GCP/RAF/271/FIN-FM/19 (En) November 1995

GUIDELINES FOR CATCH HANDLING ON BOARD *R/V TANGANYIKA EXPLORER*

by

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OF THE UNITED NATIONS

Bujumbura, November 1995

PREFACE

The Research for the Management of the Fisheries on Lake Tanganyika project (LTR) became fully operational in January 1992. It is executed by the Food and Agriculture Organization of the United Nations (FAO) and funded by the Finnish International Development Agency (FINNIDA).

LTR's objective is the determination of the biological basis for fish production on Lake Tanganyika, in order to permit the formulation of a coherent lake-wide fisheries management policy for the four riparian States (Burundi, Tanzania, Zaïre and Zambia)

Particular attention is given to the reinforcement of the skills and physical facilities of the fisheries research units in all four beneficiary countries as well as to the buildup of effective coordination mechanisms to ensure full collaboration between the Governments concerned.

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* a series of **technical documents (GCP/RAF/271/FIN-TD)** related to meetings, missions and research organized by the project; and

* a series of **manuals and field guides (GCP/RAF/271/FIN-FM)** related to training and field work activities conducted in the framework of the project.

For both series, reference is further made to the document number **(01)**, and the language in which the document is issued: English **(En)** and/or French **(Fr)**.

<u>For bibliographic purposes this document should be cited as follows</u>:

Mannini, P., and E. Aro, Guidelines for catch handling
1995 on board *R/V Tanganyika Explorer.* FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika.
GCP/RAF/271/FIN-FM/19 (En): 19p.

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1. INTRODUCTION

The following notes provide a standard procedure on fish catch handling and data collection for fish biology teams working on board *R/V Tanganyika Explorer* during the execution of lake-wide fishery resource surveys. Based on experience gained from the first, pilot survey, some adjustments to the procedures may be made at a later date. These guidelines must be carefully read by all those involved in fish biology to ensure a smooth work routine under the variable conditions which can take place during the cruises.

1.1 Fishery resources survey objectives and priorities

A fish resource survey is expected to provide information on:

— species composition in the area

— species distribution within the area and how they vary seasonally and spatially.

— species abundance and potential for exploitation.

- what is the optimal yield.

Clearly, the achievement of these objectives depends on the frequency and time coverage of the fishery resource surveys. For example, pelagic species often show great differences in local abundance over short periods of time due to rapid migrations for feeding and reproduction. Ideally in such cases monthly surveys are required. As a compromise the minimum rate of survey of four times a year should be feasible in practice.

While the above points are the primary aim of the survey another objective will be to collect biological data on the target species. This will be a valuable and useful supplement to commercial catch sampling. Commercial fishermen take a selected and biased sample of the population because of the gear they use and times and places they use it. It should be remembered however that commercial catch sampling provides a much more continuous source of samples than research surveys.

Biological data from the survey will be used to separate different unit stocks, to follow migration of fish, to study their reproductive cycles and feeding ecology and to make a more refined stock assessment by using information on age structure, growth and mortality rates.

Finally, it is important to remember that the trawl catch is being used to calibrate the acoustic gear. Therefore the catch must be accurately analyzed for species and for length distributions so that the total estimate from the acoustic gear can be subdivided between the species and length classes (then relative age classes) contributing to it.

2. SAMPLING THE CATCH

Each haul should be sorted, the required measurements recorded, and any biological samples collected before the next haul catch comes on deck. Normally fishing operations should not interrupt the on board sampling procedures.

The attention given to species other than the target ones *(Stolothrissa tanganicae, Limnothrissa miodon, Lates stappersii, Lates mariae, Lates angustifrons, Lates microlepsis)* will depend on the amount of spare time available after the target species have been sorted and the entire data collection process completed.

Handling the catch should be quite easy as the species complex in the pelagic environment of the lake is simple and massive catches made up of many different species is unlikely to occur. However, in the case of a large catch, the crew should be called upon for assistance in sorting the catch if they are available.

Two methods to process the catch can be applied. The first (**A**) is carried out when the catch is small and made up of very few species. The second (**B**) is implemented when the catch is large or when other factors such as bad weather, time constraints, etc., do not allow sorting by species. Obviously, when deciding how to handle the catch, some common sense is required as a catch of 15 kg of clupeids is not the same as 15 kg of adult *Lates.*

A) This operates when the total catch < 10-15 kg and made up of few species. The whole catch is processed.

The total catch is weighed and the entire catch is sorted out by species. The total weight of each **non-target species** is recorded and the number of fish counted. The total weight of each **target species** is than taken, while counting of fish can be done either at that time or later while recording their lengths (see paragraph 3.3).

This catch handling procedure is illustrated in Figure 1.

B) The catch is large (> 15 kg) and subsampling is required.

The total weight of the unsorted total catch is recorded. Larger fish which are readily visible (e.g. very large *Lates* spp.) are removed and placed in a separate box. The remainder of the catch (of smaller size fish) is mixed with shovels and subsampling is started by filling, for example, from three parts of the total mixed catch, three boxes of uniform size, while continuing to remove larger fish.

The fish from the three boxes are mixed together and a final subsample of adequate size (depending on the species and size composition of the catch) obtained. The total weight of the subsample is recorded. Then the subsample is sorted into species, weighed by species and counted. If it is a **non—target species** the number of fish is counted and raised to the total by multiplying by the ratio of the total weight of the unsorted catch to the total sample weight. In the case of **target species**, counting of fish is done either then or when measuring them (instructions given in paragraph 3.3).

The larger fishes, previously removed and kept apart, are weighed individually and measured. These data are

added to the raised weights and numbers previously computed from the smaller fish of the same species.

Upon completion of this last operation estimates of the total catch, both in weight and number, by species are obtained.

Further processing of the target species is described in Section 3. The overall catch handling procedure is outlined in Figure 2.

Totals, both in weight and numbers, are recorded in the haul summary sheet (see paragraph 3.1).

Priority is given to target species, and those selected by subsampling should be measured as described in paragraph 3.3. Other biological information such as sex and maturity stages and stomach samples are obtained from a more limited number of individuals within the subsample taken by length stratification (i.e. five specimens within each length group). This procedure is the same as that implemented in processing commercial catch samples and described in paragraphs 3.4 and 3.5.

3. DATA COLLECTION AND RECORDING

Several forms are required to record all the information collected during a survey. The specific forms (number is given in brackets) are as follows:

Details of individual stations or hauls and information concerning catch (**Form 1**)

Information on catch in the form of length frequency distributions (**Form 2 and 3**)

A document to record biological information (**Form 4**)

<u>It is compulsory that all the writing of data and other information to be done **only in lead pencil!**</u>

3.1 Station/haul identification and recording observations

The **haul summary sheet** (**Form 1**) will contain details of a station or a survey position. It will also provide a complete general summary of fishing operations at a defined station. The information required can be recorded and verified by the scientist in charge of the fish biology on board.

It is suggested that the first part of the form should be completed by the ship's officer responsible for navigation and checked by the scientist in charge.

The haul number, which is allocated in a time sequence, should be clearly displayed so that it can be checked to verify that a form for each haul is completed. Instructions for completing the entries are as follows:

Survey code: the year and the sequential number of the survey. For example, the second survey carried out in 1995 has the following code: 95/02.

Haul number: an Arabic number following a numerical sequence. All hauls, whether discarded or accepted at a later stage, must be given a number.

Mesh size: stretched mesh size of the net used

Date: dd/mm/yy

Station no.: this is not to be confused with the haul number which is in strict numerical sequence. The station number should be fixed for each fishing position and may be the same for cruises of the same kind throughout a survey.

Time shot: this is defined as the time when the winch is set and actual fishing started.

Time hauled: the time when retrieval of the net begins.

Haul duration: the difference in time between time hauled and time shot.

Speed: reported in knots (n mile hr^{-1})

Bottom depth: the bottom sounding from the echo sounder, in metres. Where this varies during a haul give the depth at the beginning and the end of the haul (e.g. 60–90m)

Fish. depth: the depth at which the net has been fishing, in metres.

Lat. shot)
Long. shot) to measure the actual distance over which
Lat. hauled) the gear was towed.
Long. hauled)

Tot. catch weight: the weight of the total unsorted catch, in kg.

Tot. sample weight: the weight of the unsorted sample, in kg.

3.2 Catch information

Information on catch composition by species, estimated weight and number, must be reported in the haul summary sheet (**Form 1**). Target species have the usual code name which, for the sake of clarity, is repeated hereby:

***S**tolothrissa **ta**nganicae*	:	**STA**
***L**imnothrissa **mi**odon*	:	**LMI**
***L**ates **st**appersii*	:	**LST**
***L**ates **ma**riae*	:	**LMA**
***L**ates **an**gustifrons*	:	**LAN**
***L**ates **mi**crolepsis*	:	**LMC**

Blank entries are for non target species to which a code name cannot yet be assigned.

It is required to enter estimates of weight and number of each species caught. In case of target species from which the length composition is recorded, the estimate number in the haul can be conveniently obtained also from the **Grand Total** in **Form 2** and **3**.

3.3 Recording length composition

Length composition data (L/F) are collected on fishery surveys mainly for the purpose of obtaining information on the population structure. Length measurements are a major part of the results collected during a resource survey.

For this purpose **Form 2** for clupeids and **Form 3** for *Lates* spp. have been prepared. For clupeids one millimetre length (TL) intervals are used, while for *Lates* spp. the length class adopted is ten millimetres, in this case the lengths are recorded to the nearest unit below.

In **Form 2** and **3** the column “**BIOL**” serves to sort the number of fish required for biological data collection while recording L/F distributions. The alternate shadowed and unshadowed five—cells areas in **Form 2** are to facilitate the identification of the five millimetres length groups used for biological subsampling purposes. Once five specimens within a length group have been reached, and the fish put aside for biological data, successive lengths are reported into the adjacent “**Measured**” column. The same applies for **Form 3** but is even easier as length class for L/F distributions and biological sorting coincide (i.e. ten millimetres). Examples of filled forms are shown in **Annex I** and **II.**

On some occasions it will not be possible to measure all the fish during a haul and subsampling has to be done. In section 2 the procedure to select a subsample of the catch was described.

To illustrate the length recording procedure, it is assumed that from a hypothetical haul a catch of 7 baskets of *L. stappersii* was obtained and the weight was recorded. Within the time available it was not possible to measure all the fish. Four baskets out of the 7 were sorted out and examined for length measurements and biological sampling purposes. Of these fish 368 were measured (out of which 72 were sorted, following the criterion of 5 specimens per length group, to collect the required biological data) and 136 counted only.

It has to be noted that the ratio between the total number of baskets and sorted baskets of the given example is equivalent, and has the same purpose as the Raising Factor, to the ratio between total catch weight and sample weight.

In **Form 3**, reported in **Annex I**, the recording of these data has been done systematically and the length distribution can now be raised appropriately and verified as all the information is available. The **raising factor** (RF) for the length frequency distribution of the fish measured is therefore:

7/4 * (368+136)/368 = 2.397

Multiplying the **row totals** by the raising factor gives the frequencies in the **Raised Total column**. The Raised Total column now contains the estimate of the length frequency distribution of *L. stappersii* caught in that haul and the **Grand Total** contains the number of fish caught. In **Annex II** a similar example is given for *Stolothrissa.* If the catch was processed as described in type "B" method (see section 3), the L/F distribution and the resulting total number will refer to the total sample and not to the total catch.

It is important not to confuse the raising to total sample and raising to total catch. When the total catch was subsampled (type B catch processing), further raising to total catch is required. This is achieved by multiplying the L/F data by the ratio from **TCw/ws** where TCw is the total catch weight and ws is the total sample weight.

Annex III exemplifies the raising to total catch of a length distribution of *L. miodon* by using the weight of the total catch (TCw) and of the unsorted sample (ws). If TCw was 135.250 kg and ws was 14.671 kg then RF will be 135.250/14.671 = 9.219. All *Limnothrissa* specimens from the sample were measured. The resulting L/F distribution was multiplied by the calculated RF to mean the length distribution of *L. miodon* in the catch. Clearly, whenever the catch is very small subsampling and raising to total catch may not be necessary.

3.4 Biological data

Biological data (individual total length, weight, sex and maturity stage) are collected from a limited number of individuals within the subsample of each target species.

To be representative of the total catch this information is obtained by taking length stratified subsamples. Five specimens **are sorted out in each five millimetre length group for clupeids and in each ten millimetre length group for Lates spp**. The

number
of sorted specimens is recorded in the column headed as "**Biol**" in **Forms 2** and **3**. Therefore the sorting work is carried out together with L/F recording and using only one form. At the completion of L/F recording, or at the same time if enough man-power is available, the selected specimens are processed for the collection of the required biological data.

Biological data are recorded in **Form 4** together with basic information concerning the haul as it is necessary to link this sample with other catch data. Basically, the procedure for biological data collection and recording is the same as the one used to process commercial catch samples.

3.5 Stomach collection

Stomachs are collected from target species as soon as the catch has been sorted. In some circumstances (e.g. small size fish) it may be decided that, in order to keep to a minimum the time between catch and preservation of the fish, stomach samples are not taken by length stratification. **Fifty specimens of each target species** are sorted at random and preserved in plastic jars with 10% formalin.

In the case of clupeids or small size Lates the entire fish can be preserved **(i.e. one jar/species/haul,** if the jar size is adequate), while for larger specimens, say more than 150 mm TL, the stomach is extracted and preserved in 10% formalin in small, 100–125 ml, plastic vials. In both cases jars and vials are labelled, clearly with a pencil, giving **species code name, survey code and haul number.**

When **length-stratified sampling** is implemented five specimens per length group (5 mm for clupeids and 10 mm for *Lates spp.)* are sorted out, the stomach extracted and preserved in 10% formalin.

4 RESPONSIBILITIES

The cruise leader for fish biology shall ensure that the overall work is carried out as outlined in this document or otherwise agreed with the field coordinator and/or scientific coordinator. The scientist in charge should have control over the handling of the catch. Nothing should be done until he has given his instructions. In principle and in practice scientists own the catch till when all the required samples have been taken.

Whenever possible all fish data forms are filled by the scientist in charge of the fish biology subcomponent. He/she must **always** check that the forms have been properly filled by the other colleagues, correct mistakes and ensure that no information is missing. He/she **must ensure** that all preserved samples are properly labelled and stored.

Also, the person in charge has to ensure that the first part of the haul summary sheets (**Form 1**) is properly compiled with the assistance of the ship's navigation officer.

List of equipment to be available on board during fish surveys

Plastic basins

Shovels

Full set of spring balances

Eilersen electronic scales equipped with adequate voltage stabilizer.

Fish measuring boards

Plastic bags of various size

Pencils

Pencil sharpeners

Erasers

Waterproof markers

Punching machine

Acetate paper (for preservative resistant labels)

Fish data collection survey forms

Holder boards for data collection forms

Hard-back file holders

Paper clips

Adhesive labels

10% Formalin solution

Formaldehyde powder

Ethanol

Closing buckets of various sizes

125 and 250 ml plastic bottles

yials for otoliths

Dissection tools (scissors, forceps, pincers, scalpels)

Kitchen knives

Table magnifying lens

Portable computer for data entry

Liste des équipements qui doivent être disponibles à bord lors des études de poissons

Bassins an plastique
Pelles

Set complet de balance de pesée

Echelle éléctronique Eilersen équipée d'un stabilisateur de voltage adhéquat.

Planches de mesure de poissons

Sachets an plastique de différantes tailles

Crayons

Taille crayon

Gommes

Marqueurs Waterproof

Machine de découpage

Papier Acéate (pour préserver les marques résistantes)

Formulaires de collecte des données d'étude de poisson

Planche support pour les formulaires de collecte des données

File support cartonées

Trombones

Etiquettes

Solution de formol à 10%

Poudre de Forma ldehyde

Ethanol

Bouchons de fermeture de différentes tailla

Bouteilles plastiques de 125 et 250 ml

Flacons pour otolithes

Outils de dissection (sciceaux, pinces, tenailles, scalpes)

Couteaux de cuisine

Table à verre grossisant

Ordinateur portatif

Figure 1. Catch processing type "A"

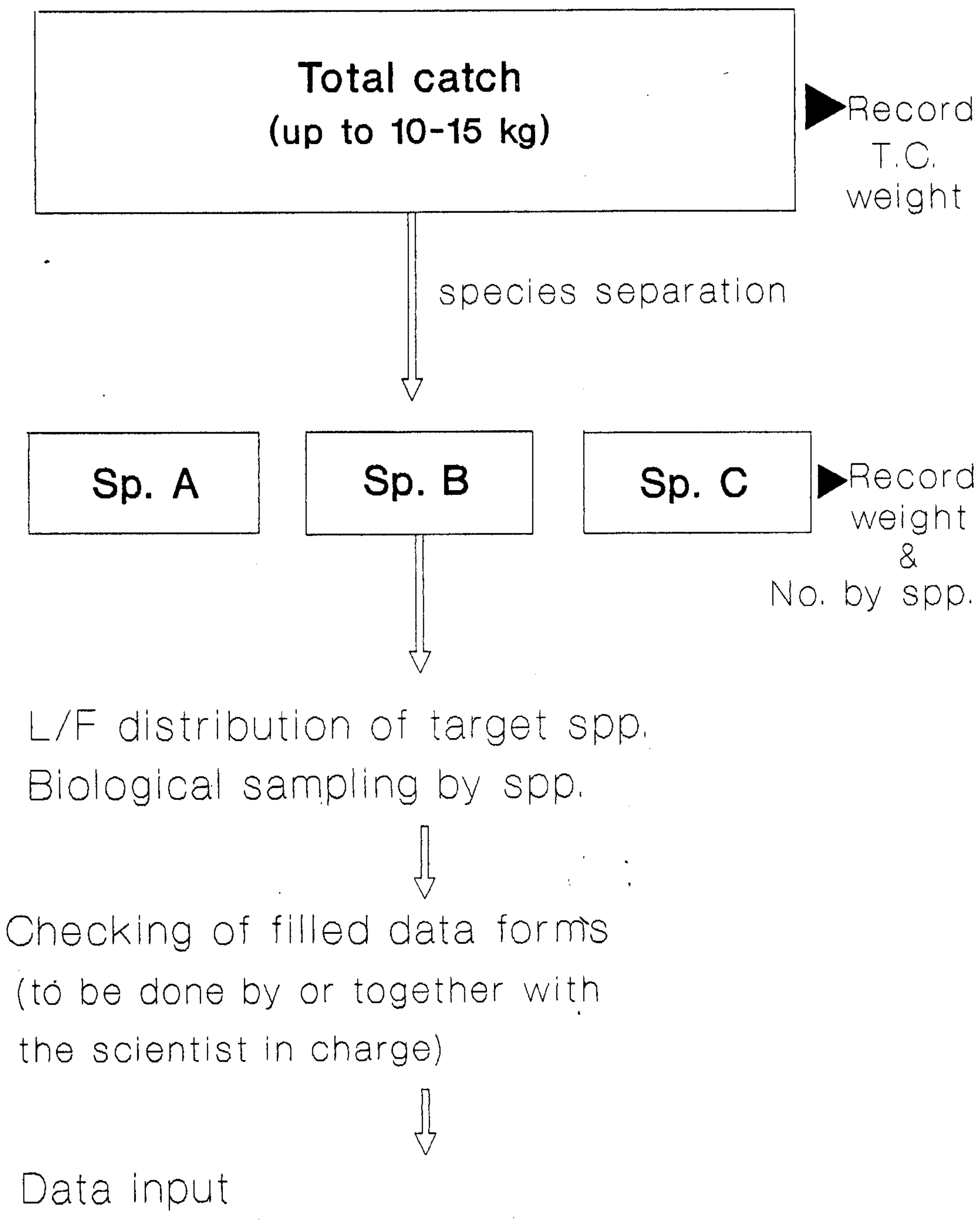
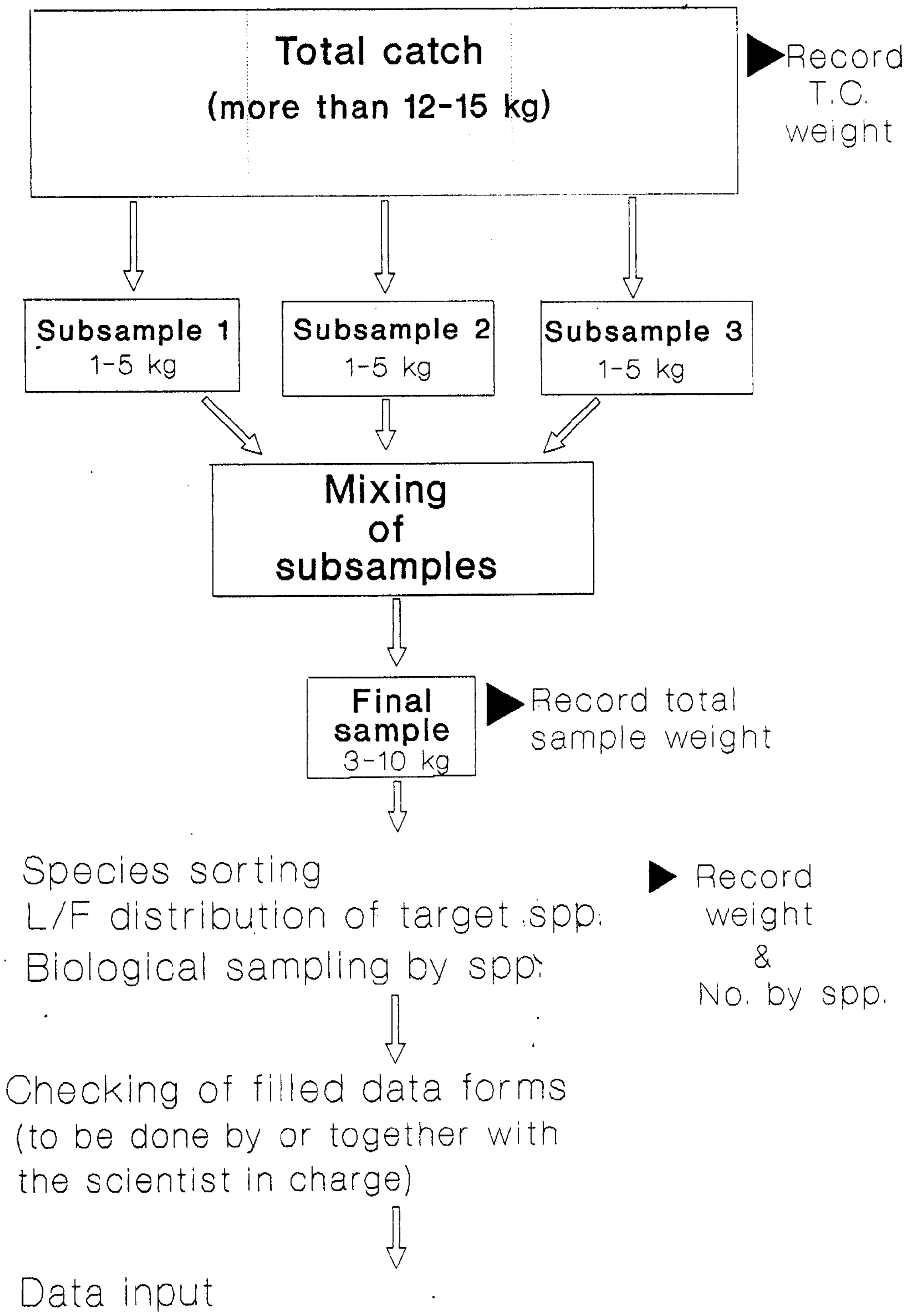


Figure 2. Catch processing type "B"



Form 1

HAUL SUMMARY

Survey code		Haul No.

Mesh size used	Date	Station

Time shot	Time hauled	Duration

Speed	Time	Opening	Time	Bottom depth	Time

Lat. shot	Long. shot

Lat. hauled	Long. hauled

Fishing depth	Time

Total catch weight	Total sample weight

Remarks: ______________________________

Code	Species	Numbers caught		Weight caught	
		sample	raised	sample	raised
STA	*S. tanganicae*				
LMI	*L. miodon*				
LST	*L. stappersii*				
LMA	*L. mariae*				
LAN	*L. angustifrons*				
LMC	*L. microlepsis*				

Summarised by: ______________ Checked by: ______________

Form 2

Survey code: ______________ Haul No: ____________ Station: ____________

Species: ______________ Date: ____________

TL (mm)	BIOL	Measured	Total	Rais. Total	TL (mm)	BIOL	Measured	Total	Rais. Total	TL (mm)	BIOL	Measured	Total	Rais. Total
10					65					120				
1					6					1				
2					7					2				
3					8					3				
4					9					4				
15					70					125				
6					1					6				
7					2					7				
8					3					8				
9					4					9				
20					75					130				
1					6					1				
2					7					2				
3					8					3				
4					9					4				
25					80					135				
6					1					6				
[illegible]					2					7				
8					3					8				
9					4					9				
30					85					140				
1					6					1				
2					7					2				
3					8					3				
4					9					4				
35					90					145				
6					1					6				
7					2					7				
8					3					8				
9					4					9				
40					95					150				
1					6					1				
2					7					2				
3					8					3				
4					9					4				
45					100					155				
6					1					6				
7					2					7				
[illegible]					3					8				
9					4					9				
50					105					160				
1					6					1				
2					7					2				
3					8					3				
4					9					4				
55					110					165				
6					1					6				
7					2					7				
8					3					8				
9					4					9				
60					115									
1					6									
2					7									
3					8									
4					9									
Tot.					Tot.					Tot.				

Counted: (not measured) [ ] Raising Factor: [ ] GRAND TOTAL: [ ]

Fraction sampled: [ ] Filled by: ______________ Checked by: ______________

Form 3

Survey code: ______________ Haul No: ____________ Station: ____________

Species: __________________ Date: ____________

TL (mm)	BIOL	Measured	Total	Rais. Total	TL (mm)	BIOL	Measured	Total	Rais. Total
10					410				
20					420				
30					430				
40					440				
50					450				
60					460				
70					470				
80					480				
90					490				
100					500				
110					510				
120					520				
130					530				
140					540				
150					550				
160					560				
170					570				
180					580				
190					590				
200					600				
210					610				
220					620				
230					630				
240					640				
250					650				
260					660				
270					670				
280					680				
290					690				
300					700				
310									
320									
330									
340									
350									
360									
370									
380									
390									
400									
Total					Total				

Counted: (not measured) [ ] Raising Factor: [ ] GRAND TOTAL: [ ]

Fraction sampled: [ ] Filled by: ______________ Checked by: ____________

Form 4

Survey code: ______________ Haul No: ______________ Date: ______________

Species: ______________ Station: ______________

Fish number	TL (mm)	Weight (g)	Sex (f, m, i)	Mat.	Stomach (mark "x")	Otolith (mark "x")	Fish number	TL (mm)	Weight (g)	Sex (f, m, i)	Mat.	Stomach (mark "x")	Otolith (mark "x")	Observations

Filled by: Checked by:

Form 3

Survey code: ____________ Haul No: ____________ Station: ____________

Species: LST Date: ____________

TL (mm)	BIOL	Measured	Total	Rais. Total	TL (mm)	BIOL	Measured	Total	Rais. Total
10					410				
20					420				
30					430				
40					440				
50					450				
60					460				
70					470				
80					480				
90					490				
100					500				
110					510				
120						3	7	520				
	𝍸			6	14	530				
140	𝍸	|||	8	19	540				
150	𝍸	𝍸 𝍸 ||	17	41	550				
160	𝍸	𝍸 𝍸 𝍸 𝍸 𝍸	30	72	560				
170	𝍸	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 ||	37	88	570				
180	𝍸	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸	45	108	580				
190	𝍸	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 ||	52	125	590				
200	𝍸	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸	45	108	600				
210	𝍸	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 ||	37	89	610				
220	𝍸	𝍸 𝍸 𝍸 𝍸 𝍸 |||	33	79	620				
230	𝍸	𝍸 𝍸 𝍸 𝍸 ||	27	65	630				
240	𝍸	𝍸 𝍸		16	38	640				
250	𝍸	|||	8	19	650				
260							4	10	660				
270					670				
280					680				
					690				
300					700				
310									
320									
330									
340									
350									
360									
370									
380									
390									
400									
Total	42		368	883	Total				

Counted: (not measured) 136

Raising Factor: 2.377

GRAND TOTAL: 883

Fraction sampled: 4/7

Filled by: ____________

Checked by: ____________

Form 2

Survey code: ______________ Haul No: ______________ Station: ______________

Species: STA Date: ______________

TL (mm)	BIOL	Measured	Total	Rais. Total	TL (mm)	BIOL	Measured	Total	Rais. Total	TL (mm)	BIOL	Measured	Total	Rais. Total
10					65	II	卌 III	10	32	120				
1					6	I	III	4	13	1				
2					7		卌 卌 卌	15	48	2				
3					8	II	II	4	13	3				
4					9		I	1	3	4				
15					70	II	II	4	13	125				
6					1	I	IIII	5	16	6				
7					2	I	I	2	6	7				
8					3					8				
9					4	II	卌 II	9	29	9				
20					75	III	卌 I	9	29	130				
1					6	I	III	4	13	1				
2					7					2				
3					8					3				
4					9	I	III	4	13	4				
25					80	I		1	3	135				
6					1	II	II	4	13	6				
[illegible]					2					7				
8					3	I		1	3	8				
9					4	I	II	3	10	9				
30					85	IIII	I	5	16	140				
1					6					1				
2					7					2				
3					8					3				
4					9	I		1	3	4				
35					90					145				
6					1					6				
7					2					7				
8					3					8				
9					4					9				
40					95					150				
1					6					1				
2					7					2				
3					8					3				
4					9					4				
45					100					155				
6					1					6				
[illegible]					2					7				
8					3					8				
9					4					9				
50					105					160				
1					6					1				
2					7					2				
3					8					3				
4					9					4				
55					110					165				
6	I		1	3	1					6				
7	I		1	3	2					7				
8	II		2	6	3					8				
9	I		1	3	4					9				
60	I	II	3	10	115									
1	I	I	2	6	6									
2	II	II	4	13	7									
3	I	卌 IIII	10	32	8									
4		卌 卌 卌	15	48	9									
Tot.	10		39	124	Tot.			86	276	Tot.				

Counted: (not measured) 74

Raising Factor: 3.184

GRAND TOTAL: 400

Fraction sampled: 2/4

Filled by: ______________

Checked by: ______________

Form 2

Survey code: ______________ Haul No: ______________ Station: ______________

Species: LMi Date: ______________

TL mm	BIOL	Measured	Total	Rais. Total	TL (mm	BIOL	Measured	Total	Rais. Total	TL (mm	BIOL	Measured	Total	Rais. Total
10					65					120			9	83
1					6					1			10	92
2					7					2			3	28
3					8					3			8	74
4					9					4			22	203
15					70					125			25	230
6					1					6			7	65
7					2					7			12	111
8					3					8			16	148
9					4					9			6	55
20					75					130			18	166
1					6					1			1	9
2					7					2			6	55
3					8					3			9	83
4					9					4			3	28
25					80					135			7	65
6					1					6			3	28
7					2					7			2	18
8					3					8			1	9
9					4					9			2	18
30					85					140			4	37
1					6					1			1	9
2					7					2			2	18
3					8					3			2	18
4					9					4			1	9
35					90					145				
6					1					6				
7					2					7			1	9
8					3					8				
9					4					9				
40					95					150			1	9
1					6					1				
2					7					2				
3					8					3				
4					9					4			1	9
45					100					155				
6					1					6				
7					2					7				
8					3					8				
9					4					9				
50					105					160				
1					6					1				
2					7					2				
3					8					3				
4					9			1	9	4				
55					110			1	9	165				
6					1			2	18	6				
7					2			1	9	7				
8					3					8				
9					4					9				
60					115			5	46					
1					6			1	9					
2					7			5	46					
3					8			4	37					
4					9			5	46					
Tot.					Tot.	15		25	230	Tot.	52		183	1684

Counted: (not measured) [ ] Raising Factor: 9.219 GRAND TOTAL: 1977

Fraction sampled: [ ] Filled by: ______________ Checked by: ______________