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MANAGEMENT OF LAKE TANGANYIKA FISHERIES RESOURCES

by

George HANEK

FINNISH INTERNATIONAL DEVELOPMENT AGENCY

FOOD AND AGRICULTURE ORGANIZATION
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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 Programme for the United Nations Development Organizations (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 are 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
LTR Coordinator

LAKE TANGANYIKA RESEARCH (LTR)
FAO
B.P. 1250
BUJUMBURA
BURUNDI

Telex: FOODAGRI BDI 5092

Tel: (257) 22.97.60

Fax: (257) 22.97.61

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Dr. George Hanek is LTR Coordinator.

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LIST OF ABBREVIATIONS

CAS	= Catch Assessment Survey
CEPGL	= Communauté Economique des Pays des Grands Lacs
CIFA	= Committee for Inland Fisheries of Africa
CPUE	= Catch Per Unit Effort
FAO	= Food and Agriculture Organization of the United Nations
FS	= Frame Survey
GEF	= Global Environment Facility
LTFC	= Lake Tanganyika Fisheries Commission
LTR	= Lake Tanganyika Research
LVFO	= Lake Victoria Fisheries Organization
PTA	= Preferential Trade Area
SADC	= The Southern African Development Community
SSP	= Scientific Sampling Programme

1. LAKE TANGANYIKA CHARACTERISTICS AND FISHERIES UPDATE

1. Lake Tanganyika is situated at an altitude of 773 m, in the north-south direction, between the latitudes of 3°20′ and 8°18′ S and the longitudes of 29°03′ to 31°12′ E. The lake is 673 km long from north to south and has a maximum width of 48 km. With a maximum depth of 1,470 m, Lake Tanganyika is the second deepest lake in the world. Its average depth is 570 m and the lake volume is estimated to be some 18,800 km^3. The lake is shared by four riparian States *i.e.* Burundi, Tanzania, Zaïre and Zambia (Figure1). The total length of its shoreline was estimated to be about 1,850 km, shared as follows: Burundi: 159 km or 9%; Tanzania: 669 km or 36%; Zaïre: 795 km or 43%; and Zambia: 215 km or 13% of the total (Hanek *et al*., 1993). The type of shoreline substrate has been classified as follows: 31 % of sand, 21% of rock/sand, 43% of rock and 5% of marsh (Coenen *et al*., 1993).

2. Lake Tanganyika harbours the most diverse cichlid and non–cichlid fauna of the large African lakes. It is composed of remarkable and genetically diverse benthic and pelagic fish communities. The benthic community consists of almost 300 fish species, with over two thirds of them being endemic. The pelagic fish community, on which the fishery of Lake Tanganyika is principally based, is composed of six endemic, non–cichlid species. These are the two schooling clupeids, *Limnothrissa miodon* (Boulenger, 1906) and *Stolothrissa tanganicae* Regan, 1917, and their major predators, *i.e.* four members of the genus *Lates* (Centropomidae): *L. stappersii, L. angustifrons, L. mariae,* and *L. microlepis.*

3. The potential yield of Lake Tanganyika, whose surface is 32,900 km^2 (Welcoinine, 1972; Vanden Bossche and Bernacsek, 1990), was estimated anywhere between 295,000 to 460,000 tonnes, assuming a potential yield estimate at 90 kg/ha/year (Mikkola and Lindqvist, 1989) and/or at 140 kg/ha/year (Coulter, 1981).

4. Lake Tanganyika fisheries have been described before. Consequently, only a brief summary of its characteristics and an overall update are presented here in order to facilitate a better comprehension of its present status.

5. Most fishing is done at night as virtually all fishing methods (purse seines, lift nets, beach seines, scoop nets, etc.) rely on clupeids being attracted to fishing lamps. This is the reason why fishing activities practically cease every month during full moon. Fishing activities are also adversely affected by strong winds and/or rain which diminish light intensity and thus the fish gear effectiveness.

6. There are three recognizable types of fisheries on Lake Tanganyika i.e. traditional, artisanal and industrial.

7. The latter started in 1954, when a number of mainly Greek nationals introduced the purse seine net. A typical industrial fishing unit consists of a 16 to 20 m long steel purse seiner, a purse seine net which is carried by a smaller steel boat, 5

lampboats and a crew of 30 to 40 fishermen. A number of these industrial fishing units was established around the lake over the years. Presently, there are 10 semi—active units in Burundi, 3 in Kigoma, 16 in Mpulungu, 4 in Moba, and 17 in Kalemie. The number of these units is decreasing in Burundi where 23 units were active in 1976 (Bellemans, 1991). It remains almost constant in the other countries, although recently a number of Kalemie based units moved to Zambia.

8. The artisanal fishery is carried out in the northern portion of the lake by mainly catamarans and to some degree trimarans, although the latter disappeared totally from Burundi (Belleinans, 1991). A typical fishing unit catamaran consists of two (three for trimarans) mainly wooden plank hulls, with an average of 5—6 lamps/unit, lift net, and an average of 4.7 fishermen/catamaran. Since the introduction of these units in the late 1950's, a sustained growth of these units was registered: (1) in the period from 1962 to 1972 an average of some 3.3 catamarans entered the fisheries on a monthly basis; (2) from 1972 to 1978 the growth was even more intensive when almost 11 catamaran units entered every month; and (3) over the last 12 years an average of 0.4 units entered monthly. The efficiency of the fleet has increased through: (a) the introduction of larger nets; (b) the use of larger canoes; (c) an increase of the light intensity; (d) their motorization; and (e) through the introduction of 'Apollo' lift-nets whose fishing power is nearly equivalent to an industrial fishing unit (Belleinans, 1991). There were respectively 604 and 67 active catamarans and appolos in Burundi in 1992 (Coenen, 1994), 739 of these units in Kigoma and Rukwa Regions of Tanzania (Chakraborty *et al.*, 1992) and some 45 catamarans in Uvira and Fizi zones, Zaïre (Maes *et al.,* 1991). There are virtually no catamarans in the southern portion of the lake (e.g. 5 in Zambia in 1994; Mwape, 1994). There, the large majority of fishing units are beach seine units operating at night in association with lights, targeting the clupeids (Hoekstra and Lupikisha, 1992).

9. The traditional fisheries sector is basically a subsistence fishing activity. A wide variety of fishing gear is used (gill nets, hook and line, scoopnet, longlines, traps, mosquito nets, etc.); while these fishing techniques are generally inefficient, this sector absorbs a large number of people around the lake.

10. The fishing pressure was estimated, lakewide, by recording the density of fishing craft (Hanek *et al.*, 1993). A total of 13,976 canoes was counted. The highest density of canoe per kilometer of shoreline was recorded in Burundi (11.3 canoes/km or a total of 1,802 canoes), followed by Zaïre (10.3 canoes/km or 7,570 canoes), Tanzania (6.0 canoes/km or 3,839 canoes) and Zambia (3.6 canoes/km or 765 canoes).

11. During the same study (Hanek *et al.,* 1993) a total of 459 fish landing sites was recorded as follows: 34 in Burundi, 127 in Tanzania, 257 in Zaïre and 41 in Zambia. Most fish landing sites around the lake (192 or 41.8%) were classified into Category II i.e. having between 11 and 30 canoes each. Further, some 147 or one third of all fish landing sites around Lake Tanganyika were classified into Category I i.e. having between 1

and 10 canoes each. Largest percentage of largest fish landing sites i.e. those with more than 81 canoes each was recorded for Burundi where 8 such sites are located.

12. The density of fish landing sites per 10 km of shoreline's length was also calculated. The average density of landing sites for the entire Lake Tanganyika was 2.5 fish landing sites per 10 km of shoreline or 1 landing site each 4 km of shoreline. By country, the density per 10 km was as follows: 2.1 in Burundi, 1.9 in Tanzania, 3.2 in Zaïre and 1.9 in Zambia (Hanek *et al*., 1993)

13. The total fishing effort is considerable. According to the Frame Survey (FS) results of October 1992 (Coenen, 1994), the fishing fleet on Lake Tanganyika in Burundi was composed of 13 purse seiners, 671 liftnet units (604 catamarans and 67 apollo units) and 298 traditional fishing units. In addition, there were 36 additional purse seiners active as follows: 3 in Tanzania, 16 in Zambia and 17 in Zaïre. Furthermore, the results of the first ever aerial frame survey (Hanek *et al*., 1993) indicate the number of canoes for the three other riparian states as follows: 3,839 for Tanzania, 765 for Zambia and 7,570 for Zaïre.

14. A major decline of the catch per unit effort (CPUE) was recorded over the last ten years for the industrial as well as the traditional fisheries for Burundi (Coenen and Nikomeze, 1994). For example, the average CPUE/night for the industrial fishery in Burundi decreased from 1173 kg/night/unit in 1983 to 150 kg/night/unit in 1993, making it hardly profitable. On the other hand, the artisanal liftnet fishery, due to the use of bigger nets, better fishing lamps and the choice of more productive fishing grounds in the south, manages to maintain or even increase its CPUE at a profitable level. For example, the CPUE for 'Apollos' stood at 300 kg/night/unit in 1993 (Coenen and Nikoineze, 1994)

15. The fish species composition and its fluctuation was also determined. In 1993, in Burundi, the Clupeids accounted for 67%, *Lates stappersii* for 31.6%, other *Lates spp.* for 0.2%, and others for 1.2% of the total catch. Clupeids are generally the most abundant species, although monthly fluctuations in species composition exist, especially when they are compared with the other dominant species, *L. stappersii.* For example, in 1992, *L. stappersii* was more abundant than the Clupeids in Burundi during the periods February-April and September-October. On the other hand, the Clupeids represented almost 100% of the total catch during the period November–December (Coenen and Nikomeze, 1994).

16. The total overall fish catch for Lake Tanganyika for 1992 was estimated to amount to 167.000 metric tonnes, shared as follows: Burundi: 24,000 tonnes, Tanzania: 80,000 tonnes, Zaïre: 50,000 tonnes and Zambia: 13,000 tonnes (Coenen, 1994).

17. The value of the catch has been determined only for Burundi and Tanzania (Coenen and Nikoineze, 1994; Tanzania Annual Report Fisheries Division, 1992). By extrapolation, it is estimated

that the value of the catch of Lake Tanganyika was in the region of US$ 26 million in 1992 (Coenen, 1994)

18. Social and economic importance of Lake Tanganyika fisheries is considerable. Over 40,000 fishermen as well as several hundred thousand persons are involved in the fisheries related activities *i.e.* fish processing and marketing (Coenen, 1994). Consequently, if the dependents of these people are included, one could state that the fisheries of Lake Tanganyika supports well over one million people.

19. Considerable differences exist in the level of fisheries infrastructure around the lake. There is an extensive and costly infrastructure (cold stores, processing plants, refrigerated trucks, etc.) in Mpulungu, Zambia and to some extent in Kalemie, Zaïre. No such facilities are available elsewhere, including the large cities of Bujumbura and Kigoma. While a detailed inventory of fisheries infrastructures of Lake Tanganyika is regularly made (Hanek, 1993 a,b), its overall value still has to be determined.

20. Fish processing is not well developed around the lake. Clupeids are either sold fresh or sundried. Improved methods to preserve them in brine and dry them on racks were developed but are almost never used. Consequently, only in Mpulungu and to some degree in Kalemie the processing, cleaning, brining, freezing and sometimes smoking of particularly *L. stappersii* takes place. Recently, canning of clupeids as well as of *L. stappersii* was developed in Zambia.

21. Fish marketing of catches in excess of local needs is difficult and complex. With the exception of Burundi and the Uvira and Fizi regions of Zaïre, most roads are tangential to the lake. Furthermore, the shores are steep and few roads link the populations around the edges of the lake. This particularly applies to the extensive shores of Zaïre and Tanzania. Clupeids are thus traded along the coast, using 'water–taxis' or particularly *M/V Liemba* and *M/V Mwongozo* which ply regularly to and from Mpulungu and Bujumbura. Major outlets for dry fish are: the 'Copperbelt' complex of large towns in Zambia, the large Zairian cities of Lumumbashi, Bukavu and Goma, and Rwanda.

2. MANAGEMENT OF LAKE'S FISHERIES RESOURCES: PRESENT STATUS

22. Over the years, the four riparian States have introduced their own regulations aimed at controlling either the quantitative or qualitative dimensions of fishing effort. These, however, have never been introduced in the 'lake–wide' context and, due to poor design and very limited enforcement capabilities, the effectiveness of those which were introduced is quite insignificant. The efforts made to date to manage the Lake's fisheries resources are now detailed together with a summary of areas where lakewide harmonization is possible and/or desirable.

23. For a long time now, it is generally accepted by the authorities of each riparian State that, due to the unique characteristics of the Lake's resources (the most important fish

species are all migratory), the only sensible approach must be 'regional' in nature. Regional cooperation among riparian states exists in the context of regional, intergovernmental organizations such as SADC, PTA and CEPGL, as well as in the context of joint bilateral commissions. However, these institutions are generally concerned with more macro—economic and political aspects and are seldom geared to act as coordinating mechanisms for specific fisheries management activities (Gréboval, 1990).

24. This void was dealt with by the Third Meeting of the Committee for Inland Fisheries of Africa (CIFA)[1] which consequently established, in 1977, the Sub-Committee for Lake Tanganyika; its main objective was to formulate a regional research project. The overall purpose of the regional project was given as the coordination of fisheries research and the promotion of international collaboration in the management of the shared resources of Lake Tanganyika as a means to stimulate fishery development. The Sub-Committee for Lake Tanganyika's First Session was held in Lusaka, Zambia in 1978.

25. The concerns related to the harmonization of fisheries legislation were voiced during the 3rd Session of CIFA's Sub-Committee for Lake Tanganyika[2] in 1985. At that time, the Sub-Committee acknowledged the priority need to harmonize fisheries legislation and development policy. While a detailed compendium of fisheries legislation in each riparian state was prepared (FAO, 1989), no real progress has been made since. The slowness of the process indicates that, despite the common interests involved, there are certain limiting factors that cannot be ignored (Bonnucci, 1990). There are three forms of obstacles to legislative harmonization: (i) legal: while Tanzania and Zambia possess an Anglo—Saxon legal framework, Burundi and Zaïre operate within the Roman civil law system; (ii) technical: the lack of biological knowledge on the resource and fisheries of the Lake; differences in fishing practices and fisheries development in the four riparian States; and (iii): political: Lake Tanganyika is not only a fishing ground but also a border and a place of communication and trade. It is difficult, therefore, for any related agreement not to be wide—reaching (Bonnucci, 1990)

26. The following sections provide examples of different approaches and differences to/in the management of Lake Tanganyika fisheries by different riparian States and thus clearly show the desirability for harmonization of their approach.

27. There were several efforts to harmonize the collection and analysis of fisheries statistical data. Unfortunately, no legislation currently in force prescribes particular procedures for the establishment of statistical data. In practice, each State employs its own method which makes any comparison

1 Report of the third meeting of the Committee for Inland Fisheries of Africa, FID/R 210, recommendation 77/2.

2 Report of the third session of the Sub-Committee for Lake Tanganyika, FIPL/R355, para 6.

impossible and undermines the credibility of the data obtained in spite of the fact that 'the introduction of the principle of integration in the national fisheries statistical systems so as to ensure that the produced statistics are comparable at various levels' and other recommendations were proposed by the four riparian States during the Workshop on Fishery Statistics for Lake Tanganyika (FAO, 1984). Further, the Fourth Session of CIFA Sub-Committee for Lake Tanganyika[3] examined this issue and recommended that: (i) a study be conducted on the possibility of proposing alternate, more cost effective, methods of statistical collection; and (ii) the regional research project for Lake Tanganyika take the lead in coordinating any necessary action to standardize the collection, compilation and analysis of statistical data.

28. In addition, the Fourth Session of the Sub—Committee[4] also discussed a proposal of the delegation of Burundi dealing with the conditions of access to the fisheries on Lake Tanganyika. As with the other recommendations, no concrete action was ever taken. Consequently, it could be stated that, despite the above proposal, together with a host of others, no concrete action/s was/were ever taken and all hopes were placed on putting in place the regional research project.

29. There is a great diversity among riparian States with regard to fishing categories. Burundi classifies its fisheries as industrial, artisanal and traditional. Zaïre recognizes recreational and individual fishing, taking into account the type of craft and gear used. There is no comparable classification in Tanzania nor Zambia, although the fee exacted in Tanzania depends on the type of craft employed.

30. Mainly due to the differences outlined above, there exists a considerable disparity in licence fees, particularly for industrial fisheries.

31. Considerable disparities are noted in the area of conservation measures as well. For example, concerning the minimum mesh size and prohibited gear: (i) in Burundi and Zaïre fishing is prohibited with mesh sizes inferior to 4 mm and the use of beach seines is prohibited; (ii) in Zambia a minimum mesh size of 120 mm for monofilament nets is set and 10 mm for all other types of nets and the use of beach seine is authorized; and (iii) in Tanzania the use of monofilament nets is prohibited in all national inland waters (Bonnucci, 1990).

32. Access of a State's vessels to waters under the jurisdiction of other States is similarly unharmonized. At present, three of the four States have no provisions regarding access of foreign vessels to their waters. The exception is Tanzania which strictly prohibits access to foreign fishing vessels unless provided for by law or by international agreement.

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[3]Report of the fourth session of the Sub-Committee for Lake Tanganyika, FIPL/R403, para 13.

[4]Report of the fourth session of the Sub-Committee for Lake Tanganyika, FIPL/R403, para 33.

33. Similarly, and although all national legislations allow research operations in their waters, these are, nevertheless, subject to prior authorizations (Bonnucci, 1990).

34. Lastly, and while there is considerable convergence in the legal provisions of each riparian State considering the introduction of non–indigenous species, several clarifications are required i.e. the definition of the term 'indigenous species', etc. (Bonnucci, 1990).

3. TOWARDS MANAGEMENT OF LAKE TANGANYIKA FISHERIES RESOURCES

35. As apparent from the above and even before even attempting to propose what is so obviously needed *i.e.* a Lake Tanganyika Fisheries Management Plan, it is essential to ensure that management objectives and strate~v are clearly defined. The objectives must be clearly specified and constraints recognized. Generally, a fisheries elan should be a relatively simple document, containing no more details than are required for the sort of management and development decisions that are anticipated for the fishery (Christy, 1990).

36. A basic plan should include the following: (i) a description of the fishery including estimates of the resource and of fishing effort; (ii) a statement of management objectives for the fishery, particularly whether fishing effort should be increased or decreased; (iii) a description of the management and licensing measures required to achieve the objectives; and (iv) a statement of needs i.e. specify needs for further information as well as the means of obtaining them (Christy, 1990).

37. In addition, it is essential that each riparian State has sufficient confidence in its knowledge of the shared resources of Lake Tanganyika so as to be able to assess the effects of sharing them as there is no incentive for cooperation in management unless there is an information system that guarantees each riparian State its proper share of the fishery benefits (Kapetsky, pers. comm.)

38. The process of an actual fisheries planning must involve the fishing and general community as much as possible in order to both: (i) benefit from knowledge and perception of people directly concerned with the fishery; and (ii) ensure fishermen eventual acceptance of the decisions that will eventually flow from the plan (Christy, 1990).

39. In addition, appropriate institutional requirements, legislative framework, information systems, research requirements and an eventual management unit all have to be specified and/or developed in order to ensure putting such a plan in place.

40. Consequently, the role of LTR in achieving most prerequisites for the formulation of such a plan is essential as it is, in fact, its *raison d'être.*

41. The need for a lakewide fisheries research project became clear after several fisheries research and development projects had shown that independent, uncoordinated research programmes on the lake cannot be expected to provide the required knowledge and data. Consequently, and while first discussed in 1966, the first project document for such a project was proposed during

the First Session of CIFA's Sub-Committee for Lake Tanganyika[5] in 1978. After numerous modifications, the first regional fisheries research project, entitled 'Research for the Management of the Fisheries on Lake Tanganyika' now known as LTR, became fully operational in January 1992.

42. Fundamentally, LTR is to provide the information reguired to formulate a fisheries management plan. LTR's Project Document calls for execution of its five year long programme in two phases i.e. (i) 18 months long preparatory phase, and (ii) 3.5 years long execution phase.

43. LTR's preparatory phase was successfully completed; briefly, all required infrastructure was put in place, local and international staff were both recruited and trained, equipment ordered and LTR's Coordination and International Scientific Committees established.

44. LTR execution phase consists of coordination and execution of a complex multidisciplinary research programme (=SSP); its design was fully tested and subsequently modified/refined accordingly. Its demanding execution started as scheduled, In July 1993. It has six major subcomponents as follows:

(i) hydrological modelling: studies the upwelling and downwelling phenomena of the nutrient rich waters and their effects on the pelagic biological production; it also includes water current measurements and the collection of meteorological data;

(ii) remote sensing: studies the spatial and seasonal distribution of the upwelling phenomena in relation to surface water temperature;

(iii) fish and zooplankton biology: numerous parameters are collected: fish length frequency distribution, maturity stages and numerous other classic parameters of the 6 target pelagic species, weekly and intensive zooplankton sampling down to 300 m, etc;

(iv) genetic structure of pelagic fish: to determine possible genetic discreetness of pelagic fish stocks;

(v) limnology and carbon/energy budget: numerous parameters are measured at regular intervals down to 300 m; and

(vi) fisheries statistics: are collected and analyzed, and annual Catch Assessment Surveys and Frame Surveys reporting standardized.

[5] Report of the first session of the Sub-Committee for Lake Tanganyika, CIFA/80/5, paras 6-9.

45. The above outlined activities will be complemented by a hydroacoustic studies and integrated sampling surveys for the other subcomponents which will start immediately after the commissioning of *R/V Tanganyika Explorer* is completed i.e. in January 1995. A series of lake-wide hydroacoustic cruises will be carried out in order to estimate the biomass of the different target fish species. The latest hydroacoustic equipment has been already installed on board of *R/V Panganyika Explorer.* Similarly, the mid—water pelagic trawl was also received and the training of the crew is to start shortly.

46. Regular sampling and data entry/analysis takes place, simultaneously, at 3 main LTR stations in Bujumbura (Burundi), Kigoma (Tanzania) and Mpulungu (Zambia). Partial sampling is also done at 6 LTR sub—stations as follows: in Karonda (Burundi), Kipili (Tanzania), Nsuinbu (Zambia) and in Uvira, Kalemie and Moba (all in Zaïre)

47. Sampling frequencv is the following: (i) regular weekly sampling is carried out for hydrodynamics, limnology, zooplankton, fisheries biology and statistics; (ii) intensive sampling (=24 hours cycle) takes place every 6 weeks for limnology and zooplankton; and (iii) seasonal sampling is carried out for limnology and fish genetics; and (iv) regular surveys are organized regarding fisheries statistics.

48. Considerable inputs are reguired to execute our SSP as more than 120 persons are involved in data collection, analysis and reporting.

49. The amount of data collected by LTR automatic meteorological and hydrological instruments and by LTR staff is considerable; over 4 megabytes of data/information are received every month. Consequently, the management of LTR’s data banks is a complex task.

50. The analysis of the data collected during the first 12 months of SSP is now being carried out at all LTR stations around the lake as well as in several Finnish Universities and Scientific Institutes. Detailed technical presentations will be given to the members of LTR Coordination and International Scientific Committees during the 3rd Joint Meeting of LTR Committees which will be held in Kigoma, Tanzania from 28 to 30 November 1994.

4. CONCLUSIONS

51. Given the above, it should be apparent that LTR already has a great deal of data as well as a good understanding of the Lake Tanganyika fisheries. In , LTR should be in position to propose an interim fisheries management plan proposal soon and a comprehensive one on schedule i.e. after completing its execution phase at the end of 1996, if indeed allowed to execute its SSP fully and providing its existing budgetary constraints are resolved soon.

52. It would also seem that numerous actions can be taken even now. For example, it would seem logical, that particularly the disparities detailed in paragraph 31 above *i.e.* standardization of the prohibitions regarding fishing gear could be dealt with by the authorities of the four riparian States under their existing powers without delay. Further, already published data (Coenen and Nikomeze, 1994) clearly indicate that further entry of industrial fishing units is unwise, particularly in Zambia. It is also evident that particularly the southern portions of both Tanzania and Zaïre territorial waters of Lake Tanganyika can sustain additional fishing effort providing that appropriate infrastructures are put in place followed by corresponding fisheries development of their respective artisanal fisheries.

53. It is also clear and in fact indispensable to strengthen the role of members of both LTR Committees. Particularly those representing the four concerned States must be involved more closely. Resultingly, it would seem desirable to increase the freguency of both LTR Committees meetings, particularly during 1995 and 1996, so that they can take active part in the formulation of a fisheries management plan, particularly in expressing the views of their respective Governments.

54. It must be underlined as well that while LTR will provide considerable biological information regarding Lake Tanganyika's pelagic fisheries resource and, as stated before, propose a comprehensive fisheries management plan, it is clearly outside LTR's scope to resolve all problems.

55. The role of other projects, particularly that of GEE project 'Pollution Control and Other Measures to Protect Biodiversity of Lake Tanganyika' should not be neglected. It would appear that this particular project should be starting shortly. As there is a number of common interests it is recommended that GEF/N.Y. is invited to participate, as observer, in the 3rd Joint Meeting of LTR Committees.

56. As detailed in paragraphs 35, 36, 37 and 38 above, the implementation of a fisheries management plan will demand a number of complementary measures ranging from proposing the required institutional and legal framework to designing the eventual management entity, etc. They will all compel additional financial commitments and resources and all are clearly outside of LTR's Terms of Reference.

57. It should be noted that during the most recent Session of CIFA's Sub-Committee for Lake Tanganyika[6], held in 1993 in Lusaka, the Sub—Committee examined current problems of fishery development and management, and noted that the major constraint was the lack of a permanent mechanism and institution for fisheries management on the lake. It subsequently recommended that the riparian States make concerted efforts to establish the Lake Tanganyika Fisheries Commission (LTFC) with a mandate to undertake research programmes, harmonize and implement fishery management measures, as well as to coordinate fisheries regulations.

58. Many valuable lessons were learned during the establishment of the Lake Victoria Fisheries Organization (LVFO). As similar actions will be required during the establishment of the LTFC, it is recommended that the LTR Committee members representing the United Republic of Tanzania be given the prominent role due to their experience in establishing the LVFO.

59. It must be emphasized once again that no management plan can succeed without the active participation of the fishing community. Provisions should be made, therefore, to associate its representatives in the process at the earliest possible opportunity.

60. Lastly, and in view of the above, it is now proposed that: (i) members of both LTR Committees consider this document as a baseline document to be discussed during the forthcoming 3rd Joint Meeting of LTR Committees; (ii) at that time, they will be requested to name one person from each participating State who will be responsible for the coordination and subseguent preparation of each State's statement which should clearly specify each State's priorities, preferences and positions, including the views of the representatives of their fishing communities, regarding the format and scope of the Lake Tanganyika Fisheries Management Plan; (iii) they, together with two representatives of the fishing communities (one for the artisanal fisheries community and the other for the traditional fisheries) for each State will be invited to take part in LTR's Workshop on Fisheries Management of Lake Tanganyika now scheduled for June 1995; (iv) it follows that the results of this Workshop *i.e.* draft Fisheries Management Plan for Lake Tanganyika will be presented to the 4th Joint Meeting of LTR Committees.

[6]Report of the sixth session of the Sub-Committee for Lake Tanganyika, FIPL/R501, para 15.

5. REFERENCES

Bellemans, M.S., Historique des pêcheries artisanales et
1991 coutumières au Burundi de 1952 & 1991. PNUD/FAO BDI/90/002, Raport de terrain No. 5, 54 p.

Bonnucci, N., The outlook for the harmonization of Lake
1990 Tanganyika Fisheries Leguislation. In: Gr6boval, D. (ed.), Principles of Fisheries Management and Legislation of Relevance to the Great Lakes of East Africa:Introduction and Case Studies. UNDP/FAO Regional Project for Inland Fisheries Planning (IFIP), RAF/87/099—TD/05/90 (En) : 41 p.

Coenen, E.J., Frame Survey results for Lake Tanganyika, Burundi
1994 (28—31.10.1992) and comparison with past surveys. FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika. GCP/RAF/271/FIN-TD/18 (En): 26 p.

Coenen, E.J., G. Hanek and P. Kotilainen, Shoreline
1993 classification of Lake Tanganyika based on the results of an aerial frame survey (29.09.—03.10.1992). FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika. GCP/RAF/271/FIN—TD/l0 (En): 11 p.

Coenen, E.J. and E. Nikomeze, Lake Tanganyika, Burundi, results
1994 of the 1992-1993 Catch Assessment Surveys. FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika. GCP/RAF/271/FIN-TD/24 (En): 27 p.

Coulter, G.W., Biomass, production and potential yield of the
1981 Lake Tanganyika pelagic fish community. Trans. Am. Fish. Soc., 110:325—35.

Chakraborty, D., E.O. Lyimo and N.C. Shila, Fisheries
1992 inventories in Lake Tanganyika. URT/87/016, Field Document No. 10, 28 p.

Christy, L.C., Principles of fisheries legislation.
1990 In: Gr&boval, D. (ed.), Principles of Fisheries Management and Legislation of Relevance to the Great Lakes of East Africa: Introduction and Case Studies. UNDP/FAO Regional Project for Inland Fisheries Planning (IFIP) , RAF/87/099—TD/05/90 (En) : 41 p.

FAO, Compendium of Fisheries Legislation in Lake Tanganyika.
1989 FAO Fisheries Management and Law Advisory Programme, FL/IOR/87/20 Rev. 1, 128p.

Gréboval, D. (ed.), Principles of Fisheries Management and
1990 Legislation of Relevance to the Great Lakes of East Africa: Introduction and Case Studies. UNDP/FAO Regional Project for Inland Fisheries Planning (IFIP), RAF/87/099—TD/05/90 (En) : 41 p.

Hanek, G. (ed.), 1992 Lake Tanganyika Fisheries Directory. FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika. GCP/RAF/271/FIN-TD/08 (En & Fr): 63 p.

Hanek, G. (ed.), 1993 Lake Tanganyika Fisheries Directory/ Repertoire des p4ches du lac Tanganyika 1993. FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika. GCP/RAF/271/FIN-TD/14 (En & Fr): 69 p.

Hanek, G., E.J. Coenen and P. Kotilainen, 1993 Aerial frame survey of Lake Tanganyika Fisheries. FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika. GCP/RAF/271/FIN—TD/09 (En): 29 p.

Hoekstra, T.M. and J. Lupikisha, 1992 The artisanal capture fisheries of Lake Tanganyika, Zambia: major socioeconomic characteristics of its fishermen and their fishing units. UNDP/FAO Regional Project for Inland Fisheries Planning (IFIP), RAF/87/099—TD/41/92 (En) : 93 p.

Maes, M., K. Leendertse et Mambona Wa Bazolana, 1991 Recenseinent des unités de pêche zaïroise dans la partie nord du lac Tanganyika. Projet Regional PNUD/FAO pour la Planification des Pêches Continentales (PPEC). RAF/87/099—WP/09/91 (Fr) : 61 p.

Mikkola, H. and O.V. Lindqvist, 1989 Report on a Project Mobilization Mission. Preparatory phase GCP/RAF/271/FIN, FAO, Rome, July 1989: 104 p.

Mwape, L.M., 1994 Frame survey Lake Tanganyika (Zambian waters), 6.06.—9.07.1994. FAO/FINNIDA Research for the Management of the Fisheries on Lake Tanganyika. Draft Report, October 1994: 10 p.

Vanden Bossche, J—P. and G.M. Bernacsek, 1990 Source book for the inland fishery resources of Africa. Vol. 1. CIFA Tech. Pap. (18/l):411 p.

Welcomme, R.L., 1972 The inland waters of Africa. CIFA Tech. Pap. (1):117 p.

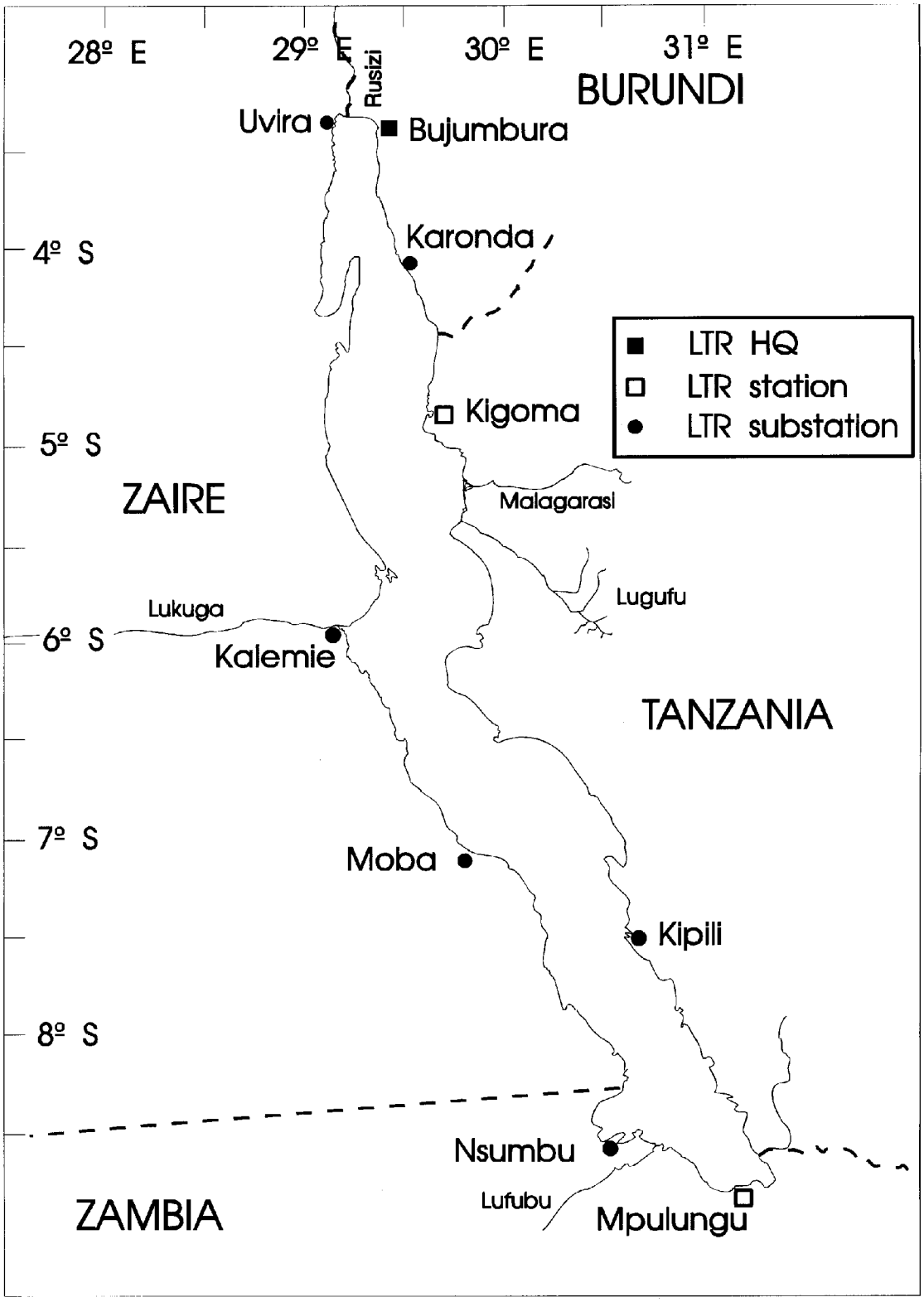

Figure 1: Location of LTR's HQ, stations and substations.