

Artbasic case study

Part 2: Description of a fictional fishery and a statistical monitoring scheme

1. A fictional fishery



Figure 1. Illustration of a fictional fishery with one major stratum, two minor strata, and five sampling sites (marked in red). All homeports and landing sites not participating in the data collection programme are marked in amber.

2. Characteristics of the fishery.

Table 1 gives a summary of the characteristics of the fictional fishery illustrated in Figure 1.

Table 1. Characteristics of the fictional fishery presented in Figure 1.

<i>Elements</i>	<i>Description</i>	<i>Remarks</i>
1. Major stratum	ARTFISH Island	CPUEs and species composition are known to be different in the SSE and NNW parts of the island.
2. Minor strata	North/North – West South/South – East	Catch/effort estimates will be produced at this level and in combination with boat/gear types.
3. Sampling sites	<p>In North/North – West:</p> <ul style="list-style-type: none"> • Crazy crab • Airport <p>In South/South – East:</p> <ul style="list-style-type: none"> • Golden sand • Pirates' cave • Windy beach 	<p>All other sites not participating in data collection (amber spots), will be grouped as "Other NNW".</p> <p>All other sites not participating in data collection (amber spots), will be grouped as "Other SSE".</p>
4. Boat/gear types	<ul style="list-style-type: none"> • Traps • Hook and line 	Boats with traps go out for trips of 1-3 days and do not operate on Sundays. Boats operating H&L go fishing for one day and work normally on Sundays.
5. Species to be statistically monitored:	<ul style="list-style-type: none"> • Grouper • Snapper • Misc. reef-fish (traps only) 	<p>Both boat/gear types target grouper and snapper. It is of interest to know if there are significant differences in:</p> <ul style="list-style-type: none"> • Fish size • price • CPUE

6. Frame survey data	Boats using traps	Boats using H & L
NNW		
Crazy crab	20	50
Airport	30	75
OTHER NNW	250	625
SSE		
Golden sand	28	16
Pirates' cave	35	32
Windy beach	40	21
OTHER SSE	420	280

3. Methodological guidelines

The entire Artfish process is built around the following two generic formulae that are used for estimating catch and fishing effort:

Estimated fishing effort = (Boat Activity) x (Total boats) x (Active days)

Estimated total catch = (Overall CPUE) x (Estimated effort)

A combined expression is:

$C = (CPUE) \times (BAC) \times F \times A$

CPUE stands for “Catch Per Unit Effort”. It applies to a specific boat/gear type and expresses the weighted mean catch by a single boat of all species in one day of fishing operations. It is formulated by examining the total catch of all sampled boats during the reference period (i.e. a month), and dividing it by the total duration of the associated fishing trips.

BAC stands for “Boat Activity Coefficient”. It is a weighted mean expressing the proportion of boats (in general fishing units), that are expected to be active (=fishing) on any given day during the reference period. It applies to a specific boat/gear type and is formulated by examining a number of boats for their state of activity (active, non-active), and dividing the number of those found active by the total number.

F is the total number of boats of a specific boat/gear type that are reported to be *potentially* operational in a geographical stratum. There are many ways of obtaining this figure (licensing schemes, records by port authorities, vessel registers, quick baseline surveys, etc.).

A is a time extrapolation factor. It is formulated by first considering the calendar days of the reference period (i.e. a month), and then removing days of zero or negligible fishing activity applying uniformly in the stratum. Such might be cases of bad weather, national or religious holidays, or regular non-activity days (weekends, market days, etc.) However, if boat activity samples are already inclusive of such cases, then **A** is simply set to the number of days in the month.

The combined generic formula described above is repeatedly applied to all different combinations of months, strata and boat/gear types. A specific combination “month-stratum-boat/gear” will thereafter be referred to as an *estimation context*. For a more detailed presentation and discussion on the methodology used in Artfish, users may wish to refer to document *FI/TP/425 – Sample-based fishery surveys, a technical handbook*, a PDF version of which is available in the **FIGIS-ARTFISH** literature section.

4. Operational guidelines

In order for Artfish to recognize all different estimation contexts and perform catch/effort estimations, its users must first set-up the *system standards, tables and classifications*, involving:

- (a) A three-level geographical stratification of major strata, minor strata and homeports/landing sites. To be noted that estimations are always performed at *minor* stratum level.
- (b) A list of boat/gear categories which, combined with the minor strata and a month, will form all different estimation contexts.
- (c) Specifying numbers of fishing units (e.g. boats) at each site and by boat/gear type. These figures will serve as spatial extrapolation factors (**F**) for estimating fishing effort.
- (d) A list of species that will be statistically monitored.

Only after steps (a)-(d) have been completed will users be able to enter sample data on catch/effort and produce estimates.

5. Data collection scheme

Table 2 summarizes the methodological and operational characteristics of the data collection scheme for the fictional fishery. An example of a form to be used for data collection is given below.

Artfish Island: Data collection scheme – Effort and landings survey							
Minor stratum:	NNW			Boat/gear type:	Motorized boats using traps		
Sampling site:	Crazy crab						
Date:	3 January 2004			Boats active:	6		
Recorder:	FIGIS-ARTFISH			Boats sampled:	10		
Sample 1 Duration (days): 2					Sample 2 Duration (days): 3		
Species	Quant.	# fish	Price		Quant.	# fish	Price
Grouper	50	25	5		60	20	5.5
Snapper	20	40	6		35	45	6.2
Misc. reef-fish	10	60	2		5	-	-
TOTALS:	80			100			
Remarks							
Good weather. Stayed for two hours. Selected at random the 3 rd and 9 th landings.							

Table 2. Characteristics of the data collection scheme for the fictional fishery

Element	Description	Remarks
1. Human resources	<p>One data collector, also statistical assistant. Trained in species identification and in recognizing boat/gear types. Good empirical knowledge of the fishery and its operators.</p> <p>One data operator for Artfish operations.</p>	<p>He will be using a motorcycle, and be given fuel allowance and some money for extra expenses.</p> <p>Low volume of data, System can be handled by one PC.</p>
2. Itinerary of data collector Excludes days 4,11,18,25 that are Sundays.	<p>In North/North – West:</p> <ul style="list-style-type: none"> • Crazy crab • Airport <p>In South/South – East:</p> <ul style="list-style-type: none"> • Golden sand • Pirates' cave • Windy beach 	<p>Period: January 2004</p> <p>Both sites visited on days: 3, 9, 12, 17, 20, 24, 26, 31.</p> <p>All three sites visited on days: 2, 7, 10, 16, 19, 23, 27, 30.</p>
3. Data on effort	<p>At each site the recorder will use a list of ten randomly pre-selected boats for each of the two boat/gear types.</p> <p>His task will be finding out (by checking or asking), how many of the selected units were active during the sampling day.</p>	<p>Data collected for NNW will in the end result in 160 checked units.</p> <p>The sample size for SSE will be 240, as three sites are involved.</p> <p>Expected relative accuracy in estimating BAC will be over 90% for both strata.</p>
4. Data on catch	<p>At each site, and for each of the two boat/gear types, the recorder will collect data on two randomly selected landings.</p> <p>He will record species composition and, whenever possible, first-sale price and number of fish found in the catch.</p>	<p>There will be 32 sampled landings for NNW and 48 samples for SSE.</p> <p>In both cases the expected relative accuracy in estimating the CPUE will be $\geq 90\%$.</p>