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Fish Biology
(Application in Fisheries Management)

by

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Species Composition and Biological Data Collection and Analysis

1. Objectives of Data Collection

Data are needed to make rational decisions, evaluate the fisheries performance in relation to management objectives and fulfils regional requirements. The extent to which objectives are achieved is assessed using indicators, which are generated from data. There is no standard set of indicators, but all must be tailored to each fishery dependent on which social, economic or environmental concerns are important. Appropriate indicators can be developed which measure the state of the resource, the performance of fishing controls, economic efficiency, socio-economic performance and social continuity. A fishery authority may also be respect to straddling or highly migratory stocks

2. Species Composition

Species composition refers to the contribution of each fish species in particular fishing area or fishing vessels. Species composition is generally expressed as a percent, so that all species components add up to 100%. Species composition can be expressed on either an individual species basis, or by species groups that are defined according to the objectives of the inventory or monitoring program. Species composition is an important indicator of ecological and management processes at a site.

Species composition provides the essential description of the character of the fisheries at particular study area. The relative contribution of a species also signifies its dominance in the vegetation and its ability to capture resources. Slight different inferences of competitive ability are suggested if species composition is expressed on the basis of cover, density, or biomass measurements. Species composition is used to determine range condition and range trend, which are valuable tools to judge the impact of previous management and guide future decisions.

3. Biological Data Collection

The compilation of biological data constitute an important component of fishery resources management. The responsibility to collect biological data relevant to the management of the marine fishery resources. The biological data on commercial species are available from references are as
follow :

- Length frequency distribution
- Length and weight relationship
- Age and growth
- Sex ratio
- Maturity
- Stomach fullness and food composition
- Morphometric measurement
- Tissue samples for DNA study.
- Scales or otolith for age determination

4. Expected outcomes

The purpose of collecting fisheries data is to provide information on fishing operation and some important biological information of selected fishes. This is vital for stock assessment of targeted species. Some of the outcomes to be obtained from the analyses of these data are as follows:

(i) Status of fishing operation and fishing area
(ii) Species composition of the selected fishing gear deployed to catch target species
(iii) Total catch and catch per unit effort (CPUE) of selected fishing gear
(iv) Length composition of fish
(v) Growth parameters:
  a) K – growth coefficient (growth rate constant)
  b) $L\infty$ - Length at infinity (asymptotic length)
iv) Mortality parameters:
  a) Z – Total mortality coefficient, instantaneous rate of total mortality or total mortality rate (per time unit), $Z = M + F$
  b) M – natural mortality coefficient, instantaneous rate of natural mortality or natural mortality rate (per time unit)
  c) F – fishing mortality coefficient or instantaneous rate of fishing mortality (per time unit)
v) Catch curve analysis is used to estimate L50% (length at which 50% of the fish is retained by the gear and 50% escape) and convert it to age, t50% (age at which 50% of the fish is retained in the gear).
vi) Determination of Exploitation rate, E ($E = F/Z$) using mortality parameters
vii) Determination of yield per recruit (Y/R) pattern.
viii) Length-weight relationship ($W = a L^{b}$)
ix) Length at first maturity (Udupa, 1986, *Fishbyte* Vol. 4 (2))
x) Sex ratios
xi) Spawning season determination from Gonad somatic index
xii) Stock unit/population structure using morphological and DNA methods

Example on Biological Parameters Necessary for
The Study of Shared Stock

Parameters	**Necessary data**	**Collecting merhods**
Length-weight relationship	Pairs data of length-weight	Measure fish body
Growth curve	Pairs data of age-length	Analysis age and measure fish body
Natural mortality coefficient	Longevity growth equation tagging data Data of virgin stock	Analysis age etc, analysis age, fish body analysis recapture data survey in unexploited area
Fishing mortality coefficient	Age composition catch and effort tagging data	Analysis age operation records analysis recapture data.
Longevity	Growth, sex ration, survival, rate, etc	Analysis age, sex, etc.
Availability	Catch composition	Fish market census
Reproductive mechanism	Recruit-parent relationship	Analysis age composition over many years.
Sex ratio	Frequency distribution of each sex	Analysis gonad
Maturity rate	Frequency distribution of gonad index	Analysis gonad
Number of spawned eggs	Number of incubation and spawning, etc	Analysis ovary, etc
Age composition	Frequency distribution of are	Analysis age
Population index	Density of each area	Experimental survey, etc
Effective over-roll fishing intensity	Density of each area	Experimental survey
Catch ability coefficient	Selectivity and escape rate	Experimental survey
selectivity	Mesh experiment	Experiment survey
Escape rate	Experimental data	Hypothetical experiment
Density of are	Experimental data	Experimental survey
Catch pre year	Statistics	All related country

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5. Data collection and analysis

5.1 Fishing operation and catches data collection and analysis

Information on operation and catch are collected according to the standard format i.e. **Fishing Operation and Catches Data Sheet**.

a. Interview the skipper/owner of the boat every day in order to get information on Fishing Operation i.e. no. of haul/trip, no. of day/trip (fishing duration), no. of trip/month and total catch/trip.
b. Obtain fish species and group composition by weight.
c. Borrow or rent about 20-30 kg of fish and sort into species.
d. Fish sample for species and group composition studies could be further use for biological studies (length frequency and gonad maturity). See the **flow diagram of sampling method in annex 1**
e. Record the weight of each target species e.g. mackerels and round scads.
f. All data must be compiled in a proper format e.g. ***Microsoft Excel*.**

Catch Composition Sheet From Trawl Survey Vessel

Date: ____________ Station No: _____________ Tag No: __________________

Total Weight: ___________________

Location / Area	Group / Species	Weight (kg)	Number of individual

Fishing Operation and Catches Data Sheet From Purse Seine Vessel

Interviewer…………………………………………….………**Date**……………………..……

Fisheries Information

Section 1: Fishing Vessel		
Vessel Name:	**Flag State:**	
Engine type: ❍ Inboard ❍ Outboard	**Vessel speed:** nm/h	**Engine power:** hp
Vessel size: GRT	**Length:** meters	

Section 2: Fishing Gear	
Type of gear:	**Mesh size**: cm
Net length: m.	**Net width:** m.

Section 3: Fishing Operation		
Fishing method:	❍ Purse seine ❍ Luring light ❍ FADs ❍ Other…………………………	
Fishing Ground: ……………………..…. (refer to Map)		**Depth fished:** …………………... meter
Far from shore……………………….….. Nautical miles		**Fishing time:** ❍ Day ❍ Night
Frequency of fishing operation?	No. of Haul per Trip……………………................. Duration of trip .... days	
Estimated Total Catch (Kg/trip)		

Section 4: Catch data (Sub Sample)		
Catch Details	**Weight (kg)**	**Sp. Composition %**
Short Mackerel (*Rastrelliger brachysoma*)		
Indian Mackerel (*Rastrelliger kanagurta*)		
Shortfin Scad (*Decapterus macrosoma*)		
Amberstripe Scad (*Decapterus maruadsi*)		
Indian Scad (*Decapterus russelli*)		
Other fish group		
Total weight of sub-sample		

Total Catch data (Group Composition by weight)	
❍ Mackerel (Target Group)	
❍ Scads (Target Group)	
❍ Other mackerel	
❍ Other scads	
❍ Trevally	
❍ Promfret	
❍ Sardine	
❍ Small tuna	
❍	
❍	
Total Catch By Weight Per Trip	

Section 5: Market data				
5 Target species	***Income / trip***	**Selling price (US/kg)**		
		Small	**Medium**	**Large**
Short Mackerel (*R.. brachysoma*)				
Indian Mackerel (*R.. kanagurta*)				
Shortfin Scad (*D. macrosoma*)				
Amberstripe Scad (*D. maruadsi*)				
Indian Scad (*D. russelli*)				
After collect catch, what will you do	❍ **Sell at fresh market** ❍ **Sell to whole seller** ❍ **Sell directly to retaurant** ❍ **Sell to fish industries** ❍ **Consume in family**			
Note:				

5.2 Growth and Mortality of fish

Growth

The growth study of fish is the determination of the body size as a function of age. Therefore, age composition data is important. In temperate waters, such data can be obtained through the counting of year rings on hard parts such as scales and otoliths. These rings are formed due to strong fluctuations in environmental conditions from summer to winter and vice-versa. In tropical areas there is no occurrence of drastic changes, so impossible to use this kind of seasonal rings for age determination. However, length-frequency data are converted using several numerical methods to determine the age composition of fish.

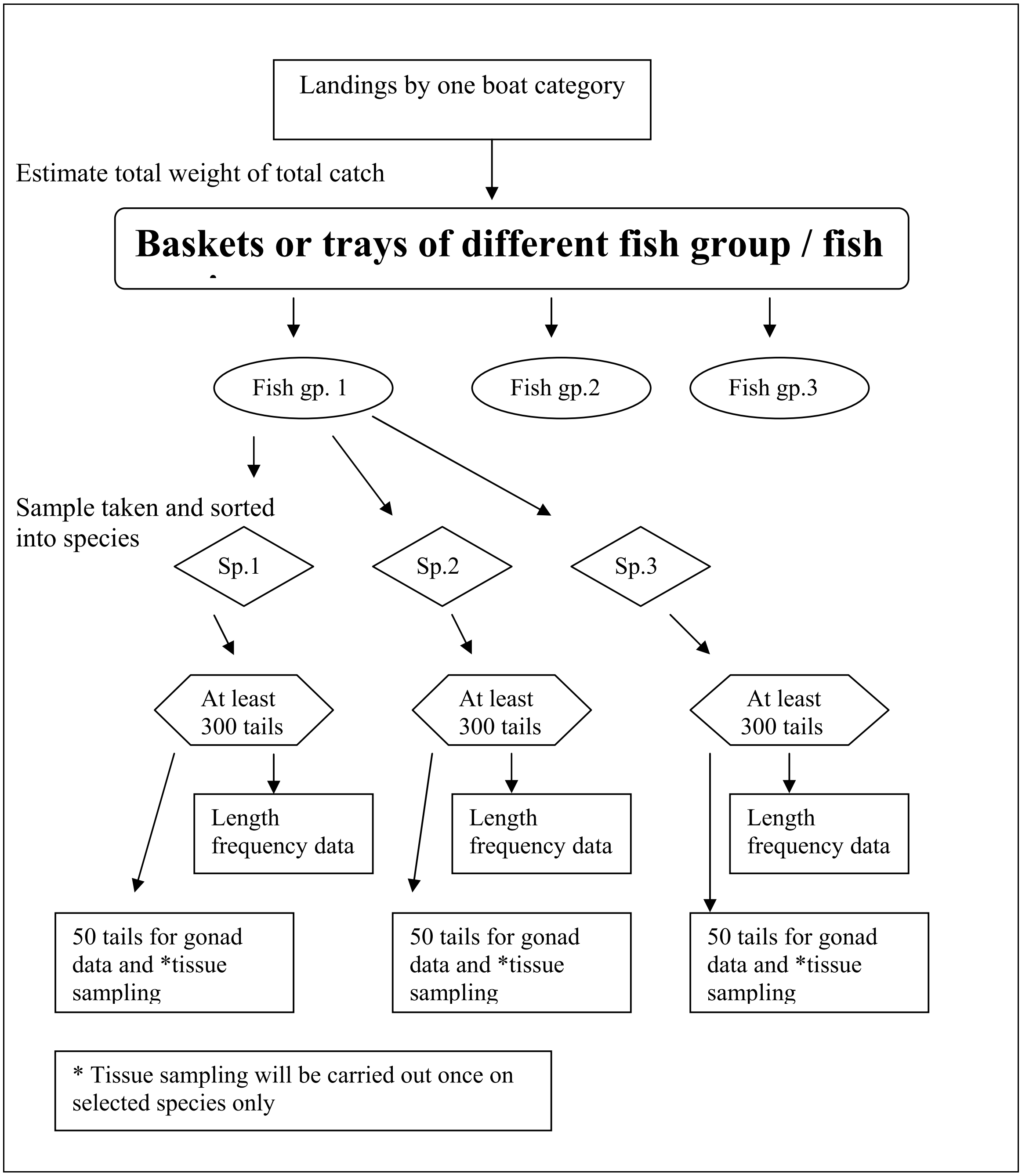
Mortality

The negative aspect in the dynamic of a fish stock is the death process or mortality. The mortality of fish can be described by using models and a number of parameters. Mortality caused by fishing is considered as **fishing mortality**. Mortality due to other causes such as predation, disease and deaths due to old age is called **natural mortality**. The total number of deaths (**total mortality**) is the number of dying due to fishing and dying due to natural causes. The formula are given as: $Z = F + M$ where Z is called the “total mortality rate”, F is called the “ fishing mortality coefficient” and M is called the “natural mortality coefficient”. The fraction of deaths caused by fishing, F/Z, is called the “exploitation rate”, E.

Procedures for length-frequency data collection for growth and mortality studies of fish

a. Equipments: measuring board, spring weighing balance, data sheet, etc.
b. Fish sampling is carried out at landing sites on a monthly basis. See the **flow diagram of sampling method**.
c. Sampling should focus on target species e.g. mackerels and round scads.
d. Measure Total Length (TL) of at least 300 tails each species per port using measuring board/punch sheet and record the length on a standard format i.e. **Length Frequency Data Sheet**.
e. Borrow or rent fish samples used for measurement of length-frequency from fishermen in order to reduce sampling cost.
f. Sampling for biological data collection only concentrate on major category of sampling gear of that particular sampling port.
g. Record the samples weight of all fish measured from all boat.
h. If the species has been sorted out into different size category, take sample of at least 3 kilograms for each sizes category and then measure and record the TL.
i. Prepare length frequency data set for analysis.
j. The length frequency data will be analyzed using a program package for length-based fish stock assessment called **FiSAT II** version 1.0.0 (FAO-ICLARM Stock Assessment Tools). [ICLARM = International Center for Living Aquatic Resources Management]

Flow diagram of length-frequency data collection



Example of semi-processed length-frequency data

Length Frequency Data Sheet			
Country:		Malaysia	
Province:		Kelantan	
Fishing Area:		off Kelantan waters	
Name of sampling port:		Tok Bali	
Date:		02-Nov-02	
Time:		600	
Type of fishing boat:		PS	
Total catch of the boat:		12000kg	
Sample Weight:		80kg	
Name of Enumerators		N. Rahman	
Lower limit	Upper limit	Frequency	Total
100	105		
105	110	I	1
110	115	III	3
115	120	IIII/ II	7
120	125	IIII/ IIII/	10
125	130	IIII/ IIII IIII IIII III	23
130	135	IIII/ IIII/ IIII/ IIII/ IIII/ IIII/ IIII/ IIII/ IIII/ I	46
135	140	IIII/ IIII/ IIII/ IIII/ IIII/ IIII/	30
140	145	IIII/ IIII/ IIII/ IIII/ IIII/ I	26
145	150	IIII/ IIII/ IIII/ IIII	19
150	155	IIII/ IIII/ II	12
155	160	IIII/ I	6
160	165	IIII	4
165	170	I	1
170	175	IIII	4
175	180	IIII/ II	7
180	185	IIII/ IIII	9
185	190	IIII/	5
190	195	IIII/ II	7
195	200	IIII/ IIII/ II	12
200	205	IIII/ IIII/ IIII/ IIII/ IIII	24
205	210	IIII/ IIII/ IIII/ IIII	19
210	215	IIII/ IIII/ III	13
215	220	IIII/ III	8
220	225	IIII/ II	7
225	230	IIII	4
230	235	II	2
Total			**309**

5.3 Length-weight relationships

Data on the length and weight of fish have commonly been analyzed to yield biological information. The analysis has, in fact, become one of the standard methods employed in fishery biology.

The length-weight relationship formula: a) provides a means for calculating weight from length, b) is a direct way of converting logarithmic growth rates for weight, and c) gives indications of taxonomic differences and events of the life history such as metamorphosis and the stages of maturity.

It has been found that the length-weight relationship of most fish can be described by a formula of the type:
$W = a L^{b}$, where W = weight, L = length, *a* is a constant and *b* an exponent usually lying between 2.5 and 4.0. For an ideal fish which maintains the same shape (i.e. symmetrical growth or isometric), b=3. If b>3, the fish is fatter and if b<3, the fish is considered thinner.

Individual fish are measured for TL, BL, SL etc. in millimeter and record weight in grams. A set of data should be obtained from each sampling port.

5.4 Determination of sex and gonads maturity stages

Sex

Fish gonads are inspected to determine the sex of a fish. In adults female eggs are readily discernible in the ovaries. In adult male the testes are typically smooth, whitish and non-granular in appearance. In adult fish the sex is readily determined by gross inspection through a slit made on the right side of the body.

Gonad

The state of gonad maturity of the fish is examined in order to determine whether each fish is sexually immature, mature, ripe or spent. Immature means that there are no easily visible eggs or milt. Ripe means that the gonads contain obvious eggs or sperms, and spent that the fish has spawned.

Procedures of gonad maturity data collection for reproductive biology studies of fish.

b. Equipment - Measuring board, spring weighing balance, digital weighing balances, scissors, forceps and etc.
a. Fish sampling is carried out at landing sites on a monthly basis. See the **flow diagram of sampling method**.
b. Sampling should focus on targeted species.
c. Purchase fish samples of at least 50 tails each species per port.
d. Measure and record TL, BL, SL, BW and gonad weight to the nearest millimeter and gram.
e. Identify sex and gonad stage of fish through visual senses. As for the characteristic of gonad stages, refer to the standard maturity scale as attached (**Five-Point Maturity Scale For Partial Spawners**).
f. Record the data onto a standard format i.e **Gonad Maturity Data Sheet**.
g. The gonad maturity data will be analyzed in order to obtain:
    i. Length-weight relationships,
    ii. Sex ratio,
    iii. Spawning season through GSI,
    iv. Length at first maturity using *Udupa*, 1986.

Example of semi-process data of Gonad Maturity

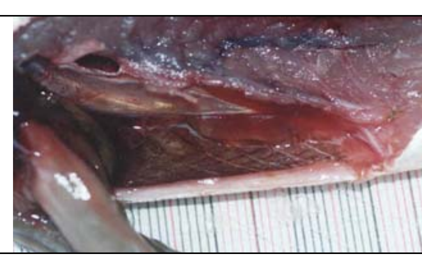
Gonad Maturity Data Sheet

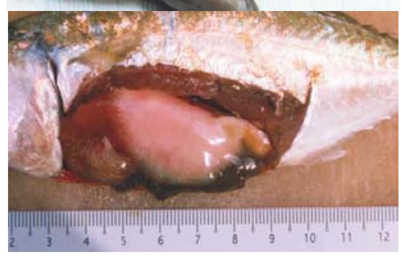
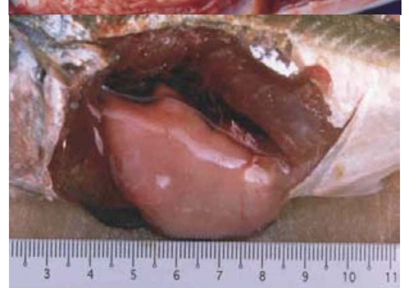
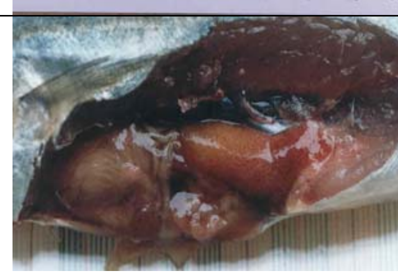
Country:	Malaysia
Province:	Kelantan
Fishing Area:	off Kelantan waters
Name of sampling port:	Tok Bali
Date:	02-Nov-02
Time:	600
Type of fishing boat (PS/Ring net/Trawl/Gill net):	PS
Total catch of the boat:	12000kg
Sample Weight:	80kg
Name of Enumerators	N. Rahman
Species name:	*Rastrelliger kanagurta*

Sample no.	TL (mm)	BL (mm)	FL (mm)	SL (mm)	BW (g)	Sex & Stages	GW (g)	GSI
1	205	167	184		112	F1	0.3	0.27
2	210	173	187		114.9	F1	0.2	0.17
3	228	209	227		211.7	F3	8.3	3.92
4	244	193	213		163.2	F3	3.4	2.08
5	252	280	220		193.1	F3	7.8	4.04
6	248	193	212		176.2	F3	5.8	3.29
7	215	176	195		137.3	F3	3.1	2.26
8	216	179	195		125.6	F3	3.3	2.63
9	258	217	225		218.7	F4	8.5	3.89
10	222	181	196		145.4	F4	7.2	4.95
11	265	212	232		226.6	F5	6.6	2.91
12	255	211	225		185.6	M3	7	3.77
13	242	295	213		176.1	M3	10.2	5.79
14	252	214	223		193.2	M3	8.9	4.61
Total GSI Males								41.00
Average GSI Males								3.15
Total GSI Females								30.41
Average GSI Females								0.29

Notes: GSI=GW/BW*100
Average GSI Males=SumGSI/number of males
Average GSI Females=SumGSI/number of females

Five-point maturity scale for partial spawners

Stage	State	Description	
I	Immature	Ovary and testis about 1/3 length of body cavity. Ovaries pinkish, translucent; testis whitish. Ova not visible to naked eye.	

II	Maturing	Ovary and testis about ½ length of body cavity. Ovary pinkish, translucent; testis whitish, more or less symmetrical. Ova not visible to naked eye.	 
III	Ripening	Ovary and testis is about 2/3 length of body cavity. Ovary pinkish-yellow colour with granular appearance, testis whitish to creamy. No transparent or translucent ova visible.	 
IV	Ripe	Ovary and testis from 2/3 to full length of body cavity. Ovary orange-pink in colour with conspicuous superficial blood vessels. Large transparent, ripe ova visible. Testis whitish-creamy soft.	 
V	Spent	Ovary and testis shrunken to about ½ length of body cavity. Walls loose. Ovary may contain remnants of disintegrating opaque and ripe ova, darkened or translucent. Testis blood shot and flabby.	

5.5 Statistical method of estimating the size at first maturity (Udupa, Fishbyte, August 1986)

This method corresponds to 50% maturity.

a. $\log_{10}$ m=X_k+X/2 - (X Σp_i) ………………… (1)
b. where X_k = last log size at which 100% of fish are fully matured
c. X = log size increment = X_{i+1} - X_1,
d. Xo = last log size at which no fishes are fully mature
e. r_i= number of fully mature fish in the i^{th} size group
f. p_i=proportion of fully mature fish in the i^{th} size group=r_i/n_i
g. The mean size at first maturity M=antilog (m) ………….. (2)
h. m $\pm$ Z(α/2) $\sqrt{}$ [(var (m)] ……………………. (3)
i. Z(α/2) = Confidence coefficient at α level of risk.
j. If α = 0.05, then 95% confidence limits are given by
   antilog [m $\pm$ 1.96$\sqrt{}$(X2 Σ(pi*qi)/(ni-1))] ………. (4)

Example of data arrangement for estimating the size at first maturity

Estimated the Size at First Maturity in Fishes

Length group (cm)	Mid length (cm)	Log Mid length (Xi)	No of fish samples (ni)	Number of fish at maturity stages			Total of fully matured fish (ri)	Proportion of fully matures fish pi=ri/ni	Xi+1-Xi=X	qi=1-pi	pi*qi/(ni-1)
				Stage I	Stage II	Stage III					
13-15			5	0	5	0					
15-17			12	2	10	0					
17-19	18	1.2553	15	6	7	2	0	0.00	0.046	1.00	0.0000
19-21	20	1.3010	25	7	5	4	9	0.36	0.041	0.64	0.0096
21-23	22	1.3424	43	0	3	6	34	0.79	0.038	0.21	0.0039
23-25	24	1.3802	16	0	0	2	14	0.88	0.035	0.13	0.0073
25-27	26	1.4150	6	0	0	0	6	1.00		0.00	0.0000
Total								3.03			0.0208

From equation (1)

m = 1.415 + (0.04/2) – (0.04*3.03)

m = 1.3138

From equation (2)

M = antilog (1.3138)

= 20.59cm

From Equation (4), the 95% confidence limits are given by;

antilog [1.3138 $\pm$ 1.96 $\sqrt{((0.04)^2 (0.0208))}$]

m = 1.3138 $\pm$ 0.01131

M_U = antilog (1.3138 + 0.01131) = 21.14 cm

M_L = antilog (1.3138 – 0.01131) = 20.07cm

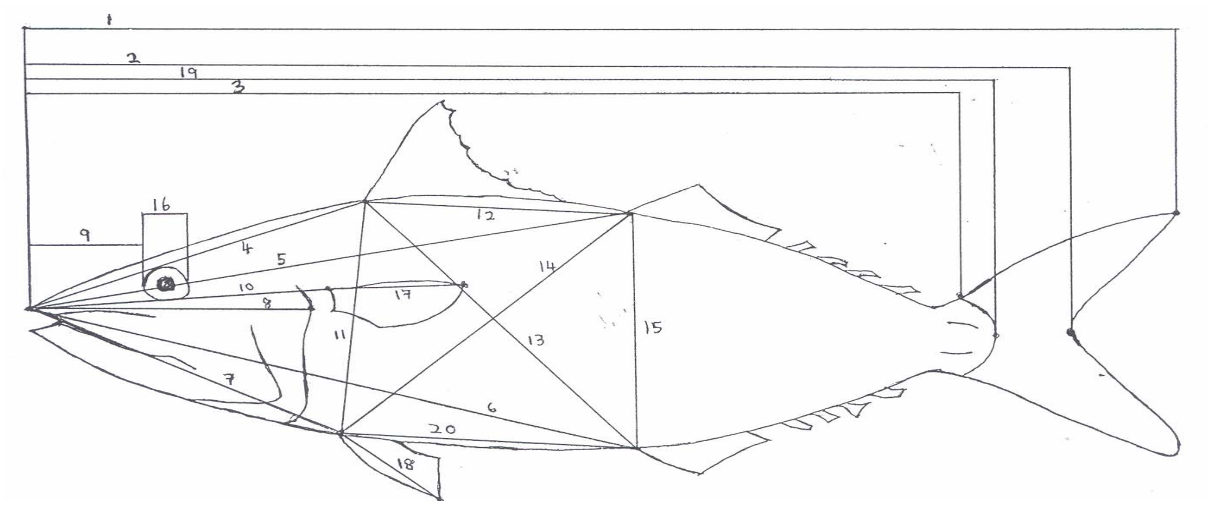
5.6 Stock identification

There are two methods had been practiced by the scientist for identifying the stock unit / population of marine fishes. These methods are: i. Morphological variation (morphometric measurement) and ii. Molecular biological (DNA study).

5.6.1 Morphometric measurement

Twenty (20) morphological characteristics (Figure 1) need to be measured on each individual of the targeted species which covered the various sizes of fish. A total of 100 individuals from each species will be measured and weighted to the nearest millimeter (mm) and gram (g) respectively using the digital or dial caliper. The morphological characteristics which need to measure are described below:

ACRONYM AND FEATURE OF MORPHOMETRIC CHARACTER



ACRONYM		**MORPHOMETRIC CHARACTER**
1	TL	Total length
2	FL	Fork length
3	BL	Snout to insertion of caudal fin
4	SFDF	Snout to insertion of first dorsal fin
5	SSDF	Snout to insertion of second dorsal fin
6	SAF	Snout to insertion of anal fin
7	SPF	Snout to insertion of pelvic fin
8	HL	Head length
9	STL	Tip of snout to eye
10	SPCF	Snout to insertion of pectoral fin
11	HT	Insertion of first dorsal fin to insertion of pelvic fin
12	FDSD	Insertion of first dorsal fin to insertion of second dorsal fin
13	FDAF	Insertion of first dorsal fin to insertion of anal fin
14	PFSDF	Insertion of second dorsal fin to insertion of pelvic fin
15	SDAF	Insertion of second dorsal fin to insertion of anal fin
16	ED	Eye diameter
17	PCL	Pectoral fin length
18	PFL	Pelvic fin length
19	SL	Standard length
20	PAF	Insertion of pelvic fin to insertion of anal fin

5.6.2 Data analysis

The morphometric measurements were first transformed to common logarithms. These data were then analyzed through ANOVA and ANCOVA to obtain the canonical discriminate using several specific statistical software such as Statistical Analysis Software (SAS), MINITAB and JMP.

Sample sheet on morphometric data measurement of *Rastrelliger kanagurta*

Date: _______________ Sampling port: ________________

Species: _____________ Location: (Latitude ________ Longitude __________)

No	TL (mm)	BL (mm)	FL (mm)	SL (mm)	Bw (g)	Sex	Stage	OW (g)	SFDF (mm)	SSDF (mm)	SAF (mm)	SPF (mm)
1	232	185	203	195	140.50	F	3	2.5	71.33	121.93	122.86	66.04
2	225	186	202	197	118.20	F	3	2.0	69.66	119.13	126.27	64.79
3	217	180	195	190	98.30	M	2	0.5	65.53	116.93	120.45	59.82
4	248	197	218	212	158.30	F	4	5.5	76.43	130.45	131.87	72.23
5	213	197	203	198	132.10	M	3	1.8	71.62	120.57	123.47	65.80
6	234	195	213	208	171.20	F	3	1.4	74.36	128.06	129.58	68.69
7	233	188	205	198	134.90	M	3	3.0	72.90	121.74	123.42	66.67
No	**HL (mm)**	**STL (mm)**	**SPCF (mm)**	**HT (mm)**	**FDSD (mm)**	**FDAF (mm)**	**PFSDF (mm)**	**SDAF (mm)**	**ED (mm)**	**PCL (mm)**	**PFL (mm)**	**PAF (mm)**
1	52.99	13.94	56.22	47.53	51.63	73.09	75.54	46.88	12.79	26.48	19.90	59.10
2	49.17	12.18	53.47	43.06	50.36	71.38	73.26	45.39	11.63	22.96	18.22	63.60
3	45.90	12.28	49.30	41.72	49.35	69.19	72.78	41.47	12.49	24.33	20.24	64.46
4	54.32	15.83	59.27	54.20	55.42	79.15	81.80	53.50	14.32	29.16	23.78	65.00
5	50.44	14.75	55.73	48.66	50.36	72.54	75.65	47.35	12.70	23.96	21.64	59.90
6	53.39	14.78	58.74	51.67	56.20	77.29	81.19	50.14	13.01	25.61	22.06	65.83
7	50.19	12.91	54.08	50.62	52.63	74.53	78.59	51.77	12.64	25.02	19.68	59.23

5.6.3. Molecular biological technique (DNA study)

At least 30 individual of fish sample for gonad study are required for adequate sample for population study. The freshness of fish sample is important to genetic study. Always kept the fish samples with ice and propel labeling. The tools that required extracting the tissue sample in laboratory are. The tools that required extracting the tissue sample in laboratory are; measuring board, digital weighing balance, a couple of dissection scissors, tweezers and scalpels, two beaker filled ethanol, burner or alcohol lamp, tray, data sheet and fine paper / issues paper. For the DNA study several biological needs to be to collected such as total length (TL), fork length (FL), standard length (SL) and body weight (WT) of the fish sample. There are several meyhods for analyzing the tissue samples for identifying the stock unit / population which based on DNA fingerprint**.** These methods are; i. multilocus allozyme electrophoresis (MAE), ii. mitochondrial DNA (mtDNA), iii. microsatelite DNA (msDNA) and iv. single-Strand CP analysis (SSCP).

Example sheet on biological data for tissues samples.
Date: ______________ Sampling port: ________________
Species: ___________________ Location: Lat ______ Lon _____

No	TL(mm)	BL(mm)	FL(mm)	SL(mm)	BW (g)	Sex	Stage	OW (g)
1	197	166	180		85.4	J		
2	224	188	206		134.0	F	1	
3	193	167	180		88.6	J		
4	208	174	190		110.7	F	1	0.1
5	218	180	197		116.7	J		
6	229	196	212		164.1	M	3	1
7	244	204	220		181.2	F	2	1.4
8	229	192	210		154.6	F	1	0.3
9	223	196	212		155.4	F	1	0.6
10	229	194	211		150.2	M	1	0.3
11	225	187	205		142.2	M	1	
12	226	190	206		149.5	M	1	
13	272	225	246		248.4	M	2	0.6
14	238	197	215		156.8	M	1	
15	219	187	203		128.6	F	1	
16	239	201	219		171.9		Broken	
17	238	203	221		179.6	F	4	
18	218	185	200		124.7	F	1	

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