GCP/RAF/271/FIN–TD/55 (En) December 1996

# REPORT OF THE FIFTH JOINT MEETING OF THE LTR'S COORDINATION AND INTERNATIONAL SCIENTIFIC COMMITTEES

by

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(eds.)

FINNISH INTERNATIONAL DEVELOPMENT AGENCY

FOOD AND AGRICULTURAL ORGANIZATION
OF THE UNITED NATIONS

Bujumbura, December 1996

## 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) and the Arab Gulf Program for the United Nations Development Organization (AGFUND).

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 build-up of effective coordination mechanisms to ensure full collaboration between the Governments concerned.

**Prof. O.V. LINDQVIST**
**LTR Scientific Coordinator**

**Dr. George HANEK**
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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)**.

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# TABLE 0F CONTENTS

## ACKNOWLEDGMENTS

We wish to acknowledge the hard work of all LTR personnel, both national and international, in all LTR research stations around Lake Tanganyika as well as in numerous Universities and Research Institutes in Finland. We also wish to record the efforts of Ms. Baricako and Ms. Gatungane in the preparation and translation of all meeting's documentation.

In addition, we wish to acknowledge the effective assistance of Mr. Mann, Dr. Kapetsky and Mr. Everett in drafting the adopted report.

Lastly, we wish to record the effective and constructive participation of all members of the LTR's Committees, that of numerous observers and, above all, the effective chairmanship of Mr. T.W. Maembe.

**REPORT OF THE FIFTH JOINT MEETING**
**OF THE LTR'S**
**COORDINATION AND INTERNATIONAL SCIENTIFIC COMMITTEES**
**Rome (Italy), 25–26 November 1996**

1. The Fifth Joint Meeting of the Coordination and International Scientific Committees of Project GCP/RAF/271/FIN 'Research for the Management of the Fisheries on Lake Tanganyika'
(LTR) was held from 25 to 26 November 1996 in Rome, Italy.

## ITEM 1: OPENING OF THE MEETING AND ELECTION OF THE CHAIRMAN

2. The Zambian delegate, Chairman of the Fourth Joint Meeting of LTR's Coordination and International Scientific Committees, welcomed the participants and observers and called the meeting to order. The list of participants is given in Annex 1.

3. Dr. Y. Kato, Director of Fishery Policy and Planning Division, welcomed all participants and observers and officially opened the meeting on behalf of the Assistant Director General for Fisheries Mr. M. Hayashi.

4. The Tanzania delegate, proposed by Burundi and seconded by Zambia, was elected Chairman. The Zaïre delegate, proposed by Burundi and seconded by Tanzania, was elected Vice Chairman.

## ITEM 2 ADOPTION OF THE AGENDA

5. The agenda (Annex 2) was adopted as proposed by the Chairman.

## ITEM 3: LTR COORDINATOR'S REPORT: SUMMARY OF LTR's ACTIVITIES (DECEMBER 1995 - NOVEMBER 1996) AND REVIEW OF PROGRESS ON RECOMMENDATIONS OF THE FOURTH JOINT MEETING OF LTR COMMITTEES

6. The LTR Coordinator presented the details of LTR activities carried out during the last 12 months; they are amplified in Annex 3. The key highlights were: (1) successful completion of LTR's Scientific Sampling Programme (SSP); (2) effective execution of six lake–wide scientific cruises; (3) organization and execution of four training courses; (4) preparation of the project's revision document which outlines the objectives and activities for 1997 and 1998; (5) continued upgrading of the LTR Documentation Centre; (6) preparation and presentation of LTR's activities at the Second World Fisheries Congress; (7) cooperation with the UNDP/GEF project RAF/92/G32 'Pollution control and other measures to protect biodiversity in Lake Tanganyika' including details on execution of an Inter–Agency Agreement between UNOPS and FAO, and (8) details on publications and reports prepared during the last 12 months.

7. The Coordinator then detailed several changes in both the field staff and the membership of the LTR committees.

8. The Chairman congratulated the LTR Coordinator and all the staff for their achievements, re—emphasized the need for close and effective cooperation with the GEF project and expressed his hope for the continued support by the key donor agencies. The Burundian delegate congratulated the LTR Coordinator for the quality of the documentation for the meeting, supported the project's extension and thanked Finland and FAO for their efforts to make the project so successful. He underlined the fact that these achievements were realized under difficult conditions which have faced the region for some time. He finally provided clarification concerning the use of *R/V Tanganyika Explorer* and expressed a commitment of his Government to guarantee the free movement of the said vessel in the future while, at the same time, expressed his wish that the said vessel could be used even after the end of the project. The Chairman and the heads of other delegations endorsed this view and expressed their commitment to ensure free movement of project's personnel, equipment including *R/V Tanganyika Explorer* as specified in LTR's Project Document.

**ITEM 4: LTR SCIENTIFIC COORDINATOR'S REPORT: SUMMARY OF SSP RESULTS**

9. The three years of data collection are now complete and a summary of the results are given in Annex 4. The LTR Scientific Coordinator thanked all the staff involved in the project for their dedication and for the scientifically skillful work done. He noted the high motivation of everyone working in the field and in the laboratories. The results of the research would be published in scientific journals making sure that due credit is given to all involved.

10. The delegate of Tanzania proposed that in order to increase the efficiency of LTR/Kigoma the station should be supplied with a new photocopying machine as soon as possible. The LTR Coordinator responded by stating that the project is well aware of this deficiency since the project is now operating for five years and some equipment will have to be replaced soon. To this effect FAO already approached the AGFUND requesting additional funds for equipment and training.

11. Dr Craig presented some preliminary key results from each of the components. All data collected during the SSP have been compiled into a database which contains over 3500 files. These will be made available to all parties concerned.

12. The Chairman thanked all the staff involved in the sampling programme and thought that the report presented highlighted the extensive achievements of the study. The Zambian delegate thanked the Scientific Coordinators for their report. He mentioned that, in his view, not enough work was carried out in fish biology of which better understanding is essential for the formulation of a management plan. He further expressed his happiness to have the GEF project operational as it could be of

assistance in increasing knowledge of the lake's ecosystem, his hope for the project's continuation and for a workshop prior to the end of the project to disseminate the results. Dr Craig explained that the efforts made in the fish biology component were considerable and comprehensive and several reports would soon be available. The Burundian delegate emphasized the importance of shrimps in the food chain, further stating that due to the socio-economic problems in the region and resulting changes in the fishing communities there is an urgent need to execute frame surveys in all countries.

**ITEM 5: LTR MONITORING PROGRAMME: PROPOSAL**

13. In response to the request of the Fourth Joint Meeting of LTR Committees Dr Craig outlined a simple and inexpensive monitoring programme; its estimated cost is approximately US$ 20,000/year. It is amplified in Annex 5. He stressed the need to carry out such a programme over an extended period of at least ten years. He further proposed that such a programme be carried out by the nationals of the four countries in order to provide a regional body with information required to effectively manage the lake's resources.

**ITEM 6: LTR REVISION PROPOSAL**

14. This item was presented by Mr Mann and is detailed in Annex 6. He explained that the project results to date were appraised by a consultant Mr. Kuikka engaged by the Finnish Ministry of Foreign Affairs and his report was reviewed at FAO HQ in September 1996. The general conclusions were that the research programme, implemented by the project to date had yielded considerable new knowledge regarding the hydrology and fisheries of the lake, that the fisheries and the environment are normal and no risk in the collapse of the fisheries had been identified. Nevertheless the full analysis and interpretation of the data already collected needs to be completed in order to serve the next level of operation which must provide practical results for the management of the shared fish stocks and related fisheries. Lastly he underlined that considerable additional work still needs to be undertaken with the assistance of the project in order to: (1) consolidate the analysis of the data collected to date; (2) transfer and communicate the relevant information to the governments and fisher—people concerned; (3) prepare an initial lake-wide fisheries management plan; and (4) define a simple regular precautionary monitoring programme for the future.

**ITEM 7: ANY OTHER MATTERS**

15. Dr Menz, Coordinator of the GEF project thanked LTR and CIFA for inviting him and his colleague to the meetings. He then proceeded to give an overview of the GEF project including its objectives, proposed activities while stressing the common goals of GEF and LTR. He further outlined the project strategy indicating that its special study phase is due to start in January 1997. He informed the delegates that cooperation between

the projects, both formal and informal, already existed. He expressed his wish that this continue because sharing knowledge will benefit both parties. He specifically outlined the requirements for the use of the research vessel *Tanganyika Explorer,* further stating that socio—economic studies and the preparation of a fisheries management plan are two key areas for future cooperation. Lastly Dr Menz informed the meeting that all GEF existing and future documentation would be made available to all parties.

16. The Burundian delegate again expressed his concern about the location of the GEF HQ. The Chairman informed the meeting that this item should be dealt in the appropriate forum.

17. The Chairman gave the floor to Mr Laamanen, representative of the Finnish Ministry of Foreign Affairs. He expressed the Ministry's satisfaction with LTR's achievements to date, confirmed his Ministry's commitment to fund LTR's activities during 1997 and 1998 and, lastly, indicated that further efforts will be made to increase the funding committed for the next two years while hoping that it will be possible to support LTR beyond the year 2001.

18. The Chairman and heads of all delegations thanked Mr Laamanen and asked him to convey their appreciation to the Government and people of Finland for their continuing support of LTR.

19. The Chairman and heads of all delegations also expressed their appreciation to the AGFUND for its continuing support of LTR.

20. The LTR Coordinator informed delegates on recent developments in the preparation of navigational charts for Lake Tanganyika and sought their support to pursue this matter further. The Chairman and the members gave approval to this requesting the LTR Coordinator and FAO to proceed with this matter in cooperation with the International Hydrographic Organisation in order to secure the required funding for the preparation of navigational charts for Lake Tanganyika.

21. The delegate of Tanzania in formed the members that the officers of *R/V Tanganyika Explorer* have experienced contractual problems. Specifically, because of the difficult situation in the region the two of the officers did not receive salary for three months while the *R/V Tanganyika Explorer* was retained in the harbour of Bujumbura. He subsequently proposed that the contracts
of officers are finalized as soon as possible in order to guarantee the efficient operation of the said vessel. These contracts should include a provision for overtime payments in order to limit their financial loss.

**ITEM 8: DATE AND VENUE OF THE NEXT MEETING**

22. The Zambian delegate informed the members that his government had offered an invitation to host the Sixth Joint

Meeting of LTR Committees in Zambia. The Chairman thanked the Zambian delegate for this offer charging LTR to consider appropriate venue and dates for such a meeting in due course.

**ITEM 9: ADOPTION OF THE REPORT**

23. The Coordination and International Scientific Committees adopted the report on 26 November 1996.

24. The delegate of Zambia thanked the Chairman for his effective chairmanship and wise guidance which allowed for effective deliberations.

25. The Chairman thanked all participants for their good preparation and constructive debate. Lastly, he thanked the secretariat, the FAO, observers and translators for their good work.

**ANNEX 1**

**FIFTH JOINT MEETING**
**OF THE LTR'S**
**COORDINATION AND INTERNATIONAL SCIENTIFIC COMMITTEES**

**Rome (Italy), 25-26 November 1996**

**LIST OF PARTICIPANTS**

| | | |
|---|---|---|
| **Burundi** | | |
| Ir. S. BAMBARA | Conseiller | Département des eaux, pêche et pisciculture, Ministère de l'Agri-culture et de 1'Elevage Bujumbura |
| Dr. B. NYAKAGENI | Coordonnateur technique | Ministère de l'Agri culture et de l'Elevage Bujumbura |
| Mr. E. HADJIANDREOU | Director | Tanganyikaise SARL Bujumbura |
| **Tanzania/Tanzanie** | | |
| Mr. T. W. MAEMBE | Director of Fisheries | Ministry of Natural Resources and Tourism Dar es Salaam |
| Prof. P.O.J. BWATHONDI | Director General | TAFIRI - Kunduchi |
| **Zaïre** | | |
| Mr. A. SAMBA MOOMI TE | Reprèsentant Permanent | Representation Permanent du Zaïre auprés de la FAO, Rome |
| Mr. M.K. KALIBU | Directeur des Pêches | Ministère de l'Environ nement de la Conservation de la nature et du tourisme Kinshasa |
| **Zambia/Zambie** | | |
| Mr. H. G. MUDENDA | Director of Fisheries | Ministry of Agriculture Food and Fisheries Chilanga |

| | | |
|---|---|---|
| Mr. M.A. KATUNDU | Chief Fisheries Research Off. | Ministry of Agriculture Food and Fisheries Chilanga |

**OBSERVERS/OBSERVATEURS**

**Finland/Finlande**

| | | |
|---|---|---|
| Prof. O.V. LINDQVIST | Professor | University of Kuopio Kuopio |
| Dr. H. MOLSA | Professor | University of Kuopio Kuopio |
| Mr. M. LAAMANEN | First Secretary | Ministry of Foreign Affairs Helsinki |

**United Kingdom/Royaume Uni**

| | | |
|---|---|---|
| Mr. G. PATTERSON | | NRI Chatham, Kent |
| Dr. A. MENZ | Project Coordinator | GEF Project Dar es Salaam |

**FISHERIES DEPARTMENT/ DEPARTEMENT DES PECHES**

**Headquarters/Siége**

| | | |
|---|---|---|
| Mr. G.W. SSENTONGO | Fishery Liaison Officer | FAO, FIPL Rome - Italy |
| Mr. G. EVERETT | Senior Fishery Planning Officer | FAO, FIPP Rome - Italy |
| Dr. J. KAPETSKY | Senior Fishery Resources Officer | FAO, FIRI Rome – Italy |
| Mr. M. MANN | Senior Project Operations Officer | FAO, TCO4 Rome - Italy |

**SECRETARIAT**

| | | |
|---|---|---|
| Dr. G. HANEK | LTR Coordinator | LTR Bujumbura – Burundi |
| Dr. J.F. CRAIG | LTR Biostatistician | LTR Kigoma - Tanzania |

**ANNEX 2**

**FIFTH JOINT MEETING**
**OF THE LTR'S**
**COORDINATION AND INTERNATIONAL SCIENTIFIC COMMITTEES**

**Rome (Italy), 25-26 November 1996**

**AGENDA**

**Item 1:** **Opening ceremony and election of the Chairman and the Vice-Chairman.**

**Item 2:** **Adoption of the agenda.**

**Item 3:** **LTR Coordinator's Report: summary of LTR's activities (December 1995 – November 1996) and review of progress on recommendations of the Fourth Joint Meeting of LTR Committees.**

**Item 4:** **LTR Scientific Coordinator's Report: summary of SSP results.**

**Item 5:** **LTR Monitoring Programme: proposal.**

**Item 6:** **LTR Revision Proposal.**

**Item 7:** **Any other matters.**

**Item 8:** **Date and venue of the next meeting.**

**Item 9:** **Adoption of the report.**

**ANNEX 3**

**FIFTH JOINT MEETING
OF THE LTR'S
COORDINATION AND INTERNATIONAL SCIENTIFIC COMMITTEES**

**Rome (Italy), 25–26 November 1996**

# LTR COORDINATOR'S REPORT: SUMMARY OF LTR'S ACTIVITIES (DECEMBER 1995 - NOVEMBER 1996)

## INTRODUCTION

1. During this reporting period LTR closely followed the recommendations of the Fourth Joint Meeting of the LTR Committees and took all necessary actions to meet them. These and other activities are now detailed hereafter.

## RESULTS

### Scientific Sampling Programme

2. The three full years of LTR Scientific Sampling Programme were completed on 2 July 1996. This is a major achievement. Consequently, I wish to record our appreciation of the hard and dedicated work of all who were part of our SSP team in the four participating countries and elsewhere. The initial summary of the scientific report will be presented as LTR/96/3 and its detail account as LTR/96/Inf. 4. It should be noted that while considerable progress in treatment of data collected during the entire SSP was made (see section 17) complementary analyses of these data will continue for some time.

### *R/V Tanganyika Explorer*

3. During the last twelve months 6 scientific cruises were executed as follows:

cruise No. 5 (23 October-3 November 1995): studies of currents and other parameters

cruise No. 6 (16 November-4 December 1995): acoustics and fish biology

cruise No. 7 (31 January-9 February 1996): studies of currents and other parameters

cruise No. 8 (2–12 April 1996): acoustics and fish biology

cruise No. 9 (17-25 June 1996): ADCP probe installation and testing, monitoring of other parameters

The vessel subsequently underwent periodic maintenance in her home port in Bujumbura, Burundi in early July 1996. Unfortunately, after declaration of embargo against Burundi on 31 July 1996, the said vessel was blocked in harbour of Bujumbura until 10 November 1996. The permission of Tanzanian authorities to allow *R/V Tanganyika Explorer* to sail to Kigoma, which was requested on 3 August 1996 was received on 3 October 1996, the one from Burundese authorities to allow the vessel to leave Bujumbura was requested on 10 October 1996 and received on 10 November 1996. Consequently, *R/V Tanganyika Explorer* left Bujumbura on 11 November and arrived to Kigoma the following day. After the required cruise preparation the vessel left for cruise No. 10 on 15 November 1996 and was due to complete this cruise on 26 November 1996. It should be noted that this included extra detailed work executed under UNOPS/FAO Inter-Agency Agreement for the project GEF (RAF/92/G32).

It should be clear to all that the timely execution of both projects *i.e.* LTR and GEF can not be guaranteed unless the authorities of all participating countries fulfill their obligations as clearly specified in LTR's Project Document.

**Training activities**

**4.** The following training activities took place during this reporting period:

* Training in hydrodynamics modelling, Bujumbura (11-12 December 1995). Course leader: Dr. V. Podsetchine, ~ participants from Burundi, Zaïre and LTR/Bujumbura staff.

* Practical training in hydrodynamics, acoustics, limnology, zooplankton and primary production studies: aboard R/V Tanganyika Explorer during the fifth, sixth, seventh, eighth, ninth and tenth scientific cruises (23 October-3 November 1995, 16 November-4 December 1995, 30 January—9 February 1996, 2-12 April 1996, 17—25 June 1996 and 15—26 November 1996). Course leaders: all cruise's leaders, 18 participants from Burundi, Tanzania, Zaïre and Zambia.

* Training in the use of ADCP probe, Kigoma (18-25 October 1996). Course leader: Ms. Aho, 5 participants from Tanzania, Zaïre and Zambia.

* Ongoing computer training of counterparts — in WordPerfect, Windows, Lotus, Excel and ProCite at all LTR stations.

5. LTR Second Phase

The proposal for the LTR second phase was presented during the Fourth Joint Meeting of LTR Committees. Subsequently, the Committees members comments and suggestions were included and finalized proposal submitted to the major donor in December 1995. Finally, the project results and the proposal for LTR second phase were appraised in July-August 1996 by consultant engaged by the Finnish Ministry of Foreign Affairs and his report was then reviewed at FAO HQ on 23-24 September 1996. The conclusions and Project Revision Proposal then prepared will be presented under LTR/96/4. Requests were also submitted for further complementary inputs by AGFUND as well as for two APO Socioeconomists.

**Meetings**

6. LTR activities to date and future tasks were presented and discussed during the following meetings:

Second World Fisheries Congress (Brisbane, 28 July-2 August 1996) - the objectives and activities of LTR were presented by LTR Coordinator; and

LTR Joint Review (Rome, 23-24 September 1996) - was based on the findings and recommendations of the appraisal study carried out by Mr. S. Kuikka, consultant of the Finnish Ministry of Foreign Affairs. Taking part were: Messrs. Kuikka and Laamanen, Finnish Ministry of Foreign Affairs, Prof. O.V. Lindqvist and Dr. H. Mölsä, respectively the LTR Scientific Coordinator and Deputy Scientific Coordinator, FAO HQ based operational and technical officers and the LTR Coordinator.

**Documentation Centre**

7. Thanks to the effective cooperation of FAO's Fisheries Department Library and that of many friends our Documentation Centre continues to grow and is extensively used by university students, researchers and consultants.

**LTR Publications**

8. A total of 52 Technical Documents was produced to date, in English and French. For those produced during the reporting period see section 17.

9. A total of 20 Field Guides and Manuals was produced to date, in English and French. For those produced during this reporting period see section 17.

10. To date, 19 issues of LTR Newsletter were produced and distributed worldwide; four issues were produced during the last year (see section 17).

11. A total of 9 Progress Reports were prepared by the LTR

Coordinator to date; two were produced during the last 12 months, the last one *i.e.* Progress Report No. 9 included all actions taken under UNOPS/FAO Inter-Agency Agreement (see section 17).

12. Management of Lake Tanganyika Fisheries

A joint consultancy (Messrs. Cacaud and Maembe) took place during July 1996 in order to prepare documentation for the 7th Session of CIFA Sub-Committee for Lake Tanganyika.

**Cooperation with the GEF project RAF/92/G32 'Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika'**

13. An Inter-Agency Agreement between UNOPS and FAO was signed on 12.1.1996. Under the terms of this agreement LTR will provide UNOPS/GEF project with an improved water circulation model of Lake Tanganyika. Up to the present, the following actions have been taken: (1) a detailed Work Programme has been proposed; (2) specifications for equipment and other material have been prepared and a large number of orders placed; (3) all the specialized equipment ordered has been already received, cleared, installed and tested; (4) recruitment of both the international and national hydrologists has been completed; (5) training course on the use of ADCP probe was organized and took place in LTR/Kigoma from 18-25 October 1996; and (6) a lake-wide cruise was executed from 15 to 26 November 1996.

Apart from the above it is now clear that the GEF project and specifically the implementing agent Natural Resources Institute (NRI) is interested in further cooperation with LTR. Specifically, there has been an expressed interest in using *R/V Tanganyika Explorer* and other of auxiliary vessels, using the Documentation Centre, etc. It is hoped that once the GEF's Work Programme is proposed and agreed upon, these arrangements could be finalized.

**LTR PERSONNEL**

14. The membership of the LTR Committees remains basically the same during the last five years. The exception is a change in the delegation of Zaïre where Dr. Nshombo Muderhwa, the Director General of CRH/Uvira, replaced Mr. Tshibangu Kalala on LTR International Scientific Committee.

15. There were numerous changes in LTR Staff during the last year. After the completion of the LTR Scientific Sampling Programme on 3 July 1996 a large number of national colleagues were thanked for their important contribution in its execution. Similarly, the national staff at LTR HQ in Bujumbura was considerably reduced. Finally, it should be recorded that Dr. Plisnier and Ms. Kurki left LTR in December 1995 and January 1996 respectively.

The continued scientific cooperation of all four participating countries is recorded and gratefully acknowledged. All of them assigned a large number of competent researchers and technicians to the LTR stations around the lake. It goes without saying that without our national colleagues it would not have been possible to execute SSP. Consequently, the dedication and hard work of LTR's national counterparts is hereby recorded and acknowledged.

It is also important to record the dedication and hard work of all LTR's international staff. Last but certainly not least it is my pleasure to recognize, record and acknowledge the effective backstopping by both the University of Kuopio and by both the operation and technical services of FAO Fisheries Department.

## CONCLUSIONS

16. LTR has successfully carried out most of its planned executive phase. Unique and comprehensive data have been collected concerning the major components of the ecosystem of Lake Tanganyika. Some lakewide surveys, employing the research vessel, remain outstanding and FAO still has the vessel under charter to do the work. The data collected will generate information on which a management plan can be based. In the short—term, the analysis can only be quantitative in nature and provide general guidelines. In the long—term, a thorough scrutiny of the data will give quantitative information on the lake's ecosystem which will not only help the fishery managers in the four riparian countries but will be of use to all those, worldwide, who have interest in Lake Tanganyika and the conservation of its diverse fauna and flora.

## LTR Publications

17. The following publications and reports were produced since the Fourth Joint Meeting of LTR Committees:

### TECHNICAL DOCUMENTS

**Kotilainen, P., T. Huttula and A. Peltonen,** Results of the
**1995** period of March 1993 - December 1994 in Hydrodynamics on Lake Tanganyika. FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika.
**GCP/RAF/271/FIN-TD/43 (En): 97p.**

**Kotilainen P., T. Huttula et A. Peltonen,** Résultats des
**1996** Résultats des experiences effectuées sur le lac Tanganyika dans le domaine d'Hydrodynamique pendant la pèriode allant de mars 1993 - décembre 1994. FAO/FINNIDA Recherche pour l'aménagement des Pêches au lac Tanganyika.
**GCP/RAF/271/FIN—TD/43 (Fr): 101p.**

**Järvinen, M., K. Salonen and J. Sarvala,** Experiments on
**1996** Phytoplankton and bacterial production ecology in lake Tanganyika: the results of the first Lake-wide research cruise on *R/V Tanganyika Explorer.* FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika.
**GCP/RAF/271/FIN-TD/44 (En): 43p.**

**Järvinen, M., K. Salonen et J. Sarvala,** Experiences sur la
**1996** production écologique de bactéries au lac Tanganyika: Résultats de la première croisière de recherche effectuée sur tout le lac à bord du *B/R Tanganyika Explorer.* FAO/FINNIDA Recherche pour l'Aménagement des Pêches au lac Tanganyika
**GCP/RAF/271/FIN-TD/44 (Fr): 45p.**

**Podeschine V. and T. Huttula,** Hydrological Modelling: Activity
**1996** Report for the periods of 01.04-31.05.1995 and 01.09-30.09.1995. FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika.
**GCP/RAF/271/FIN—TD/45 (En): 109p.**

**Podsetchine, V. et T. Huttula,** Le modèle hydrologique: rapport
**1996** d'activité pour les périodes de 01.04—31.05.1995 et 01.09-30.09.1995 . FAO/FINNIDA Recherche pour 1'Aménagement des Pêches au lac Tanganyika.
**GCP/RAF/271/FIN—TD/45(Fr):109p.**

**Plisnier, P.-D., V. Langenberg, L. Mwape, D. Chitamwebwa,**
**1996** **K. Tshibangu and E. Coenen,** Limnological sampling during an annual cycle at three stations on lake Tanganyika (1993-1994). FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika.
**GCP/RAF/271/FIN—TD/46 (En): 136p.**

**Mambona Wa Bazolana C.,** Enquête Cadre Simultanée pour le lac
**1996** Tanganyika, Zaïre. FAO/FINNIDA Recherche pour 1'Aménagement des Pêches au lac Tanganyika.
**GCP/RAF/271/FIN—TD/47 (Fr): 100p.**

**Hanek, G. (ed.), Reports of** Travel 61 - 75 of project
**1996** **GCP/RAF/271/FIN.** FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika.
**GCP/RAF/271/FIN—TD/48(En): 240p.**

**Paffen, P. and E. Lyimo,** Frame survey results for the Tanzanian
**1996** coast of lake Tanganyika, March 1995, and comparison with past surveys. FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika.
**GCP/RAF/271/FIN-TD/49 (En): 36p.**

**Paffen, P. et E. Lyimo,** Résultats de l'Enquête Cadre effectuée
**1996** sur la côte Tanzanienne et Comparaison avec les enquêtes antérieures. FAO/FINNIDA Recherche pour l'aménagement des Pêches au lac Tanganyika
**GCP/RAF/271/FIN-TD/49 (Fr): 37p.**

**Bwebwa, D.,** Variations saisonnière et spatiale dans l'abondance
**1996** de la communauté pélagique du zooplancton dans l'extrémité nord du lac Tanganyika. FAO/FINNIDA Recherche pour l'aménagement des Pêches au lac Tanganyika
**GCP/RAF/271/FIN-TD/50(Fr): 29p.**

**Kurki, H.,** The results of zooplancton at three locations in Lake
**1996** Tanganyika: July 1993 - December 1995. FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika.
**GCP/RAF/271/FIN-TD/51(En) 45p.**

**Paffen, P., C. Lukwesa and L. Mwape,** Frame Survey results for
**1996** the Zambian coast of lake Tanganyika, March 1995, and comparison with past surveys. FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika.
**GCP/RAF/271/FIN-TD/52 (En): 92p.**

**FIELD GUIDES AND MANUALS**

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**ANNEX 4**

**FIFTH JOINT MEETING**
**OF THE LTR'S**
**COORDINATION AND INTERNATIONAL SCIENTIFIC COMMITTEES**

**Rome (Italy), 25–26 November 1996**

# LTR SCIENTIFIC COORDINATOR'S REPORT

## INTRODUCTION

1. Lake Tanganyika has been in existence for at least ten million years and probably contains about one fifth of all the standing freshwater in the world. With a depth of almost one and half kilometers it is the second deepest lake on earth. About 7 to 10 million people live in the catchment area of the lake and depend on it one way or another for their livelihood and well being.

2. The fishermen form an important link between the lake's resources and the people's need for protein. As the population grows their demands increase but the supply is not infinite. A conservative estimate suggests a yield up to 300,000 tonnes per year but this could only be sustained if the fish stocks are very carefully managed for the good of all the people dependent on the lake.

3. A management plan will have to rely on knowledge of the dynamics of the exploited fish and the production system of the lake which sustains them. One approach to acquire this knowledge is to monitor the fish being landed over many years and use these historical data to estimate optimal yields and exploitation rates. This is often referred to as the 'top down' approach. However there are many problems in collecting comprehensive information on the fisheries including the difficulties of access to the fishing communities. Another approach is to examine the trophic levels which ultimately support fish production i.e. a study of the ecosystem, a 'bottom up' approach. It is this last approach that has been mainly followed by the current FINNIDA/FAO Lake Tanganyika Research Project (LTR).

4. The scientific sampling programme (SSP) has been carried put for three years. Its main thrust has been the ecosystem approach and the principal studies have been on hydrodynamics, limnology, zooplankton and fish biology. In addition LTR has been concerned with remote sensing, fish genetics and fisheries statistics.

## SUMMARY OF A PRELIMINARY SYNTHESIS OF THE SSP

5. The preliminary results of SSP provide the following picture of lake dynamics which confirm some previous work and add some new and important discoveries. The study is unique in that it has been carried out continuously over an extended period, and at three main locations spread over the lake. The data collected have still to be quantifies. It covers the period of July 1993 to December 1995 although SSP continued until July 1996.

6. There are two main seasons in the Lake Tanganyika region which influence lake dynamics and production: the wet season with weak winds and considerable precipitation and the dry season with strong normally southerly winds and some precipitation in the north. The influence of these external forces varies from north to south of the lake and the results of SSP illustrate the distinct differences in the freshwater ecosystem between north and south.

7. The kinetic energy of wind is transferred to the lake water causing movements at all depths. In the dry season wind stress per unit area applied to the lake at Mpulungu can be three times that of Bujumbura. The wind drives the epilimnion water to the north and the thermocline deepens there. In the south the epilimnion cools, stratification breaks down and there is upwelling. This upwelling has been identified by remote sensing. Wedderburn numbers were low during the dry season indicating high wind shear stress on the lake and thus extensive lake mixing. Numbers were high for the rest of the year from which stability could be interred.

8. Internal waves, identified by spectral analysis, were of 23.5 days duration during the dry season and 34.8 days in the wet season. These waves were also identified from depth fluctuations in physical and chemical factors.

9. The vertical distribution of nutrients was influenced by the meromictic condition of the lake. Concentrations of phosphate, nitrate, ammonia and silica in the epilimnion were generally low compared to the hypolimnion. In a five month period three distinct phases were noted in the relationship between nutrient and chlorophyll a concentrations but these phases were different between Bujumbura and Kigoma in the north and Mpulungu in the south. Increase in concentrations of nutrients in the upper layers, and subsequent increase in chlorophyll a, resulting from upwelling was greater at the northern stations although upwelling was greater at Mpulungu. This may be due to the position of the thermocline, oxycline and chemocline in relation to the photic zone.

10. The pelagic crustacean zooplankton was dominated by *Tropodiaptomus simplex* and cyclopoid species. The yearly mean abundance and dry weight biomass of total copepods species. The yearly mean abundance and dry weight biomass of total copepods was always highest at Bujumbura compared to Kigoma and Mpulungu. Abundance fluctuated with an annual periodicity but the periodicity was not distinct. Diel vertical migrations of

copepoda were observed. Zooplankton tended to be in shallower water at Bujumbura.

11. The abundance of shrimps was always greater at Mpulungu than at Bujumbura and the abundance of medusae was always greater at Bujumbura than at Kigoma and Mpulungu.

12. *Stolothrissa tanganicae, Limnothrissa miodon* and *Lates stappersii* are exploited by different gears in the various areas of the lake mainly due to differences in fish distribution. *Stolothrissa tanganicae* and *L. stappersii* are pelagic throughout their life. Immature L. miodon are thought to live inshore while in their second year they are pelagic. No *L. stappersii* >100mm were caught further north than the Rumonge sub—basin.

13. Growth and mortality have been calculated for the three main commercial species. Values were similar to those already published and there appeared to no within lake differences. No segregation of the pelagic fish species has been found from DNA analysis. Estimates are also provided for length at maturity. *Stolothrissa tanganicae* becomes mature when 73% of its somatic growth is complete compared to 54% for *L. miodon* and 51% for *L. stappersii.* All three fish species are multiple spawners with varying periodicity between species within years and within species between areas and years.

14. The diet of *L. stappersii* was more varied at Kigoma than at Mpulungu where at the latter it consisted mainly of clupeids and shrimps. At Kigoma S. *tanganicae* was the main clupeid eaten.

15. Preliminary biomass and relative yield per recruit models were developed mainly for S. *tanganicae* and *L. stappersii.* As S. *tanganicae* cohort (whole lake) reached maximum biomass at 5 months of age when the fish was fully recruited to the fishery. Although they were captured below length of maturity (in particular at Bujumbura) they did not appear to be overexploited lake-wide. At Kigoma *L. stappersii* were lightly exploited from 6 months. There was no indication of overexploitation although an increase in effort could have significant impact due to the length of recruitment to the fishery gear. At Mpulungu intensive fishing started at 1.5 years and was noted a sharp decline in the cohort biomass. Any further increase in fishing effort should be avoided.

16. The collection of fisheries statistics is ongoing around the lake in the four riparian countries and has been assisted by LTR. Results from frame surveys are available but catch statistics are still being processed.

17. A bottom up approach to ecosystem dynamics and lake production requires simultaneous estimates, on a seasonal basis, of rates of production and biomass for all major trophic groups and limnological factors (physical and chemical). In depth, short term studies can identify the rapid variation in and possible links between hydrodynamics, nutrients, primary production, zooplankton production and short lived fish production but long-term studies are required to measure production of long lived fish and also to measure the influence

of climate (e.g. on the Mpulungu L. stappersii fishery). Wedderburn numbers can be used to determine mixing between the epilimnion and hypolimnion and the potential upwelling of nutrients. At present there are no available estimates for primary, secondary or tertiary biomass and production. Some measurements have been made and require analysis (e.g. primary production, zooplankton development rates, zooplankton abundance from lake—wide cruise surveys, fish biomass from lake—wide acoustic surveys and clupeid gut contents) but so far the number of lake—wide cruises has been limited and there are not enough data for input into a ecosystem model.

18. Top down effects require comprehensive data sets gathered over an extended period. The available data sets need careful examination and analysis and future collection of fisheries statistics needs adequate planning and supervision so that it can be cost effective and provide the information required.

19. A detailed version of this report is presented as LTR/96/Inf. 4. Its quantified version will be completed by the end of 1996.

**ANNEX 5**

**FIFTH JOINT MEETING
OF THE LTR'S
COORDINATION AND INTERNATIONAL SCIENTIFIC COMMITTEES**

**Rome (Italy), 25-26 November 1996**

# A MONITORING PROGRAMME FOR LAKE TANGANYIKA

The Lake Tanganyika Research Project, LTR, has been collecting data for the last three years mainly in hydrodynamics, limnology, zooplankton and fish biology. The following is a proposal for a long—term monitoring programme which will be simple and inexpensive to run but will provide the necessary indicators of lake productivity. These indicators will then be used in establishing procedures for managing the pelagic fish stocks of the lake. The programme should be run at each station in Burundi, Tanzania, Zaïre and Zambia by nationals attached to the appropriate research institute. The monitoring programme should be overseen by the Lake Tanganyika Fisheries Commission or other regional body i.e. the CIFA Sub-Committee for Lake Tanganyika. This body should insure that dialogue takes place between the various researchers and statistical departments around the lake.

An initial time period for monitoring should be established. Due to the variability in the dynamics of the lake and in order to detect interannual changes a minimum of ten years should be planned.

Labour costs should be met by the national institutions. Operating and maintenance costs will have to be supplied by external funding. The overall cost of maintaining each station (computers, office supplies, vehicles, boats, etc.) are not included in the following estimates. Boat crew time is not included in manpower estimates.

## Hydrodynamics

Wind speed and direction determine the extent of lake mixing and the upwelling of nutrients and thus lake productivity. Water temperature indicates the extent of stratification and the stability of the system. Automatic stations have been established at Bujumbura (weather station at the port), Kigoma (land wind station and lake (buoy) meteorological station), Mpulungu (land
wind station and lake (buoy) meteorological station) and at Kalemie (land wind station). These stations require one person each to visit each site (every 5 months for the Mpulungu buoy and 2.5 months for the Kigoma buoy), collect the data that have been stored, carry out the necessary maintenance, enter the data

and make preliminary analyses using suitable software.

Costs (Total: 4 stations)

Operations of the automatic equipment: US$ 300 per year
Maintenance including spare parts: US $ 5,000 per year
Time per station: 6 person days per month

NOTE: this programme should be integrated with the GEF project who could carry some of the costs.

**Limnology**

Only physical limnology measurements will be made to determine upwelling and indicate the extent of nutrient input into the epilimnion. The variables to include are water temperature, dissolved oxygen, pH, conductivity and turbidity.

Primary production can be directly estimated by measuring chlorophyll a and secchi depth and the depth of the photic zone from solar radiation measurements using light sensors. Two persons required per station.

Measurements to be made twice a month. Costs depend on boats being in good condition.

Costs (Total: 4 stations)

Operations: US$ 7,000 per year
Maintenance including spare parts: US$ 5,000 per year
Time per station: 27 persons days per month

**Zooplankton**

There is good evidence that zooplankton abundance can be correlated with fish abundance, the latter indirectly measured by local catch per unit effort. There is a lot of spatial and temporal variability in zooplankton measurements but trends are very likely to appear if the monitoring is carried out over an extended period of years.

Zooplankton should be collected (at the same time as the limnological sampling) and counted twice per month. Three vertical hauls with standard 100µm mesh net and three hauls with torpedo gear should be made. Two people are required per station for collecting, identifying, counting and data entry.

Costs (Total= 4 stations):
Operation: US$ 400 per year
Maintenance including spare parts: US$ 400 per year
Time per station: 27 persons days per month
* the boat running costs are included under limnology

**Fish biology**

Important information concerning the local abundance (catch per unit effort, CPUE) and biology of exploited pelagic fish has been collected from landings at Bujumbura, Kigoma, Kalemie and Mpulungu. These collections should be continued. Sampling is made from liftnets at Bujumbura, Kigoma and Mpulungu, purse seines at Kigoma and Mpulungu and beach seines at Mpulungu. For liftnets, samples are purchased weekly during the fishing season from 4 fishing units, the proportion of each species in the catches are determined and length distributions of each species measured. The data are extrapolated to the total landings on the beach sampled. Three persons per station are required to collect the data on the beach and to process in the laboratory and one to enter the data into a database. For purse seines, data are collected once a month from deck sampling on the single purse seine operating out of Kigoma and from two vessels chosen from the total number of purse seiners based in Mpulungu. In addition 14 purse seiners should be inspected at the landing sites once per month in particular to establish the proportion of clupeids (kapenta) in the catches. Two persons are required at Kigoma and Mpulungu stations to collect and record purse seine statistics. Beach seine samples should be collected weekly during the fishing season and treated as for liftnets. Attention should be paid to the species composition of the whole catch (littoral and pelagic). Three persons are required at Mpulungu.

Costs (Total = 3 stations):

Operation: US$ 2,000 per year
Maintenance: US$ 500 per year
Time: Bujumbura = 12 persons days per month
Kigoma = 24 persons days per month
Mpulungu = 36 persons days per month
Kalemie = 12 persons days per month

**NOTE**

Although not part of the lake ecosystem monitoring programme, the continuation and improvement of the national fisheries statistical systems should be supported by LTR and coordinated by the Lake Tanganyika Commission.

Costs (coordination, meetings and travel and running frame surveys every three years).

TOTAL ESTIMATE: US$ 20,500 per year

**ANNEX 6**

**FIFTH JOINT MEETING
OF THE LTR'S
COORDINATION AND INTERNATIONAL SCIENTIFIC COMMITTEES**

**Rome (Italy), 25-26 November 1996**

**PROJECT REVISION PROPOSAL**

The project results to date were appraised in July-August 1996 by consultant engaged by the Finnish Ministry of Foreign Affairs and the report was then reviewed together at FAO HQ on 23-24 September 1996.

The general conclusions were that the research programme implemented by the project to date had yielded considerable new data and knowledge regarding the hydrology and fisheries of the lake, but that the fisheries and the environment are normal and no immediate risks for collapse of the fisheries had been identified. Nevertheless, the full analysis and interpretation of the unique data already collected needs to be completed in order to serve the next level of operation which must provide practical results for the management of the shared fish stocks and related fisheries.

A management system based on estimates of biological production and on the establishment of optimum Total Allowable Catches (TACs) or quotas, was regarded as inappropriate to either the characteristics of the stocks concerned, or to the present socio-economic conditions at the lake, therefore a more simple, cheaper, monitoring system to warn of major risks was recommended.

Considerable additional work still needs to be undertaken with the assistance of the project in order to:

- consolidate the analysis of the data collected so far;
- transfer and communicate the relevant information to the government authorities and fisher—people concerned;
- prepare an initial lake-wide fisheries management plan, which must take into account the ownership and sustainability of the resources, as well as socio economic situation which is insufficient known, and of which women's contribution to development is an integral component, so as to guide and not stifle private sector development initiatives;
- define a simple regular precautionary monitoring system for the future, capable of indicating the general trends in the fisheries and identifying whether any risks of instability

are appearing. Such a monitoring system should provide a ready index of the status of the stocks: acoustic estimates of biomass should also be used in the immediate future but catch-per-unit-effort (CPUE) data derived from regular statistical records is probably the most appropriate in the longer term, although the best units and techniques of measurement remain to be defined.

The recent FAO report by Messrs. Cacaud and Maembe presented various institutional options for inter—government discussions and harmonized action on fisheries management which would be considered at the forthcoming CIFA Sub-Committee meeting, in conjunction with the LTR project's Coordination and International Scientific Committees meeting.

In summary there needs to be an extension phase of the current project with the following outputs and activities, responding to the original project objectives no. 2 - plan for management of the fisheries, and no. 3 - establishment of uniform methods for long—term data collection:

Output 1. A series of supplementary reports on the hydrodynamics, limnology and fisheries biology.

Activity 1.1: complete the analysis of the scientific data collected during 1993-96;

Output 2. Reports on the analysis of the CPUE data from the four frame—surveys plus the related acoustic survey data.

Activity 2.1: analyse collected CPUE data, and recommended minimum monitoring system,

Activity 2.2: execute 3 lake-wide acoustics surveys and subsequently analyse all the collected acoustics data, including "patchiness".

Output 3. Counterpart staff and fishing community members with a better understanding of the data and management issues involved, provide through in—service and/or group training activities;

Activity 3.1: prepare and execute training exercises (courses, workshops) in all participating countries aimed at effective conception and use of the plan.

Output 4. An initial lake wide fisheries management plan

Activity 4.1: execute and report on socio-economic surveys in all four participating countries

Activity 4.2 prepare the framework for a management plan
Activity 4.3 draft the initial management plan

Output 5. An preliminary inter—governmental fisheries commission in operation and taking steps to implement the initial management plan;

Activity 5.1: advise the CIFA Sub-Committee regarding the establishment and technical operations of such a preliminary commission

Output 6. An agreed plan for hand—over of current project's responsibilities and facilities to the preliminary fisheries commission and/or member governments;

Activity 6.1: prepare a routine monitoring programme to be maintained by the nationals of all four countries after the project's completion

Activity 6.2: prepare and agree a schedule and list for hand—over

The additional inputs required over 1997 to achieve these objectives are indicated below, however, although given the current political and economic difficulties facing the four countries concerned, it is already recognized that a further extension in time may be required to release some remaining immediate objectives.

| | | | **US$** |
|---|---|---|---|
| 1101 | Project Coordinator | 12 m/m | 128 628 |
| 1106 | Biologist | 4 m/m | 32 820 |
| 1151 | Consultants (economics, sociology, acoustics, legal, fisheries management, etc as required) | 5 m/m | 30 000 |
| 0000 | Associate Prof. Officers (APOs) | 48 m/m | gratis |
| | | **Subtotal** | **191 448** |
| 1300 | Admin. support personnel (inc. vessel crew) | | 40 000 |
| | | **Component total** | **231 448** |
| 2000 | Duty travel | | 5 000 |
| 3000 | Contracts | | 65 000 |
| 4000 | General Operating Expenses | | 75 000 |
| 5000 | Expendable equipment | | 10 000 |
| 8000 | training | | 20 000 |
| | | **Subtotal** | **406 448** |
| 9100 | Project Support Costs (13%) | | 52 838 |
| 9600 | Unallocated balance | | 2 327 |
| | | **Grand Total** | **461 613** |