GCP/RAF/271/FIN–TD/40 (En) August 1995

REPORT ON LTRS THIRD SCIENTIFIC SAMPLING PROGRAMME ASSESSMENT MEETING, KIGOMA, 17-19 JULY 1995

by
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FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

Bujumbura, August 1995

PREFACE

The Research for the Management of the Fisheries on Lake Tanganyika Project (Lake Tanganyika Research) 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) and the Arab Gulf Programme for United Nations Development Organizations
(AGFUND).

This project aims at 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 will be also 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.

Prof. O.V. Lindqvist
Project Scientific Coordinator

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GCP/RAF/271/FIN PUBLICATIONS

Publications of the project are issued in two series:

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

* 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)**.

For bibliographic purposes this document should be cited as follows:

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TABLE OF CONTENTS

1. INTRODUCTION

Dr John Craig introduced himself to the participants, the international LTR scientific staff. All staff must work as a team and take a more holistic approach using the abilities of each team member to the best advantage. The current principal objectives of LTR are to a) develop a model of biological productivity, b) integrate conclusions of various sub—components and formulate a working hypothesis to be tested in the field, c) develop a draft management plan and d) identify a long term programme for monitoring and research to provide continuous assessment of the fish stocks and progressive adjustment of the fisheries management plan.

Dr Craig asked each of the field coordinators to present briefly the objectives of the sub—component and how these relate to the overall LTR objectives, give an outline of the available historic and current databases and a statement of what has been done and what still needs to be done. The first day of the meeting was taken up with these presentations and with discussions.

The uncertainties concerning the continuation of LTR were outlined and it was stated that plans for two scenarios should be considered. They should be compiled bearing in mind the recommendations of the Evaluation Mission. The second day of the meeting was used to develop workplans (SSP3) and these are presented in this document.

The meeting also discussed training of nationals, communications, equipment and the production of reports and publications.

2. PLANNING AHEAD - SSP3

A considerable amount of data has been collected over the first two years of LTR. Over the next phase the critical activity must be the analysis and synthesis of the data to achieve the objectives listed above in the introduction.

The most important field work for 55P3 is lake wide surveys using hydroacoustics and mid-water trawling. As well as providing biomass data the sampling will give other vital information about the pelagic fish such as spatial distribution by size, nursery areas, migration patterns and predation. Other studies should include primary production, shrimps and fish fecundity.

Basic monitoring established during SSPl and SSP2 should continue carried out by nationals at each station (see Section 2.3). The information gathered should be used in determining management strategy for the pelagic fish stocks.

Two possibilities for the continuation of LTR are considered: a) Scenario One up to December 1996 and b) Scenario Two up to December 1998.

2.1. Scenario One

The proposed plan is summarised in Fig. 1.

At the end of July 1995 the programme will be cut to basic monitoring, cruises and primary production studies. Two months of flexibility will remain for hydrodynamics to cover the important periods. Craig will coordinate the programme and make sure that staff keep to the schedule (see Fig. 2 for responsibilities and lines of communication)

Basic monitoring would continue by nationals throughout the period with very limited supervision from international staff.

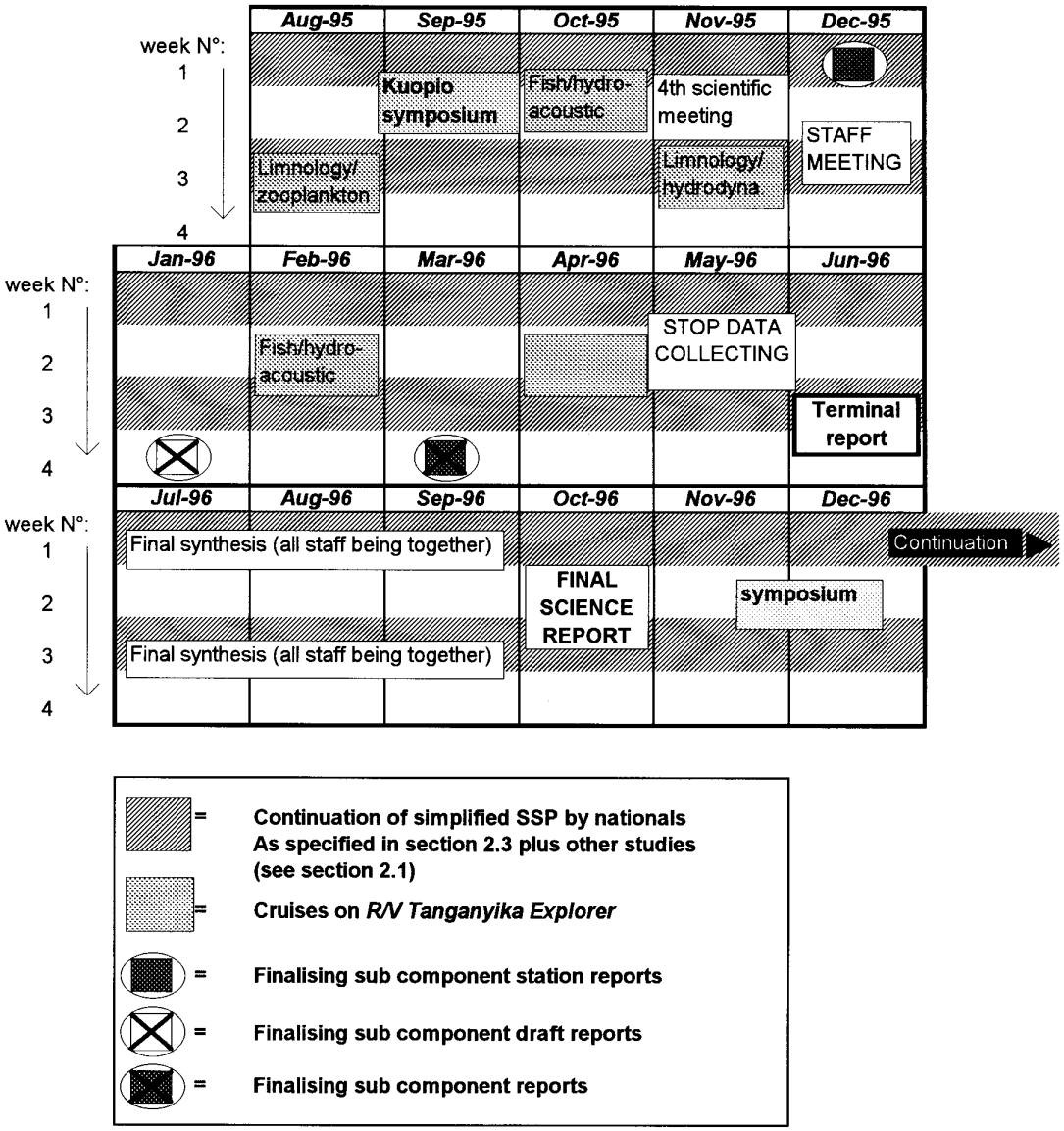
Phytoplankton and primary production studies should commence at stations and on cruises after trials performed during the limnology cruise of August 1995.

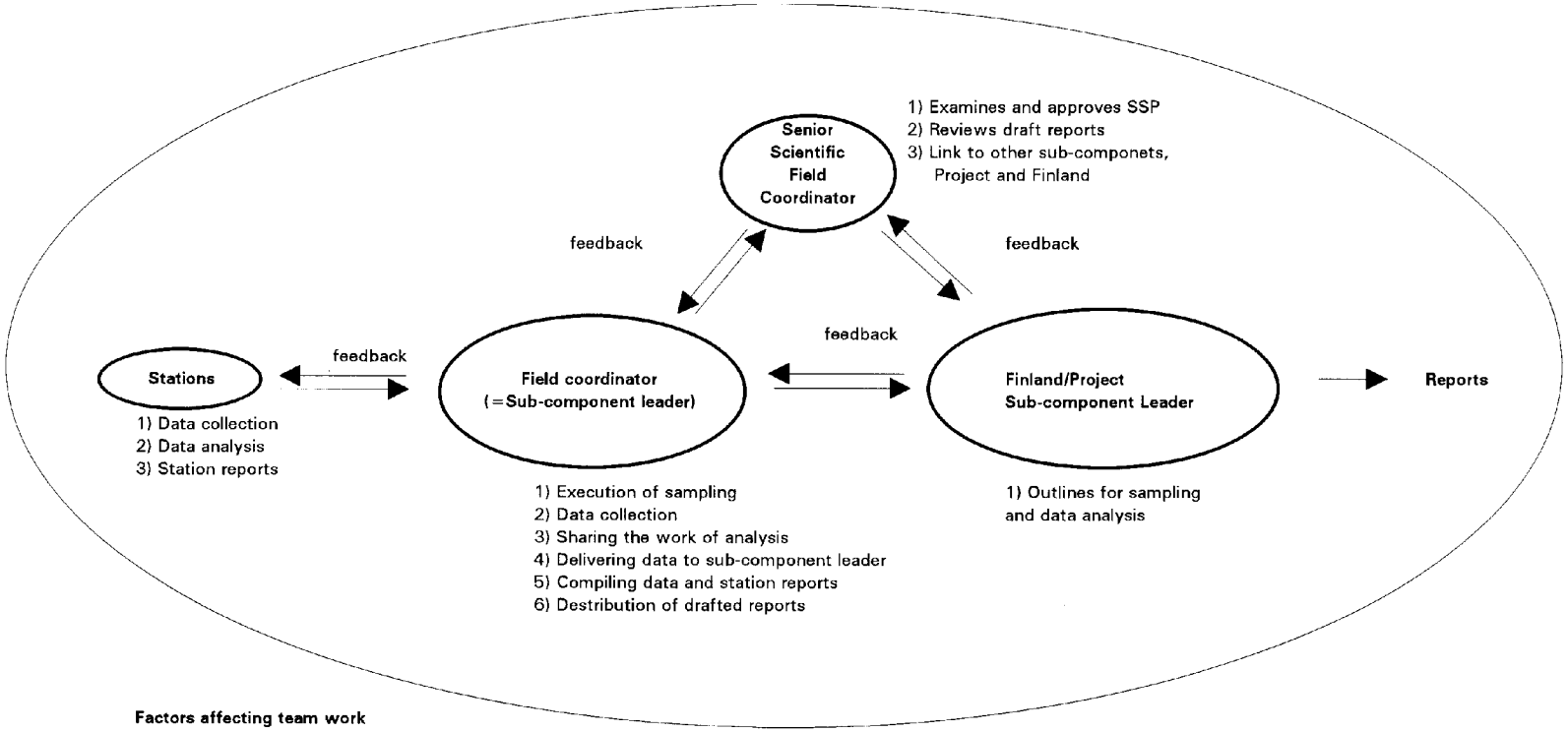
The hydrodynamical sub—component have major problems with handling their large amounts of data and thus finishing their reports on time. Two months of hydrodynamical data from the automatic recorders, up to October, are required to cover the dry season.

The compilation of data should proceed as follows: 1) There must be an absolute free flow of data between the stations. Data should be checked by the field coordinators and then returned to the stations. 2) All station will produce their basic reports by December 1995 when a staff meeting will be held. 3) Sub-component draft reports should be ready by January 1996 and final reports by March 1996. 4) Combinations and links must be established between these reports. At the end we will be working with several short and clear scientific reports to produce a final document, the Final Science Report by October 1996. Analyses, synthesis and writing needs constant interchange between scientific staff and they should be housed together during the final phase (from June 1996). While Bujumbura was suggested because of its documentation centre, Kigoma is preferred because of its logistics.

The September Symposium in Kuopio should be used to exchange ideas between LTR field staff and their Finnish counterparts.

Fig. 1 Workplan for scenario 1





Factors affecting team work

General factors

1) Time
2) Communication, distance, facilities
3) Planning of work
4) Organization of work

Personal factors

1) Knowledge
2) Motivation
3) Relationships
4) Character

Fig 2. Responsibilities and lines of communication of Project staff.

2.2. Scenario Two

The proposed plan is summarised in Fig. 3.

The new phase of investigations will place the main emphasis on the cruises and important neglected areas such as phytoplankton production.

The hydrodynamics sub-component will study Huttula's new proposal concerning the current measurements in deep waters. If funding allows (through GEF) new automatic current devices should be ordered.

The limnology sub—component will put more emphasis on the A/H (traditional sampling extended with one horizontal sampling at the surface and chlorophyll a analyses) and A/CE sampling (traditional sampling extended with primary production measurements). Plisnier and Langenberg will search for possibilities of analysing phytoplankton and bacteria. These need more input and scientific backup from Finland. The Kuopio meeting will be used to discuss these matters (with Sarvala and Salonen).

Limnology sampling during cruises. Two types of sampling are proposed, deep (D) and surface (epilimnion) (E), 0 to 40 m (Figs 4 and 5). Only a few deep (D) investigations should be made since sampling will be intensive while surface (E) sampling should have a relatively high frequency, El every 30 km and E2 every 60 or 90 km. Limnology sampling should be carried out at the same time as fish and zooplankton studies. Samples taken for D and E2 should be analysed for SD, temperature, DO, conductivity, pH, turbidity, chlorophyll a, fluorescence, TP, TDP, SRP, TN, $NH4^{+}$, $N03^{-}$, $N02^{-}$, alkalinity and silicates. Those taken for El should be analysed for SD, temperature, conductivity, chlorophyll a and fluorescence. Two types of cruises are suggested: 1) Limnology and zooplankton and 2) fish biology. Measurements taken during cruise of type 1) include D and El. Experiments on primary production should be performed using the on board incubator. For type 2, surface sampling El and E2 should be undertaken close to the trawled areas. Transparency and fluorescence should also be measured during the latter cruises.

The zooplankton sub—component will use the torpedoes which were constructed a year ago. More work will be done on the shrimps and fish larvae collected during the cruises. The real carbon content of the zooplankton species of Lake Tanganyika is needed. At present we rely on values from the literature. Information is lacking of growth rates, turnover rates and P/B ratios of *T. simplex* and cyclopoids. There is a plan for a Finnish student to rear Copepoda in the laboratory at Kigoma later this year.

Fig. 3 Workplan for scenario 2

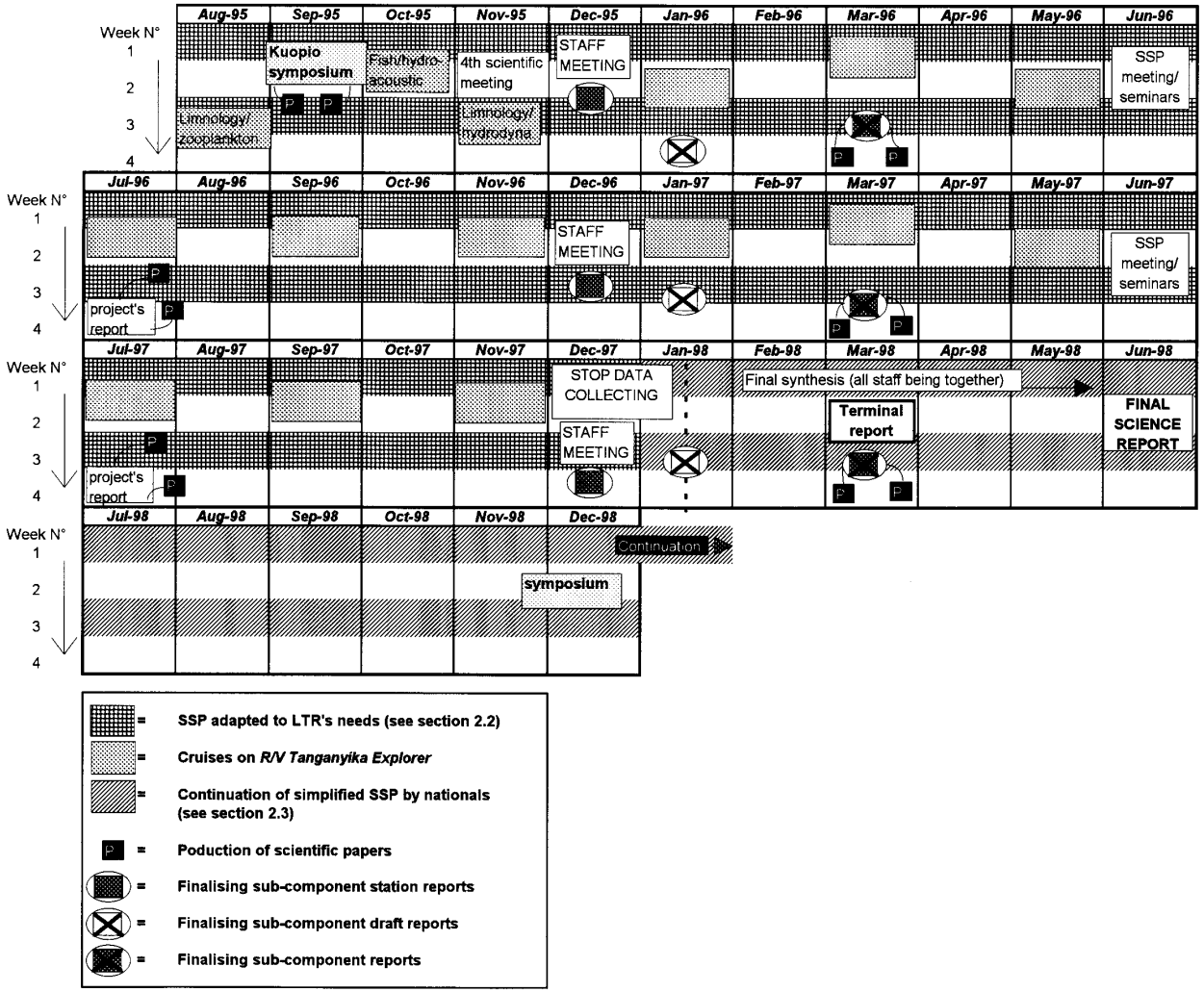
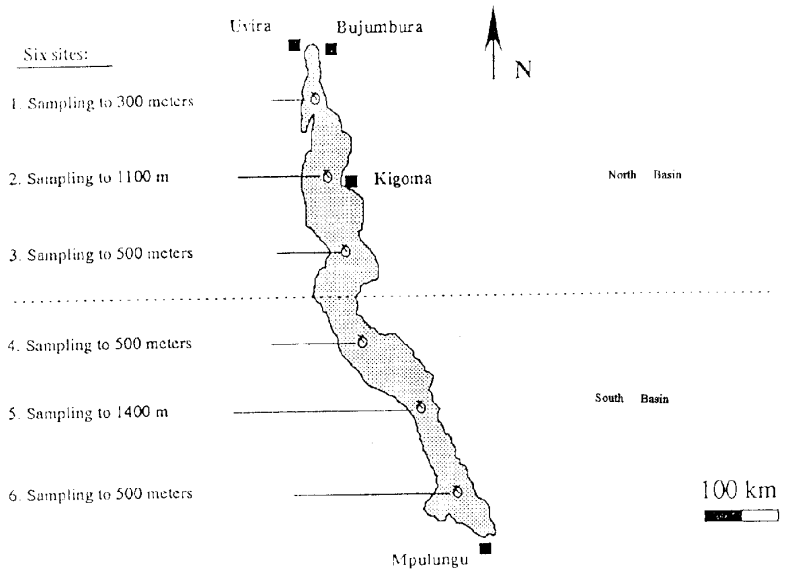


Fig. 4 Proposed deep sampling sites and parameters to measure during cruises of R/V Tanganyika Explorer.



Parameters (A = all sampling, X see N° for specified sampling)

Sampling n°

Depth	1	2	3	4	5	6
0	1	2	3	4	5	6
20	1	2	3	4	5	6
40	1	2	3	4	5	6
60	1	2	3	4	5	6
80	1	2	3	4	5	6
100	1	2	3	4	5	6
200	1	2	3	4	5	6
300	1	2	3	4	5	6
400		2	3	4	5	6
500		2	3	4	5	6
800		2			5	
1100		2			5	
1400					5	

Every limno cruise with deep samplings

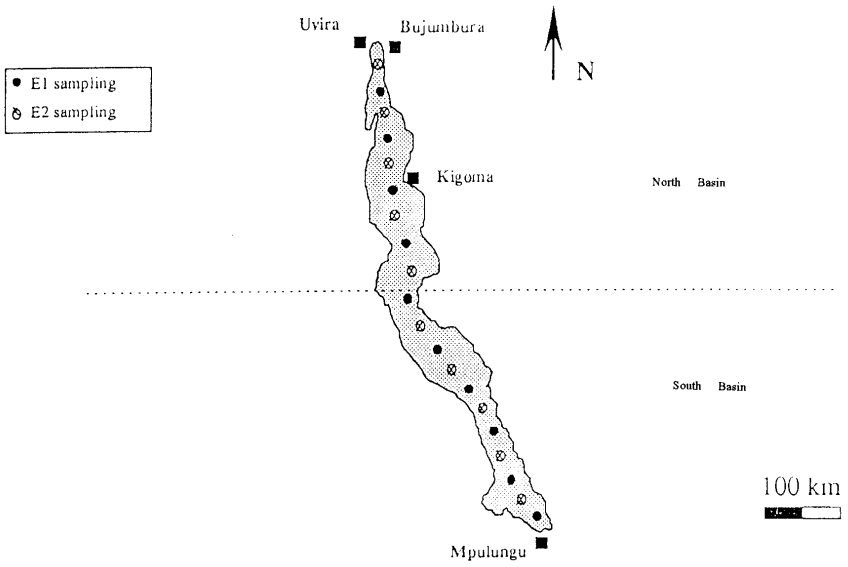
Depth	SD	T°	DO	C	pH	TURB	TP	TDP	SRP	TN	NH4	NO3-	NO2-	Chl a	P alk	Tot alk	Si02
0	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
20		A	A	A	A	A								A	A	A	A
40		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
60		A	A	A	A	A								A	A	A	A
80		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
100		A	A	A	A	A								A	A	A	A
200		A	A	A	A	A	A	A	A	A	A	A	A				
300		A	A	A	A	A					A	A	A		A	A	A
400		x	x	x	x	x											
500		x	x	x	x	x					x	x	x	x		x	x
800		x	x	x	x	x					x	x	x				
1100		x	x	x	x	x					x	x	x	x		x	x
1400		x	x	x	x	x					x	x	x				

Twice per year (dry and rainy season)

Depth	Ca++	Na+	K+	SO4--	Cl-	Tot Hard.
0	2+5	2+5	2+5	2+5	2+5	2+5
20						
40						
60						
80						
100	2+5	2+5	2+5	2+5	2+5	2+5
200	2+5	2+5	2+5	2+5	2+5	2+5
300						
400	2+5	2+5	2+5	2+5	2+5	2+5
500						
800	2+5	2+5	2+5	2+5	2+5	2+5
1100	2+5	2+5	2+5	2+5	2+5	2+5
1400	5	5	5	5	5	5

Sampling 2 (North Basin)
Sampling 5 (South Basin)

Fig. 5 Proposed surface sampling and parameters to measure during cruises of R/V Tanganyika Explorer



Sampling

Depth
0
20
40

→ mixed

E1 Every 30 km

SD	T°	C	Chl a
A	A	A	A

E2 Every 60 or 90 km

SD	T°	DO	C	pH	TURB	TP	TDP	SRP	TN	NH4	NO3-	NO2-	Chl a	P alk	Tot alk	SiO2
A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A

NB : Fluorescence measurements should be done on every cruise if possible

For fish biology, decisions on hydroacoustics will be made and are expected from Aro in Finland. Cruises will combine fish studies with other biotic factors and with abiotic measurements, in particular using the CTD. Priority will be given to investigations of fish temporal and spatial biomass distributions and predator/prey relationships.

Remote sensing studies have to be fully implemented with help from Finnish colleagues.

Compilation of data will follow a similar format to Scenario One. Station reports should be ready by December each year when a staff meeting will be held. Sub-component draft reports will be available by January and final reports by March. A meeting to present and discuss progress will be held in June. Apart from basic monitoring, data collection will cease in December 1997 and final synthesis of the data will occur from February to June 1998. A final science report will be produced in June 1998.

2.3. Basic Monitoring

Regardless of the length of time that LTR carries on, basic monitoring will be continued by national staff. The statistics gathered from this monitoring will be used in the management of the pelagic fish stocks. The basic monitoring programme will be as follows:

1) Hydrodynamics - Data collection by the automatic stations.

2) Limnology - The A/H (see Annex 3) and A/CE (carbon/energy) sampling. Each every two weeks alternating with each other.

3) Zooplankton - Three hauls with 100 pm net during limnology sampling at A every week.

4) Fish - Only total catches and effort from weekly landings. Length frequency, maturity, and gonad weight measurements every two weeks.

Personnel involved with this sampling and their specific duties are listed in Annex 4.

3. TRAINING OF NATIONAL STAFF

Nationals would be capable of running some parts of the sampling programme when LTR ends. A simple, basic but effective monitoring programme could be established to be checked by outside experts.

The studies carried during the cruises will require different skills from the normal sampling programme. A considerable volume of data will be collected. The desirability of training nationals in the skills required should be considered.

There is a need to set certain objectives for training. For example, nationals should be moved around the stations as this would enhance friendship, homogeneity and improve the exchange of data. Because of differences in languages it was suggested to exchange people between Bujumbura and Kigoma and between Kigoma and Mpulungu)

LTR should continue with the same training techniques that have been used in the last two years. However a serious effort must be made to try improve motivation and skills by providing responsibility, suitable visits and incentives.

National staff should be trained in length frequency methods to estimate VBGF parameters. Values of growth and mortality rates are essential in deriving biomass and production estimates.

When significant improvements are made and abilities established plans can be made for establishing a regional research organisation.

4. MISCELLANEOUS

Craig would like written comments about the Evaluation Mission Report and how we are going to respond to their recommendations.

Some workable form of the meteorological data must be presented to LTR's staff in the near future.

With regard to cruise planning, logistics, scientific equipment requirements, etc. it was stressed that procedures must be followed exactly as given in LTR Field Manual No. 17 entitled *'R/V Tanganyika Explorer:* Guidelines and Procedures'.

There is a requirement to review safety in LTR especially relating to boats, chemicals and laboratory procedures. Methods to be used in the primary production studies are complex.

ANNEX 1: LIST OF SSP ASSESSMENT MEETING PARTICIPANTS

Bujumbura, Burundi:

Dr J F Craig
Mr P Kotilainen
Mr V Langenberg

Kigoma, Tanzania:

Mrs H Kurki
Mr P Mannini

Mpulungu, Zambia:

Ms E Bosma
Dr P-D Plisnier
Mr P Verburg

ANNEX 2: ITINERARY AND AGENDA

15 July 1995

- Arrival to Kigoma by *R/V Tanganyika Explorer* of LTR Bujumbura participants.

16 July 1995

- Arrival to Kigoma by cars of LTR Mpulungu participants. 17 July

1995

MORNING:
— Introduction.
— Presentation and discussions on
Hydrodynamics
Limnology.

AFTERNOON:
— Presentation and discussions on Zooplankton
Fish biology.

18 July 1995

MORNING:
— Formulation of a workplan
Six months
One year

AFTERNOON:
— Formulation of a workplan
Three and a half years.
— Discussion on the training of counterparts/nationals.
- Formal introduction of Senior Scientific Field Coordinator to TAFIRI staff.

19 July 1995

MORNING:
— Discussion on communications
Within LTR
With participating scientists in Finland.

— Discussion on equipment requirements.

- Discussion on the production of publications and reports.

AFTERNOON:
— Informal discussions of LTR staff.

20 July 1995

MORNING:

- Departure of Bujumbura participants by *R/V Tan ganyika Explorer* to Bujumbura taking CTD measurements on the way.

- Departure of Mpulungu participants by cars to Mpulungu.

LAKE TANGANYIKA RESEARCH PROJECT - LIMNOLOGY - weekly sampling (A/H)

Station (full name):		Latitude :			Before discarding water, data checked by :
Team sampling :		Longitude :			
Team analysing :		Hour start:			Before computer input, data checked by :
Date (DDMMYY) :		Hour end:			
Lake/wind condition :		Input right coefficient for radiation : air or water !			Air. radiation
Cloud cover :	from 1 (= no clouds) to 5 (= covered)	Measure conductivity before pH !			start / end

PELAGIC	Depth	Zoop.	Secchi Disk			T°	D.O.	C.	pH	Turb.	S.R.P	NH4-N	NO3-N	NO2-N	SIO2	Chl a	W. Rad. 1	W. Rad. 2
SITE A						°C	mg/l				mg/l						down	up
9 H	(m)			start	end	(probe)		uS/cm		NTU	(PO4---)	mg/l	mg/l	mg/l	mg/l	mg/m3	µm/s-m per µA	
Burundi time	0		1.															
	10		2.															
	20		3.															
	30		Av =															
	40																	
	50																	
	60																	
	70																	
	80																	
	90																	
	100																	

means "required" means "optional or not possible"

Latitude :					
Longitude :					Air. radiation
Hour start:					start / end
Hour end:					

Cloud cover : from 1 (= no clouds) to 5 (= covered)

COAST		Secchi Disk				T°	D.O.	C.	pH	Turb.	S.R.P	NH4-N	NO3-N	NO2-N	SIO2	Chl a	W. Rad. 1	W. Rad. 2
SITE H4	Depth					°C	mg/l				mg/l						down	up
11 H	(m)	1.	2.	3.	Av.	(probe)		uS/cm		NTU	(PO4---)	mg/l	mg/l	mg/l	mg/l	mg/m3	µm/s-m per µA	
Burundi time	0																	
	10																	

NB 1 : H4 = 50 m from coast.
NB 2 : It is essential that the weekly sampling is performed every week without interruption to attempt understanding of the short fluctuations of parameters.
NB 3 : SRP after filtration ----> 0.45 µm (do NOT use others filters for this, thanks !)

Remarks:

ANNEX 4: PROGRAMME FOR BASIC MONITORING BY NATIONALS.
(Name given in italics is responsible for the activity at the station).

BUJUMBURA

Hydrodynamics - *Mr Kakogozo,* Mr Nikomeze
Limnology - *Mr Tumba,* Mr Nyamushahu, Mr Tshibangu, Mr Butoyi, Mr Ndimunzigo, Mr Nikomeze, Mr Gahungu
Zooplankton - *Mr Bwebwa,* Mr Nyamushahu
Fish biology - *Mr Nikomeze,* Mr Butoyi, Mr **Ndimunzigo, Mr** Tumba, Mr Nyamushahu, Mr Gahungu
Fish statistics - *Mr Nikomeze,* Mr Ndimunzigo, Mr Gahungu, Mr Tumba

KARONDA

Fish biology - *Mr Nibigira*

KALEMIE

Hydrodynamics - *Mr Detsimas*
Fish biology - *Mr Mundula,* Mr Chalula, Mr Kavula

MOBA

Fish biology - *Mr Mpweto*

UVIRA

Fish biology - *Mr Bahane, Mr Mbemba*
Fish statistics - *Mr Mambona*

KIGOMA

Hydrodynamics - *Mr Kihakwi*
Limnology - *Mr Chitamwebwa,* Mr Lyoba, Mrs Lyoba
Zooplankton - *Mr Kalangali,* Mr Muhoza, Mr Kadula
Fish biology - *Mr Katonda,* Mr Kissaka, Mr Kashushi
Fish statistics - *Mr Kissaka,* Mr Katonda, Mr Kashushu

MPULUNGU

Hydrodynamics – *Mr Makassa,* Mr Kaoma, Mr Sichivu
Limnology – *Mr Mwape,* Mr Lukwessa, Mr Ngandu, Mr Shapola
Zooplankton - *Mr Zulu,* Mr Sichivu, Mr Kaoma
Fish biology - *Mr Milindi,* Mr Mwape, Mr Kabakwe, Mr Mwenda, Mr Chomba, Mr Syapila, Mr Skaona, Mr Banda
Fish statistics - *Mr Mwape,* Mr Milindi, Mr Kabakwe, Mr Mwenda, Mr Chomba, Mr Syapila, Mr Skaona, Mr Banda