

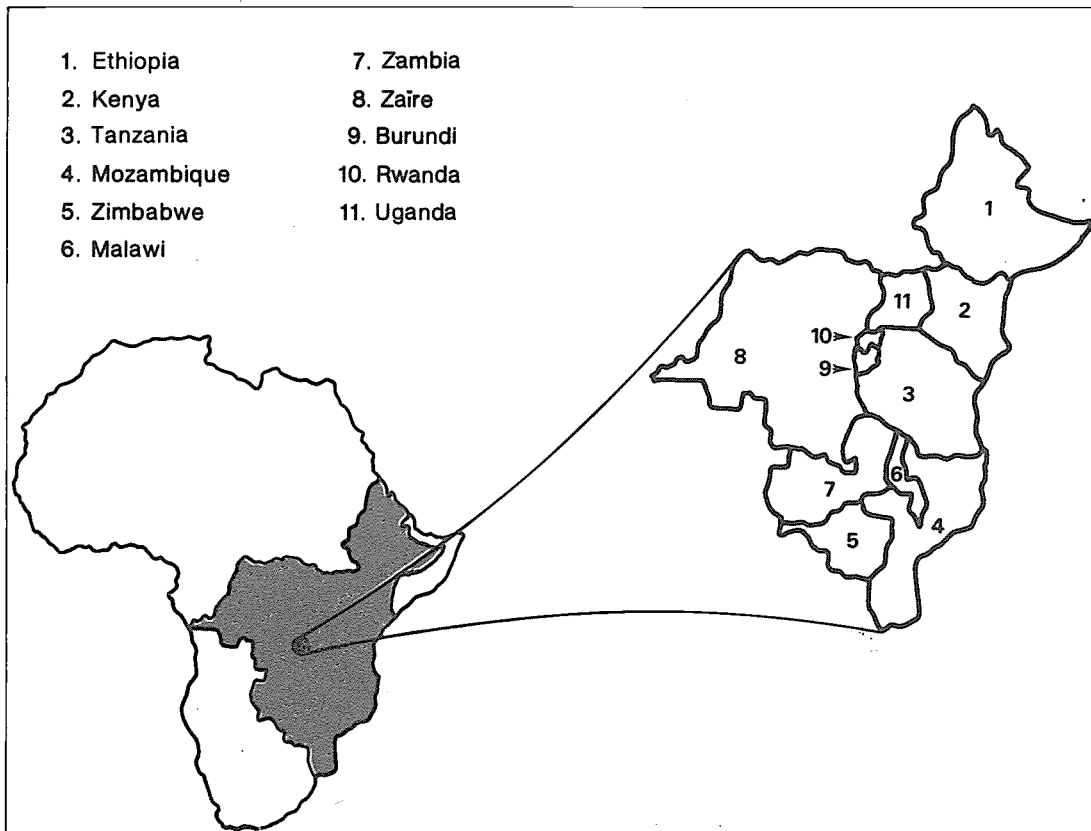
REGIONAL PROJECT FOR INLAND FISHERIES PLANNING, DEVELOPMENT AND
MANAGEMENT IN EASTERN/CENTRAL/SOUTHERN AFRICA (I.F.I.P.)

IFIP PROJECT

RAF/87/099-TD/25/91 (En)

November 1991

Structural Characteristics of the Burundian
Fisheries in 1990 and Historical Review



UNITED NATIONS DEVELOPMENT PROGRAMME



FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

C O R R I G E N D U M

Document RAF/87/099-TD/25/91 (EN)

In reference to IFIP Technical Document RAF/87/099-TD/25/91, "Structural Characteristics of the Burundian Fisheries in 1990 and Historical Review" by Mr. M. Bellemans:

The attached figures are missing from the original document should be appended to your copy.

CENSUS BY INDIVIDUAL FISHING UNIT ON THE BEACH

Clarification of codes to be used

Boat : M = traditional canoe; C = catamaran
W = Wood; P = plastic; M = metal
O = operational; H = Out of use
age : indicate the age in months

Engine : M = motorized unit; " " = un-motorized unit
../.. = indicate the purchase date of the engine

Lamps : std .. = number of standard lamps if there are some
anch.. = number of "ANCHOR" lamps if there are some
if there are no lamps, do indicate "none"

Gear : Fishing gear most often used by the fishing unit
use following codes :

| | |
|----------------------|-----------------------|
| Lif = Liftnets | Tra = Traps |
| H.L = Hook and line | Har = Harpoons |
| L.L = Longlines | Csn = Castnets |
| EGN = Encer. Gillnet | Bsn = Beach seines |
| DNT = Drift. Gillnet | Lus = Lusenga |
| Mos = Mosquitonets | Oth = Other (specify) |

age : indicate age of gear in months

Beach : 1..... = Beach of landing most often used
2..... = Beach of landing most often used in second place

Period of operation : M.ser ../.. = date unit has been put in operation
Arrêt ../.. = date unit activity has been stopped

Number of fishermen : M = number of fishermen when unit is active
with an engine
nM = number of fishermen when unit is active
without an engine

Activity : ../21 days = average number of fishing days/lunar month (for
artisanal fishery) or calendar month (for
traditional fishery)
../...-../... = Break of one or more months

Page 1

 Name of beach : _____
 Province : _____

 Survey Date :/..../..
 District : _____

CENSUS BY INDIVIDUAL FISHING UNIT ON THE BEACH

| nr | Fishing Boat | Engine | Lamps | Fishing Gear | Beach | Period of operation | number fisherm | Activity |
|----|---------------------|-----------|------------------|-------------------|------------------|--------------------------------|---------------------|--------------------------------------|
| 1 | age..... | M/.. | std .. anch.. | age..... | 1..... 2..... | M.ser/.. Arret/.. | M nM |/21 days/..-..../..../.. |
| 2 | age..... | M/.. | std .. anch.. | age..... | 1..... 2..... | M.ser/.. Arret/.. | M nM |/21 days/..-..../..../.. |
| 3 | age..... | M/.. | std .. anch.. | age..... | 1..... 2..... | M.ser/.. Arret/.. | M nM |/21 days/..-..../..../.. |
| 4 | age..... | M/.. | std .. anch.. | age..... | 1..... 2..... | M.ser/.. Arret/.. | M nM |/21 days/..-..../..../.. |
| 5 | age..... | M/.. | std .. anch.. | age..... | 1..... 2..... | M.ser/.. Arret/.. | M nM |/21 days/..-..../..../.. |
| 6 | age..... | M/.. | std .. anch.. | age..... | 1..... 2..... | M.ser/.. Arret/.. | M nM |/21 days/..-..../..../.. |
| 7 | age..... | M/.. | std .. anch.. | age..... | 1..... 2..... | M.ser/.. Arret/.. | M nM |/21 days/..-..../..../.. |
| 8 | age..... | M/.. | std .. anch.. | age..... | 1..... 2..... | M.ser/.. Arret/.. | M nM |/21 days/..-..../..../.. |
| 9 | age..... | M/.. | std .. anch.. | age..... | 1..... 2..... | M.ser/.. Arret/.. | M nM |/21 days/..-..../..../.. |
| 10 | age..... | M/.. | std .. anch.. | age..... | 1..... 2..... | M.ser/.. Arret/.. | M nM |/21 days/..-..../..../.. |
| 11 | age..... | M/.. | std .. anch.. | age..... | 1..... 2..... | M.ser/.. Arret/.. | M nM |/21 days/..-..../..../.. |
| 12 | age..... | M/.. | std .. anch.. | age..... | 1..... 2..... | M.ser/.. Arret/.. | M nM |/21 days/..-..../..../.. |
| 13 | age..... | M/.. | std .. anch.. | age..... | 1..... 2..... | M.ser/.. Arret/.. | M nM |/21 days/..-..../..../.. |
| 14 | age..... | M/.. | std .. anch.. | age..... | 1..... 2..... | M.ser/.. Arret/.. | M nM |/21 days/..-..../..../.. |
| 15 | age..... | M/.. | std .. anch.. | age..... | 1..... 2..... | M.ser/.. Arret/.. | M nM |/21 days/..-..../..../.. |

UNDP/FAO Regional Project
for Inland Fisheries Planning
Development and Management in
Eastern/Central/Southern Africa

RAF/87/099-TD/25/91 (En)

RAF/87/099-TD/25/91 (En)

November 1991

Structural Characteristics of the Burundian
Fisheries in 1990 and Historical Review

by

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The conclusions and recommendations given in this and other reports in the IFIP project series are those considered appropriate at the time of preparation. They may be modified in the light of further knowledge gained at subsequent stages of the Project. The designations employed and the presentation of material in this publication do not imply the expression of any opinion on the part of FAO or UNDP concerning the legal status of any country, territory, city or area, or concerning the determination of its frontiers or boundaries.

PREFACE

The IFIP project started in January 1989 with the main objective of promoting a more effective and rational exploitation of the fisheries resources of major water bodies of Eastern, Central and Southern Africa. The project is executed by the Food and Agriculture Organisation of the United Nations (FAO), and funded by the United Nations Development Programme (UNDP) for a duration of four years.

There are eleven countries and three intergovernmental organisations participating in the project: Burundi, Ethiopia, Kenya, Malawi, Mozambique, Uganda, Rwanda, Tanzania, Zambia, Zaire, Zimbabwe, The Communauté Economique des Pays des Grands Lacs (CEPGL), The Preferential Trade Area for Eastern and Southern African States (PTA) and the Southern African Development Coordination Conference (SADCC).

The immediate objectives of the project are: (i) to strengthen regional collaboration for the rational development and management of inland fisheries, particularly with respect to shared water bodies; (ii) to provide advisory services and assist Governments in sectoral and project planning; (iii) to strengthen technical capabilities through training; and (iv) to establish a regional information base.

PREPARATION OF THIS DOCUMENT

The document describes the structural characteristics of the Burundi fisheries of Lake Tanganyika. It is based on a frame survey conducted in 1990 within the framework of the UNDP/FAO BDI/90/002 Project "Fisheries Statistics and Information". An historical review of the fleet evolution over the last 30 years is also presented. The report was prepared for IFIP by Mr. M. Bellemans, Chief Technical Advisor of the aforementioned project, with the aim of disseminating recent information not yet available in the English language.

IFIP PROJECT
FAO
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BUJUMBURA
BURUNDI

IFIP PUBLICATIONS

Publications of the IFIP project are issued in two series:

A series of technical documents (RAF/87/099-TD) related to meetings, missions and research organized by the project.

A series of working papers (RAF/87/099-WP) related to more specific field and thematic investigations conducted in the framework of the project.

For both series, reference is further made to the document number (25), the year of publication (91) and the language in which the document is issued: English (En) or French (Fr).

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**STRUCTURAL CHARACTERISTICS OF THE BURUNDI
FISHERIES IN 1990 AND HISTORICAL OVERVIEW.**

The present report contains a description of the structural characteristics of the Burundian fisheries of Lake Tanganyika based on an analysis of the frame survey, conducted within the framework of the UNDP/FAO/BDI/90/002 Project - "Informations et Statistiques de Pêches", in December 1990. It also presents a historical overview of the fleet evolution over the past 30 years. The report is largely based on published work undertaken by the project (Bellemans, 1990 and 1991) but only available in French.

1. Introduction - description of the fisheries sector :

In Burundi, fishing activity is presently carried out by three clearly distinct types of fisheries : traditional, artisanal and industrial.

The traditional fishery makes use of dug-out or planked canoes for catching pelagic and demersal species. The fishing gear used by this fishery include the Lusenga (a kind of large scoop net), traps, beach seines, gill nets and surrounding gill nets used in connection with the practice of water beating. Mosquito nets, although prohibited, are used in clandestinity for catching fingerlings moving in coastal schools. Hook and lines are used for the coastal bottom species, whose stocks are limited.

The artisanal fishery is being practised from wooden catamarans and utilises liftnets of different sizes. This artisanal fishery is active at night and uses fish attracting lamps for capturing the pelagic species of Limnothrissa miodon¹, Stolothrissa tanganyicae¹ and Luciolates stappersii² mainly.

In recent years, the artisanal fishery has expanded significantly due to the introduction of more efficient, more productive and more profitable fishing techniques.

As far as the industrial fishery is concerned, it is carried out by a fleet of 17 Greec type purse seiners. Each industrial unit is composed of a purse seiner of about 16 to 17 m. long, a fishnet carrying boat and four to five lamp boats. This fleet has no fixed port of operation and moves along the coastline of lake Tanganyika during the different fishing campaigns in pursuit of the resources.

¹ Locally known as "Ndagala"

¹ locally known as "Ndagala"

² Adults locally known as "Mukeke"; small size known as "Nyamu-Nyamu"

2. Objectives of the inventory :

For some eleven years already, the composition, spatial distribution and relative importance of the artisanal and traditional fishery sectors in Burundi, were not properly known for lack of annual censuses. In fact, since the end of the seventies, censuses have not been carried out with the same level of precision and regularity.

The objectives of the frame survey conducted in December 1990, by the Department of Waters, Fisheries and Fishculture (D.W.F.F.) in the context of the project BDI/90/002 were :

- (i) to obtain a status of the structural characteristics of the artisanal and traditional fishery on lake Tanganyika in 1990;
- (ii) to obtain precise quantified information on the number of fishing units in view of a comparison with results from previous frame surveys;
- (iii) to obtain adjusted raising factors in view of the compilation of statistical information for the fisheries concerned;
- (iv) to obtain preliminary information in view of the conduct of a socio-economic study of those sectors, to be undertaken in collaboration with the IFIP project in 1991.

3. Methodology used :

3.1. Survey preparations :

Preliminary preparations for the conduct of field operations of the frame survey consisted of the use of topographical maps and field observations aimed at drawing an exhaustive sequential list of fishing villages, from north to south and by administrative entities (provinces and districts).

Field visits permitted to identify and to propose a standard questionnaire for the collection of quantified information, by village and by fishing unit. The questionnaire used for the end 1990 frame survey is presented in annex 1. This form contains a first part concerning the structural characteristics of the fishing villages and a second part about the fleet characteristics, by individual unit.

During the break of the lunar fishing campaign, a training course was organised for 18 field recorders of the D.W.F.F., for a field supervisor and for four assistant biologists. Its purpose was to clarify practical modalities of the field operations of the frame survey and to explain the use and ways to fill out correctly the survey questionnaires.

2 METHODOLOGY

2.1 The survey area

The survey area consisted of the entire shoreline of Lake Kivu i.e. 1,196 km and its numerous islands, the largest being Ijwi Island with surface of 200 km². The Lake Kivu is situated at the altitude of 1,463 m, in western part of Rwanda and in eastern part of Zaire, forming a natural border of some 100 km between these two countries (Figure 1). Its total surface is 2,370 km² of which approximately 1,000 km² or 42% of the total surface is part of the territory of Rwanda. Its shoreline is not easily accessible by road; roads are very poor, particularly on Zaire's lake side.

The fish fauna of Lake Kivu is poor, consisting of only 26 fish species. There are two species of Claridae, five Cyprinidae, one introduced species of Clupeidae and 18 species of Cichlidae (De Vos, pers. comm.).

There are not well defined fishing villages or settlements since the very high population density, particularly on Rwanda's lake side, results in virtually even distribution of population along Lake Kivu's shoreline. There are three larger towns, all capitals of respective prefectures, Gisenyi, Kibuye and Cyangugu on Rwanda's lake side. The largest city situated on southern Lake Kivu's shore is Bukavu, followed by the town of Goma and two smaller towns of Kalehe and Katana, all situated on Zaire's lake side. The least populated area and the most difficult to access is the lake's northwestern portion.

2.2 Stratification of the survey area

The Lake Kivu was divided into seven sectors (strata): Stratum I: shoreline of Prefecture of Gisenyi; Stratum II: shoreline of Prefecture of Kibuye; Stratum III: shoreline of Prefecture of Cyangugu, all three in Rwanda; Stratum IV: shorelines of zones of Ibanda, Bagira and Kabare; Stratum V: shorelines of zone of Kalehe; Stratum VI: shoreline of Ijwi Island and Stratum VII: shorelines of zones of Masisi and Goma, all last four strata in Zaire.

2.3 Sample size

There was a total coverage of all strata; the entire shoreline of Lake Kivu as well as that of its numerous islands were surveyed and thus a 100% of all FEU's, active on Lake Kivu between 29.06 and 30.08.1991, were accounted for. The following table provides data on total number of FEU's surveyed in each stratum, their types, number of FEU's which provided information on type and size of fishing boats, gear used and number of fishermen/FEU, and lastly the number of FEU's whose coverage included all required information and thus including socio-economic information on their backgrounds and altitudes, etc... This information was not obtained from the remaining number of fishermen due to their absence and/or unwillingness to respond.

Table 1: Lake Kivu socio-economic survey: sample size

| STRATUM | FEU's: TRIMARAN | | | | | FEU's: TRADITIONAL | | | | |
|----------|-----------------|----------|-----|----------------|-----|--------------------|----------|-----|----------------|-----|
| | N°s | N° resp. | % | Socio-economic | % | N°s | N° resp. | % | Socio-economic | % |
| I | 32 | 32 | 100 | 25 | 78 | 248 | 248 | 100 | 248 | 100 |
| II | 44 | 39 | 87 | 39 | 87 | 175 | 174 | 99 | 174 | 99 |
| III | 94 | 92 | 98 | 92 | 98 | 388 | 388 | 100 | 387 | 100 |
| Subtotal | 170 | 163 | 96 | 156 | 92 | 811 | 810 | 100 | 809 | 100 |
| IV | 33 | 33 | 100 | 13 | 39 | 385 | 383 | 99 | 383 | 99 |
| V | 27 | 27 | 100 | 16 | 59 | 529 | 526 | 99 | 104 | 20 |
| VI | 5 | 5 | 100 | 0 | 0 | 310 | 308 | 99 | 38 | 12 |
| VII | 4 | 4 | 100 | 4 | 100 | 82 | 79 | 96 | 34 | 41 |
| Subtotal | 69 | 69 | 100 | 33 | 48 | 1306 | 1296 | 99 | 559 | 43 |
| Total | 239 | 232 | 97 | 189 | 79 | 2117 | 2106 | 99 | 1368 | 65 |

2.4 Preparation

The original questionnaire has been adopted and subsequently tested in Gisenyi. Further modifications were made and the questionnaire finalized after additional testing. The testing provided the opportunity for the initial training of interviewers and allowed them to become familiar with the questionnaire. A more formal training of interviewers followed; it lasted two days during which all four interviewers became thoroughly familiar with all aspects of the survey.

2.5 The questionnaire

A copy of the questionnaire is presented in Appendix 1. The questions were grouped according to the following six areas of information:

1. landing site;
2. owners/fishermen backgrounds, including family status and education;
3. fishing effort;
4. attitudes regarding the fishery and problems encountered;
5. fishing boats and engines;
6. fishing gear.

Table 1 : Inventory of artisanal and traditional fishing units
by province - (April 1989 and Decembre 1990).

| | Fishing center | CATAMARANS | | CANOES | | Strat- um | Provin ce |
|--------------------|------------------|------------|------|--------|------|--------------|---|
| | | 1989 | 1990 | 1989 | 1990 | | |
| 1 | KATUMBA-GAHARAWE | ? | 0 | ? | 88 | I | B U J J U M M B B U A |
| 2 | KATUMBA-KIBERO | ? | 4 | ? | 9 | | |
| 3 | KADJAGA | 20 | 16 | 10 | 7 | | |
| 4 | CIMENTAL | 6 | 4 | 25 | 33 | | |
| 5 | KIBENGA | ? | 4 | ? | 9 | | |
| 6 | KANYOSHA | 33 | 14 | 30 | 39 | | |
| 7 | NYAMUGARI | 53 | 7 | 0 | 9 | | |
| 8 | NYABAGE | ? | 0 | ? | 6 | | |
| 9 | KABEZI | ? | 0 | ? | 22 | | |
| 10 | GAKOMBERA | ? | 1 | ? | 10 | | |
| 11 | MIGERA | 3 | 2 | 0 | 10 | | |
| 12 | KIRASA | ? | 1 | ? | 4 | | |
| 13 | GASANGE | ? | 2 | ? | 5 | | |
| 14 | KITAZA | 41 | 30 | 0 | 2 | | |
| 15 | NYAMUSENYI | ? | 3 | ? | 2 | II | U R A |
| 16 | MWAMBOKO | ? | 0 | ? | 2 | | |
| 17 | RUTUNGA | ? | 9 | ? | 8 | | |
| 18 | NYARUHONGOKA | ? | 0 | ? | 4 | | |
| 19 | MAKOMBE | ? | 2 | ? | 12 | | |
| 20 | MAGARA | 55 | 89 | 0 | 28 | | |
| Province Bujumbura | | 211 | 188 | 65 | 309 | | |
| 21 | GATARE | ? | 4 | ? | 7 | | |
| 22 | KIYONJA | ? | 1 | ? | 2 | | |
| 23 | CHANGA | ? | 1 | ? | 2 | | |
| 24 | MINAGO_KAYENGWE | ? | 21 | ? | 2 | | |
| 25 | KAGONGŌ | 29 | 103 | 3 | 10 | | |
| 26 | KIZUKA | 9 | 8 | 0 | 0 | | |
| 27 | NYACIJIMA | ? | 1 | ? | 1 | | |
| 28 | KINANI | 32 | 28 | 0 | 12 | | |
| 29 | RUMONGE | 40 | 40 | 10 | 17 | | |
| 30 | GATETE | ? | 0 | ? | 4 | | |
| 31 | KARONDA | 39 | 43 | 0 | 24 | | |
| 32 | KIGWENA_GIKUMU | 12 | 9 | 0 | 3 | | |
| Province Bururi | | 161 | 259 | 13 | 84 | | |

Table 1 (cont.) : Inventory of artisanal and traditional fishing units by province - (April 1989 and Decembre 1990).

| | Fishing center | CATAMARANS | | PIROGUES | | Strat- um | Provin ce |
|------------------|-----------------|------------|------|----------|------|--------------|---------------------------------|
| | | 1989 | 1990 | 1989 | 1990 | | |
| 33 | BUZENGO | ? | 0 | ? | 0 | III | M A K A M B A |
| 34 | MWIRIMBA | ? | 0 | ? | 0 | | |
| 35 | MUGURUKA | 41 | 78 | 0 | 4 | | |
| 36 | RUBINDI_BUGANZA | ? | 6 | ? | 3 | | |
| 37 | GWATA | ? | 0 | ? | 0 | | |
| 38 | MVUGO | 40 | 52 | 0 | 6 | | |
| 39 | KIFURUZI | ? | 8 | ? | 3 | | |
| 40 | NYANZA_LAC | ? | 38 | ? | 13 | | |
| 41 | GASABA | ? | 8 | ? | 0 | | |
| 42 | KABONGA | 40 | 34 | 0 | 3 | | |
| Province Makamba | | 121 | 224 | 0 | 32 | | |
| Country Total | | 493 | 671 | 78 | 425 | | |

Note : ? = data not available.

The difference between the results of both surveys can be accounted for on the one hand by the selection of the period of the field survey itself (April 1989 and December 1990) and on the other hand, by the higher level of precision of the second survey which covered all fishing sites along lake Tanganyika in its Burundi part.

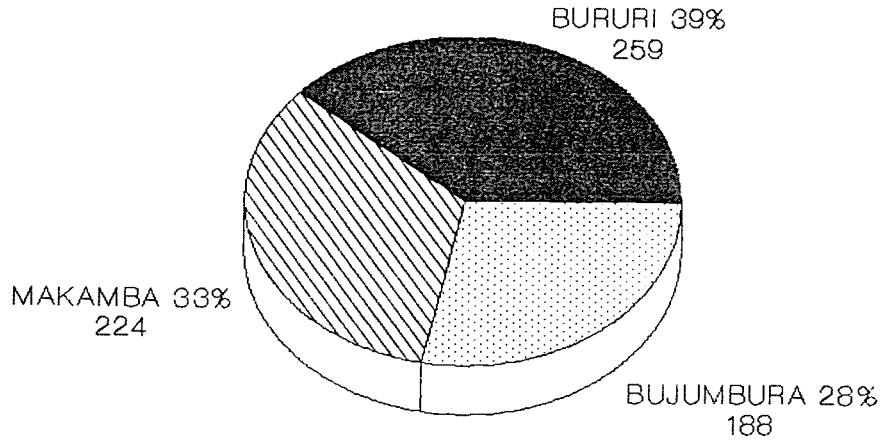
Fishing units inventories as well as their level of coverage, seem to have suffered in the past from certain short-comings inherent to (i) the methodology used and the means made available and to (ii) the dynamic characteristic of the fishery itself (mobility).

The systematic and exhaustive methodology of the present frame survey provides for a more reliable assessment of the artisanal and traditional fisheries of Burundi. Thus, one cannot state that the difference observed between both surveys was the result of a spectacular increase in the fishing fleet. It would merely be the result of a more appropriate methodology and of a more exhaustive coverage of the fishing centers.

The difference in the period of the year during which both surveys were carried out (April and December) is not enough to justify the difference between the observed values. At most, it could have explained the difference between values of certain important fishing centers and one would have expected to find similar global figures.

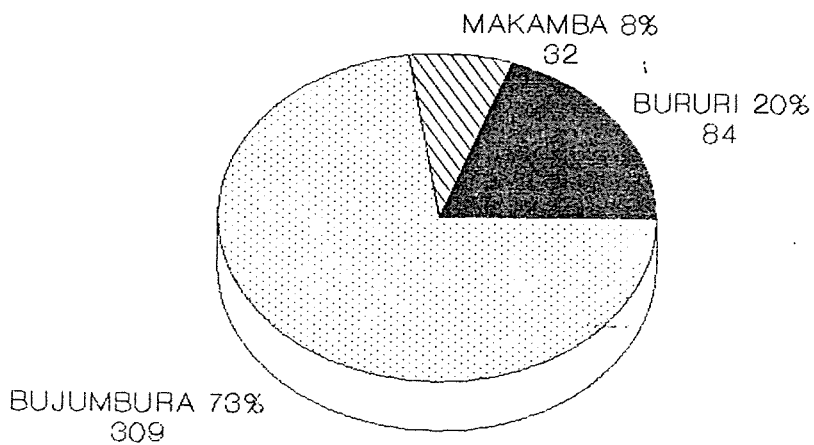
The mobility of the artisanal fleet during the year implies the need to carry out other inventory surveys in the course of the year, in order to (i) adjust the space raising factors to the changing situation (agricultural and/or off-fishing season) and (ii) to better understand the mobility and dynamics of the artisanal fishery.

FIGURE 2 : CATAMARANS DISTRIBUTION/PROVINCE



DECEMBER 1990.

FIGURE 3 : CANOES DISTRIBUTION/PROVINCE



DECEMBER 1990.

Thus, as shown in table 1, the concentration of the artisanal fishery units (= catamarans) during the year-end period, is highest in the South Bururi province (259); Makamba province (224). The concentration of the artisanal fishery units per km of coastline is the highest in the Makamba province (5.3 units per coastal km), followed by the Bururi province (4.2 units per km of coastline). The concentration is the lowest in the Bujumbura province with 3.1 units per km of coastline.

As far as the traditional fishery is concerned, the year-end concentration of canoes is highest in the North Bujumbura province (309); Bururi province (84) and the Makamba province (32). Also, the concentration of traditional fishing units per km of coastline is the highest in the Bujumbura province (5.2 units per km of coastline), followed by the Bururi province (1.4 units per km coastline). The lowest concentration is found in the Makamba province (0.8 units per km of coastline).

One finds then a situation with two opposite gradients for the artisanal and traditional fishery. The first shows a decreasing gradient from south to north; the second showing a decreasing gradient from the north to the south of the Burundi part of the lake.

Figures 2 and 3 represent schematically the distribution of catamarans and canoes according to the coastal provinces.

The progressive displacement of the artisanal fisheries toward the south has been noted for some years. It appears to have led to a semi-specialisation by area with the Northern and Southern fisheries being predominantly traditional and artisanal respectively. A similar evolution and distribution have been noted for the Northern portion of the Zairean part of the lake: Uvira-Baraka area (Maes et. al. 1991).

5. Inventory of fishing units :

The census methodology allowed to assess the total number of active (operational and non-operational) artisanal and traditional fishing units as well as the number of 'out-of-use' units along the different beaches visited. It also allowed to quantify the number of light skiffs and tugging units, used in connection with catamarans, and to identify the improved "Appollo" units, used in the artisanal fishery.

The distinction between active, inactive and out-of-use units was done on the basis of following definitions, used for the conduct of the field survey operations :

- Active unit : unit actively fishing during survey days;
- Inactive unit : unit capable of going to water but not equipped for fishing activity during the survey days;
- Out-of-use unit: unit not capable of going to water at the time of the survey conduct;

5.1. Artisanal Fishery :

The artisanal fishery is carried out by some 671 operational catamarans, distributed along the Burundi coastline of lake Tanganyika (Table 2).

One also observes the total disappearance of trimarans, from the Burundi part of the lake (the June 1991 survey, showed only one single active trimaran unit).

5.1.1. Artisanal fishing units :

During the conduct of the frame survey, coinciding with the beginning of the fishing campaign, 589 active artisanal fishing units, 82 inactive units and 71 out-of-use units were identified. The activity level of the artisanal fishing fleet was thus of about 88 % and the out-of-use units only represented about 10 % of the total fleet.

Figure 4 graphically represents the distribution of all artisanal fishing units enumerated during the 1990 frame survey, according to their status.

Table 2 : Inventory of artisanal fishing units (December 1990)

| | P R O V I N C E | CATAMARANS | | | | |
|---|-----------------|------------|------------|------------|-------------|-----------------|
| | | Active | Non-Active | Out-of Use | Lamp skiffs | 'Tugging' Units |
| 1 | BUJUMBURA | 149 | 39 | 31 | 4 | 10 |
| 2 | BURURI | 234 | 25 | 35 | 4 | 26 |
| 3 | MAKAMBA | 206 | 18 | 5 | 5 | 20 |
| | Country Total | 589 | 82 | 71 | 13 | 56 |

5.1.2. Lamp skiffs :

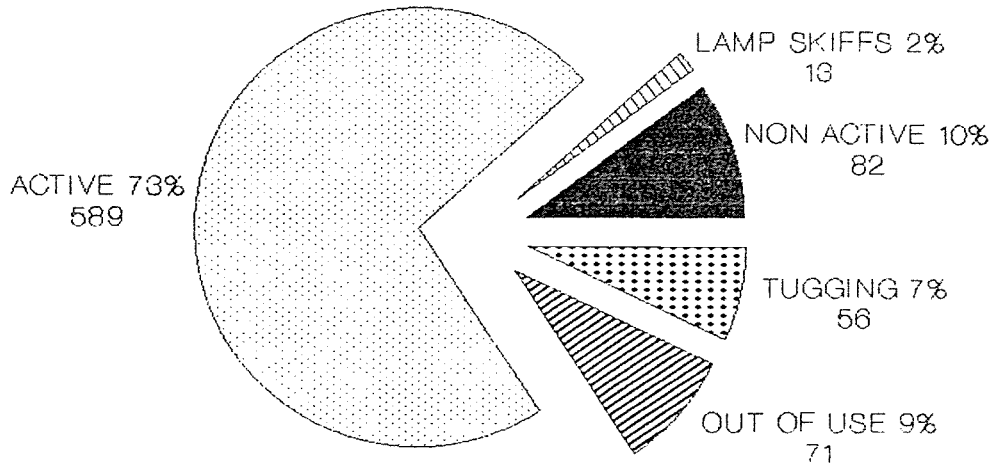
The lamp skiffs are made of a simple unit in wooden planks carrying three to four additional fish attracting lamps. They are manoeuvred by one person using paddles, in order to increase the fish attracting power of a catamaran. These lamp skiffs are used in a way similar to the lamp-boats of the industrial fishery.

This means that the lamp skiff joins the catamaran whilst going fishing. On the fishing grounds, it separates from the catamaran and independently attracts fish with its lamps. Once the potential catch is being judged promising, it approaches slowly the catamaran and turns off its lights. The net from the catamaran is then lifted. It can operate in this way several times per fishing night.

The introduction of this fishing technique renders necessary the introduction of a new methodology for statistical purposes, because catches per unit of fishing effort will be function of the presence of those lamp-boats and of their number per fishing unit.

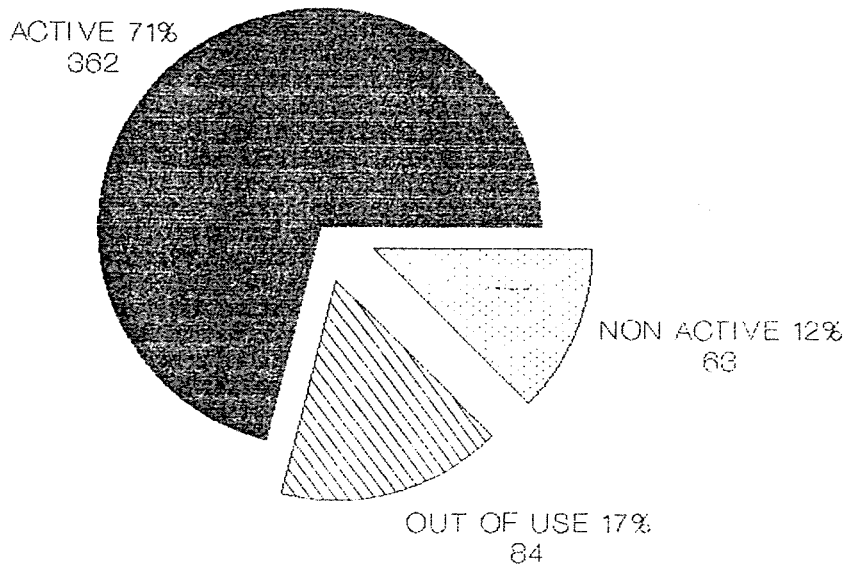
During the December 1990 census, one recorded 13 such units. They were essentially based in important fishing centers (Magara, Rumonge, Mvugo and Nyanza Lac) in the south of the country.

FIGURE 4 : CATAMARANS FLEET INVENTORY



DECEMBER 1990.

FIGURE 5 : CANOES FLEET INVENTORY



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5.1.3. "Tugging" units :

The "tugging" units are simple planked units, powered in general by a 25 Hp. engine. They help to bring several non-motorised catamarans units to and from the fishing grounds. Although they do not as such form part of the fishing operation itself, they intervene on the fishing power of the non-motorised units by helping them to reach more distant fishing grounds and by allowing longer fishing times and faster returns (higher commercial values).

During the 1990 census, one could distinguish the existence of 56 such units (table 2).

These units were also based in the important fishing sites such as Magara, Kagongo, Rumonge, Mvugo and Kabonga; i.e. mostly in the South.

5.1.4. 'APPOLLO' units :

The recent introduction of the so-called "Appollo" nets, provides since 1990 for a renewed dynamism of the artisanal fisheries. These units are large catamarans using boats of 7 to 9 m long and a net of up to 100 meters of opening circumference (55 to 65 meters for regular liftnets) and are operated by a crew of eight to eleven persons. Fourteen to nineteen lamps are used, of which two have the same power as those used by the lamp boats of the industrial fishery. Early 1990, these units had daily catches often superior to those of the industrial units.

During the 1990 census, three such units were recorded, all based in Muguruka (Makamba province). During a June 1991 spot survey, their number reached 35.

According to available catch statistics, the fishing power of these units would equal that of three to four typical non-motorised catamarans. This consequently requires a distinctive statistical approach, which has been introduced from January 1991 onwards.

5.2. Traditional fishery :

The traditional fishery is being practised by some 425 non-motorised units, operating mainly in the northern part of the Burundi coast (table 3).

Figure 5 represents the inventory of the traditional fisheries units resulting from the 1990 frame survey. During the execution of this survey, one counted 362 active traditional fishery units, 63 inactive units and 84 'out-of-use' units (Table 3).

The activity level of the traditional fishery fleet was thus about 83%, with the 'out-of-use' units representing 19 % of the entire traditional fleet. This is higher than the proportion observed for the artisanal fishery.

Table 3 : Inventory of traditional fishing units.
(December 1990)

| | P R O V I N C E | C A N O E S | | |
|---|-----------------|-------------|------------|------------|
| | | Active | Non-Active | Out-of Use |
| 1 | BUJUMBURA | 277 | 37 | 54 |
| 2 | BURURI | 62 | 22 | 22 |
| 3 | MAKAMBA | 28 | 4 | 8 |
| | Country Total | 362 | 63 | 84 |

6. Structural characteristics of the fishing villages :

In the Bujumbura province, twenty fishing centers were identified, distributed along the 60 kms of coastline of this province. The Bururi province, with its 62 kms of coastline only had twelve fishing centers whilst on the 43 kms of the Makamba province, one identified seven fishing sites.

Table 4 presents by province the number of fishing villages by site structure (continuous, seasonal or sporadic occupation) and by type of fishing activity (permanent, seasonal or sporadic fishing activity).

Table 4 : Structure of inventoried fishing centers.

| Province | Occupation by the fishermen | | | Fishing activity | | |
|-----------|-----------------------------|----------|----------|------------------|----------|----------|
| | continued | seasonal | sporadic | continued | seasonal | sporadic |
| Bujumbura | 20 | 0 | 0 | 17 | 2 | 1 |
| Bururi | 12 | 0 | 0 | 12 | 0 | 0 |
| Makamba | 6 | 1 | 0 | 4 | 2 | 1 |
| Total | 38 | 1 | 0 | 33 | 4 | 2 |

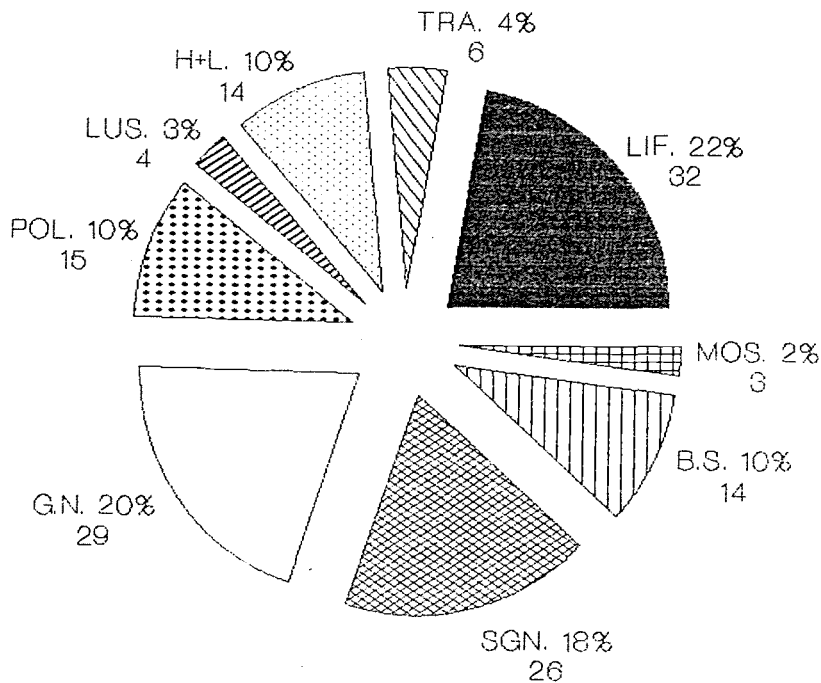
7. Use of fishing gear :

7.1. Types of fishing gear used :

Table 5 depicts the frequency of use of the various fishing gear commonly operated by the fisheries of lake Tanganyika, for the fishing villages where the survey was conducted. Each value unit corresponds to a recorded village.

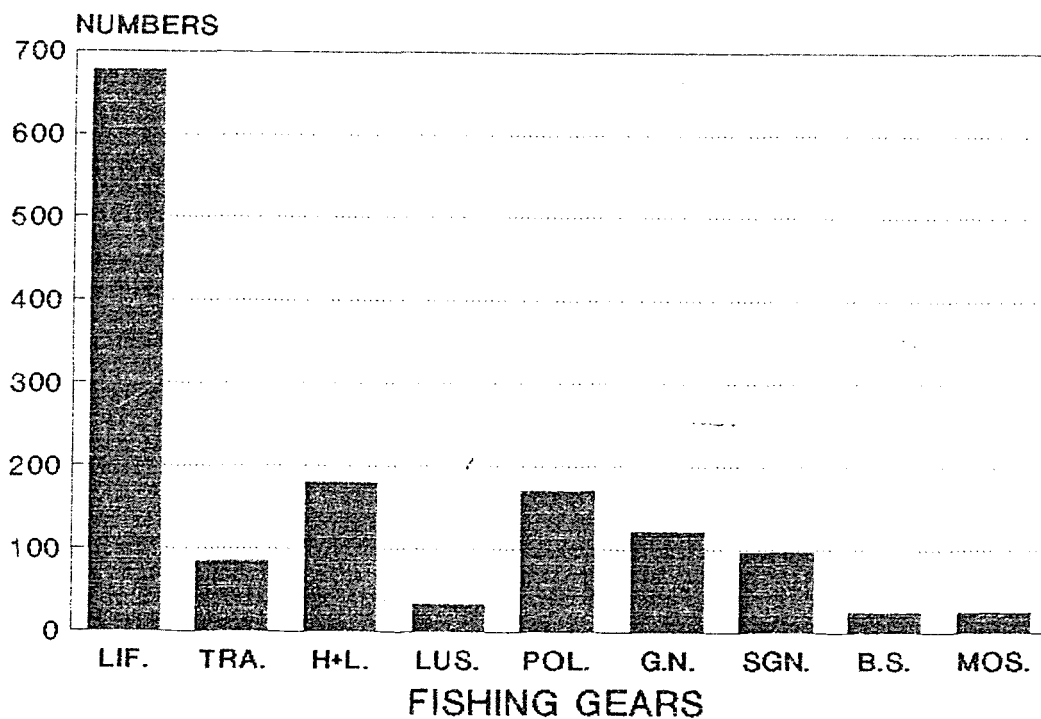
From table 5 and from figure 6 it appears that beach seines are mainly used in the provinces of the northern part of lake Tanganyika, with 14

FIGURE 6: FISHING GEAR USED IN VILLAGES



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FIGURE 7: # FISHING GEAR



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villages having notified the use of this gear. These are principally concentrated in the Bujumbura province (57 % of the villages).

Table 5 : Frequency of use of various fishing gear.

| FISHING GEAR | PROVINCE | | | Total |
|----------------------|-----------|--------|---------|-------|
| | Bujumbura | Bururi | Makamba | |
| Beach seines | 8 | 5 | 1 | 14 |
| Surrounding Gill Net | 13 | 7 | 6 | 26 |
| Gill Net | 15 | 9 | 5 | 29 |
| Poles | 8 | 2 | 5 | 15 |
| Hook and lines | 7 | 5 | 2 | 14 |
| Traps | 5 | 1 | - | 6 |
| Scoop nets | 4 | - | - | 4 |
| Lift nets | 14 | 11 | 7 | 32 |
| Mosquito nets | 3 | - | - | 3 |

Note : - = gear not used or not recorded in the province.

The surrounding gill nets as well as the drift nets are also concentrated in the Bujumbura province, although they are also used in numerous villages in the Bururi and Makamba provinces.

Poles, traps and hook and lines are also principally used in the northern part of the lake.

The scoop nets and the mosquito nets, are little used, but it is however possible that this second fishing gear is being used in other fishing villages as well but that the census did not record it because its use is prohibited by law.

Liftnets are commonly used in all provinces.

7.2. Periods of use of the different fishing gear :

According to the results of the survey, it seems there are no well defined seasonal periods for the use of certain fishing gear. Only the activity of light-related gear (liftnets and scoopnets) is better defined in time, as it coincides with the lunar cycles. However, one notes a tendency for light fishing to continue during the full moon period for the major fishing villages.

7.3. Number of fishing gear :

According to the census of fishing gear, the artisanal fishery operated some 678 liftnets, whilst the traditional fishery consisted of 26 beach seines, 97 surrounding gill nets, 122 drifting gill nets, 171 poles, 181 hook and lines, 84 traps, 33 scoopnets and some 25 mosquito nets (table 6 and figure 7).

Table 6 : Number of fishing gear by type and by province.

| Province | Fishing gear | | | | | | | | |
|-----------|--------------|--------|------|-------|------|-------|-------|-------|-------|
| | B.S. | S.G.N. | G.N. | Poles | H+L. | Traps | Scoop | Mosqu | Lift. |
| Bujumbura | 19 | 70 | 72 | 60 | 50 | 76 | 33 | 25 | 194 |
| Bururi | 6 | 17 | 38 | 6 | 27 | 8 | - | - | 270 |
| Makamba | 1 | 10 | 12 | 105 | 104 | - | - | - | 214 |
| Total | 26 | 97 | 122 | 171 | 181 | 84 | 33 | 25 | 678 |

The Bujumbura province represented 73 % of all beach seines operating in Burundi, 72 % of the surrounding gill nets and 59 % of the drifting gill nets. Traps (90 %), scoopnets (100 %) and mosquito nets (100 %) are also mainly used in the province.

The liftnets, on the other hand are essentially concentrated in the south (Bururi 40 %, Makamba 31 %). Hook and line fishing is more practised in the Makamba province.

7.4. Average price of fishing gear :

Average unit price by type of fishing gear and by province are presented at table 7.

Table 7 : Average unit price by type of gear and by province.
in Fr.Bu. 1/

| Province | Fishing gears | | | | | | | | |
|-----------|---------------|--------|-------|------|------|------|-------|--------|--------|
| | B.S. | S.G.N. | G.N. | Pol. | H+L. | Tra. | Scoop | Mosqui | Liftn. |
| Bujumbura | 111750 | 24700 | 26447 | 2100 | 3500 | 370 | 3125 | 1600 | 168285 |
| Bururi | 84000 | 21043 | 21056 | 575 | 2930 | 200 | - | - | 168636 |
| Makamba | 150000 | 16825 | 22500 | 1192 | 2000 | - | - | - | 256428 |
| Average | 104571 | 22320 | 24150 | 1656 | 3082 | 342 | 3125 | 1600 | 187688 |

1/ Exchange rate : 1 dollar U.S. = 160 Fr.Bu. in December 1990.

8. Analysis of fleet characteristics by sector :

During the inventory survey, it was possible, (as per the second part of the questionnaire : individual census by fishing unit - Annex 1) to record detailed information for 922 out of the 1096 operational units, which gives a survey coverage of about 84 %. Amongst recorded units, 596 were catamarans (65 %) and 326 (35 %) single boat units, amongst which one finds 13 (4 %) "tugging" units and 3 (1 %) light skiffs.

Considering the size of the sample taken, one can easily assume that the information derived from this analysis can well be applied to the entire fleet.

8.1. Artisanal fishery :

The characteristics of the sample of surveyed catamarans were :

- 582 wooden operational catamarans (97,7 %)
- 5 wooden out-of-use catamarans (0,8 %)
- 8 ply-wood operational catamarans (1,3 %)
- 1 ply-wood out-of-use catamaran (0,2 %)

8.1.1. Materials of catamarans hulls :

Table 8 depicts the distribution of catamarans by type of material used for the construction of their hull. It shows that 99 % of the artisanal fishing fleet is being made from wooden planks and that only 1 % of the units are still made off ply-wood.

The units made of ply-wood were introduced under the framework of a now defunct parastatal (SUPOBU: Société des Usines du Poisson du Burundi), which, with credit provided by the World Bank, was engaged in the development of the artisanal fishery during the late 70's, early 80's.

Catamarans made out of steel do not exist any longer in the Burundi part of lake Tanganyika.

Table 8 : Materials of catamaran hulls.

| Province | Hull Materials | | | | | |
|------------|----------------|----------|-------|------|----------|-------|
| | Number | | | % | | |
| | Wood | Ply-Wood | Steel | Wood | Ply-Wood | Steel |
| Bujumbura | 170 | 4 | - | 28.5 | 0.7 | - |
| Bururi | 225 | 5 | - | 37.8 | 0.8 | - |
| Makamba | 192 | - | - | 32.2 | - | - |
| Country T. | 587 | 9 | 0 | 98.5 | 1.5 | 0.0 |

8.1.2. Average age of catamaran hulls :

As far as the average age of the catamarans units is concerned, Table 9 shows that the Makamba province has the oldest units (4 years). In the Bujumbura province, the catamarans are on the average 3 years old whilst the Bururi province has the youngest fleet (2.5 years). The average age of the wooden operational fleet is 3 years whilst the units made from ply-wood are almost 5 years old.

The out-of-use units encountered in the survey have on the average about 9 years of age.

The age distribution of the hulls of the operational units by age classes is given in table 10. From this table, it is being observed that the 1-year and 1-2 year classes represent respectively 28 and 32 % of the artisanal fishing fleet. This observation reflects the dynamism of the fishing fleet indicating that a renewal of the boats is being undertaken on a regular and normal basis. The table further shows that the sector is still in expansion since 1988 (canoes younger than three years) after a slow down or regression observed around 1987, corresponding to a period of political transition in Burundi.

Table 9 : Average age of catamaran hulls.

| Province | Average age of the boats (months) | | |
|-----------|-----------------------------------|------------|-------------|
| | Wood | | Ply-Wood |
| | operational | Out-of-use | operational |
| Bujumbura | 35.6 | 60.0 | 45.0 |
| Bururi | 29.3 | 118.5 | 74.3 |
| Makamba | 48.1 | - | - |
| Average | 37.3 | 106.8 | 59.6 |

Note - = no samples.

Table 10 : Distribution of catamaran hulls by year classes.

| Province | Year classes (in years) | | | | | | | |
|------------|-------------------------|------|------|------|------|------|------|-----|
| | <1 | 1 | 2 | 3 | 4 | 5 | 6 | >7 |
| | 1990 | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 | |
| Bujumbura | 42 | 17 | 44 | 28 | 10 | 14 | 3 | 15 |
| Bururi | 72 | 32 | 38 | 32 | 19 | 12 | 12 | 13 |
| Makamba | 51 | 38 | 22 | 29 | 8 | 7 | 8 | 30 |
| Country | 165 | 87 | 104 | 89 | 37 | 33 | 23 | 58 |
| Percentage | 27.7 | 14.6 | 17.5 | 14.9 | 6.2 | 5.5 | 3.9 | 9.7 |

Figure 8 depicts the distribution of the average age frequencies expressed in years for the catamarans hulls.

8.1.3. Motorisation level of catamarans :

Amongst the surveyed catamarans, the level of motorisation was of about 35 % (Table 11). This table further displays the level of motorisation reached, by province and compared, on the one hand, to the total surveyed motorised units and, on the other hand, to the total number of operational catamarans surveyed.

From this table it appears that the global level of motorisation reached in the Bujumbura province it is the lowest (20 %) while it is highest in the Bururi province (47 %).

Table 11 : Motorisation level of catamarans.

| Province | Motorisation level | | | |
|-----------|--------------------|-------|--------------|--------|
| | # Motorised | % | # Catamarans | % |
| Bujumbura | 34 | 16.5 | 173 | 19.7 |
| Bururi | 105 | 51.0 | 225 | 46.7 |
| Makamba | 67 | 32.5 | 192 | 34.9 |
| Total | 206 | 100 % | 590 | 34.9 % |

8.1.4. Average age of catamaran engines :

The average age of engines used by catamarans is given in Table 12. It is shown that engines have, in all provinces of the country, a very similar average age of about 2.5 years. This low figure reflects a new process of motorisation which translate well the dynamic character of the artisanal fishery and the expansion of the sector since 1988.

The relatively low average age (2 years) of the "tugging" units further reflects the expansion and intensification trends of the sector. It shows the recent introduction of this new concept into the fishery, especially if one compares the average age of the engines and of the "tugging" units (1.5 years of age).

Table 12 : Average age of engines used by catamarans and "tugging" units.

| Province | Average engine age (months) | |
|-----------|-----------------------------|-----------------|
| | Catamaran | "tugging" units |
| Bujumbura | 36.8 | - |
| Bururi | 29.4 | 19.6 |
| Makamba | 32.4 | - |
| Average | 31.6 | 19.6 |

8.1.5. Lamps used by the artisanal fishery :

Table 13 shows the number of lamps of the "Standard" type (with light beam directed downward without an important shadow zone) and the number of lamps of the "Anchor" type (ordinary household kerosene pressure lamps) used by artisanal fishermen.

It can be seen that the average number of "Standard" lamps per catamaran unit is about 1.5 lamps per fishing unit for the entire fleet. This ratio does not change greatly from one province to the other.

Table 13 : Number of lamps used by catamarans.

| Province | Number of lamps used (total and average) | | | |
|---------------|--|-------------------|---------------|-------------------|
| | "STANDARD" TYPE | | "ANCHOR" TYPE | |
| | Number | Average/catamaran | Number | Average/catamaran |
| Bujumbura | 230 | 1.3 | 953 | 5.5 |
| Bururi | 299 | 1.3 | 1315 | 5.7 |
| Makamba | 274 | 1.4 | 1088 | 5.7 |
| Total/average | 803 | 1.4 | 3356 | 5.6 |

The number of "Anchor" type lamps per fishing unit is more important (5.6 "Anchor" lamps per catamaran unit) than for the "Standard" lamps.

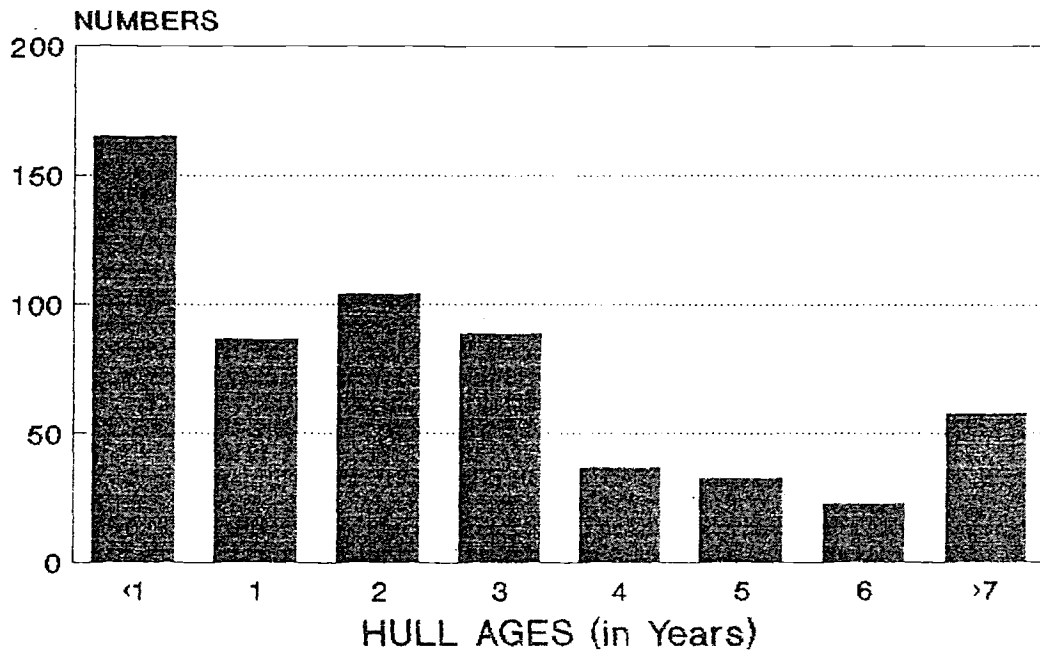
The lower use of "Standard" lamps is due to the fact that this type of lamps had been massively introduced during the SUPOBU period through its artisanal fishery development programme, but have been seldom imported since its dissolution in 1984. This reduced considerably their level of dissemination and utilisation by the artisanal fishery.

Table 14 further shows the total estimated number of lamps used by the artisanal fishery.

Table 14 : Number of lamps used by the artisanal fishery.

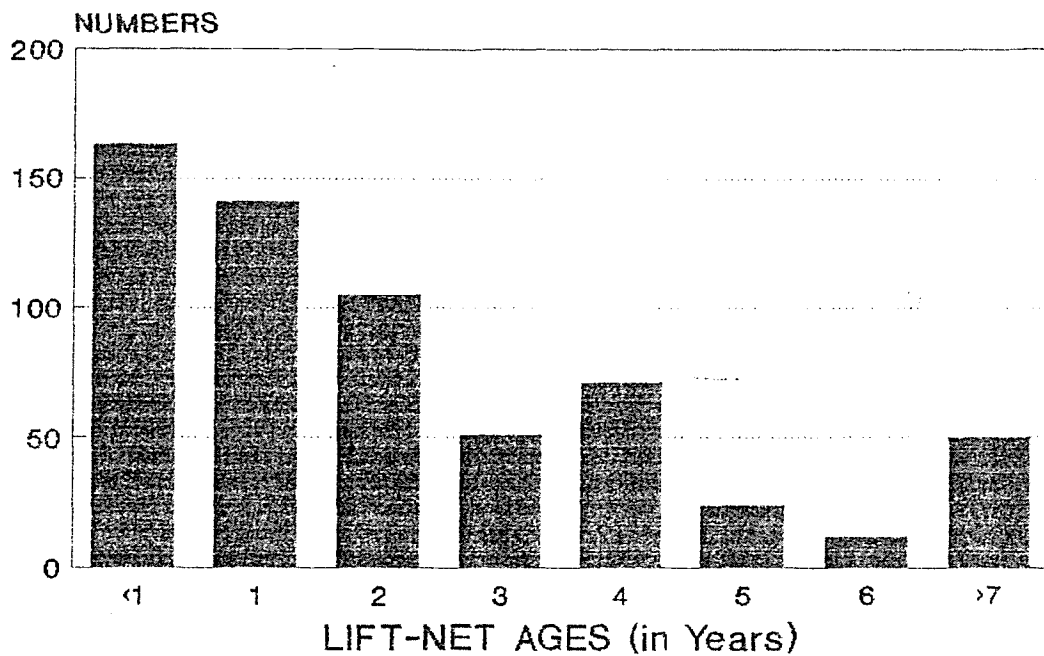
| Units | Total number of used lamps | | | |
|-------------|----------------------------|-----------|---------------|-----------|
| | "Standard" Type | | "Anchor" Type | |
| | recorded | estimated | recorded | estimated |
| Catamarans | 803 | 893 | 3,356 | 3,732 |
| Lamp skiffs | 4 | 13 | 28 | 97 |
| Total | 807 | 906 | 3,384 | 3,829 |

FIGURE 8: AGE DISTRIBUTION OF CATAMARAN HULLS



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FIGURE 9: AGE DISTRIBUTION LIFT-NETS



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8.1.6. Average age of liftnets used by the artisanal fishery :

Table 15 shows that the average age of the liftnets used by the artisanal fishery is about 3 years and significantly less in the Bururi province. Figure 9 depicts the average age frequency distribution of the liftnets, expressed in years.

Table 15 : Average age of the liftnets.

| Province | Average age of liftnets (months) |
|-----------|----------------------------------|
| Bujumbura | 43.14 |
| Bururi | 30.62 |
| Makamba | 40.79 |
| Average | 37.63 |

Table 16 : Distribution of liftnets per year classes.

| Province | Year classes (in years) | | | | | | | |
|------------|-------------------------|------|------|-----|------|-----|-----|-----|
| | <1 | 1 | 2 | 3 | 4 | 5 | 6 | >7 |
| Bujumbura | 38 | 39 | 29 | 17 | 25 | 9 | 3 | 22 |
| Bururi | 75 | 52 | 39 | 20 | 29 | 9 | 3 | 10 |
| Makamba | 50 | 50 | 37 | 14 | 17 | 6 | 6 | 18 |
| Country | 163 | 141 | 105 | 51 | 71 | 24 | 12 | 50 |
| Percentage | 26.4 | 22.8 | 17.0 | 8.3 | 11.5 | 3.9 | 1.9 | 8.1 |

A distribution of the liftnets per year classes is given in Table 16 and Figure 9, showing that recent acquisitions are important with nearly half of the liftnets having less than two years. With increasing age, the number decreases consequently. This information seems to confirm the generally healthy and dynamic state of the artisanal fishery sector, which is still showing a growing trend in 1991.

8.1.7. Number of artisanal fishermen :

Table 17 shows the average number of fishermen per catamaran fishing unit. A low provincial difference and surprisingly little difference in crew size between motorised and non-motorised units can be observed.

Table 17 : Average distribution of artisanal fishermen per unit.

| Province | Average number of fishermen per unit | |
|-----------|--------------------------------------|-----------|
| | non-motorised | motorised |
| Bujumbura | 5.2 | 5.2 |
| Bururi | 4.5 | 4.7 |
| Makamba | 4.5 | 5.0 |
| Country | 4.7 | 4.9 |

Table 18 depicts the total number of fishermen recorded during the survey. For the artisanal fishery, their estimative number for the Burundi part of the lake, amounts to some 1 134 fishermen on the motorised units and to some 2 078 fishermen on the non-motorised units. In total, it amounts to some 3 225 artisanal fishermen.

Table 18 : Distribution of the number of artisanal fishermen

| Fishermen | Total recorded number of fishermen | | | |
|-----------|------------------------------------|-----------|---------------------|-----------|
| | Motorised units | | Non-Motorised units | |
| | recorded | estimated | recorded | estimated |
| Bujumbura | 177 | 197 | 731 | 813 |
| Bururi | 501 | 561 | 564 | 627 |
| Makamba | 338 | 376 | 574 | 638 |
| Total | 1,016 | 1,134 | 1,869 | 2,078 |

8.1.8. Average number of fishing days :

Concerning the average number of active fishing days per lunar campaign, it is shown in Table 19 that motorisation is of little influence and that the average is slightly higher for the Makamba province.

The number of fishing days per unit per year is affected by the number of lunar fishing campaign during the year (between 12 and 13) and one can estimate that a unit can easily fish some 250 days per year.

Table 19 : Average number of fishing days per lunar fishing campaign.

| Province | Average number of fishing days/campaign | |
|-----------|---|---------------------|
| | Motorised units | Non-motorised units |
| Bujumbura | 22.4 | 22.8 |
| Bururi | 22.3 | 21.1 |
| Makamba | 22.7 | 22.7 |
| Country | 22.5 | 22.3 |

8.2. Traditional Fishery :

The characteristics of the surveyed traditional fishery sample (the term canoe is being used here as synonymous for a simple fishing unit) were :

- 306 wooden operational canoes (99,7 %)
- 1 wooden out-of-use canoe (0,3 %)

Out of a total of 425 operational units recorded it represents a sampling level of about 72 % of the traditional fishery. Lamp skiffs and "tugging" units were not included in this analysis of the traditional fishery.

8.2.1. Materials of canoe hulls :

Table 20 shows the distribution of the canoes per province. All canoes are now made of wood.

Table 20 : Materials of canoe hulls.

| Province | Materials of the hull | | | | | |
|------------|-----------------------|----------|-------|------|----------|-------|
| | Number | | | % | | |
| | Wood | Ply-Wood | Steel | Wood | Ply-Wood | Steel |
| Bujumbura | 194 | - | - | 63.4 | - | - |
| Bururi | 84 | - | - | 27.5 | - | - |
| Makamba | 28 | - | - | 9.1 | - | - |
| Country T. | 306 | 0 | 0 | 100 | 0.0 | 0.0 |

8.2.2. Average age of canoe hulls :

The average age of the traditional fishery units is shown in Table 21. It shows that the Makamba province has the most recent units (1.5 years of age). The average age of the operational fleet is about 2 years.

Table 21 : Average age of canoe hulls.

| Province | Average age of the units (months) | | |
|-----------|-----------------------------------|------------|-------------|
| | Wood | | Ply-Wood |
| | operational | Out-of-use | operational |
| Bujumbura | 25.1 | - | - |
| Bururi | 19.6 | 60.8 | - |
| Makamba | 16.3 | - | - |
| Average | 22.8 | 60.8 | - |

Note - = no samples.

8.2.3. Level of canoe motorisation :

Except for the "tugging" units and some mixed units (tugging + lamp skiffs), the observed level of motorisation is negligible (1 out of 306 operational canoes surveyed).

8.2.4. Lamps used by the traditional fishery :

The number of "Standard" type and "Anchor" type lamps, used by the traditional fishery, is given in table 22.

Table 22 : Number of lamps used by the canoes.

| Province | Lamps used by the canoes | |
|-----------|--------------------------|---------------|
| | Standard Type | "Anchor" Type |
| Bujumbura | 9 | 18 |
| Bururi | - | - |
| Makamba | - | 4 |
| Country | 9 | 22 |

Note : - = no samples.

These lamps are essentially used by the scoopnet fishery which is concentrated in the Bujumbura province. The other traditional fishing techniques only rarely use light attraction devices.

8.2.5. Average age of traditional fishing gear :

Concerning the average age of the traditional fishing gear, one observes that the average age of the beach seines is about 3.2 years and that they are in general more recent in the Bujumbura province (Table 23).

The surrounding gill nets have on the average 1.6 years of age whilst the drifting gill nets are on the average 1.2 year old.

Table 24 : Average age of traditional fishing gear.

| Province | Fishing gears | | | | | | | |
|---------------|---------------|------|--------|--------|------|-------|-------|--------|
| | B.S. | G.N. | S.G.N. | Scoop. | Pole | H.+L. | Traps | Mosqu. |
| Bujumbura | 36.8 | 16.9 | 22.0 | 14.1 | 13.1 | 16.6 | 7.2 | 13.3 |
| Bururi | 41.8 | 10.8 | 14.4 | 3.0 | 62.8 | 14.8 | 4.8 | - |
| Makamba | - | 10.4 | 11.0 | 6.0 | 24.3 | - | - | - |
| Country Aver. | 38.4 | 14.0 | 19.2 | 13.0 | 19.7 | 15.4 | 6.0 | 13.3 |

All traditional fishing gear show in general a tendency to be more recent in the Makamba province.

8.2.6. Number of traditional fishermen :

The analysis of the number of surveyed fishermen for the traditional fishery is given in table 24.

Table 24 : Number of surveyed traditional fishermen.

| Province | Number of traditional fisherm. |
|-----------|--------------------------------|
| Bujumbura | 477 |
| Bururi | 217 |
| Makamba | 57 |
| Country | 751 |

For the traditional fishery as a whole, the extrapolated estimative number of fishermen for the Burundi part of the lake, amounts to some 1 043 fishermen, all fishing techniques combined.

Table 25 depicts the average crew size by fishing techniques.

Table 25 : Average crew sizes by fishing technique.

| | Fishing gear | | | | | | | |
|---------------|--------------|------|--------|--------|------|------|-------|--------|
| | B.S. | G.N. | S.G.N. | Scoop. | Pole | H+L. | Traps | Mosqu. |
| Country Aver. | 6.2 | 2.3 | 2.9 | 1.7 | 1.4 | 1.4 | 1.0 | 2.0 |

8.2.7. Average number of fishing days :

Concerning the average number of active fishing days per calendar month, it can be seen from table 26 that the traditional fishery carries out on the average and for all fishing techniques combined, about 26 fishing days per month.

The average number of fishing days per unit and per month is highest for traps. Beach seines and scoopnets operate on the average less fishing days per month which is understandable because of heavy work (beach seines) and because of the lunar cycle (scoopnets).

Table 26 : Average number of fishing days per month per gear.

| | Fishing gear | | | | | | | |
|------------|--------------|------|--------|--------|-------|------|------|--------|
| | B.Sein. | G.N. | S.G.N. | Scoop. | Poles | H+L. | Trap | Mosqu. |
| Days/month | 23.3 | 26.9 | 25.9 | 23.9 | 26.0 | 21.6 | 28.2 | 25.7 |

Country average all gears = 25.75 days/month.

8.3. Inventory of the industrial fishery :

The inventory of the 17 industrial fishery units active in 1990 is given in table 27.

9. HISTORICAL OVERVIEW OF THE FISHING INDUSTRY IN BURUNDI :

An attempt was made to analyse, on the basis of available archive information, the evolution and spatial distribution of the artisanal and traditional fisheries sectors in Burundi (Bellemans, 1991). This evolution is shown in figures 10 to 12. It should be noted that from 1972 up to 1976, two frame survey's (in March and November) were carried out yearly.

9.1 Artisanal sector :

Over the years, from 1962 to 1991, three main periods can be identified in the evolution of the active artisanal fleet. This can clearly be seen in Figures 10 and 12.

i) - From 1962 to march 1972 : this period is characterized by sustained growth with an average of some 3,3 catamaran units entering the fishery every month. The events which took place in Burundi in 1972 brought much disruption to the entire sector.

ii) - From end 1972 to end 1978 : this second period of recovery was characterized by a rapid growth with an average increase of some 10,9 catamarans units entering the fishery every month. This second growth period will extend over some 67 consecutive months and is characterized by the arrival of numerous Zaïrian fishermen especially around end 1976. The end of this second period coincided with the expulsion of the Zaïrian fishermen from

Burundi in november 1978. The resulting collapse of the sector was fortunately tempered by the actions of the former SUPOBU which assisted Burundi fishermen by providing them with gear, engines, boats and credit facilities.

iii) - from end 1980 to 1991 : this third period is characterized by a much slower growth with on the average only 0,4 catamarans units entering the fishery on a monthly basis. This seems to indicate that after the SUPOBU intervention, which ceased to be effective in the early eighties, the artisanal fishery, without much assistance from outside the sector, has found itself in a period of stagnation and of research of new methodologies and techniques which led to a new period of expansion after 1987.

Although the total number of catamarans units did not increase much during this last period, one has to realise that in the meantime, the efficiency of the fleet has very much increased through (i) the introduction of larger nets, (ii) larger canoes (iii) an increase in the distance between the two boats of the units, (iv) an increase in the light attraction power on each unit, (v) their motorisation which reached 35 % in 1990, and finally (vi) through the introduction of "Appollo" lift-nets which have a fishing power nearly equivalent to an industrial fishing unit.

9.2. Traditional sector :

As far as the traditional sector is concerned, the number of active fishing units has been very high until the year 1972. With the national crisis, the traditional fishery sector drastically collapsed and was not able to recover (unlike the artisanal sector), inspite of the small recovery period observed between 1973 and 1978. During the eighties, the traditional fishery reached a very low activity. It has nearly become a subsistence fishing activity, using rudimentary fishing gear and inefficient techniques. The evolution of the sector is presented at figure 11. Figure 12 presents the comparative evolution of both fishing fleets in terms of numbers of active fishing units.

9.3. Industrial sector :

Figure 13 shows the evolution of the industrial fleet since it's start in 1954. Fleet size peaked at about 19-23 units in the late seventies/early eighties and is now stable at 17 units.

TABLE 27 : LIST OF VESSELS OF THE BURUNDI INDUSTRIAL FISHERY - 1990.

| | COMPANY | VESSEL | | | | | | | | | | ENGINE | | NET | | MESH SIZE | |
|----|--------------|----------------|-------------|-------------|------------|-----------|------------------|-------------|-----------------|-----------|----------|-----------------|------------|-----------------|------------|-----------|--|
| | | NAME OF VESSEL | YEAR IN USE | YEAR CONSTR | LENGTH (m) | WIDTH (m) | HORSE POWER (HP) | YEAR CONST. | Nbr LIGHT BOATS | LENGT (m) | SIDE (m) | EXTER -IOR (mm) | POCHE (mm) | | | | |
| | | | | | | | | | | | | | | EXTER -IOR (mm) | POCHE (mm) | | |
| 1 | Aris Magos | Samos | 1960 | 1959 | 15,8 | 4,3 | 280 | 1985 | 5 | 300 | 80 | 18 | 5 | | | | |
| 2 | Kalomeris | St Nicolas | 1969 | 1968 | 15,8 | 4,6 | 140 | 1983 | 5 | 300 | 100 | 20 | 5 | | | | |
| 3 | Kintis | Mariena | 1970 | 1968 | 16,4 | 5,4 | 280 | 1980 | 5 | 300 | 100 | 17 | 5 | | | | |
| 4 | Koccos | Helena | 1984 | 1983 | 16,8 | 5,3 | 355 | 1989 | 5 | 380 | 100 | 17 | 5 | | | | |
| 5 | Koccos | Melina | 1979 | 1978 | 17,1 | 4,7 | 185 | 1983 | 5 | 380 | 100 | 18 | 5 | | | | |
| 6 | Koudunis | St. Georges | 1984 | 1983 | 21,0 | 5,4 | 220 | 1983 | 5 | 300 | 100 | 18 | 6 | | | | |
| 7 | Koudunis | Taxiarchis | 1969 | 1968 | 15,7 | 5,2 | 175 | 1978 | 5 | 380 | 100 | 18 | 6 | | | | |
| 8 | Marinatos | St. Barbara | 1976 | 1976 | 15,6 | 5,2 | 180 | 1979 | 5 | 300 | 100 | 16 | 6 | | | | |
| 9 | Papanagiotis | St. Andre | 1986 | 1985 | 20,7 | 5,5 | 145 | 1984 | 5 | 300 | 100 | 18 | 5 | | | | |
| 10 | Petrelis | St. Dimitri | 1969 | 1968 | 17,4 | 5,0 | 145 | 1979 | 5 | 300 | 100 | 20 | 6 | | | | |
| 11 | Petrelis | Menippos | 1971 | 1970 | 15,6 | 5,0 | 160 | 1986 | 5 | 300 | 100 | 18 | 6 | | | | |
| 12 | Rakatzis | Alexandre | 1970 | 1969 | 16,4 | 5,3 | 210 | 1987 | 5 | 300 | 96 | 15 | 6 | | | | |
| 13 | Sarissavas | St. Marie | 1968 | 1968 | 14,6 | 5,0 | 320 | 1987 | 5 | 320 | 120 | 22 | 6 | | | | |
| 14 | Sarissavas | St. Mathieu | 1983 | 1983 | 17,9 | 5,4 | 320 | 1983 | 5 | 400 | 150 | 22 | 6 | | | | |
| 15 | Seplata | Manos | 1975 | 1975 | 17,6 | 5,4 | 260 | 1980 | 4 | 350 | 100 | 18 | 6 | | | | |
| 16 | Vrampas | Akarovyi | 1961 | 1961 | 15,4 | 3,3 | 120 | 1974 | 5 | 225 | 95 | 18 | 6 | | | | |
| 17 | Vrampas | Mutwenzi | 1979 | 1979 | 13,6 | 4,1 | 140 | 1979 | 5 | 320 | 90 | 18 | 6 | | | | |

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