Fish survey of South Passage, Shark Bay, Western Australia

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Abstract

In April 1979, 323 species of fish were recorded from the South Passage area of Shark Bay. The majority of these are tropical species (83%), with smaller numbers of warm temperate (11%) and cool temperate (6%) species. Many of the tropical species, however, were found to be present in only low numbers, while some warm temperate and one cool temperate species were abundant. The fishes of South Passage, therefore, are considered to belong to an impoverished tropical fauna. Furthermore, South Passage is the southernmost mainland area of Western Australia which supports a predominantly tropical fish fauna. Its fauna is even more diverse than that of the Houtman Abrolhos, a very much larger area of offshore islands and coral reefs located to the south off Geraldton.

Résumé

En avril 1979, 323 espèces de poissons furent répertoriées dans la région de South Passage de la Baie des Chiens Marins. La majorite d'entre elles sont des espèces tropicales (83%), avec de plus petits nombres d'espèces tempérées chaudes (11%) et tempérées froides. Beaucoup d'espèces tropicales, cependant, furent trouvées présentes en petits nombres seulement, tandis que certaines espèces tempérées chaudes et une seule espèce tempérée froide abondaient. Les poissons de South Passage, par conséquent, sont considérés comme appartenant à une faune tropicale appauvrie. En outre, South Passage est la région continentale la plus méridionale d'Australie-Occidentale qui entretient une faune de poissons principalement tropicaux. Sa faune est même plus variée que celle de Houtman Abrolhos, une région beaucoup plus vaste d'îles continentales, et aussi de récifs coralliens situé au sud de Geraldton.

Introduction

Although some of the earliest collections of Australian fishes were made in the Shark Bay area (e.g. Dampier in 1699), the fish fauna of this region is still poorly known. Many new species descriptions have been published based on material from the area, but these are scattered throughout the literature. The only published fish list for Shark Bay reports a small collection of species from Hamelin Pool (Lenanton 1977). Collections made during the 1960's by staff of the Fisheries Department, mostly of trawl-caught material, remain largely unreported. In 1979, the present author conducted a survey of the South Passage area of Shark Bay (Figure 1) as part of a zoogeographical study of the coastal reef fish fauna of Australia's southern half. This paper reports the results of the survey as a contribution to the knowledge of the fish fauna of Shark Bay. It is also supplemented by a report on the near-shore fishes at Monkey Mia included elsewhere in this publication (Black *et al.*).

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Methods

Study Site

South Passage is that portion of Shark Bay located between the southern extremity of Dirk Hartog Island and the mainland. For the purposes of this investigation the passage is delineated by Surf Point and Steep Point to the west, and Cape Ransonnet and Wright's anchorage to the east (Figure 1). It is approximately six km long by four km at its widest point. The passage is mostly shallow, the main channel being up to 12 m deep in parts. A rocky bar approximately 6 m in depth is located in the western portion, to the north-east of Monkey Rock. The bottom falls away rather quickly to the west of this bar, with a prominent vertical drop-off to 18 m just to the north of Monkey Rock. This drop-off continues westward to the base of Steep Point where, on the western side, the bottom drops almost vertically to 28 m. The seaward side of Surf Point is 11-14 m in depth. During spring tides, the current in the centre of the channel is strong, and creates an obvious area of disturbed water over the shallow bar (the spring range for Denham, located in the middle of Shark Bay (Figure 1), is about 1.2 m). Coral growth is concentrated in the shallow area to the south-east of Surf Point, where colonies of staghorn *Acropora* predominate, and in the lee of Steep Point where plate *Acropora* is common. *Turbinaria* coral is concentrated in the eastern end of the passage, particularly around Ransonnet Rocks (see Marsh, this publication, for further details on the coral fauna of South Passage). The northern and southern portions of the passage to the east of the bar are shallow, with low rocky ledges, some coral growth, and also areas of *Sargassum* weed. Meadows of *Amphibolus* and *Posidonia* are also present in the eastern portion of the passage on both sides. Mangroves are located to the east of the passage in the Mount Direction area.

The investigation occupied 17 days (4-20 April), although one day's work was lost due to inclement weather. A base camp was established at Wright's anchorage, with transportation being provided by vessels from the Fisheries Department and the Western Australian Museum (6.4 and 5.4 m respectively).

Sampling

The method of survey was based on the visual census technique described by Wilson and Marsh (1979). During the course of a dive, all observed fishes were identified to species, classed into several categories (i.e. juvenile, female, and male), habitat preferences noted, and subjective graded estimates of their relative abundance tabulated (i.e. abundant, frequent, occasional, and rare). A brief description of each site was also made, including data on air and water temperatures, nature of the substrate, water movements, wind direction and approximate strength, water clarity, and depth range. This method enabled reasonably accurate correlations to be made between the numerous sites surveyed. In addition, collections were made with spear, nets, and rotenone. Details of all visual surveys and collections are provided in Table 1, and their locations

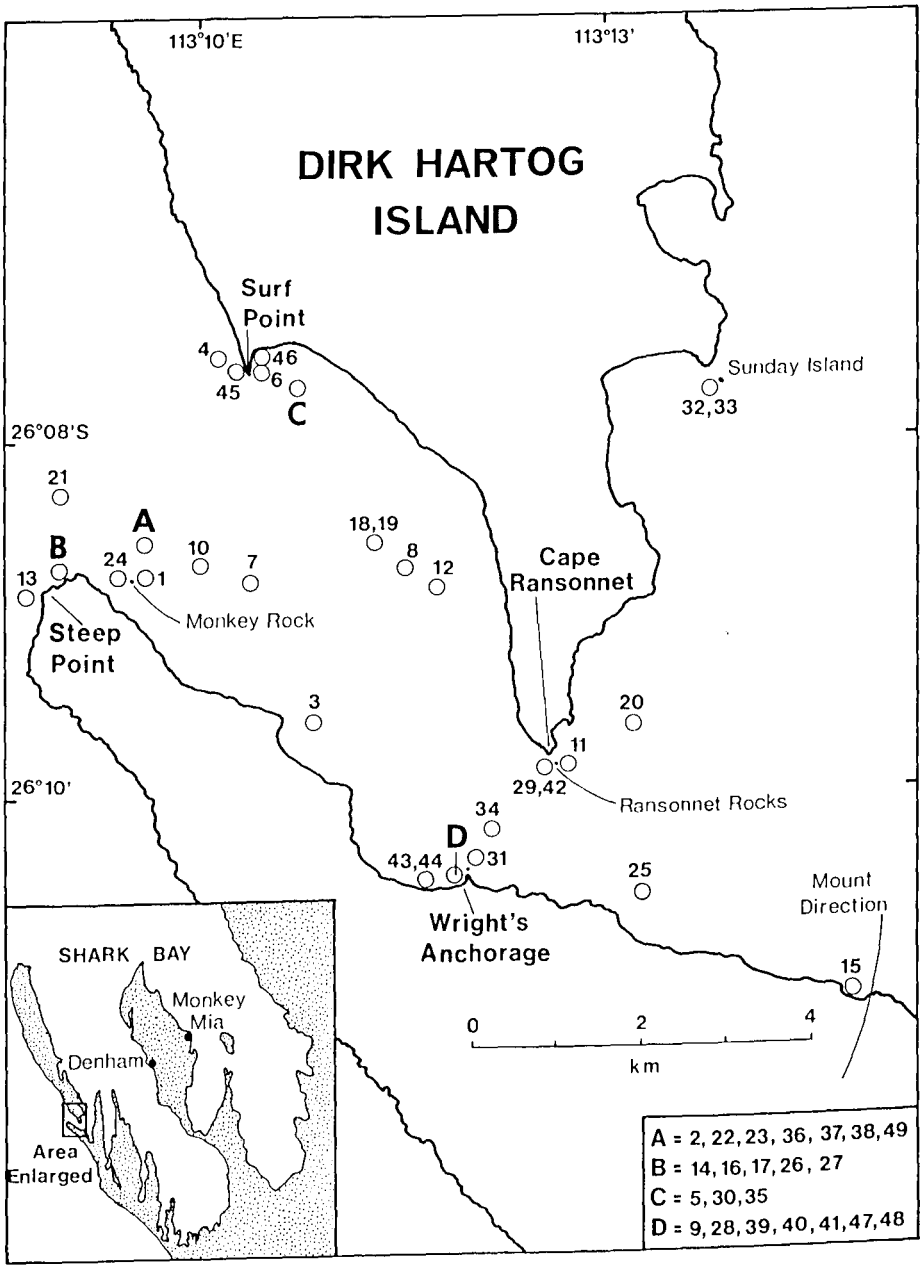

Figure 1. Map of the South Passage area of Shark Bay. Numbers 1-49 refer to the sites sampled (see Table 1) and letters A-D denote areas where three or more surveys took place (see box in lower right hand corner). Insert shows position of South Passage in relation to Denham and Monkey Mia.

are indicated in Figure 1 (these positions were checked using an aerial photograph, but some are possibly not precisely located). The surveys concentrated on areas of coral and rocky reef, but some seagrass, sand, and mangrove areas were also investigated. The deepest dive was to 28 m at the western entrance to the passage.

Table I. Sampling stations at South Passage, Shark Bay (see Figure 1)

Station	Date	Locality	Habitat	Depth (m)	Method
1	4.4	Monkey Rock	Coral, rock	1-6	Visual
2	4.4	Monkey Rock, N of	Coral, rock	8-21	Visual
3	4.4	Passage, S side	Weed, rock	3-4	Visual, spear
4	5.4	Surf Point, W of	Rock, coral	11-14	Visual
5	5.4	Surf Point, E of	Coral, sand	2	Visual, spear
6	5.4	Surf Point, inside	Sand, rock, coral	1	Visual, spear
7	6.4	Monkey Rock, E of	Coral, rock	12	Visual, spear
8	6.4	Passage, N side	Coral, rock, weed	1-5	Visual, spear
9	6.4	Wright's anchorage	Rock, sand	1	Hand net
10	7.4	Monkey Rock, E of	Coral, rock	9-15	Visual
11	7.4	Ransonnet Rocks	Rock, weed, coral	5-10	Visual, spear
12	7.4	Passage, N side	Coral, rock, weed	5	Visual, spear
13	8.4	Steep Point, W of	Rock, coral, sand	28	Visual
14	8.4	Steep Point, N side	Rock, coral	15	Visual
15	8.4	Mount Direction, N of	Sand, mangrove, rock	1	Visual
16	9.4	Steep Point, N side	Rock, coral	15	Visual
17	9.4	Steep Point, N side	Rock, coral	13-15	Rotenone
18	9.4	Passage, N side	Sand, weed	5-6	Dredge
19	9.4	Passage, N side	Sand, weed	5-6	Dredge
20	9.4	Cape Ransonnet, NE of	Sand	5-6	Dredge
21	10.4	Steep Point, N of	At sea's surface	0	Hand net
22	10.4	Monkey Rock, N of	Rock, coral	15-18	Visual
23	10.4	Monkey Rock, N of	Cave	12-15	Rotenone
24	10.4	Monkey Rock	Rock, coral	6	Spear
25	10.4	Wright's anchorage, E of	Sand	1-5	Dredge
26	11.4	Steep Point, N side	Rock, coral	15-20	Visual
27	11.4	Steep Point, N side	Rock, coral	14	Rotenone, spear
28	11.4	Wright's anchorage	Sand, weed, rock	1-7	Visual
29	12.4	Ransonnet Rocks	Weed, rock, sand	4-9	Visual
30	12.4	Surf Point, E of	Coral, sand	1-2	Visual, spear, hand
31	12.4	Wright's anchorage	Sand, weed	1-12	Visual, spear, hand
32	13.4	Sunday Island	Sand, coral, weed	1-2	Visual
33	13.4	Sunday Island	Coral, weed	1-2	Rotenone, spear
34	13.4	Wright's anchorage, N of	Sand, weed	10	Visual
35	14.4	Surf Point, E of	Coral	2	Rotenone
36	14.4	Monkey Rock, N of	Rock, coral	15-18	Visual

Table 1 (continued)

Station	Date	Locality	Habitat	Depth (m)	Method
37	15.4	Monkey Rock, N of	Rock, coral	15-18	Visual
38	15.4	Monkey Rock, N of	Rock, coral	14	Rotenone, spear
39	15.4	Wright's anchorage	Rock, coral	1	Visual
40	15.4	Wright's anchorage	Rock	Intertidal	Visual
41	17.4	Wright's anchorage	Sand, weed	2	Box trawl
42	17.4	Ransonnet Rocks	Weed, rock, sand	1-2	Visual
43	17.4	Wright's anchorage	Sand, weed	1-2	Set net
44	17.4	Wright's anchorage			Washed up
45	18.4	Surf Point, W side	Rock	Intertidal	Rotenone
46	18.4	Surf Point, inside	Sand, rock	1	Rotenone
47	19.4	Wright's anchorage	Rock, coral	1-2	Rotenone
48	19.4	Wright's anchorage	Weed, sand	1-2	Rotenone
49	20.4	Monkey Rock, N of	Rock, coral	15-19	Visual

Presentation

The fish list presented below follows the phylogenetic arrangement of Paxton *et al.* (1989) up to and including the family Carangidae, and thereafter mostly follows Nelson (1976). Of the species recorded visually, only those positively identified to species are included (an additional ten species were observed, but their correct identities could not be determined). Species which are possibly undescribed are listed under the most appropriate genus as "species". The graded estimates of relative abundance are based on the estimated numbers found in the study area during the investigation. However, estimates of secretive species are always difficult to determine, and must here be considered as only tentative. A more thorough collecting program would probably reveal some of the species listed as rare to be considerably more numerous.

All the material collected during this survey is at the Western Australian Museum.

List of Fishes

Key to symbols:
Number = sampling station where collected (see Table 1); p = photographed; + = collected but not retained; * = report from team member other than JBH; blank = visual record; a = abundant; f = frequent; o = occasional; and r = rare.

	Method	Relative Abundance
DASYATIDIDAE		
Dasyatis brevicaudata (Hutton, 1875)	p	o
Himantura uarnak (Forsskål, 1775)		r

	Method	Relative Abundance
MYLIOBATIDIDAE		
Aetobatus narinari (Euphrasen, 1790)		r
MOBULIDAE		
Manta birostris (Donndorff, 1798)	p	o
RHINOBATIDAE		
Rhynchobatus djiddensis (Forsskål, 1775)	p	r
CARCHARHINIDAE		
Carcharhinus brevipinna (Müller and Henle, 1839)		r
Galeocerdo cuvier (Péron and Lesueur, 1822)	*	r
Rhizoprionodon acutus (Rüppell, 1837)	44	r
ORECTOLOBIDAE		
Chiloscyllium punctatum Müller and Henle, 1838	24	r
Orectolobus ornatus (De Vis, 1883)		o
RHINCODONTIDAE		
Rhincodon typus (Smith, 1828)		r
MURAENIDAE		
Gymnothorax eurostus (Abbot, 1861)	17,23,27	o
G. prasinus (Richardson, 1848)	17,27	r
G. undulatus (Lacepède, 1803)	33	r
Siderea thyroideus (Richardson, 1845)	p	o
CLUPEIDAE		
Herklotsichthys quadrimaculatus (Rüppell, 1837)	31	r
Sardinella gibbosa (Bleeker, 1849)	46	r
Spratelloides robustus Ogilby, 1897		r
PLOTOSIDAE		
Paraplotosus albilabris (Valenciennes, 1840)	48	r
Plotosus lineatus (Thunberg, 1791)	p	o
SYNODONTIDAE		
Synodus variegatus (Lacepède, 1803)	p	o
BATRACHOIDIDAE		
Halophryne diemensis (Lesueur, 1824)		r
ANTENNARIIDAE		
Antennarius nummifer (Cuvier, 1817)	23	r
BYTHITIDAE		
Dipulus caecus Waite, 1905	17, 23	r
ATHERINIDAE		
Allanetta mugiloides (McCulloch, 1912)	46	r
Atherinomorus ogilbyi (Whitley, 1930)	9, 31, 46	o
Craterocephalus pauciradiatus (Günther, 1861)	46	r
HOLOCENTRIDAE		
Myripristis murdjan (Forsskål, 1775)	p	r
Sargocentron rubrum (Forsskål, 1775)	p	r
FISTULARIIDAE		
Fistularia commersonii Rüppell, 1838		o
SYNGNATHIDAE		
Festucalex scalaris (Günther, 1870)	48	o
Halicampus brocki (Herald, 1953)	17	r
Hippocampus species	45	r

	Method	Relative Abundance
SCORPAENIDAE		
Dendrochirus zebra (Cuvier, 1829)	17	o
Pterois volitans (Linnaeus, 1758)	47	f
Scorpaena picta Kuhl and van Hasselt, 1829	8, 33	o
Scorpaena species	17, 23, 27, 35, 38, 47, 48	a
Scorpaenodes scaber (Ramsay and Ogilby, 1886)	17, 23, 27, 38	a
Scorpaenopsis venosa (Cuvier, 1829)	27	r
APLOACTINIDAE		
Neoaploactis tridorsalis Eschmeyer and Allen, 1978	33	r
PLATYCEPHALIDAE		
Leviprora inops (Jenyns, 1840)	8	r
Platycephalus endrachtensis Quoy and Gaimard, 1825	46	r
CENTROPOMIDAE		
Psammoperca waigiensis (Cuvier, 1828)		f
SERRANIDAE		
Acanthistius pardalotus Hutchins, 1981	27	f
Anthias cooperi Regan, 1902	7, 17, 38	a
Cephalopholis miniata (Forsskål, 1775)	38	f
C. sonnerati (Valenciennes, 1828)		r
Chromileptes altivelis (Valenciennes, 1828)		r
Ellerkeldia rubra Allen, 1976	17, 23, 27, 38	a
Epinephelides armatus (Castelnau, 1875)		r
Epinephelus bilobatus Randall and Allen, 1987		o
E. fasciatus (Forsskål, 1775)	p	o
E. lanceolatus (Bloch, 1790)	p	o
E. multinotatus (Peters, 1877)	p	r
E. quoyanus (Valenciennes, 1830)		r
E. rivulatus (Valenciennes, 1830)	p	o
E. suillus (Valenciennes, 1828)	p	o
Plectropomus maculatus (Bloch, 1790)	p	r
Variola louti (Forsskål, 1775)	p	r
GRAMMISTIDAE		
Grammistes sexlineatus (Thunberg, 1792)		r
PSEUDOCHROMIDAE		
Blennodesmus scapularis Günther, 1871	17, 23, 30, 33, 35	f
Congrogadus subducens (Richardson, 1843)		r
Labracinus lineatus (Castelnau, 1875)	23, 33	f
Pseudochromis punctatus (Richardson, 1846)	33	o
P. wilsoni (Whitley, 1929)	33, 47	o
TERAPONTIDAE		
Amniataba caudavittata (Richardson, 1845)		r
Pelates sexlineatus (Quoy and Gaimard, 1824)		r
PRIACANTHIDAE		
Heteropriacanthus cruentatus (Lacepede, 1801)	27	r
APOGONIDAE		
Apogon aureus (Lacepède, 1802)	38, 47	f

	Method	Relative Abundance
A. coccineus Rüppell, 1838	17, 23, 33, 38, 47	f
A. cookii Macleay, 1881	12	f
A. cyanosoma (Bleeker, 1853)		o
A. doederleini Jordan and Snyder, 1901	38	f
A. fraenatus Valenciennes, 1832		r
A. rueppellii Günther, 1859	p	o
A. semiornatus Peters, 1876	17, 27, 35, 38	f
A. taeniophorus Regan, 1908	17, 35	o
A. victoriae Günther, 1859	p	f
A. species	p	r
Archamia fucata (Cantor, 1850)	p	f
Cheilodipterus lineatus Lacepède, 1801	p	r
Siphamia cephalotes (Castelnau, 1875)	20	r
SILLAGINIDAE		
Sillago schomburgkii Peters, 1865	43	r
POMATOMIDAE		
Pomatomus saltatrix (Linnaeus, 1766)		o
ECHENEIDAE		
Echeneis naucrates Linnaeus, 1758		r
CARANGIDAE		
Carangoides fulvoguttatus (Forsskål, 1775)	p	o
Caranx ignobilis (Forsskål, 1775)	p	o
C. sexfasciatus Quoy and Gaimard, 1825		o
Decapturus macrosoma Bleeker, 1851	p	o
Gnathanodon speciosus (Forsskål, 1775)		o
Pseudocaranx dentex (Bloch and Schneider, 1801)		r
Selaroides leptolepis (Kuhl and van Hasselt, 1833)	p	o
Seriola dumerili (Risso, 1810)		r
S. hippos Günther, 1876	21	o
S. lalandi Valenciennes, 1833		o
Trachinotus botla (Shaw, 1803)	46	r
Trachurus novaezelandiae Richardson, 1843		o
CAESIONIDAE		
Caesio caerulaurea Lacepède, 1801		o
C. cuning (Bloch, 1791)		r
Pterocaesio diagramma (Bleeker, 1865)		o
CAESIOSCORPIDIDAE		
Caesioscorpis theagenes Whitley, 1945		f
LUTJANIDAE		
Lutjanus bohar (Forsskål, 1775)		r
L. carponotatus (Richardson, 1842)		f
L. fulviflamma (Forsskål, 1775)	+	f
L. kasmira (Forsskål, 1775)		r
L. lemniscatus (Valenciennes, 1828)		o
NEMIPTERIDAE		
Pentapodus porosus (Valenciennes, 1830)	p	r
P. vitta Quoy and Gaimard, 1824	p	a

	Method	Relative Abundance
Scaevius milii (Bory, 1823)		o
Scolopsis bilineatus (Bloch, 1793)		f
HAEMULIDAE		
Diagramma pictum (Thunberg, 1792)		r
Plectorhinchus flavomaculatus (Ehrenberg, 1830)	p	a
P. multivittatum (Macleay, 1878)	48	o
P. schotaf (Forsskål, 1775)	p	f
LETHRINIDAE		
Lethrinus atkinsoni Seale, 1909		f
L. genivittatus Valenciennes, 1830	p	r
L. laticaudis Alleyne and Macleay, 1877		r
L. miniatus (Schneider, 1801)		f
L. nebulosus (Forsskål, 1775)		r
SPARIDAE		
Acanthopagrus latus (Houttuyn, 1782)	+	o
Chrysophrys auratus (Schneider, 1801)	p	o
Rhabdosargus sarba (Forsskal, 1775)	43	f
SCIAENIDAE		
Argyrosomus hololepidotus (Lacepède, 1801)	p	o
MULLIDAE		
Parupeneus chrysopleuron (Temminck and Schlegel, 1843)		f
P. indicus (Shaw, 1803)		o
P. pleurostigma (Bennett, 1831)		r
P. signatus (Günther, 1867)	p	a
Upeneus tragula Richardson, 1846		o
MONODACTYLIDAE		
Schuettea woodwardi (Waite, 1905)	p	o
PEMPHERIDAE		
Parapriacanthus ransonneti Steindachner, 1870		o
Pempheris analis Waite, 1910	p	o
P. klunzingeri McCulloch, 1911		r
P. oualensis Cuvier, 1831	6, 35	a
P. schwenkii Bleeker, 1855	6	f
KYPHOSIDAE		
Kyphosus cornelii (Whitley, 1944)	35	a
K. gibsoni Ogilby, 1912		a
K. sydneyanus (Günther, 1886)	21, 30, 46	o
SCORPIDIDAE		
Microcanthus strigatus (Cuvier, 1831)	p	a
Neatypus obliquus Waite, 1905		o
Scorpis aequipinnis Richardson, 1848	p	r
EPHIPPIDAE		
Platax teira (Forsskål, 1775)		r
CHAETODONTIDAE		
Chaetodon assarius Waite, 1905		a
C. auriga Forsskål, 1775		f
C. lineolatus Cuvier, 1831	p	o
C. lunula (Lacepède, 1802)		f

	Method	Relative Abundance
C. plebeius Cuvier, 1831		f
C. speculum Cuvier, 1831	p	r
C. trifascialis Quoy and Gaimard, 1824	35	r
Chelmon rostratus (Linnaeus, 1758)	8, 47	f
Chelmonops curiosus Kuiter, 1987	p	o
Coradion chrysozonus (Cuvier, 1831)	p	r
Forcipiger flavissimus Jordan and McGregor, 1898	p	r
Heniochus acuminatus (Linnaeus, 1758)	47	o
Heniochus diphreutes Jordan, 1903		r
Heniochus singularius Smith and Radcliff, 1911	p	r
POMACANTHIDAE		
Centropyge tibicen (Cuvier, 1831)	38	o
Chaetodontoplus duboulayi (Günther, 1867)	p	o
C. personifer (McCulloch, 1914)	p	o
Pomacanthus imperator (Bloch, 1787)	p	r
P. semicirculatus (Cuvier, 1831)	35	f
P. sexstriatus (Cuvier, 1831)		r
ENOPLOSIDAE		
Enoplosus armatus (Shaw, 1790)		r
POMACENTRIDAE		
Abudefduf bengalensis (Bloch, 1787)	p	f
A. sexfasciatus (Lacepède, 1802)	46	f
A. sordidus (Forsskål, 1775)	45	r
A. vaigiensis (Quoy and Gaimard, 1824)	21, 35	f
Amphiprion clarkii (Bennett, 1830)	p	f
Chromis atripectoralis Welander and Schultz, 1951		r
C. margaritifer Fowler, 1946	p	r
C. weberi Fowler and Bean, 1928	17	o
C. westaustralis Allen, 1976	23	a
Dascyllus reticulatus (Richardson, 1846)	38	o
D. trimaculatus (Rüppell, 1828)		f
Neopomacentrus azysron (Bleeker, 1877)	17, 23, 35, 47	a
N. cyanomos (Bleeker, 1856)	p	f
N. filamentosus (Macleay, 1882)	23, 33, 47	a
Parma occidentalis Allen and Hoese, 1975	23, 47	f
Plectroglyphidodon dickii (Lienard, 1839)		o
P. johnstonianus Fowler and Ball, 1924	p	r
P. lacrymatus (Quoy and Gaimard, 1824)		o
P. leucozona (Bleeker, 1859)		o
Pomacentrus coelestis Jordan and Starks, 1901	35	f
P. milleri Taylor, 1964	33	f
P. molluccensis Bleeker, 1853		r
P. vaiuli Jordan and Seale, 1906		r
Stegastes obreptus (Whitley, 1948)	17, 47	f
CIRRHITIDAE		
Cirrhitichthys aprinus (Cuvier, 1829)	p	f
C. oxycephalus (Bleeker, 1855)	p	r
Cyprinocirrhites polyactis (Bleeker, 1875)	38	r

	Method	Relative Abundance
Paracirrhites forsteri (Schneider, 1801)	p	r
CHEILODACTYLIDAE		
Cheilodactylus gibbosus Richardson, 1841	p	o
C. rubrolabiatus Allen and Heemstra, 1976		f
SPHYRAENIDAE		
Sphyraena obtusata Cuvier, 1829	p	o
LABRIDAE		
Anampses caeruleopunctatus Rüppell, 1829	17	r
A. geographicus Valenciennes, 1839	27	f
A. lennardi Scott, 1959		r
A. meleagrides Valenciennes, 1839		r
Austrolabrus maculatus (Macleay, 1881)	23	r
Bodianus axillaris (Bennett, 1831)		o
B. bilunulatus (Lacepède, 1802)		o
Cheilinus bimaculatus Valenciennes, 1839		r
C. chlorurus (Bloch, 1791)		o
Cheilio inermis (Forsskål, 1775)		o
Choerodon cauteroma Gomon and Allen, 1987	p	a
C. jordani (Snyder, 1908)		o
C. rubescens (Günther, 1862)	p	a
C. schoenleinii (Valenciennes, 1839)		o
Cirrhilabrus temmincki Bleeker, 1852	7, 38	f
Coris auricularis (Valenciennes, 1839)	23, 35	f
C. aygula Lacepède, 1802		r
C. caudimacula (Quoy and Gaimard, 1834)	3	o
Gomphosus varius Lacepède, 1802		r
Halichoeres brownfieldi (Whitley, 1945)	18	f
H. marginatus Rüppell, 1835		o
H. nebulosus (Valenciennes, 1839)		o
Hemigymnus fasciatus (Bloch, 1792)		r
H. melapterus (Bloch, 1791)		r
Hologymnosus annulatus (Lacepède, 1801)		r
Labroides dimidiatus (Valenciennes, 1839)	38	f
Macropharyngodon ornatus Randall, 1978	27	o
Notolabrus parilus (Richardson, 1850)	30, 18	o
Pseudojuloides elongatus Ayling and Russell, 1977	3	o
Pteragogus flagellifera (Valenciennes, 1839)	3, 18	f
Stethojulis bandanensis (Bleeker, 1851)	33	a
S. interrupta (Bleeker, 1851)	18	o
S. strigiventer (Bennett, 1832)		o
Suezichthys cyanolaemus Russell, 1985	12, 23, 27, 38	a
Thalassoma amblycephalum (Bleeker, 1856)	p	r
T. hardwichei (Bennett, 1830)		r
T. jansenii (Bleeker, 1856)		r
T. lunare (Linnaeus, 1758)	33	a
T. lutescens (Lay and Bennett, 1839)		a
T. purpureum (Forsskål, 1775)		r
T. septemfasciata Scott, 1959		o

	Method	Relative Abundance
SCARIDAE		
Leptoscarus vaigiensis (Quoy and Gaimard, 1824)	48	o
Scarus festivus Valenciennes, 1840	p	o
S. frenatus Lacepède, 1802		r
S. ghobban Forsskål, 1775		a
S. gibbus Rüppell, 1828		o
S. rivulatus Valenciennes, 1839		r
S. rubroviolaceus Bleeker, 1849		o
S. schlegeli (Bleeker, 1861)		o
S. sordidus Forsskål, 1775		o
MUGILOIDIDAE		
Parapercis clathrata Ogilby, 1910		o
P. haackei (Steindachner, 1884)	5	o
P. nebulosa (Quoy and Gaimard, 1824)	31	o
CREEDIIDAE		
Squamicreedia obtusa Rendahl, 1921	20	r
BLENNIIDAE		
Aspidontus taeniatus Quoy and Gaimard, 1834	38	r
Cirripectes filamentosus (Alleyne and Macleay, 1877)	35, 47	o
C. hutchinsi Williams, 1988	17	f
Ecsenius bicolor (Day, 1888)	17, 23, 38	o
E. oculus Springer, 1971	35	r
Entomacrodus striatus (Quoy and Gaimard, 1836)	45	f
Istiblennius edentulus (Bloch and Schneider, 1801)	45, 46	r
I. meleagris (Valenciennes, 1836)	46	o
Liaphognathus multimaculatus Smith, 1955	23, 38	r
Meiacanthus grammistes (Valenciennes, 1836)	23	r
Omobranchus germaini (Sauvage, 1883)		o
Petroscirtes breviceps Valenciennes, 1836	11, 21, 48	o
P. mitratus Rüppell, 1830		r
Plagiotremus rhinorhynchos (Bleeker, 1852)	17, 23, 38	f
P. tapeinosoma (Bleeker, 1857)	33	o
Salarias fasciatus (Bloch, 1786)		r
Stanulus talboti Springer, 1968	35	o
TRIPTERYGIIDAE		
Helcogramma decurrens McCulloch and Waite, 1918	17, 23, 27, 35, 45, 47	a
Helcogramma species	23	r
Norfolkia brachylepis (Schultz, 1960)	12, 17, 23, 27, 35, 38	a
Enneapterygius species	33	r
CLINIDAE		
Heteroclinus species	48	r
GOBIIDAE		
Amblygobius phalaena (Valenciennes, 1837)		o
Bathygobius cocosensis (Bleeker, 1854)	45	r
Cryptocentrus fasciatus (Playfair, 1866)	31	r
Eviota bimaculata Lachner and Karnella, 1980	p	a

	Method	Relative Abundance
E. smaragdus Jordan and Seale, 1906	38	f
E. storthynx (Rofen, 1959)	33	r
Eviota species 1	17, 23	o
Eviota species 2	17, 23, 27, 33, 35, 47	o
Fusigobius duospilus Hoese and Reader, 1985	23, 38	f
Fusigobius species	33, 47	o
Gnatholepis inconsequens Whitley, 1958	38, 47	a
Gobiodon citrinus (Rüppell, 1838)	30	o
G. quinquestrigatus (Valenciennes, 1837)	30	o
Istigobius decoratus (Herre, 1927)		o
I. nigroocellatus (Günther, 1873)		o
Priolepis cinctus (Regan, 1908)	23, 38	o
P. nuchifasciatus (Günther, 1873)	23, 35	r
P. semidoliatus (Valenciennes, 1837)	17, 23	r
P. species	23	r
Ptereleotris evides (Jordan and Hubbs, 1925)		r
Trimma okinawae (Aoyagi, 1949)	23, 38	o
Valenciennea immaculatus Ni Yong, 1981	31	r
V. longipinnis (Lay and Bennett, 1839)	p	o
V. puellaris (Tomiyama, 1956)	31	o
V. species	31	o
ACANTHURIDAE		
Acanthurus grammoptilus Richardson, 1843	30	f
A. mata (Cuvier, 1829)	p	o
A. olivaceus Schneider, 1801		r
A. triostegus (Linnaeus, 1758)		o
Naso tuberosus Lacepède, 1802		r
N. unicornis (Forsskäl, 1775)		r
Zebrasoma veliferum (Bloch, 1797)		o
SIGANIDAE		
Siganus fuscescens (Houttuyn, 1782)		o
SCOMBRIDAE		
Grammatorcynus bicarinatus (Quoy and Gaimard, 1824)		o
Scomberomorus commerson (Lacepède, 1800)	p	o
GOBIESOCIDAE		
Lepadichthys sandaracatus Whitley, 1943	17, 23	o
CALLIONYMIDAE		
Callionymus calcaratus Macleay, 1881	31	r
C. goodladi (Whitley, 1944)	31, 46	r
BOTHIDAE		
Engyprosopon species	19	r
CYNOGLOSSIDAE		
Cynoglossus maculipinnis Rendahl, 1921	48	r
BALISTIDAE		
Sufflamen chrysopterus (Bloch and Schneider, 1801)	p	f
S. fraenatus (Latreille, 1804)	p	o

	Method	Relative Abundance
MONACANTHIDAE		
Cantherhines fronticinctus (Günther, 1866)	p	o
C. pardalis (Rüppell, 1835)	p	f
Colurdontis paxmani Hutchins, 1977	3, 11, 48	f
Monacanthus chinensis (Osbeck, 1765)	18, 19	r
Oxymonacanthus longirostris (Bloch and Schneider, 1801)	35	o
Pervagor janthinosoma (Bleeker, 1854)	17	o
Stephanolepis species	21	r
ARACANIDAE		
Anoplocapros robustus (Fraser-Brunner, 1941)	+	r
OSTRACIDAE		
Ostracion cubicus Linnaeus, 1758	23, 47	o
O. meleagris Shaw, 1796	p	r
TETRAODONTIDAE		
Arothron hispidus (Linnaeus, 1758)	p	f
A. stellatus (Bloch and Schneider, 1801)	31	o
DIODONTIDAE		
Diodon holocanthus Linnaeus, 1758		r

Discussion

A total of 323 fish species were recorded for the South Passage area of Shark Bay during this survey. The fauna is predominently tropical (83%), with small warm temperate (11%) and cool temperate (6%) elements. The area with the greatest diversity of species was in the region of the Monkey Rock drop-off (70-80 species observed per dive). However, prominent numbers of fishes were also found on the South Passage bar, in the shallow area to the east of Surf Point, and at Ransonnet Rocks. Surveys of areas to the west of both Steep Point and Surf Point produced relatively low numbers of fish species (both of these areas are subjected to constant pounding by large waves, and consequently have a much poorer habitat diversity). Sunday Island, to the north-east of South Passage, was found to support a relatively rich fish fauna, although considerably lower in both species and numbers of individuals when compared to similar sites in the passage. Species with the largest numbers of observed individuals were mostly tropical (e.g. *Parupeneus signatus, Neopomacentrus filamentosus, Stethojulis bandanensis,* and *Thalassoma lunare*), but many tropicals which are common in more northern areas of the state, such as the Ningaloo region (latitude 22°42′S), were rarely sighted (e.g. *Chaetodon trifascialus, Pomacanthus sextriatus, Chromis atripectoralis,* and *Gomphosus varius*). Some warm temperate species were also abundant (e.g. *Chromis westaustralis, Choerodon rubescens,* and *Kyphosus cornelii*), but cool temperate species were mostly found in low numbers, *Helcogramma decurrens* being the only exception to this. Many of the species which were rarely sighted are considered to be transients from breeding

populations to the north of Shark Bay, in the case of tropicals, and to the south of the bay for cool temperate species. Therefore the fish fauna of South Passage could be best classed as an impoverished tropical fauna with an obvious warm temperate element.

Comparison with other surveys conducted along the west coast of Western Australia indicate that South Passage is the most southerly mainland region of the state which supports a diverse tropical fish fauna. The tropical element at Kalbarri (latitude 27°42′S) was found to be 42%, while at Port Gregory (latitude 28°12′S), where areas of rich coral growth occur in a lagoonal situation, it was 55%. However, in the latter area, the most conspicuous fishes were found to consist equally of tropical and temperate species. The survey of Port Denison (latitude 29°16′S) produced a tropical element of only 37%, and at Jurien Bay (latitude 30°18′S), this had fallen to 28%. However, at the offshore location of the Houtman Abrolhos (latitudinal range 28°18′S - 29°00′S), tropical species made up 69% of the fauna. As at South Passage, the most conspicuous fishes at the Houtman Abrolhos were tropical, but many of the temperate species, particularly those belonging to the warm temperate element (14% of the fauna), were also in very large numbers. Nevertheless, the fish fauna at the Houtman Abrolhos was not as diverse as that found in South Passage during this study. A total of only 254 fish species were recorded from the former region employing the same techniques as used at South Passage (36 additional species have been recorded from the Houtman Abrolhos (Allen 1984), mostly on the basis of collections taken by trawlers). The area surveyed at the Houtman Abrolhos was many times larger in size, possessed a far greater diversity of habitats, especially with respect to corals (see Wilson and Marsh 1979), and was subjected to a much greater sampling effort (Allen, 1984). The close proximity to South Passage of the rich northern breeding grounds for tropical fishes (e.g. the Ningaloo area (Allen, pers. comm.)), in addition to its lower latitude and therefore higher water temperatures, obviously contribute to this difference in fish diversity.

Brief surveys were also conducted in other parts of Shark Bay, particularly near Denham and Monkey Mia (Figure 1). These indicated that the more internal areas of Shark Bay possess far less diverse fish faunas than South Passage, the tropical element being considerably smaller (Hutchins, unpublished data). This lack of tropical species led Logan and Cebulski (1970) to describe the Shark Bay fauna as "subtropical" (warm temperate). Shark Bay is located near the northern limit of a transistion region between temperate and tropical faunas (see Wilson and Gillett 1971), the northernmost limit being just to the north of Coral Bay (latitude 23°05′S) (Hutchins, unpublished data). Whereas the fauna inhabiting the more protected portions of Shark Bay may have a higher proportion of temperate species, and therefore be more "subtropical", there is little doubt that the more exposed South Passage area has a predominently tropical fauna.

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