of Trade and Industry, respectively.

8.5 Shore-based Activities, Processing and Marketing

Virtually all processing (heading of prawns, grading, packing) of catches takes place at sea, and most catches are ultimately retailed to the public in whole form. A limited amount (< 3%) of white and pink prawn tails are shelled and deveined at onshore facilities. Shore-based activities, in the sense of catch processing factories etc. are therefore not an integral part of this fishery. Viking Fishing, Polana Fishing and Sterling Fisheries all undertake their own distribution of products. Spray Fishing supplies a local wholesaler (Seafeast) and Ocean Trawling supplies Lusitania Food Products as part of a joint venture agreement. The products are then re-sold by these companies to retailers and ultimately the public.

8.6 Management of the Fishery

Since 1985, skippers have been required to fill in drag sheets in logbooks and submit them to Marine and Coastal Management (MCM). Landing sheets are also completed by the companies and submitted along with the logbooks. Although the recording of catch and effort data was instituted in 1985, data capture effectively only commenced in 1988 once a database at MCM had been created. Until 1994, data was captured at the MCM (then Sea Fisheries) office in Durban, whereafter data capture was taken over by ORI. Currently, the drag and landing sheets are collected from the companies by KZN Wildlife staff (previously the Natal Parks Board), as representatives of MCM in KZN, and are delivered to ORI. One of the permit conditions requires companies to inform KZN Wildlife staff 24 hours before a trawler discharges its catch, so that it may be inspected. However, neither notification nor inspections occur as a matter of course. There are currently no quota or gear restrictions for this fishery, and the main input control is a limited number of permits (8 – see Development of the Fishery). Trawlers may not operate in any of the marine reserves in KZN, and they are also governed by the current regulations that apply to linefish species caught by commercial linefishing. However, an exception was made in the case of spotted grunter, a recreational linefish species that may not be sold. For several years, a concession was granted to one of the trawling companies to sell spotted grunter. This concession was withdrawn in March 2000, as there was concern that inshore trawlers were targeting this species.

No stock assessments have been undertaken for any of the species targeted by this fishery, apart from preliminary assessments for langoustines and pink prawns during 1997. These indicated that langoustines were unlikely to be biologically over-exploited at current levels of effort, while further analysis on stock-recruit relationships was required before changes in effort for pink prawns could be recommended (Tomalin 1998).

Since 1997, trawling has been prohibited within 7nm of the KZN coast between Green Point and Cape St Lucia (but effectively on the Tugela Bank) in January and February each year. This permit condition is based on research work done by ORI in the early 1990s, funded by the (then) Sea Fisheries Research Institute. This work showed that catches by the Tugela Bank trawlers were impacting on linefish catches of the squaretail kob (*Argyrosomus thorpei*) (Fennessy 1994c). This species was an important component of commercial linefish catches at the time, and concern had been expressed by line fishermen about the potential effects of inshore trawlers on ski-boat fishing on the north coast of KZN. Juvenile squaretail kob recruit to the Tugela Bank mainly in January and February each year, and trawl catches of this species were reducing potential yield to the line fishery, hence inshore trawling was prohibited during these months.

Although there is very little other direct overlap in species composition between catches by inshore prawn trawlers and linefishing, the question of sustainability of the trawl by-catch organisms is an important issue. Prawn trawling, in South Africa and other first world countries, is destructive and wasteful because the majority of organisms that are caught along with the target species are discarded. The Tugela Bank provides a habitat for a unique community of organisms on the South

African coast, and work by Fennessy (2000) has also shown that the area functions as a nursery for several species of fish. Preliminary work on the other trawl grounds (St Lucia and the offshore grounds) suggests that they, too, harbour communities not found elsewhere in South African waters. Trawling off the St Lucia Estuary mouth is also of concern, as the Greater St Lucia Wetland Park, which includes the St Lucia trawl grounds, has recently been declared a World Heritage Site.

The ecological consequences of trawling in these areas are not well understood, particularly since they have not all been well studied, and also because the time series of catch information is not very long. In an attempt to address the situation, KZN Wildlife convened a liaison body in 1998, consisting of line fishermen, trawler operators, ORI and other affected parties. This body met on several occasions so that the views of the various parties could be explained, and was to some extent successful.

Also in an attempt to resolve user-conflict, ORI conducted an investigation, funded by MCM, into the potential effectiveness of a by-catch reduction device in the inshore trawl fishery during 1999. The device, a square mesh panel, significantly reduced quantities of discarded catch (Fennessy 2000), but the effect on losses of target species (prawns) could not be adequately assessed owing to the timing of the sampling trip. The project proved to be logistically difficult to undertake, owing to a shortage of suitable trawlers to conduct experimental trawling. The square mesh panel holds considerable promise in reducing discarded catches by prawn trawlers, but much more work is required to refine its application.

8.7 Perceptions on Transformation

It has proved difficult to examine transformation in this fishery, as, of the five companies that currently possess permits, four have their headquarters in Cape Town. By definition, transformation implies a change, and in order to measure transformation, a historical baseline is required. This baseline is not known for the shore-based (administrative / managerial) component of any of the KZN prawn trawling companies. The vast majority of prawn trawler crews, from the skippers downwards, are previously disadvantaged individuals (PDIs), but this has always been the case. In the case of Spray Fishing, some effort at including PDI as shareholders has been made, and some company shares are apparently held as an employee trust.

8.8 Issues Relevant to the Granting of Long Term Fishing Rights

Resource issues

- The KwaZulu-Natal prawn fishery is based on a small resource, and the trawl grounds themselves are also small.
- Since the stocks of the target organisms have not been properly assessed, and are unlikely to be regularly assessed in future, there is a need for caution when determining total allowable effort (TAE) levels.
- The limited investigation of the offshore resource to date suggests that it is already fairly heavily

fished, and there is a significant negative correlation between catch rates and fishing effort.

- The offshore species are probably slow-growing, with a slower population turnover and hence will only recover slowly from exploitation.
- Theoretically, the inshore resource of white prawns is more resilient to exploitation than the offshore, deep water species, because of a fast growth rate. The inshore prawn resource may be able to sustain greater fishing effort, although caution is advised in the absence of any stock assessment information. Also, catches of white prawns are strongly linked to precipitation, and if there are several years of low rainfall, catch rates are likely to decline. It is also likely that the Tugela River will be dammed within the next five years, leading to potential losses of habitat and nutrients for the inshore white prawns on the Tugela Bank, with a concomitant decline in catch.
- The highly variable nature of landings, probably caused by variable recruitment, increases the risk to the resource of allocating long term rights, i.e. if long term rights are granted, there is a risk of investment in the fishery (boats, gear, etc.) which may not be warranted given the uncertainty in catches.

<u>Fishery issues</u>

- If Durban-based prawn trawlers are prevented from fishing in Mozambique (as has happened before), there is the potential for increased demand for access to the KZN resource.
- Apart from the user-conflict issues related to the catching of by-catch, inshore trawlers that operate close inshore at night run the risk of running aground. This has happened three times in the last two years, with two vessels being irreparably damaged and with loss of crew's lives.
- Issuing of inshore permits for use on trawlers that are not powerful enough to operate on the offshore grounds has resulted in less powerful trawlers continuing to operate on the inshore grounds when inshore prawn catches are very low. This in turn has led to unnecessarily high by-catch rates. This has also increased pressure on the St Lucia trawl grounds as an alternative to the Tugela Bank grounds that are closed during January and February. It is likely that this is the reason why an application to trawl in the KZN marine protected areas has also been received by MCM – it being uneconomic to have a trawler tied up for two months of the year.
- Closure of the Tugela Bank to trawling during January and February was specifically intended to reduce trawl catches of squaretail kob, and has probably been successful in this, although re-assessment is required.

<u>By-catch and biodiversity issues</u>

- There are high levels of by-catch associated with both the inshore and offshore fisheries, most of which is discarded. The ratio of prawns:by-catch in the inshore fishery can be as high as 1:15, particularly during the early and late part of the season. Since the impacts of prawn trawling on marine biodiversity are not well understood, consideration should be given to restricting inshore trawling to periods when by-catch rates are not as high.

- Careful consideration must be given to permitting trawling off the St Lucia Estuary mouth. Although current knowledge is limited, the fauna of this area are very different from the Tugela Bank, and the trawl grounds fall within the Greater St Lucia Wetland Park world heritage site. The proposed southward extension of the St Lucia Marine Reserve would also include the St Lucia trawl grounds.

Economic issues

- In terms of direct employment, one KZN trawl permit represents 15 jobs for sea-going trawler crew. Calculation of the number of shore-based jobs associated with each permit is more difficult, as it depends on whether the company holds more than one permit, and whether it is involved in processing, marketing, distribution, etc.
- In theory, additional permits will mean more catch, fewer permits mean lower catch, with greater or lesser taxable revenue respectively. Changes in the availability of crustaceans to the local market will also potentially have knock-on effects in the retail and catering sectors. However, KZN trawlers cannot satisfy local demand as it is. For example, a recent survey showed that, of the crab marketed in KZN, less than 40% was trawled in KZN waters, with the rest being imported. Crustaceans therefore have to be obtained from other sources, including Mozambique and Australia. Mariculture of white prawns is becoming increasingly important in this regard, with harvests of locally farmed prawns approaching half the wild catch in recent years.
- The fishery may be only marginally economically viable, hence over-allocation of effort may reduce catch per vessel and therefore revenue. This is the opinion of one of the companies that has been operating in KZN for several years. The economic information supplied by the permit-holding companies seems to support this assertion, with net annual profit before tax in the region of R250 000 for a typical vessel worth R5 000 000, and with fixed and operational costs of R5 000 000 per year.

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9. THE SOUTH COAST ROCK LOBSTER FISHERY

9.1 Distribution of the Fishery

South Coast rock lobster (*Palinurus gilchristi*) is endemic to the southern coast of South Africa, where it occurs on rocky substrata at depths of 50-200m. Commercial fishing occurs on the continental shelf between East London and Cape Agulhas, and up to 250km offshore along the outer edge of the Agulhas Bank. The species is important to both the eastern and western Cape commercial fishing sectors, but its deep-water nature excludes a recreational sector.

9.2 History of Exploitation

The fishery commenced in 1974 when numerous local and foreign fishing vessels converged on the fishing grounds. Foreign fishing vessels had to withdraw from the fishery in 1976, when south coast rock lobster was recognised as a species occurring wholly within South African waters. From 1977 onwards, the sector operated solely as a local commercial fishery.

Many local fishing boats withdrew from the fishery when catches and catch rates collapsed between 1979 and 1981. A reduction of effort and catches during the early 1980s allowed the resource to recover, and an annual total allowable catch (TAC) was introduced in 1984. The TAC and limited entry stabilised the sector at 450 – 477 t tail mass (approximately 1 050 t whole lobster) until the 1993-1994 season. The historical trends of numbers of active fishing vessels, TACs and catches are given in Table 9.1.

Table 9.1. Historical records of TAC, numbers of active vessels, catches, effort and CPUE.

SEASON (4)	TAC Tail mass (tons)	NUMBER OF ACTIVE BOATS	RECORDED CATCHES (3)		EFFORT (2)	CPUE (1)
			Tail mass (tons)	Whole mass (tons)	Thousands of trap-hauls	kg tails / trap
1974		12	372	800		0.78
1975		19	973	2092		0.41
Jan-Jun76		36	551	1185		0.35
76/77		33	712	1531		0.25
77/78		26	667	1434	3461	0.21
78/79		20	461	991	2212	0.2
79/80		18	122	262	644	0.17
80/81		15	176	378	696	0.24
81/82		18	348	748	1529	0.21
82/83		16	407	875	2078	0.19
83/84		17	524	1127	2687	0.19
84/85	450	17	450	968	1090*	0.15
85/86	450	14	450	968	1043*	0.15
86/87	450	15	450	968	690*	0.19
87/88	450	14	450	968	634*	0.21
88/89	452	13	452	972	933*	0.19
89/90	452	14	452	972	817*	0.21
90/91	477	13	477	1026	1084*	0.17
91/92	477	15	477	1026	2889	0.16
92/93	477	12	477	1026	2844	0.17
93/94	477	15	477	1026	3167	0.16
94/95	452	13	452	972	3442	0.13
95/96	427	14	427	918	3217	0.13
96/97	415	12	415	892	3624	0.11
97/98	402	13	402	864	4036	0.09
98/99	402	13	402	864	4206	0.08
99/00	377	14	377			0.07
00/01	365	13	365			

* Effort between 1984/85 and 1990/91 does not represent the full effort of the fishery.
(1) CPUE has been standardised by a GLM.
(2) Effort is given as the total trap-hauls, irrespective of soaktimes.
(3) Catches made after 1984/85 are assumed to be equal to the TAC.
(4) A split-season which opens on 1 October (November in some years) and continues until 30 September (30 June or 31 August in some years) was introduced for administrative purposes in 1976.

9.3 Resource Assessments and Recent Trends

Resource assessments introduced in 1993-1994 indicated a continuous decline in biomass since the 1989-1990 fishing season. In response, a programme of annual TAC reductions was initiated in 1994-1995. In spite of the steady reduction in the TAC (from 477 t in 1994-1995 to 365 t in 2000-2001), the most recent CPUE-index (2001) shows that the abundance of this resource has declined by 65% over the past 12 years (Table 9.1).

Despite the declining TAC, and probably as a response to declining catch rates, fishing effort has sharply increased in recent years (Table 9.1). The fishery is currently over-capitalised, with too many operational boats, and with individual boats now employing more gear than previously.

9.4 Infrastructure: Distribution of the Fishing Fleet

Fishing for south coast rock lobster requires large steel-hulled ocean-going fishing boats (30 – 60m length) specifically rigged for longline trap-fishing. Thirteen boats were active during the 2000-2001 fishing season. Of these, only one (MFV Palinurus) was also used in other line fisheries – the other 12 fished only for rock lobster. Each boat operates with 2 000 – 6 000 barrel-shaped plastic traps, which are tied to longlines in sets of 100 – 200 traps, with a line of traps being 2 - 3nm long. To operate this longline trapping system, south coast lobster boats typically require a large holding pen (often aft, behind the superstructure) in which traps can be stacked, a powerfull line-hauler with which to haul lines and retrieve traps, and one or two chutes (port or starboard) to set gear. Boats are furthermore equipped with modern navigational equipment and with an onboard processing factory, packing and freezing facilities or specially designed live fish holding facilities.

Table 9.2 summarises the details of the fleet:

a) Vessels are all categorised as south coast rock lobster fishing boats, with steel hulls, inboard engines and power units with similar outputs, and all the vessels are registered in South Africa;

b) Vessel lengths range from 32.2 - 60.5m, and GRT range from 183.8 – 1 036 tons. An average vessel is 50m long, with a GRT of 500 tons;

c) The fleet is ageing, with most vessels having been built prior to 1970 (i.e. many vessels are older than 30 years);

d) The market value (insured value) of the vessels range from R4.5 million – R10 million;

e) Vessels each carry a crew complement of 28 - 35 sailors;

f) Vessels all have large (> 20 000kg) storage, and freezing or other cooling facilities;

g) Four vessels (Southern Raider, Southern Patriot, Baratz and Romano Paulo) are fitted with live lobster tanks;

h) The four live rock lobster boats remain at sea for 2 – 16 days at a time (depending on the proximity of the fishing grounds to the harbour) whereas the nine freezer boats remain at sea for 28 – 40 days at a time; and

i) Boats are at sea for 180 – 300 days per year.

Table 9.2. South coast rock lobster fishery: Summary of data of vessels active in 2000-2001.

VESSEL NAME	VESSEL REG.	AREA NO	FLAG	CONST-RUCTED	ACQUI-RED	LENGTH	CALL SIGN	GRT	MAX CREW	MARKET VALUE
Southern Raider	350702	CTA 139	RSA	1956	#	56	ZR 4291	458,03	31	R 5,000,000
Southern Patriot	350629	CTA 130	RSA	1962	#	46.1	ZR 4145	519,59	28	R 5,000,000
Southern Saint	350669	CTA 129	RSA	1958	#	50.2	ZR 3983	550,32	31	R 5,000,000
Southern Victor	19736	CTA 73	RSA	1978	#	60.5	ZR 3938	1 036	35	R 5,000,000
Rigel 4	10004	PEA 305	RSA	1980	2000	43.1	ZR 3688	538,39	32	R 10,000,000
Baratz	350848	PEA 272	RSA	1974	2000	32.2	ZR 2673	183,78	29	R 4,500,000
Romano Paulo	350683	PEA 273	RSA	1964	2000	46.2	ZR 4529	455,59	30	R 6,000,000
Helena Marie	18909	PEA 91	RSA	1969	2000	50.25	ZR 4961	489,63	32	R 7,000,000
Palinurus			RSA							
Arctic Fox		CTA705	RSA			49.1				
Cape Flower		CTA162	RSA			47.1				
Eagle Star		CTA83	RSA			50				
Portia 1		CTA164	RSA			40.6				

9.5 Infrastructure: A Break-down of Land-based Facilities

The four live lobster boats deliver to two refrigerated live lobster tank facilities, in Cape Town and Port Elizabeth harbours. Most other processing occurs at sea, and includes tailing and rough-packing of lobster tails or whole frozen lobsters. The shore-based infrastructure is therefore limited to docking and administration facilities, and limited processing (repacking) factories in Cape Town, Port Elizabeth and Hout Bay harbours. Besides repacking, little value is added at the onshore processing facilities. It is important to note that factories often process for a variety of fishing companies, and are also geared to process several products or species. Factories are all situated on owned or leased land and are HACCP certified.

9.6 Employment

The longline trap-fishing method is labour-intensive and each boat has a complement of ~ 30 officers and crew. The total sea-going complement of the fleet is therefore about 400 individuals, nearly all previously disadvantaged individuals (PDIs) – see Key Indicators for the 8 vessels captured on the database. In addition to the sea-going compliment of the fishery, the sector employs ~ 100 land-based factory (processing) and administrative personnel, mostly PDIs.

9.7 Rights Holders

There were 19 rights holders in the south coast rock lobster fishery in 2000-2001. These consist of established companies (of which some have transformed) with larger rights, and of smaller rights holders, most of which are recent entrants (mostly PDIs) or workers' trusts belonging to established companies. The rights holders and their respective quota allocations (in kg) for each of the last three fishing seasons are given in Table 9.3. As there are more rights holders than vessels in the fishery, some vessels (or catching companies) catch for more than one rights holder, based on joint venture agreements or on the basis of vessel hire. Table 9.3 therefore includes details on the catching companies, and on the distribution of rights among these companies and fishing vessels.

Table 9.3. Rights holders in the south coast rock lobster fishery.

CATCHING Co.	QUOTA HOLDER	ALLOCATIONS			VESSELS
		1998/99	1999/2000	2000/2001	
Premier Fishing	Atlantic Fishing Enterprises	145996	129853	127381	Southern Saint
					Southern Raider
					Southern Patriot
					Southern Victor
Lusitania Group	Lusitania Fishing Company	28101	28994	28442	Helena Marie
	Baratz Fishing	15827	14077	13809	Romano Paulo
	Seafarer Distributors	9044	8044	7892	Baratz
	C&S Underwater Products	8721	7757	7609	Palinurus
Hout Bay Fishing	Hout Bay Fishing Industries	60104	41247	40462	Eagle Star
	Amandla Abasabensi Fishing		9000	8829	Portia
	Tradequick 62		5471	5367	Arctic Fox
	Fullimput	20000	15529	15233	Mare Serenitatis
					Cape Flower
Ruwekus Fishing	Imbumba		11000	10271	Rigel 4
	Bluefin Fishing Enterprises	20000	15000	14005	
	Cisco Fishing		13628	12724	
	Arniston		8000	7469	
Others	SA Sea Products	20000	15000	14714	
	PJ Oliphant		11000	10271	
	Eastern Marine Enterprises	19207	14400	13445	
	Risar Fishing		11000	10271	
	Phambili Fisheries		10000	9337	
	AFD Fishing	15000	8000	7469	
	Phakamisa Fishing	20000			
TAC		382000	377000	365000	

9.8 Investment

The fishery is capital-intensive, and the costs of a vessel is ca. R5 million. Operational costs are several million rands per boat per year. Investment categories in the sector are demonstrated either as shareholding or ownership of boats, or of land-based factory facilities with packing, cold-storage (including live lobster) and shipping capabilities.

9.9 Transformation

Ensuring the transformation of the south coast rock lobster sector, either through the promotion of internal company restructuring (management, shareholding etc.), equitable redistribution of fishing rights, or a combination of the above, remains a high government priority. To date transformation in this sector has followed both these avenues, with varying degrees of success.

Redistribution of fishing rights have thus far been problematic, with new entrants being entirely reliant on the established companies for the activation (catching processing and marketing) of their new rights. Often these new entrants degenerated into paper-quota holders, who do not invest in the sector, but merely “sell” their rights back to established companies.

Two related problems facing the redistribution of fishing rights in this sector are (1) its capital intensive nature (i.e. large expensive fishing vessels), which requires a relatively large right (roughly 30 000kg tail mass) to stand alone as an economically viable entity, and (2) the decline (in biomass) of the resource, which makes it difficult to accommodate the granting of new fishing rights as large as 30 000kg per applicant. However, some success was achieved in the 1999-2000 season, when a number of small “new” entrants (Arniston, Bluefin, Cisko and Imbumba) combined their quotas (a total of ca. 45 000kg) and invested in a fishing vessel (Rigel 4), which was admitted to the fishery. The high level of fishing effort at present discourages the addition of further vessels to the fishery, except when another vessel is replaced.

Recognising the inherent transformational difficulties faced by this sector (its capital-intensive nature; infrastructural, marketing and distributional domination by established companies; resource decline), transformation and black economic empowerment in this fishery may be best achieved through company restructuring (management, share-holding etc.).

Further detailed information on transformation is given in 9.14, Key Indicators.

9.10 Markets

Products (frozen lobster tails, whole frozen lobster, live lobster) are exported to the United States, Europe and the Far East. Sales are affected by seasonal overseas market trends and competition from other lobster producing countries. High prices on international markets and a declining Rand–Dollar exchange rate makes this sector lucrative. Prices for commodities fluctuate but examples of current sales prices are R250 – R350 per kg tail mass in the USA.

9.11 Current Management Strategy and Compliance Methods

Fishing occurs year-round (1 October to 30 September) and is managed by a combination of a TAC and TAE (total applied effort) strategy. The TAC is based on an annual resource assessment, and is allocated to the rights holders in the local commercial sector only. The TAE is measured in sea days (numbers of days spent at sea) that are allocated to each vessel (or group of vessels) based on the quantity (tonnage) allocated to it, and its fishing capacity. The fishing capacity of each vessel is based on the power of its winch, the number of chutes used to set gear, and its preferred fishing strategy (summer or winter fishing). The number of days spent at sea by each vessel is monitored using VMS (vessel monitoring system) connected to an operations room at MCM, catch control statistics provided by skippers and port control records of port exit and entry. A vessel can fish until its sea days expire or its quota is filled, whichever occurs first. In the Sector Plan it is envisaged that south coast rock lobster fishing vessels will not, in future, be allowed to have licenses to operate in any other fishery in South African waters. Catches may only be off-loaded in the presence of Marine Control Officers, and are weighed at designated off-loading points. Skippers must, at the conclusion of each trip, provide Marine and Coastal Management (MCM) with accurate daily catch rate statistics. Exporters must apply for export permits, which MCM will approve for legally-caught south coast rock lobster.

9.12 Fees and Levies

Fees for fishing permits, processing facilities and export permits are normally R100 for processing, about R700 for fishing license renewals, and R700 for permit (catching right) renewals. In addition, a training levy is paid (SETA / MITB) which varies for fishery, boat size and crew.

In 2000 levies were R454 per ton of whole south coast rock lobster landed, and R979 per ton of tail mass landed. The levies owed for lobster landed during one month must be paid before the end of the following month.

9.13 Challenges

The three main challenges in this sector are:

(1) to reverse the downward trend in biomass and reduce fishing effort.
(2) to greatly improve compliance, and thereby eliminate substantial over-catching.
(3) to continue the transformation of the fishery without creating marginal quotas or paper quota-holders, and without eroding the capacity of sector to function properly.

9.14 Key Indicators

The following indicators are summarised from the Economic and Sectoral Study Database. The database covers a sample size of approximately 65% of the fishery (Table 9.4). Most of the missing information pertains to one company, which did not take part in the ESS survey.

Table 9.4. Summary of the ESS database coverage of the south coast rock lobster fishery.

	TOTAL FOR FISHERY (2000)	RECORDED IN ESS	% COVERAGE
Rights holders	19	11	58%
Quota (tons)	377	260.2	69%
Vessels	13	8	62%

<u>Ownership</u>

Rights ownership was calculated as the number of PDI shareholders in a company multiplied by the amount of quota held by the company. Vessel ownership was calculated by multiplying the number of vessels owned by a company by its percentage of PDI shareholders. According to the information supplied by the fishing companies to the ESS, PDI shareholders own approximately 69% of the rights and 78% of the fishing fleet (Fig. 9.1 and 9.2).

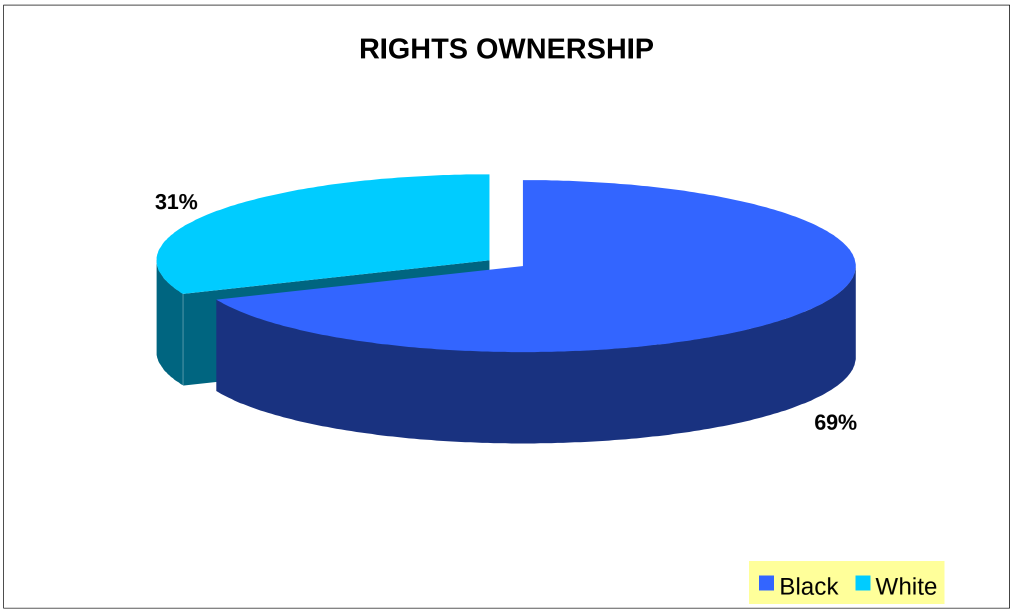


Figure 9.1. Percentage ownership of the right to fish for south coast rock lobster in 2000.

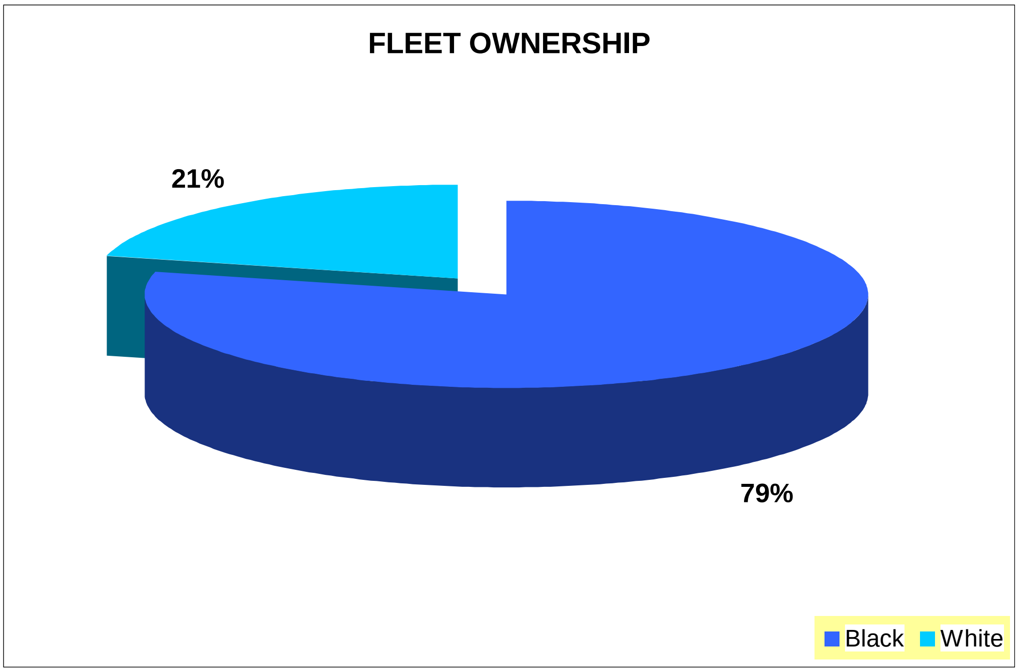


Figure 9.2. Percentage ownership of the south coast rock lobster fishing fleet in 2000.

<u>Employment</u>

The following labour summary for the south coast rock lobster fishery is based on vessel-based employment and shore-based (processing) employment. Approximately 94% of the work force is made up of PDI, earning 86% of the total income (Fig. 9.3 and 9.4). PDI employment representation and income for the major skills categories are shown in Figures 9.5 and 9.6.

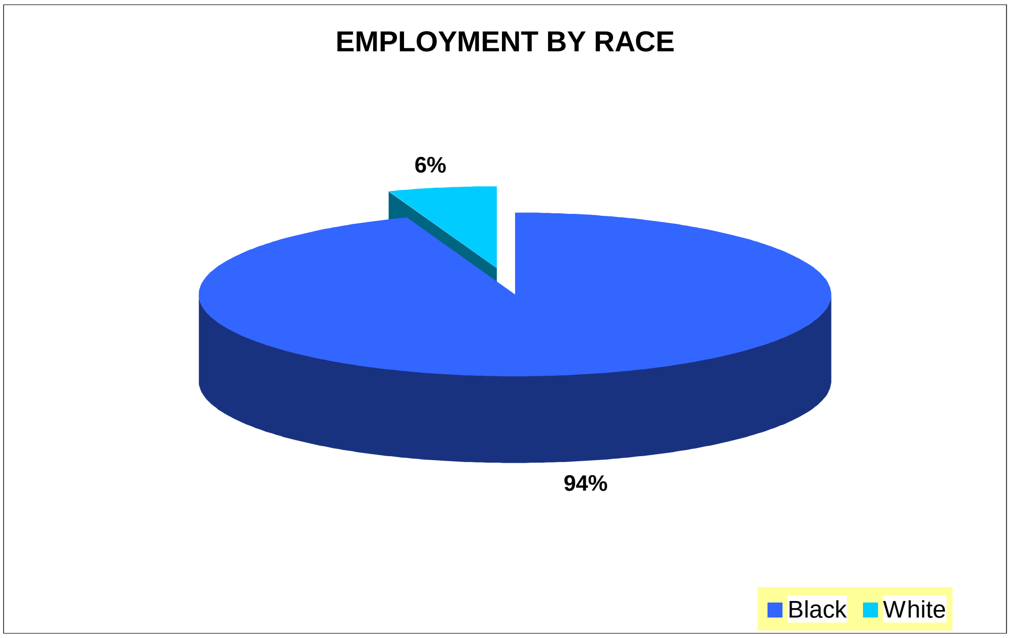


Figure 9.3. The percentage of Previously Disadvantaged Individuals employed in the south coast rock lobster fishery.

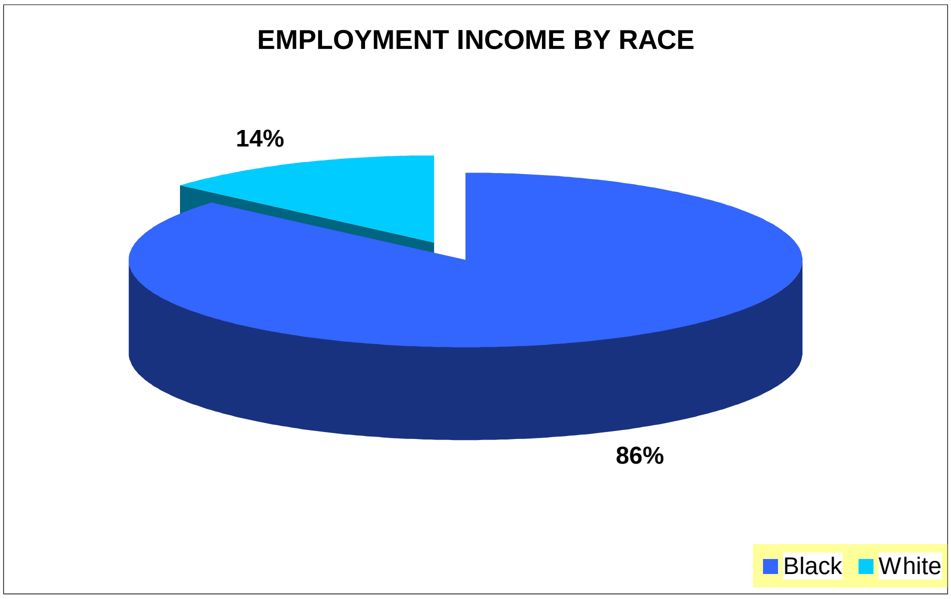


Figure 9.4. The percentage income earned by the PDI employees in the south coast rock lobster fishery.

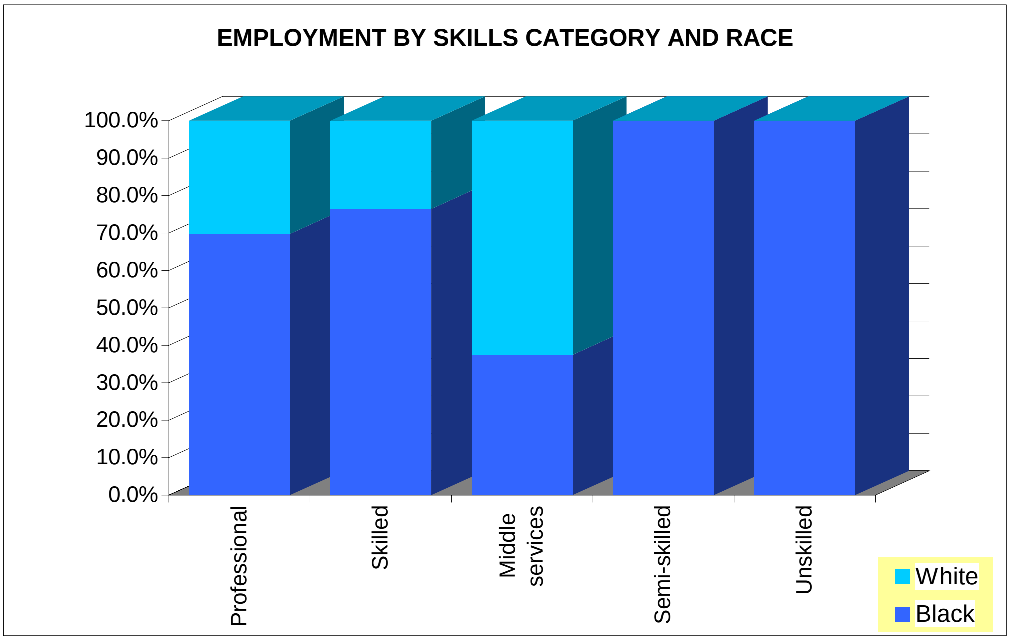


Figure 9.5. The percentage PDI employment in the south coast rock lobster fishery, by skills category.

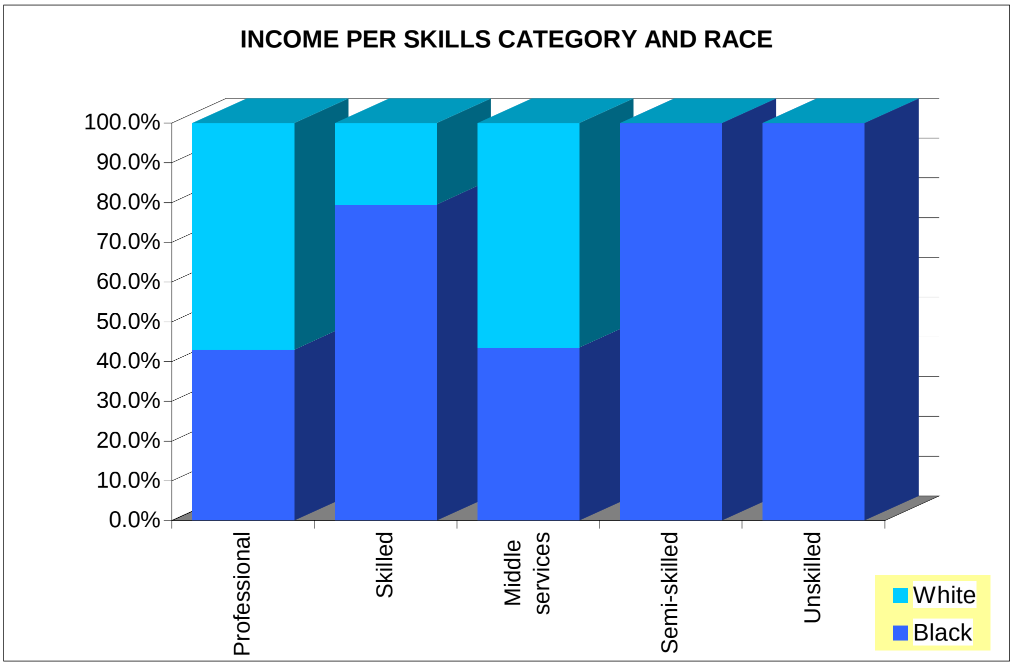


Figure 9.6. The percentage PDI income earned in the south coast rock lobster fishery, by skills category.

The average annual income for the different skills categories is represented in Figure 9.7. The discrepancy between the average Black (PDI) and White professionals' income is most likely an artifact of small sample size. For example, only one PDI and four White individuals were recorded in the "professional" category. Most (75%) of the workforce consisted of Black, semi-skilled employees (Fig. 9.8).

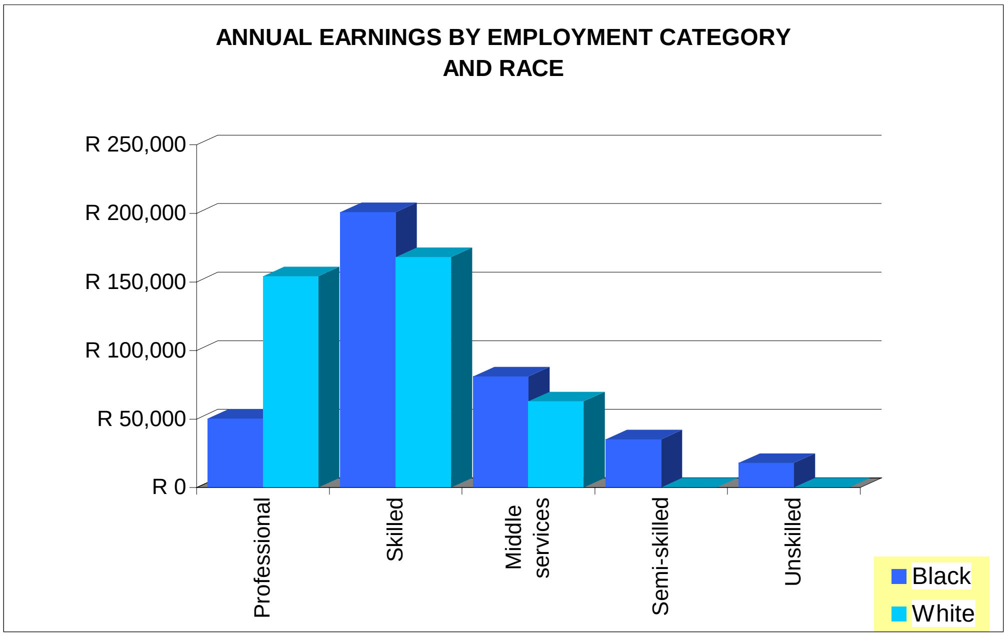


Figure 9.7. Average annual income per skills category for employees in the south coast rock lobster fishery.

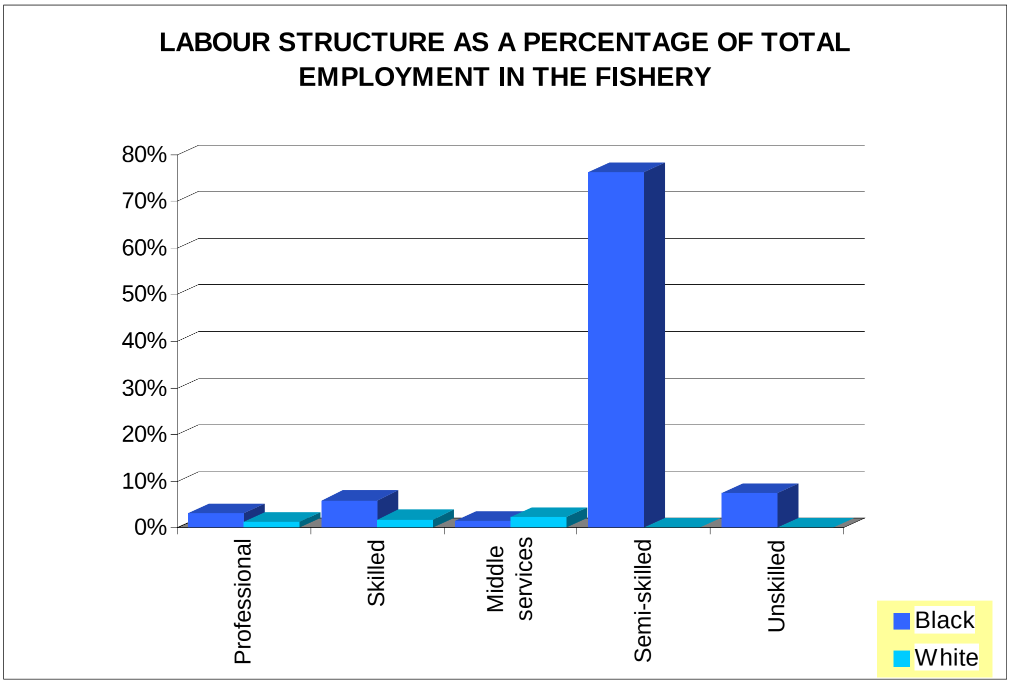


Figure 9.8. The number of employees in each of the skills categories, as a percentage of the total employment in the south coast rock lobster fishery.

10. THE SHARK LONGLINE FISHERY

10.1 Origin and Development of the Shark Longline Fishery

South Africa has a coastline of almost 3 000km extending from the mouth of the Orange River on the southern African west coast to Ponta do Ouro on the Mozambique border on the east African coast. The 200nm fishing zone (EEZ), declared in 1977, covers an area of approximately 1155 000km^2. Chondrichthyans are caught around the whole southern African coast, although distributions of both target and by-catch species may extend beyond the limits of known commercially exploited grounds. Target fisheries for sharks are, however, limited to commercial grounds and include three major bottom-trawling areas. These are the west coast extending from Cape Agulhas (20^{o}E) north and west to approximately 30^{o}S, the south/east coast, including the Agulhas Bank extending east from Cape Agulhas to approximately 27^{o}E, and the Natal coast extending north along the east coast from approximately 29^{o}S. These areas therefore encompass three major commercial fisheries that have significant shark by-catches i.e. the deep-sea trawl hake-directed fishery, the inshore sole/hake-directed fishery and the Natal crustacean fishery. Shark catches differ significantly between these areas and fisheries as a result of different bathymetric and oceanographic characteristics. The shark fauna on the east coast of South Africa, for example, is subtropical in character and is influenced by the warm Mozambique Current. The fauna on the west coast is more temperate and is influenced by the Benguela Current system with its pulsed seasonal upwelling regime.

Historically, interest in fishing for shark in South African waters has been present since the arrival of the early settlers, but only after the beginning of this century has commercial exploitation been recorded. Fishing for sharks and the potential for greater exploitation was first reported in 1934. Directed shark fishing started in the early 1930s off Durban in Natal (using gill nets). These early catches are poorly documented although an annual production of 136 t in 1931 and over 1 000 t by 1940 was reported. The second World War, however, gave rise to demand for vitamin A as a health supplement for soldiers and led directly to an increase in shark targeting as the regular supply of cod liver oil from the Northern Hemisphere was severely disrupted by the war. A directed shark fishery was initiated in 1941, exploiting primarily soupfin shark (*G. galeus*). Data on catches are, however, sparse for the 1939-1945 period and the earliest documentation on shark catches is reported in 1969 from total annual production estimates of shark liver oil.

With respect to the economic assessment of the shark longline fishery, it is vital that reasonable perspective be retained with regard to the shark sector as a whole. Sharks are caught as a by-catch in nearly all fishing sectors of South Africa's commercial and recreational fisheries, the only exception being the directed shark-longline sector which includes only 23 rights holders operators of which some target shark regularly and others irregularly.

All known forms of exploitation of sharks in South African waters are presented in Table 10.1, including target fisheries for shark, shark by-catch in other target fisheries, incidental shark catches (protective nets) or, more recently, as tourist attractions (cage diving).

Table 10.1. Activities impacting sharks in South African waters.

ACTIVITY	AREA	NATURE
Offshore Trawl	West Coast, Agulhas Bank to shelf edge (600m depth)	By-catch only
Prawn Trawl	Natal East Coast to 600m	By-catch only
Inshore Trawl	South and East Coast to 200m	By-catch only
Hake Longline	West and South Coast to 500m	By-catch only
Shark Longline	West and South Coast	Target
Domestic Tuna Longline	Offshore to EEZ	By-catch
Foreign Tuna Longline	Offshore to beyond EEZ	Target/by-catch
Recreational Line	Inshore to 200m	By-catch
Commercial Handline	Inshore to 200m	By-catch/target
Gill Net	West Coast	Target
Beach Seine	West and South Coast	Target/by-catch
Protective nets	East Coasts	Incidental
Cage diving/Tourism	South Coast	Cage diving

10.2 Summary of Fishing Sectors in which Shark are Caught

The fisheries in which shark are taken (either as a by-catch or directed) are as follows:

a) Longline fisheries: Several longline-directed fisheries exist (Table 10.1). These include the bottom hake-directed longline fishery, the pelagic longline (local fleet) shark-directed fishery and the tuna-directed (foreign and local fleets) pelagic longline industry. These fisheries, with respect to the proportions exploited, have the highest level of shark targeting. Target shark species, aimed primarily for overseas markets, are the soupfin *(Galeorhinus galeus)*, the houndsharks *(Mustelus* spp.), the blue shark (*Prionace glauca*), cowsharks (*Notorhynchus cepedianus*) and the mako (*Isurus oxyrhincus*).

In the domestic pelagic (tuna-directed) longline fishery it has been possible to identify the target species (reference to targeting is somewhat ambiguous as tuna are the primary species, but shark are also targeted and are highly valued).

Foreign pelagic tuna-directed catches have been more difficult to assess than the domestic fleet, however, as large-scale under-reporting is known to occur. The foreign vessels (mostly Japanese and Republic of China vessels) catch species of a more oceanic nature such as the mako, blue, silky (*Carcharinus falciformes*), oceanic white tip (*C. longimanus*), threshers (*Alopias vulpinus*) and porbeagle sharks (*Lamna nasus*), i.e. the inshore species such as the houndsharks and soupfin are excluded. Discard ratios are estimated to be high if compared to known catch rates in other areas of the world. A more recent fishery in which small quantities of shark are also known to be caught is the longline fishery in Antarctic waters for patagonian toothfish (*Dissosotichus* *eleginoides*). However, no details of the shark by-catch in this fishery are available but are reported to include mostly chimaeras, greenland sharks, porbeagles and some skate species.

b) Trawl Fisheries: Potentially the greatest impact on condrichthyans in South African waters is from the bottom-trawl hake directed fisheries. The offshore and inshore fisheries combined, target hake (TAC 151 000 t), sole (TAC 872 t) and horse mackerel (Upper Catch Limit of 55 000 t). Annual demersal landings, including all shark and other by-catch, in the South African trawl fisheries varies from year to year and in 1995 approximated 180 000 t. Shark export prices have increased sharply in recent years, making shark products more attractive. Species processed on trawlers include the biscuit skate (*Raja straeleni*), the soupfin and the St Joseph (*Callorhinchus capensis*). The most common trawl-caught shark on the Agulhas Bank is the dogshark *(Squalus megalops*), which has been estimated to have relatively high biomass. Landings of this species have increased, but they are generally considered too small for processing and marketing. Clearly the trawl catch of shark landed is a small proportion of the actual total chondrichthyan catch in trawls, with many species discarded. Prawn-directed trawls differ somewhat in their species composition to the larger industrial bottom-trawl fisheries. It is reported that small rays dominate the elasmobranch by-catch in the Natal prawn fishery. Generally, however, the annual shark catch in Natal waters (all fisheries) is insignificant compared to the larger hake-directed trawl fisheries, with the dominant species landed being grey sharks, of which the most common is *Carcharhinus obscurus* (dusky shark).

c) Gill and Beach-Seine Net fisheries have operated traditionally on the South African west coast since 1652 and a directed gill-net fishery for St Joseph (*C. capensis*) was initiated in 1980. Other elasmobranchs caught in gill nets includes soupfin and houndsharks and also, depending on location, sandsharks (*Rhinobatus annulatus*). Beach Seine Net fisheries target mostly bony fish species, although significant quantities of elasmobranchs are frequently caught, comprising on average 70% skates and rays including sandshark, bull rays (*Myliobatis aquila),* and blue rays *(Dasyatus chrysonata).* These are usually not retained.

d) Recreational Line fisheries occur around the entire South African coast and include shore anglers (rod and line), ski-boats (rod and line), estuarine fishermen (light tackle, rod and line) and spearfishermen. Recreational fishermen do generally not desire sharks although they are targeted extensively in competitions. In Natal, the sharks most commonly targeted by recreational fishermen include dusky sharks (and the closely related bronze whaler *C. brachyurus)*, sandsharks, milksharks (*Rhizoprionodon acutus*) and skates (Dasyatidae). Houndsharks (*Mustelus* spp.) are also often caught in large numbers in estuaries.

e) Commercial Line fisheries have historically targeted shark and is the oldest fishery to have specifically fished for shark in South Africa. Due to highly variable markets, shark catches have fluctuated dramatically in the past, although since 1991, there has been a steady increase in catches. Species preferred include the soupfin and houndsharks, but also the dusky sharks (*C. obscurus*), copper sharks or bronze whaler, spotted gully sharks (*Triakus megalopterus*), threshers, cowsharks (Hexanchidae), dogfish (*Squalus* spp.), catsharks (*Poroderma* spp.) and skates (Dasyatidae). With the exception of the soupfin, hound and bronze whalers, most others are discarded.

10.3 Recent Catch, Effort and Fleet Characteristics for the Line and Longline fisheries Directed at Shark

The shark line component of the total shark landings makes up the second largest (to trawl) exploitation of sharks in South African waters. In the past specific shark-directed longline rights have been allocated.

Between 1991-1994, 31 permits were issued annually, and in 1995 this amount was increased to 35 (reduced to 23 in 2000).

No effort or quota control is enforced, although permits are limited to smaller tuna-type vessels with the intention of augmenting the out-of-season activities of these vessels. Generally, vessels are < 30m in length and deploy bottom longlines with up to 3 000 hooks per set in water depths from 50-450m. South African shark permit holders target predominantly large pelagic shark species, including the mako, blue shark and soupfin. Vessels operate mostly from Cape Town, although activity is directed seasonally on the South Coast (Mossel Bay landings). A recent development is an attempt to reduce the number of foreign tuna longline permits holders and to increase the permits issued to local fishermen. In 1998 thirty tuna (experimental) permits were issued for local tuna directed longlining. Although sharks are still caught, these (tuna) permits are still highly contentious since most effort is been directed at the lucrative swordfish market.

<u>The directed shark longline fleet</u> can be broken down into two distinct categories:

I) Operators targeting bottom-dwelling shark using bottom-set gear mostly in the inshore environment (shallower than 100m). Target species are the soupfin and houndsharks for which there is a lucrative Australian market.

II) Operators targeting pelagic sharks using pelagic drifting gear (offshore) – target species are the moro (mako) and blue sharks (by-catch of other species such as tuna and swordfish can be high in this sector).

10.4 Gear Types

This has a significant bearing on the economics of the sector, as the capital outlay is high. Most shark operators have switched from the traditional “Japanese” single line multi-stranded lines to the nylon monofilament Lindgren Pitman spool system. This is a very expensive system to install, but is definitive of a serious shark operator. Pitman systems cost about R500 000 to install, including the line, hooks and spool. Further, other shark-directed gear includes changes to electronic equipment with computers for tracking weather and sea fronts (warm-water eddies) to identify suitable water. These units cost about R30-40 000 each and include monthly service fees for the supply of the data.

Bottom-set shark longlines are less expensive and use mostly single lines similar to hake longlines. The type of shark gear deployed has a significant effect on catch rates and therefore gear type and performance can make the difference between a viable and non-viable operator.

10.5 Vessel Types

No “shark only” vessels operate in South African waters. All rights holders carry more than one permit on their vessel and use shark fishing to augment their year round operations. Shark fishing therefore forms an integral component of the viability of some (but not all) of the operators. Shark operators are typically existing “tuna” fishers – most carry tuna pole permits. The vessels deployed in the fishery range from 12 – 23m and are predominantly of wooden construction. A few boats have freezer capability giving them the ability to stay at sea for longer periods. Replacement costs also vary, with those vessels with freezers and monofilament line-haulers valued higher than others (mostly > R2 million).

10.6 Economics and Markets

<u>Historical Markets</u>

Generally shark fishing has never enjoyed a high profile, competing in South Africa with an abundance of other marine resources, particularly the large commercial trawl operations focusing on the whitefish market (local and export). More recently (last ten years) shark exports from South Africa have begun to increase again. This may be attributed to several factors, including:

a) Relaxation of the mercury concerns with more effective quality control and testing;
b) Political change making exporting of local products to countries such as Australia acceptable;
c) Favourable exchange rates for exporting; and
d) Increased demand for shark meat overseas.

Presently most of the shark processing is done in and around Cape Town, in areas where most of the fish are landed. Estimated landings, landed value and wholesale value for 1994 and 1995 by species and fishery is given in Table 10.2 (compiled by the economics unit of MCM).

Table 10.2. Commercial catches of shark (1994-1995) in South African waters – Landings and Values (De Swardt 1997)

FISHERY	NOMINAL CATCH (T) 1994 & 1995	SPECIES	LANDED VALUE (R/TON) 1994 &1995	TOTAL VALUE (WHOLESALE)
Offshore Trawl	37 & 33	St Joseph & Shark	R430 & R460	R13 000 & R13 000
Inshore Trawl	1 121 & 934	Skate	R800 & R860	R224 000 & R201 000
Inshore Trawl	116 & 84	Shark	R430 & R460	R21 000 & R16 000
Inshore Trawl	234 & 227	St Joseph	R430 & R460	R101 000 & R104 000
Line & Longline	498 & 298	Shark	R2 200 & R2 500	R1 098 00 & R745 000
Nets (Gill & Seine)	32 & 139	St Joseph	R600 & R1000	R43 000 & R200 000
Nets (Gill & Seine)	6 & 9	Shark	R1 500 & R2 000	R9 000 & R19 000
Total	2 044 & 1724	All	-	R1 509 000 & R1 298 000

Generally the big commercial trawl operations do not process large quantities of shark. Most of the sharks are processed by small factories that have developed specific overseas markets and joint venture arrangements. Many of these factories are located near to the landing points, such as St Helena Bay (near the gill-net fisheries), Cape Town (access to many of the handline and longline fishers) and Gansbaai (small localised line and net fishers). The exact sizes of the markets are difficult to judge. Locally small amounts are sold throughout the country in the form of frozen fish, dried fish or smoked. Most of the *inshore* trawled shark is also sold locally, including skate wings (Ocean Fillets) and St Joseph (Silver Flake). The main market however is for export product.

More recently (2001), however, interest in shark has increased dramatically. Currently some of the larger trawl-based processing groups are buying large quantities of shark from any available source, including line boats.

10.7 Export Markets

Frozen shark meat (trunks mostly) and dried fins are exported abroad. The main buyers of frozen shark are Australia, Greece and Italy where a healthy demand for shark meat has persisted. Other smaller markets exist, for example one South African processor purchases St Joseph from the net fishers at R2-R3 per kg and exports fillets to the Democratic Republic of Congo at R10-15 per kg. Other shark species exported include fillets of the soupfin and houndsharks. Belly flaps are removed and the fish are filleted. Import and export masses and estimated Rand (local) and $US values are given in Table 10.3.

Table 10.3. Import and export volumes of shark in South Africa by country for the two major shark commodities (frozen shark and shark fin) for 1995 (after Stuttaford 1997).

	IMPORTS			EXPORTS		
	Mass (mt)	Rand value	$US Value	Mass (mt)	Rand value	$US Value
Product: Frozen						
Australia				16.56	181927.00	40428.22
Belgium				4.44	35106.00	7801.33
Germany				7.46	20808.00	4624.00
Greece				65.18	279473.00	62105.11
Hong Kong				5.00	5357.00	1190.44
Italy				57.24	416797.00	92621.56
Japan	0.95	1428.00	317.33			
Netherlands				12.36	61775.00	13727.78
Taiwan				21.35	32027.00	7117.11
Product: Shark Fins						
Hong Kong				14.60	1657866.00	568930.14
Japan	26.07	172838.00	38408.44	3.30	403235.00	89607.78
Singapore				0.07	15494.00	3443.11
Taiwan	10.09	74090.00	16464.44			

Because of the mercury content, fish over 7kg are not exported, as stringent tests for mercury in Australia are likely to reject fillets from the larger fish. Product is exported at between R10-30/kg. Larger fish (> 7kg) are exported (to Italy and Greece), but not before quality control tests are done in South Africa. Another smaller company based in Cape Town exports almost entirely to Australia. Preferred species are the soupfin (R10-20/kg landed price) and the houndsharks. This same company exports larger shark as well, including the carcharhinids, mako, blue and cow sharks.

10.8 Revenue, Profitability and the Workforce

Economic evaluations of shark fisheries in South Africa have generally not been given a high priority. Annual economic reviews of the different fisheries sectors conducted by MCM have not in the past considered shark catches independently. Import and export masses with local and $US estimated values from 1990 to 1995 are shown in Table 10.4 below (after Stuttaford 1993-1997).

Table 10.4. Import and export masses of frozen shark and shark fins from 1990 to 1995 as given by the South African Customs Union (after Stuttaford 1993-1997).

	IMPORTS			**EXPORTS**			**Exchange Rate**
	Mass (mt)	Rand value	$US Value	Mass (mt)	Rand value	$US Value	Rand/$US
Product: Frozen Shark							
1990	0.49	243.00	66.58	141.52	378545.00	130710.96	3.65
1991	0.00	0.00	0.00	180.22	735011.00	201372.88	3.65
1992	22.88	33970.00	9306.85	177.56	608122.00	166608.77	3.65
1993	0.95	1428.00	391.23	189.58	1033270.00	283087.67	3.65
1994	9.48	14505.00	3626.25	186.06	1011626.00	252906.50	4.00
1995	0.00	0.00	0.00	152.69	783448.00	174099.56	4.50
Product: Shark Fins							
1990	0.00	0.00	0.00	0.00	0.00	0.00	3.65
1991	30.80	78966.00	21634.52	54.49	927219.00	254032.60	3.65
1992	56.18	1098031.00	300830.41	55.85	2637715.00	722611.64	3.65
1993	36.18	246928.00	67651.51	17.97	2076595.00	568930.14	3.65
1994	47.24	431703.00	107925.75	95.47	240565.00	60141.25	4.00
1995	15.58	92308.00	20512.89	95.67	4083004.00	907334.22	4.50

The value of export frozen shark peaked in 1993 at just over R1 million ($US 283 000) and for shark fin at R4.1 million ($907 000) in 1995. The difference between the two is significant as it illustrates the huge disparity in value between the two products and the Japanese demand for fins. It is also worth noting that the market for shark-fin only has been the subject of repeated demands for increased monitoring and control of the shark fishery as the industry has been perceived as wasteful and misreporting high – only a fraction of the presumed catch is reported and on the basis of the known quantities of shark fins exported, the catch is assumed to be significantly higher than reported.

The returns of the different fisheries in which shark are either targeted or are a by-catch is somewhat variable. For example in the directed tuna longline fisheries (foreign) the shark by-catch is a small but profitable component of the total catch and as indicated in Table 10.4, shark fin commands a high price. The two directed shark fisheries in South Africa (local fishermen only) are economically marginal. Several factors influence the profitability of the local shark fisheries.
These include:

1. The declining value of the South African Rand in recent years has increased the viability of exploiting shark for export;

2. Development of overseas markets and a more favourable political climate (South African products are now more acceptable overseas);

3. Development of local processing facilities and greater awareness of the value of shark by local fishers;

4. Effective use of vessels permitted to fish with different licenses. Seasonality of many of the smaller fisheries in South Africa is a major factor in profitability. For example, expansion in the 1960s and 1970s of the tuna pole-directed fishery resulted in a build up of excessive vessel capacity. As the tuna catches declined and the season shortened, many boat owners began desperately seeking alternative stocks to exploit to retain year-round income and to keep vessels and crew active. Many vessels now carry multi permits targeting on longline tuna and shark, handline and more recently hake-directed bottom longlines.

The Shark Fishery's workforce is somewhat diluted and integrated into the different fishing sectors. In most cases, due to the seasonal nature of many of the fisheries, the workforce is transient or semi-permanent. Most shark-directed vessels vary in size from 15-30m, averaging 22 metres overall length. Shark operations using longlines and handlines are labour intensive and most vessels have to increase the capacity (safety certification) to enable them to carry more crew. On average each vessel carries 15-22, crew of which only 4-5 may be permanent. The small gill-net fishery on the Cape coast has its origins as an artisanal fishery but has evolved into a full commercial operation. However, numbers employed directly remain small (10-20 fishers deploying nets) with a small factory force in the St Helena and Saldanha Bay areas.

10.9 Objectives for the Management of the Shark Fisheries

No clear management objectives have ever been set for the exploitation of shark in South Africa, as in the past, effort has always focused on the larger commercial (industrial) fisheries. This changed with the formation of the Chondrichthyan Working Group (CWG), which effectively recognised the need to provide management advice on the exploitation of chondrichthyans. A shark management plan is currently being developed.

10.10 Regulations and Permit Conditions Pertaining to Shark Fisheries in South Africa

In the pelagic longline fisheries, permits are restricted in number (presently 23 shark longline rights). To avoid targeting on TAC-controlled species such as hake and kingklip, by-catch of these species is limited to 10 and 5 respectively at any one time. Operators are not allowed to fish in closed bay areas and reserves. Fishers are also permitted to head and gut fish provided the vessel has a refrigerator on board, but must retain the head, gut and tail in the refrigerator until the catch is landed.

A recent change to the permit conditions is the removal of tuna by-catch restrictions (although swordfish limits are strictly monitored). This is viewed as an important development and move towards the integration of the tuna and shark longline sectors, which use identical gear (pelagic longline) and also have similar by-catches.

10.11 Summary and Conclusions

South Africa has a long history of shark exploitation. The nature of this exploitation has been mostly non-directed and only a few small, directed shark fisheries are active. Shark fisheries have in the past had a relatively low profile and management and control has been lacking. These problems have been exacerbated by the recent uncertainty in the existing and future legislation. At the fisher level there is general uncertainty and insecurity regarding future access rights and only if security of access and tenure is assured, will responsible fishing be achieved.

Shark-directed fishing on its own will not provide a stable income for a boat operator and crew for a full year. Catches are generally marginal and unlikely to be sustainable throughout the year.

Shark-directed fisheries are profitable, but in their existing forms are either a by-catch in an established fishery or augment other seasonal fishing operations. Typically shark longline operators fish intermittently, obviously targeting tuna (pole) in the season and then shark in other months. Hake longline (when it occurs and only if the operator has a right or is chartered for this purpose) is a major contributor to boat income and a two or three month hake longline fishing period can significantly boost the income of an operator permitting a more equitable distribution of income and year-round employment for the crew.

The shark fishery needs positive proactive management and, because of the gear and by-catch similarities between tuna and shark longline, integration of the two sectors in the future is a logical management option.

10.12 Key Indicators of the Shark Longline fishery

The following indicators are summarised from the Economic and Sectoral Study Database. ESS datasheet returns were received from 12 of the 23 shark longline rights holders (Table 10.5), representing 52% of the active participants in the fishery in 2000.

<u>Ownership</u>
Very little company ownership information was provided to the ESS by the shark longline rights holders. Company shareholding could only be determined for 31% of the rights holders, of which 5% were PDI and the rest were white individuals (Fig. 10.1). Ownership details were supplied for 9 of the vessels active in the shark longline fishery in 2000, and consisted of 19% PDI and 81% White individuals (Fig. 10.2).

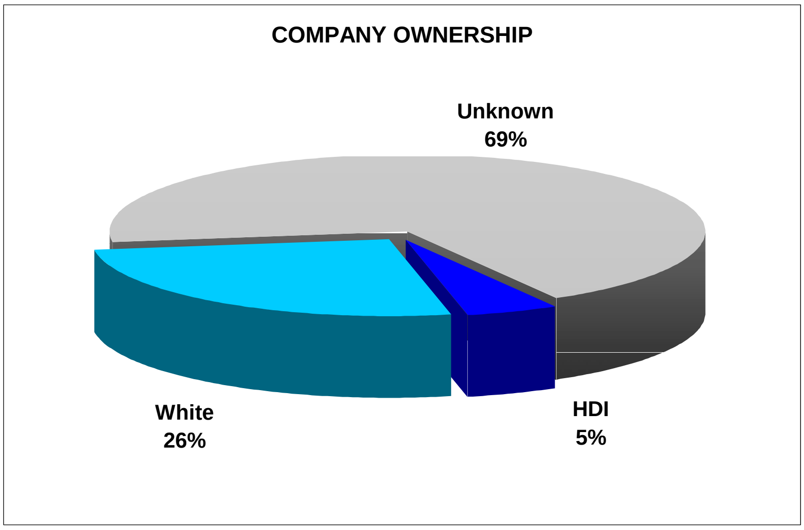


Figure 10.1. Percentage ownership of the shark longline rights holding companies in 2000.

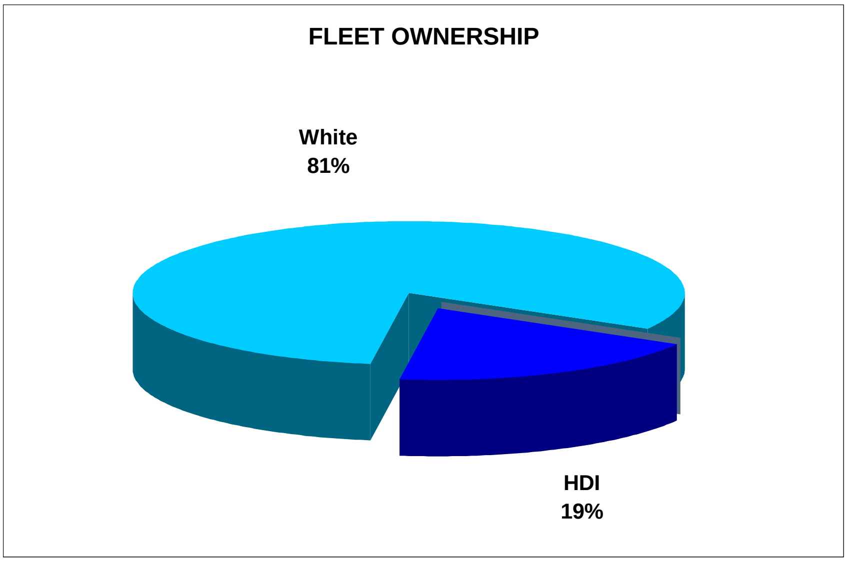


Figure 10.2. Percentage ownership for 9 of the vessels in the shark longline fishery during 2000.

<u>Employment</u>

The ESS received employment data for 12 of the vessels active in the shark longline fishing industry in 2000, and for 5 shark processing/packing facilities. The number of people employed by these vessels and land-based facilities was estimated at approximately 339 individuals, of which 89% were PDI, earning approximately 83% of the total annual wages (Fig. 10.3 and 10.4).

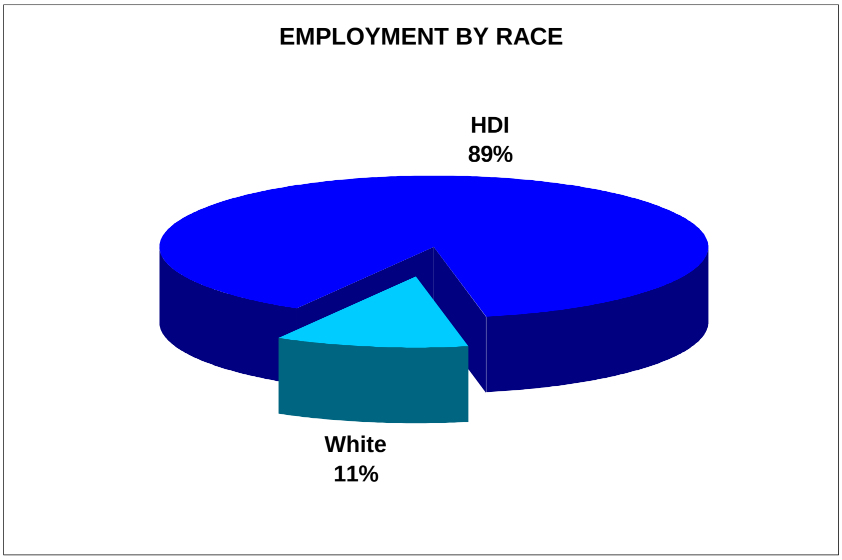


Figure 10.3. The percentage of White and Previously Disadvantaged Individuals employed in the shark longline fishery in 2000.

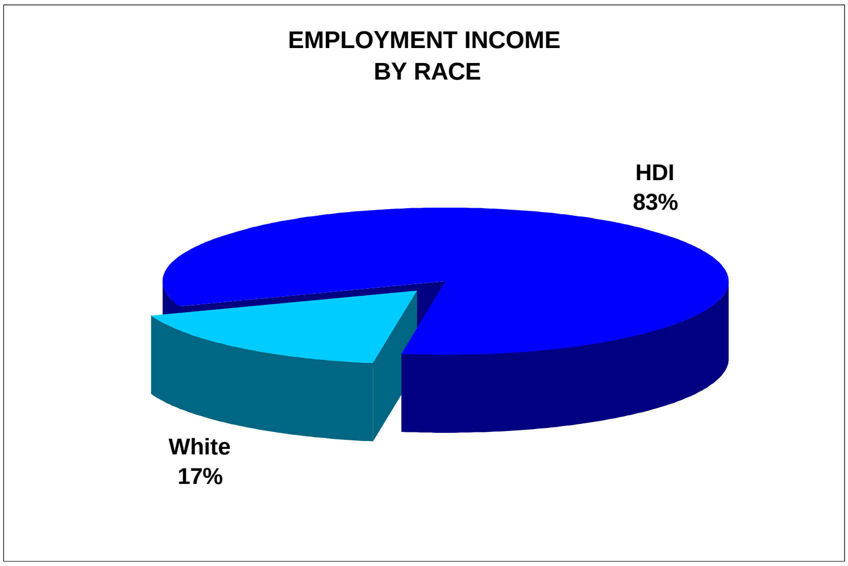


Figure 10.4. The percentage income earned by White and PDI employees in the shark longline fishery in 2000.

The number and annual wage earnings of White and PDI employees in the shark longline fishing industry in 2000 was compared for skills category in Figures 10.5 and 10.6.

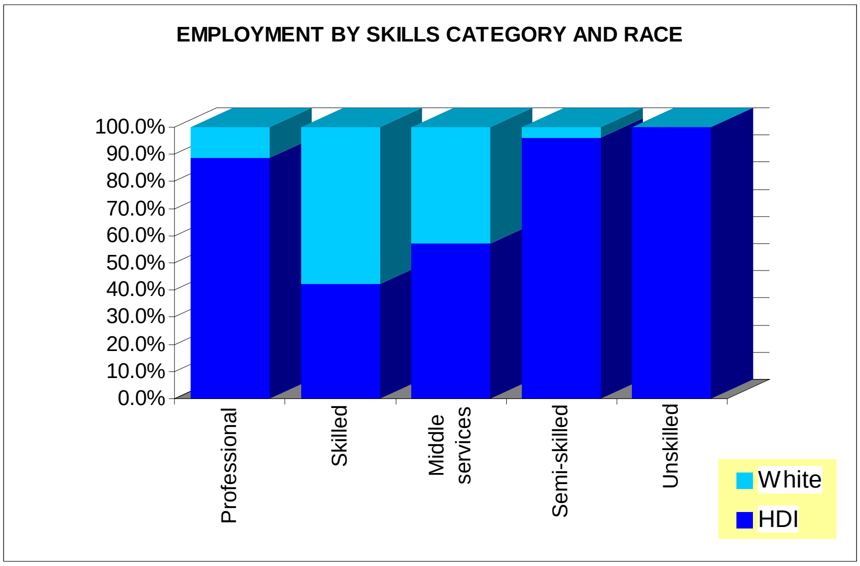


Figure 10.5. The percentage White and PDI employment in the shark longline fishery, by skills category.

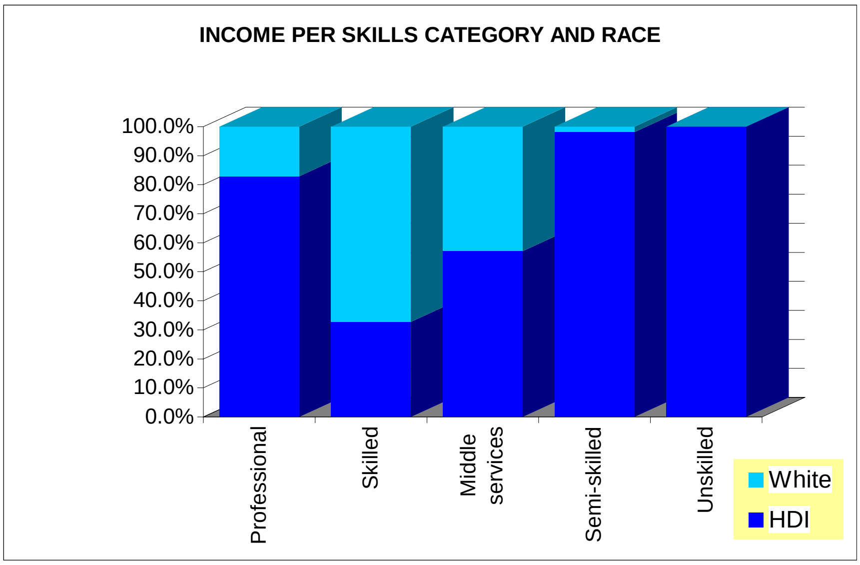


Figure 10.6. The percentage White and PDI income earned in the shark longline fishery, by skills category.

The average annual wage earnings for the different skills categories in the shark longline fishery for 2000 is represented in Figure 10.7. The labour structure of the fishery in 2000 is shown in Figure 10.8, where the number of individuals in each labour category is represented as a percentage of the total number of employees reported to the ESS for the shark longline fishery.

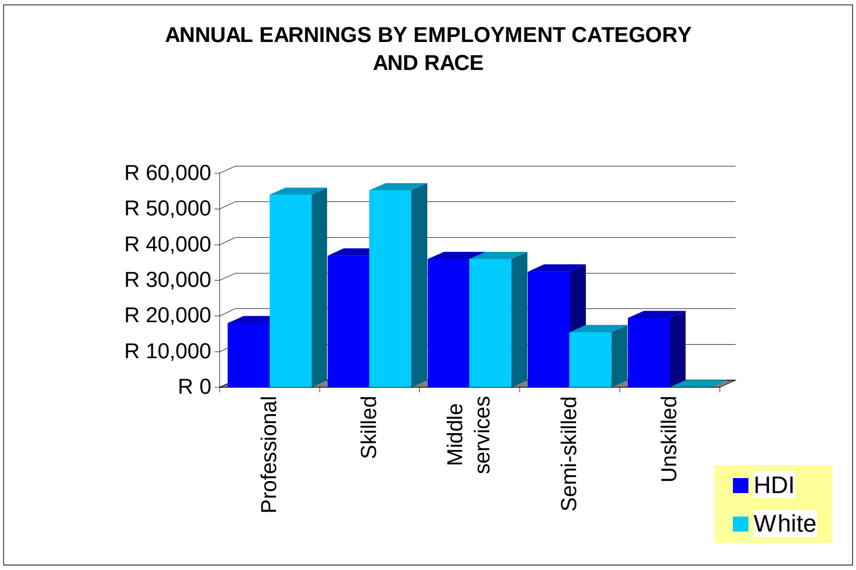


Figure 10.7. Average annual income per skills category for employees in the shark longline fishery in 2000.

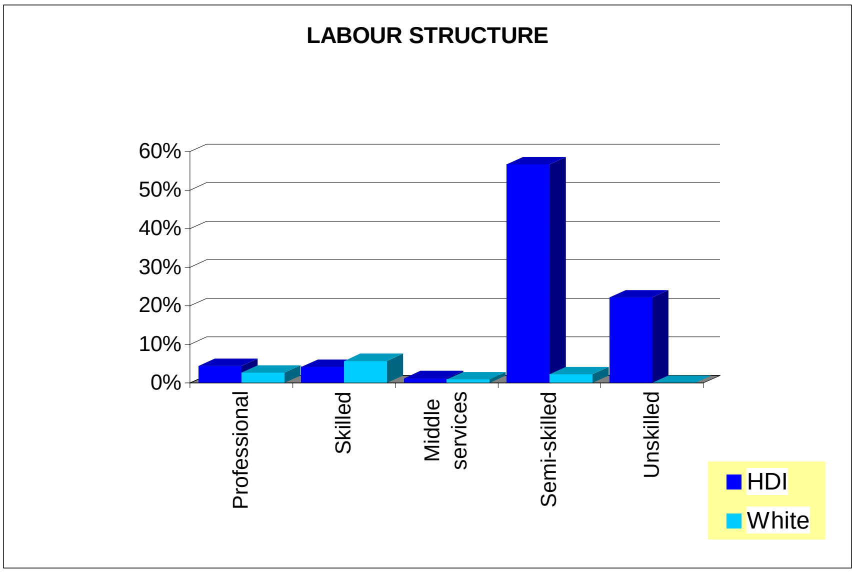


Figure 10.8. The number of employees in each of the skills categories, as a percentage of the reported employment in the shark longline fishery in 2000.

<u>Region</u>

All of the employment recorded in the ESS for the shark longline fishery occurred within the Western Cape Province.

11. THE SQUID FISHERY

11.1 Overview

During the 1960s and 1970s, foreign fleets heavily exploited South African resources. Chokka squid was trawled at that time by fishing fleets mainly from the Far East. This foreign activity was gradually phased out during the late seventies and early eighties. Chokka and other cephalopods (such as other squid species and octopus) continued to be taken by South African whitefish trawlers as a by-catch, which fluctuated between 200 and 600 tons.

Chokka squid has been caught for bait by line fishermen along the southeastern Cape coastline for as long as sport fishing has existed in South Africa. In about 1984 it was first realised that catching and exporting of squid could be a lucrative business, this led to a large increase in catch as the coastal jigging fishery along the south east coast developed. All jigging is done by hand. The squid are placed into plastic crates as they are caught, and fishers are paid per kilogram of squid caught. At regular intervals the squid are sorted by size and packed into 10kg trays, which are placed into a blast freezer on board the vessel. Once frozen the blocks of squid are knocked out of the trays, glazed using seawater and placed into plastic bags in a holding freezer. The highest catch recorded by the industry was in 1989 when 9 800 t was landed. A closed season in October-November (currently four weeks) was introduced in 1988. Between 1986 and 1988 a licensing system was introduced, thus limiting the number of boats allowed to fish and effectively introducing an effort control system.

This fishery is strong and fairly stable, provides employment for roughly 2 500 people and generates in excess of R180 million per year. The current Total Allowable Effort level (TAE) stands at 2 324 men. In addition, two types of area bound restricted permits exist. The first are permits originally issued to catch squid for bait purposes where the restrictions imposed were a limited area of operation and the permit holders were not allowed to sell their catch. The latter restriction was subsequently lifted. The second type of restricted permit relates to permits issued in the Transkei/Ciskei region prior to re-incorporation into South Africa. These remain area bound permits. Currently 145 vessels are participating in the fishery. These vessels range from small ski-boats (these initially dominated, but few are left in the industry at present) to fairly large boats more than 20m in length. Hand-held jigs are used. Jigging machines have been tried but were not successful. The fishery is producing a high quality export product of international standard.

11.2 Policy Issues

<u>Allocation plan</u>

1 There is a single stock of *Loligo vulgaris reynaudii* (chokka) in South African waters. This stock is targeted by the jigging industry and caught as a by-catch by demersal trawlers.

2 At present the by-catch from the trawling industry is a small part of the overall catch and no restrictions are necessary. It is, however, recognised that trawlers can target squid on occasion.

Should the total by-catch of chokka squid exceed 500 tons per annum, measures to limit the by-catch should be implemented.

3 The jigging industry is regulated through the setting of a total allowable effort (TAE) level.

4 The TAE is reviewed annually.

5 It is proposed that the annual TAE be determined as follows:

- Scientific research will update the status of the stock and its relationship to the actual TAE.
- The results of this research will be discussed and specific recommendations made by the Scientific Working Group. These recommendations will include possible ways in which a reduction or increase of TAE (if any) will be implemented.
- These recommendations will be discussed by the proposed Management Working Group (MWG) (see under CAF).
- Should it become necessary to reduce the TAE, this will be done through a variety of methods including:
  1. banning of lights in certain areas
  2. closed areas
- All available TAE will be allocated; permits issued in the Transkei/Ciskei region should be re-assessed.
- Rights, as units of TAE, will be attached to vessels nominated in the fishing plan submitted by the applicant.

In addition to those listed in the General Application form, the following criteria should apply to applicants for squid jigging rights.

- Applicants will be awarded a right attached to a vessel
- Vessels will be placed into vessel categories
- Each vessel category will be allocated a maximum carrying capacity of people
- Applicants will be required to append a valid safety certificate (vessel assessed by a competent authority, e.g. the South African Maritime Safety Authority, SAMSA) placing the vessel into one of the proposed categories, and with the maximum people carrying capacity (as stipulated above) for that category endorsed on the safety certificate.
- New entrants, in their fishing plans, must state clearly into which vessel category a proposed fishing operation will fall.
- Recognising that the jig fishery makes a significant contribution to the economy of the South Eastern Cape Coast region, preference should be given to enterprises with their port of registration in the region.

11.3 Transformation

There are many inactive role players in this sector, who could be removed to the advantage of existing, active right holders and/or a limited number of additional participants. Some small right holders have formed consortia/joint ventures, which have enabled meaningful activation of rights, and these should be supported where possible. It is also implicitly recognised that SMME rights holders, with a single vessel operation, have limited scope for transformation.

11.4 Management

The squid jig fishery is to be formally managed through the allocation of specific rights.
Management objectives for this fishery include:

- Maintaining a sustainable and stable fishery
- The transformation of the fishery through PDI involvement and ownership of rights
- Stimulate the economic and social development of south eastern Cape coastal communities

11.5 Resource Assessment

For the purpose of stock assessment, reliable survey data are required on an annual basis. The September survey that is conducted by the Department is particularly important. In order to ensure that the requisite data is available, regular vessel-based research surveys should be re-instituted. Reliable catch per unit effort data is equally important. The industry must be compelled to provide speedy and accurate catch returns, which are to be captured (immediately) on the MCM database.

11.6 Key Indicators in the Squid Fishery

The following indicators are summarised from the Economic and Sectoral Study Database. ESS datasheet returns were received from 160 rights holders, representing 100% of the active participants in the chokka squid fishery in 2000.

<u>Ownership</u>
The ownership of the entities (companies, trusts, etc.) holding fishing rights for chokka squid was made up of 14% PDI and 38% white individuals, while 48% could not be determined (Fig. 11.1). This translated into 16% PDI and 36% white ownership of the rights fished by these entities (Fig. 11.2). About 136 vessels were active in the squid fishery in 2000. Ownership details were supplied for 52% of the vessels, in the ESS questionnaires. Twenty-eight percent of these squid vessels were owned by PDI (Fig. 11.3). About 26% of the vessels in the 2000 squid fleet were sole-owned (35 vessels).

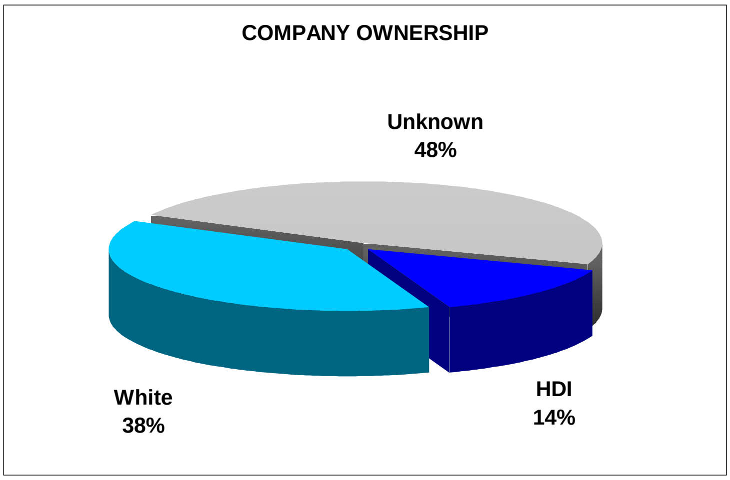


Figure 11.1. Percentage ownership of the chokka squid rights holding companies in 2000.

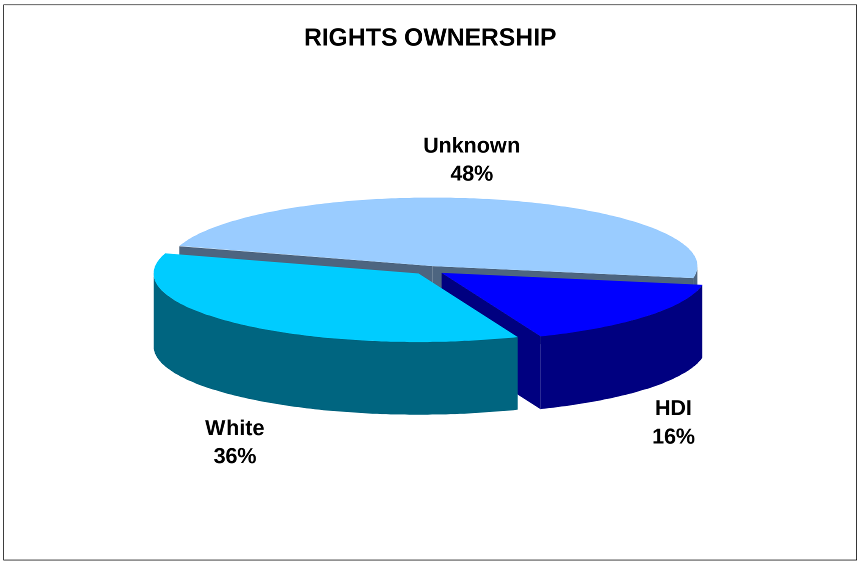


Figure 11.2. Percentage ownership of the chokka squid fishing rights in 2000.

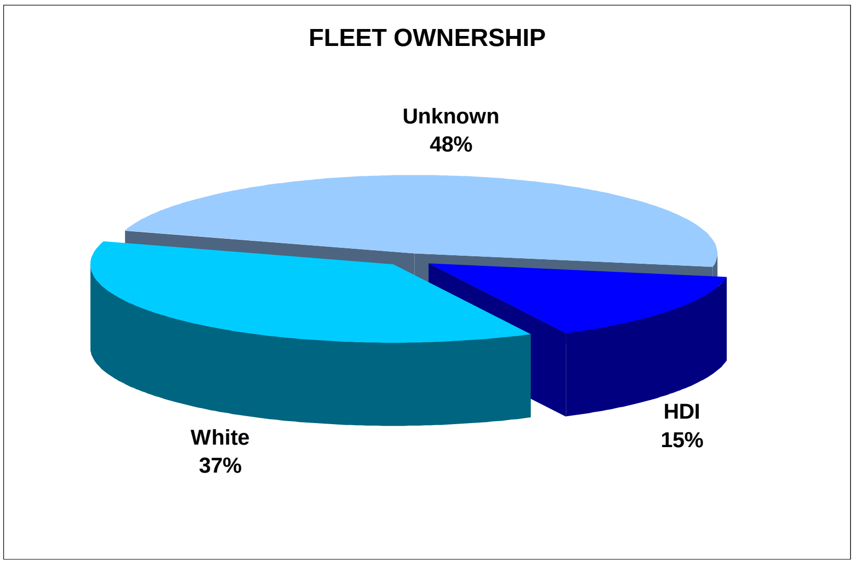


Figure 11.3. Percentage ownership of the vessels fishing for chokka squid during 2000.

Employment

The ESS received employment data for 87.5% of the vessels active in the commercial squid fishing industry in 2000 (119 vessels), and 12 squid processing/packing facilities. Total employment in the industry was estimated at approximately 2 475 individuals, of which 91% were PDI, earning approximately 80% of the annual wages (Fig. 11.4 and 11.5).

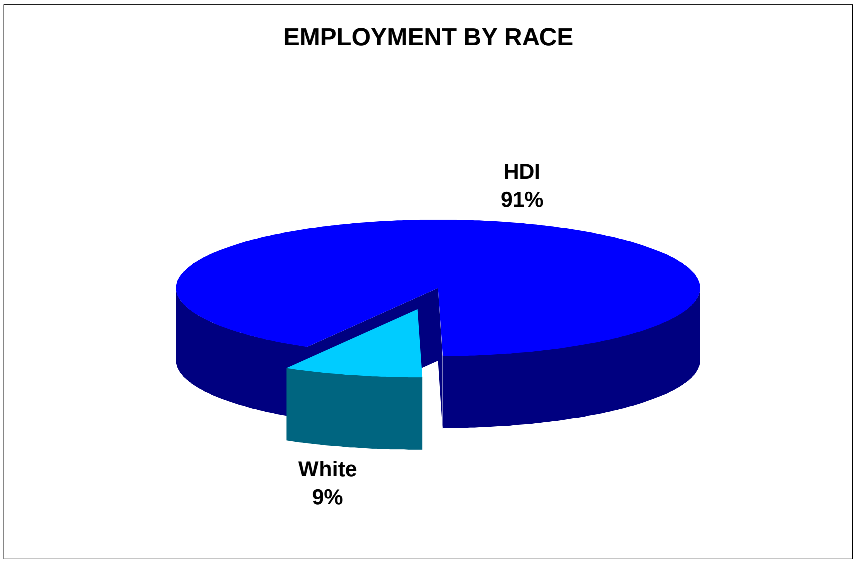


Figure 11.4. The percentage of White and Previously Disadvantaged Individuals employed in the chokka squid fishery in 2000.

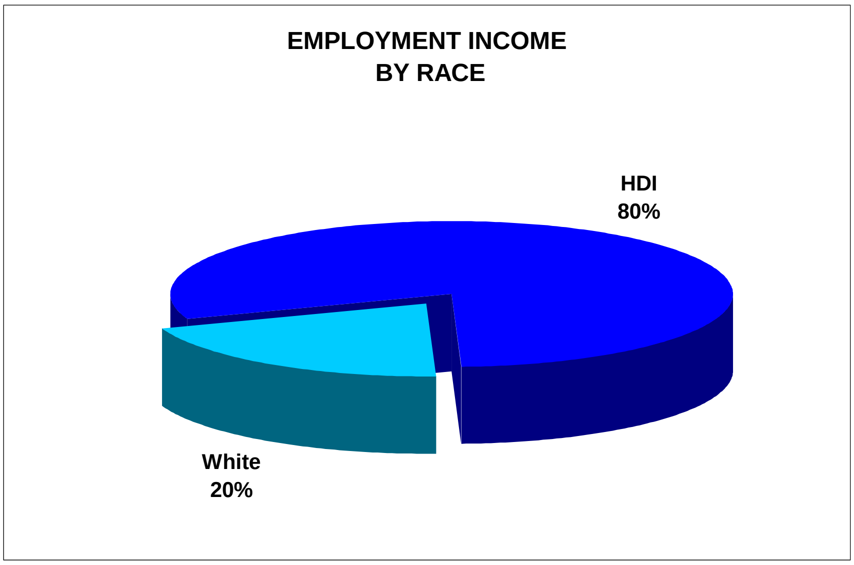


Figure 11.5. The percentage income earned by White and PDI employees in the chokka squid fishery in 2000.

The number and annual wage earnings of White and PDI employees in the chokka squid fishing industry in 2000 was compared for skills category in Figures 11.6 and 11.7.

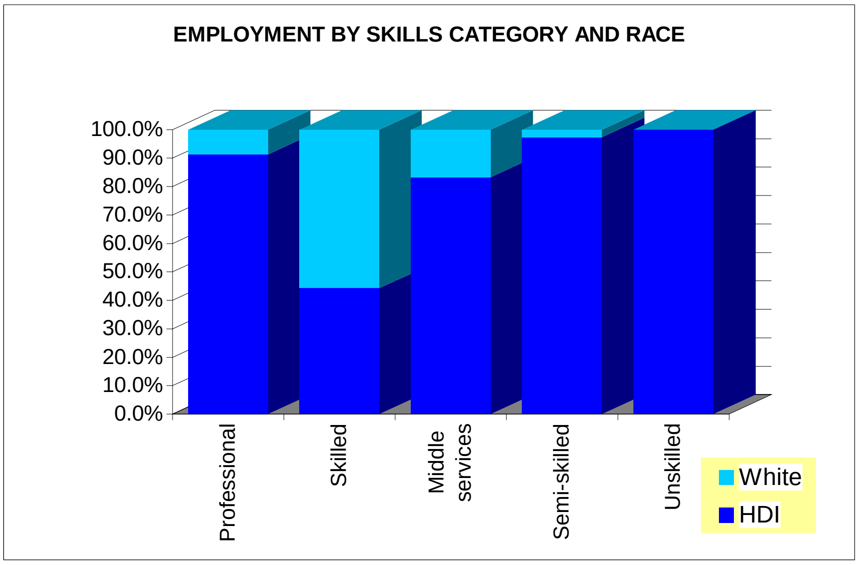


Figure 11.6. The percentage White and PDI employment in the chokka squid fishery, by skills category.

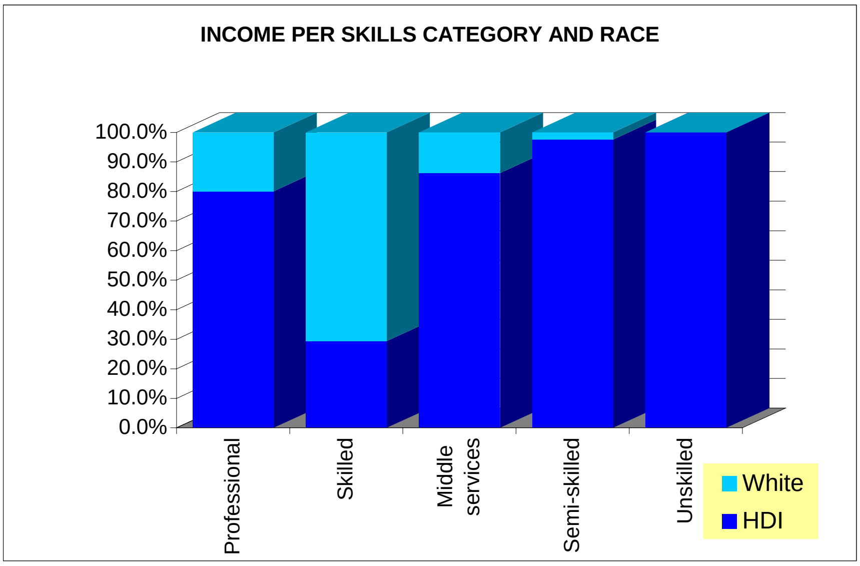


Figure 11.7. The percentage White and PDI income earned in the chokka squid fishery, by skills category.

The average annual wage earnings for the different skills categories in the chokka squid fishery for 2000 is represented in Figure 11.8. The labour structure of the fishery in 2000 is shown in Figure 11.9, where the number of individuals in each labour category is represented as a percentage of the total number of employees in the chokka squid fishery at the time.

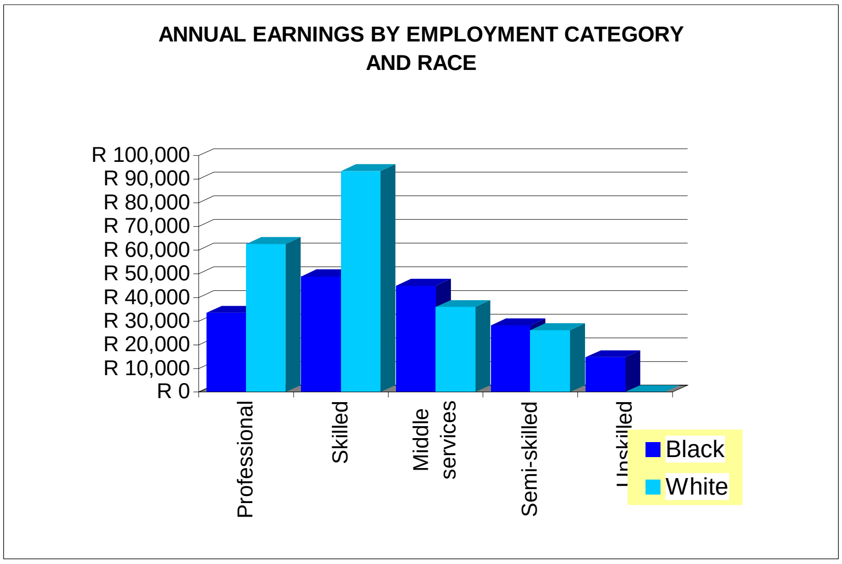


Figure 11.8. Average annual income per skills category for employees in the chokka squid fishery in 2000.

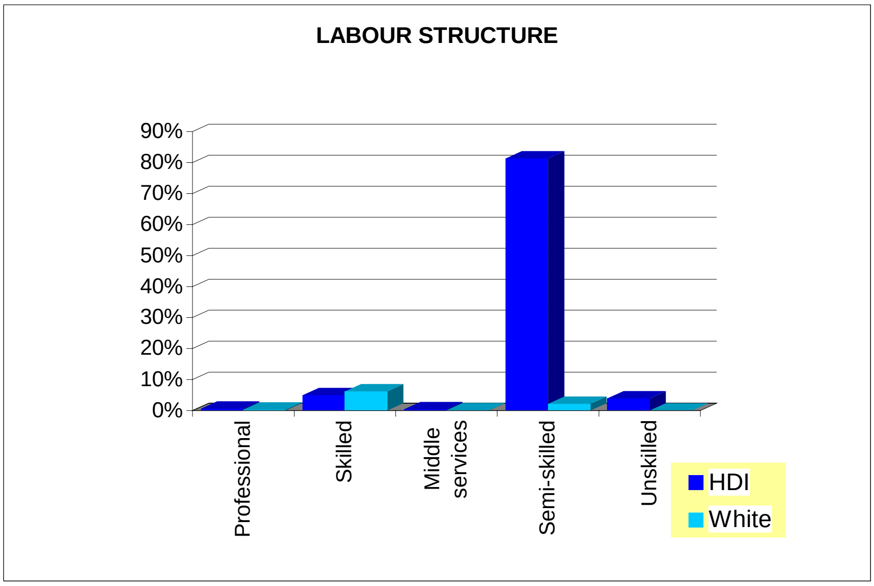


Figure 11.9. The number of employees in each of the skills categories, as a percentage of the total employment in the chokka squid fishery in 2000.

<u>Region</u>

Most of the employment generated by the chokka squid fishery in 2000 occurred in the Eastern Cape Province (82%), with some employment reported from the Western Cape Province (11%, Figure 11.10).

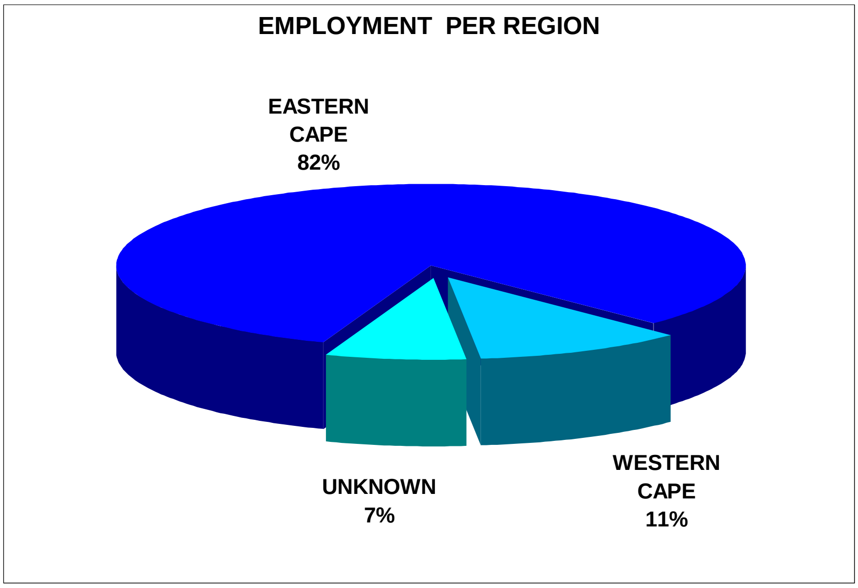


Figure 11.10. Employment in the chokka squid fishery in 2000, by region.

12. THE WEST COAST ROCK LOBSTER FISHERY

12.1 INTRODUCTION

12.1.1 Preface

The report includes a general historical background, a review of current resource status and management, a detailed review of the current commercial fishery and brief summaries of the recreational and subsistence fisheries for this species.

The current management of this fishery can be divided into two distinct phases:

i) the determination of a global or overall Total Allowable Catch (TAC) based on best scientific information; and

ii) the division or allocation of this TAC between the various fishing sectors (see Table 12.1) and the further subdivision of the TAC within these components, where necessary.

Table 12.1. The global TAC for the 2000-2001 season and its breakdown into fishing sectors.

FISHING SECTOR	TAC ALLOCATED TONS	% OF GLOBAL TAC
Commercial	1 614	80
Recreational	174	8.6
Subsistence	230	11.4
GLOBAL TAC	2 018	100

12.1.2 General historical background to the South African *Jasus lalandii* fishery

West Coast rock lobster *Jasus lalandii* are distributed generally close to shore from about 23^0S, just north of Walvis Bay in Namibia, to about 28^0S, near East London in South Africa. Commercial densities are, however, only encountered along the west coast from about 25^0S in Namibia to slightly east of the Cape of Good Hope in South Africa. Commercial exploitation commenced in the late nineteenth century and expanded during the early twentieth century, eventually levelling off at a catch of about 10 000 tons, a level maintained from about 1950 to 1965. The fishery was initially based on the use of hand-hauled baited hoopnets, but traps have come into increasingly greater use since the early 1970s.

Despite the introduction of a minimum size limit of 89mm carapace length (CL) in 1933 and a tail-mass production quota in 1946, catches declined during the 1960s, probably because of overfishing (Figure 12.1).

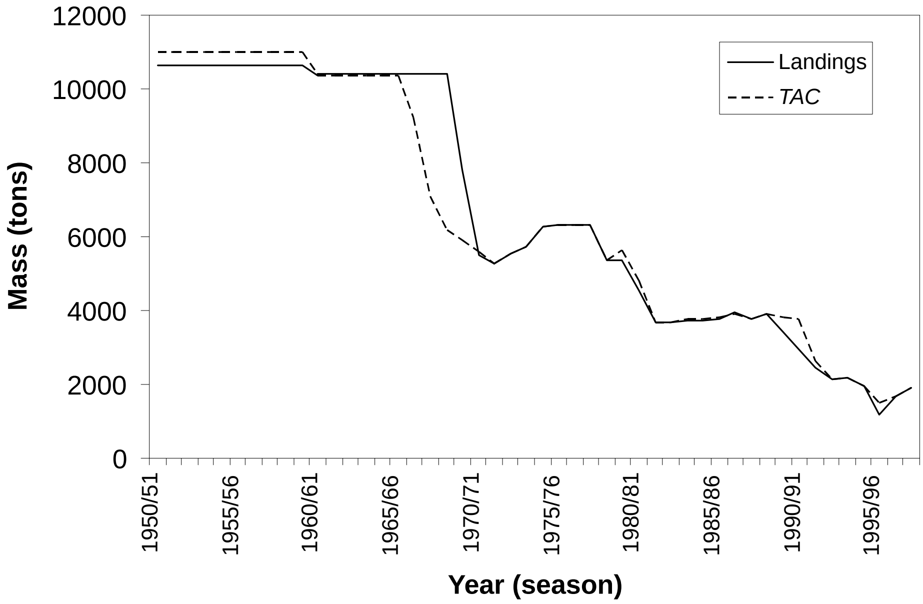


Figure 12.1. West Coast rock lobster TAC and landed catch (tons whole mass) for the period 1950/51 – 1999/2000.

Available data show that the decline was particularly severe in the northern areas, where virtually uncontrolled exploitation took place at a reduced minimum size of 76mm CL after 1959. In 1970, the production quota was cut to the tail-mass equivalent of about 5 513 tons and the 89mm size limit was applied everywhere. The tail-mass production quota was replaced by a whole lobster (landed mass) quota, and management by means of Total Allowable Catches (TACs) was introduced in the early 1980s. Other management measures enforced early on include prohibition on the possession of berried females or soft-shelled lobsters, a closed winter season and a daily bag limit for recreational fishermen.

By the mid 1980s, utilisation of the resource had stabilised at levels of 3 500 - 4 000 tons per annum. The stability in the fishery ended after 1989. This was considered to be the direct result of reduced somatic growth rates that resulted in decreased recruitment to the component of the resource above the minimum size. Average growth rates in the period 1989-1992, based on growth data recorded in six different areas, were about half of those recorded in 1987 and 1988, years believed to be representative of “normal” growth. Although the causes of this slow growth are not yet clearly understood, the widespread nature of the growth reduction was indicative of a large-scale environmental perturbation. It has been postulated that the productivity changes in the southern Benguela Current off South Africa, associated with the anomalous *El Niño* years of 1990-1993, may have been the major reason for the widespread retardation in growth.

The decline in growth rate had a profound effect on the resource and its management. Continued slow growth and resultant poor catches early in the 1991-1992 season resulted in the temporary reduction of the minimum size from 89 to 75mm CL. The minimum size for the 1992-1993 season was initially set at 80mm, but it was then reduced to 75mm, largely for economic reasons, in 1993-1994. TACs during the same period decreased from 3 790 tons in 1990-1991 to 2400 tons in 1992-1993 and further to 1 500 tons in 1995-1996. A slow recovery followed with the commercial TAC reaching just over 1 900 tons in 1997-1998. Since then the commercial TAC has decreased slightly, reaching 1 614 tons in 2000-2001.

12.1 3 Current Resource Status

The West Coast rock lobster resource remains heavily depleted, both in terms of the harvestable component of the population (> 75mm carapace length) and spawning biomass (females > 65mm carapace length) when compared to estimated levels prior to the onset of exploitation in the 19th century. The present low level of the harvestable component (about 6% of the respective pre-exploitation levels) arises primarily from two effects: large unsustainable catches taken particularly during the first half of the 20th century and, more recently, a substantial reduction in the somatic growth rate of individual lobsters over the last ten years. In 1997 concerns were raised that as a consequence of this recent lower abundance of the parent population, a reduction in recruitment might be expected. Accordingly, care had to be taken in management, as the effects of such a reduction would become evident only some 10 years later because of the time taken by rock lobsters to grow to the legal size limit. It is in the interest of all stakeholders to ensure that the TAC level is, over a period of time, increased from its current level.

12.1.4 Overview of Current Management Strategy

In 1997, the Sea Fisheries Advisory Committee (SFAC) adopted a resource management strategy aimed at achieving a 20% increase in resource biomass (>75mm carapace length) between 1996 and 2006. The most recent assessments suggest that, largely as a consequence of higher recruitment over recent years, the biomass level is currently about 10% above that of 1996. However, although biomass thus appears to have increased, it is still very low relative to estimates of pristine levels. If the medium term strategy for this resource is to continue the rebuilding strategy, two issues are of major importance. These are:

(i) The desired extent of rebuilding
(ii) The period of time to achieve this rebuilding.

Because rock lobsters are long-lived slow-growing animals, rapid rebuilding is impossible. Furthermore, there is a trade-off against immediate catch levels: the greater the extent of the rebuilding sought, the lower the TAC over the rebuilding period. Thus, very roughly, over the next 6 years the average annual TAC will be about 50 tons lower for each additional 1% above the 1996 level that the rebuilding target is set.

An operational management procedure (OMP) was developed and implemented during the 1997-1998 assessment. Essentially the OMP revolves around a relatively simple mathematical formula, which provides as output a TAC recommendation. Once a global TAC has been established, zonal and area TACs are set. A 15% tolerance for each area may be activated during the season depending on the catchability of lobsters.

12.2 THE COMMERCIAL WEST COAST ROCK LOBSTER FISHERY

12.2.1 Commercial Fishing Zones/ Areas

The South African West Coast rock lobster fishing grounds are divided into four traditional fishing zones (Zones A to D) each consisting of two fishing areas (Figure 12.2). Three geographically separated small fishing areas (Areas 10, 11 and 12) have been combined into a fifth zone (Zone E) for completeness. (See also Appendix 1.)

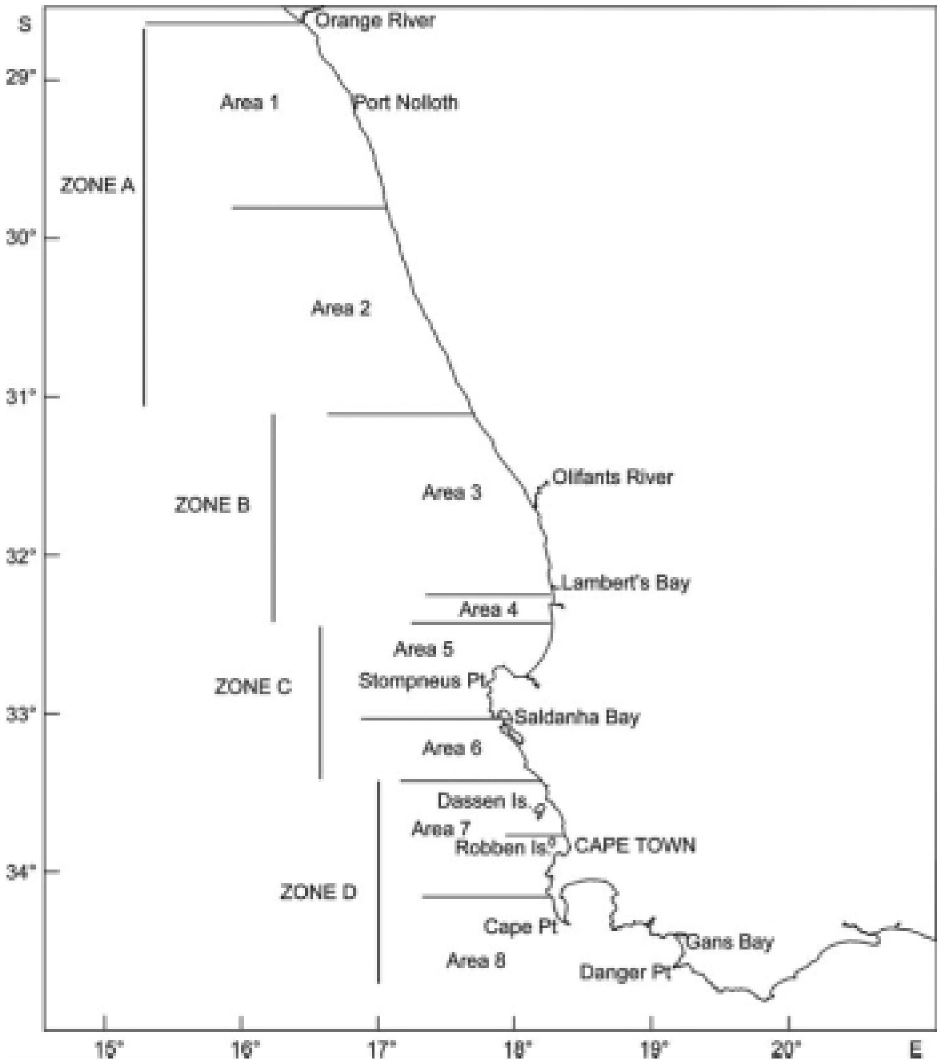


Figure 12.2. West Coast rock lobster fishing zones.

Appendix 2 lists the commercial landings of lobster in the various zones and/or areas from 1992-1993 to 1999-2000. These are briefly summarised in Table 12.2.

Table 12.2. Zonal catches as a percentage of total industry landings in 1992-1993 and 1999-2000.

SEASON	ZONE A	ZONE B	ZONE C	AREA 7	AREA 8	ZONE E
92/93	2%	25%	22%	18%	30%	3%
99/00	<1%	9%	<1%	33%	52%	5%

The contribution of the catches (as a percentage of total landings) made in the northern zones (especially Zones B and C) has decreased dramatically over the past decade. The relative contribution of the catches made in the more northern zones has decreased from about 50% in 1992-1993 to about 10% in 1999-2000. The relative contribution of Areas 7 and 8 have both increased markedly over the same period, with these two areas supplying about 85% of all lobster caught by the commercial sector. The decrease in the productivity in Zones B and C are postulated as a result of decreased somatic growth rates and the cumulative effect of increased lobster stranding events in these zones.

Fishing in the area east of Cape Hangklip (Area 12 of Zone E) is part of an experiment designed to examine the resource and management implications of a small-scale commercial fishery (currently a one ton allocation which is caught by hoopnets only) in this area. Preliminary indications from the experiment are that small-scale commercial fishing could be expanded in this area, thereby increasing the relative contribution of the southern fishing grounds to total catch landed.

While the ecological implications of the concentration of lobster fishing in the southern portion of the fishing grounds are not immediately clear, the economic implications (especially for the fishing communities in the northern areas) could be considerable and should be considered.

The commercial sector can be divided into three major groupings: the catching, processing and marketing components.

12.2.2 The Catching Component

There are currently 1 300 seasonal and full-time employees involved in the catching segment. This component can be divided into various groupings based on:

A) the size of the quota holding
B) the harvesting method used
C) the size and type of the vessels used in fishing

A. Quota Holding Categories

Three categories of quota holding are recognised by the West Coast rock lobster industry:

i) small quota holders – those holding quotas of less than 10 tons
ii) medium quota holders – those holding quotas of between 10 and 40 tons
iii) large quota holders – those holding quotas of more than 40 tons

Currently (2001), some 226 quota holders harvest a Total Allowable Commercial Catch (TACC) of 1 614 tons, a vast difference to the situation in the late 1980s where 39 quota holders harvested a TACC of 4 000 tons. The bulk (88%) of current quota holders have quotas of less than 10 tons and together these small quota holders catch 40% of the TACC (Table 12.3 and Annexure 3).

Table 12.3. The numbers of quota holders in and the amounts of lobster allocated to small, medium and large quota holders in 2000-2001.

CATEGORY	Quota Holders		MASS ALLOCATED	
	Numbers	%	tons	%
Small	199	88	655	40
Medium	18	8	400	25
Large	9	4	559	35
Total	226	100	1 614	100

Although only 4% of quota holders fall into the large category, they account for some 35% of the TACC. While the West Coast rock lobster industry regard small, medium and large categories as logical units, the current study may indicate a more practical breakdown based on economic considerations.

B. Harvesting Method Used

Prior to the introduction of lobster traps in the 1960s, the commercial fishery depended almost exclusively on hand-hauled hoopnets, which are light and easy to deploy from small boats (rowing or outboard) in shallow waters. Hoopnets are seldom used at depths exceeding 30m.

Hoopnet dinghies may either operate independently from the shore (harbour) by means of an outboard motor or rowing, or be transported to the fishing grounds by means of a motorised mother vessel (deck-boat).

Although the use of hoopnets has persisted in some areas, the need for greater efficiency in deeper water has promoted the use of traps. A trap consists of a rectangular metal frame covered by polyethylene netting, with a top or a side entrance. Due to their increased volume and weight traps can only be deployed from inboard motor vessels (6 – 14m in length) and are used in conjunction with power winches.

The methods used to harvest lobster in the various zones and/or areas over the past decade are presented in Annexure 4. Some clear trends are evident from these data. Hoopnets deployed from dinghies have been used to land the bulk of the lobster in the northern fishing zones (Zones A, B and C) in recent seasons while the use of traps and deck-boats (motherboats) have decreased greatly. In contrast, most (>90%) of the lobsters caught in the southern fishing areas (which contributes about 90% of total landed catch) are landed using traps.

Table 12.4. Lobster fishing methods used by quota holders in 1999-2000.

METHODS USED BY QUOTA HOLDERS	QUOTA-HOLDERS	% OF QUOTA HOLDERS	MASS LANDED (T)	% MASS LANDED	% S*	% M*	% L*
Traps Only	167	74	1114	65	89	9	2
Dinghies Only[1]	36	16	142	8	100	-	-
Deck-boats Only	0	0	0	0	-	-	-
Traps and Dinghies	20	9	266	16	70	10	20
Traps and Deck-boats	0	0	0	0	-	-	-
Traps, Dinghies, Deck-boats	3	1	194	11	-	33	67
TOTAL	226	100	1716	100			

[1] Includes the 25 participants in the East of Cape Hangklip Experiment
* % Small (<10 tons), Medium (10 - 40 tons) and Large (> 40 tons) quota holders

Examination of the lobster fishing methods deployed on a quota holder basis (Table 12.4) indicates that the bulk (74%) of quota holders used traps exclusively to land their allocation in the 1999-2000 season. Approximately 89% of these “trap only” quota holders held small (< 10 tons) quotas while 9% fell into the medium category. Hoopnets deployed from dinghies were used exclusively by 16% of quota holders, all of who held small allocations.

While 9% of quota holders use both traps and hoopnets to land their allocations, only 1% used all three methods (two large and one medium quota holder). No quota holders used deck-boats exclusively.

C. Size and Type of Vessels Used

Historically, lobster fishers were more or less restricted to fishing near their homeport as a result of their rudimentary equipment. However, with the changes to more mobile craft, fishers became capable of catching lobster at various locations around the coast, and today it is common for some fishers domiciled in one area to land lobsters at several other ports. There are currently approximately 292 vessels operating in the fishery. This segment can also be sub-divided into different categories, according to the size and or type of vessel from which fishing operations are conducted (Table 12.5). This information must be used in conjunction with Tables 12.3 and 12.4 and Annexure 3 to provide a complete overview of the interactions between quota size, the method and vessel used to harvest lobster and the Zone or fishing area within which fishing takes place.

Table 12.5. The type, size and number of vessels currently used in the West Coast rock lobster fishery.

VESSEL TYPE	VESSEL LENGTH (M)	GEAR TYPE	NO. OF VESSELS	MINIMUM ALLOCATION (TONS)	MAXIMUM ALLOCATION (TONS)	CREW
Dinghy	4 - 6	Hoopnets	120	1	5	2
Dinghy	4 - 6	Hoopnets	50	2	12	2
Ski-	4 - 6	Hoopnets	12	2	12	2
Chukki	6 - 9	Hoopnets or traps	10	5	0	3
Small	>10	traps	81	8	30	5
Large		> 50 traps	19	12	60	7
Total			292			

12.2.3 The Processing Component

This component consists of approximately 19 factories with over 2 800 employees. As a result of the reduced TAC during the recent past, the existing factories are operating well below their optimum capacity. At full capacity a TAC of 4 000 tons could be processed without any further capital investment. As a result of this situation, most of the factories have become multi-faceted, processing various other sea products so as to ensure their economic viability. The coastal communities are heavily dependent on the factories and processing plants. Lower production levels (whether caused by reduced TACs or changes in allocation of the TAC) may detract from the viability of the factories and processing plants. This may result in job losses, to the detriment of the coastal communities for whom, in many respects, the factories and processing plants present the only viable employment opportunities.

12.2 4 The Marketing Component

During the 1987-1988 season, only two South African companies were permitted to engage in the complex and difficult process of marketing rock lobster, both on a local and international basis. They were South African Frozen Rock Lobster Packers (SAFROC) and Cape Lobster Exporters Association (CLEA). In the early 1990s the law was amended with the result that the law currently promotes an efficient free market where all existing quota holders have a number of feasible choices as to how to market their lobster products.

South Africa supplies less than 2% of the world's total lobster market demand, with the current annual value of foreign earnings derived from this fishery approximately R200 million. The products (frozen lobster tails; whole frozen lobster; whole cooked lobster; live lobster) are exported to the United States, Europe and the Far East. The sales of these products (Table 12.6) depend on seasonal overseas market trends and competition from other lobster producing countries.

Table 12.6. Sales of West Coast rock lobster products in 1995 and 1996 (information from South African Commercial Review ~ 1996).

COMMODITY (KG AS SPECIFIED)	MASS	PRICE (R/KG)*	VALUE(R'000) 1996	VALUE(R'000) 1995
Frozen tails	34 003	129 (335)	4 386	2 507
Whole frozen, cooked	670 349	72.74 (170)	48 762	48 479
Whole frozen, raw	115 923	67.88 (170)	7 869	32 298
Live	478 133	82.69 (183)	41 191	37 661
Total			102 208**	120 945

* Current average market price for these commodities is given in brackets
** Current annual value of foreign earnings derived from this fishery approximately R200 million

12.2.5 Transformation in the Commercial Sector

An estimate of the current level of transformation within the commercial sector (based on information submitted to West Coast Rock Lobster Association) is presented in Table 12.7. The percentage of Previously or Historically Disadvantaged Individuals (PDI or HDI) is greatest in the small (<10 tons) and lowest in the medium (10 to 40 ton) quota holder components.

Table 12.7*.* Estimated current level of transformation within the commercial rock lobster fishing sector*.*

	NUMBERS	%	PDI %
Small	199	88	58
Medium	18	8	41
Large	9	4	76
Total	226	100	64*

** overall level of transformation not total of column*

The overall current level of transformation within the commercial is given as 64%. This information is provided in order to present the Industry's view on the level of transformation within this sector. However, transformation can be defined and calculated in many different ways and the estimate presented here should be considered in this light. The Economic and Sectoral Study shows that PDI ownership of the West Coast rock lobster fishing companies is approximately 62%, which is close to the figure provided by the West Coast Rock Lobster Association (Figure 12.3). Approximately 58% of the West Coast rock lobster quota is owned by PDI (Figure 12.4). Reliable ownership data was supplied for about 50% of the rock lobster vessels in the ESS database, of which 49% were owned by PDI (Figure 12.5).

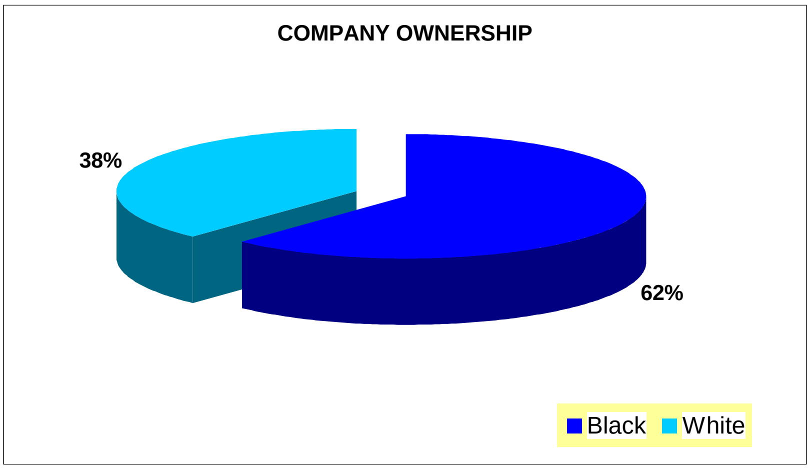


Figure 12.3. Percentage ownership of the West Coast rock lobster fishing companies in 2000.

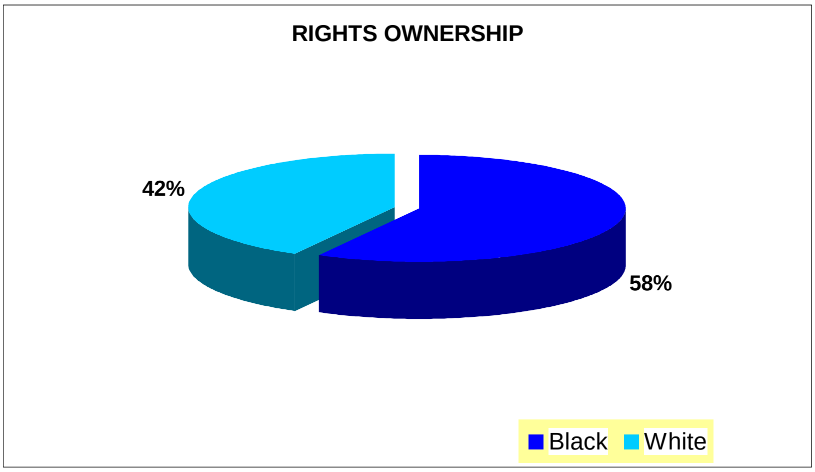


Figure 12.4. Percentage ownership of the right to fish for West Coast rock lobster in 2000.

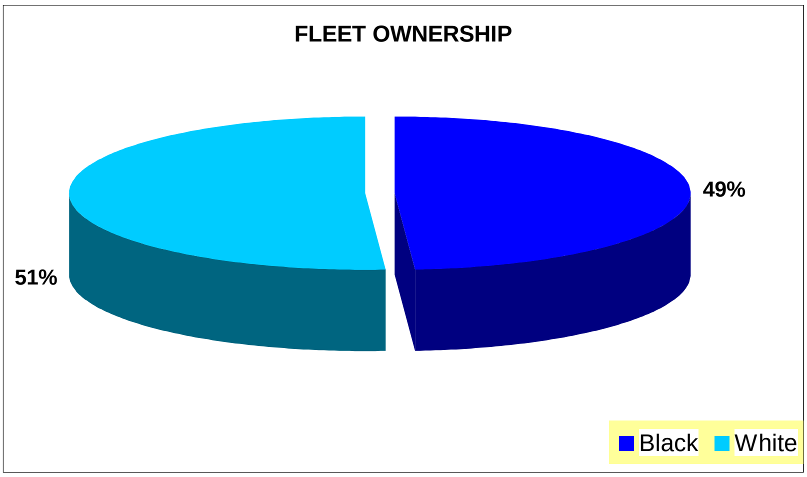


Figure 12.5. Percentage ownership of the West Coast rock lobster fishing fleet in 2000.

12.2.6 Key Indicators in the Commercial Sector

The following indicators are summarised from the Economic and Sectoral Study Database. The database covers a sample size of approximately 99% of the fishery (Table 12.8).

Table 12.8. Summary of the ESS database coverage of the West Coast rock lobster fishery.

	TOTAL FOR FISHERY (2000)	RECORDED IN ESS	% COVERAGE
Rights holders	201	197	98%
Quota (tons)	1589	1587	100%
Vessels	292	300	100%

<u>Employment</u>

The following labour summary for the West Coast rock lobster fishery is based on vessel-based employment and shore-based (processing) employment. About 50% of the vessels in the West Coast rock lobster fleet were sampled for employment data, while about 90% of the processing companies were covered. Approximately 95% of the work force is made up of PDI, earning 87% of the total income (Fig. 12.6 and 12.7). PDI employment representation and income for the major skills categories are shown in Figures 12.8 and 12.9.

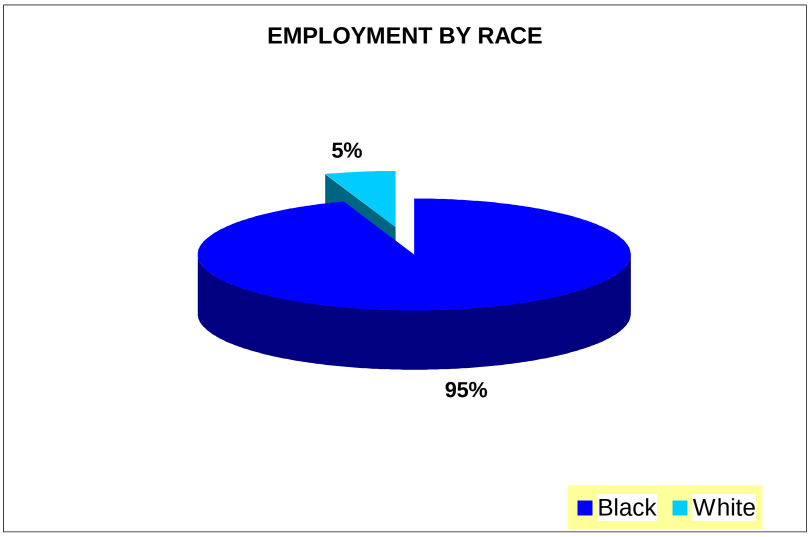


Figure 12.6. The percentage of Previously Disadvantaged Individuals employed in the West Coast rock lobster fishery.

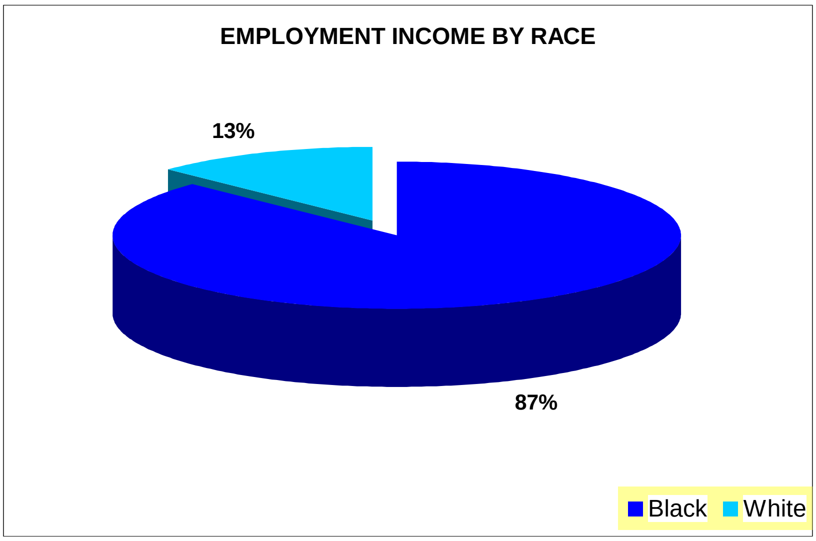


Figure 12.7. The percentage income earned by the PDI employees in the West Coast rock lobster fishery.

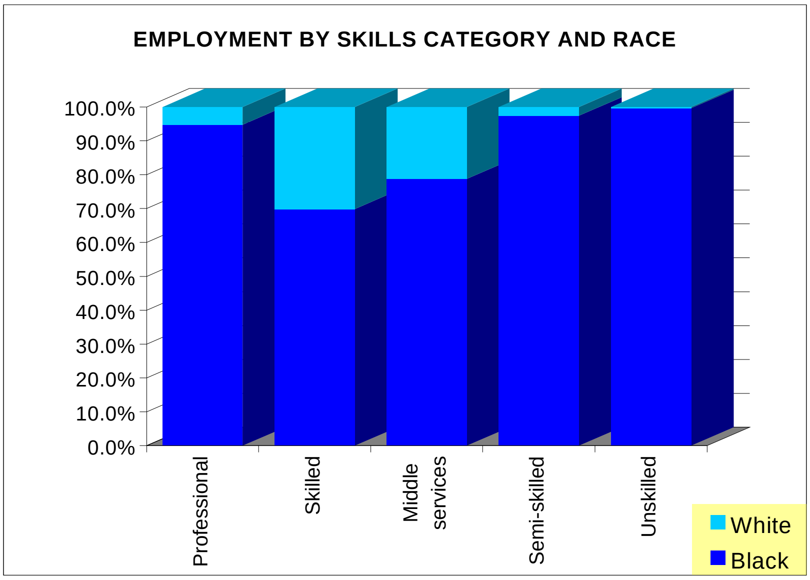


Figure 12.8. The percentage PDI employment in the West Coast rock lobster fishery, by skills category.

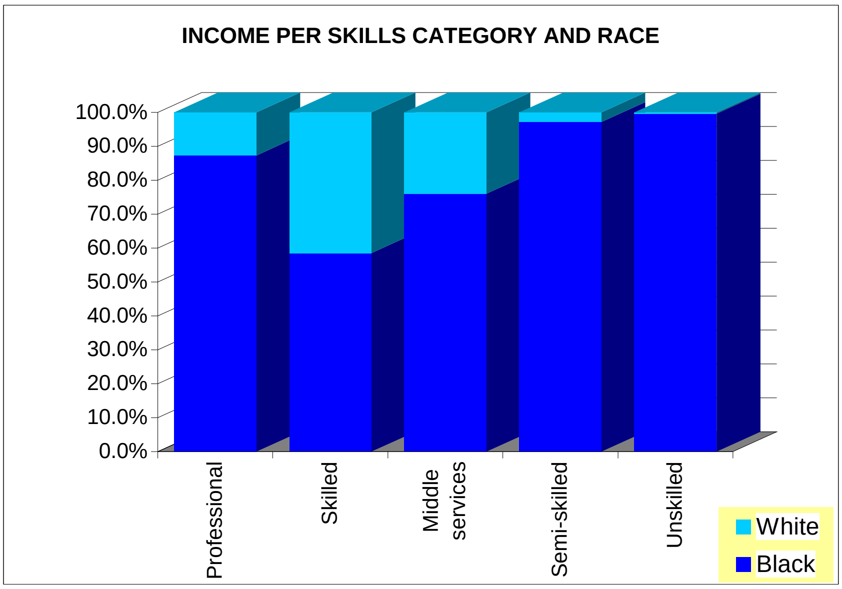


Figure 12.9. The percentage PDI income earned in the West Coast rock lobster fishery, by skills category.

The average annual income for the different skills categories is represented in Figure 12.10. Most (71%) of the workforce consisted of Black, semi-skilled employees (Figure 12.11).

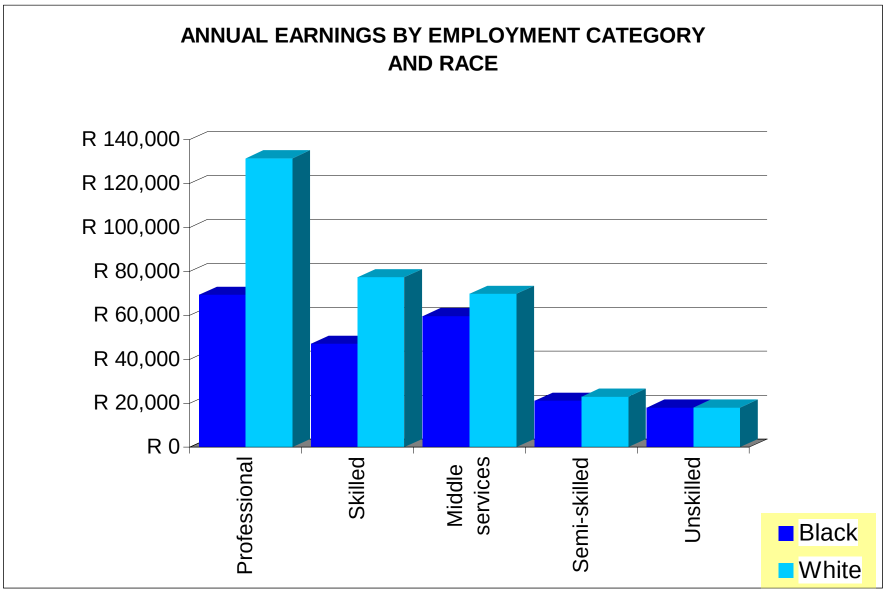


Figure 12.10. Average annual income per skills category for employees in the West Coast rock lobster fishery.

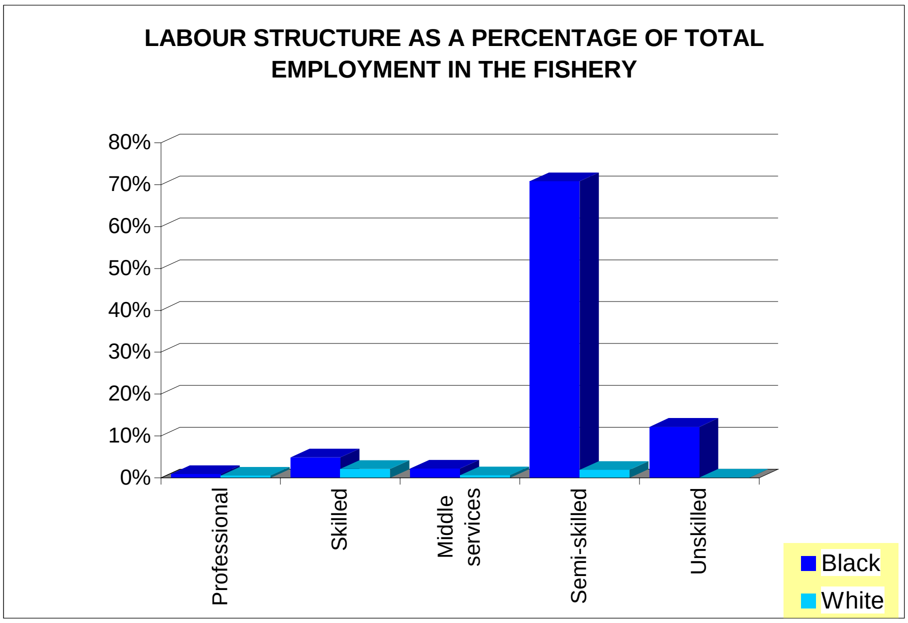


Figure 12.11. The number of employees in each of the skills categories, as a percentage of the total employment in the West Coast rock lobster fishery.

<u>West Coast Rock Lobster Employment Centres</u>

The West Coast rock lobster fishery provides direct employment for approximately 4 400 people. However, some of the vessel crew and most of the processing workers are also active in other fisheries, such as linefish, abalone or pelagic fish. While most of the West Coast rock lobster caught is landed in the western sub-region (Cape Town and environs) of the Western Cape (61%), most of the processing of the West Coast rock lobster takes place in the north-western sub-region (Saldanha Bay and environs). Please refer to Figures 12.12 and 12.13 for further details. West Coast rock lobster-related employment in the Western Cape Province sub-regions and the Northern Cape Province were similar to the pattern shown in the Landings and Processing graphs.

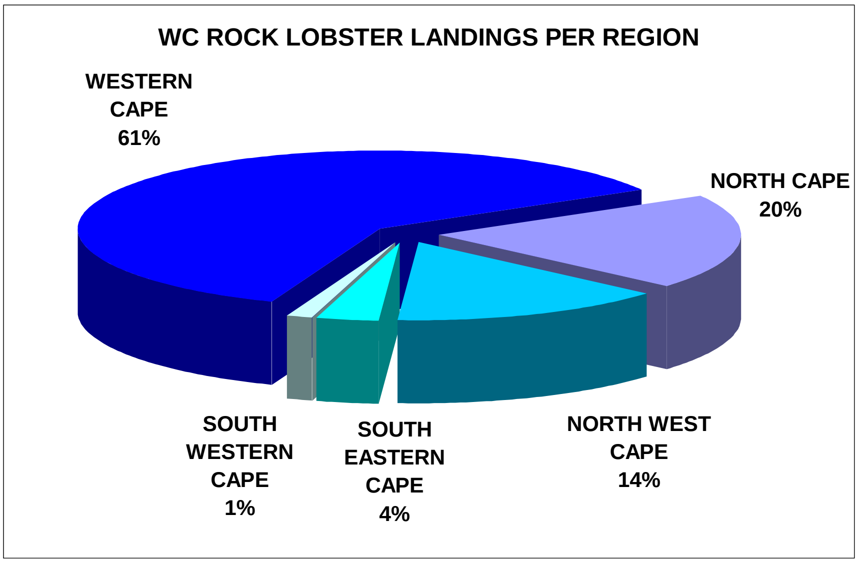


Figure 12.12. West Coast rock lobster landings in the Western Cape Province sub-regions and the Northern Cape Province.

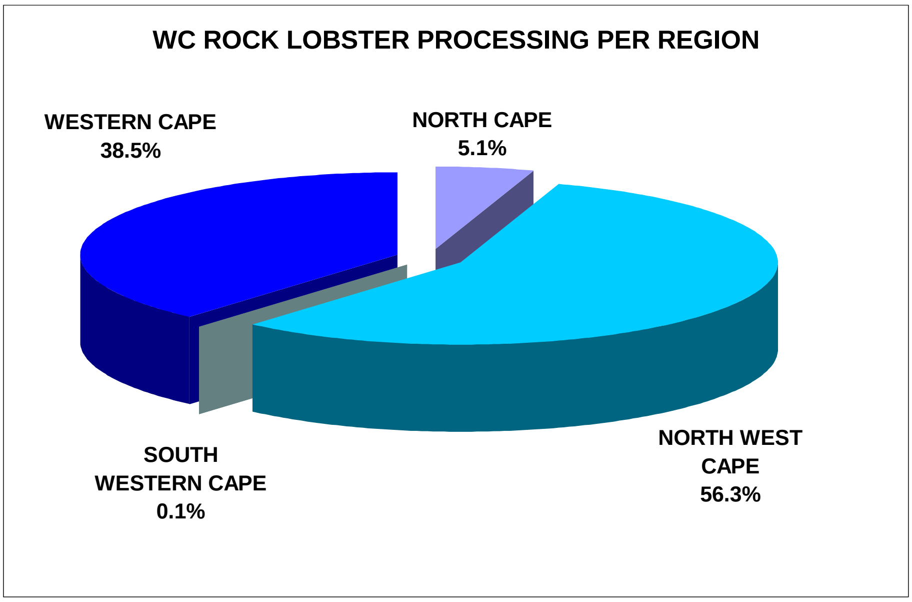


Figure 12.13. West Coast rock lobster processing in the Western Cape Province sub-regions and the Northern Cape Province.

12.2.7 Minimum Viable Quotas

VESSEL CATEGORY	MINIMUM VIABLE QUOTA (TONS)	ATTACHED TO:
Outboard Dingy	1.0	A linefish licence
Chukkie	1.5	A linefish licence
Ski-boat	1.5	
Small Trap Boat (30 ft)	3.5	
Medium Trap Boat (45 ft)	5.0	
Large Trap Boat (60 ft)	8.0	

Please Note: This table does not take into account regional differences. Catches in Zone A are far more expensive than in the southern areas. For example, outboard vessel landing costs = R50 per kg in the north (Zone A) compared to R6 per kg at Cape Point. It also depends whether the fishermen have full-time or seasonal/part-time employment and whether the vessel is owner operated (generally lower cost and more efficient).

12.3 THE RECREATIONAL FISHING SECTOR

The recreational fishery for J*asus lalandii* is regulated by daily bag limits, 80mm carapace length minimum size, gear restrictions (only hoopnets, or diving without compressed air are allowed), restrictions on fishing during the week during certain periods and closed seasons. No lobster sales result from this sector, but its economic impact is substantial considering capital invested in small craft, gear and equipment, and expenditure on fishing trips.

Multi-stage telephone interview surveys conducted by a professional survey company were first commissioned during the 1991-1992 recreational season and have continued since then. A detailed description of the questions asked and methodology used to calculate the volumes removed by the recreational sector are given in Cockcroft and Mackenzie (1997).

The amount of lobster landed by recreational fishers (Table 12.9) reached a level of almost 500 tons (29.5% of the commercial catch) in 1996-1997 but has been reduced in recent seasons, reaching 258 tons (14% of commercial catch) in 1998-1999. The recreational sector was allocated 174 tons (8.6% of the global TAC and 10.7% of commercial allocation) for the 2000-2001 season. Although the recreational lobster fishing season was reduced in order to obtain the desired reduction in total recreational catch, it remains to be seen whether these measures were effective in limiting catches by this sector.

Table 12.9. Summary of recreational rock lobster catches from the 1991-1992 to the 1998-1999 fishing season.

SEASON	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99
Number of permits sold	44 469	59 202	57 590	54 160	57 778	65 617	44 383	39 982
Number of rock lobster caught	419 286	1 360 166	1 133 731	973 963	1 097 782	1 436 571	984 233	748 591
Average number of rock lobster caught per permit	9	23	20	18	19*	22	22	19
Mass of rock lobster caught (tons)	159	469	391	336	379*	496	340	258
Mass as % of commercial TAC	6.6%	21.3%	17.7%	16.8%	25%*	29.5%	19.5%	14%

12.4 THE SUBSISTENCE FISHERY

The subsistence fishers operate with hoopnets only, from the shore or from small fishing boats. Daily catches (4 lobsters per permit holder) are sold to individuals, restaurants, fish shops and processing factories. Subsistence fishing was introduced in 1999-2000 and almost 1 700 subsistence permits were issued during the 2000-2001 season. The subsistence catch for 2000-2001 was estimated at 230 tons (the amount set aside for this sector – see Table 1) despite the very late start to fishing due to administrative delays. This, of course, will now form the basis of the small-scale commercial sector.

APPENDIX 1: DETAILED DESCRIPTION OF WEST COAST ROCK LOBSTER FISHING ZONES AND THE FISHING SEASONS FOR THESE ZONES.

ZONE/AREA	**SEASON**
Zone A This is the area between a line in the north (approximately 234° true bearing) drawn from the mouth of the Orange River, as indicated on a sea chart SAN FZ1 and a line in the south, drawn from the mouth of the Brak River (270° true bearing).	1 October – 30 April
Zone B This is the area between a line in the north (270° true bearing) drawn from the mouth of the Brak River, and a line in the south (270° true bearing) drawn from the water tower at Dwarskersbos.	15 November – 30 June
Zone C This is the line in the north (270° true bearing) from the water tower at Dwarskersbos, and a line in the south (270° true bearing) drawn from the beacon marked YF, situated at Yszerfontein.	15 November – 30 June
Area 7 This is the area between a line in the north (270° true bearing) drawn from a beacon marked YF mentioned in respect of Zone C above and as a southern boundary the northern beacon MB1 of the rock lobster sanctuary at Melkbos Point.	15 November – 30 June
Area 8 This is the area with a northern boundary, a line (270° true bearing) drawn from the beacon HD1 of the Cape Peninsula rock lobster sanctuary and as a southern boundary a line (180° true bearing) drawn from the lighthouse at Cape Hangklip.	15 November – 30 June
Area 10 This is the line drawn 270° true from the beacon at Oudeschip and a similar line drawn from the beacon marked H1 at “Die Josie”, situated near Chapman’s Peak.	1 March – 31 March
Area 8 (Deep Water) This is a sub-area of the already described Area 8. Fishing will only be permitted in the area south of a straight line joining the co-ordinates 34°18.6’S, 18°20.0’E and 34°23.2S, 18°27.0’E and a straight line between 34°23.2S, 18°27.0’E and 34°25.0S, 18°49.8’E.	1 July – 30 September
Zone E This is the area north of a straight line drawn from the lighthouse at Cape Point to the lighthouse at Cape Hangklip, excluding the area within 1 nautical mile from the high water mark in the area bounded by: northern boundary – a line (270° true bearing) drawn from the mouth of the Buffels River, and a southern boundary – a line (270° true bearing) drawn from the lighthouse at Cape Hangklip.	15 November – 30 June

APPENDIX 2: RIGHTS HOLDERS IN 2000-2001

	ALLOCATION
Small Rights Holders (<10 tons)	
Ferreira E M	881
Ferreria S	881
Sebien A	1,152
Arries J	1,173
Daniels F W	1,173
Dyer Eiland Visserye bk	1,173
Gordon H	1,173
Julies N	1,173
Kwenane R	1,173
Laubscher J P	1,173
Lusitania Fishing Co (Pty) Ltd	1,173
Masconi E	1,173
Pick R C	1,173
Reid D E	1,173
Vaughan J	1,174
Rocky Bank Fishing cc	1,225
Tiger Reef Fishing CC	1,499
Walters E F H	1,521
Ferro Fishing (Pty) Ltd	1,564
Lino J D N	1,564
Sancho S R	1,564
Ferreira M R	1,761
Abreau Fishing Co (Pty) Ltd	1,869
Adams C R	1,869
Agrela Fishing (Pty) Ltd	1,869
Angelico S M	1,869
B P Quality Products CC	1,869
Bodenstein C P	1,869
Compmatix Ten (Pty) Ltd	1,869
Docmatrix Fourteen (Pty) Ltd	1,869
Docmatrix Ten (Pty) Ltd	1,869
Dormakorp Vier (Edms) Bpk	1,869
Dynavest Nine (Pty) Ltd	1,869
Easy Choice Twelve (Pty) Ltd	1,869
Friceba Fishing (Pty) Ltd	1,869
Indlovu Fishing (Pty) Ltd	1,869
Inyanga Fishing (Pty) Ltd	1,869
Isigalo Marine (Pty) Ltd	1,869
Laters M A	1,869
Marion Dawn Fishing cc	1,869
Mullins R	1,869
Pesc Smokers CC	1,869
Pimpano Twelve (Pty) Ltd	1,869
Plaatjies W	1,869
Shergold A F	1,869
Sibange Fishing (Pty) Ltd	1,869
Three Coins Fishing CC	1,869
Trade Factor Eleven (Pty) Ltd	1,869

Trade Factor Fifteen (Pty) Ltd	1,869
Ukulima Fishing (Pty) Ltd	1,869
Uthando Fishing (Pty) Ltd	1,869
Ibhotwe Fishing (Pty) Ltd	1,938
The Best Aquaculture cc	1,953
Sternside Fishing CC	1,963
Sunset Fishing CC	1,963
Imifuno Fishing (Pty) Ltd	2,024
Imizamoyethu Fishinhg (Pty) Ltd	2,053
Dewmist Investments cc	2,335
Docmatrix Eleven(Pty) Ltd	2,337
Nagel N H	2,337
Visveld Beleggings Bk	2,337
Batsilva CC	2,627
Joc Fishing cc	2,627
Calvin Visserye	2,804
Daddy's Money (Pty) Ltd	2,804
Doringbaai Visserye Bpk	2,804
Du Preez Fishing cc	2,804
Fantique Trade 486 cc	2,804
Fisherman's Movement cc	2,804
Gomens Fishing (Pty) Ltd	2,804
Levendal H H	2,804
Moreson Bemarking (Pty) Ltd	2,804
Nat Si Nako Fishing cc	2,804
Nogie Klarie Fishing cc	2,804
North Blinder (Pty) Ltd	2,804
Safrica Fishing cc	2,804
Sederzee Visserye Bk	2,804
Peninsula Fishing Ent. (Pty) Ltd	3,014
Jurassic Fishing Enterprises cc	3,271
Kusasa Commodities 63 (Pty) Ltd	3,271
New District Six Fishing (Pty) Ltd	3,271
Brand F J	3,739
Ezintlanzini Fishing (Pty) Ltd	3,739
Grey's Marine CC	3,739
Komicx Products (Pty) Ltd	3,739
Pakamani Fishing (Pty) Ltd	3,739
Vestworx Thirteen (Pty) Ltd	3,739
Jaffers Bay Fishing cc	3,910
Kleinbegin Visserye Bk	3,910
Latief Albertyn Fisheries cc	3,910
Penguin Visserye Bk	3,910
Sardinas Ko-operasie BK	3,910
Sewester Seeprodukte Bk	3,910
Walpat (Edms) Bpk	3,910
Vaughn A	4,244
Abba Langebaan Fishing Bk	4,499
Algemene Vissers Bk	4,674
Alpha Visserye (Edms) Bpk	4,674
Amandia Abasabenzi Fishing (Pty) Ltd	4,674
Askala Visserye Bk	4,674
B J Engelbrecht Visserye Bk	4,674

Bafiaansberg (Edms) Bpk	4,674
Biz Africa 32 (Pty) Ltd	4,674
Bluefin Holdings (Pty) Ltd	4,674
D Oliver & Vennote Bk	4,674
Davy's Fishing CC	4,674
Erongo Fishing cc	4,674
Ezolwandle Fishing (Pty) Ltd	4,674
Full Deck Investments (Pty) Ltd	4,674
Harry Cottle Fisheries (Pty) Ltd	4,674
Henbase 2655 cc	4,674
Hentiq 2349 (Pty) Ltd	4,674
Inter Nation Traders (Pty) ltd	4,674
Khoisan Fishing cc	4,674
Klein Opstaan Visserye Bk	4,674
Kreefbaai Visserye Bk	4,674
Langklip Seeprodukte (Edms) Bpk	4,674
Louwenians Fishing cc	4,674
Louw's Fishing cc	4,674
Malande Fishing cc	4,674
Malgas Visserye Bk	4,674
Manetrade 2052 cc	4,674
Miya's Fisheries (Pty) Ltd	4,674
Mtshau Fishing CC	4,674
Ocean Ukhozi Fisheries cc	4,674
Ocean View Fishing CC	4,674
Olympia Fishing cc	4,674
Pike Rock Fishing Corp, cc	4,674
R D Summers Fisheries cc	4,674
Saul Cloete & Vennote (Edms) Bpk	4,674
Schotshe Kloof Fishery cc	4,674
Seaweed Fisheries cc	4,674
Simon's Town Fisheries cc	4,674
Sir Lowry's Pass Visserye	4,674
Siyakha Fishing cc	4,674
T & N Visserye Bk	4,674
Taridor Five cc	4,674
Thandani Fisheries cc	4,674
Vaughan J A	4,674
Viswater Visserman Bk	4,674
Young V M	4,674
Achmad S	4,865
John Quality Products Ltd	4,973
Bato Star (Pty) Ltd	5,474
Bobbejaanberg Visserye Bk	5,474
CSM Fishing cc	5,474
Denburg Fisheries (Pty) Ltd	5,474
Elapa Visprodukte Bk	5,474
Geelbek Visserye Bk	5,474
I Fortune & Crew (Pty) Ltd	5,474
Ithuba Fisheries cc	5,474
Jessica Fishing Enterprisescc	5,474
Karbonkelberg Marine cc	5,474
Mafukuzela Fishing (Pty) Ltd	5,474

Sibanye Fishing Co. (Pty) Ltd	5,474
SLH Fishers Ltd	5,474
Quayside Fish Supplies cc	5,608
De Seeda Seeprodukte (Edms) Bpk	5,691
Atlantic Fishing Ent. (Pty) Ltd	5,885
Hicksons Fishing Co. Ltd	5,961
Boventrek Beleggings (Edms) Bpk	6,543
Sharpley N L	6,558
C J W van Zyl Beleggings	6,609
Port Nolloth Visserye (Pty) Ltd	6,692
Gourmet Fish Products (Pty) Ltd	6,884
Wasserfall E C	7,010
Umzamania Fishing Bk	7,665
Sentinel Sea Foods (Pty) Ltd	7,726
Activest Twenty (Pty) Ltd	9,347
Suid Oranje Visserye Bpk	9,347
Suidelike Boot Assistente	9,347
Van der Merwe J E	
Total	**654,540**
Medium Rights Holders (10 - 40 tons)	
Live Rock Lobster Corp. (Pty) Ltd	11,105
Good Hope Fisheries (Pty) Ltd	11,216
Sparkor (Pty) Ltd	11,473
Cape Reef Products (Pty) Ltd	11,672
Bridger & Angelico Fisheries (Pty) Ltd	14,021
Kalk Bay Lobster & Commercial Linefishing Assoc.	16,124
Friedman & Rabinowitz (Pty) Ltd	18,694
Saldanha Bay Canning Co. (Pty) Ltd	19,004
Lusitania Sea Products (Pty) Ltd	20,961
St Helena Bay Fishing Ind Ltd	21,171
Namaqua Fishing Co Ltd	25,163
Konsortium Kreef Belange (Edms) Bpk	25,334
Premier Fishing (Pty) Ltd	27,007
Elandia Visserye Bk	29,491
Umoya Fishing (Pty) Ltd	29,596
Chapmanspeak Fisheries (Pty) Ltd	33,544
Coast Trading Co. (Pty) Ltd	37,227
Paternoster Visserye Ltd	37,234
Total	**400,037**

Large Rights Holders (>40 tons)	
Elandsbaai Handelsmaatskappy (Edms) Bpk	40,518
Stephans Rock Lobster Packers (Pty) Ltd	48,838
Dromedaris Visserye Ltd	52,778
John Ovenstone Ltd	52,955
Foodcorp (Pty) Ltd	53,385
Lamberts Bay Canning Co. (Pty) Ltd	73,645
North Bay Canning Co. Ltd	82,728
S A Sea Products Ltd	99,429
Total	**559,423**

APPENDIX 3: WEST COAST ROCK LOBSTER CATCHES IN THE VARIOUS ZONES AND FISHING AREAS FOR THE PERIOD 1992-1993 TO 2000-2001

		Zone A		Zone B		Zone C		Zone D		Zone E			Total
Season	TAC	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Area 7	Area 8	Area 10	Area 11	Area 12	Catch
92/93	2 200t	37t	9t	212t	329t	168t	320t	378t	654t	39t	30t		2 176t
93/94	2 200t	37t	2t	5t	550t	88t	283t	342t	828t	32t	32t		2 199t
94/95	2 000t	27t	0,3t	69t	433t	24t	106t	316t	932t	28t	27t		1 962t
95/96	1 520t	30t		13t	360t	14t	40t	267t	745t	30t	18t		1 517t
96/97	1 675t	29t		17t	369t	15t	23t	318t	857t	29t	22t		1 679t
97/98	1 920t	26t	0,1t	0,4t	152t	17t	32t	663t	965t	37t	23t		1 917t
98/99	1 781t	4t	5t	21t	88t	3t	12t	578t	1 015t	36t	31t		1 793t
99/00	1720t	6t	0,2t	63t	85t	7t	7t	568t	891t	33t	31t	25t	1716t
00/01	1614t	13t		55t	40t	7t	3t	579t	376t*	28t*	1t*	20t*	1122t*

APPENDIX 4: THE FISHING METHODS USED TO LAND WEST COAST ROCK LOBSTER IN THE VARIOUS FISHING ZONES AND AREAS

Season	Zone A				Zone B				Zone C				Area 7				Area 8			
	Catch t	% Trap	% Deckboat	% Dinghy	Catch t	% Trap	% Deckboat	% Dinghy	Catch t	% Trap	% Deckboat	% Dinghy	Catch t	% Trap	% Deckboat	% Dinghy	Catch t	% Trap	% Deckboat	% Dinghy
Av 80s					1003	50	32	18	1100	72	16	12	904	98	2	0		80		
1990/91	39				510	74	14	12	686	81	7	12	716	95	2	3				
1991/92	31				512	75	11	14	607	65	1	35	504	77	20	3	767	84		16
1992/93	46				541	60	21	19	488	75	12	13	378	99	0	<1	654	88		12
1993/94	39				555	45	26	29	370	75	12	13	342	100	0	0	827	87		13
1994/95	27		33	67	502	53	22	25	130	78	17	5	315	91	9	0	929	83	<1	17
1995/96	30		33	67	361	59	21	20	54	89	0	11	266	99	<1	<1	745	86	<1	14
1996/97	29		31	69	387	50	19	31	37	73	0	27	318	99	1	0	851	88		12
1997/98	27		19	81	152	19	32	49	50	80	0	20	663	100	0	0	966	91		9
1998/99	9		56	44	109	28	37	35	14	80	0	20	578	94	6	0	1014	89		11
1999/00	6		<1	>99	148	34	14	52	14	43	0	57	568	97	2	<1	892	90		10

Season	Area 10				Area 11				Area 12			
	Catch t	% Trap	% Deckboat	% Dinghy	Catch t	% Trap	% Deck boat	% Dinghy	Catch t	% Trap	% Deckboat	% Dinghy
Av 80s		100	0	0	-	-	-	-	-	-	-	-
1990/91	-	100	0	0	-	-	-	-	-	-	-	-
1991/92	-	100	0	0	-	-	-	-	-	-	-	-
1992/93	39	100	0	0	30	100	0	0	-	-	-	-
1993/94	32	100	0	0	32	100	0	0	-	-	-	-
1994/95	28	100	0	0	27	100	0	0	-	-	-	-
1995/96	30	83	17	0	18	100	0	0	-	-	-	-
1996/97	29	100	0	0	22	100	0	0	-	-	-	-
1997/98	37	100	0	<1	23	100	0	0	-	-	-	-
1998/99	36	86	11	3	31	100	0	0	-	-	-	-
1999/00	33	96	0	4	31	100	0	0	25	0	0	100

13. THE TUNA FISHERY

13.1 History of Tuna Fisheries in South Africa

The occurrence of tuna species in the oceans off South Africa was first documented by Günther in 1860 from specimens housed in the British Museum. Over the next seventy years, information on the occurrence of tuna species in South African waters steadily accumulated from ichthyofaunal surveys (Gilchrist 1902, Thompson 1918, Barnard 1927) and catches by recreational fishermen off the Cape Peninsula (Biden 1930). Most of these studies considered tuna to be rare in South African waters and Biden (1930) was the first to suggest that tuna may occur in greater numbers than the sporadic sport catches indicated. However, early work did indicate that oceanic fronts such as those occurring off the Cape Peninsula were likely places to find tuna (Thompson 1917, Murphy and Shomura 1955).

By 1948, adequate evidence had accumulated to prompt Molteno (1948) to encourage the development of a commercial fishery for tuna species occurring off southern Africa: albacore, bluefin, yellowfin, bigeye and skipjack. However, at that time commercial fishing interests were focused on the developing trawl fishery for sole (*Austroglossus* sp.) and hakes (*Merluccius* sp.) and were not easily diverted (Lees 1969, Botha 1980). In contrast, successful sport catches attracted increasing numbers of shore anglers to Cape Point and, by the late 1950s, thousands of tuna, mainly small bluefin (presumably southern bluefin tuna, *Thunnus maccoyii*) and yellowfin (*Thunnus albacares*), were being caught annually from the Rooikrantz Ledges in False Bay (Talbot and Penrith 1968).

Despite these early indications of availability of tuna, there are no records of a South African commercial tuna fishery prior to 1960 (Talbot and Penrith 1968). Between 1960 and 1963, Talbot and Penrith (1968) conducted the first methodical longline fishing survey off the SW Cape between Saldanha Bay and Algoa Bay, locating substantial quantities of albacore (*Thunnus alalunga*), bluefin and yellowfin tunas between Port Elizabeth and Lamberts Bay. These results prompted the development of the first South African commercial longline fishery, using the same equipment as on the Japanese longline vessels visiting Cape Town harbour at the time (van den Berg and Matthews 1969, Nepgen 1971).

Early South African longline catches of tunas increased rapidly from 1960 onwards to approximately 2 000 tons by 1962. Bluefin tuna initially contributed the highest proportion of the catch by weight, particularly in winter, with yellowfin tuna predominating in summer (Welsh 1968). Over the next few years, the proportion of albacore caught increased and, by 1963, bluefin and albacore were both contributing about 40% of the catch at a time when Japanese vessels were catching 2% bluefin and 95% albacore (Nepgen 1970). Catches then declined to 1 500 tons by 1965 and became negligible from 1965 onwards, apparently as a result of a poor market for the low quality bluefin and bigeye tuna landed by South African fishermen (Welsh 1968). Instead, South African fishermen turned their attention to developing the more lucrative Vema Seamount rock lobster and west coast hake trawl fisheries (Nepgen 1970, Botha 1980).
Although a few fishermen retained longline permits, these were primarily used to catch demersal shark species, or benthic linefish off deep reefs such as Vema Seamount. The South African commercial tuna fisheries remained inconsequential until 1979 when an unusually high availability of yellowfin tuna off Cape

Point, initially located and targeted by recreational rod and line fishermen, attracted the attention of numerous vessels engaged in the pelagic, demersal and rock lobster fisheries. Experimental purse-seine fishing for these fish proved to be unsuccessful, due to the diffuse and rapidly moving nature of the tuna shoals in the temperate waters off the Cape. However, many vessels successfully adopted the use of baited poles and a record yellowfin tuna catch of almost 5 000 tons was made in 1979.

Complete failure of the expected yellowfin run the following year almost caused the collapse of the fledgling South African baitboat (pole and line) fishery (Penney *et al.* 1992). However, although most of the operators attracted to the 1979 yellowfin occurrence returned to other fisheries, a few of the larger vessels commenced exploratory fishing for albacore to the northwest of Cape Town. The existence of albacore shoals in areas around South Bank, Vema Seamount and Tripp Seamount had been reported many years earlier by a number of authors (Nepgen 1970, Talbot and Penrith 1968), but long steaming distances and cold-storage problems discouraged local fishermen. Those operators that experimented with pole fishing in these areas were well rewarded, however, and initial catches of about 2 000 tons in 1980 rapidly increased over the next few years to develop into South Africa's principal tuna fishery.

Developments in demersal longlining in South Africa for species such as hake and kingklip (*Genypterus capensis*) during the 1980s were primarily responsible for re-awakening interest in tuna longlining (Penney and Griffiths 1999). In an effort to control escalating longline catches of hake, the use of longlines was brought under control of specific longline permits, stimulating a spate of applications for permits, ostensibly to catch tuna, but motivated more by the desire to catch hake. However, re-negotiation of foreign fishing permit conditions under bilateral fishing agreements between South Africa, Japan and Taiwan after 1990 increased local awareness of tuna catches by foreign longline vessels in South African waters. Increasing access to international tuna markets further stimulated South African interest in longlining for species such as yellowfin and bigeye tuna for the fresh fish and *sashimi* export markets.

An initial experimental joint-venture pelagic longline permit issued in 1995 confirmed that these species could be profitably exploited within South African waters. In addition, this initial South African pelagic longline venture achieved high catch rates of large swordfish, resulting in a rapid surge in interest in fishing for this species. In response to subsequent industry motivations, 30 experimental pelagic longline permits were issued to South African fishermen in mid-1997, 20 to existing tuna fishermen and 10 to new entrants, primarily for targeting on tuna species (Penney and Griffiths 1999).

The Japanese commercial longline fishery in the Atlantic Ocean began in western equatorial waters in 1956, expanding into the entire tropical area by the mid-1960s (Uozumi 1996). Initially, yellowfin was the principal target species, although this changed to albacore in the early 1960s. After 1965 part of the Japanese fleet shifted to the Indian and Pacific oceans where southern bluefin and other tunas were targeted. With this shift in effort, nominal effort in the Atlantic decreased from a peak of 97 million hooks in 1965 to 30 million hooks in 1969. The development of super cold freezers in the early 1970s resulted in the introduction of *sashimi* quality Atlantic tunas to the Japanese markets. As a result, fishing effort in the Atlantic Ocean again increased to a peak of 56 million hooks during the 1970s, with the target species shifting to bluefin, southern bluefin and bigeye. Effort was primarily concentrated off Nova Scotia, Morocco, Angola and South Africa, shifting from the western tropical Atlantic to the eastern Atlantic during the decade.

In the equatorial Indian and Pacific oceans, deep longline (DLL) operations were developed in the late 1970s to specifically target bigeye. DLL was introduced to the Atlantic in 1976, and although initially only contributing a minor portion to the total effort in the Atlantic, increased steadily during the following decades. Consequently, whereas albacore and yellowfin had constituted the bulk of the catch in the 1960s, bigeye tuna constituted over 70% of the catch in the late 1980s and early 1990s.

The Japanese longline fishery in the Indian Ocean began in 1952 when the post-war limitations on operational area were removed (Okamoto and Miyabe 1995). In the 1950s the fishing area was limited to waters north of 30°S, extending the following decade to between 30°S and 50°S where good southern bluefin tuna (SBT, *Thunnus maccoyii*) grounds were discovered. The development of super-freezers and demand for *sashimi* quality fish resulted in division of the fishing grounds at about 20°S. In the northern, tropical area, the target species changed to bigeye tuna, whereas SBT targeting intensified south of 20°S. This pattern of fishing has persisted to date. Patterns of Japanese longline effort distribution within the Indian Ocean vary seasonally, with effort being concentrated off South Africa in the 2nd and 3rd quarters, when SBT occur in the region. Indian Ocean effort declined from a peak of 127 million hooks in 1985 to 60 million hooks in 1994, before increasing to the current level of about 75 million hooks.

The Taiwanese longline fishery has essentially followed a similar pattern to that of the Japanese fishery, with a lag of a decade or so. Taiwanese operators purchased older Japanese vessels from about 1970 onwards, as these were phased out of the Japanese fishery. They also initially targeted albacore, and recently shifted effort towards deeper longline sets, targeting bigeye tuna in southern temperate regions, including off South Africa. However, in contrast with the Japanese fleet, a significant proportion of the Taiwanese fleet still fishes in nearshore waters, using shallower sets, catching high proportions of species such as albacore, sharks and, more recently, swordfish. In the South African area, nearshore albacore and swordfish catches compete directly with the South African fishery.

The development of the South African sport fishery is inextricably linked to that of the general commercial line fishery. These two components of the line fishery have developed in unison, using the same vessels, gear and methods to target the same species in the same areas (Pulfrich and Griffiths 1988, Penney *et al.* 1999). The South African commercial line fishery originated in the Cape as a result of the development of Table Bay as a replenishment station for passing ships during the years when the Dutch East India Company plied their trade with the East Indies (Thompson 1913, Muller 1938, Robb 1975). In the late 19th century, linefishing was conducted from sailing vessels of various types, operating out of harbours and off beaches (Pulfrich and Griffiths 1988). Towards the end of the century when larger steam-powered vessels were introduced to exploit the rich demersal fish resources of the southern Cape (Lees 1969), the first linefishing vessels started operating out of

Cape Town and Durban harbours. In these early days, the first recreational fishing was conducted off these same vessels, during occasional charter trips.

Between 1900 and 1940, numerous fisheries harbours developed in the Cape, allowing the line fishery to expand rapidly over this period (Pulfrich and Griffiths 1988, Sauer *et al.* 1997). This and other factors contributed to marked changes in the magnitude and nature of the recreational linefishing sector after 1945 (Penney *et al.* 1999). The most important of these factors was the development of the 'ski-boat', a compact, affordable, trailable, beach-launched vessel of 4m to 6m length, powered by twin outboard engines. Although the first wooden ski-boats were under-powered and limited to near-shore waters, they freed fishermen from constraints imposed by the lack of harbours, allowing effort to be deployed from beaches and river mouths along the coast (Impey 1961, van der Elst and Garratt 1984). These craft provided recreational anglers with their first affordable means of participating effectively in the offshore line fishery, particularly in areas beyond harbours (Mara 1986), and recreational effort expanded rapidly to virtually the entire coast. Entry into the recreational fishery has never been limited and the SA Deep-Sea Angling Association (SADSAA) now has a total membership of over 7 000 people and 4 000 registered boats.

Coincident with the development of the ski-boat was the introduction of rods, reels, nylon line and eyed hooks to replace the natural fibre handlines originally used throughout the South African line fishery (Pulfrich and Griffiths 1988), contributing to effort increases. Technological developments have continued to contribute to creeping effort increase in this sector, particularly the development of colour echo-sounders and Global Positioning System (GPS) navigation systems in the 1990s.

Recreational targeting on tunas started in the Western Cape, following initial catches by shore anglers in False Bay (Biden 1930). Availability of fisheries harbours and small craft rapidly led to development of a targeted tuna sport fishery, primarily targeting yellowfin tuna and albacore, which operates out of harbours along the Cape Peninsula to this day. In Natal, expansion of recreational fishing effort northwards, coupled with management measures restricting catches of reef fishes, led to increased targeting on gamefish, including giant mackerels, marlins, sailfish and yellowfin tuna (Penney *et al.* 1999). More recently, larger ski-boats operating out of the Eastern Cape have developed a recreational fishery on the yellowfin tuna, which annually migrate southwards in the Agulhas Current. These recreational Cape tuna and Natal gamefish fisheries remain important components of the South African recreational boat-based line fishery.

South African tuna fisheries can be divided into 4 distinct fisheries, viz. the sport fishery, the baitboat fishery, the pelagic longline fishery and the foreign pelagic longline fishery.

13.2 The Tuna Sport Fishery

Different vessel types are used by the recreational sector to target tunas and gamefish in different areas. In the Cape Peninsula area, larger gamefishing craft (8m - 15m) operating out of Cape Town, Hout Bay, Simonstown and Gordons Bay harbours are used to fish for yellowfin, bigeye, albacore and, most recently, swordfish, at distances up to 50nm offshore. In other areas, recreational ski-boats ranging in size from 3.8m to 8m in length, powered by twin 50 hp to 150 hp outboard or inboard engines and crewed by two to eight anglers, are used. These vessels all make single day (or night, in the case of swordfish) trips, and fish are either retained for consumption or sold to tuna dealers. To date, this sale has been legal, as most of the larger recreational gamefishing vessels in the Cape currently carry commercial linefish B-permits. In fact, the catch rates of species such as yellowfin tuna by the larger gamefishing vessels using trolled lures are often better than those by the baitboats using poles.

The fishing gear used is fairly standard throughout the sport fishery, and recreational anglers have adopted the same rods, reels and nylon fishing line as used in the commercial line fishery. As a result of the higher degree of recreational targeting on gamefish, the recreational sector tends to make more use of trolling techniques, using larger gamefishing reels and artificial lures. In particular, increased use of Rapala® lures during the 1980s and 1990s greatly increased the efficiency of fishing for gamefish. During the early 1990s, few recreational ski-boats carried echo-sounders. However, from about 1970 onwards, recreational anglers increasingly adopted echo-sounders, colour sounders and GPS navigation units, contributing to increased effective recreational angling effort.

13.3 The Tuna Baitboat Fishery

From its inception, the South African tuna baitboat fishery has predominantly exploited albacore (*Thunnus alalunga*), with species such as yellowfin (*T. albacares*), bluefin tuna (initially assumed to be a single species, *T. thynnis,* but actually comprising northern bluefin and southern bluefin tuna, *T. maccoyii*) and bigeye tuna (*T. obesus*) generally being caught as a by-catch. Even in the 1960s, during the initial period of longline fishing off South Africa, albacore dominated the catch, despite the comparatively high availability of bluefin tuna. As availability of other species declined, and the industry switched to using pole and line, the proportion of albacore increased. The current baitboat fishery is almost entirely dependent on catches of albacore, which account for approximately 90% of the total annual South African baitboat catch.

<u>SA Baitboat Fishing Areas</u>
Taiwanese tuna longline catch statistics indicate that albacore occur over much of the South Atlantic Ocean throughout the year. There are, however, certain times of year when they appear to be more concentrated in the area of the sub-tropical convergence, which supports large numbers of albacore from March to June. After this they shift to the area off the Cape and Namibia from May to August, when shoals of pelagic bait fish move down the south-west African coast. Adult albacore build up fat deposits prior to migration and spawning (Sharp and Dotson 1977) and this is therefore a good area for them to forage for this purpose.

Because limited intermixing does appear to occur between the albacore and yellowfin tuna resources of the Indian and Atlantic oceans off southern Africa (Morita 1978), consideration must be given to whether South Africa exploits Atlantic or Indian ocean stocks of these species. The sport fishery has always exploited tuna in the area off Cape Point (34∀35\S, 18∀19\E), while the commercial fishery has directed effort to Tripp Seamount, Vema Seamount and South Bank off the west coast (29∀32\S, 14∀17\E).

Albacore have been caught predominantly in the northern part of this range and yellowfin in the southern area bordering the Agulhas Bank. Commercial fishermen have always considered that albacore in the Benguela region migrate down from further north, or up from the southern Atlantic via the sub-tropical convergence. Movement of individual shoals and tagged fish tends to support this conclusion (Penney *et al.* 1998) and few albacore are caught on the Agulhas Bank. All indications are therefore that the albacore exploited by South Africa come from the southern Atlantic resource.

With the introduction of tuna logbooks in 1987, detailed data on catch per 1° block became available. Using these data, Penney *et al.* (1992) and Penney (1994) presented albacore catch distribution maps which show that catches are predominantly made in areas characterised by seabed topographical features that concentrate surface shoals of medium-sized albacore, notably Tripp Seamount off Namibia, South Bank off the west Cape and the Cape Canyon, which bisects the continental shelf off Cape Town (see Figure 13.1 below). To the south, in the vicinity of Cape Point (the southwest Cape), smaller vessels, including recreational and sports fishermen, target on albacore within 60 nautical miles of the coast, usually during daily fishing trips. Off the South African west coast (the West Cape), commercial ice and freezer vessels target on albacore up to 180 nautical miles offshore, particularly in the vicinity of South Bank (31°S, 16°W), during trips of one to two weeks' duration. Further north (off Namibia), the largest vessels, including many freezer vessels, fish on the important Tripp Sea Mount fishing grounds, also up to 180 nautical miles offshore.

Catch rates of albacore in these three areas differ for a number of reasons. Shoaling behaviour and seasonal occurrence differ, affecting local availability in each area. Different gear is used, with sports vessels localised in the SW Cape using rod and line whereas commercial vessels use baited poles. The larger ice and freezer vessels, generally equipped with efficient navigation and colour-sounder systems, have the range and endurance to access the further grounds, and to remain on located tuna shoals for longer periods. There are indications from length-frequency data that fish from these areas also differ in size, with fish from the northern, offshore Tripp Seamount fishing grounds being slightly larger than those caught near the shore off Cape Town (Penney 1994). The South African tuna fishing area has therefore been divided into three statistical areas (see Figure 13.1). The relative importance of these three areas in terms of catch is indicated in Table 13.1 below.

Table 13.1. Annual South African catches of southern albacore in three main fishing areas off the southwest African coast (see map in Figure 13.1) from 1985 to 1992 (Penney 1994).

AREA	1985	1986	1987	1988	1989	1990	1991	1992
Namibia	3200	2900	3070	3670	2940	1780	0	370
W Cape	890	1640	1900	1520	1440	1490	960	3160
SW Cape	2610	1390	2300	1380	2510	2010	2450	2830
Total	6700	5930	7270	6570	6890	5280	3410	6360

Of the three areas, Tripp Seamount has always been the most productive albacore fishing area, followed by the SW Cape. However, following Namibian independence in 1990, after which Tripp Seamount fell within Namibian waters, South African effort on Tripp Seamount declined sharply, with no South African catch being reported from the area in 1991. In contrast, yellowfin tuna have been caught primarily in association with warm Agulhas Current water, mainly off Cape Point and the edge of the Agulhas Bank. As boat sizes, hold capacities and freezer facilities have increased, there has also been a tendency for vessels to operate further offshore, and small catches of albacore, yellowfin and bigeye tuna being made further northwards (up to 10\S) during exploratory fishing.

SA Baitboat Fishery Season

Availability of albacore in the Benguela region shows marked seasonal fluctuations. Catches of albacore in the south-eastern Atlantic tend to peak around March/April each year in the longline fishery (Yang 1984, 1985, 1986) and in September in the sport fishery (Rose, pers. comm.) with very few mature fish being taken in November, December and January. Juvenile or immature albacore of 5 - 15kg are found throughout the year in nearshore waters in the Benguela system, where they are regularly taken on the troll by sport fishermen.

Availability of albacore to the South African baitboat fishery follows a fairly consistent annual cycle, fish being most available in the austral summer and autumn months from November to May and practically absent during winter (Penney *et al.*1992). The albacore catch cycle is partially influenced by the squid (*Loligo vulgaris reynaudi*) fishing season on the Agulhas Bank. This typically extends from June to December and many tuna fishermen participate in this lucrative fishery. Exploratory fishing has, however, confirmed that albacore are generally not available at this time. Albacore availability within South African waters, particularly in the nearshore waters, also exhibits inter-annual variations that do not appear to result solely from the abundance of the albacore resource, but rather from changes in local proportional availability in response to larger scale oceanographic changes (such as El Niño events).

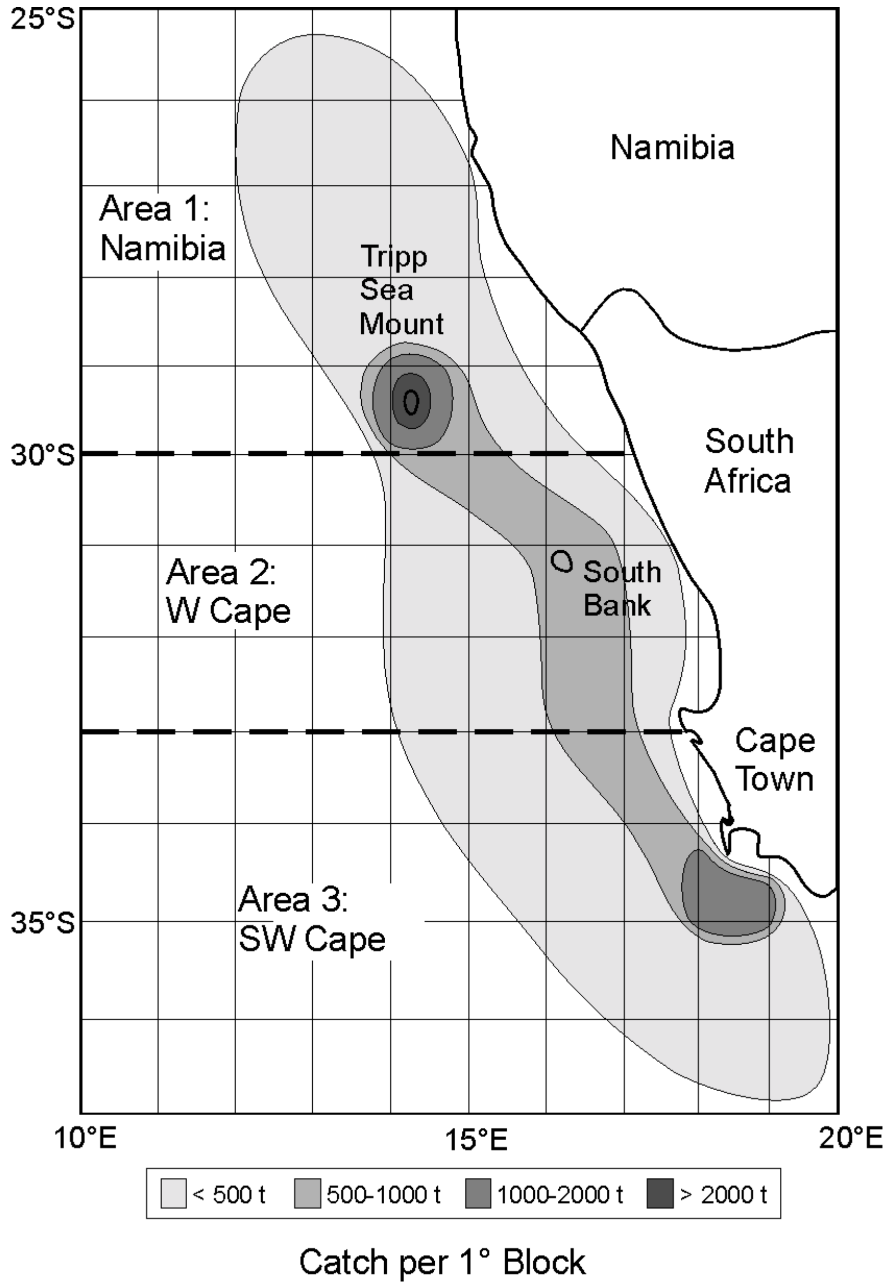


Figure 13.1.
Map of the southwest African coast showing the typical annual distribution of South African albacore catches off Namibia and South Africa and the three main statistical areas (Namibia, West Cape and Southwest Cape) (from Penney 1994).

<u>SA Baitboat Fishery Effort Trends</u>

Collection of vessel-specific catch and effort returns from South African tuna vessels started in 1985, with the introduction of the National Marine Linefish System (NMLS). At that time, there were no specific vessels dedicated to the catching of tuna, with vessels being diverted from other fisheries at times when albacore or yellowfin tuna (*Thunnus albacares*) were particularly abundant in nearshore (<25nm) waters. To a large extent this is still the case, and the vessels comprising the current tuna fleet are also active participants in the squid (*Loligo vulgaris*) jigging, snoek (*Thyrsites atun*) handline and inshore line fisheries. Targeting generally follows the seasons of maximum availability of the species concerned, but vessels frequently change from one species or area to another on a weekly or daily basis. As a consequence of this multi-species nature of South Africa's line fisheries, NMLS data do not distinguish between dedicated "tuna" vessels and those used predominantly in other fisheries.

The total number of vessels reporting line catches of tuna to the NMLS ranged between 200 and 300 vessels between 1985 and 1993. However, many of these are incidental or "recreational" participants in the fishery and there are only 100 - 150 larger vessels that participate in the South African tuna baitboat fishery on a regular basis. These vessels form only part of the 2 800 registered linefishing vessels fishing for approximately 120 different line-caught fish species, and reporting data to the NMLS. It is difficult to distinguish tuna vessels using existing data, apart from by their catches, and many of the vessels participating in the tuna fishery change from year to year, depending on availability of tuna or alternate target species.

Tuna-directed effort in the South African baitboat fishery has increased steadily since 1980. Purse-seine vessels have not been used since 1986 but the number of freezer and ice-boats deployed increased from 74 in 1985 to a maximum of 129 in 1989. As a result of poor catches, the number of freezer and ice-boats decreased to 115 in 1990. There has also been a gradual increase in size and hold capacity of boats and conversion from ice to freezer storage, but these power-factor increases have not been quantified. An index of tuna-directed effort expressed in boat-days fished has only been available since the introduction of tuna logbooks in 1987. Prior to this, reported effort for tuna could not be separated from effort targeted on the approximately 130 other species caught in the inshore line fishery.

Vessels participating in the South African baitboat fishery range in size from 5m ski-boats, carrying as few as 3 crew, to 30m or longer freezer vessels, carrying up to 30 crew. There is, in fact, a close relationship between size of vessel and number of crew carried, as South African marine safety regulations limit the maximum permissible number of crew on any vessel to the length of the vessel in metres. Although the actual type of vessel (ski-boat, ice-boat or freezer boat) is not indicated on returns submitted to the NMLS, a histogram of the mean number of vessels with various crew complement between 1985 and 1993 (see Figure 13.2 below) is tri-modal.

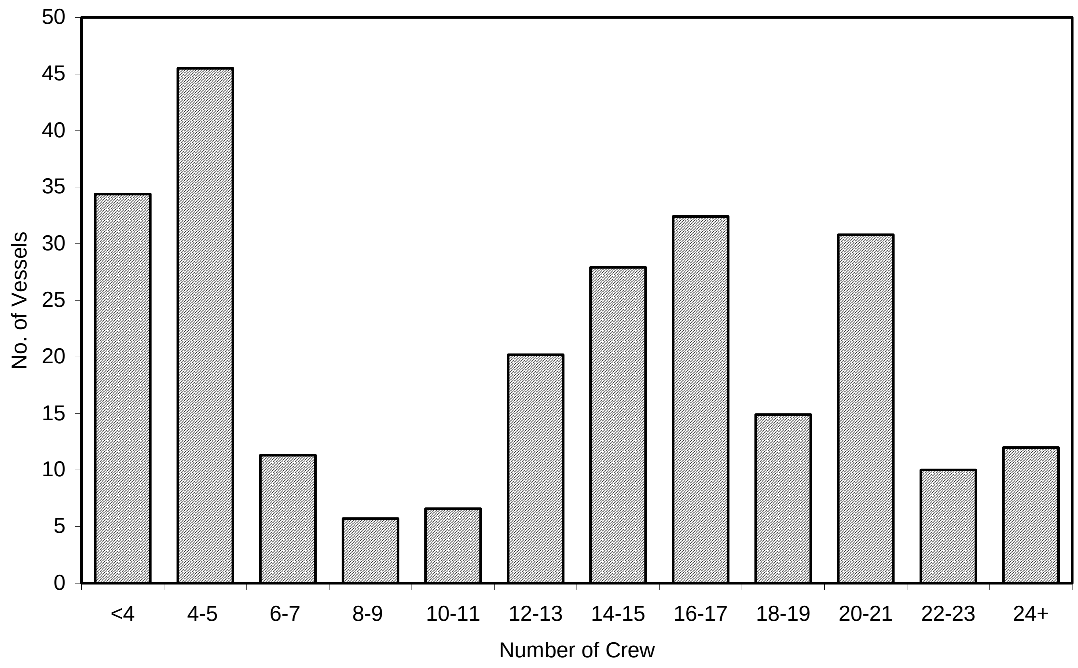


Figure 13.2. Histogram of number of tuna vessels carrying various numbers of crew, averaged over 1985 - 1993 (from Penney *et al.* 1992).

These modes in crew numbers reflect the types of vessels involved. Vessels with less than 10 crew are generally recreational ski-boats, gamefishing vessels or small commercial vessels occasionally used for tuna fishing. Vessels with 10 - 20 crew are generally ice-boats, particularly the older vessels diverted into the tuna fishery from other linefishing activities. However, this category also includes newer, smaller vessels, some with freezer capabilities, but with limited duration at sea. The vessels carrying more than 20 crew are generally the largest vessels, equipped with freezer facilities, and with extensive range and duration capabilities. In addition to being part of the effective effort equation for each vessel, the number of crew therefore also provides an index of the vessel size and type, and therefore of the equipment and capabilities of the vessel.

SA Baitboat Fishery Catches

Presenting estimated total catch data for the South African tuna fishery, Penney *et al.* (1992) noted that catches had been under-reported by 20% to 30% between 1980 and 1990, and had probably reached 7 000 tons to 8 000 tons in years of good catches. During 1992 and 1993, dealer return logbooks, initially introduced to a few dealers in 1991, were issued to all major tuna dealers. Discussions were also held with representatives of the South African tuna industry to try and obtain consensus on the likely magnitude of under-reporting. It was evident that catches had been under-reported, largely as a result of efforts to avoid trade restrictions on export of South African tuna between 1980 and 1990. During this period, a proportion of the South African catch was exported under foreign flag under trade agreements with other nations fishing in South African waters. More recently, South African fishermen were excluded from Tripp Seamount, the most productive surface albacore fishing area off southwestern Africa, following the declaration of Namibian independence in March 1990. In response, joint-venture fishing agreements have been negotiated between South African and Namibian fishing interests and a proportion of the South

African vessel albacore catch was landed as Namibian fish, and therefore not reported to South African statistical systems.

The magnitude of under-reporting was estimated by determining total purchases from dealer returns and total exports from export data obtained from the Department of Customs and Excise for recent years (1992 onwards). These latter data provide the most accurate estimate of total exports by South African fishermen and, since almost all of the South African tuna catch is exported, South African catch data have been revised to these export totals. Local dealers and industry representatives also reported that the total tuna catch had reached a peak of 8 000 tons in 1987, and had been approximately 6 500 tons in 1992.

Compared with data reported on dealer returns, these totals indicate that catches were consistently under-reported in log-books by 25% - 27%. Reported catches from 1972 to 1992 were therefore corrected by scaling them up by a constant 25% and rounding them to the nearest 10 tons. The revised total catches, as now reflected in the ICCAT Statistical Document Series, are shown in Table 13.2 below.

Table 13.2. Revised estimated total South African catches of South Atlantic albacore from 1972 - 1992 (From ICCAT 2002).

YEAR	ESTIMATED TOTAL CATCH (MT)	YEAR	ESTIMATED TOTAL CATCH (MT)
1972	100	1987	7275
1973	100	1988	6570
1974	150	1989	6890
1975	150	1990	5280
1976	150	1991	3410
1977	150	1992	6360
1978	150	1993	6881
1979	480	1994	6931
1980	1850	1995	5214
1981	2320	1996	5634
1982	3180	1997	6708
1983	2760	1998	8412
1984	3540	1999	5101
1985	6697	2000	3610
1986	5930		

Total annual South African tuna catches between 1972 and 2000 are shown in Figure 13.3 below. The high yellowfin catch in 1979 and the subsequent rapid increase in albacore catch are clearly illustrated, as is the dominance of albacore in the fishery. Both yellowfin and bigeye tuna only contribute sporadically to catches in years of increased availability of these species and there is no effort directed at skipjack tuna. The sporadic availability of yellowfin and bigeye tuna appears to result from favourable oceanographic conditions extending the peripheral ranges of these species into the Benguela region, and these species are largely caught as a by-catch.

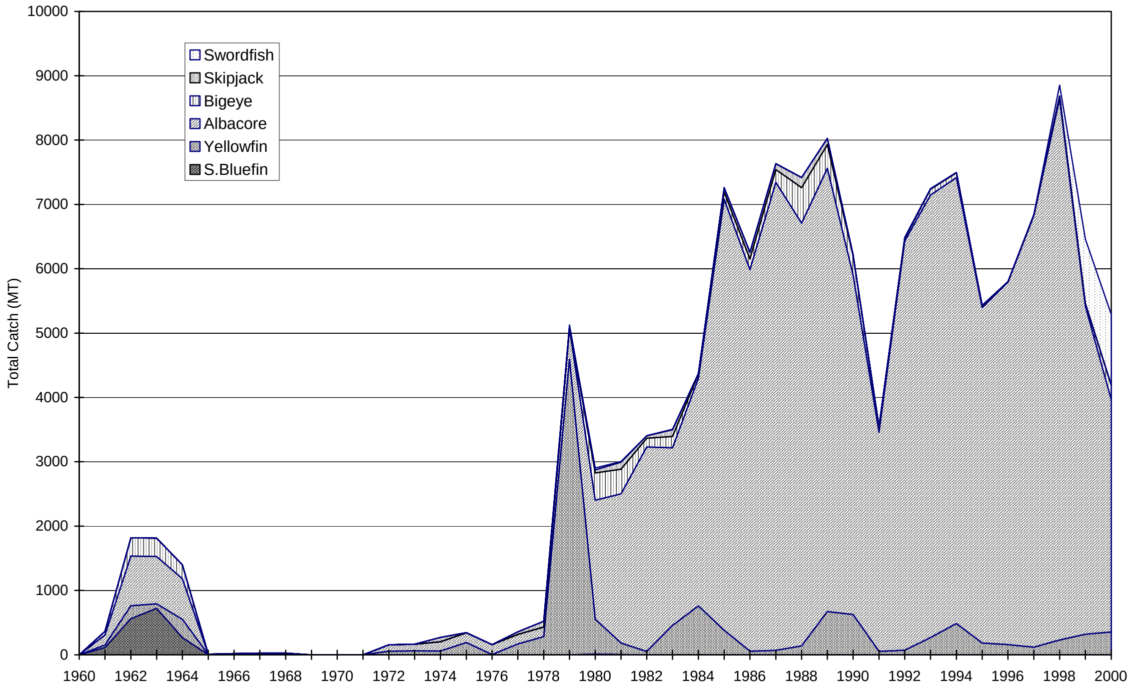


Figure 13.3. Estimated total annual South African catches per species of tunas and swordfish from inception of the first tuna longline fishery in 1960 up until 2000. Note the abnormally high yellowfin catch in 1979, the subsequent development of the baitboat fishery dominated by albacore and recent catches of swordfish in the pelagic longline fishery.

13.4 The Pelagic Longline fishery

The South African experimental pelagic longline fishery has had an extremely difficult start-up period, following the first issuing of 30 experimental permits in 1997. Problems have resulted primarily from the industry's desire to catch swordfish (in addition to tuna species), South Africa's lack of a swordfish quota allocation at ICCAT, and resultant disputes over swordfish access rights and permit conditions between Marine and Coastal Management and the permit holders. In particular, permit condition disputes, and repeated expiry of short term permits from 1997 – 1999, resulted in many of the original permit holders re-flagging their vessels and fishing on the high-seas, or under contract in Namibian waters.

The South African pelagic longline fishery is currently still an experimental fishery, with 26 permits currently issued out of a total of 30 originally issued in 1997. Of these, some 15 - 20 are active (varying with vessel availability). These permits primarily target large tunas (bigeye, *Thunnus obesus* and yellowfin, *Thunnus albacares*) for the Japanese *sashimi* market, and swordfish (*Xiphias gladius*) for fresh (iced) export. Many of these vessels fish near the edge of, or on, the continental shelf, where by-catches of sharks are often also significant. Variable *ad hoc* observer coverage has been placed on these vessels since 1997. Data have been summarised for 30 of the 33 observer trips made, covering a total of 275 186 hooks deployed between July 1998 and July 2001.

SA Pelagic Longline fishing Areas

The areas exploited by the current South African pelagic longline fishery are expanding as South African fishermen accumulate pelagic longlining experience. Initially, from 1997 - 1998, exploratory fishing was primarily conducted over an area ranging from off East London to the South African southeast coast off Namibia, from about 15° to 30° E (see Figure 13.4). Although some fishing occurred outside South African waters, most fishing was conducted between 50nm and 100nm offshore, along the edge of the continental shelf. Catches were therefore made in fairly close association with the Agulhas Current, which follows the shelf edge around southern Africa (Gründlingh and Lutjeharms 1979). Catch rates of yellowfin tuna and swordfish are highest within these warmer Agulhas Current waters, whereas bigeye tuna tend to be more abundant at oceanic fronts between the Agulhas Current and cooler water further to the south or west.

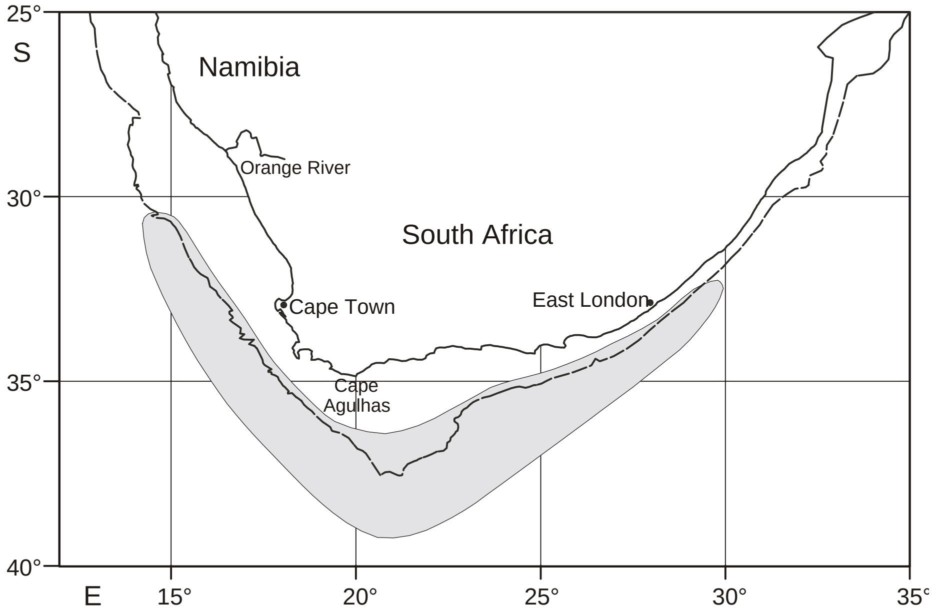


Figure 13.4. Map of southern Africa showing the 200m depth contour (dotted line) and the main pelagic longline fishing area (shaded).

More recently, local longline fishermen have been fishing further north in or off Namibian waters, and further west, exploiting the fishing areas on the Walvis Ridge and out onto the mid-Atlantic Ridge, that are intensively fished by distant water longline fleets from Spain, Taiwan and Japan.

A variety of vessels are used in this fishery, from converted beam trawlers to small purchased or chartered longliners. Although a few vessels have been specifically purchased for use in this fishery, others are contracted under some form of joint venture agreement, particularly those being used by new entrants. The vessels range in size from 30m to 54m, and have been rigged for pelagic longlining with American mono-filament fishing gear used in North and South Atlantic longline fisheries. Typically, 20m long buoylines and 20m long trace lines are used, so the gear effectively fishes at a depth of 40m. The lines are typically deployed in a single night set in each 24-hour period, and hauled the following day. Traces are baited with squid and lightsticks and clipped to the main line during the set. The length of line deployed averages between 35nm and 40nm per night, and the number of hooks ranges from about 750 to 1 500 per set.

SA Pelagic Longline Catch Composition

Composition of catches has changed as the fishing areas have been extended, and as permit holders accumulated local experience. Initially, the most abundant species (in numbers) in catches was swordfish, followed by bigeye tuna, yellowfin tuna, albacore and sharks. Although southern bluefin tuna are known to be a target species of Asian longliners operating off southern Africa, South African vessels appear to be fishing too close to the coast to catch this species, and have caught few southern bluefin tuna so far.

As fleets have moved into more temperate or offshore waters, the proportion of temperate tunas in the catch has increased. The observed fishing effort achieved a total catch of 14 236 fish (see Table 13.3 below). Elasmobranchs, mostly blue sharks, contribute more to catches than any single teleost species, 3 912 sharks caught making up 28% of the catch, with the highest overall CPUE of over 14 sharks / 1 000 hooks. The next highest CPUE (in number) was for the by-catch species albacore (longfin tuna, *Thunnus alalunga*), 3 471 caught at 12.6 fish / 1 000 hooks, and then swordfish, 3 004 caught at 10.9 fish / 1 000 hooks (see Table 13.3 below). A total of 2 976 other large tunas (yellowfin and bigeye tuna) were caught.

Table 13.3. Species composition of observed catches by South African experimental pelagic longlines between July 1998 and July 2001 showing a) the overall composition of the catch in numbers, % and CPUE / 1 000 hooks, and b) the composition of the elasmobranch by-catch in numbers, % and CPUE / 1 000 hooks.

SPECIES	NO. CAUGHT	% IN CATCH	CPUE
a) All Species			
Albacore	3471	24	12.6
Swordfish	3004	21	10.9
Yellowfin tuna	1933	14	7.0
Bigeye tuna	1043	7	3.8
Other teleosts	873	6	3.2
Elasmobranchs	3912	28	14.2
b) Elasmobranchs			
Blue shark	2918	75	10.6
Mako shark	530	14	1.9
Pelagic Ray	376	9	1.4
Thresher shark	37	1	0.1
Crocodile shark	26	1	0.1
Copper shark	4	0	0.0
Porbeagle	4	0	0.0
White-tip shark	3	0	0.0
Cookie-cutter shark	2	0	0.0
Manta Ray	2	0	0.0
Dusky shark	1	0	0.0
Hammerhead	1	0	0.0
Other sharks	8	0	0.0

SA Pelagic Longline Size Composition

Data have been analysed for a proportion of the fish measured during the scientific observer cruises. 2 366 swordfish ranging in size from 80cm to 290cm LJFL were measured, and show a strong mode from 170 - 190cm and a mean LJFL of 182cm. There is also little discernible difference between the size frequency of swordfish caught in the ICCAT area (W of 20° E) and the Indian Ocean Tuna Commission area (E of 20° E).

A fairly narrow size range of bigeye are caught, and the 584 fish measured ranged in size from 110cm to 190cm, with a single mode at about 140cm. Yellowfin tuna are primarily caught in warmer Agulhas Current water to the south and east of Cape Agulhas, and are scarce in catches in the ICCAT area. 292 yellowfin, ranging in size from 120cm to 180cm fork length, were measured. These showed a similar size range to bigeye tuna, but with a mode at 150cm, somewhat larger than that of bigeye tuna. The 162 measured albacore ranged in size from 70cm to 120cm fork length, averaging about 100cm. This is somewhat larger than the albacore caught in the South African pole and line fishery, which average about 90cm fork length.

The shark species caught occur throughout the year, and across a wide size range. Mako sharks are generally retained, whereas blue sharks are discarded. Blue and mako sharks caught range from 50cm to 3m fork length, with a strong mode at 1.1 - 1.2m, most of the sharks caught being less than 2m fork length. The thresher sharks caught are far larger and most break free, or are cut loose. Those that are brought aboard range from 1m - 3m fork length, with most being larger than 2m. In contrast, most of the copper sharks landed are less than 1.5m fork length. Catches of sharks are generally not welcome in this fishery, and usually coincide with poorer catches of tuna and swordfish. Gear damage caused by sharks is substantial and fishing positions are generally moved when blue shark catch rates are high.

There is little information available on the size distribution of past catches of swordfish, bigeye and yellowfin tuna in South African waters. However, measurements of a few swordfish caught in South African waters by recreational and commercial fishermen prior to 1997 indicated that they were large in comparison with mean sizes of those caught in other areas of the Atlantic Ocean. These data confirm those early results. All bigeye and yellowfin tuna caught were large adults, similar in size to those caught in the southern Atlantic and Indian Ocean regions by Asian longliners.

The size of swordfish caught was also consistently large, with few (0.4%) being below the ICCAT minimum size limit (125cm LJFL). The mean size of swordfish caught (182cm) was also larger than swordfish currently caught in North Atlantic fisheries, most of which range from 100cm to 200cm LJFL, with a strong mode between 125 and 175cm (ICCAT 1997, Stone and Porter 1997a), and substantially larger than swordfish caught in the Mediterranean Sea, most of which range from 80cm to 150cm LJFL, with a mode at 100 - 120cm (ICCAT 1997).

SA pelagic longline catch rates

Catch rates also vary substantially in this fishery, depending on the success with which suitable water masses are located on each cruise. Catch rates for target species are also typically lower at the start of each trip, increasing as suitable water masses are located. Initially, South African catch rates of swordfish were almost an order of magnitude higher than those reported in other fisheries. While swordfish CPUE ranged from near zero to over 9kg/hook, it averaged 3kg/hook over 1997 - 1998. In comparison, swordfish CPUE in the Azores based North Atlantic fishery declined from 1kg/hook to 0.2kg/hook between 1987 and 1993 (Simões 1995), while that off Cyprus in the Mediterranean Sea declined from 0.5kg/hook to 0.1kg/hook from 1978 to 1993 (Economou and Konteatis 1995). Even in the southern Atlantic Ocean, where substantial exploitation of swordfish has been relatively recent, Brazilian-Japanese CPUE has seldom exceeded 0.3kg/hook (Nakano 1995).

These high catch rates, in combination with the large mean size of swordfish caught in the South African fishery, indicate that the swordfish resource in the southern African region was lightly exploited. This conflicts with stock assessments produced by ICCAT for the 'southern Atlantic' swordfish stock, which indicate that southern Atlantic swordfish are over-exploited. This suggests that swordfish occurring off southern Africa either do not form part of an over-exploited southern Atlantic stock, or constitute a partially resident component of that stock. Catch rates have subsequently declined to become more similar with those in the southern Atlantic and Indian oceans.

There appears to be a strong association of swordfish with the edge of the continental shelf off southern Africa, and particularly with the Agulhas Current running along the 200m depth contour (see Figure 13.4). This is a similar distribution pattern to swordfish in other parts of the world, such as the concentration of swordfish along the 200m depth contour, in association with the Gulf Stream, off Novia Scotia, Canada (Stone and Porter 1997a, b). This association with the Agulhas Current, coupled with the contrast between swordfish catch rates and size structure in the southern African and other southern Atlantic regions, suggests that the swordfish caught off southern Africa may be derived from an Indian Ocean stock, migrating into the Agulhas and Benguela upwelling regions to feed on the rich prey resources occurring there. This has recently been confirmed by analysis of genetic samples from the Agulhas region (M. Griffiths, pers. comm.), which indicate the presence of Indian Ocean swordfish in the area.

13.5 The Foreign Pelagic Longline fishery

Japanese and Taiwanese fishermen have been issued with permits to fish in South African waters for tunas and associated species using longlines for the past thirty years, in terms of an inter-governmental Bilateral Fisheries Agreement. The number of permits issued to Japan has been decreased over the past decade from 100 to 69 (in 2001), and those to Taiwan from 60 to 12 over the same period.

Japanese vessels primarily target southern bluefin and bigeye tuna for their *sashimi* market, although catches of yellowfin tuna have increased to dominate catches in recent years (see Table 13.4 below). The only other species caught in any number is their original 1960s target species, albacore, which contributes 13% of the catch.

In contrast, the Taiwanese vessels still primarily target albacore (with shallower sets) for canning, bigeye tuna (using deeper sets) for the *sashimi* market and swordfish for frozen export. The trend over the past 5 - 10 years has been towards increasing catches of bigeye (with some southern bluefin tuna) and swordfish. Unlike the Japanese fishery, Taiwanese fishermen, particularly those fishing for albacore in near-shore waters, catch substantial numbers of sharks.

Past catch returns indicate that certain vessels may specifically target sharks, while previous investigations have ascertained that sharks are occasionally targeted during the last few days of a trip to provide the crew with a 'bonus'. These investigations have also confirmed that the key reason for this occasional targeting is primarily for fins for the lucrative shark fin export market. During the last bilateral fisheries agreement negotiations, the South African government indicated its probable intention of terminating Taiwanese fishing permits at the end of 2002. Should this occur, the impact of Taiwanese fishing in our region will decrease substantially, provided this prohibition is effectively implemented.

Table 13.4. Reported catch (MT dressed weight) per species by Japanese longliners permitted to fish in South African waters from 1997 - 2000.

ALL SPECIES	**1997**	**1998**	**1999**	**2000**	**TOTAL**	**%**
Southern bluefin tuna	36.1	86.313	25.757	41.605	189.8	1.5
Albacore	462.4	504.919	241.423	382.587	1591.3	12.8
Bigeye tuna	1195.6	1210.626	384.251	555.777	3346.3	27.0
Yellowfin tuna	111.2	1789.078	2235.835	1561.893	5698.0	46.0
Swordfish	262.4	240.757	159.011	163.299	825.5	6.7
Striped marlin	9.1	19.458	17.234	9.412	55.2	0.4
Blue marlin	12.1	17.117	18.421	10.068	57.7	0.5
Black marlin	16.5	20.812	28.55	19.013	84.8	0.7
Sailfish	0.4	0.887	1.061	0.297	2.7	0.0
Shortbill spearfish	0.1	0.223	2.088	0.206	2.6	0.0
Skipjack	0.0	0.056	0	0.019	0.1	0.0
Sharks	78.3	59.5	49.2	76.5	263.6	2.1
Basters	0.133	2.291	0.083	0.052	2.6	0.0
Others	76.2	55.211	55.546	87.293	274.2	2.2
Total	2260.5	4007.3	3218.5	2908.0	12394.2	100.0

13.6 Economic Data

The following comments must be borne in mind when interpreting the economic data collected for the above described tuna fishery sectors, and when attempting to assess the possible economic consequences of various rights allocation changes or shifts within or between the sectors.

South African Sport Fishery

Economic data for the recreational sport fishery sector were collected by means of questionnaires circulated through the SA Deep-sea Angling Association club structures, specifically to those members who fish primarily for tuna (or other gamefish). Only 55 out of the requested 100 to 200 questionnaire returns were returned. Given that SADSAA currently has some 7 000 members, operating about 4 000 fishing craft, this certainly does not provide a statistically adequate data set for the affiliated recreational sector. However, only a few hundred SADSAA members primarily target tuna species, and the questionnaires received probably do reflect the general characteristics of the more active of these gamefishing members.

Recreational fisheries data often report species in groups, and the questionnaire returns reflect this. References in the data to “tuna” must be interpreted depending on the area. In Natal and the Eastern Cape, the most common recreationally caught tuna, when targeted, is yellowfin tuna. When caught as a by-catch, Natal fishermen catch quantities of commercially unimportant species, including eastern little tuna, skipjack and striped bonito (see Penney *et al.* 1999 for a comprehensive table of Natal recreational target species). In the Western Cape, yellowfin is also a prime target tuna species but, due to its fluctuating availability, most of the “tuna” catch is, in fact, albacore, with a small component of bigeye tuna. Off the Cape Peninsula, the recreational gamefish boats are therefore often to be found fishing among commercial pole vessels, and the pole boats often rely on the recreational fleet to locate albacore shoals when these are sparsely distributed.

Strictly speaking, in terms of current legal definitions, it is incorrect to refer to many of the current tuna sport fishermen as ‘recreational’, as many of them, particularly those in the Cape, carry commercial linefish B-licenses. Prior to 1985, any vessel could apply for a commercial license, which permitted them to sell fish within fisheries harbours, and most boat-anglers in the Cape did so. At that time the line fishery was not recognised as a specific fishery sector, and no commercial linefish permit system existed. When linefish permits were first established (and limited) in 1985, all those vessels that carried licenses to sell fish qualified for linefishing permits. Most of the ‘recreational’ fishermen operating out of fisheries harbours qualified for the category of ‘part-time commercial’, or B-permit, line fishermen. In total, about 2 500 B-permits and 500 A-permits were issued.

The current linefish rights allocation proposals aim to withdraw virtually all the B-permits, particularly from part-time (‘weekend’) fishermen. While this will not affect recreational fishermen that currently do not have B-permits (including most of the SADSAA members), this will constitute a substantial withdrawal of rights from part-time fishermen, many of whom have held these commercial permits for more than a decade. This will include many of the larger gamefishing vessels which operate out of harbours on the Cape Peninsula, and currently carry B-permits. More important than the withdrawal of the right to sell fish, these B-permit vessels are currently permitted to make unlimited catches of tuna species. After withdrawal of the B-permits, these boats will be forced into the ‘recreational’ sector, where they will be limited to a maximum of 10 tuna per man per day.

The true recreational tuna fishing sector does differ substantially from the genuine commercial (fisheries-income dependent) commercial sector, in that fishing expenses are substantially higher than any income derived from fishing. For those fully recreational fishermen that do not sell catches, no income is derived from fishing, and fishing activities are entirely subsidised by income earned from other occupations. From the data received, affiliated sport fishermen own fishing equipment (including boats and tow vehicles) to the average value of R332 000, and spend an average of R64 000 per year on their fishing activities (including accommodation, travel and fishing-related costs). In return, they catch an average of 326kg of fish, during an average 31 days fishing. Even if these catch and effort figures are under-reported, it is clear that affiliated recreational anglers make no profit from fishing.

The recreational gamefishing sector does not provide much direct employment, apart from a few crew, cleaning staff and drivers. However, the sport fishing sector supports a substantial industry associated with boat building and maintenance, supply of fishing equipment (engines, rods, reels and lures), supply of tow vehicles and tourism (both local and foreign) related to fishing. In developed countries such as the United States and Australia, the general recreational linefishing sector is substantially larger, and economically more important, than the commercial linefishing sector. In these countries, it is often argued that the economy derives more benefit from allocating linefish to the recreational sector, than to the commercial sector. This is only partly true for tunas and swordfish, which support substantial and economically important commercial fisheries around the world. Where recreational catches are too small to affect commercial quota allocations or market prices, which is the case in South African tuna fisheries, the recreational and commercial sectors can certainly coexist. The proportional rights allocation between them then needs to be adjusted to maximise the overall benefit to the economy.

South African Baitboat Fishery

Economic data for the baitboat fishery were also collected using questionnaires, but these were supported by direct interviews, telephonic interviews and faxed queries where necessary. Most of the active baitboat fishery participants are members of the SA Tuna Association (SATA), which has represented the interests of tuna fishermen for over a decade. Questionnaires were therefore distributed and completed with the assistance of the SATA Executive Committee. In addition, existing SATA databases, collected to keep track of members' catches, levy payments and safety certificate requirements, were used to supplement information provided directly by the members. Of the 123 current SATA members approached, 81 (66%) returned completed questionnaires. This is a close reflection of the proportion of SATA members that have provided catch returns to Marine and Coastal Management in the past. Separate questionnaires, completed during direct interviews, were used to obtain information from most of the major dealers active in the tuna industry.

Perhaps the over-riding economic characteristic of the South African baitboat fishery is the low average profit made by participants. Virtually all the fish are exported, incurring fairly high (in comparison with fish sale prices) freezing, storage and shipping costs. Recent efforts to maximise prices by exporting fresh fish incur substantially higher airfreight costs. However, most albacore are destined for canning markets, and international prices for such fish are relatively low. They are also prone to sudden decreases when large catches by, for example, international high-seas longline fleets or other baitboat fisheries, flood the markets.

Few of the vessels active in this fishery are new or purpose-built pole and line vessels. In fact, most are old wooden vessels transferred from the rock lobster or pelagic purse-seine fisheries after the 1979 yellowfin run. They range in length from 11m - 32m, and the average age of the fleet is now 35 years. Many of these wooden vessels are therefore overdue for replacement with faster, more compact and more efficient baitboats, equipped with improved freezing or iced-fish facilities. Many SATA members are also interested in using small-scale longlines to fish deeper for bigeye tuna or larger albacore when surface shoals are not available, and modern vessels would be required to efficiently deploy such gear. However, the average replacement cost of these vessels is now almost R2.5 million each, and it would take decades to pay off such an investment at current profit margins. It is therefore unlikely that any new participant without an existing vessel could successfully and profitably enter this fishery, without substantial access to other fishing rights (see below).

Although the profit margins are low, the fishery is relatively large in terms of numbers of vessels and total catch. After Taiwan, South Africa is the next major albacore fishing nation in the South Atlantic Ocean, making almost one third of the total South Atlantic catch. South African baitboats employ an average of 18 officers and crew per vessel (total complement ranging from 10 - 28), and the 250 baitboats recommended in the Tuna Rule Book will therefore employ 4 500 people. One third of the officers and virtually all of the fishing crew on these vessels are PDIs, and the sector is therefore a relatively important PDI employer in the fishing industry.

The vessels that returned questionnaires fished for an annual average of 173 days between 1994 and 2000, reporting an average annual catch of 96MT (all species), about 90% of which was albacore. The 81 vessels that returned questionnaires are certainly the most active in the fishery, and average effort and catch by the others will be substantially lower. Indeed, the catch reported by these vessels accounts for practically all of the estimated annual South African albacore catch.

While the SATA members are all particularly active in the pole and line fishery, virtually none of them survive on tuna catches alone. As a result of the widely fluctuating availability of albacore, and the fluctuating and fairly low market price for this species, it is unlikely that they could survive without fishing for other species. The albacore season seldom extends for more than 6 months of the year, and baitboats certainly require access to other fisheries to keep full-time crews employed. The other fisheries that these baitboats are involved in reflects the past interests of the vessels, and the upsurge in interest in hake longlining since the late 1980s. Many of the baitboats hold linefish B-permits, and regularly fish for snoek on the west coast. Some of the vessels also fish for species such as yellowtail and carpenter on the Agulhas Bank. A number of the SATA vessels still hold west coast rock lobster and/or squid permits, and a few are active in the pelagic bait purse-seine and shark longline fisheries. Many SATA members were also participants in the initial hake longline experiment, and retain a strong interest in obtaining hake longlining rights. Some mix of rights will be necessary to allow these baitboats to operate profitably throughout the year.

With regard to shore processing, the only processing conducted, particularly for albacore, is freezing, storage and export. However, this is an important component of the fishery, and is largely handled by a small number of dedicated tuna traders. Most of the vessels are individually owned by individuals or small companies, and their catches are too small and sporadic to support associated independent marketing operations. Marketing is therefore usually handled by central facilities with the capacity to purchase, freeze, store, market and export the fish from many vessels. These marketing facilities therefore have to carry the risk (and sometimes the benefit) associated with storing fish until enough have been accumulated to justify an export shipment. This necessitates averaging of prices or delayed payments to fishermen, to cater for the fluctuating international prices.

South African Pelagic Longline fishery

Economic data for the experimental longline permits were also collected using questionnaires, supplemented by direct or telephonic interviews to clarify uncertainties. Although 30 experimental permits were originally issued in 1970, ongoing disputes over permit conditions and access to swordfish have discouraged commitment by a number of permit holders, and only about 26 permits have been taken up in 2001. Of these, the number of active vessels ranges between 10 and 20, depending on fish availability. Questionnaires were obtained from 19 permit holders / vessel owners, covering all of the active participants in this fishery.

Although it has been indicated that long term (4 year) rights may be issued in this fishery in early 2002, this is currently still an experimental fishery, with no associated guarantee of ongoing rights. In addition, this is one of the few fisheries conducted by South African fishermen that cannot rely on rights unilaterally issued by South Africa. The species exploited are all highly-migratory species and straddling stocks, distributed beyond the EEZ onto the high-seas. They are internationally managed by various regional fisheries management organisations, the most important being the International Commission for the Conservation of Atlantic Tunas (ICCAT) in the Atlantic Ocean (west of 20°E), and the Indian Ocean Tuna Commission (IOTC) in the Indian Ocean (east of 20°E).

South Africa is a member of ICCAT, and is therefore bound to abide by the ICCAT management recommendations. MCM therefore cannot easily issue fishing rights for species under ICCCAT jurisdiction to local fishermen that are in violation of the international management recommendations for these species. South Africa must first obtain such rights at an international level, before issuing them to her fleets. The IOTC was established more recently and, as yet, has not recommended any Total Allowable Catch (TAC) limitations for the Indian Ocean. However, it is likely to do so over the next few years, particularly for bigeye tuna and swordfish.

South Africa’s lack of past performance in these longline fisheries, and resultant lack of international quota allocations, has resulted in substantial problems with the allocation of swordfish rights to the experimental longline fishery. In 1997, South Africa had no country quota allocation for swordfish in the Atlantic Ocean, and was expected to share an ‘Other Countries’ quota of 804MT with a number of other South Atlantic coastal states. Since then, South Africa, as part of a substantial lobby of coastal states within ICCAT, has been motivating strongly for a quota allocation of at least 1 000 MT of swordfish in the Atlantic Ocean. No agreement has yet been reached by ICCAT on a revised sharing arrangement, but it appears that South Africa will receive an allocation of around 1 000 MT. In the absence of an agreed sharing arrangement, countries have been required to declare 'voluntary' catch limits, and South Africa declared a 1 500 MT swordfish quota for 2001 and 2002.

However, because these are international fisheries, the pelagic longline fishery is one of the few that offers scope for growth, provided South Africa successfully motivates for quotas at ICCAT and the IOTC. There has been increasing recognition of the fishing rights of coastal states in the United Nations Convention on the Law of the Sea (UNCLOS), the UN Implementation Agreement on Straddling Stock Management (UNIA) and the recently developed revised list of ICCAT Allocation Criteria. Resultant recognition of South Africa's right to a swordfish quota at ICCAT has enabled experimental longline permit holders to fish for swordfish during 2001, resulting in activation of most of the issued permits. There is now a substantial increase in interest in becoming involved in this fishery, and local longline fishermen are motivating for an increase in the number of South Africa permits to at least 50 vessels, together with a phased reduction in the number of permits issued to foreign longline vessels to fish in our waters.

As a direct result of the experimental and uncertain nature of this fishery to date, there has been a wide variation in degree of investment in vessels, equipment, crew and infrastructure by the existing permit holders or vessel owners. This high variance reflects the uncertainty in the sector, with different owners putting very different amounts into various items, depending on available capital, risk preferences and individual vessel or crew performance. In the questionnaire returns, most owners responded with average annual costs for all items, even trip related costs, taken off annual balance sheets, and there are wide ranges in the provided information. Apart from noting that there is definite scope for the development of a stable, competitive South African pelagic longline fishery, similar in nature to the many modern pelagic longline fisheries around the world, it is difficult to accurately estimate what the income / expenditure profile of the sector will be.

In many cases, the experimental permits are held by different companies from the vessel owners / charterers. Various business arrangements have therefore been made between permit holders and those with access to vessels, to form joint ventures of various forms. Certain of these have amounted to direct leasing of the permit out to joint venture partners, including Korean vessels operated by South African based companies, but operating under the Korean flag. On the other end of the scale, certain permit holders have leased / purchased their own vessels to fish their own permits. As a result of the problems with permit conditions, the lack of a South African swordfish quota, offers to fish for Namibia under contract and cheaper fuel prices to non-SA vessels, a number of the vessels used in this fishery have been flagged outside South Africa. When such vessels fish the high-seas (as is increasingly happening), the operations cannot really be considered to be South African fishing operations. Such operations raise questions regarding rights allocations and responsibility for monitoring and management.

The vessels used in this fishery are all second-hand vessels, leased or purchased overseas for use in the fishery. They are all steel-hulled, ranging in length from 18m to 50m (mean length 29m), and on average 27 years old. However, most of them have been substantially re-fitted, particularly by installation of American monofilament longline fishing systems, at substantial cost to the vessel operators. The average market value of the currently used vessels is about R4.8 million, but replacement value with new vessels would average about R11 million each. This is therefore not a fishery suitable for participation by small new entrants without access to a suitable vessel. Substantial capital is required, at least to acquire and fit out the necessary vessel. To make this profitable, this fishery will always have to target on high quality fresh or super-frozen fish for export, particularly to the Japanese *sashimi* and United States fresh swordfish markets, which are the main markets currently used. This, in turn, requires that South Africa obtain adequate international rights to support a pelagic longline fishery of this size, and that these rights actually be issued to South African fishermen.

Vessels of this size carry an average of 21 crew, and the proposed 50 vessels would therefore directly employ over 1 000 people. In addition, the onshore handling, packing and airfreight export operation is labour intensive, providing further employment for 10 or more persons for each simultaneous discharge. The vessels that have been fishing actively since 1997 report an average of 155 days fished per year, and an average total annual catch of about 100 MT, of which about two thirds consists of the primary target species (swordfish and large tunas). At an average price for these species of about R60/kg, this would generate an annual income of about R6 million per vessel. Expenses (particularly vessel payments and maintenance, fishing gear and bait, fuel and airfreight) are reported to usually amount to about half of the total income, although the costs reported in the questionnaires are often far higher. The active operators in this fishery are certainly running at a profit at the moment, and it is unclear why the reported costs appear to equal or exceed the reported income.

13.7 Key Economic Indicators for the Tuna Baitboat Fishery

The following is a summary of the key economic indicators for the South African tuna baitboat fishery, based on data from the Economic and Sectoral Study (ESS) Database. ESS datasheet returns were received for 85 vessels, representing approximately 85% of the participants in the fishery.

<u>Ownership</u>

Ownership data was poorly documented in the tuna baitboat ESS database, with only 46% of the returns containing full vessel ownership details. Ninety-six percent of these vessels were white owned, while 4% were PDI-owned (Fig. 13.5). Of the 85 vessels recorded in the ESS, 85% were sole-owner or closed corporations, while only 13% were company-owned (Fig. 13.6).

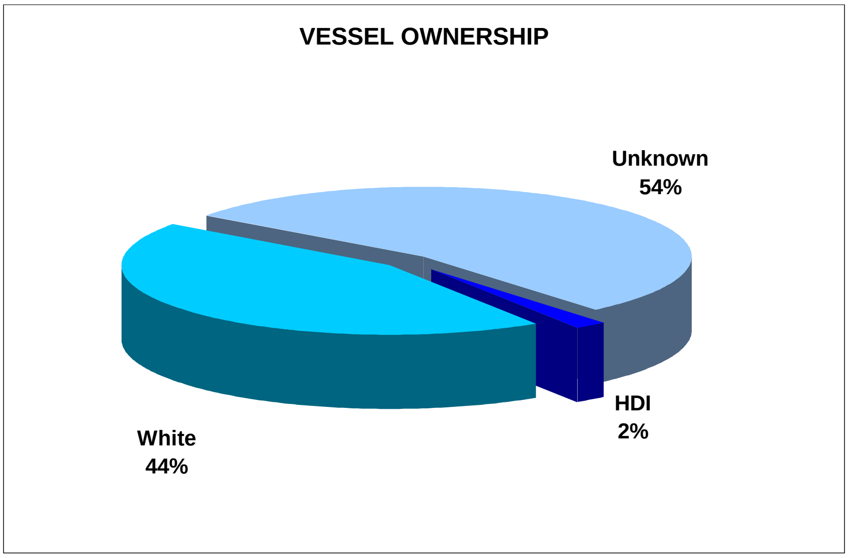


Figure 13.5. The racial makeup of tuna baitboat vessel owners recorded in the ESS database.

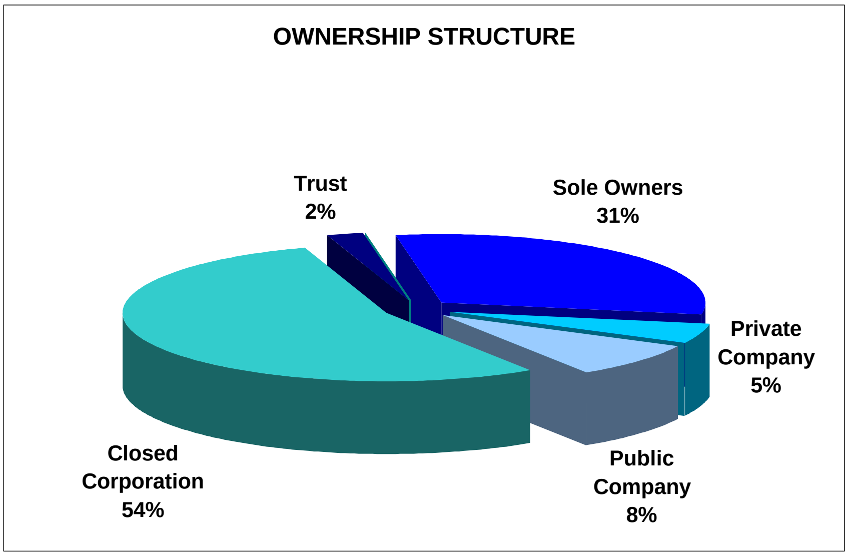


Figure 13.6. The ownership structure of the tuna baitboat vessels recorded in the ESS database.

<u>Employment</u>

The employment data recorded for the tuna baitboat vessels captured in the ESS database was good, with 98% coverage. Total employment for the recorded vessels was in the region of 1 500 individuals, of which 13.5% were white and 86.5% were PDI (Fig. 13.7), with 20.3% of the wages going to whites, and 79.7% going to PDI (Fig. 13.8).

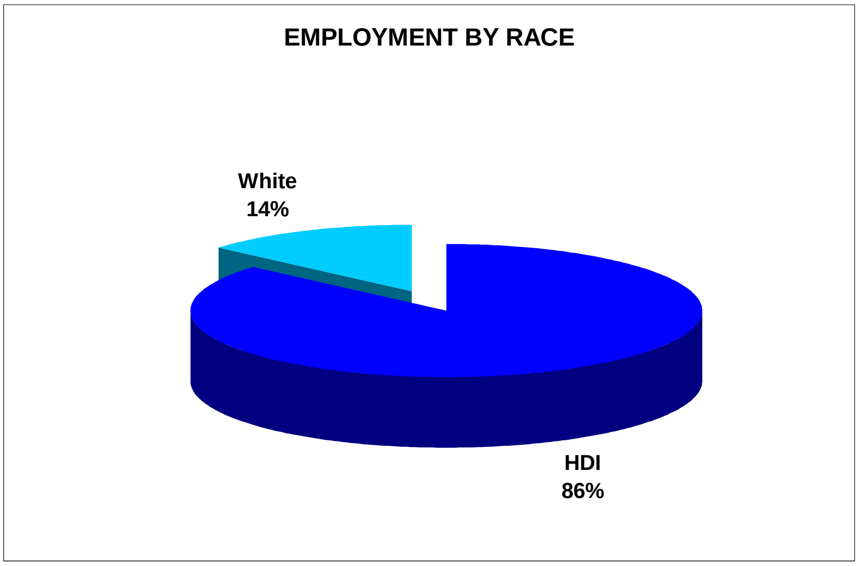


Figure 13.7. The percentage of White and PDI employees recorded in the ESS database for the tuna baitboat fishery in 2000.

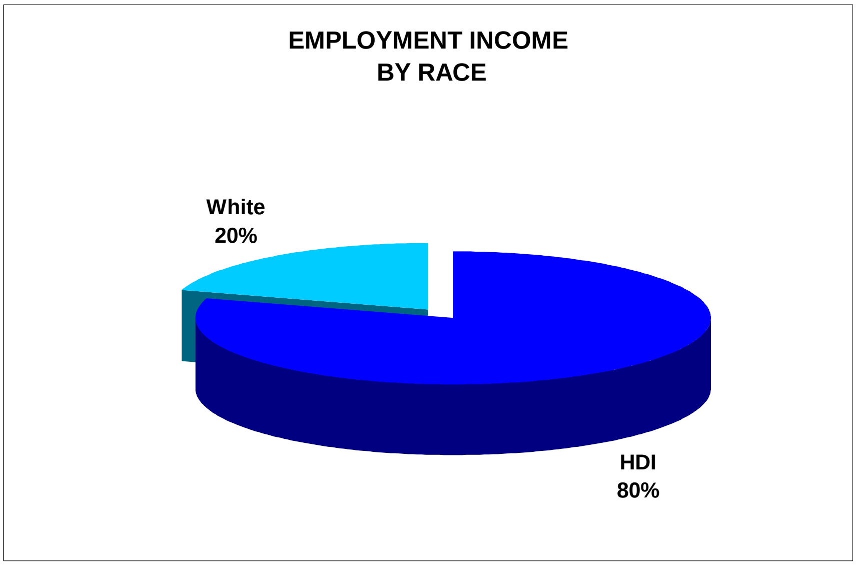


Figure 13.8. The percentage income earned by White and PDI employees of the tuna baitboat vessels recorded in the ESS database, during 2000.

The employment in the tuna baitboat fishery fell within two skills categories: the vessel skippers (classed as Skilled Labour), and the fishers (Semi-skilled Labour) (Fig. 13.9, 13.10 a and b). There were more white skippers (Skilled Labour) than PDI skippers in this fishery, indicating a relatively high number of owner-operated vessels in the fleet.

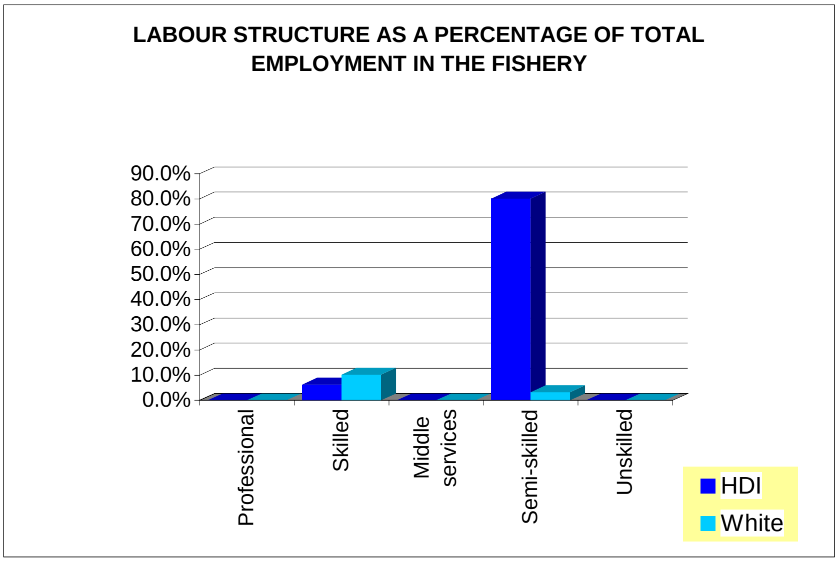
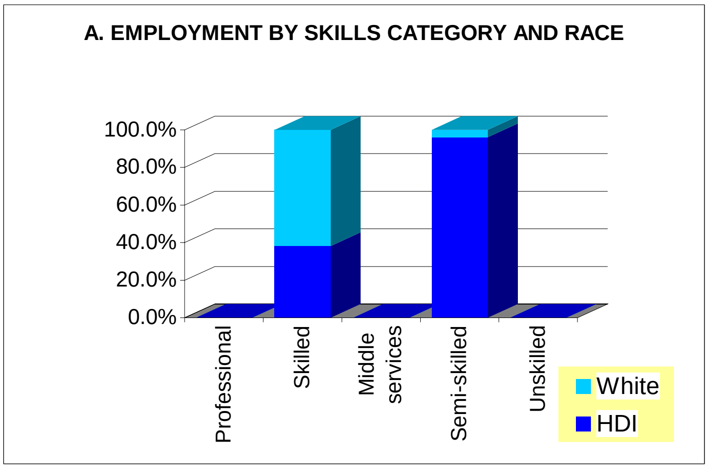


Figure 13.9. The number of employees per skills category, as a percentage of the total employment recorded in the ESS for the tuna baitboat fishery in 2000.



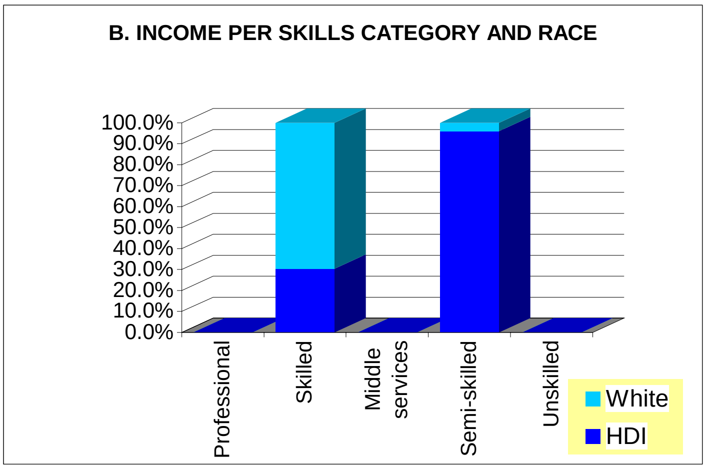


Figure 13.10. The percentage White and PDI employment (A) and employment income (B) by skills category for the tuna baitboat vessels recorded in the ESS database.

The average annual wage earnings in the tuna baitboat fishery for 2000 for the different skills categories are represented in Figure 13.11. The annual wages earned by white skippers (Skilled Labour) were significantly higher than those earned by their PDI counterparts in this fishery.

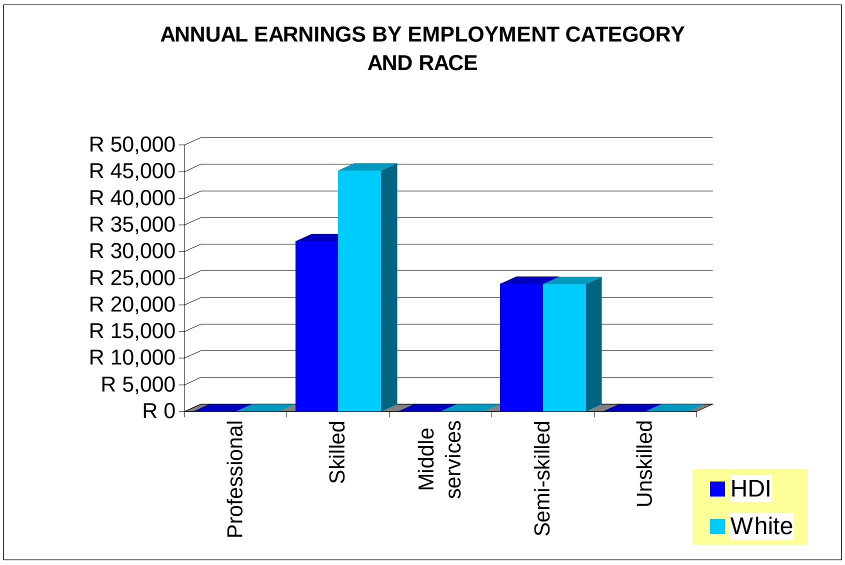


Figure 13.11. Average annual income per skills category for employees in the tuna baitboat fishery in 2000.

<u>Regional Employment</u>

Most of the tuna baitboat vessels operated out of the Western Cape Province, but a few landed fish in the Eastern Cape (Fig. 13.12). Assuming that local vessel employment is directly related to landings, then most of the employment in the fishery occurred in the western Cape region (77%) of the Western Cape Province, followed by the southeastern (10%) and southwestern (4%) regions. About 8% of the employment in this tuna fishery occurred in the Eastern Cape in 2000.

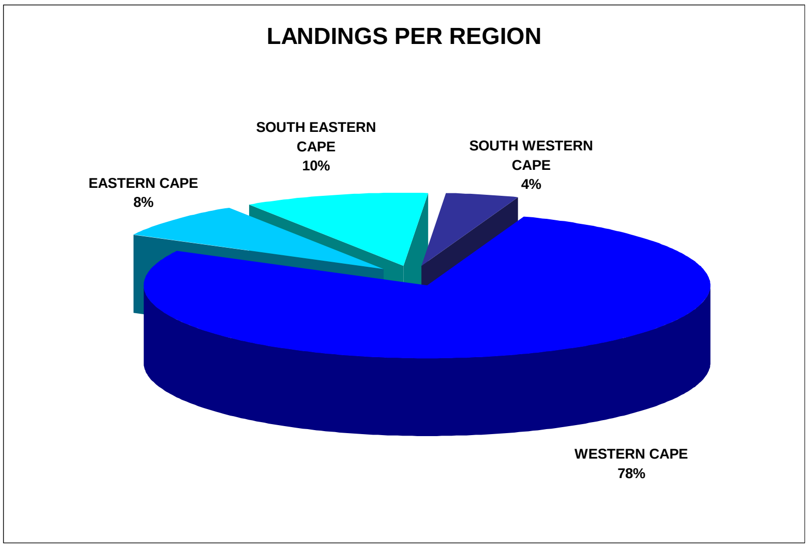


Figure 13.12. Vessel landings by region for the tuna baitboat fishery for 2000, as recorded in the ESS database.

13.8 Key Economic Indicators for the Tuna Longline Fishery

The following is a summary of the key economic indicators for the South African Tuna Longline fishery, based on data from the Economic and Sectoral Study (ESS) Database. ESS datasheet returns were received for 19 vessels, representing approximately 75% of the permit holders for the fishery, but representing 100% of the *active* participants in the fishery in 2000.

Ownership

Ownership data was fairly well documented in the tuna longline ESS database, with 63% of the returns containing full vessel ownership details. Seventy-eight percent of these vessels were white owned, while 22% belonged to PDI (Fig. 13.13). Of the 19 vessels recorded in the ESS, companies owned 8 and 7 were owned by closed corporations, while only 3 were solely owned (Fig. 13.14).

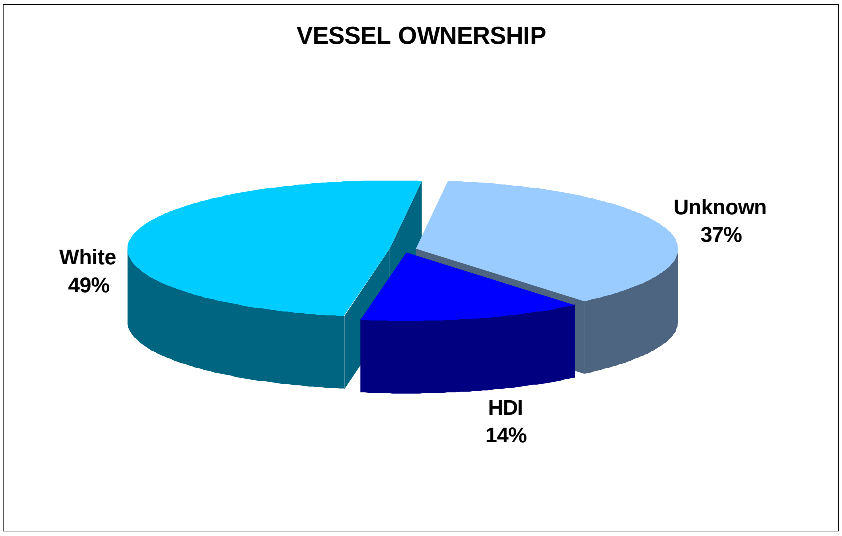


Figure 13.13. The racial makeup of tuna longline vessel owners recorded in the ESS database.

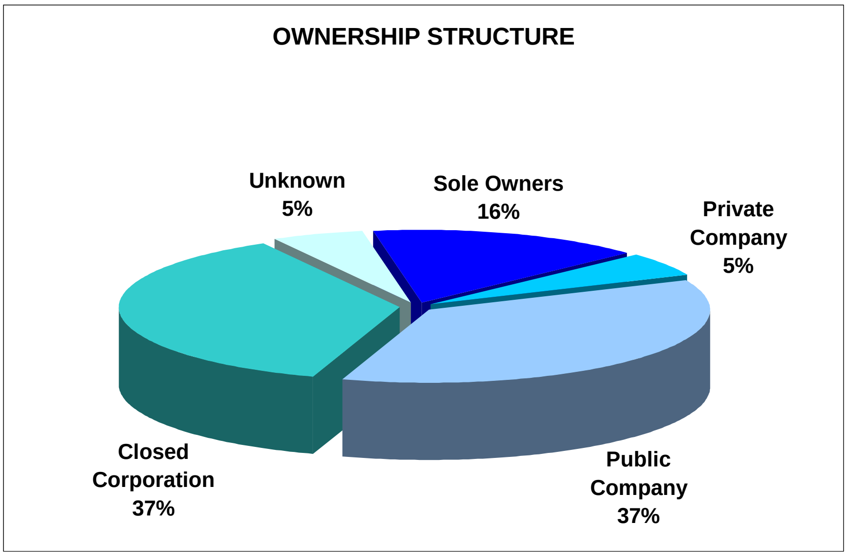


Figure 13.14. The ownership structure of the tuna longline vessels recorded in the ESS database.

Employment

The employment data recorded for the tuna longline vessels captured in the ESS database was excellent, with 100% coverage. Total employment for the recorded vessels was in the region of 335 individuals, of which 19.7% were white and 80.3% were PDI (Fig. 13.15), with 36.4% of the wages going to whites, and 63.6% going to PDI (Fig. 13.16).

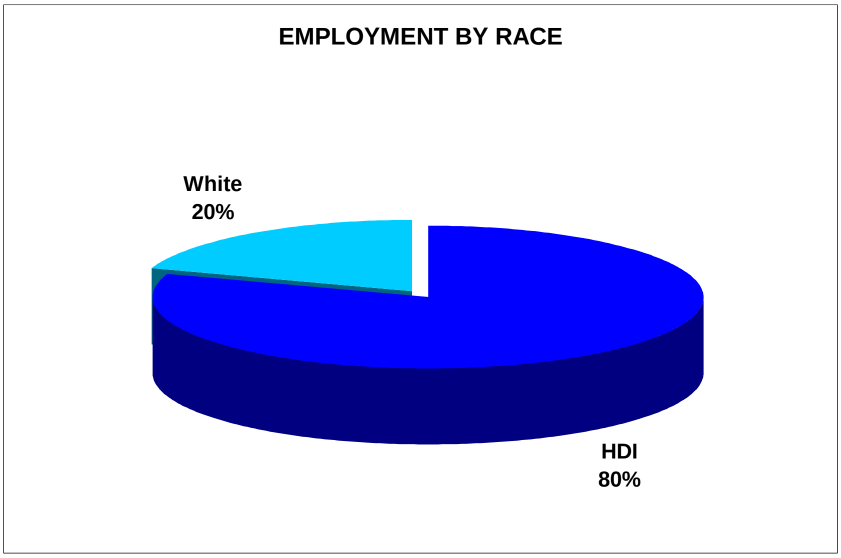


Figure 13.15. The percentage of White and PDI employees recorded in the ESS database for the tuna longline fishery in 2000.

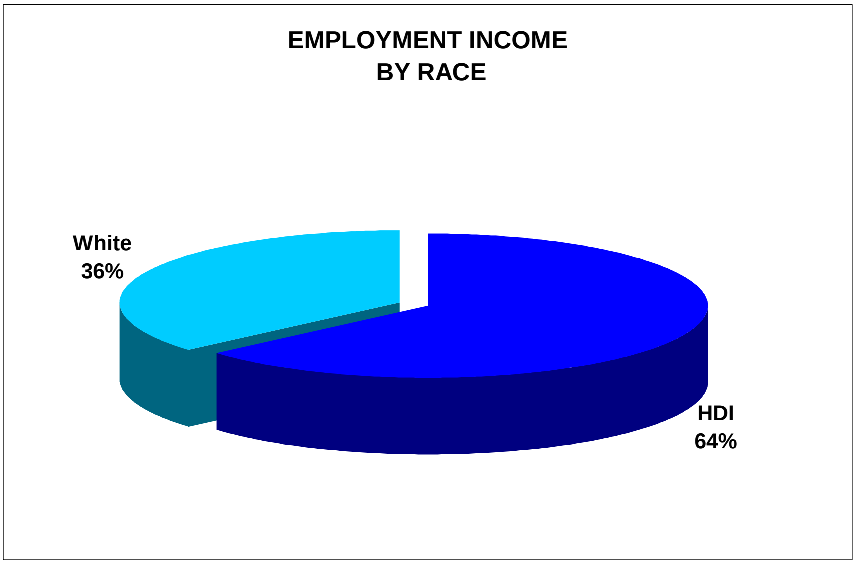


Figure 13.16. The percentage income earned by White and PDI employees of the tuna longline vessels recorded in the ESS database, during 2000.

The employment in the tuna longline fishery fell within two skills categories: the vessel skippers (classed as Skilled Labour), and the fishers (Semi-skilled Labour) (Fig. 13.17, 3.18 a and b).

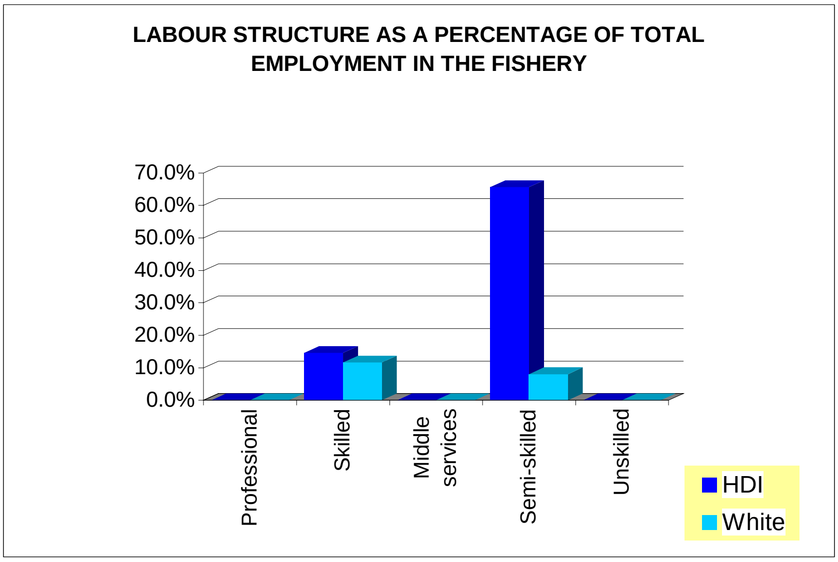


Figure 13.17. The number of employees per skills category, as a percentage of the total employment recorded in the ESS database for the tuna longline fishery in 2000.

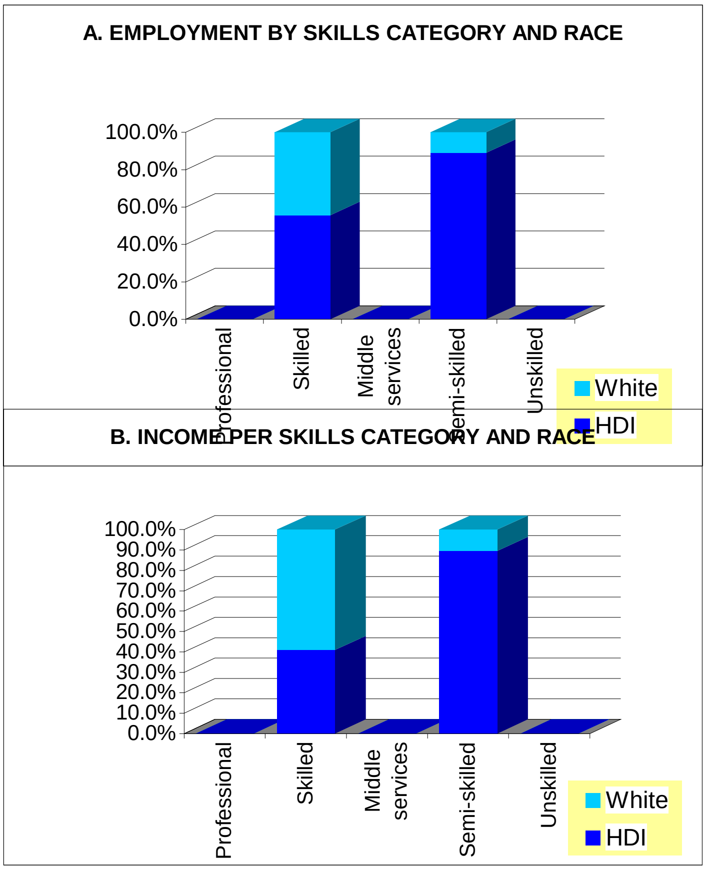


Figure 13.18. The percentage White and PDI employment (A) and employment income (B) by skills category for the tuna longline vessels recorded in the ESS database.

The average annual wage earnings in the tuna longline fishery for 2000 for the different skills categories are represented in Figure 13.19. The annual wages earned by white skippers (Skilled Labour) were almost double those earned by their PDI counterparts in the tuna longline fishery.

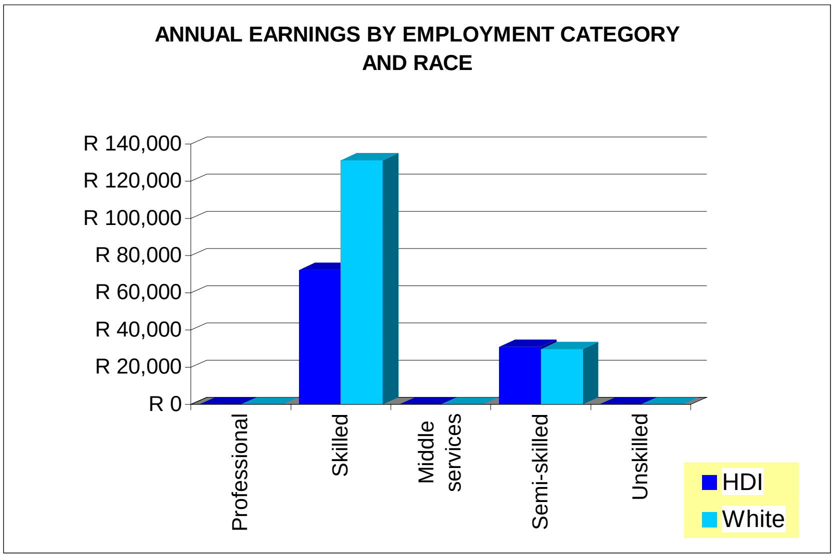


Figure 13.19. Average annual income per skills category for employees in the tuna longline fishery in 2000.

<u>Regional Employment</u>

Most of the tuna longline vessels operated out of the Western Cape Province, and a few landed fish in the Eastern Cape (Fig. 13.20). Assuming that local vessel employment is directly related to landings, then most of the employment in the tuna longline fishery occurred in the Western Cape (92%). About 8% of the employment in this fishery occurred in the Eastern Cape in 2000.

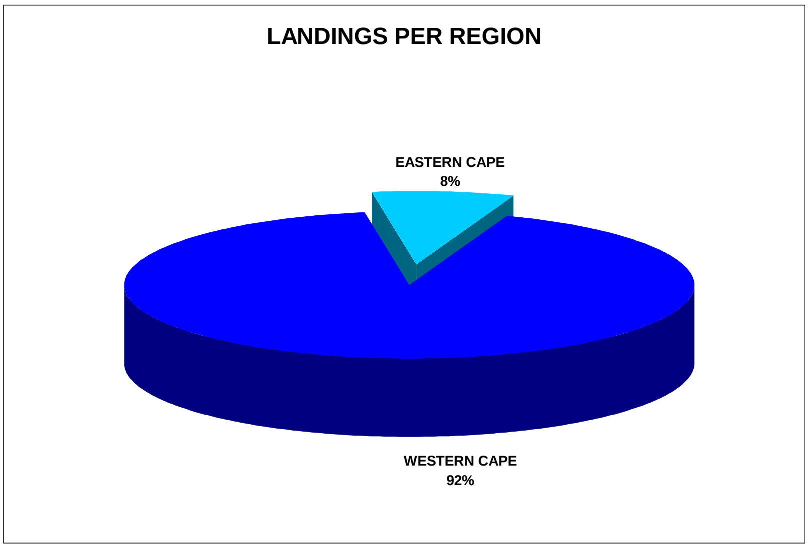


Figure 13.20. Vessel landings by region for the tuna longline fishery for 2000, as recorded in the ESS database.

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14. THE SEAWEED INDUSTRY

14.1 Key Facts

- 14 companies held seaweed concessions in 2000. One of these is a proposed amalgamation of four existing previously disadvantaged new entrants, and thus 11 companies were interviewed.
- There were 9 new entrants into the industry in the 1999-2000 allocation, 5 of which are previously disadvantaged (although 4 of the latter are in the process of amalgamating).
- 7 seaweed species are being exploited.
- The industry is largely a raw materials supplier (the majority of the concessionaires do not add value to raw harvested/collected material).
- In general, very little has been achieved in terms of value-added end products.
- 3 companies are running at a loss.
- 60% of the concessionaires involved in raw materials supply are having difficulties in marketing their products due to market volatility.
- The uncertainty in long term rights allocations is negatively affecting all companies.
- Restricted access to the seashore is hampering the industry's development.
- There is a lack of industry partnerships.
- The seaweed industry would welcome a greater R&D initiative.
- The industry is dominated by white males with respect to shareholding in companies.
- The majority of pickers are black and coloured females.
- Professional / managerial positions are filled mostly by white males.
- Employment opportunities in the seaweed industry are mostly on a “permanent part-time” or “casual” basis.
- Most concessionaires offer a skills development course to their employees.
- All concessionaires would consider participating in seaweed industry development partnerships targeted at empowering rural communities and subsistence fishing communities. Most indicated that they would be able to provide support in a number of ways.
- The majority of concessionaires are willing to subcontract seaweed collection.
- Financial constraints were experienced by most concessionaires when starting up their enterprises.
- The minimum start-up cost for a new entrant intent on being a raw materials provider is R200 000.
- Processing requires high technical competence.
- Set-up costs for processing are high.
- Most concessionaires found the current permit fee acceptable.

Concession areas

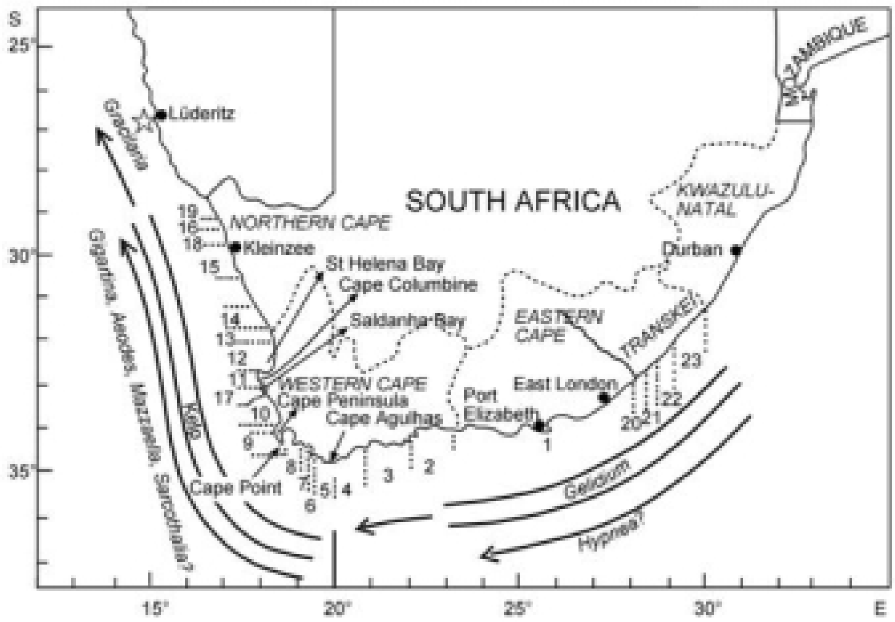

Figure 14.1. Seaweed Industry concession areas

14.2 Overview of the South African Seaweed Industry

Kelps

Kelp beds occur from Cape Agulhas north-westwards into Namibia. In the south, the dominant shallow-water kelp is *Ecklonia maxima*, with *Laminaria pallida* forming an understorey and covering reefs down to at least 20m depth. Northwards of Cape Columbine *L. pallida* develops a hollow stipe and replaces *E. maxima* as the dominant in shallow beds. Where it was formerly referred to as *L. schinzii* Foslie, it is now referred to as *L. pallida var. schinzii* (see Stegenga *et al*. 1997).

Beach-cast kelp of both species has been collected since at least 1953, in quantities that fluctuated with market demands but reached a maximum of about 5 000 tons (dry weight) in 1977 (Anderson *et al*. 1989). Since then, an average of 1 312 dry ty^{-1} has been collected, with low yields between 1993 and 1995 reflecting strong international competition from Chinese alginate production. Beach-cast kelp is sun-dried, milled and exported, mainly for the extraction of alginate. No commercial extraction has taken place in Sout Africa, due to strong international alginate production. Laboratory tests on South African kelps indicate alginate yields of between 22-40% (Hay *et al*. 1993). Recently, powdered kelp has been exported to Japan for use in formulated fish-feed.

Fresh kelp has been harvested since 1979 in relatively small quantities for the production of a liquid plant-growth stimulant (Kelpak) containing cytokinins, that has been shown to improve growth and quality of various food and horticultural crops (Stirk and van Staden 1996).

Recently, the growth of a cultured abalone industry is creating an increasing demand for freshly-harvested kelp. Commercial abalone farming in South Africa started in 1992, and now there are 10 farms, with several more planned. Current stock is estimated to be worth R150 million (20 million US$), and all the farms are growing in size. All but one of the abalone farms are situated where kelp grows, in the Western and Northern Cape, and the one farm in the Eastern Cape feeds dried kelp, cultivated *Ulva* and *Gracilaria*, and some locally-harvested *Plocamium.* Kelp harvests for abalone feed have increased over the last 8 years, as follows (data are dry weights): 0.2t in 1992, 0.9t in 1993, 1.6t in 1994, 2.1t in 1995, 5.2t in 1996, 6.1t in 1997, 23.3t in 1998 and 215.5t in 1999.

This demand for freshly-harvested kelp brought with it new research priorities. The harvesting of *Ecklonia* for the production of Kelpak was researched on the Cape Peninsula more than a decade ago (Anderson *et al*. 1989), and it was established that kelp regrowth and full biomass recovery took 2-3 years. The demand for abalone feed is centred in concessions areas 6 and 7, where harvesting experiments were done by MCM from 1992-1997 at Danger Point. The results (Levitt *et al*. in press) showed that after harvesting of whole plants (cut at the base of stipes) biomass took at least 2 years to recover to control levels, but there were no detectable effects on the understorey biota. Importantly, by harvesting only the distal parts of *Ecklonia* fronds and leaving the stipes and 20-30cm of the fond-bases intact, the kelp sporophytes remain alive, and long term, overall yields of frond material are 4-5 times higher (per area of substratum) than if whole plants are cut. The holdfasts of mature kelps were shown to provide an important refuge for juvenile sporophytes in areas where benthic grazers were numerous (Anderson *et al*. 1997).

Experimental harvesting at a site just north of Saldanha Bay, on the west coast, showed that although kelp biomass recovers within 2.5 years, the biomass of the 3 common epiphytic seaweeds has not recovered within 5 years of harvesting (Anderson, pers. comm.). These epiphytes provide a habitat and food for numerous animals, and it is therefore important that “reserve” areas are left unharvested.

Localised demand for fresh kelp will greatly increase when abalone farms reach full production, particularly in areas where farms are concentrated. A combination of management options is suggested: beach-cast kelp should be used when available; harvesters should when possible (low tides, calm conditions) harvest only the fronds (increased overall yields, minimal destruction); dried kelp should be used as backup; and farms should cultivate *Gracilaria* and *Ulva* to supply part of their own seaweed requirements (see mariculture section). From a management perspective, localised demand can only be met sustainably by spreading the harvesting over a wider area of coast. This is best achieved by maintaining large concession areas, rather than having many operators who may over-exploit their own small areas. Further demands for fresh kelp may result from the development of new, high-value cosmetic products. MCM seaweed scientists are now mapping and quantifying the major South African kelp beds, using Infra-Red aerial photography. The results should improve the management of harvesting, may lead to changes in the boundaries of Concession Areas, and should be useful in studies of large-scale ecological phenomena, e.g. the effects of climate changes.

Gracilaria

In South Africa, commercial quantities of *Gracilaria gracilis* occur in Saldanha Bay and *Gracilariopsis* in St Helena Bay. They are collected as beach-cast, and it is illegal to harvest them directly from the sea.

Gelidium

Commercial yields of *Gelidium* have been obtained from the Eastern Cape Province since at least 1957 (Anderson *et al*. 1989). Four species (*G. pristoides,G abbottiorum, G. pteridifolium* and possibly some *G. capense*) are harvested from the intertidal and shallow subtidal zones of Concession Areas 1,20,21,22 and 23 (Fig. 14.1), and exported mainly to Japan and Korea. An attempt was made to extract agar in the Eastern Cape from 1978-1982 (Rotmann 1999) but this proved uneconomical. In the 1980s, public complaints about the harvesting of *Gelidium pristoides* led to intensive research, which was reviewed by Anderson *et al*. (1991). This species obtains the highest price, gives the highest agar yields, of between 30 and 48% of dry weight, and is strictly intertidal in distribution. Aspects investigated included biomass, seasonal growth, phenology, factors controlling vertical distribution, and the effects of harvesting on associated organisms, making this the best-researched commercial seaweed in the region. The management conclusions were that current levels and methods of exploitation have a negligible ecological effect. Exploitation levels are essentially controlled by limiting effort: only one commercial operator holds the right to each concession area, and yields are monitored. Furthermore, this species is difficult to fully remove by picking, so that diminishing returns make over harvesting unlikely.

G. pristoides is found between the KwaZulu-Natal border and the Cape Peninsula, but is most abundant in Concession Area 1, where the biomass was estimated to be 118-126 t d wt (Anderson *et al*. 1991). Recent estimates of the intertidal biomass of *Gelidium* species, as far west as False Bay, indicate that commercial collections of *G. pristoides* west of Area 1 are unlikely to be viable except at a few sites, and the other species were not found in economic quantities (Anderson and Bolton, pers. comm.).

Little research has been done on *Gelidium pteridifolium, G. abbottiorum and G. capense.* The bulk of their populations are subtidal and they are not considered to be threatened by intertidal harvesting (Anderson *et al*. 1989). These species are sometimes difficult to tell apart, and the species composition of commercial harvests was never clear. *G. pteridifolium* and *G. abbottiorum* make up the bulk of the *Gelidium* harvest from the Transkei area of the Eastern Cape, where the rugged, inaccessible coastline makes biomass surveys impracticable. A current project aims at identifying the components of the harvest, and is using yield data to assess the viability of the resource.

In terms of management, there are important differences between Transkei and the rest of the seaweed Concession system. In Transkei there are few and poor roads, collection is very loosely organised by the right holder in each Concession Area, and there is effectively no enforcement of regulations. Collectors (mostly women) pick where and when it suits them, and store the *Gelidium* until the buyer fetches it. Yield is affected mainly by factors unrelated to the resource, such as weather and conflicting work opportunities. Until this situation changes, it is unlikely that management of the resource can be improved in Transkei.

14.3 Other Intertidal Species

In 2000 one concession-holder (Area 11) was granted the right to collect various intertidal species in small amounts for inclusion in specialised "health food" products. *Ulva* is mainly sought: it is dried and included as fine fragments in a niche-market sea salt product. In Area 1 a permit was recently granted to experimentally collect subtidal *Plocamium corallorhiza* as abalone feed. Other applications to collect general intertidal species for abalone feed have not been granted, in the absence of data on their biomass and the effects of harvesting.

14.4 Regulations Governing Seaweed Collection

Until 1998, exploitation of seaweeds was governed by the Sea Fisheries Act of 1973, which recognised 17 Seaweed Concession Areas (Anderson *et al*. 1989). After the first democratic election in South Africa in 1994, a project examined policy options for the management of the country's seaweed resources (Bolton and Anderson, unpubl). After socio-economic studies of the *Gelidium* and kelp resources, a public workshop was held to synthesise the recommendations, in order to guide subsequent management.

The following recommendations were included:

1. In each concession area the rights to each functional group of seaweeds should be allocated to only one applicant (the same applicant may hold the rights to more than one functional group in an area, or more than one area). This aims to prevent competitive over-exploitation of these static resources. The functional groups are kelps, *Gelidium* species, *Gracilaria/Gracilariopsis*, and "intertidal seaweeds". The groups are based on practical issues such as effective control and minimisation of conflict between users.

2. Rights should only be allocated to applicants whose main business is seaweed, unless there are no other applicants for the resource. This aims to ensure that the rights-holder uses the resource as fully as possible.

3. Due consideration should be given to addressing historic imbalances in access, whilst ensuring that the resource is used as fully as possible. The former is being achieved by allocations to new entrants, and the latter will be achieved by evaluating their commercial performance after one year and cancelling rights that have not been used.

In September 1998 the Sea Fisheries Act was superceded by the Marine Living Resources Act (MLRA) (Act 18 of 1998), which has brought several changes that were anticipated by the policy project. After 1994 former "homeland states" such as Transkei were returned to South African control, and with the MLRA jurisdiction over their marine resources returned to the Department of Environmental Affairs and Tourism. The coast of the former Ciskei was included in Concession Area 1, within which it falls geographically, and the four concession areas in the Transkei are now designated Areas 20-23. In 2000 two new Concession Areas (19,20) were designated in the Northern Cape Province, in diamond-security areas to which access had previously been denied.

The MLRA emphasises that "previously disadvantaged" communities should be granted greater access to marine resources, but at the same time recognises "sustainable utilisation" as a fundamental principle. In 1998 the seaweed concession areas fell due for re-allocation, when the previous 5-year rights expired. Bureaucratic problems with implementing the new system delayed the allocation process until 2000, during which period the established rights holders kept their concessions on an ad hoc basis, but were unable to plan ahead. In 2000 the rights were re-allocated, in terms of the principles of the MLRA, but only for a one-year period. Recognising that long terms rights are essential to stabilise and develop the industry, Marine and Coastal Management is currently negotiating with industry to develop allocation rules, and it is envisaged that soon rights will be allocated for a minimum of 5 years. At present 5 of the 23 concession areas (22%) are held by companies from "previously disadvantaged" communities: this represents at least 30% of the resource on a biomass basis. In the Northern Cape five new companies have kelp concessions, and are loosely associated under the Fisheries and Mariculture Development Association of the province. Another component of "restructuring" in the marine resource industries in South Africa, is contained in new provisions of labour and industrial regulations, which aims to encourage "white" companies to improve conditions for their employees and the bring more blacks into management. This will lead to changes within company structures.

While the broad policy for management is contained in the MLRA, the details are contained in the relevant regulations (as promulgated in the Government Gazette) and the rules for each Concession Area are specified in individual permits. The annual permit fee is R11 000 (about 1 300 US $) and there is a levy of R35 t^{-1} (dry wt) of seaweed collected.

14.5 Summary of the ESS Questionnaires

Eleven companies were interviewed in this study. One of the companies is a proposed amalgamation of four existing PDI new entrants and two of the companies are subsidiaries of a single holding company. This means that data was obtained from 10 companies. Moreover, one of the companies is no longer in operation.

40% of the companies are white owned, while 6 out of 10 are either wholly or partly owned by PDI or previously disadvantaged entities. The graph below provides an insight into company ownership.

Two of the concessionaires have plans to bring equity into their shareholding profile. One company plans to transfer 50% of shareholding to black employees and another will transfer 15% of shareholding to a trust for coloured employees.

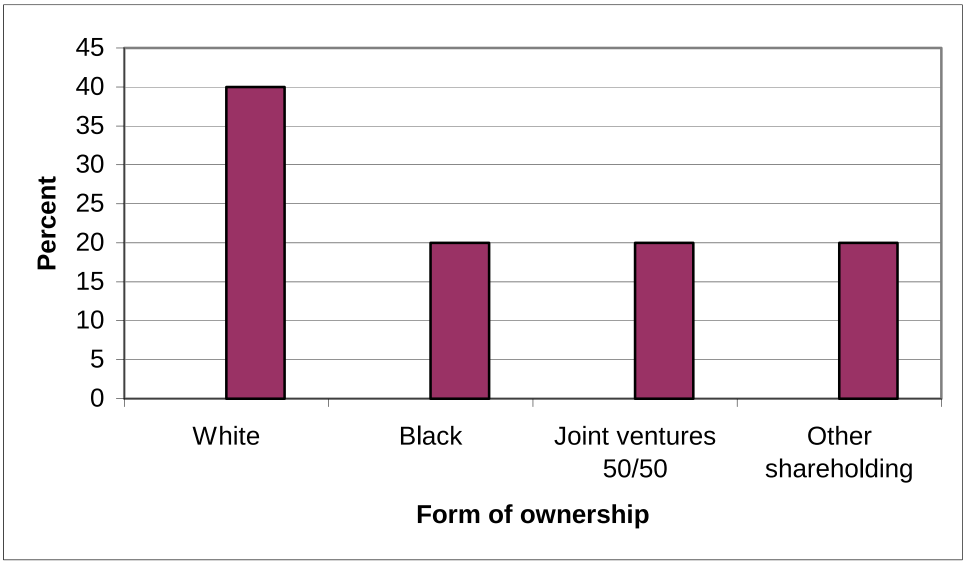

Figure 14.2. Ownership of seaweed companies (2000).

Six of the 10 companies have subcontractors, of which 4 have invested in capital equipment for their subcontractors. All six companies buy 100% of the their subcontractors' harvest.

60% of the companies are well established, while 4 of the 10 are in the start-up phase. Two of the new companies use their seaweed harvest for abalone food.

4.6 Constraints

<u>Finance</u>
The majority of the companies (80%) have found it extremely difficult to obtain start-up finance, while 2 out of the 10 did not experience any problems, given that seaweed-collecting activities contribute towards more profitable business ventures. Refer to the summary of the financial data for information pertaining to start-up costs for new enterprises.

<u>Restricted Coastal Access</u>
9 out of 11 companies found it difficult to operate because of restricted access to the resource along most of the South African coastline. Access is restricted by a number of factors:

a. Poor infrastructure – This is particularly relevant for the Northern Cape coast concession areas and the concession areas in the Ciskei and Transkei regions. This is also found in other scattered and isolated places along the rest of the country's coastline. Roads, if present, are secondary at best. This often results in the concessionaire having to access harvest sites by driving along the beach. This seriously affects 4 of the companies.

b. Privately owned land (farmland) bordering the coastline – Often the only access to the beach is found along roads traversing privately-owned land. Agreements have to be made with landowners to gain access to the beach. This requires effort in fostering good public relations with these landowners, and implies that a new entrant into the industry cannot commence operating effectively from the date of issuance of the permit. This affects all concessionaires, but especially one which has two concession areas in high security and limited access diamond-mining areas.

c. Permits for beach-going vehicles – If direct access to the resource is restricted and access is only possible by driving along the beach, the concessionaire must apply for the relevant permit from the local council to do so. This affects 8 out of 11 concessionaires.

d. Public opposition – Even though MCM has jurisdiction over coastal resources and is responsible for issuing permits to access a resource, local councils retain jurisdiction up to the high water mark. One company has been excluded from Jeffreys Bay due to a municipal-imposed restriction. This restriction came as a result of public pressure on the local council to exclude harvesting activities from their area. Public opposition has also resulted in the seasonal exclusion of companies who have concessions in recreationally important areas.

e. Restricted access due to marine reserves and restricted access through nature reserves in many concession areas.

f. Bad weather and rough seas.

g. Crime – One company operating in the Transkei is affected by violent crime in the area (cash heists).

<u>Technological Constraints</u>

8 out of 11 companies found it 'difficult' to 'very easy' to acquire the required technology for their particular application of seaweeds. Two of the new entrants found it very difficult (given the total lack of expertise and working knowledge among its employees) but not 'almost impossible', given that their applications do not require a high level of technical competence. One of the companies found it almost impossible, yet succeeded to develop the technology for their cell-burst process.

<u>Permitting</u>

None of the companies reported any permitting constraints. However, due to the uncertainty regarding long term permit allocations, the development of the seaweed industry is being negatively affected. The uncertainty prevents concessionaires from making long term investments in their businesses.

<u>Labour</u>

All concessionaires except one had little difficulty in recruiting a labour force.

Marketing

40% of the companies found marketing their product to be difficult to very difficult. These difficulties are due to other countries flooding the international market with cheaper seaweed due to lower labour costs. Indonesia and China have been responsible for changing the alginate markets, Chile for changing the *Gracilaria* markets and Morocco for changing the *Gelidium* market. Korea also recently lifted its ban on the export of Korean *Gelidium* to Japan, resulting in a fall in the price for South African *Gelidium*.

14.7 The Concessions and Current Commercial Production

Seven seaweed species are currently being exploited. *Ecklonia maxima*, *Laminaria pallida* (including *Laminaria pallida* var. *schinzii*), *Gracilaria gracilis* (includes *Gracilariopsis longissima* in St Helena Bay), *Gelidium amanzii* (name changed to *G. abbottiorum*), *G. cartilagineum* (name changed to *G. pteridifolium*), *G. pristoides* and *Plocamium corallorhiza*.

The company with the most extensive and diverse operations has 7 concessions, while another has 4 (of which 2 have a low yield). The rest of the concessionaires have either 2 areas or 1, and sometimes these are shared by two companies.

Most of the companies sell seaweed in a basic form and technological requirements are low (harvesting, milling and transporting). Three companies blend milled seaweed with other material to produce food salts and/or organic fertilisers and soil stabilisers. Only one company is involved in high-tech processing of seaweed (4 of its 7 products are processed). Two produce new wellness products and one produces a cosmetic talc application.

All concessionaires stated that they thought they were not using their resource to its maximum, thus according to them the resource is not being over-exploited. Only one company estimated that they were using 99% of their resource. The new entrants are utilising little of the resource, as they are in the process of starting up their operations (20 – 25%). Only one company produces a high value product (R38.60/kg). All the rest of the concessionaires deal in a cheap commodities ranging from 70c/kg for the raw seaweed to R15/kg for products utilising seaweed as an ingredient.

The highest proportion of operating costs are labour costs. This is expected given that the industry is primarily involved in the supply of raw material, which involves labour intensive harvesting/collecting.
80% of the concessionaires that export their products as a raw material have experienced instability, turbulence and/or decline in the international markets over the last three years. This can be accredited to supply from foreign countries with cheap labour and consequently cheap products mentioned earlier. One of the companies has experienced stable markets, probably due to having forged good ties with overseas buyers over the 23 years in operation, while another has described the market as rapidly growing. This can be accredited to good marketing and product niching, and dealing in a high-value processed product that is not subjected to the same market volatility as a raw product. The long established and larger companies often market the seaweed of other concessionaires.

14.8 Environmental Research

40% of the concessionaires have conducted/funded scientific research on environmental effects of their harvesting operations.

14.9 Financial Data

70% of the companies are re-investing profit into their company to develop them. The start-up costs of the various concessionaires ranged from R200 000 to R10 million. One company's start-up cost was R4 500. However, all capital equipment was rented unless it was already owned by the owner and this company supplies seaweed to three abalone farms. Wage cost is the largest g expense for all concessionaires. The operations are labour intensive and wage costs for the various concessionaires ranged from R50 000 p.a. to R1 783 000 p.a. Three of the companies invest in R&D (from R60 000 to R600 000 p.a.).

14.10 Permits

With one exception, all companies agreed that the permit fee was acceptable and 60% were willing to pay more for the permit if it went towards R&D in the seaweed sector.

14.11 Labour Information

Black females tend to make up the majority of the labourers in the seaweed industry. However, in 8 out of 10 companies, the employment ranks above the labourers were male dominated.

The labour force of two of the companies are employed on a full-time basis, while the majority of the work force of another company were also employed on a full-time basis. The rest of the concessionaires employ usually less than 10 people on a full-time basis as operators or a higher position. For various reasons the majority of the labour force is either permanent part-time or casual. Those companies that process their seaweed pay a higher wage than those that just harvest and sell the raw dry product.

14.12 Collaboration

8 out of 11 companies collaborate with other concessionaires on issues of technological development, planning initiatives and marketing. 6 out of 11 companies collaborate with foreign and academic institutions regarding technological development.

14.13 Labour Force Development Programmes

7 concessionaires have skills development programmes in place for employees. Participants in most cases are taught everything with respect to the particular operations of the company, from correct

harvesting method to machine operation, first aid, quality management, and supervision. 6 concessionaires also train their staff in some sort of management and entrepreneurial skills. 5 of the companies have a employee profit sharing schemes in place.

14.15 Development of Coastal Communities

All concessionaires would consider participating in seaweed industry development partnerships targeted at empowering rural communities and subsistence fishing communities. Most indicated that they would be willing to get involved immediately or in the short term. 9 out of 11 companies can provide various forms of support from knowledge dissemination to marketing/processing/investment partnerships.

Three companies have been encouraged by government to engage in coastal community development projects.

14.16 Perceptions

Most concessionaires agree that very little has been achieved towards stabilising the kelp, *Gracilaria* and *Gelidium* industry in the country via the development of value-added end products. R&D is lacking and as a result South Africa still competes as a raw material supplier with all the other main seaweed-producing countries. This limits volume stability and price. The consequences of this are evident at present with *Gracilaria*, *Gelidium* and alginate markets showing signs of instability for South African suppliers due to cheaper international suppliers.

The uncertainty regarding long term allocations is negatively affecting the development of the industry as it prevents long term investments. The South African seaweed industry is under threat from global economies with lower labour costs, but can remain competitive by ensuring quality, continuity of supply and value-adding end products.

Greater collaboration between companies would greatly benefit the industry, particularly as regards entry into niche markets. There is a misconception among coastal communities that the seaweed industry is easy money, and they have unrealistic expectations of the seaweed businesses.The domestic market for seaweed products is underrated by government and underdeveloped in terms of the potential for job creation and foreign exchange.

14.17 Industry Expansion

Points raised by concessionaires regarding ways in which the industry could be successfully expanded were:

1) Awarding long term rights with preference shown to companies that develop technologies which add value to end products, and that show high percentage utilisation of allocated resource and sustainable resource exploitation. Concessions should not be awarded to companies that are

unaware of production and market realities prevailing, which invariably make the further development of the industry impossible.

2) R&D aimed at developing technology for value-added end products.
3) Developing domestic and international markets.
4) Creating a central selling agent for concessionaires.
5) The industry must manage itself.

14.18 Further Perceptions

Competition in the international market is very stiff and often high-risk regardless of the particular application. Seaweed harvesting for the supply chain for the alginate industry requires large volumes to support the market demand for the raw material to effectively create allegiance with buyers in this market. This particular market is extremely volatile. The market for the application of brown seaweeds in animal feeds is high-risk in that markets do not exist, and thus require development. To be viable, a resource allocation for this application of brown seaweed requires the commitment of skilled ownership able to capitalise the sector. The application of brown seaweeds as health supplements has the same commercial realities. It requires small volume and raw material processing to bring the product to a state fit for human consumption. There has been no successful local application in the pharmaceutical industry to date. This application would be largely technology based. Application in the fertiliser industry is limited by the fact that markets do not exist, thus requiring development. Organic fertilisers are also much more expensive than inorganic fertilisers. The application as plant growth regulators is entirely technology-based with patent requirements and high barriers to entry. This application is high-risk due to the fact that any product arising out of new technology requires extensive research to enable product registration and sale.

14.19 The Fragmentation of the Seaweed Industry

The fragmentation of seaweed allocations to allow previously disadvantaged groups rights to a particular seaweed resource will lead to short term opportunism with little focus on industry capitalisation, and obscure growth. The ultimate result will be micro-industries which are, at best, sporadic in nature (P. Friedmann, 2001; pers. comm). New entrants working alone can only get involved in raw material production and transport. Any other application will require massive start-up capital and exorbitant marketing costs for the development of markets and niche markets. Reliability and stability in production is the only manner in which allegiances will be made with distributors and raw material processing companies. New entrants are under pressure to show that they are productive, and can do things that give the industry a bad name, as has been shown in the past. This is also of concern in terms of sustainable resource utilisation, as new entrants may end up over-exploiting the resource.

Sustainable allocations must be based on accurate scientific information and the ultimate aim of resource allocation must be the stabilisation of the industry with the view to long term growth for the benefit of all. If the opportunity exists in the resource supply line to allocate down-line processing to disadvantaged communities, and in so doing empower such individuals to create their own businesses, a sub-allocation to the new entrant should be made on the basis of committed levels of supply, at agreed and negotiated price levels. What has happened in the past is that the new entrants invariably are left to empower themselves. These enterprises failed as they lack necessary resources, which in turn negatively affects the industry as a whole. Transformation requirements should not form the criteria for resource allocation. Black empowerment has at its core the transfer of knowledge and the development of skills. Thus the best way for black **empowerment** may be to create subcontracting opportunities in which the subcontracted company is a previously disadvantaged group that enters into a strategic alliance with a seaweed concessionaire for a limited amount of time. The subcontracted company is bound by contractual agreement to be a part of the supply chain of that concessionaire. The contract time is the time determined by the industry to be necessary for the transfer of skills from the concessionaire to the subcontracted company to take place until the subcontractor is self-sufficient. Once the contract has expired, the new concessionaire qualifies for its own concession and can stipulate its own selling price. This should force the established concessionaires to move away from dealing with seaweed harvesting as a primary focus, to making concerted efforts to value-add the product.

There are only two reasons for fragmenting an allocation: Either the previous concessionaire was not utilising that resource sustainably or optimally, or the new entrant has provided a detailed business plan that is realistic in its goals. That is, it provides a method of operation, shows good knowledge regarding the most environmentally sustainable method of harvesting, shows it has the necessary capital investment potential, and shows that it has secured a market for the product.

14.10 Key Indicators for the South African Seaweed Industry

The following report was generated from data supplied by 11 of 14 seaweed concessions granted in South Africa in 2000, providing coverage for about 79% of the industry.

<u>Ownership</u>
Forty percent of the seaweed concessions were white-owned in 2000, while 20% were owned by PDI. The rest of the ownership in the industry consisted of Joint Ventures or other shareholding structures (Fig. 14.3).

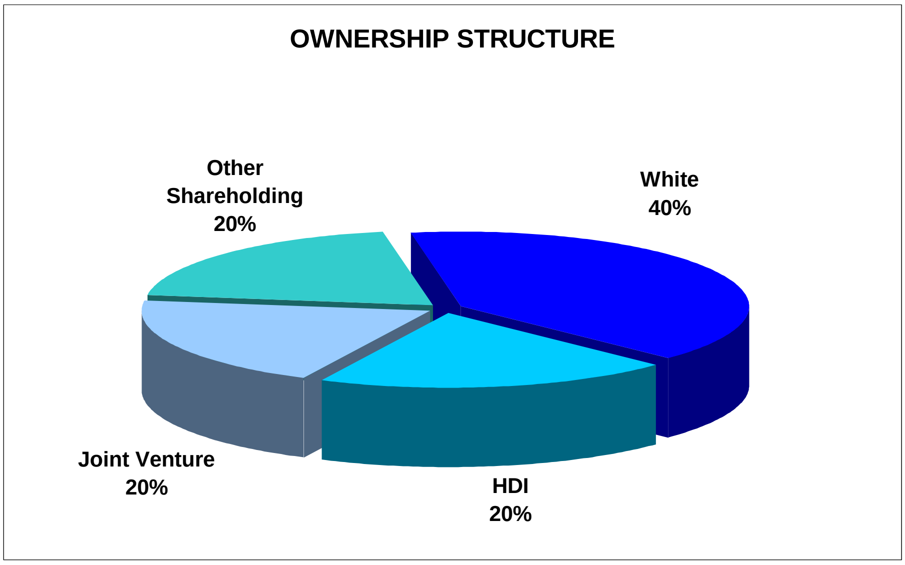

Figure 14.3. Ownership of the South African seaweed concessions in 2000.

Employment

The 11 seaweed concessions and their subcontractors provided formal employment for about 313 workers, of which 92% were PDI, earning 77% of the wages (Fig. 14.4 and 14.5). They also employed a total of approximately 1 450 temporary or casual workers for certain periods of the year, all of which were PDI.

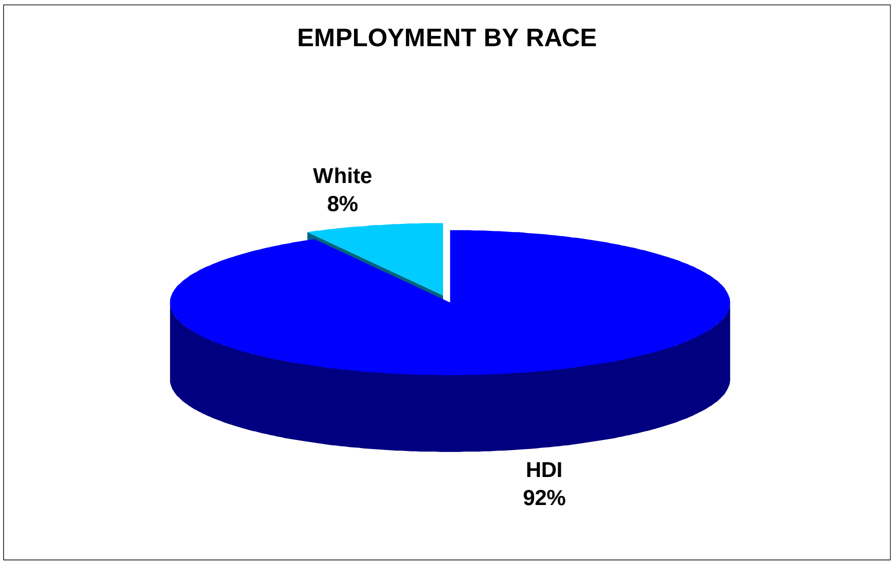

Figure 14.4. The percentage of White and Previously Disadvantaged Individuals (PDI) employed in the seaweed industry in 2000.

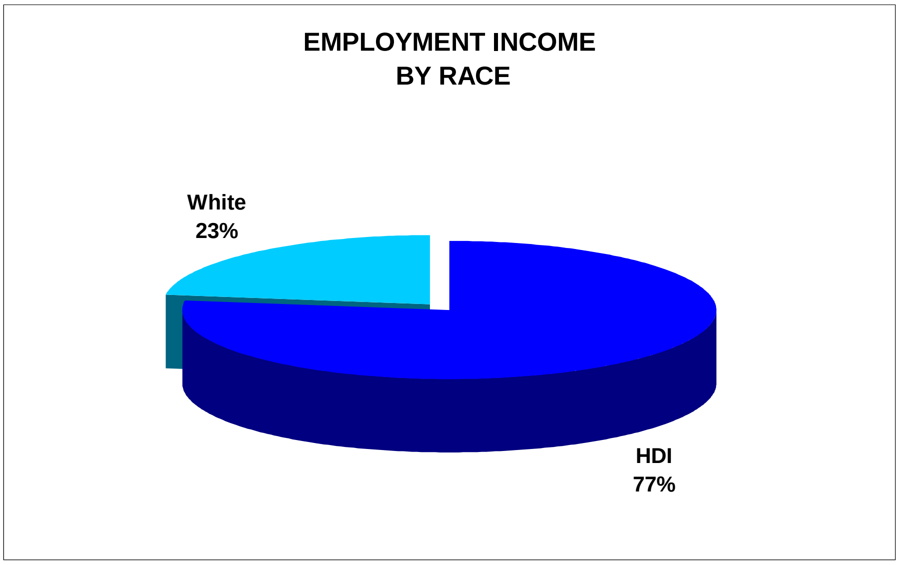

Figure 14.5. The percentage income earned by White and PDI employed in the seaweed industry in 2000.

Most of the formal work force was employed as unskilled labour in the seaweed industry (Fig. 14.6). The skilled workers were all white, while the unskilled workers were all PDI. The high number of white relative to PDI professionals correlates with the higher number of white-owned concessions, assuming that the concessions are owner-managed (Fig. 14.7 and 14.8).

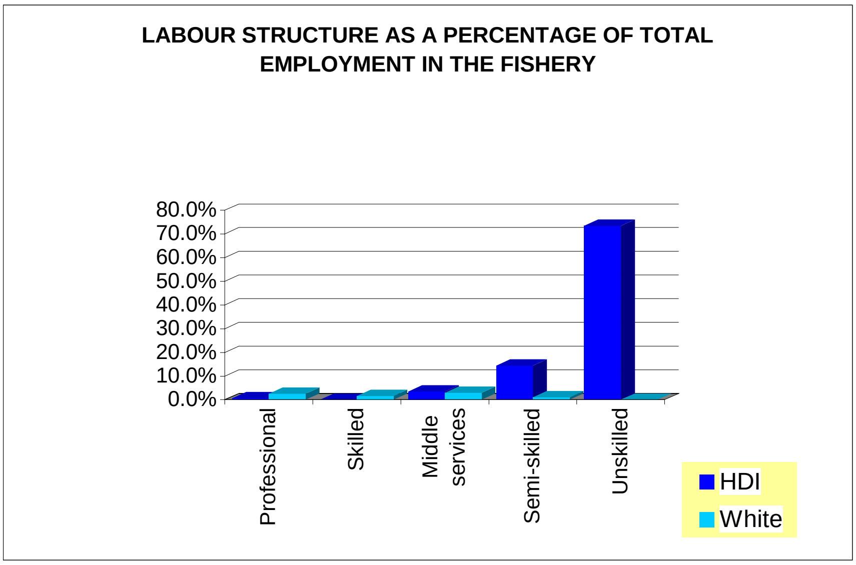

Figure 14.6. The number of employees in each of the skills categories, as a percentage of the total formal employment in the seaweed industry in 2000.

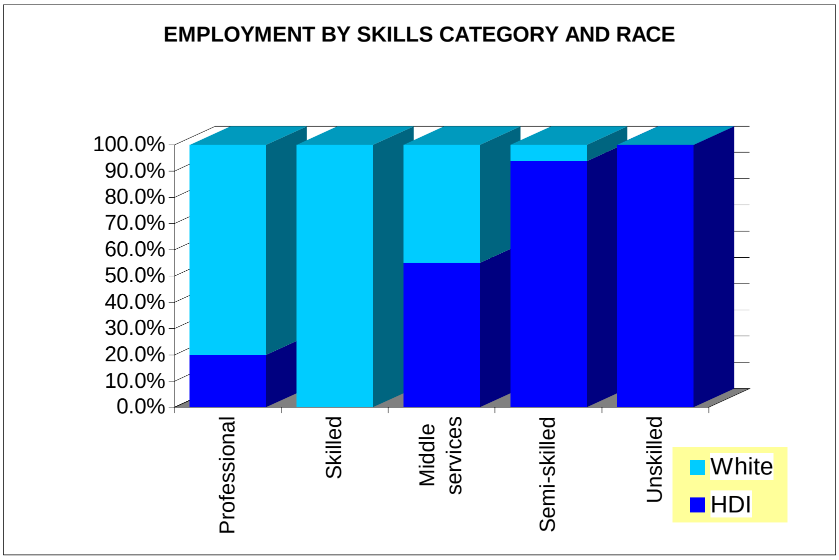

Figure 14.7. The percentage White and PDI employment in the seaweed industry in 2000, by skills category.

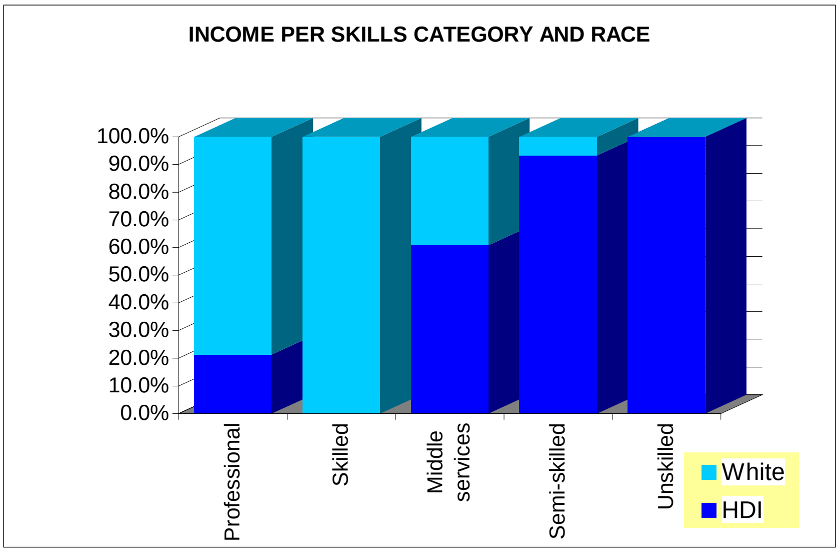

Figure 14.8. The percentage White and PDI income earned in the seaweed industry in 2000, by skills category.

The average annual earnings of the employees in the different employment categories are portrayed in Figure 14.9. There was little difference between White and PDI remuneration rates in the South African seaweed industry.

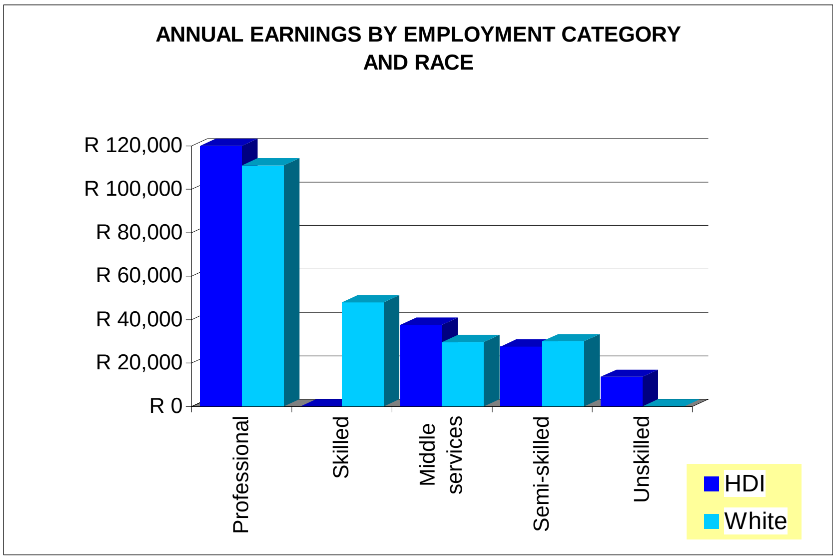

Figure 14.9. The average annual income per skills category for employees in the seaweed industry in 2000.

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APPENDIX A: CURRENT SEAWEED CONCESSION AREAS (EXCLUDING RESERVES)

1. Kei River (32°40′28″S , 28°23′00″E) to Cape Seal (34°01′12″S , 23°24′48″E)
2. Cape Seal (34°01′12″S , 23°24′48″E) to Cape St Blaize (34°10′16″S , 22°05′30″E)
3. Cape St Blaize (34°10′16″S , 22°05′30″E) to the eastern bank of the Breede River (34°24′00″S , 20°50′00″E)
4. Western Bank of the Breede River (34°24′40″S , 20°50′00″E) to Cape Agulhas (34°49′40″S , 20°00′40″E)
5. Cape Agulhas (34°49′40″S , 20°00′40″E) to the eastern bank of the Uilenkraal River (34°36′24″S , 19°24′36″E)
6. Western Bank of the Uilenkraal River (34°36′24″S , 19°24′36″E) to the eastern bank of the Mossel River (34°24′30″S , 19°16′24″E)
7. Western Bank of the Mossel River (34°24′30″S , 19°16′24″E) to the eastern bank of the Palmiet River (34°20′36″S , 19°59′56″E)
8. Western bank of the Palmiet River (34°20′36″S , 19°59′56″E) to Swartklip (34°04′29″S , 18°41′12″E)
9. Simonstown municipal border at Rocklands Point (34°13′00″S , 18°28′00″E) to the RSC boundary at Klein Koeelbaai near Bakoven (33°57′38″S , 18°22′20″E)
10. CCC/RSC boundary south of Blouberg (33°48′48″S , 18°28′12″E) to South Head, Saldanha (33°06′18″S , 17°57′18″E)
11. North Head (Schooner Rock), Saldanha (33°03′05″S , 17°54′36″E) to the southern bank of the Berg River (32°46′12″S , 18°08′42″E)
12. North Bank of the Berg River (32°46′06″S , 18°08′48″E) to the southern border of Lambert's Bay (32°06′00″S , 18°18′12″E)
13. Groothoek Bay (31°54′36″S , 18°16′22″E) to the southern bank of the Olifant's River (31°42′36″S , 18°11′15″E)
14. Northern bank of the Olifant's River (31°42′04″S , 18°11′15″E) to the southern bank of the Groen River (30°51′00″S , 17°34′36″E)
15. Security fence at Mitchell's Bay near the mouth of the Spoeg River (30°27′54″S , 17°21′22″E) to the angling club slipway at Kleinsee (29°42′48″S , 17°03′24″E)
16. Northern border of the farm Oubeep south of McDougallsbaai (29°19′45″S , 16°54′38″E) to the border of the proclaimed State Alluvial Diggings just north of Port Nolloth (29°13′56″S , 16°51′15″E)
17. South Head (33°06′18″S , 17°57′18″E) to the North Head (Schooner Rock) of Saldanha Bay including Saldanha Bay but excluding Langebaan (33°03′05″S , 17°54′36″E)
18. From the slipway at the angling club at Kleinsee (29°42′48″S , 17°03′24″E) to the northern border of the farm Oubeep, south of McDougallsbay. (29°19′45″S , 16°54′38″E)
19. From the border of the proclaimed State Alluvial Diggings just north of Port Nolloth . (29°13′56″S , 16°51′15″E) to the southern bank of the Orange River. (28°38′18″S , 16°27′42″E)
20. Kei River (32°40′28″S , 28°23′00″E) to Qora River. (32°27′00″S , 28°40′24″E)

21. Qora River (32°27′00″S , 28°40′24″E) to Mbashe River. (32°14′54″S , 28°54′00″E)
22. Mbashe River . (32°14′54″S , 28°54′00″E) to Mnenu River. (31°48′24″S , 29°19′46″E)
23. Mnenu River . (31°48′24″S , 29°19′46″E) to Mtamvuna River. (31°04′50″S , 30°11′42″E)

15. MARICULTURE

15.1 Introduction

World aquaculture production was approximately 37 million tonnes in 2000, and has increased by 10% per year since 1990. African aquaculture made up only 0.4% of this volume (ca. 150,000 tonnes), of which South Africa contributed around 4,000 tonnes.

Mariculture (the marine component of aquaculture) production in South Africa is small and underdeveloped when compared to the industries of other countries, and to the local marine harvest fishery. Total mariculture production was estimated to be in the region of 710 tonnes in 2000, with a value of approximately R45.5 million.

The first serious attempt to engage in mariculture in South Africa dates back to the establishment of the Knysna Oyster Company in the 1950’s. Between 1975 and 1985, mariculture development was fostered through various projects undertaken by the parastatal Fisheries Development Corporation (FDC). This led to the establishment of commercial production of oysters, mussels and prawns in the 1980’s, paralleling an upsurge in global aquaculture production during this decade. It is significant that the staff of the defunct FDC subsequently moved on to pioneer many of the commercial mariculture projects in South Africa. The closing of this institution was undoubtedly a blow to the further development of mariculture, as to this date, no organisation has taken over an equivalent development-orientated role. Consequently, while the aquaculture industries of many countries boomed in the 1990’s, the lack of state sponsored input into technology development and capacity building resulted in the South African industry stagnating. The only new commercial mariculture species to emerge since the 1980’s is the abalone, due to private sector investment in technology development, motivated by the exceptionally high prices paid for the product in the Far East. Seaweed culture has also been introduced in Saldahna Bay, but has yet to develop into a stable business, and finfish culture is being experimented with on one of the abalone farms.

Mariculture has been recognised by the South African Government as a means to promote diversity, vitality and long-term viability of coastal economic activities, in a bid to pro-actively alleviate coastal poverty. Also, most of South Africa’s harvest fisheries are fully utilised, thus one of the few economic growth opportunities based on living marine resources is the farming of species in sea water. After the promulgation of the Marine Living Resources Act of 1998 (MLRA), mariculture was clearly identified ‘as a sector requiring special attention with regard to promoting expansion and diversification of activities’ by the South African Government (MCM, 1999:1). The Department of Environmental Affairs and Tourism (DEAT) is the responsible Government body for South African marine fisheries and mariculture, through its Directorate of Marine and Coastal Management (MCM). However, to date MCM has performed primarily a regulatory role regarding mariculture, and presently lacks capacity to perform a developmental function.

The following document is a summary of the state of mariculture in South Africa in 2000, based on information received from individuals presently active in the industry. It forms part of a survey carried out for the Economic and Sectoral Study of the South African Fishing Industry, implemented by Rhodes University, on behalf of the Department of Environmental Affairs and Tourism. The data were not included in the aggregate data for the fishing industry as mariculture differs fundamentally from fishing in the sense that the right to undertake mariculture does not confer access to an existing resource with inherent value such as a stock of fish. The document also reports the perceptions that the South African mariculturists have of their industry, and comments on the future development of the industry.

15.2 Species summaries

<u>Oysters</u>

The farming of the exotic Pacific oyster, *Crassostrea gigas* is the oldest type of aquaculture carried out in South Africa. The first operation was initiated in 1948. Originally from the Japanese and Korean coasts, humanity has spread this marine bivalve throughout the world. The only region where it is not found is in the waters of the Arctic and Antarctic. They are excellent culture animals, attaching to almost any hard surface in sheltered waters (estuaries or bays) in the inter-tidal and shallow sub-tidal zones, to a depth of about three metres. The species has a high rate of growth and reproduction, and tolerates a wide range of environmental conditions. It is valued highly by the seafood industry, and as long as it has access to flowing seawater, it feeds itself; it's a filter-feeder, feeding on the suspended organisms and nutrients in the water column around it.

Ten permits to culture the Pacific oyster were issued by Marine and Coastal Management in 2000, of which six were located in the Eastern Cape, three in the Western Cape and two in the Northern Cape. Of the permits awarded, five were activated in the Eastern Cape, including three in Port Elizabeth, one in Port Alfred and one in Hamburg. One permit was activated in Knysna in the Western Cape, and two were activated in the Northern Cape (at Port Nolloth and Alexander Bay).

One oyster farming operation produced its own spat; the rest imported spat from the United Kingdom or Chile. Of the ten oyster-producing operations active in 2000, two used the rack culture method, three used Japanese longline technology, two grew the oysters in trays in ponds (one was an experimental operation), and one farmer reared the oysters in tanks in a pump-ashore system.

<u>Mussels</u>

The exotic Spanish mussel *Mytilus galloprovincialis* was most probably introduced to local waters by ships off-loading cargos in South African ports. They may have been carried to our shores in the ballast water of these vessels, or attached to their hulls. The Spanish mussel is presently displacing the indigenous black mussel *Chloromytillus meridionalis* in some parts of South Africa, and it is ironic that this invader has become the mainstay of the mussel mariculture industry in South Africa. The contribution from local species such as the black mussel and *Perna perna* to the annual mariculture harvest has declined to insignificant levels.

Two permits for Spanish mussel mariculture were awarded by MCM in 2000. Both were off-shore operations located off Saldahna Bay in the Western Province. Only one permit was activated; a Spanish raft-type operation located within the Langebaan Lagoon. The second permit was for an experimental longline operation.

Three hundred hectares of the bay have been allocated to mussel culture by the authorities, but only 50 ha are being farmed at present. Another 150 ha are under lease. Market size for mussels is between 55 and 100 mm. Natural settlement onto the rafts during grow-out provides new seed-stock that is sorted at harvesting. The mussels are cultured for the local market, of which 300 tonnes are consumed fresh, smoked or canned. About 1,500 tonnes are consumed frozen, with the shortfall being made up by imports from Europe.

<u>Abalone</u>

Abalone are marine gastropod molluscs. Approximately 90 species of abalone occur worldwide, and all are included within the genus *Haliotis.* Six species occur in southern Africa. These are *H. parvum*, *H. queketti*, *H. spadicea*, *H. speciosa*, *H. pustulata* and *H. midae* (colloquially known as the perlemoen in South Africa). Of the six abalone species, only the perlemoen is exploited commercially in South Africa.

Over-exploitation and rampant poaching have all but decimated the world's stocks of wild abalone. Control measures have been put in place to curb poaching, but, given the level to which the abalone resource has been fished down, it is highly unlikely that the stocks can be rebuilt. The short-fall between market demand and supply is growing, and future abalone production will be largely dependent on aquaculture.

In response to the decline in fisheries and the rising price of abalone, several countries have developed the technology for abalone farming. Two culture technologies were pioneered in Japan in the fifties and sixties as a means of replenishing abalone stocks in heavily fished areas; farming in tanks onshore, and ranching. Of the two, tank culture gained predominance and commercial abalone farming was subsequently established in Japan, California, China and Taiwan.

The abalone (*Haliotis midae*) industry was initiated in South Africa in the early 1990's by three fishing companies. By 1996 a number of smaller operators had entered the industry, with the first 10 tonnes of cultured abalone being produced in 1997. The abalone industry has subsequently grown to 12 established operations, including 10 on-shore tank farming systems in the Western Cape, one in Port Elizabeth in the Eastern Cape and one ranching operation in Port Nolloth in the Northern Cape. A total of 18 abalone mariculture permits were applied for in 2000; four permits were not activated in the Western Cape, and two were not activated in the Eastern Cape. Most of the abalone farms in the Western Cape are concentrated along the South Coast between Hermanus and Danger Point, in the Overberg district. Another node of development is in the Saldahna Bay/St Helena Bay area on the West Coast. Eleven of the 12 abalone farms have their own hatcheries. The abalone farmers are represented by the Abalone Farmers Association of South Africa (AFASA) which is a very active body promoting common interests and research into production techniques and problems.

Prawns

Six species of commercially important prawns occur along the East Coast of South Africa, including the Indian white prawn (*Fenneropenaeus indicus*, a.k.a. the red-legged banana prawn), the tiger prawn (*Penaeus monodon*), the kuruma prawn (*Marsupenaeus japonicus*), the flower prawn (*Penaeus semisulcatus*, a.k.a. the grooved tiger prawn) and the brown prawn (*Metapenaeus monoceros*, a.k.a. the red endeavor prawn). Only one species, the Indian white prawn, is cultured in South Africa. This species has a wide distribution, from the Red Sea down the East Coast of Africa to South Africa. The species is very abundant, occurring on sand, sand/mud, and mud substrata, but shows preference for soft sand. It is a euryhaline species, abundant in both low and high salinity lagoons and tolerates salinities of 45 ‰ in the Red Sea. Post-larvae and juveniles accumulate in estuaries, while the adults migrate out into the open sea. The adults normally occur at depths of 8 to 30 m, but have been reported at 90 m in some instances. They breed at sea; the eggs hatch in the sea and develop into post-larvae which migrate into the shelter of lagoons and backwaters, where they grow to maturity. They are nocturnal animals, hiding in the mud or soft sand during the daytime, and coming out to feed at night. They are omnivores, feeding on detritus, benthic amphipods, polychaete worms, mud prawns, etc.

Only one prawn mariculture permit was applied for in 2000, for a business that operates two farms. The first farm was set up in 1991 on the Amatikulu River estuary, in northern KwaZulu/Natal. The second farm was acquired in 1998, and is located at Mtunzini, on the Umlalazi River, about 30 km from the first farm. The prawns are farmed extensively in large (0.4 – 2.0 ha) ponds. Water is pumped into the ponds from the nearby estuaries. The combined surface area of the ponds at the two sites is about 26 ha.

Finfish

Two finfish permit applications were received by MCM in 2000, but only one was activated. This was for an experimental project to grow the European turbot (*Scophthalmus maximus*) at an existing abalone operation on the West Coast in the Western Cape Province. The turbot pilot project was initially set up in the late 1990's. The turbot is an exotic finfish species belonging to the family of right-eyed flounders called Pleuronectidae. The environmental conditions along the West Coast appear to be well suited to this species. The operation aims to supply a small, European-expatriate market for this high-priced species in Gauteng. Wholesale prices in the region of R80-120.00/kg are anticipated.

Seaweed

Four seaweed mariculture permits were requested from MCM in 2000. Two permits were activated; one at Port Elizabeth, in the Eastern Cape, and one at Saldanha Bay, in the Western Cape. Both operations are culturing *Gracilaria gracilis*, a species of locally occurring red seaweed. This species is distributed around the world, and is found attached to rocks and stones, both inter- and sub-tidally, especially on sandy shores. The cultivation of this agar-producing red alga is now of major importance in Asia and South America. *Gracilaria* spp. are usually cultivated in the open sea, using various ground-planting methods such as the direct insertion of thalli in soft substratum, or suspended from ropes and/or nets hung horizontally or vertically in the water column. Methods have also been investigated for culturing the algae in land-based systems, using tanks and ponds.

The Port Elizabeth operation consists of a land-based system, where the *Gracilaria* is grown in ponds supplied by effluent water from an abalone farm. The *Gracilaria* is used as a feed supplement for the abalone produced on the farm. The Saldahna Bay operation consists of ropes seeded with *Gracilaria* and then hung from rafts in the bay. It is a small-scale farming operation carried out by a coastal community empowerment group. A total of about 40 tons of cultured seaweed was produced through mariculture in 2000, which was mainly consumed locally by the abalone producers, although the international agar market is a future goal.

15. 3 Distribution of Mariculture in South Africa

A map depicting various mariculture loci along the South African coastline is presented in Figure 15.1. Most of the marine farming activity occurs in the Western Cape, where 14 of the 25 mariculture operations active in South Africa in 2000 were located (Figure 15.2). Sixty-three percent of the applications for mariculture permits in 2000 were from the Western Province, 28% were from the Eastern Cape, 8% from Northern Cape and 3% from KwaZulu/Natal.

The Western Cape was also the greatest producer of mariculture products in 2000 (Figure 15.3), earning approximately R30.05 million, followed by KwaZulu/Natal (R8.4 million), Eastern Cape (R6.05 million) and the Northern Cape Province, earning approximately R1.05 million from mariculture in 2000.

15. 4 Production and income

About 177 tons of Pacific oysters were produced in 2000, and most were sold into the local southern African market. Wholesale price depended on the size class of oysters being sold, but total turnover was estimated to be R5.1 million (± R30.00/kg).

Only about 300 tons of mussels were cultured in South Africa in 2000, compared to 750 t the previous year. This decrease resulted from restructuring of the mussel producing operation in Saldanha Bay at that time. Wholesale value of the product was about R6.50 per kilogram, resulting in a turnover of approximately R1.95 million for the year.

An estimated 100 tonnes of cultured abalone were exported from South Africa in 2000. Most of the product was cocktail-sized (70 - 100 mm shell diameter) abalone, exported live to Japan and China, but some of the product was exported in cans. Average value of the product was in the region of

US$30/kg, making the abalone component the most valuable of all the aquaculture industries in South Africa, with a turnover of about R30 million.

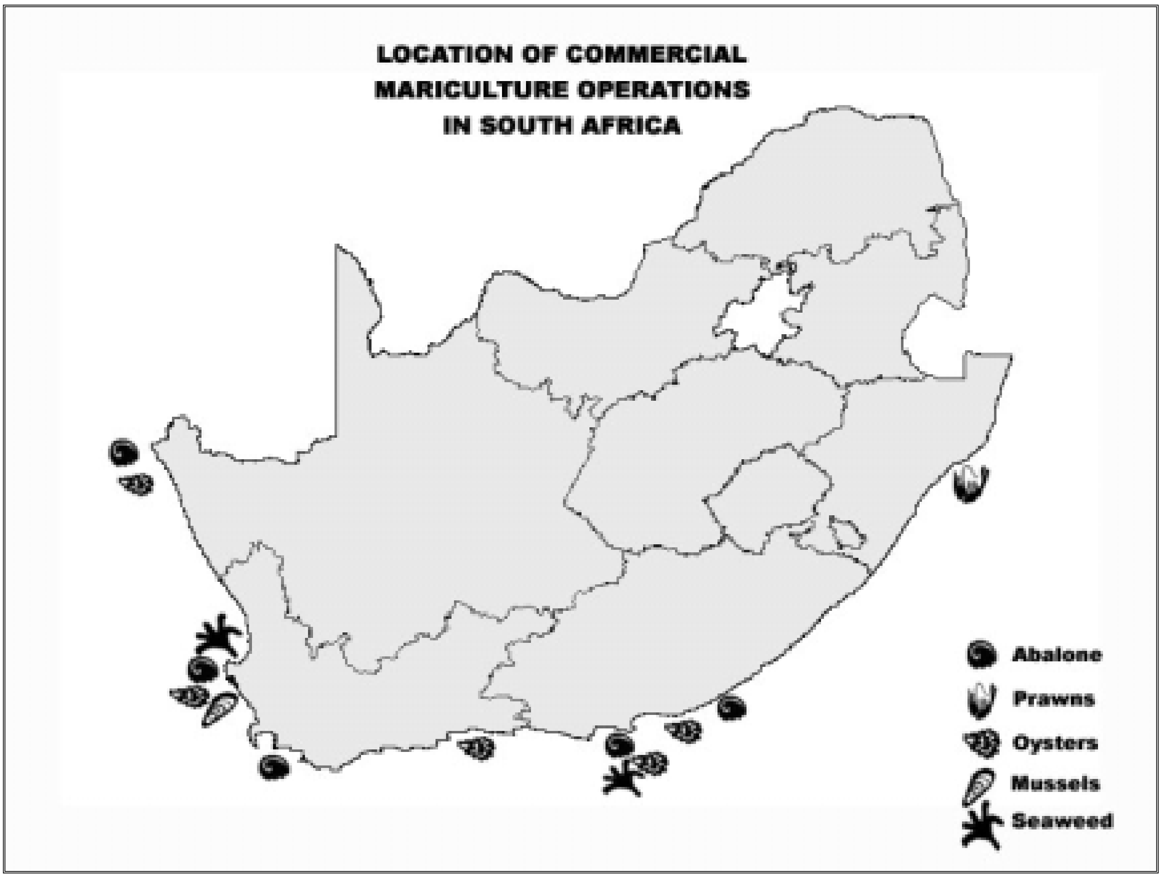

Figure 15.1. Location of mariculture operations along the South African coastline.

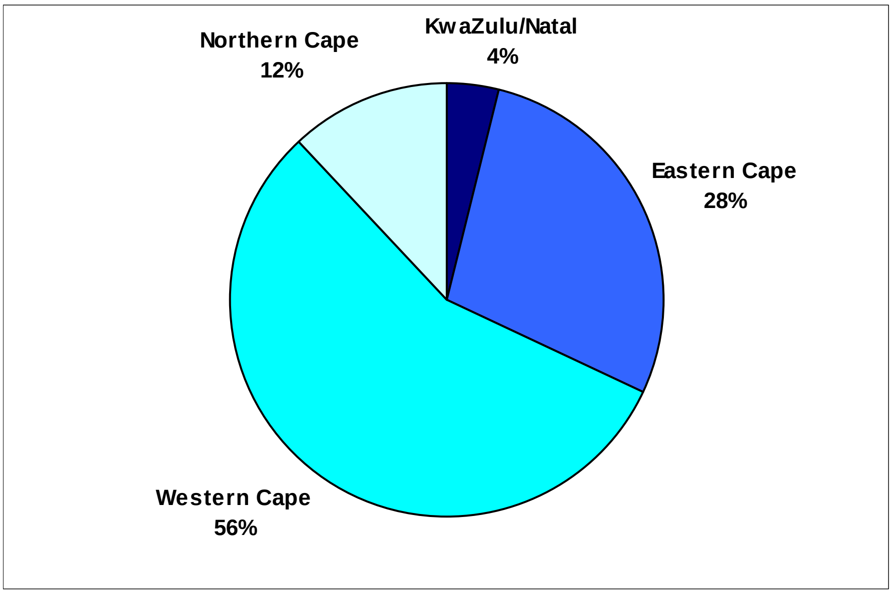

Figure 15.2. The distribution of active mariculture operations in the coastal Provinces of South Africa, in 2000.

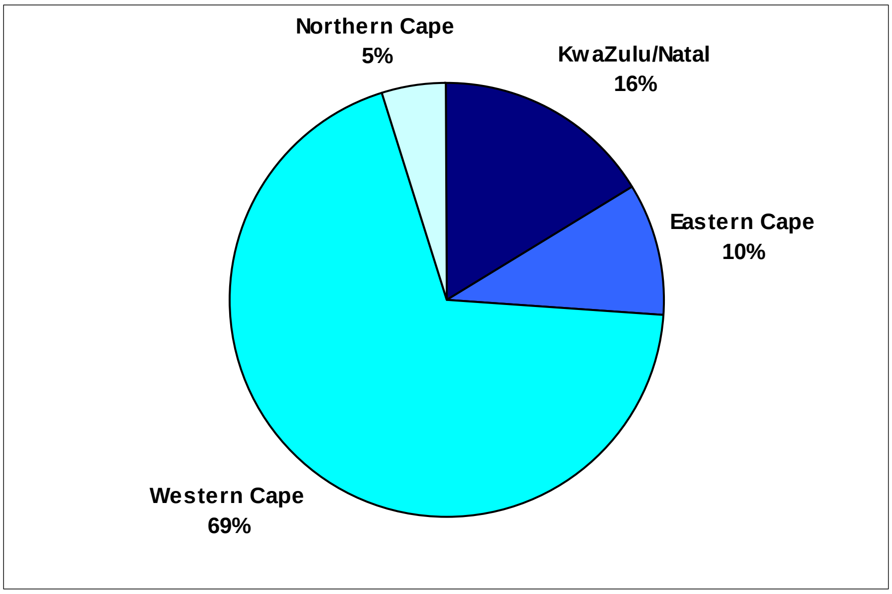

Figure 15.3. Relative Provincial contribution to total mariculture production in South Africa in 2000.

15.5 Representative production costs

The request for an estimate of production costs was not well subscribed by the respondents to the ESS mariculture survey. No data was received for the seaweed operation in Saldahna Bay. The Eastern Cape seaweed operation and the finfish operation's production costs were included in those of the abalone farms to which they were affiliated. The production costs for the rest of the mariculture operations are summarised in Table 15.1.

Table 15.1. Average production costs for mariculture operations in South Africa, for 2000.

OPERATION	AVERAGE % PRODUCTION COSTS ACCRUING TO:				*Sample size*
	Labour	Transport	Processing	Running	
Abalone	27.2	4.7	5.5	59.4	60%
Abalone hatchery	50.0	5.0	0.0	45.0	50%
Oyster	26.8	17.5	33.3	22.5	67%
Oyster hatchery	26.0	11.0	25.0	37.5	100%
Mussel	50.0	25.0	0.0	25.0	100%

It is difficult to draw conclusions from the comparisons of the different types of mariculture listed in Table 15.1, as the natures of the operations are so diverse. Nevertheless, it is interesting to note that nearly 60% of the abalone expenses are made up of running costs other than labour, transport or processing. Labour costs make up 50% of the mussel and abalone hatchery expenses, while processing is the largest single cost in the oyster industry.

15.6 Investment

The total value of all the mariculture operations in South Africa was estimated to be approximately R340 million in 2000. The abalone operations made up the bulk of this value, worth an estimated R297.5 million on the open market, followed by the prawn (±R26 million), oyster (±R13.2 million), mussel (±R3 million) and seaweed (±R300,000) operations.

15.7 Financing

Most of the initial financing of mariculture operations in South Africa to date has been through the use of private capital, supported by local investment or loans (Table 15.2). This situation is also reflected in the on-going or current financing of these operations (Table 15.3). A very small portion of the total financial investment in the mariculture industry was received from government aid sources.

Table 15.2. Initial sources of financing in the South African mariculture industry.

	Domestic investment & loans	Foreign investment	Foreign aid	Gov't assistanc e	Private capital
Abalone	36%	0%	0%	7%	57%
Abalone (H)	0%	0%	0%	0%	100%
Oyster	17%	0%	0%	0%	83%
Oyster (H)	0%	0%	0%	0%	100%
Mussels	100%	0%	0%	0%	0%
Seaweed	67%	0%	0%	0%	33%
Finfish	0%	0%	0%	0%	100%
Prawns	0%	0%	0%	0%	100%

Table 15.3. Current sources of financing in the South African mariculture industry.

	Domestic investment & loans	Foreign investment	Foreign aid	Gov't assistanc e	Private capital
Abalone	31%	0%	0%	8%	62%
Abalone (H)	0%	0%	0%	33%	67%
Oyster	0%	0%	0%	0%	100%
Oyster (H)	0%	0%	0%	0%	100%
Mussels	0%	0%	0%	0%	100%
Seaweed	51%	0%	0%	0%	49%
Finfish	0%	0%	0%	0%	100%
Prawns	0%	0%	0%	0%	100%

15.8 Capacity utilization

Half of the abalone farms were operating at full capacity in 2000, that is they were developed an employed a full staff complement (this does not imply that their full abalone production capacity had been realised). Seventy-five percent were operating at greater than 80% capacity, while 92% of the farms were operating at greater than 50% capacity. One new abalone entrant had not yet achieved 10% operating capacity. The only other operations working at full capacity were the prawn farms in KwaZulu/Natal. None of the oyster operations were producing at their full potential, and 50% of the oyster operations were at less than 10% of their potential (Table 15.4). The Saldanha Bay mussel operation produced less than 50% of its usual annual volume of mussels in 2000, while the burgeoning seaweed and finfish operations were still at less than 20% of their capacity. The potential mariculture production for 2000, assuming that all operations were running at full capacity, would have been in the region of 2,050 tons.

Table 15.4. Capacity utilization in the South African mariculture industry in 2000.

PERMIT	% CAPACITY UTILISATION									
	>10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Abalone	1	0	0	0	2	0	0	2	1	6
Oyster	4	0	1	0	0	0	1	0	1	0
Mussel	1	0	0	0	1	0	0	0	0	0
Seaweed	1	1	0	0	0	0	0	0	0	0
Fish	1	0	0	0	0	0	0	0	0	0
Prawn	0	0	0	0	0	0	0	0	0	1

5.9 Employment

The South African mariculture industry employed approximately 680 people in 2000. Table 15.5 shows the breakdown of employment into race and skills group per sector. The racial structure of the prawn operation was not available. Where more than one mariculture activity was carried out on a farm, employment was only included under the primary product of the farm (e.g. seaweed culture at an abalone farm in the Eastern Cape), unless there where dedicated staff for the product (e.g. finfish culture at an abalone farm in the Western Cape).

The racial structure of the mariculture industry (excluding the prawn operation) is summarised in Figure 15.4. Total salaries and wages paid out in 2000 amounted to approximately R22.35 million. Average monthly salaries (excluding benefits) were in the region of R8,825 for professional staff, R5,170 for skilled workers, R3,950 for middle services, R2,300 for semi-skilled labourers, and R1,500 for labourers. The income differential between Historically Disadvantaged Individuals (HDI) and white employees was about 22.5% in the middle service and semi-skilled skills groups, but as high as 57% in the artisan/skilled worker group.

Table 15.5. The employment structure of the South African mariculture industry in 2000.

Operation	Total	Sub-total		Professional		Artisan/Skilled		Middle services		Semi-skilled		Unskilled	
		Black	*White*	*Black*	*White*	*Black*	*White*	*Black*	*White*	*Black*	*White*	*Black*	*White*
Abalone	418	344	74	0	32	2	10	24	24	62	4	256	4
Oyster	132	115	17	0	15	0	0	0	2	15	0	100	0
Mussel	17	15	2	0	1	0	0	0	1	2	0	13	0
Seaweed	11	8	3	0	1	0	0	0	2	0	0	8	0
Finfish	2	2	0	0	0	0	0	0	0	0	0	2	0
Prawns	98	n/a		10		23		3		23		39	
Total	**678**			**59**		**35**		**56**		**106**		**422**	

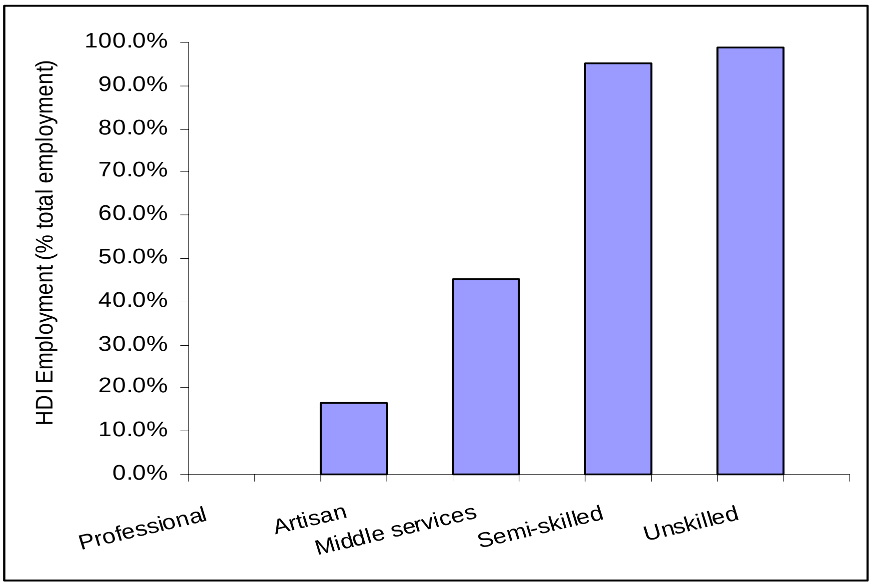

Figure 15.4. Historically Disadvantaged Individuals (HDI) employed per skills base in the South African mariculture industry in 2000, as a percentage of total employment.

There were no HDI professionals recorded during the Economic and Sectoral Study (ESS) of the mariculture sector for 2000. This anomaly reflects the nature of the mariculture industry at present. For the most part, it is a fledgling industry, driven by individual, white entrepreneurs. The technical skills required to run the relatively technology-intensive farms are fairly specialised, and are still resident within the white, tertiary-level educated community, although this situation is presently being addressed by the South African education system. The majority of mariculture operations canvassed during the ESS survey possessed skills development programs, primarily focusing on practical, on-farm training. A number of operations supported the call to establish a formal mariculture education qualification, in particular the abalone, mussel, seaweed and prawn farming communities. Respondents to the ESS survey agreed that such an initiative would increase the pool of skilled staff, enabling the mariculture industry to develop further. The industry is also willing to assist in the establishment of a mariculture knowledge-base, but notes that the education programs should be practically orientated. On the other hand, the oyster operators felt that a formal mariculture qualification was not necessary for their industry, as their on-farm training strategy was sufficient.

15.10 Perceptions in the mariculture industry

Market

The perceptions that various South Africa mariculturists have of the nature of their markets was recorded for the three year period preceding the ESS questionaire. The results are presented in Figure 15.5. The only changes in perception from 1998 to 2000 were that the mussel market had transformed from an unstable to a growing market, while the abalone market had altered from a growing to a stable market. The prawn, mussel and oyster spat markets were perceived as growing, while the abalone & abalone spat, oysters and finfish markets were thought to be stable in 2000. The seaweed market was considered to be turbulent throughout the three years monitored.

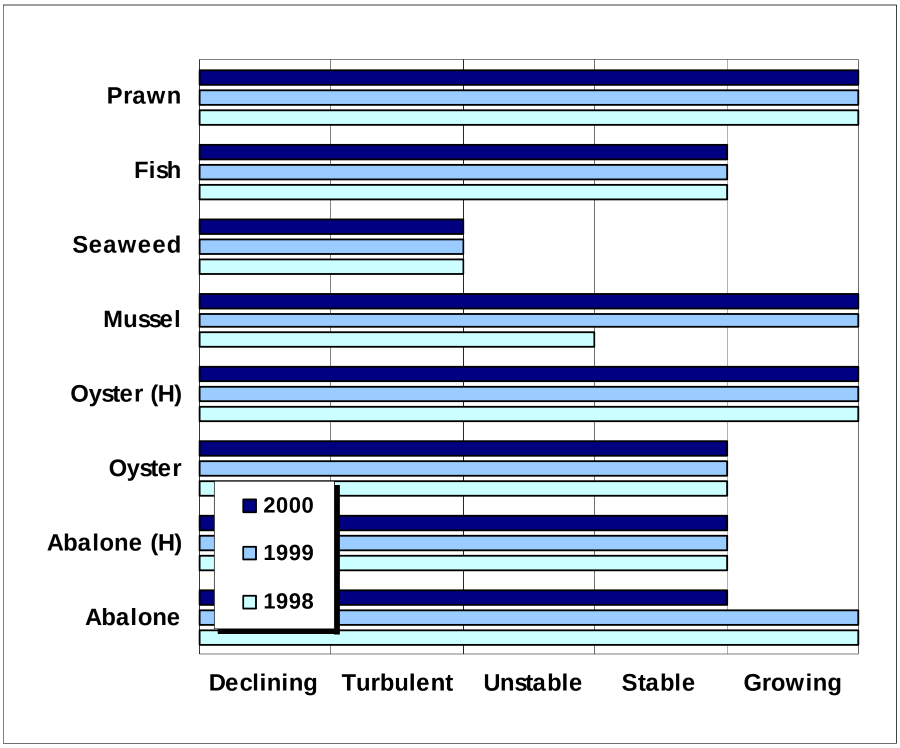

Figure 15.5. Market perceptions in the South African mariculture industry, 1998-2000.

15.11 Access to the mariculture industry

There is a perception that access to the mariculture industry in South Africa is limited by a number of operational constraints, including finance, appropriate and available sites, the technological nature of the operations, logistics, permitting strictures, and the availability of skilled labour. These perceptions were tested during the ESS by canvassing the opinions of the operators presently active in the South African mariculture industry. The results of the survey are summarised in Table 15.6.

Table 15.6. Perceived operational constraints in the South African mariculture industry.

	Finance	Site	Technology	Logistics	Skilled labour	Regulation
Abalone	Very difficult	Very difficult	Very difficult	Difficult	Difficult	Very difficult
Abalone (H)	Difficult	Difficult	Easy	Difficult	Easy	Very difficult
Oyster	Very difficult	Difficult	Easy	Difficult	Easy	Very difficult
Oyster (H)	Almost impossible	Very difficult	Easy	Easy	Easy	Almost impossible
Mussels	Easy	Easy	Difficult	Easy	Easy	Very difficult
Seaweed	Difficult	Very difficult	Almost impossible	Difficult	Almost impossible	Very difficult
Finfish	n/a	n/a	Difficult	n/a	n/a	n/a
Prawns	Very difficult	Difficult	Difficult	Difficult	Difficult	n/a

From a financial point of view, only the privately funded mussel operation reported that acquiring financial support was easy; the rest of the mariculture industry found it difficult to almost impossible to secure financing. Likewise for the site; most operators found it difficult to very difficult to find a site for their operation; however, a fairly large area in Saldanha Bay has been apportioned for mussel farming, which is presently available and underutilised. The technological nature of the abalone & oyster hatcheries and abalone on-growing farms were not considered to be operational constraints, while the rest of the industry found that the technology required in developing their operations to be difficult to almost impossible to master. Only the oyster hatchery and mussel raft operations considered the logistics of transporting goods to the farms and products to the market to not be an issue. Surprisingly, a number of operators felt that the acquisition of skilled labour was not a problem in their sectors. Only the abalone on-growing and prawn operations found it difficult to find skilled labour; however, the seaweed operator reported that it was almost impossible.

All the operators in the local mariculture industry reported problems with achieving compliance; they felt that obtaining the permits required to carry out mariculture from the regulatory bodies in South Africa was very difficult, if not almost impossible.

15.12 Regulation

Although a number of regulatory bodies are involved when setting up a mariculture operation (depending on the nature and location of the operation), it is the Minister of Environmental Affairs and Tourism to whom application to carry out mariculture must be made, and it is the Directorate Marine and Coastal Management (MCM) who oversee the application process, award the permits, and monitor permit compliance. The cost of the permits does not appear to be a major issue at present; 44% of the mariculture permit-holders canvassed during the ESS felt that the permit price was acceptable, 39% felt that it was high, and 17% remarked that it was too low. However, all of the permit-holders interviewed in the survey experienced problems with the permitting process. The greatest problem experienced by the industry was lack of feedback from MCM (Figure 15.6). Bureaucracy, disinterest and delays in permits were experienced in equal measure by the mariculture community. Surprisingly, only 5% of the mariculture industry perceived that a lack of capacity was a problem at MCM.

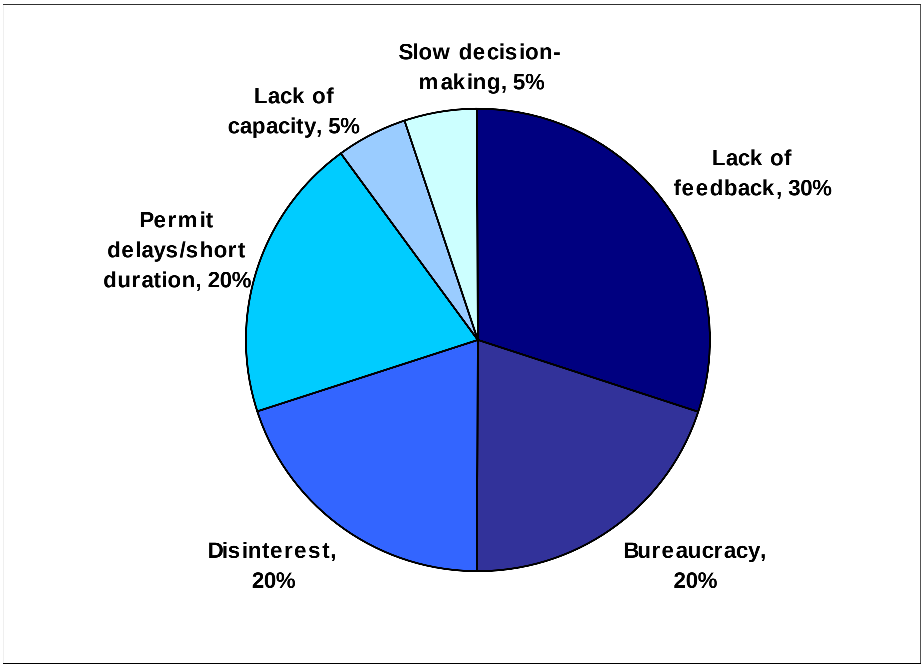

Figure 15.6. Problems experienced by the South African mariculture industry during the permitting process.

Fifty percent of the permit-holders in the mariculture industry thought that the situation could be remedied by improving the existing administration at MCM, while 32% felt that improved communication between MCM and the mariculture industry was the key. Eighteen percent of the permit-holders thought that a “one-stop” permit was the solution (Figure 15.7).

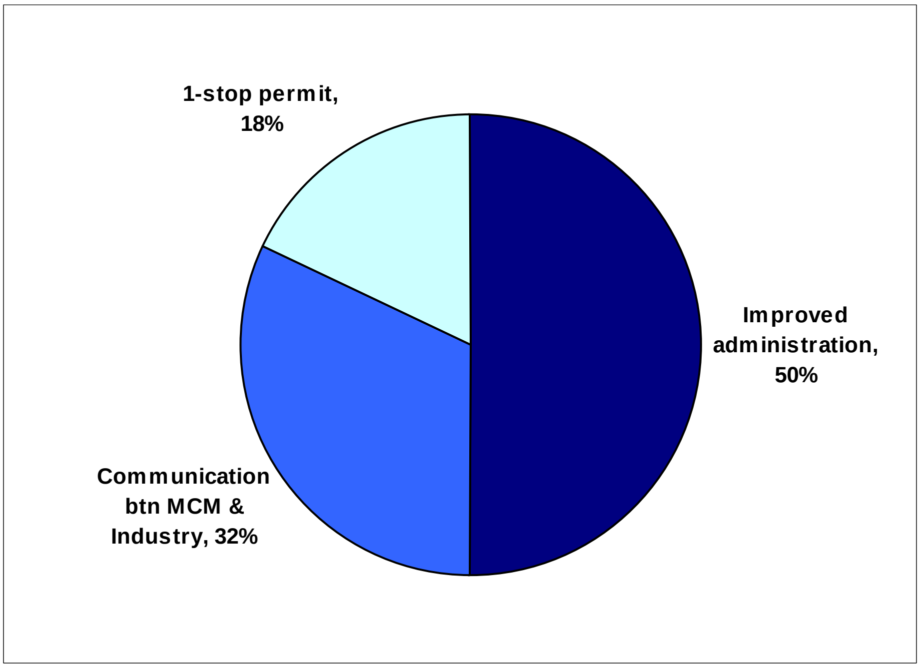

Figure 15.7. Potential solutions to the permitting problem, as perceived by the South African mariculture industry.

Assuming that the goal of a "one-stop" permit is attainable, 33% of the mariculture industry respondents reported that they would be unwilling to pay more for the permit than they are paying at present. On the other hand, 23% would pay up to 1.5 times more for the one-stop permit, 17% would be willing to pay double the current price, while 21% were willing to pay 5 times the present permit price for the convenience of a "one-stop" permit.

The concept of a "one-stop" permit is allied to a "one-stop" regulatory body for mariculture. The ESS survey asked the mariculture industry where the funding for such an institution should be obtained. The results are summarised in Figure 8. Fifty-three percent of the respondents felt that the South African Government should be mostly or fully responsible for funding the proposed institution, while 29% thought that it should be a 50/50-partnership between Government and the mariculture industry (Figure 15.8). Twelve percent replied that the industry should be mostly responsible for funding the institution.

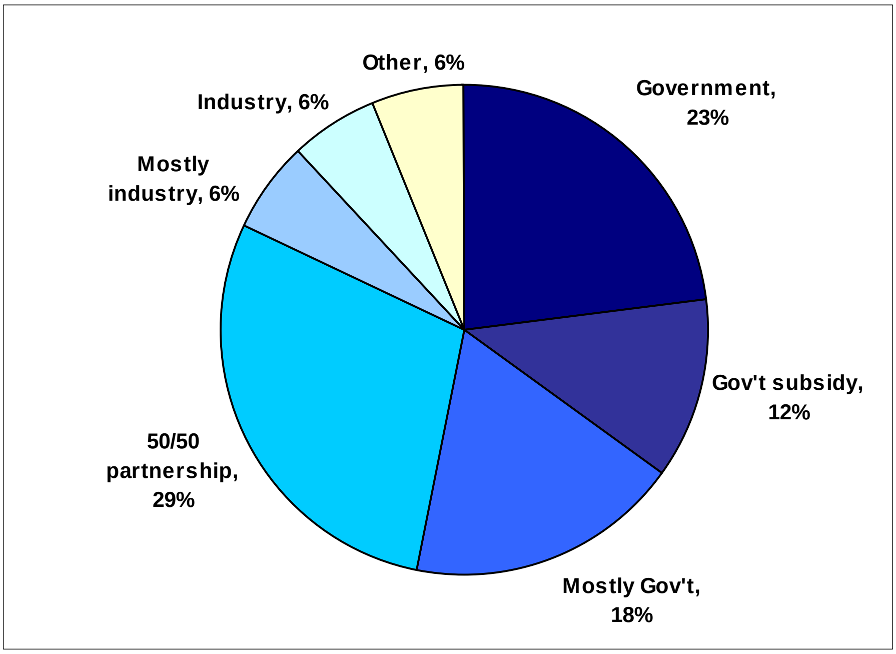

Figure 15.8. Mariculture industry perspectives on the potential sources of funding for a "one-stop" regulatory body.

15.13 Government Participation

The most important role of the Government in South African mariculture was perceived by the industry to be one of administrative support (88%, figure 15.9). Technology development and transfer (63%), and extension services (58%) were also perceived to be important roles for the Government to play. Only about a quarter of the respondents interviewed felt that the South African Government should facilitate finance and investment in the industry, while more than a third thought that the Government should be involved in sector and resource planning for the burgeoning industry.

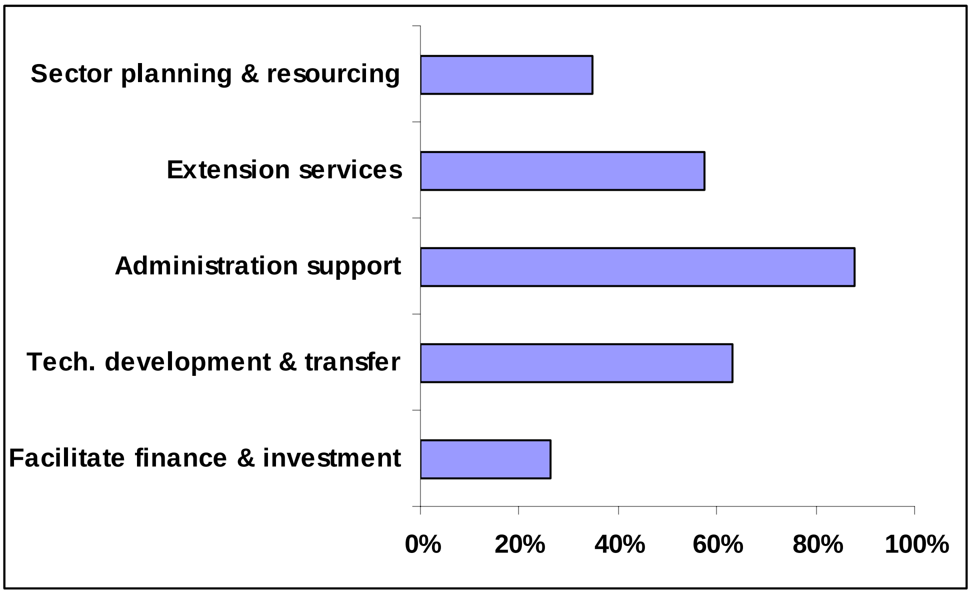

Figure 15.9. Potential areas for pro-active Government participation, as perceived by the South African mariculture industry.

15.14 Conclusion

The development of the abalone industry looks promising for the future of South African mariculture. Nevertheless, the state of the South African mariculture industry as a whole was poor in 2000, with most farms operating below capacity, and annual production lower than in recent years. In no way has the Government's policy objectives for mariculture been achieved, resulting in much frustration in the local industry. Although MCM has been identified as the "lead agent" for mariculture development, resources in terms of a development-orientated administration have not been put in place. Even MCM's regulatory role has been frustrating to the industry, and has lead to dissatisfaction and despondency. A major reason for this has been the strain that the short-term fisheries rights allocation process has placed on the Directorate's human resources; but even so, MCM is structurally not equipped to undertake an industry development role, analogous to that of the Department of Agriculture, and thus a holistic appraisal of the interventions and strategies required to promote mariculture development is required. A start was made with the convening of a sector planning workshop in 2000, which identified industry needs, and from which a National Mariculture Sector Planning initiative was launched.

A sector planning process is a comprehensive initiative which defines a developmental goal, strategies to overcome constraints, and specific projects which will deliver results. The plan also defines the resources, policies, institutional arrangements etc. required to realise the goal. The first step in the development of a sector plan is a stocktaking and diagnostic survey which defines the current situation and informs the development of the sector planning approach.

The Economic and Sectoral Study of the South African Fishing Industry (sub-sector: mariculture) has thus provided an opportunity to undertake a much need baseline survey of the country's mariculture industry, which could form part of the Sector Plan's stocktaking and diagnostic survey.