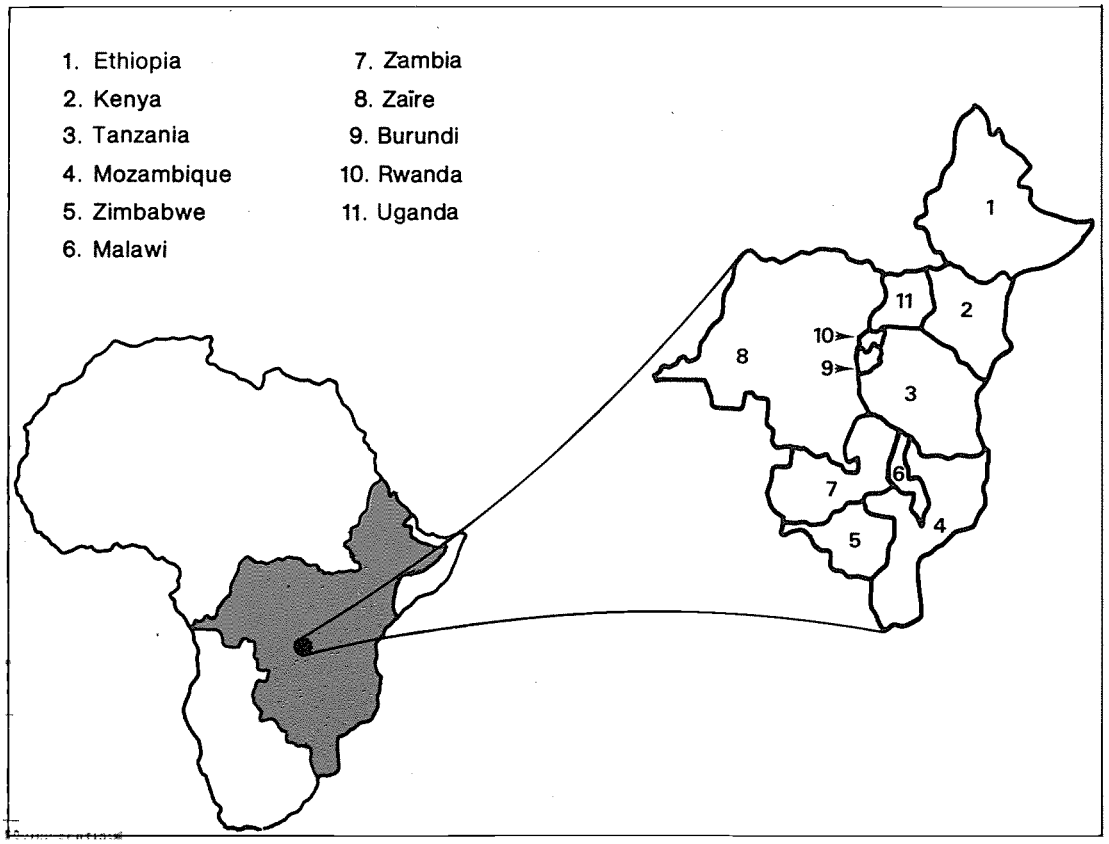
REGIONAL PROJECT FOR INLAND FISHERIES PLANNING, DEVELOPMENT AND MANAGEMENT IN EASTERN/CENTRAL/SOUTHERN AFRICA (I.F.I.P.)

IFIP PROJET

RAF/87/099-TD/19/91 (En) May 1991

A CATALOGUE OF FISHING METHODS AND GEAR USED IN LAKE VICTORIA



UNITED NATIONS DEVELOPMENT PROGRAMME

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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

RAF/87/099-TD/19/91(En)

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A CATALOGUE OF FISHING METHODS AND GEAR USED IN LAKE VICTORIA

prepared by

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
UNITED NATIONS DEVELOPMENT PROGRAMME
Bujumbura, May 1991

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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.

...

The present document provides essential information on the fishing units and gear used by fishermen on Lake Victoria. The purpose of the document is to provide a better understanding of the equipment and methods currently in use and a basis for their improvement. This is all the more important as the fisheries of Lake Victoria have undergone drastic changes over the last decade. The report is based on surveys undertaken under the auspices of the IFIP project in close collaboration with the Fishery Industries Division of FAO and with the various fisheries institutions of Kenya, Tanzania and Uganda.

The IFIP project wishes to thank the staff of these institutions for the assistance provided. Special thanks are extended to Mr. Y. Budeba from TAFIRI-Mwanza for the complementary information which he provided regarding the Tanzanian sector.

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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 (19), the year of publication (91) and the language in which the document is issued: English (En) or French (Fr).

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INTRODUCTION

This report has been prepared on the basis of information collected from surveys on fishing gear and craft during visits to Lake Victoria: Tanzanian sector by J. Prado and R.J. Beare in 1989 and 1990, Kenyan sector by J. Siwo Mbuga and J. Prado in June 1990, and Ugandan sector by L.E. Oluka and J. Prado, also in June 1990. It gives details and illustrations of a representative selection of canoes and fishing gear currently in use by the small-scale artisanal fishermen of Lake Victoria. It also lists and illustrates those fish which figure most significantly in the official commercial statistics.

The purpose of this booklet is to provide Masterfishermen, Fish Technologists, Fisheries Officers, Training Officers and Extension Workers with a brief description of the factors which influence fishing on Lake Victoria together with descriptions of the most common and representative fishing gear and craft in current use. It is hoped that the information provided will provide an improved understanding of the equipment and methods currently in use and act as the basis upon which advice and future technological improvements can be made.

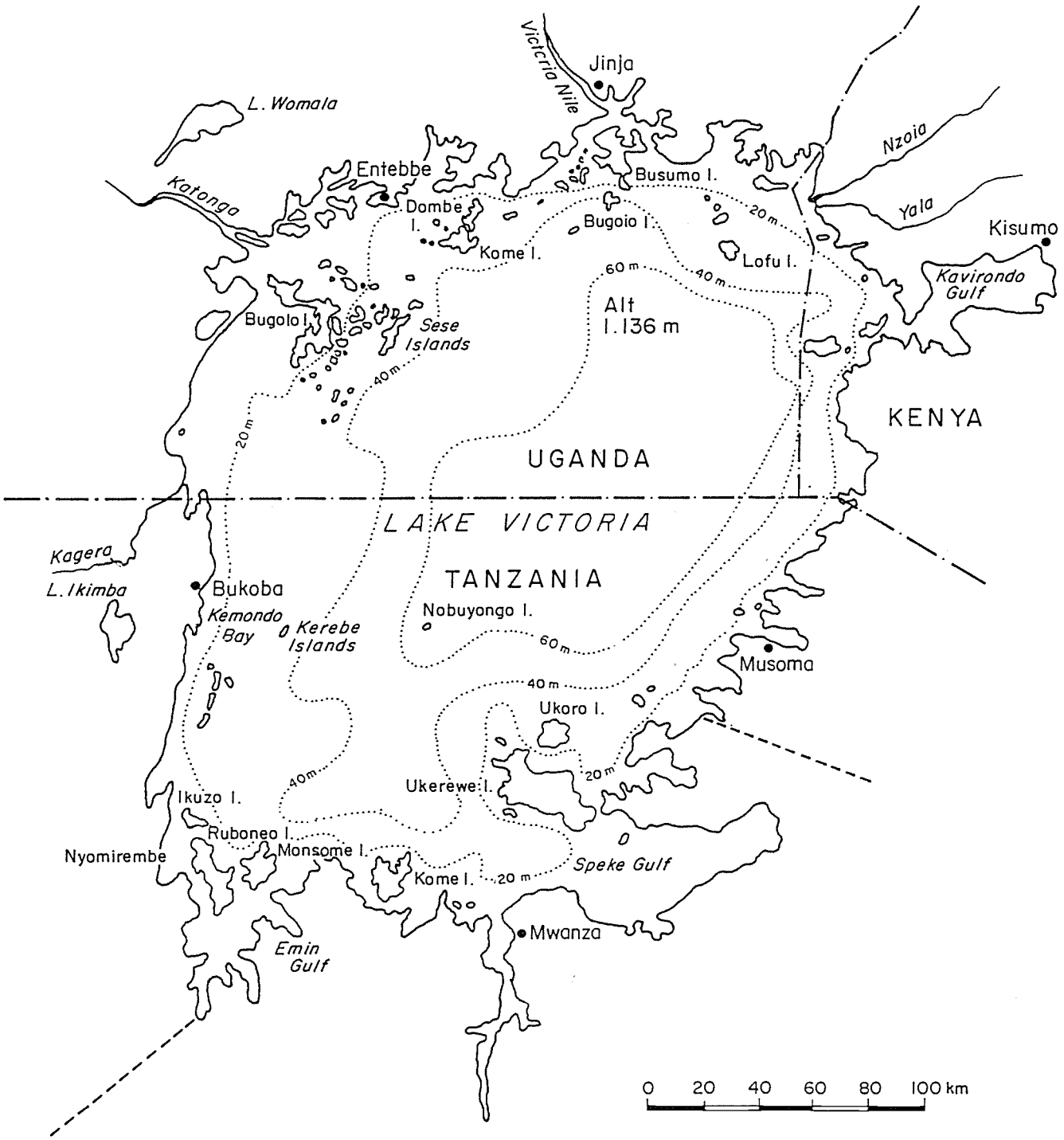
The illustrations in the text collectively provide useful background information for those whose task it is to assist in the development of the artisanal fisheries sector and their communities.

CONTEXT OF LAKE VICTORIA

Lake Victoria (altitude 1 136 m), has a total surface area of 68 800 km^2, of which Kenya has 4 100 km^2 (6%), Uganda 31 000 km^2 (45%), and Tanzania 33 700 km^2 (49%). It can be regarded as part of the river basin which drains northwards through the Victoria Nile to join the main River Nile, which eventually drains into the Mediterranean Sea. Compared with Lake Tanganyika, it is a relatively shallow lake, with a maximum depth of 84 m and a mean depth of 40 m. While only one river, the Victoria Nile, leaves lake Victoria, there are three major rivers which enter the lake. These are the Kagera river, which is 785 km in length and drains eastwards from the high land and swamps of Burundi and Rwanda; the Nzoia, 258 km, which, like the river Yaia (180 km), drains westwards into Lake Victoria from the highlands of Kenya. All together, the Lake Victoria drainage basin covers an area of 263 000 km^2.

During the past twenty years, and particularly during the past decade, the fisheries of Lake Victoria have undergone immense changes. These include increased fishing effort, environmental changes, as well as changes resulting from the introduction of fish from other areas. The most significant of the species introduced is the Nile perch, which has caused a dramatic alteration in the commercial exploitation of the lake. In brief, the indigenous Haplochromines, small fish of low commercial but high scientific significance were heavily predated by the introduced Nile perch (Lates niloticus). This has resulted in a rapid decrease in landings of Haplochromis and a spectacular increase in landings of Nile perch and, in hand with these changes, there has also been a dramatic rise in the landings of the sardine like Rastrineobola argentea (dagaa). Whether the growth in

LAKE VICTORIA



population of dagaa is a result of decreased predation from other lake species due to their removal through Nile perch predation is not clear. Neither is it clear whether the increase in the population of dagaa will be sufficient to maintain existing populations of Nile perch. Whatever the likely outcome of these interactions, the fishing craft and fishing gear of Lake Victoria tend to reflect the changes that have taken place and the opportunities for increased catches of those species which have prospered. In consequence, this report sets out to describe typical fishing craft, fishing gear and methods of fishing in current use on Lake Victoria. It does not attempt to examine the appropriateness of new and more intensive forms of fish capture imported from outside the region; neither does it attempt to interpret the end results of changes currently taking place in the various fish populations of Lake Victoria.

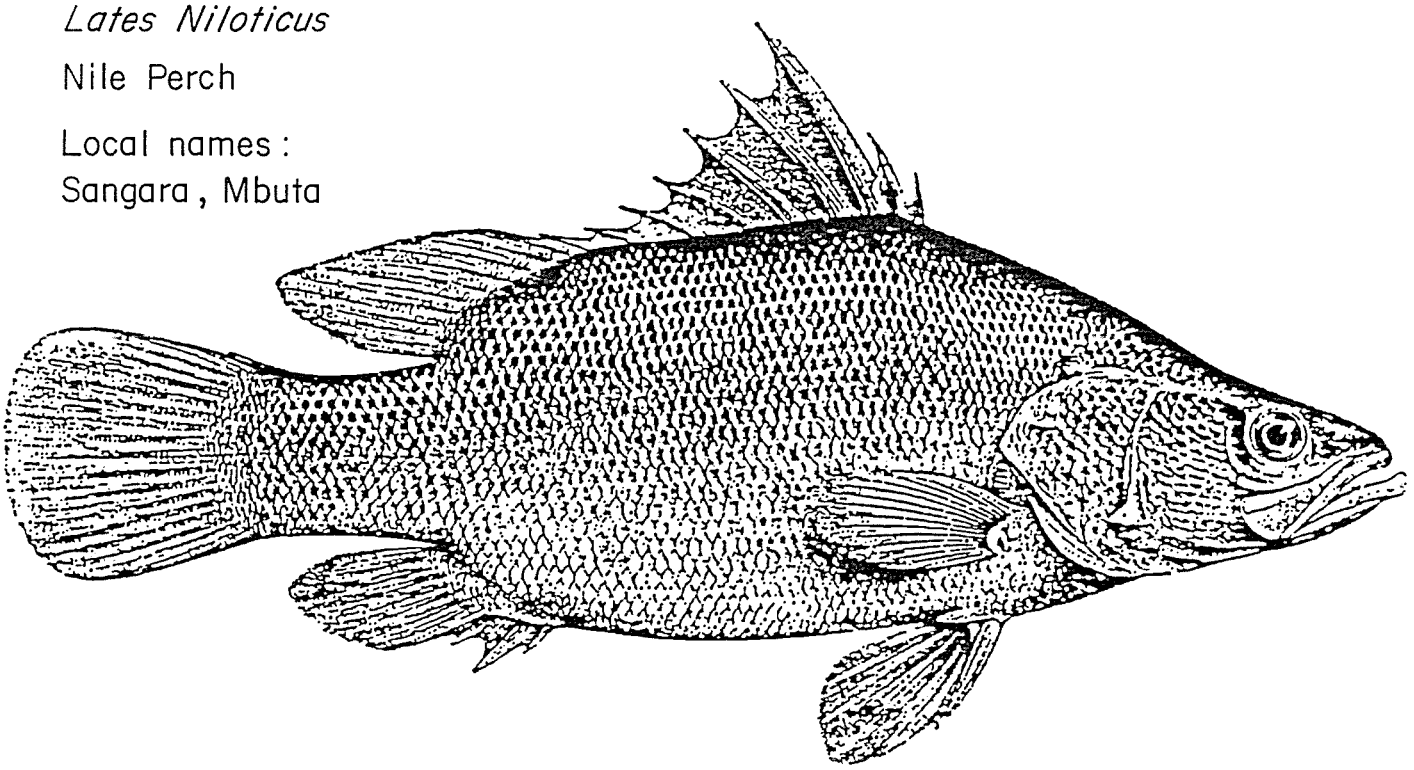
CONSERVATION ISSUES

The continued unrestricted access to the Lake Victoria fishery and the sanction of environmentally damaging forms of fishing are major problems. Uncontrolled use of trawling techniques and beach seines in particular can be very damaging not only to fish stocks but also to sea bed creatures and plants. The future sustainability of the Lake Victoria fishery is to be considered as a a whole for the three sectors: Tanzania, Uganda and Kenya. Cooperation in the formulation of a common legal and conservation framework is a priority for rapid joint action.

Lates Niloticus

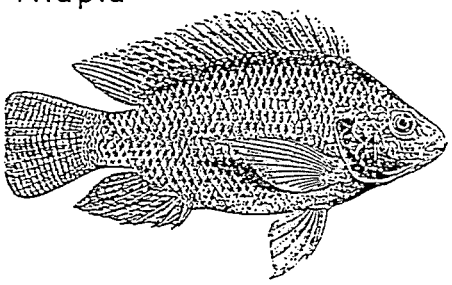
Nile Perch

Local names :
Sangara , Mbuta



Oreochromis Niloticus

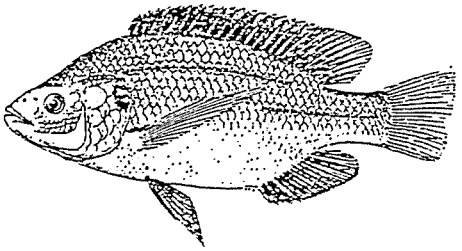
Tilapia



Local names :
Sato , Mahere , Ngege ,
Nsogora , Zogoro , Oro

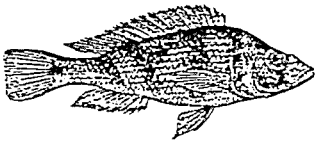
Oreochromis Esculentis

Tilapia



Local names :
Ngege , Nsalia , Anagu ,
Binage , Mnege

Haplochromis



Rastrineobola Argentea

Sardine

Local names :
Dagaa , Mukene

FISHING GEAR AND METHODS OF CAPTURE IN THE TANZANIAN WATERS OF LAKE VICTORIA

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TANZANIA

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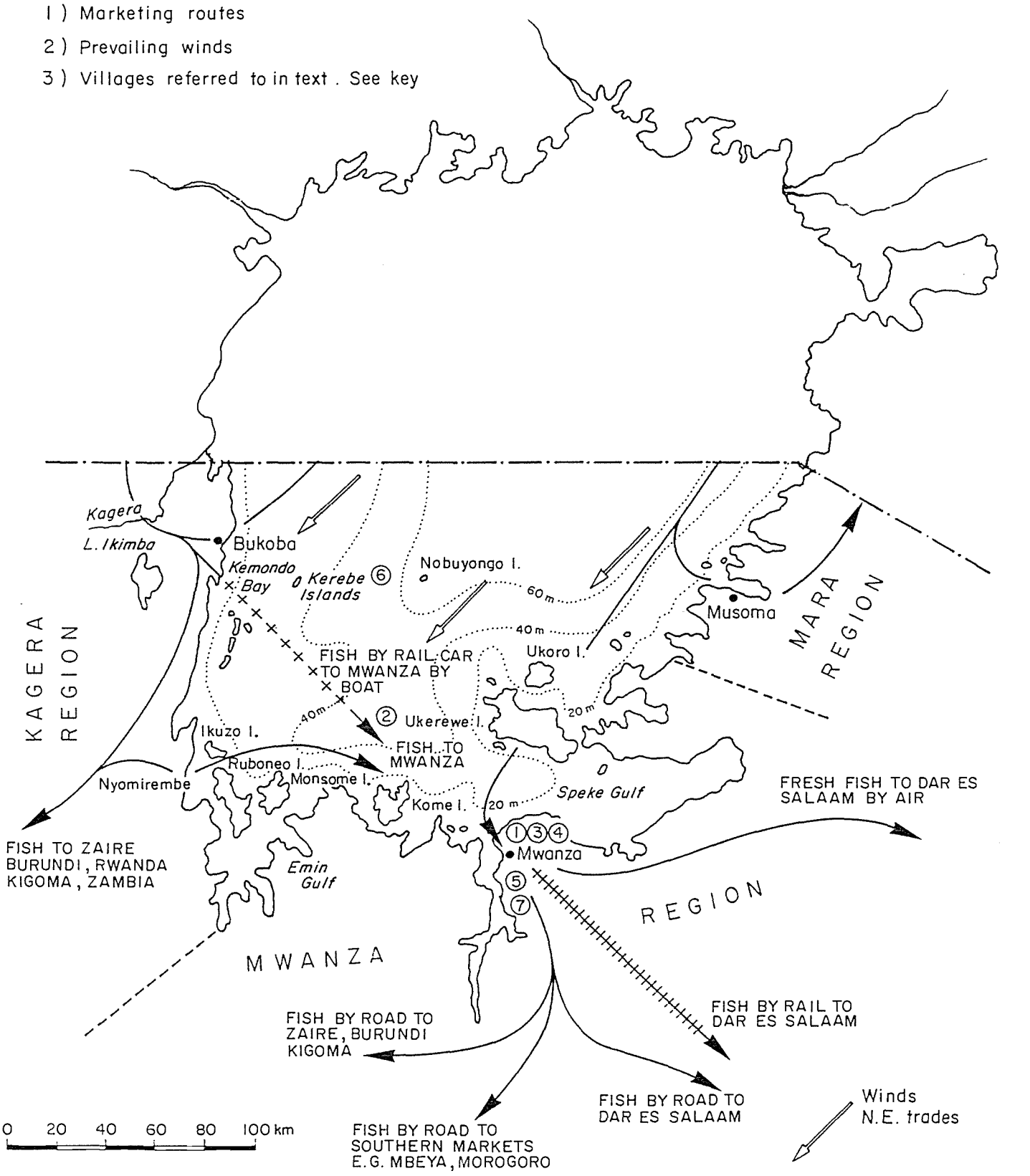
2) Prevailing winds

3) Villages referred to in text . See key



KEY

① Patiensa Mwanza district

② Ukerewe Mwanza district

③ Mwanza airport district

④ Kabamgaza Mwanza district

⑤ Niegezi Mwanza district

⑥ Kerebe Island

⑦ Busisli Mwanza district

Rains March - June
October - December

Fishing Communities in the Tanzanian Sector

The fishing communities on the lake coastline and offshore islands vary from settled large market towns, such as Bukoba, Musoma and Mwanza, to fishing farm villages and temporary camps. Fishing effort among the artisanal fleet is intensely commercial and operated on a large scale. This is particularly true of Mwanza and its hinterland, which has a large fleet of local vessels as well as acting as a marketing distribution point for other coastal villages and offshore islands. Large quantities of sun-dried and salted dagaa and processed Nile perch are assembled for onward transport by road or rail to various national and international markets.

Generally speaking, the fishermen of the western coastline tend to be more isolated, especially from Tanzanian markets, than those of the Mwanza or Mara Regions. It would appear that in the past the villagers of the mainland coast, as opposed to the offshore islands, have been mainly engaged in farming with fishing being only a secondary or seasonal occupation. Fishing villages along this coastline would be better described as temporary camps rather than fully specialized fishing villages. However, the arrival of Nile perch and increased quantities of dagaa have increased opportunities for fishermen to earn more than hitherto from fishing. In the past, the catches were confined to Haplochronis, tilapias and smaller quantities of dagaa. With the increase in commercially attractive fishing opportunities have come signs of increased numbers engaged in fishing as well as signs of increased specialization as more part time fishermen experience better prospects for higher incomes. However, the perceived status of artisanal fishermen in the Kagera Region still appears to be low in comparison with that of the full time farmer and the value of fishing to the area's development has not yet been fully appreciated. In Mwanza, and the Mara Region, to a lesser extent, it was particularly noticeable that the best prices were to be gained in foreign markets rather than in the domestic market. Fish seems to have always been a cheap and relatively plentiful resource which has hitherto been very much taken for granted on the domestic market. Trends are however evident that external forces may very well cause increases in fish prices and better returns to the fishermen. For example, increased landings of Nile perch have led to increased demand within Tanzanian markets, but in its processed form - salted and sun-dried or smoked - it has become increasingly attractive to consumers in Zaire who are prepared to pay higher prices than those currently achieved in Tanzania. Fresh, frozen fillet Nile perch, although not currently exported from the Tanzania sector of Lake Victoria, could become as large a foreign exchange earner for Tanzania as it is currently in Kenya which exports large quantities to markets in the Middle East and Europe.

Offshore Islands off the Tanzanian Coast

The fisheries established on the offshore islands vary enormously in the nature of their communities. However, there is a trend towards long-term establishment rather than just seasonal occupation of these islands. Dagaa fishing is the primary activity of most of the islands off the Kagera Region. Shoreline where advantage can be

taken of the shelter from the prevailing winds provided by the string of offshore islands. On Kerebe Island, some 20 nautical miles from Bukoba, there is a very active longline fishery for Bagrus and Nile perch where sun-dried swimbladders are prepared for export to the Far East. There is also reported to be a similarly active fishery on Nabuyongo Island, which is some 44 nautical miles to the west of Bukoba and virtually at the centre of the Lake.

To the south, the protected region of water around Kubondo Island is reported to be an active reserve which is helping to preserve suitable breeding habitats for Tilapia and other over-fished species.

On Ukerewe Island, there is a large dagaa and Nile perch fishery which contributes considerably to the landings witnessed in Mwanza. The dagaa itself is claimed to be of the lowest quality of any of the dagaa landed in Tanzania. The reason for this is reported to be that the Lake Victoria dagaa, which a different species of fish, has a bitter after taste, especially when eaten in its dried form. The dagaa from Lake Tanganyika (Limnothrissa Miodon and Stolothrissa Tanganicae) are of superior taste; in consequence, Lake Victoria dagaa is not as sought after as that of those other lakes and achieves a lower price. This is especially evident during the rains, when much dagaa has in the past been converted into animal feed. This is due to lack of drying facilities, especially in the Kagera Region, which has a heavier rainfall than Mwanza or the Mara Region. Low prices seem to have reinforced reluctance among fishermen to improve their processing methods, which commonly means drying the fish on sand and grass, with consequent contamination of the product. In the circumstances, sun-dried dagaa receives a low price whether it is free of grit and rubbish or whether it has been well dried on rocks or drying floors and racks. With no premium paid for better quality, there is currently no incentive to improve the processing methods.

Dagaa: Food of the Poor

Nevertheless, dried dagaa forms an important part of the diet and nutrition of many rural areas of Tanzania. This is particularly true of the poorest sections of society for whom the Lake Victoria dagaa forms an important source of protein. The poor quality of the product, irrespective of its naturally inferior flavour, is perhaps indicative of the need for further attempts to improve quality by using better methods of drying and processing to improve flavour. However, any changes may well be resisted due to the factors outlined above, but the continued practice of using Lake Victoria dagaa for fish meal, rather than for human consumption, is a practice which may not be the best use for a resource whose future supply would be better directed towards human consumption.

Fishing Gear Availabiity in the Tanzanian Sector

For a variety of reasons which do not concern us here, the supply of fishing gear to the artisanal fishermen of Lake Victoria has neither been consistent nor supplied at a price readily afforded by the fishermen. In spite of this, the artisanal sector has made good use of natural fibres and materials as well as alternative use of man-made waste products in their attempts to overcome these shortages.

They have, for example, used plaited palm leaf fibres in place of 12 - 15 mm beach seine hauling ropes. These "ropes" last approximately a month but are considerably cheaper than man-made fibre ropes. Alternative usage has also led to the use of flattened corrugated iron to replace bottom planks in canoes, wood net floats, and small stones wrapped in banana or sweetcorn leaves instead of lead sinkers. This arrangement has the added benefit that it helps prevent the "leadline" of beach seines cutting into soft mud as they are pulled into shallow water. The most innovative adaptation has been the common use of manmade twines used to strengthen the walls of rubber vehicle tyres. These twines are extracted in short lengths, tied together and braided into gillnets for Nile perch. Not only are they said to be as good as "manufactured" netting but are reported to last longer.

1. FISHING CRAFT OF THE TANZANIAN SECTOR OF LAKE VICTORIA (Fig. 1 to 4)

The fishing craft of the Tanzanian sector of Lake Victoria are characterized by their low level of motorization and the continued adherence to traditional methods of construction and design. The majority of fishing vessels in operation are of the canoe type and vary in length from around 5 - 9 m and cost between Tsh 40 000 for a 5 m craft to Tsh 80-90 000 for a 9 m craft. They are almost all powered by sail and paddles, although in general more fishermen use sail in the eastern and southern areas of the lake than in the west, where contrary winds make paddles the more likely form of propulsion. In consequence, fishing effort tends to become concentrated around the main marketing centres. This is particularly true of the Mwanza area where the level of fishing effort is most noticeably intense.

In general, the canoes of Lake Victoria are planked with Muninga (Pterocarpus angorensis) or other hard and cheap local timbers. However, these planks do not last long in the alkaline environment of the lake and bottom planks need frequent replacement. In the Bukoba area, these bottom planks have in some cases been replaced by flattened and shaped corrugated iron which overcomes the problem of stressed bottom planks, excessive leaks and the necessity for frequent replacement. The non-saline environment of Lake Victoria means that corrugated iron and mild steel fastenings last much longer than they would in a marine environment.

According to the most recently published statistics, there are approximately 6 500 fishing vessels registered in the Regions of Kagera (Bukoba), Mwanza and Mara, but only 130 outboard engines are in use for fishing operations (2%). These engines often double for use in the transport of fish to "landing sites" and are generally in the 6 - 15 hp for fishing and 15 - 40 hp for transport operations. The scarcity of motorized vessels in the Tanzanian sector reflects a national scarcity of foreign exchange to purchase engines and spare parts, which therefore tend to be expensive (Tsh 150 000 for 6 - 8 hp, Tsh 300 000 for 10 hp, Tsh 400 000 for 25 hp. This low level of motorization is also a reflection of the continued appropriateness of

sail power in both transport and fishing operations on Lake Victoria, especially in the Mara and Mwanza Regions. For example, in the Ingombe area, favourable North East winds during the dry season (June - August) make the use of the lateen sail a common, economic and preferred form of propulsion, whereas in Kagera adverse wind conditions militate against the use of traditional sail and hull combinations, which generally have poor windward performance.

With the increased opportunities for larger catches of dagaa, there are signs that increasing numbers of fishermen are adopting the catamaran for liftnetting for dagaa.

2. TYPICAL GEAR DESIGNS AND METHODS OF OPERATIONS USED IN THE TANZANIAN SECTOR OF LAKE VICTORIA

2.1 Gillnetting for Nile Perch (Fig. 5)

Mesh sizes used are: 152 mm (6") - 178 mm (7") - 203 mm (8"), mainly 150 - 180 mm. Gillnets of various mesh sizes are often found on board but 178 mm (7") is now the most common. The same nets with the same mesh size are used all the year round. It can be noted that a few years ago 203 mm (8") was the most common mesh size, but now there is a tendency to use smaller mesh sizes, while the use of larger mesh, up to 229 mm (9"), has practically disappeared. Twine size used is around 420 RTex (210D/15-36).

The life of a gillnet varies greatly according to the twine size from which they are made. For example, a gillnet made of PA with 210/36 (840 RTex) could llast for two years but when made of 210/15 (350/RTex) the expected duration is no more than six months.

It is to be noted that the use of gillnets made of monofilament are prohibited for all fishing except research.

2.1.1 Netting: sources of supply

The nets used have various origins: bought from a net manufacturer (there is one in Mwanza); received from abroad (NORAD has provided a lot of nets over the last few years, 1986-88); homemade of PA twine bought in spools or sometimes PE twine extracted from cereal sacks or made from the byproduct of a tyre factory.

The "tyre-type" twine is PA twisted, diameter 0.9 mm, and can be bought at many markets, yet it is not currently in use in the Bukoba area (western side). When available, it is possible to buy rough twine with the rubber still attached (Tsh 200/kg); clean twine in pieces of 1 or 2 m (Sh 50/60 m); in small pieces of webbing of various mesh sizes, 23-26 meshes deep (around Sh 3 000 to make a gillnet, 127 mm (5") - 178 mm (7") mesh size x 90 m stretched lengh). It is to be noted that the fishermen estimate that this is the best material for their gillnets (in spite of the fact that there is a knot every 1 to 3 m) as it is the strongest, lasting up to 3-4 years, and the cheapest, and according to some fishermen has superior catching qualities to purchased synthetic nets. This and the claimed longevity may reflect the high quality fibres needed in tyre construction.

The gillnets observed were mainly made from manufactured webbing or home-made from "tyre-type" twine. Fully rigged nets from the manufacturers are said to be too expensive. Cheap webbing can be bought in the larger towns. Fishermen from Bukoba often buy their netting in Mwanza, which is not far if the regular sailing lane is used. If close to a large town, and if money is available, the fishermen prefer to replace, rather than spend time mending, seriously damaged nets. This often happens in Bukoba, close to Uganda, where nets are cheap and the fishermen, due to intensive fishing, change their nets as often as every six months. Needless to say, this will not be the case in more isolated places where fishermen have less funds or sources.

Most of the gillnets for Nile perch are either white, if of PA, or brown, if of the "tyre-type" twine. However, blue gillnets are also used and said to be more efficient. The gillnets provided by NORAD are considered the best because, among other factors, of their grey colour.

The gillnets are usually hung on PA/PE ropes, diameter 2 mm, in a 45 m long unit. They are 26 meshes (sometimes 23-25) deep and hung between 0.50-0.60.

Floats used are usually PVC or expanded polystyrene diameter 40 X 50 mm (50 gf floatation), or if not available made of wood, which is often the case along the Kagera coastline. Small stones covered with corn leaves are often used as a lead. Base price of a rigged net, 45 m long, 26 mesh deep, mesh size 152-178 mm, is Tsh 2-2 500 when made of "tyre-type" twine, around Tsh 3 000 for 90 m (stretched length) when home made from PA twine, and Tsh 5 000 if bought from a manufacturer.

The number of gillnet units per boat vary greatly according to the size of the boat and the wealth of the fisherman, e.g. from around 10 nets for a 15 ft (5 m) boat or 100 or more for a 25 ft (8 m) craft; very often between 30 to 80 nets per fishing unit. Handling the nets requires from three to eight crew members, depending on the size of the canoe.

2.1.2 Method of setting (Fig. 8)

Gillnetting is carried out as follows: shooting the nets in the evening and hauling them in in the morning. Most of the time the canoes return to shore after setting the nets. However, in some areas, for instance, Bukoba, due to fear of theft the nets are never left unattended. Nets are never left at sea during the day time not only because of the risk of theft but also because of regulations which give trawling priority during the day. A few minor incidents between gillnetters and trawlers have been reported in the Ukurewe and Bukoba areas.

Nile perch are caught all the year round, but fishing grounds may change. In February (rainy season) fish are found in more inshore areas, which means two hours of rowing or sailing to the fishing grounds. In another season, it could take up to six hours or more. Fishing is carried out at any depth. On the western coast, the water depth steeply increases. On the eastern side it is shallower. Generally, fishing grounds for Nile perch and dagaa are the same. Fish caught are larger during the rainy season (August to April), especially during March-April. No large shoals of Nile perch were detected by the echo-sounder, only small patches (Ligtvoet). Therefore, it would seem that large resources of Nile perch do not exist offshore in deeper waters (Ligtvoet). However, further trials should not be excluded. Generally, the nets are set around 10 to 15 m off the bottom. This distance is said to depend upon the moon's cycle, i.e. when it is full moon the nets are set nearer the surface in midwater. Apparently Nile perch migrate according to the moon and food available. Nets are set on any type of bottom, smooth or rough, and usually only in one fleet. Some fishermen said they used to set a series of nets, hauling one after another, but changed because of thefts. The expected catch is around 15-40 fish per 1 000 m of gillnet. Very few canoes use both gillnets and longlines; nearly all the craft specialize in one method only. Most of the fishermen spoken to thought there had been a drop in catches over the last few years but no change in the average size of fish caught.

2.2 Gillnetting for Tilapia and Other Species (Fig. 6 to 10)

Gillnets with small mesh, 50-75 mm (2-3") are used for labeo, shilbe, sinodontis and small tilapia.

Nets with 75-130 mm (3-5") mesh size are used for tilapia. Floats and lead are the same as those on the gillnets used for Nile perch. Tilapia fishing is in fact less common now because of its scarcity in most areas. In some places smaller mesh is used, 40 mm (1.5"), for haplochromis, but this species is becoming more and more scarce. Fishing for tilapia with gillnets is carried out in the southwest, north of Emin Pasha Bay (mainly from the islands as most of the fishing activity is in that area), and not so much in the Bukoba district. There is some evidence to indicate the strengthening of Tilapia stocks due to diversion of effort to Nile perch fishing.

2.3 Surrounding Gillnet for Tilapia

These nets, around 70 m long, 2.5-4 m stretched depth, have a mesh size from 80 mm (3") to 90-95 mm (4") twine size, 280-350 RTex; heavily leaded they are used in shallow water. After surrounding the fish the nets are closed at the bottom by divers. The same floats and lead are used as on the other gillnets.

In Ukurewe they are reported to have 5-10 mm mesh size and to be around 60 m long with 250-440 meshes depth. The webbing with very small mesh used are knotless, sometimes with hexagonal mesh, often 8 mm, 280 RTex. The whole net, wings and bunt, is made of the same webbing, whereas sometimes the wings have mesh up to 10 mm, having 7-8 mm in the central part. Floats and lead are the same as those of the gillnet.

The seines for dagaa are set from a small canoe, 5-6 m long. For light attraction, kerosene lamps, Anchor model (made in China and available everywhere locally) are used. As a first step, the fish is attracted by the light (the number of lamps used will depend on amount of fish present, 4 to 10 lamps or more); after the light has been on for one or two hours the lamps which have been installed on locally made rafts are either towed very slowly towards the shore or left in the same position and the net is then set around the lamps. At this stage there are two ways of operating: either the seine is hauled from the canoe offshore or if the net has towing ropes it is hauled on to the beach (these small nets are in this case towed by only a few men, say five).

The time for fishing at night may vary: in Mwanza district a fishermen will put the lights on at 20.00 h if there is no wind or at midnight if it is windy. The seine is set several times in one night, as many as five times in a full night. The main species caught is dagaa, of course, but some by-catch of small Nile perch, especially when there is a new moon, has been reported. Better catches are reported in the dry season. A good catch would mean, after processing, up to six sacks or 200 kg of dried dagaa. Average catch would be around 60 to 90 kg/fishing unit/night.

One professional fisherman reported a slight drop in his inshore catch; he estimated that catches are better when using a liftnet from a catamaran further offshore.

Seines for dagaa are much used in the Ukurewe district and all the surrounding islands. They are used in the Musoma area but infrequently on the western coast because of water depth and frequent bad weather.

2.6 Scoopnet Fishing for Dagaa (Fig. 18 and 19)

These sacks, held with a long pole, are made of knotless webbing, 200 RTex, mesh size around 8-10 mm.

Scoopnets are used after the dagaa have been attracted closed to the canoe by light using two or three kerosene lamps. One or two lamps on rafts are lit separately but held from the canoe by ropes, one lamp is kept on board; after some time the lamps on the rafts are slowly hauled to the canoe in order to concentrate the fish close to the craft. There is one scoopnet per boat which has two or three

crew-members. Various types of lamps are used: Anchor, Mwenge, Butterfly or Petromax, prices between Tsh 5 500 and 8 000 (the lamps seem to be slightly more expensive in Bukoba where Petromax are more common), spare parts are available locally. (Anchor type was reported as giving a brighter light with better penetration under water). A scoopnet costs around Tsh 3-4 000 (see Fig. 23 and 24).

Scoopnets for dagaa are used in the Ukurewe area, east of Mwanza, where they are becoming more and more popular, and also in the Bukoba and Musoma areas. It seems that relative efficiency of beach seine/scoopnets depend on various conditions: moon phase, water temperature, etc. As far as catch is concerned, there is no great difference between seasons.

2.7 Liftnetting for Dagaa (Fig. 20 and 21)

This technique was imported from Lake Tanganyika a few years ago.

The liftnet, with mesh size of 8-10 mm, has an opening circumference of around 42 m. Several lamps are used for light attraction, three per fishing unit. These lamps are of various trademarks: Anchor (price around Tsh 7 500). Six litres of kerosens (Tsh 50/1) are used per night.

Liftnets are used on board catamarans, 6 m long, 4.5-6 m between the two canoes, with four outrigger poles 5-6 m long. Many of the catamarans observed were equipped with an outboard engine, around 7 HP, but they generally fish near the coast. There are around eight crew-members on a catamaran. The net is lifted from three to six times per night.

Fishermen using liftnets employ this method all year round. A better catch is reported in the rainy season but can often be affected by the moon and in some areas, for instance Musoma, fishermen do not fish when there is a full moon since light attaction is not effective. A good catch would be up to 300 kg per night.

2.8 Longlining for Various Species (see Fig. 22 to 26)

Longlines are used for Nile perch, clarias (especially in the dry season: May to July), bagrus, protopterus (in shallow water). Fishing with hooks does not seem to be very selective as far as species are concerned.

Often there are no snoods and the hooks are only a few centimetres from the mainline. The reason why there are no snoods is not clear. In fact, fishermen said that in the past they have tried using snoods but results were poor.

Bait used various: dagaa, full fresh fish, which would be the best, haplochromis, pieces of fish (Nile perch, for instance), cereal meal, earth worms, insects. In the Bukoba area insects and seaweed are used; the latter is said to be the best bait especially for bagrus.

When small fish are used as bait they are often caught with purpose-made gillnets (refer to the drawing of a small gillnet used to catch haplochromis as bait in the Bukoba area).

From 1 500 to 2 500 hooks per boat (Ukurewe) are used, up to 3 000 observed in Musoma; the average is around 600 hooks per crew member. On a canoe there are 3-4 crew members.

The cost of a longline is between Tsh 2 500 and 4 000 for a line with 400-600 hooks.

Longlines are used mainly as demersal lines near the bottom. During full moon periods lines are sometimes set in midwater. The bottom longlines are set on any type of bottom, smooth or rough. The fishing grounds are in fact the same as those for gillnetting.

In the Musoma area, a distinction can be made between longlines for Nile perch set in midwater and longlines for protopterus and clarias set on the bottom; however, Nile perch is also caught close to the bottom. Some boats use only one type of line, others fish both in midwater and on the bottom. An interesting variation on this theme was observed on Kareba Island 20 nautical miles to seaward of Bukoba. Here the use of a particular twine allowed the gear to sink slowly to the bottom through different layers catching both pelagic and dermersal fish. It was claimed that this method was much more productive than a line either set mid-water or on the bottom and caught a wider selection of fish.

In Ukurewe, lines are usually set in the morning and hauled 24 hours later, i.e. the following morning. In Bukoba the line is set in the evening and hauled the following morning with the canoe remaining close to the line.

Most of the boats using longlines are not motorized.

Generally speaking, those fishing units practising longlining will use this method exclusively the whole year round. The catch is said to be better when there is a new moon or the last quarter of moon. The rain does not greatly effect efficiency. However, in Musoma the fishermen said the catch is better in the rainy season (March-April). A good catch would be around 50 fish/300 hooks.

Fishermen said that the average size of fish caught is decreasing. Some species, especially bagrus, are becomming more and more scarce.

2.9 Other Lining Methods

Some handlining activities were observed but seemed very limited. Pole and line fishing is frequent but only at subsistence level, mainly by children.

2.10 Trawling for Nile Perch (Fig. 27 and 28)

Around 18 trawlers are now said to be used in the Tanzanian waters and a few of these operate everywhere: one from Bukoba presently operated by a private concern, two from Niegezy (a research vessel and a training/research vessel), a few from Magu Bay, two currently unused trawlers operated by the Nyanza Fishing Company east of Mwanza (15 m, steel, 175 HP, capacity around 6 t), two operated by the Victoria Fishing Company in Musoma (6 m long, plywood, 30 HP, single winch), two others are used in the same district, in addition one is being built in Ukara, Ukerewe district (10 m, 64 HP). The trawlers have no echo sounder and no ice for fish on board. Several trawlers observed were out of order because of engine problems; others were out of action due to damage to trawl gear.

Trawlers are used for bottom trawling on muddy bottom with light ground rope, diameter 10 mm with small pieces of chain. Trawling speed would be around 3 knots. Trawling is allowed only in day time.

The Nyanza Fishing Company presently operates only one trawler using a high-opening bottom trawl, 22/30 m, with mesh size 150 mm in the wings, 80 mm in the fore part, then 60 mm, with a codend of 20 mm mesh size (there is no regulation for mesh size in the codend), 8 m long, 150 mesh wide. The otter boards are 1.75 x 0.9 m, 100 kg.

The trawler from Bukoba uses a small bottom trawl with rectangular flat wooden otter boards, 1.5 x 0.7 m and a ground rope more suited to an even seabed. In consequence, it suffers much downtime due to use of an inappropriate ground rope which not only snags the seabed very easily but also causes a great deal of damage to the net. The employment of rock hopper gear would be much more appropriate for fishing unknown occasionally rocky ground and reduce downtime due to net damage.

The Victoria Fishing Company undertakes pair trawling with a small trawl made of PA, mesh size in the wings 180 mm, 420 RTex, with codend 90 mm mesh size, 2 500 RTex, 37 mesh long, 36 mesh wide. Rigging is with two bridles, diameter 6 mm, 20 m long, then warps made of synthetic fibre, diameter 25 mm. Off Musoma these vessels are trawling in 15 m depth, which is far from the shore in that area (see Fig. 17).

The best catch would be around November or in the rainy season (February-April), when there is little wind. The best fishing time is early in the morning. A good catch was reported to be around 120-130 fish per haul. The average catch in the dry season is 400-1 000 kg/day. The main species is by far Nile perch with some by-catch of tilapia in the Musoma area.

Some possibilities for development of trawling activities were reported on the western side, south of Bukoba. There is (unfortunately) a regional programme for development of a trawling fleet in Tanzanian waters, the result of which will undoubtedly be trouble, incidents and competition between trawlers and artisanal craft using traditional passive fishing methods.

Unfortunately, there are plans to develop a regional trawling fleet in Tanzanian waters while there are reports that trawling has been banned altogether in Kenyan waters. Apart from the potential damage to stocks, such encouragement could lead to friction between trawlers and artisanal fishermen competing on the same fishing grounds. This in turn could threaten the livelihood of thousands of artisanal fishermen who use more passive and more fuel efficient forms of fishing.

In this respect, it would be more practical and fuel efficient for such trawlers that are in operation to be converted to gillnetters. This form of fishing is far more fuel-efficient than trawling and would in all likelihood be a more effective use of scarce resources and lead to far less friction. Gillnetting also requires less skill, is less risky in terms of lost and damaged nets, and can be more effective than trawling.

2.11 Trap Fishing (Fig. 29)

Trap fishing is generally a very limited, part time activity engaged in by part-time farmers and the elderly living in swampy areas or the approaches to streams and rivers. Only weirs, made of bamboo-like wood installed a few metres from the coastline were observed in the Musoma district (see Fig. 35). These are used mainly for tilapia, especially in the rainy season.

2.12 Characteristics of some Nettings Commonly in use in Tanzania given in Local and Standard Units

Units in Use Locally			Standard Units	
Mesh size in inches (")		Twine size in "denier"	Mesh size in mm	Twine size in R Tex
seine and lifnet for dagaa	3/8	210/9	10	210
codend of beach seine	3/4	210/12-24	19	280-560
gillnet for tilapia	2-2.5	210/4	50-65	93
	3	210/12	76	280
	4	210/9-15	101	210-350
gillnet for Nile perch	5	210/9-15	127	210-350
	6	210/12-15	152	280-350
	7	210/15-18	178	350-420
	8	210/36	203	840

3. CONCLUSIONS

The fishing gear and methods of fishing appear to exploit all the available resources of the Tanzanian sector of Lake Victoria in a manner which is mainly appropriate to the continuation of current levels of fishing effort. The design of the fishing gear and vessels is generally good considering the lack of access to both fishing gear, techniques and markets for their fish. Improvements could be made to longlining and gillnetting efficiency, use of echo sounders, introduction of more efficient sails, and the encouragement of motor-sailing, especially along shorelines with strong on-shore breezes, such as kagera. Above all, however, improving the access to fishing gear in general would enable more fishermen to optimise their current fishing operations. Hand in hand with these processes would come the encouragement of fleet dispersal and the exploitation of resources further offshore and away from the main marketing and fish landing stations. This could be achieved by improved access to outboard engines, spare parts and repair facilities, with encouragement of motor sailing techniques of propulsion for both fishing vessels and transporters. However, the trend towards trawling should be discouraged, perhaps through the encouragement of less damaging practices such as using gillnets; perhaps introducing financial encouragement or provision of the gear necessary in exchange for the trawls together with a ban on trawling operations. Such a procedure of encouragement could also be adopted with respect to the use of beach seines. Both are expensive forms of fish capture which tend to be attractive to non-fishermen or part-time fishermen with cash to spare. The encouragement of such entrepreneurial spirit should be helped to direct their energies and resources to comparably more effective forms of fish capture without the consequent damage to the seabed and fish stocks. In this respect, it would not be sufficient to be entirely negative and destroy and discourage such initiatives, especially in areas where such entrepreneurial initiatives are so scarce.

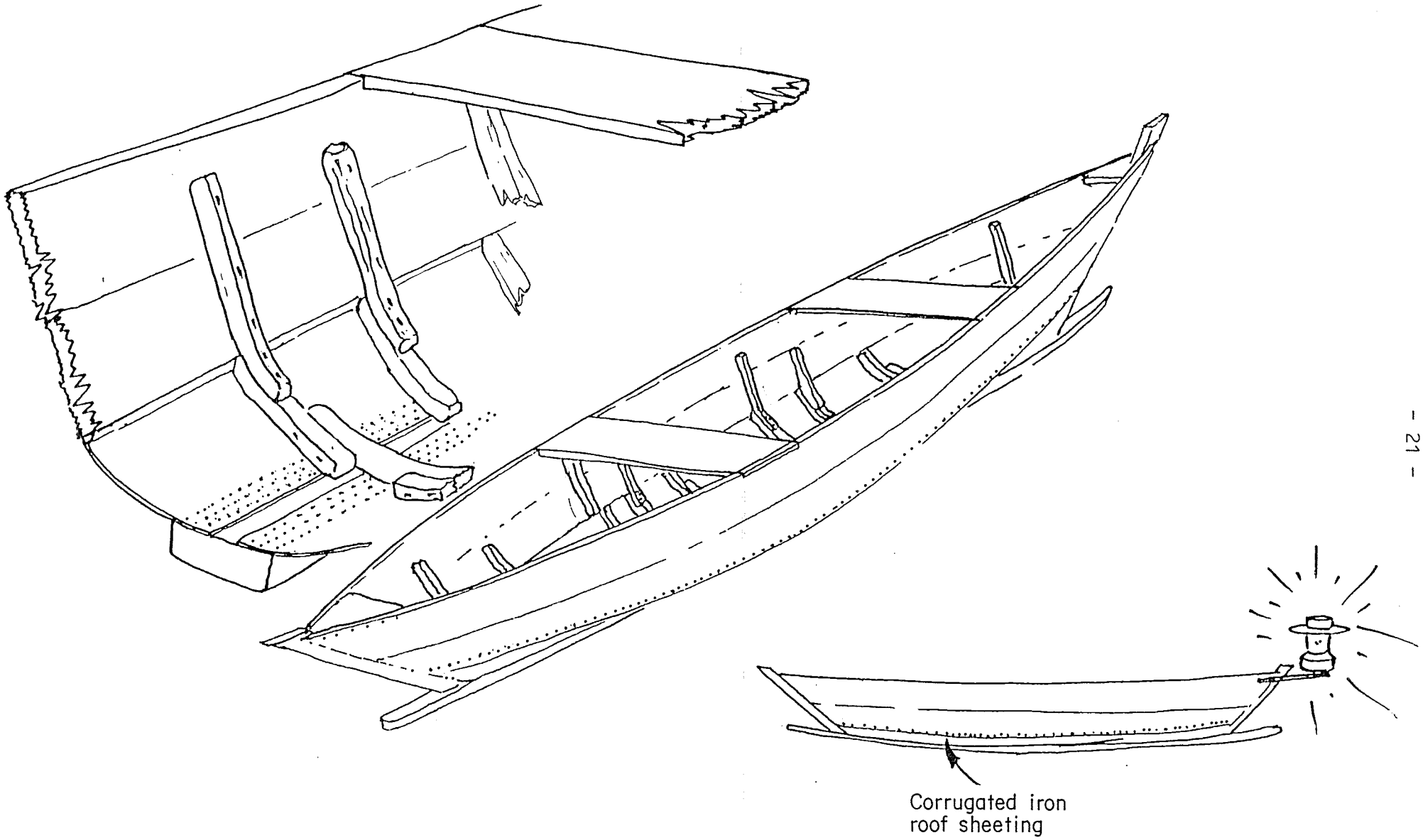


Figure 1 Type of vessel : Dagaa and long lining canoe.
Area : Kagera coastline , Lake Victoria .

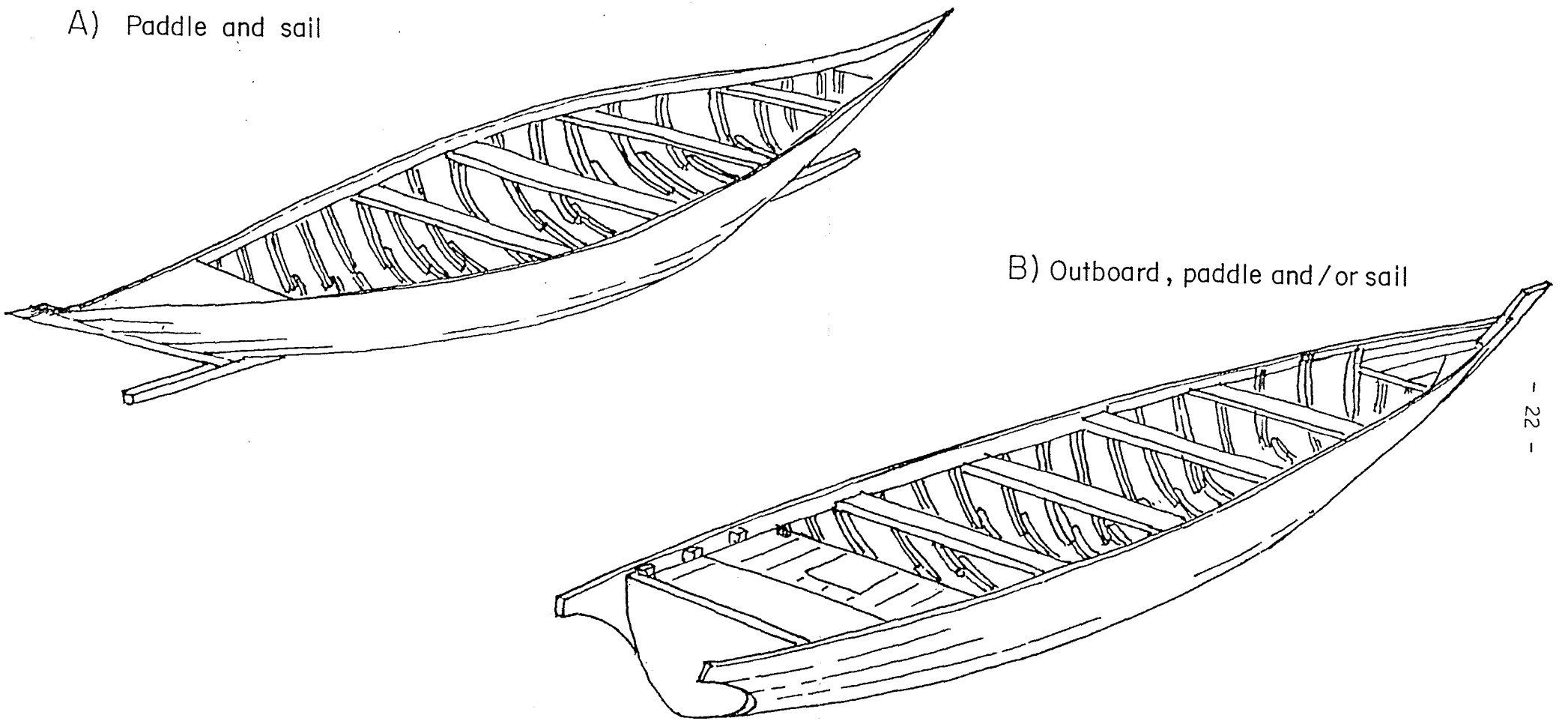


Figure 2 Type of fishing vessel : canoe (outboard and sails / paddle)
Area : Lake Victoria , Mwanza

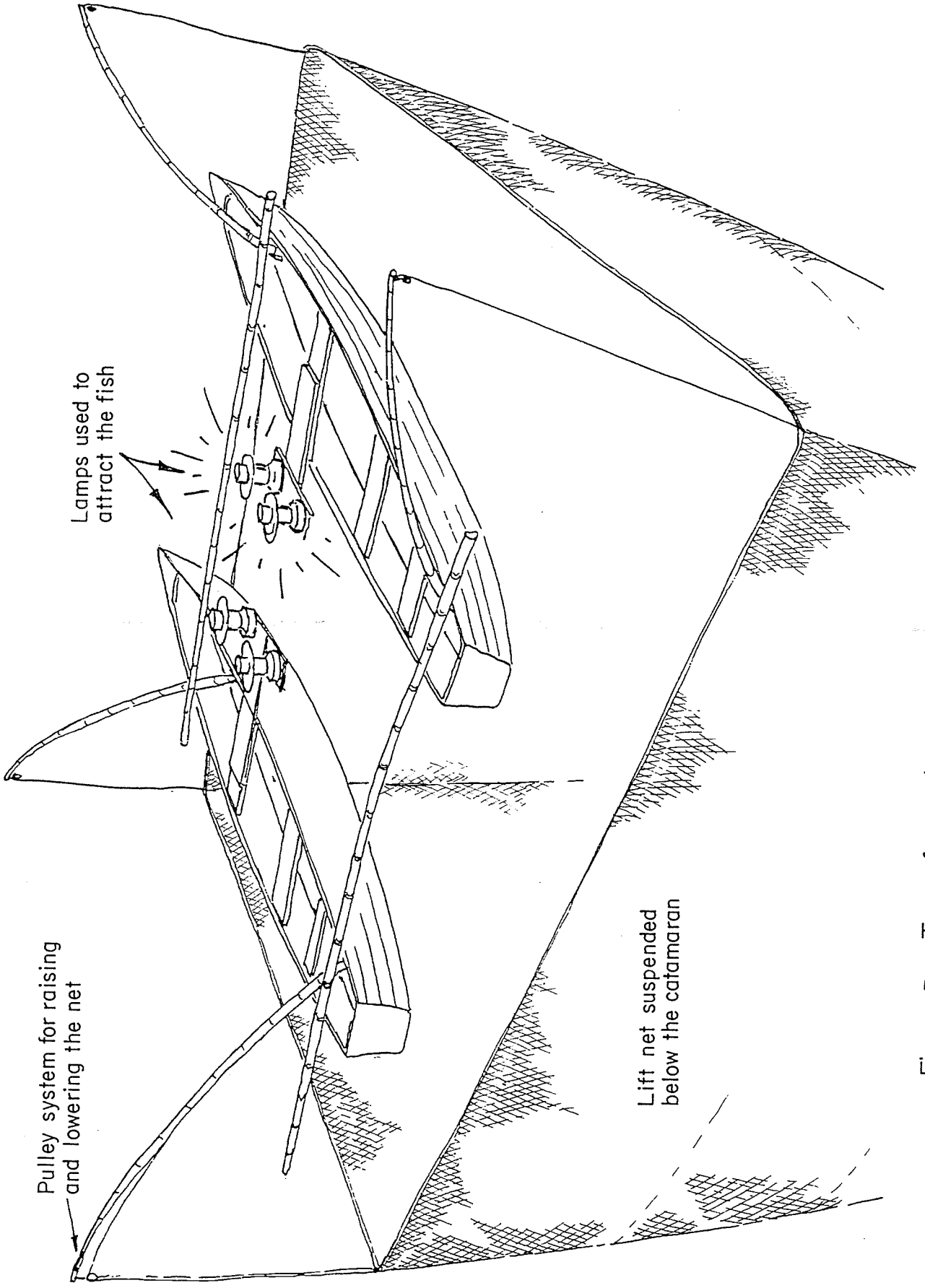


Figure 3 Type of vessel : catamaran lift net unit. Recently adopted from Lake Tanganyika

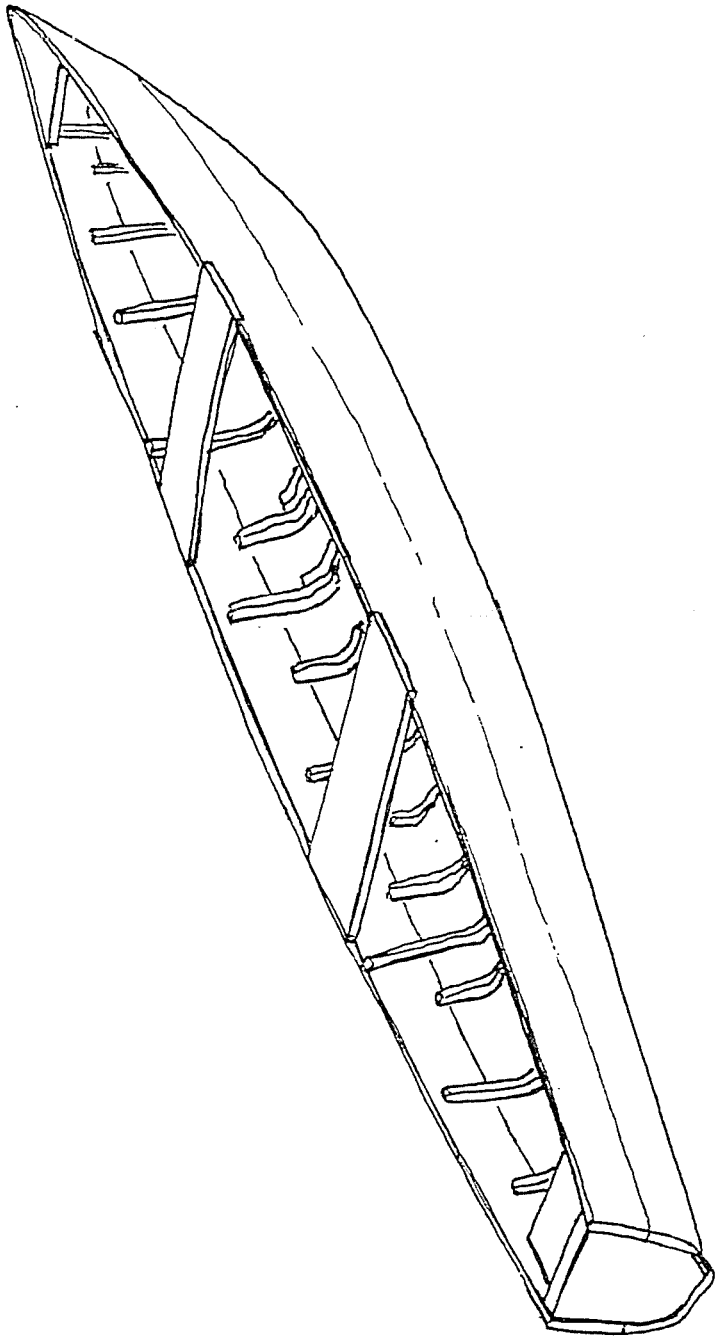
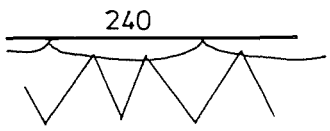


Figure 4 Type of vessel : gill net canoe.
Area : Bukoba Lake Victoria.
Paddles or outboard engine.

Fig. 5 GILLNET FOR NILE PERCH

Pasiensi , Mwanza dist.
TANZANIA
LAKE VICTORIA



E = 0,66

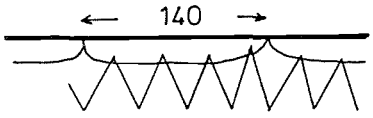
5 × PVC ø 40 ×50 45.00 PE/PA ø 2

26 180 mm PA R 93 tex

stone 45.00 PE ø 2

Fig. 6 GILLNET FOR SMALL TILAPIA

Patiensa, Mwanza dist.
TANZANIA
LAKE VICTORIA



E = 0,53

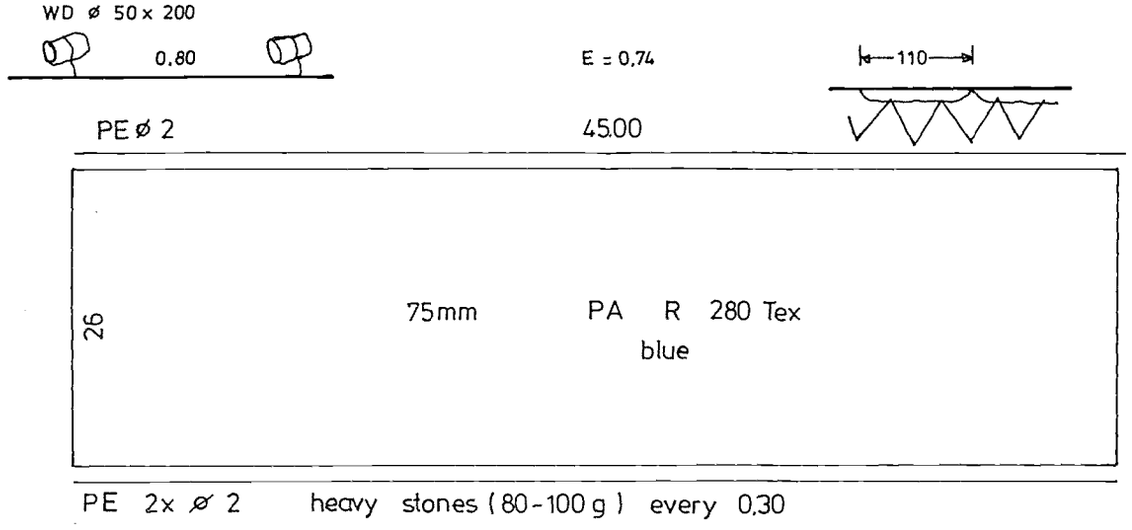
Polystyren float PA ⌀ 0,9 ~ 50.00

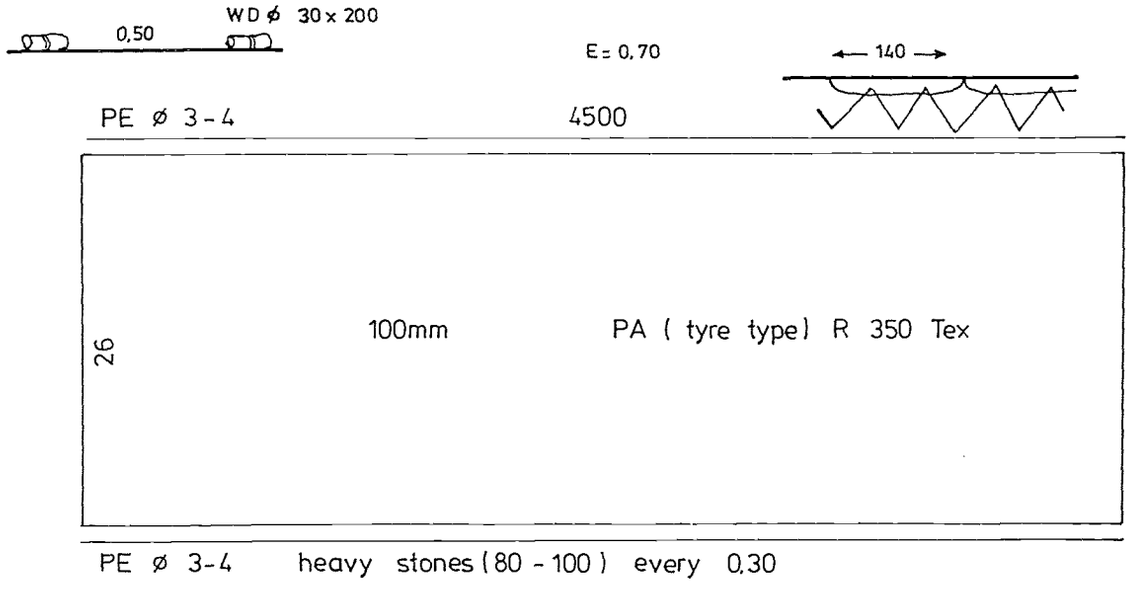
65 mm PA R 93 tex

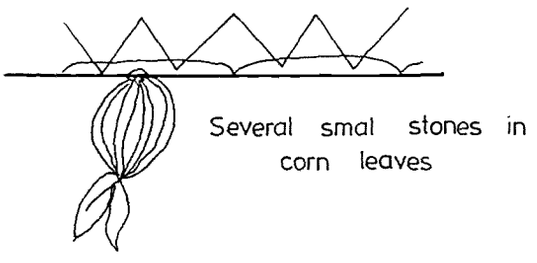
heavily lead

Fig. 7 GILLNET FOR TILAPIA
bottom set

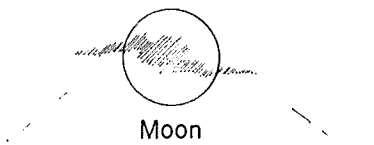
Busisi , Mwanza dist.
TANZANIA
LAKE VICTORIA

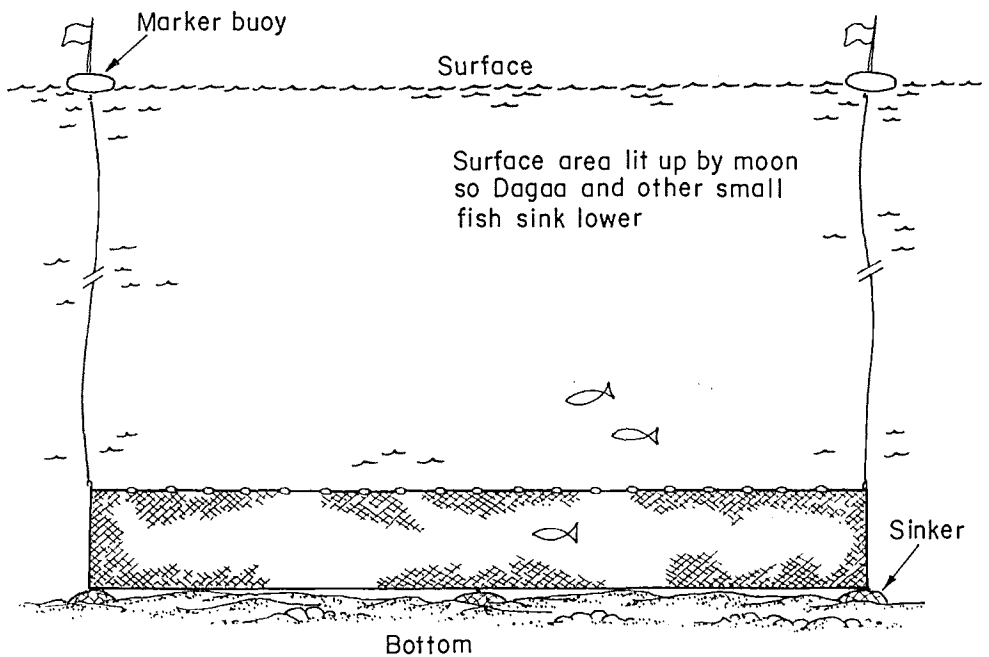






A During a moonlit period.
Nets are either set on the bottom
or close to the bottom





B During a moonless period the surface waters are
dark and Dagaa rises nearer the surface.
Gill nets are therefore set above the bottom in
a mid-water position

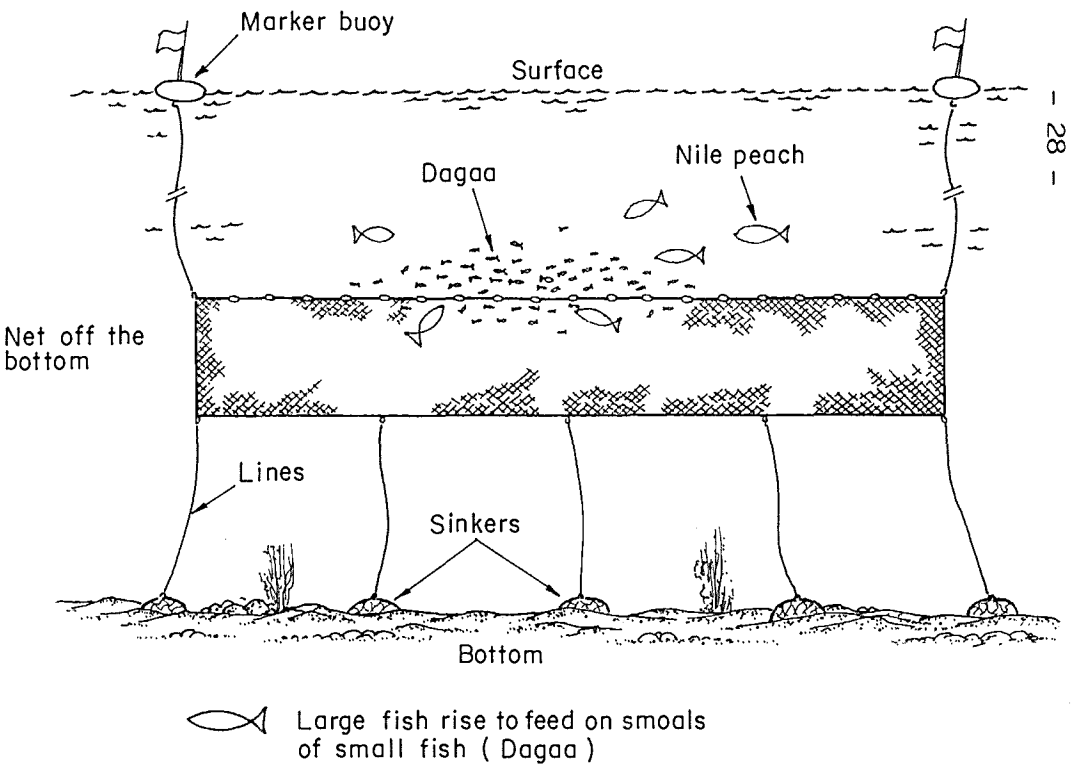


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Figure 8 Setting of bottom gillnet according to the moon

Fig. 9 GILLNET FOR HAPLOCHROMIS

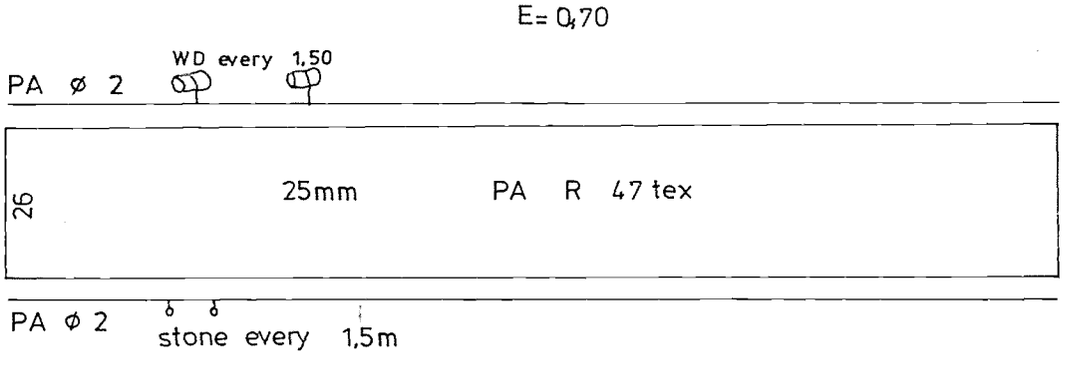
(bait fish)

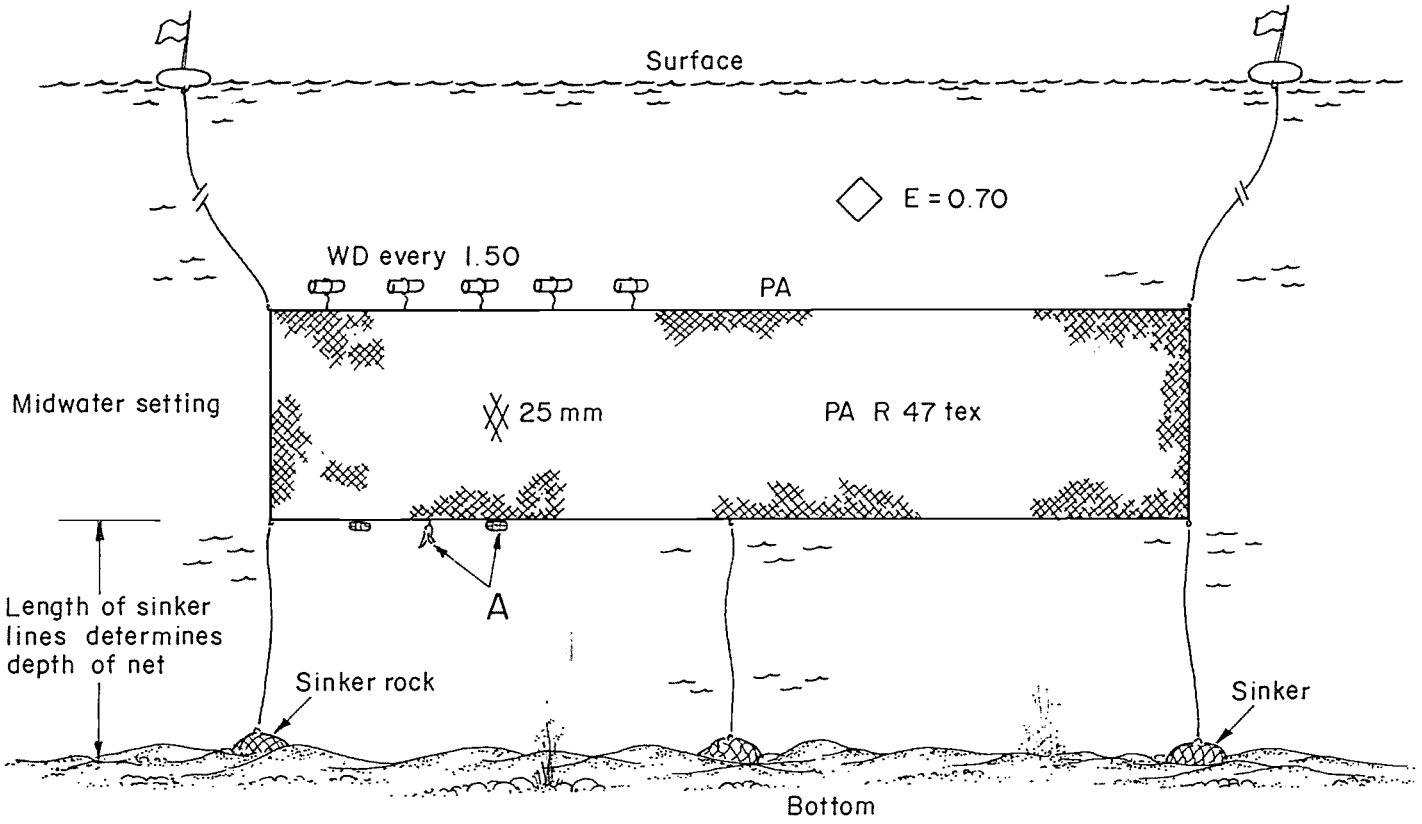
midwater

Bukoba

TANZANIA

LAKE VICTORIA





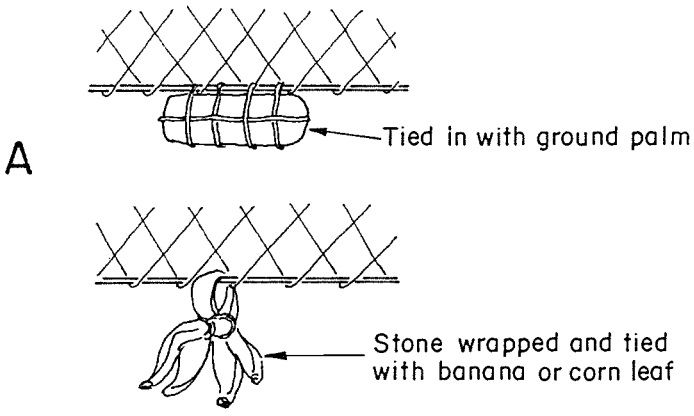
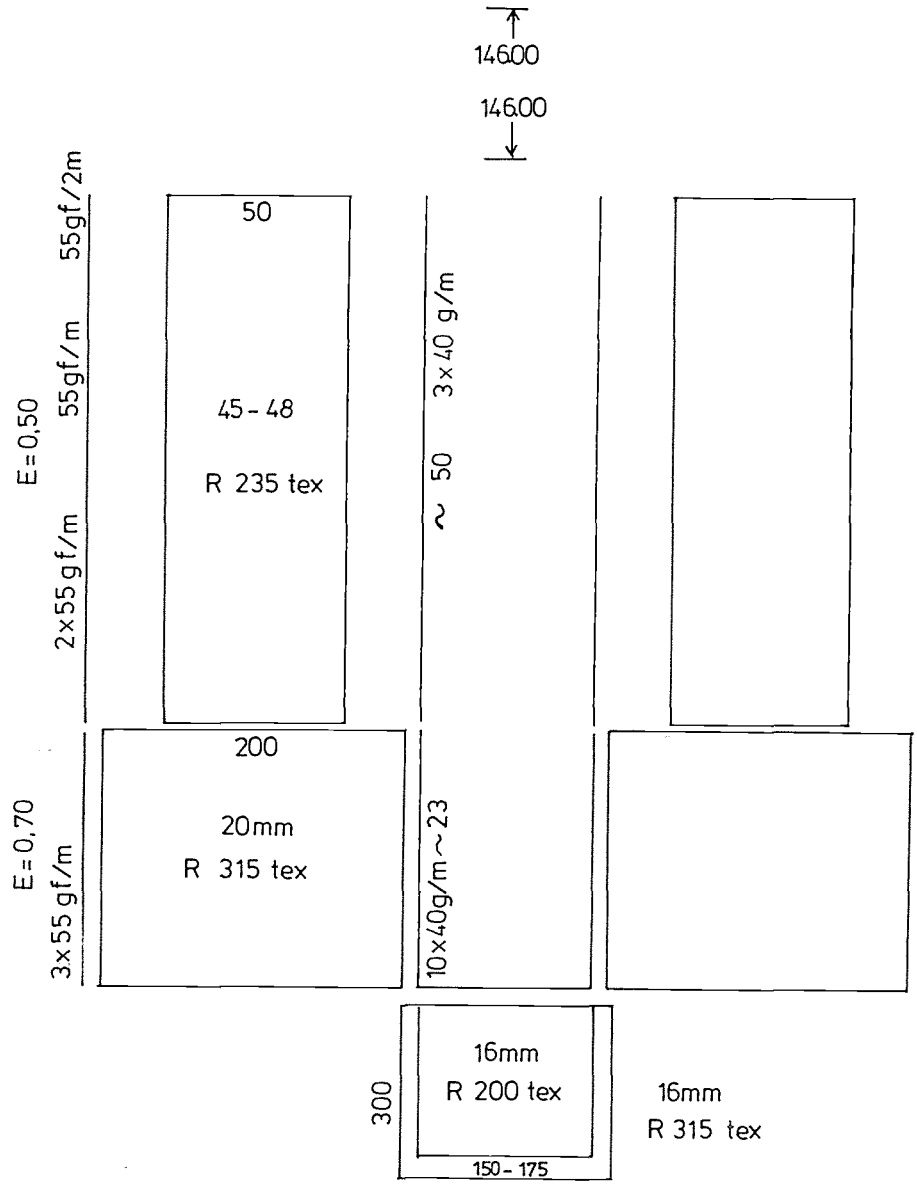


Figure 10 Setting of gillnet for Haplochromis

Fig. 11 BEACH SEINE FOR LARGE AND MEDIUM SIZE FISH with bunt

Mwanza airport
TANZANIA
LAKE VICTORIA



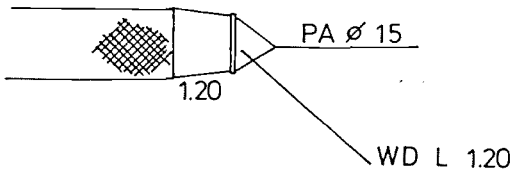
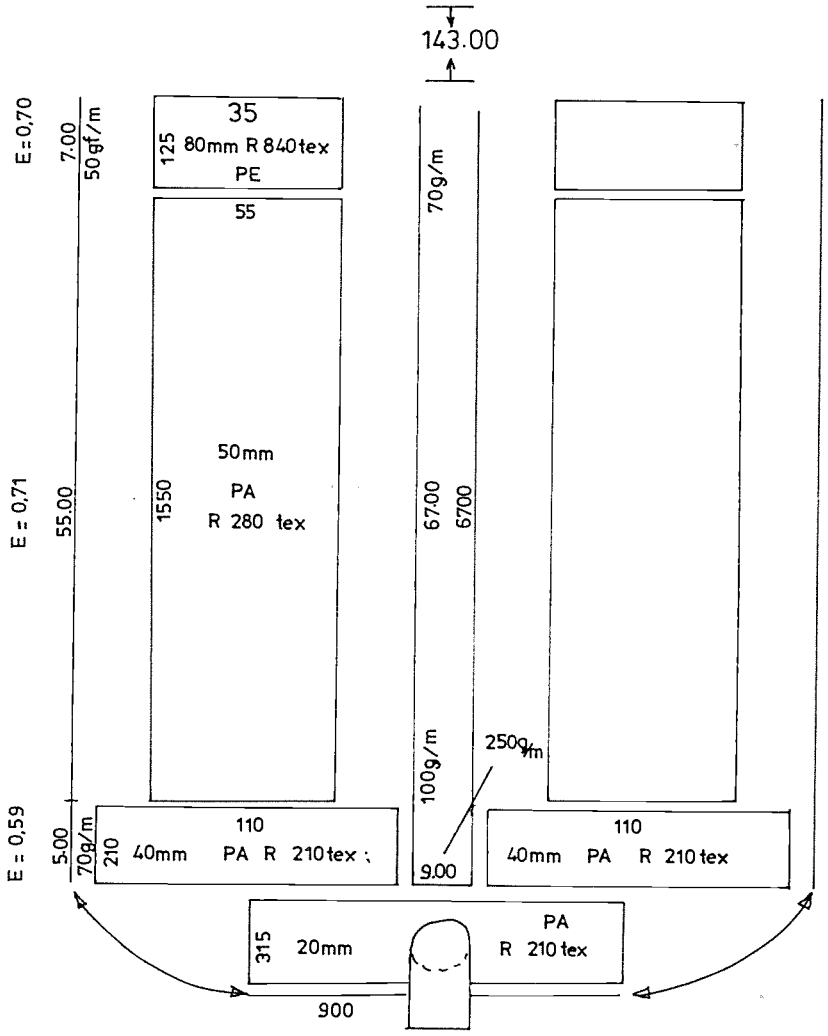


Fig. 12 BEACH SEINE FOR LARGE MEDIUM SIZE FISH, NILE PERCH with bunt "kokoros"

Patiensa, Mwanza dist. TANZANIA

LAKE VICTORIA



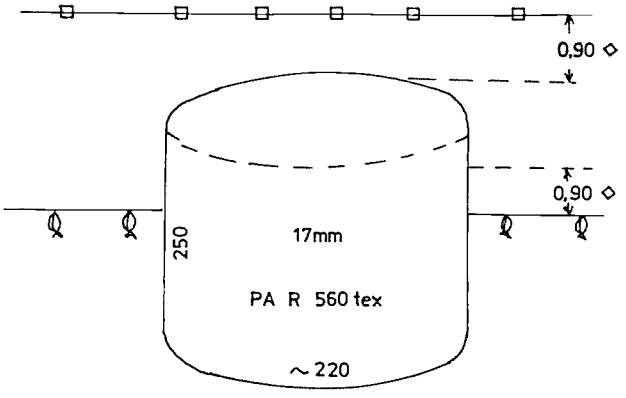


Fig. 13 BEACH SEINE FOR LARGE AND MEDIUM SIZE FISH

Niegezi, Mwanza dist.
TANZANIA
LAKE VICTORIA

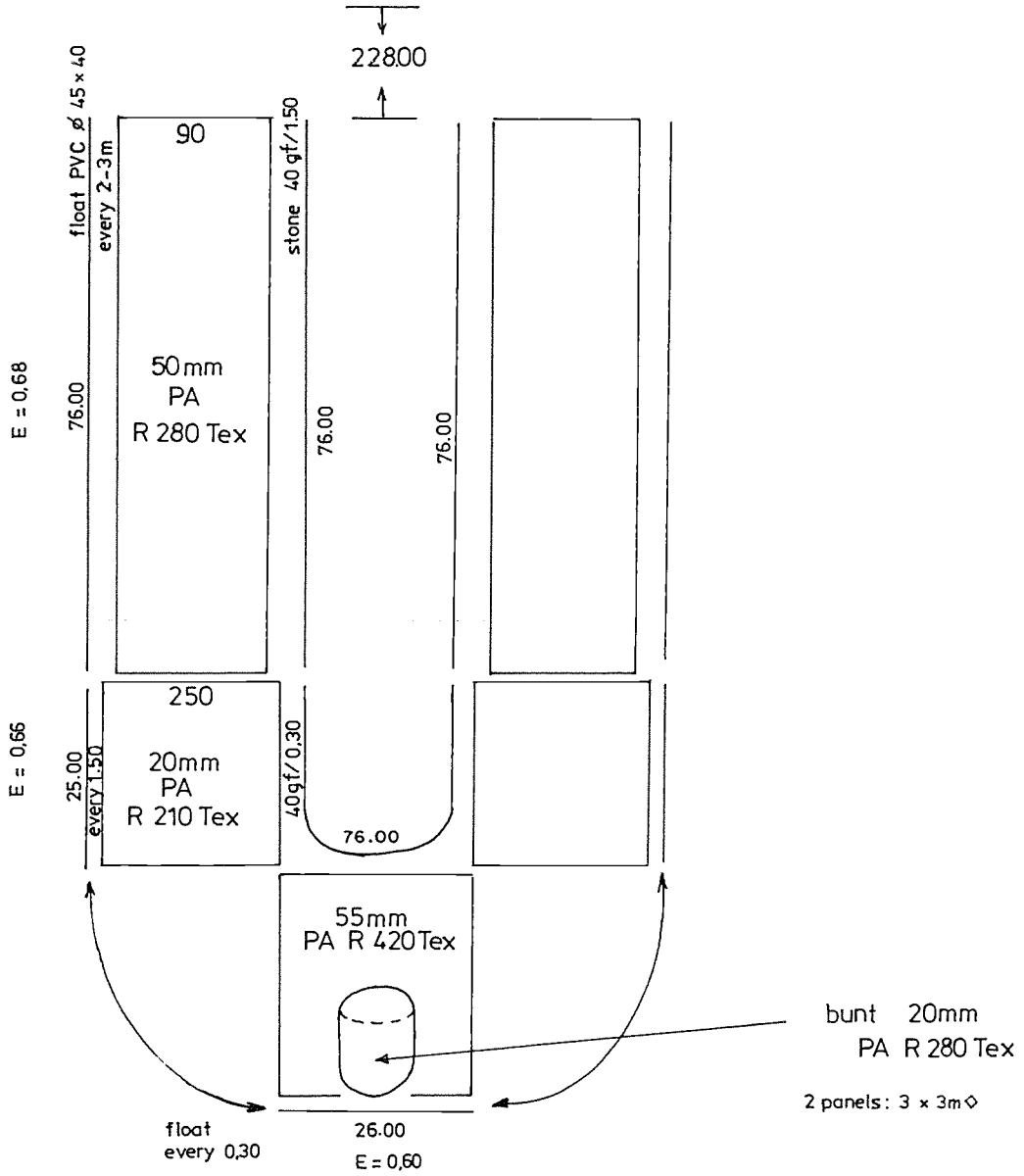
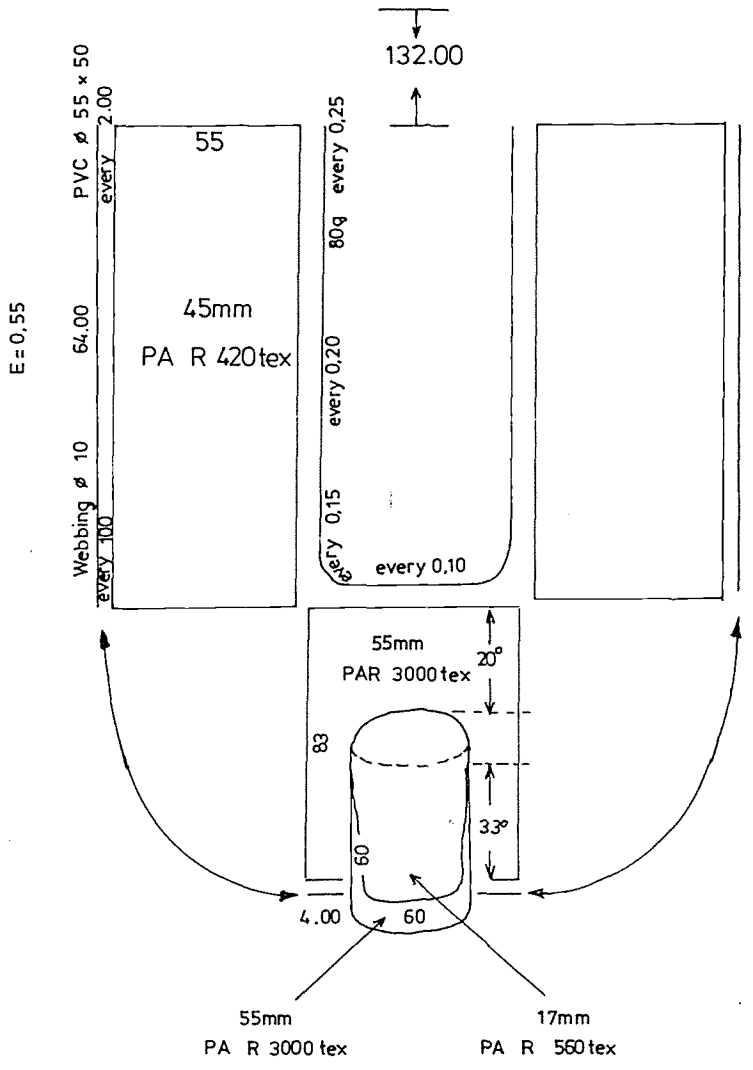
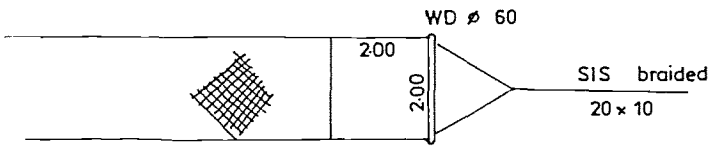


Fig. 14 BEACH SEINE FOR LARGE AND MEDIUM SIZE FISH

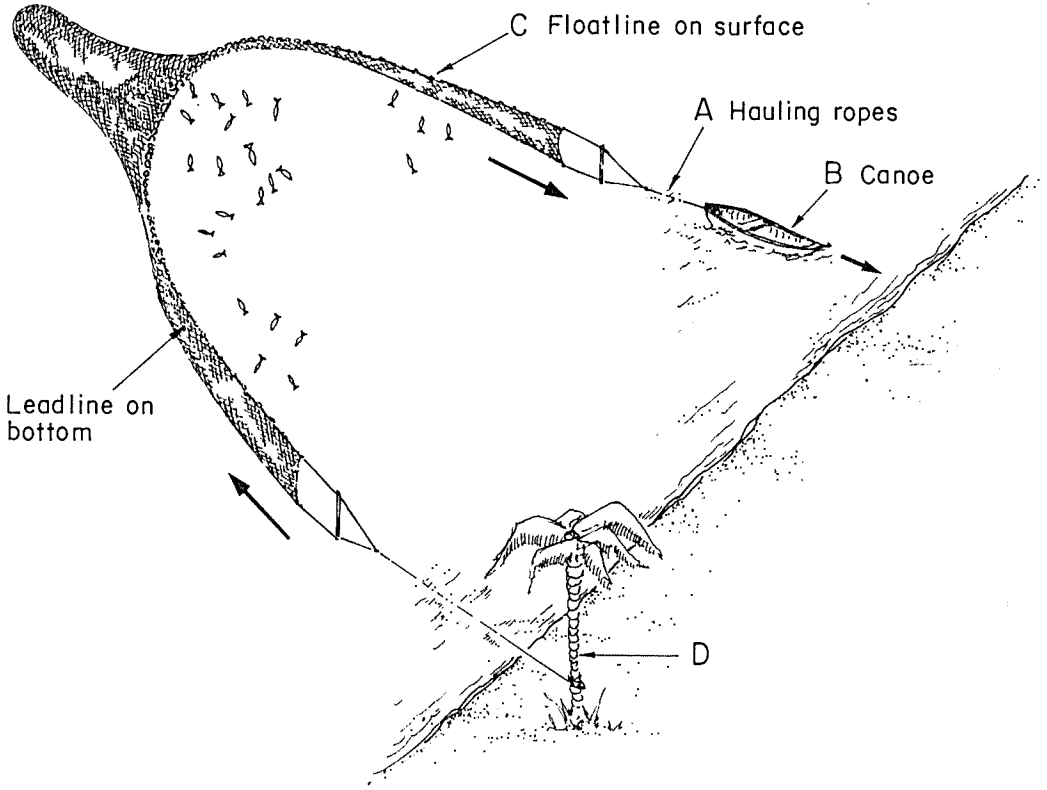
Bukoba
TANZANIA
LAKE VICTORIA





2 x 350.00

Note :
This style of fishing can be very damaging to young fish, seabed creatures and weeds.



Procedure

The net and hauling ropes are loaded into a canoe and set in a large arc from the shore.
One end is left on shore D. First the long ropes are set Then the net then the ropes back to the shore.
These hauling ropes are up to 500 metres long and made of plaited palm.

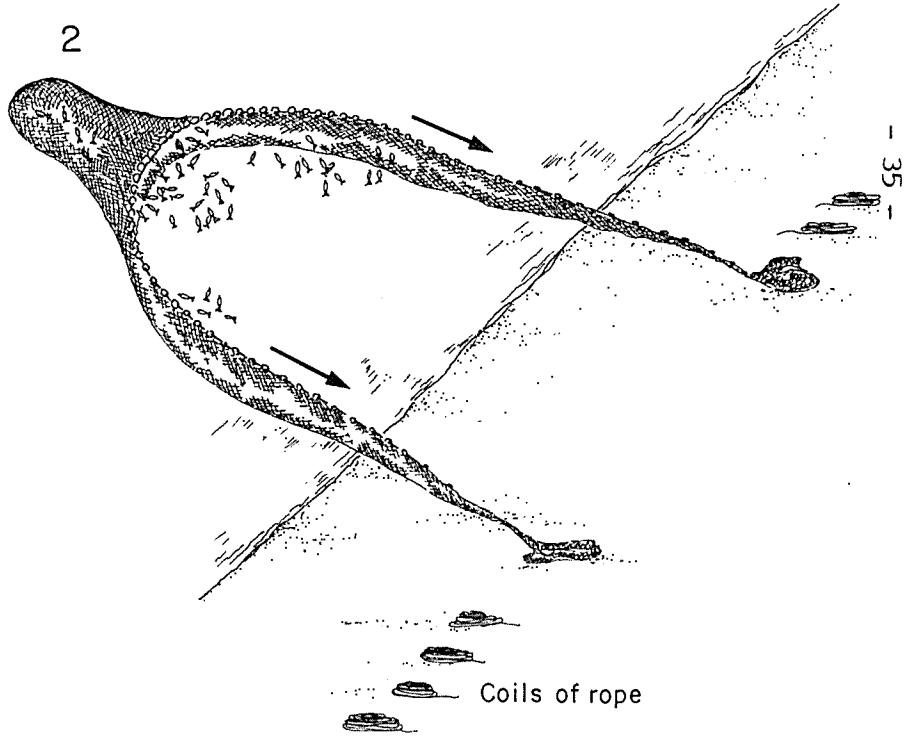
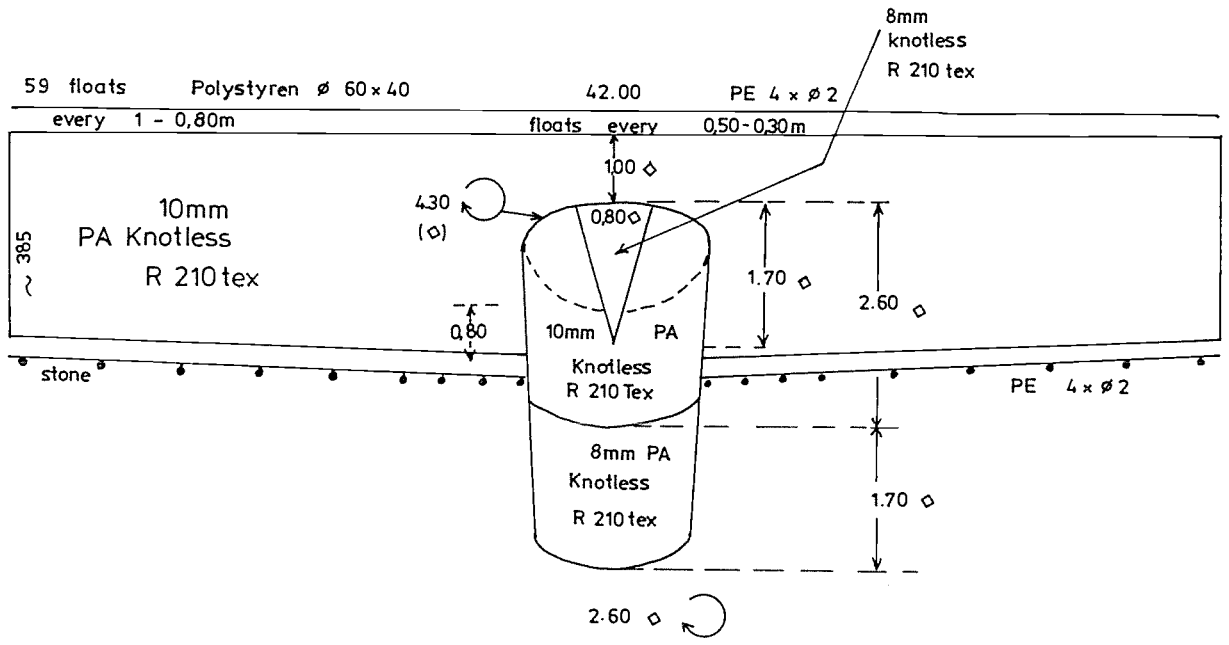
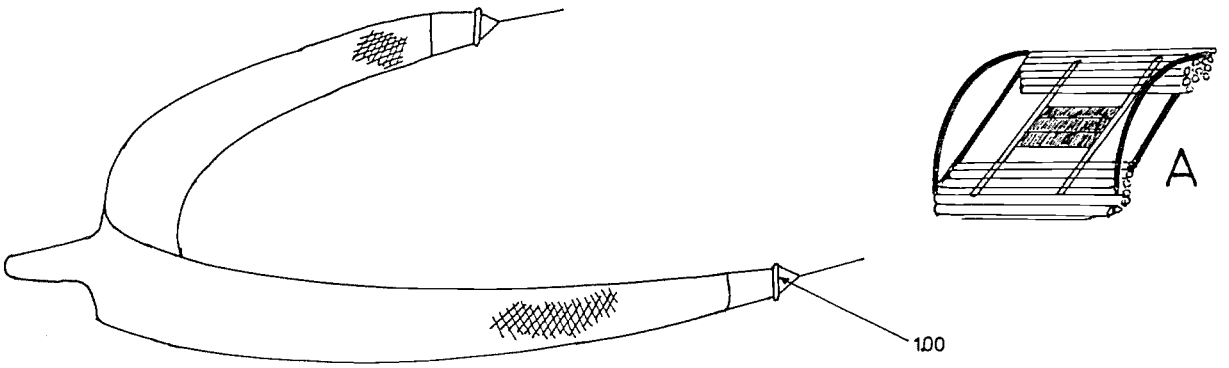


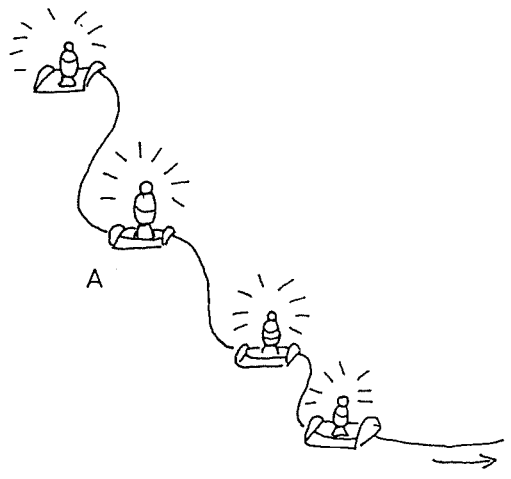
Figure 15 Beach seining for large fish

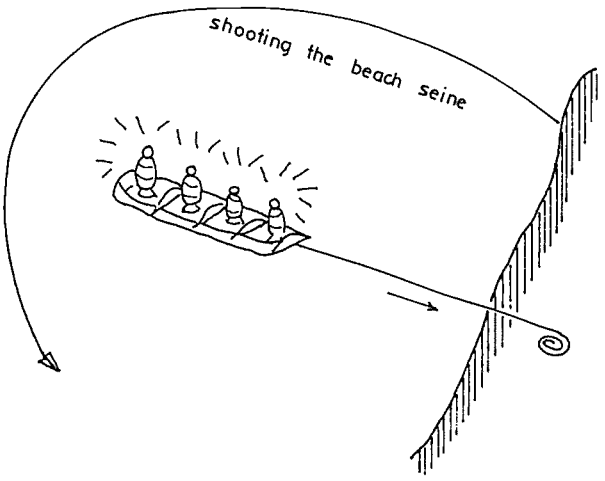
Fig. 16 BEACH SEINE FOR DAGAA

Kabamgaza, Mwanza dist.
TANZANIA
LAKE VICTORIA









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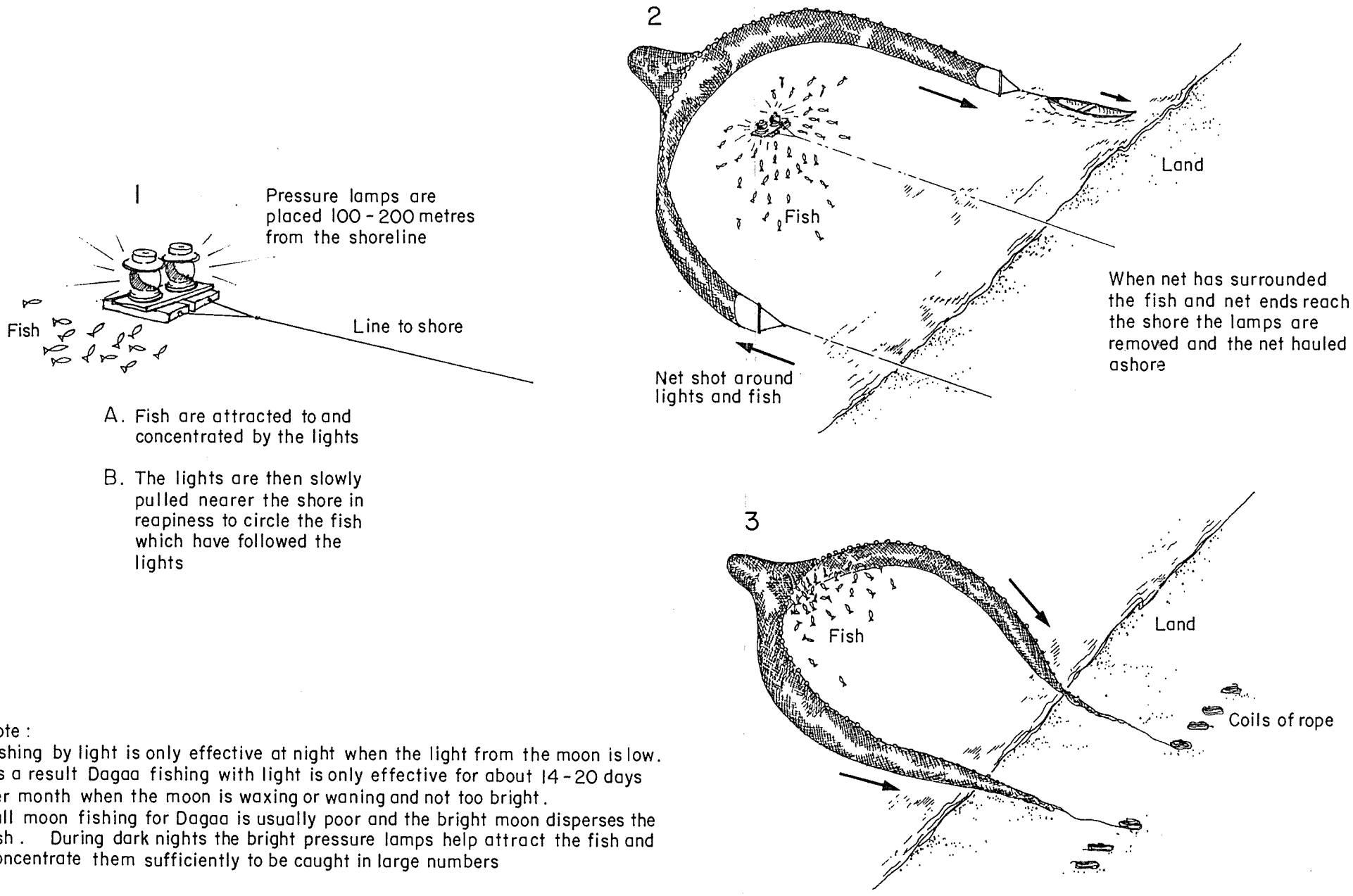


A. Fish are attracted to and concentrated by the lights

B. The lights are then slowly pulled nearer the shore in reapiness to circle the fish which have followed the lights

Note :
Fishing by light is only effective at night when the light from the moon is low. As a result Dagaa fishing with light is only effective for about 14 - 20 days per month when the moon is waxing or waning and not too bright.
Full moon fishing for Dagaa is usually poor and the bright moon disperses the fish. During dark nights the bright pressure lamps help attract the fish and concentrate them sufficiently to be caught in large numbers

Figure 17 Dagaa beach seining

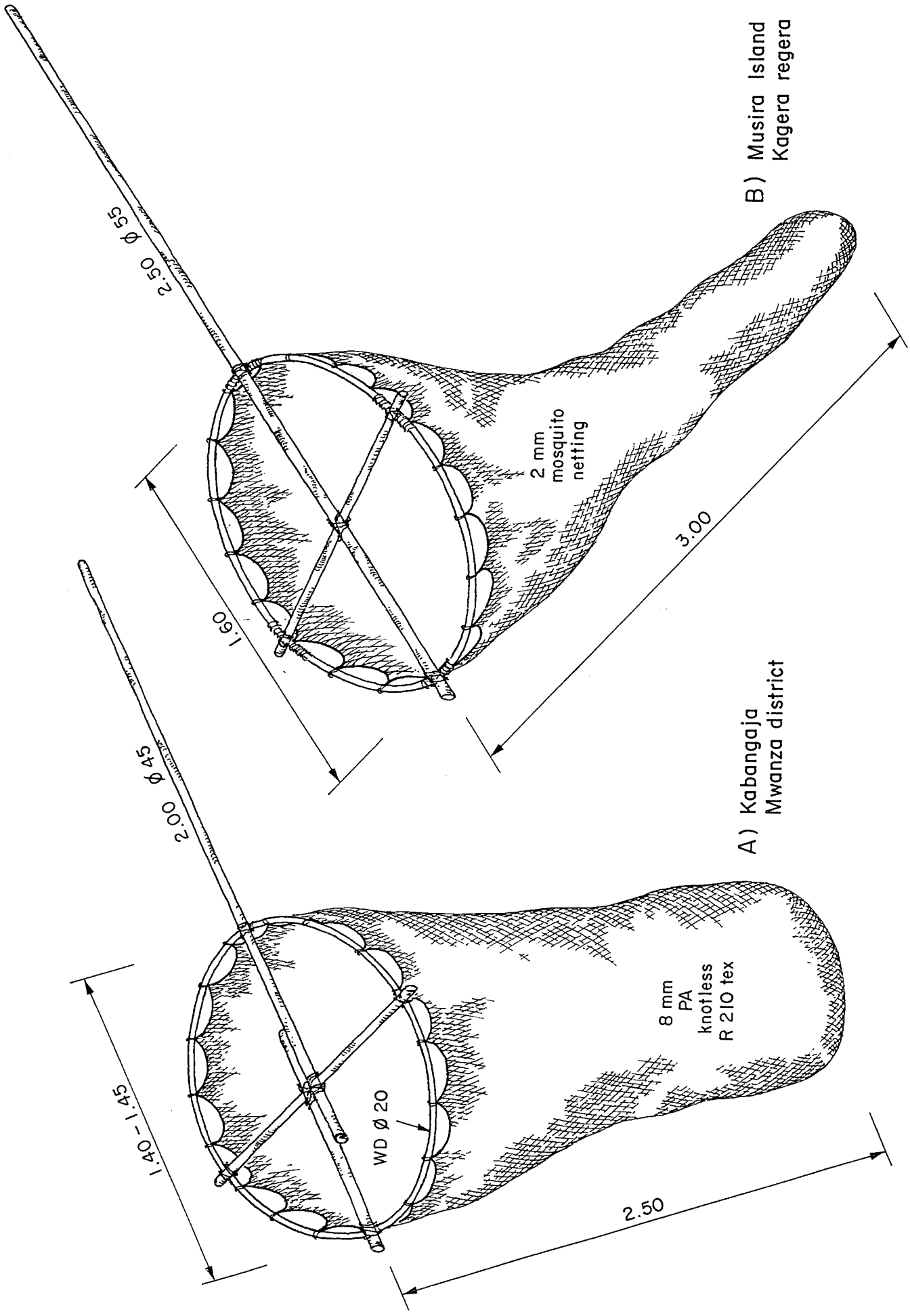
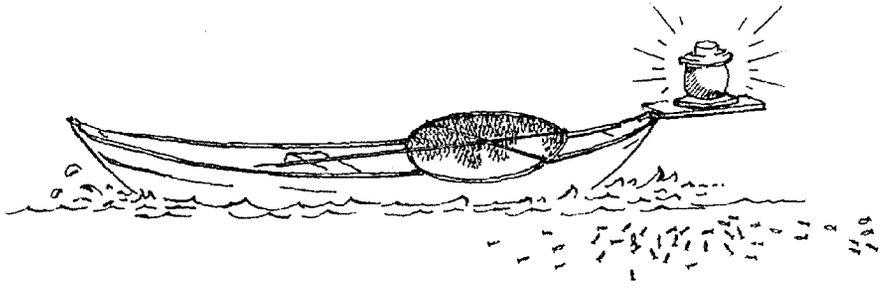


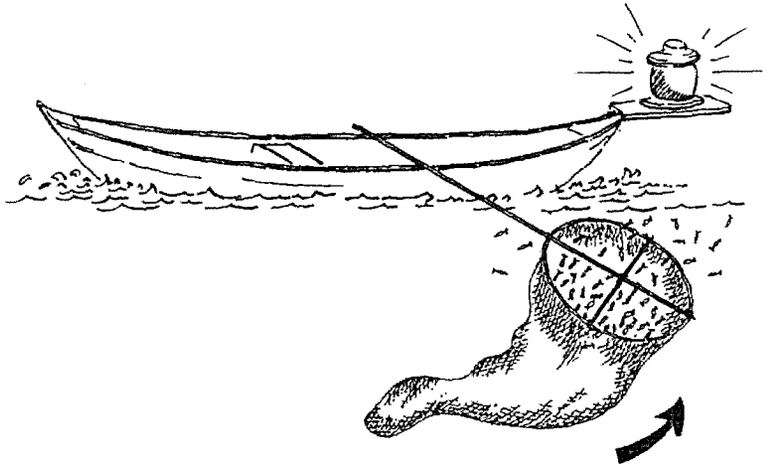
Figure 18 Scoopnet for Dagaa

1 Lamp is lit to attract fish



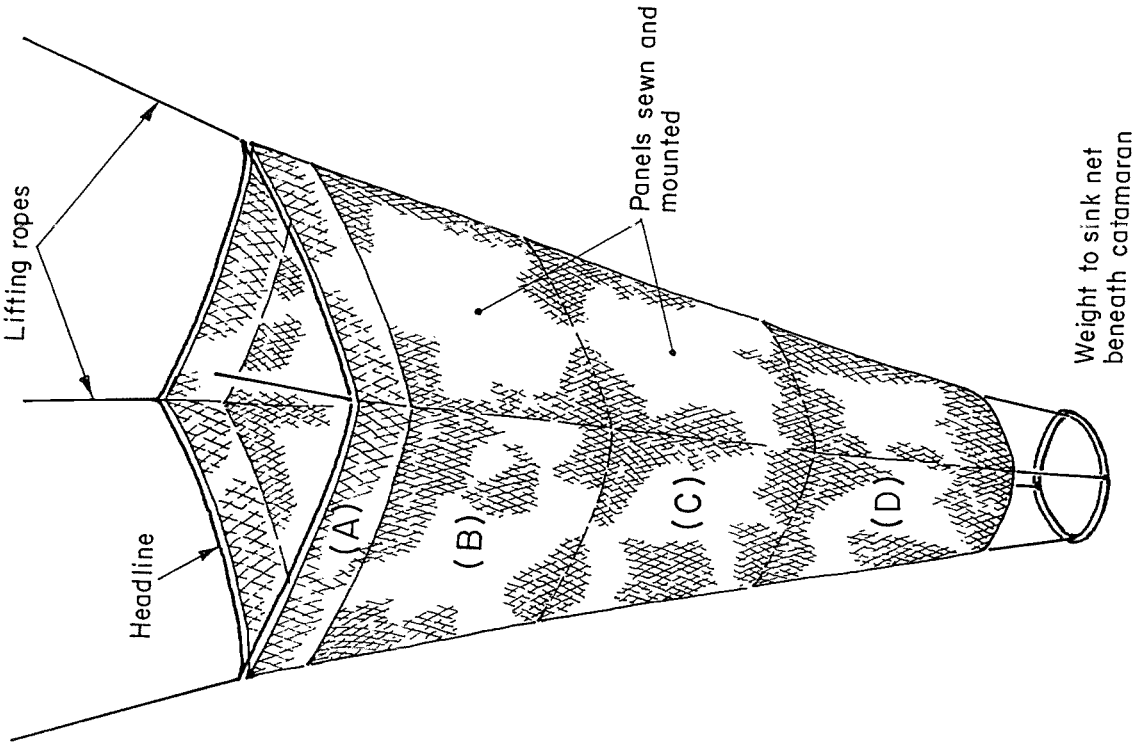
Fishermen may occassionally bang the bottom or side of the canoe.
This frightens the fish into concentrating together more closely under the light.
This gives more room for other fish to join those under the light and makes the scoop (A) more productive.

2 After a time to allow fish to shoal under the lamp the fisherman scoops up the fish under the lamp.



This scooping operation is repeated at regular intervals during the night.
Or at times when signs of a fish concentration under the light are visible, for example when fish turn or jump wear of the surface.

Figure 19 Scoop netting



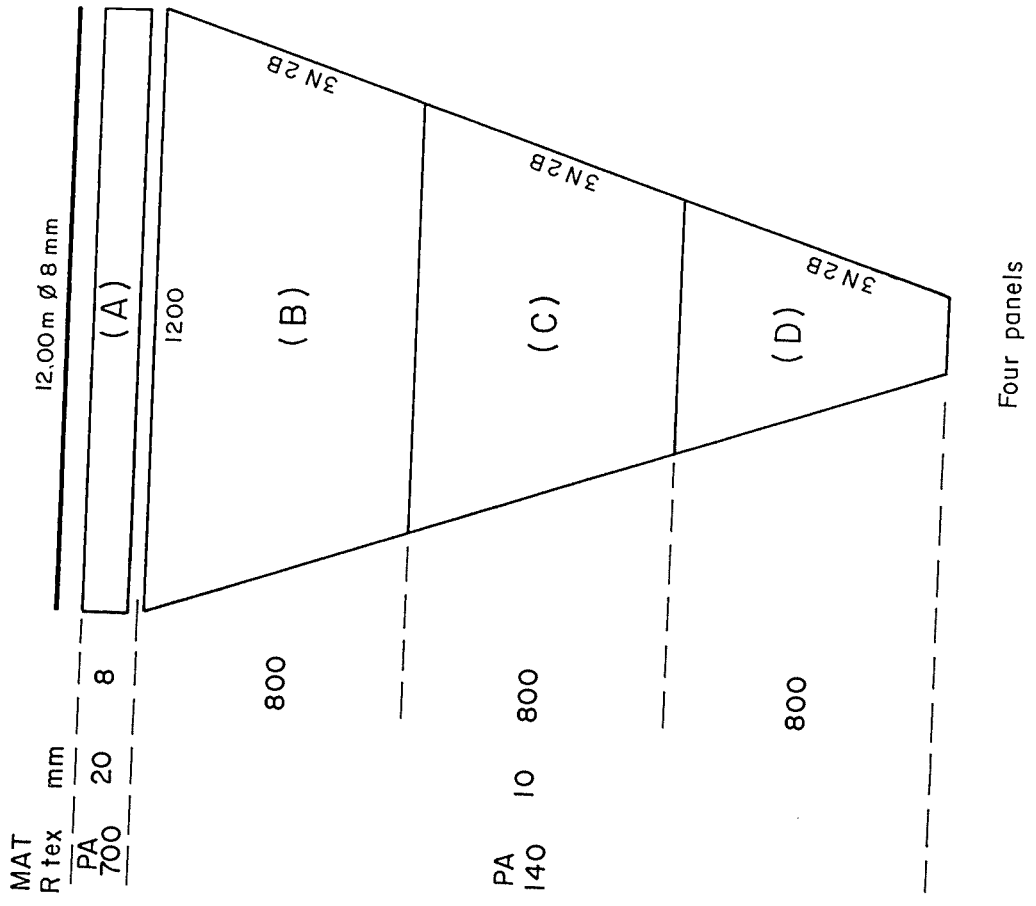
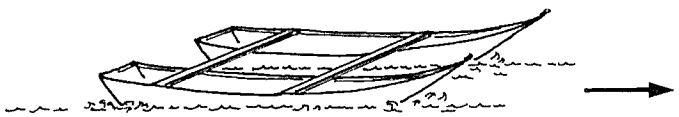
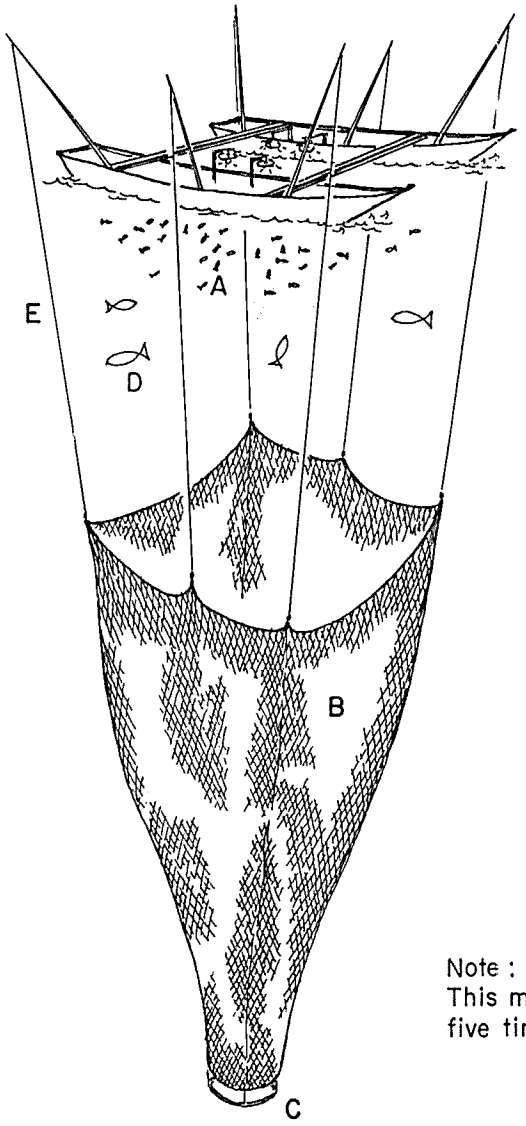


Figure 20 Liftnet for Dagaa

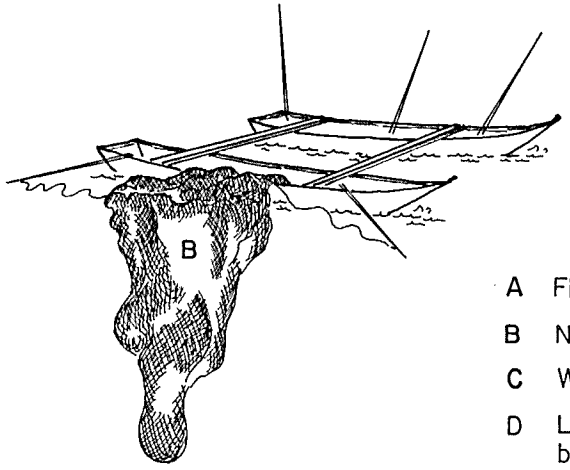
1 Vessel puts to sea (Catamaran / Trimaran)
During the moonless period



2 The net is shot below the boats and the lamps are lit to attract the Dagaa



3 Net is hauled to the surface 4 - 6 times per night and the net emptied into one or both boats



A Fish attracted by the light

B Net lowered well under boats

C Weight holds net down

D Larger fish may also be attracted by the shoaling of the Dagaa upon which they feed (lates)

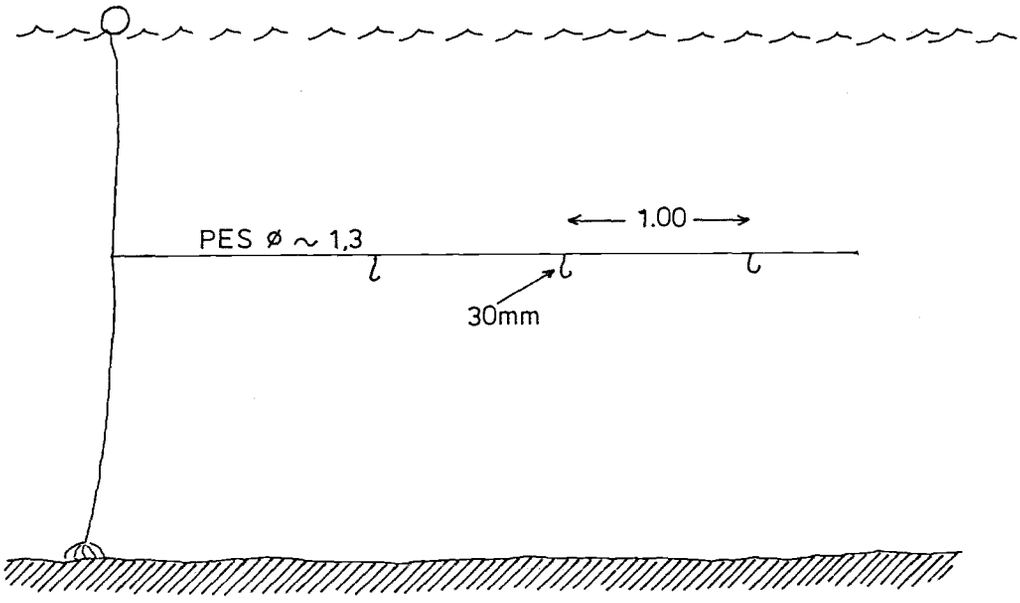
E Hauling ropes

Note :
This method catches approximately five times that of a scoop net

Figure 21 Liftnetting for Dagaa

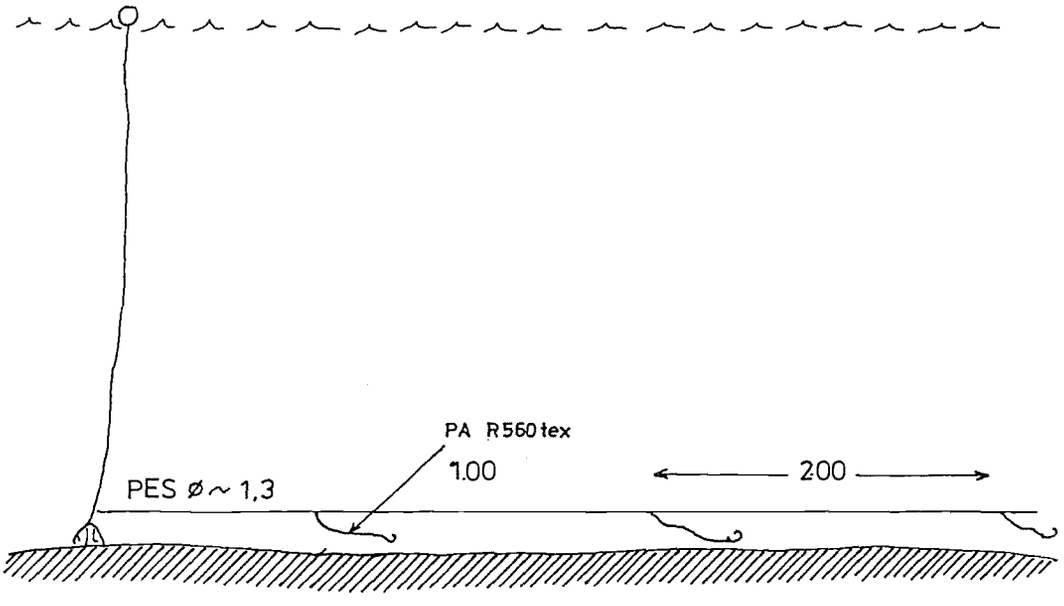
Fig. 22 LONGLINE midwater
for nile perch.

Musoma
TANZANIA
LAKE VICTORIA



Kirby hooks baited with life haplochromis or tilapia

LONGLINE bottom
for protopterus, clarias

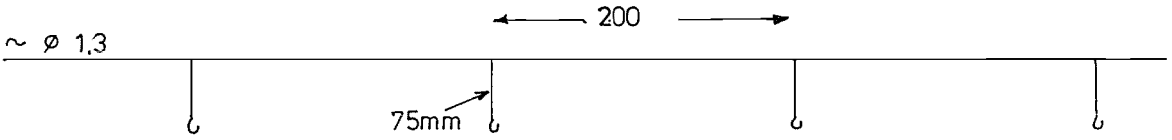


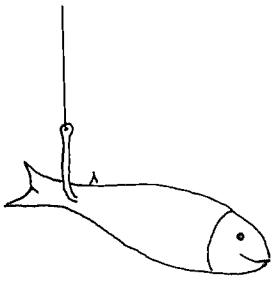
Kirby hooks baited with snail, meat, haplochromis any fish.

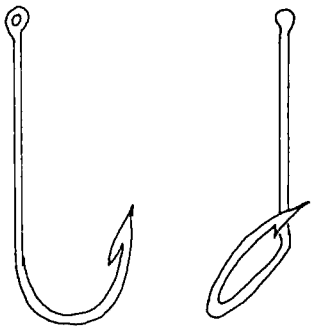
Fig. 23 LONGLINE FOR NILE PERCH

bottom, demersal or
midwater

Musoma
TANZANIA
LAKE VICTORIA







Kirby hook N° 8

baited with life haplochromis
or snail

Fig. 24 LONGLINE, demersal

Pasiensi, Mwanza dist.
TANZANIA

all species

LAKE VICTORIA

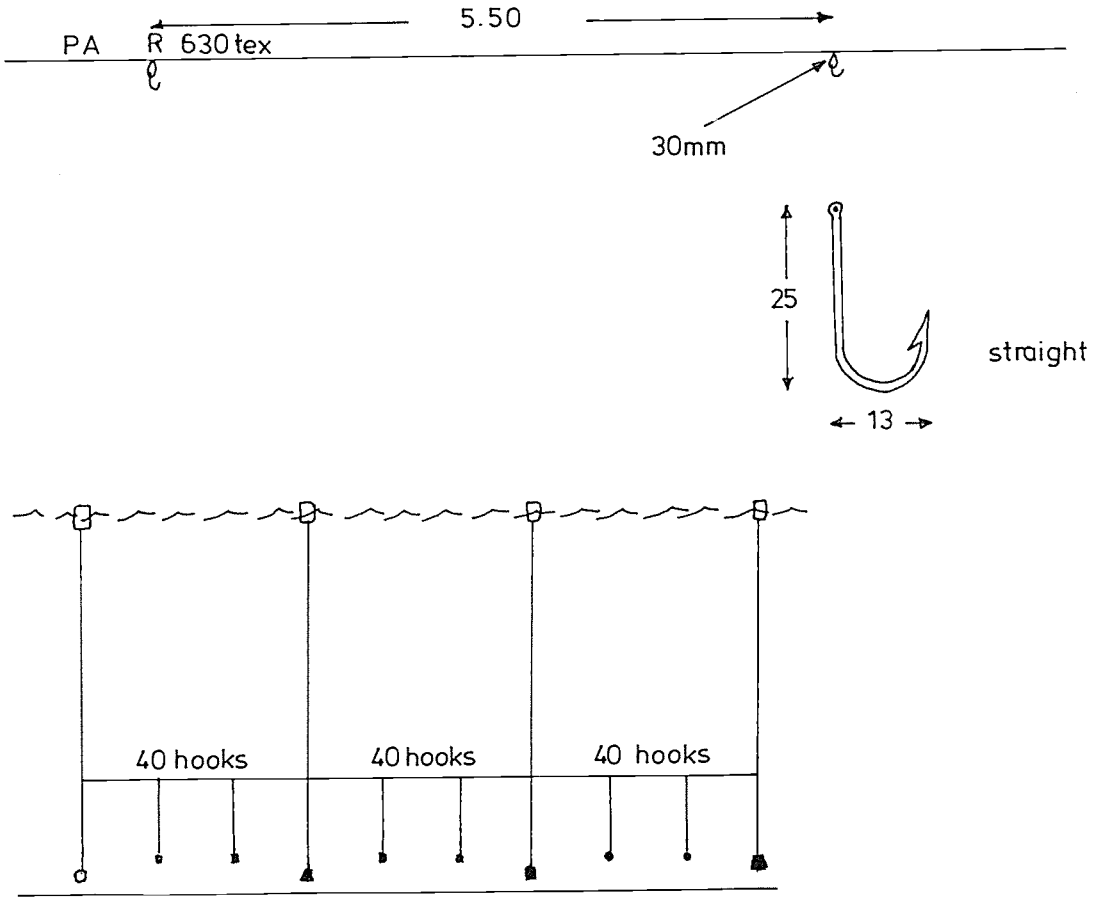


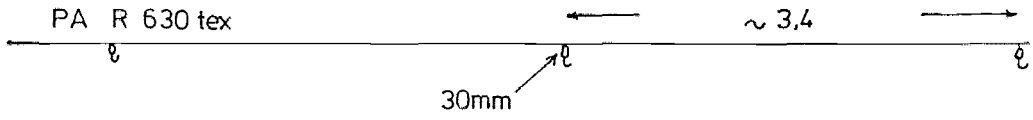
Fig. 25 LONGLINE, bottom set

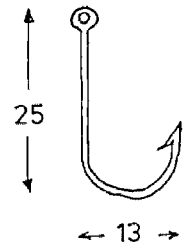
all species

Ukéréwé

TANZANIA

LAKE VICTORIA





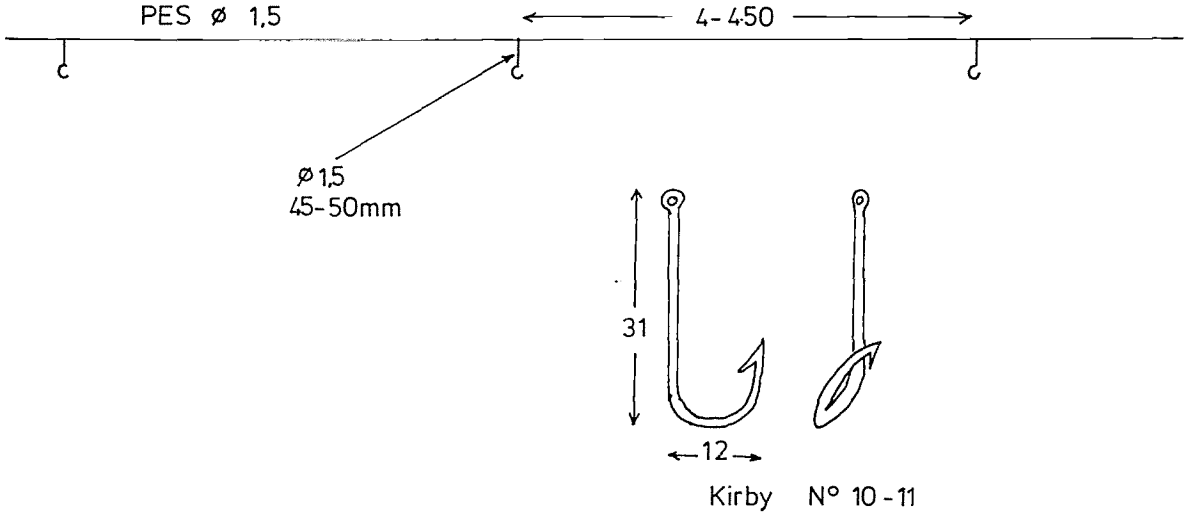
straight

bait : dagaa, nile perch meal

earth worm

Fig. 26 LONGLINE bottom
for nile perch
clarias, bagrus.

Bukoba
TANZANIA
LAKE VICTORIA



bait seaweed, insects, fish.

Fig. 27 Trawl high opening
for nile perch.

Nyanza Fishing Company
Mwanza dist.
TANZANIA

LAKE VICTORIA

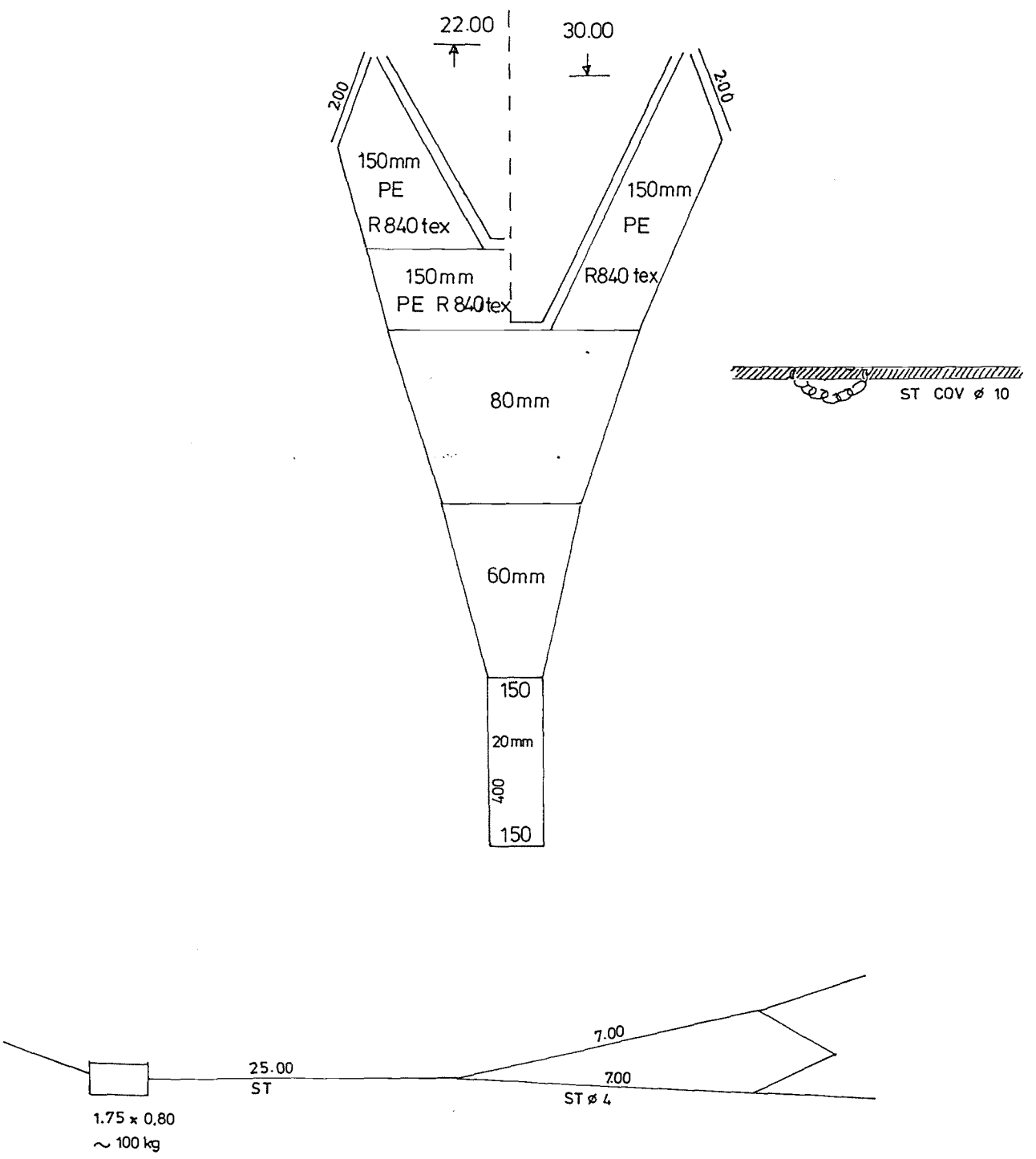


Fig. 28 TRAWL bottom pair trawling

Victoria Fishing Campany
Musoma
TANZANIA

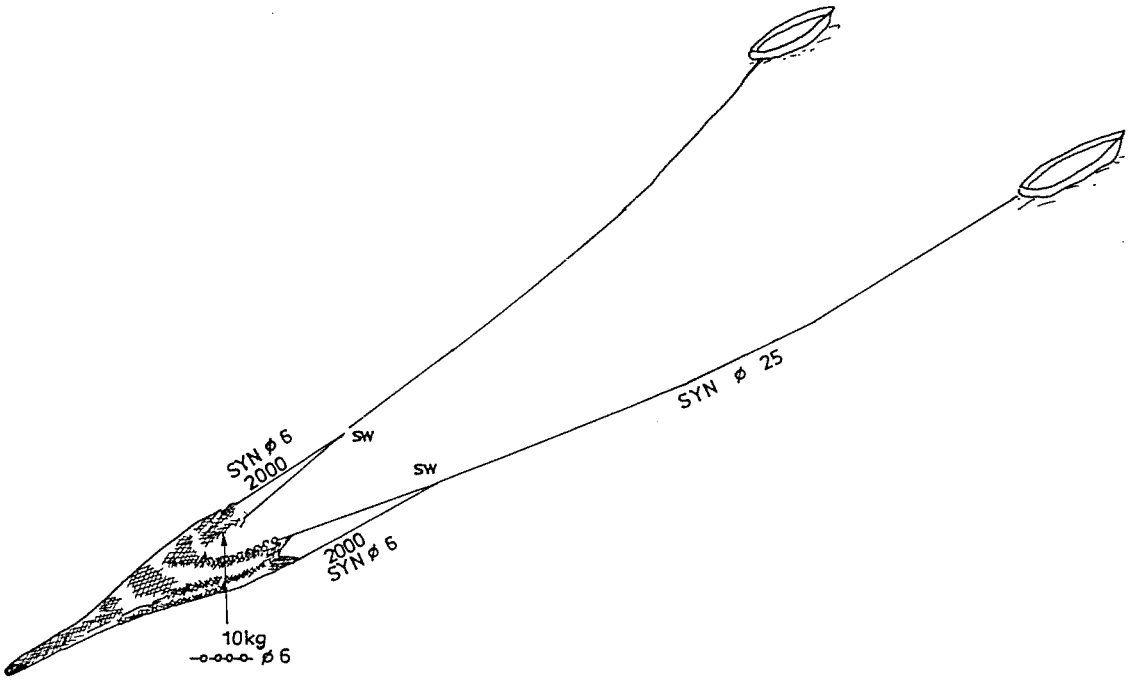
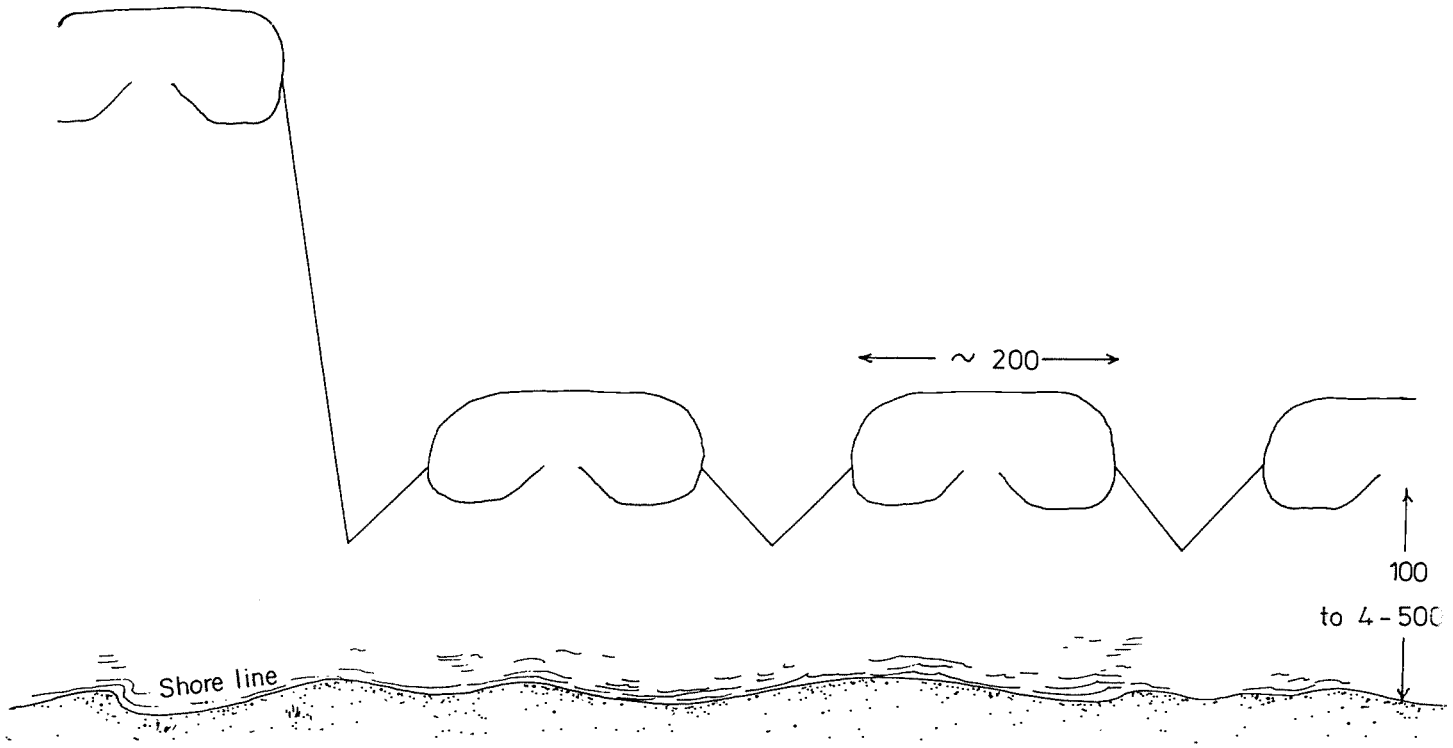
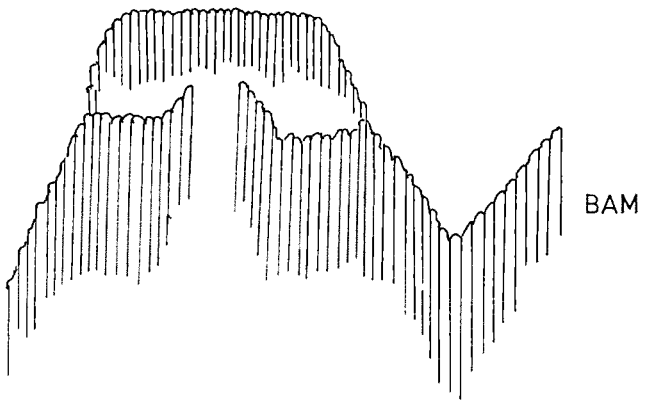


Fig. 29 TRAP, bamboo weir for tilapia

Musoma
TANZANIA
LAKE VICTORIA

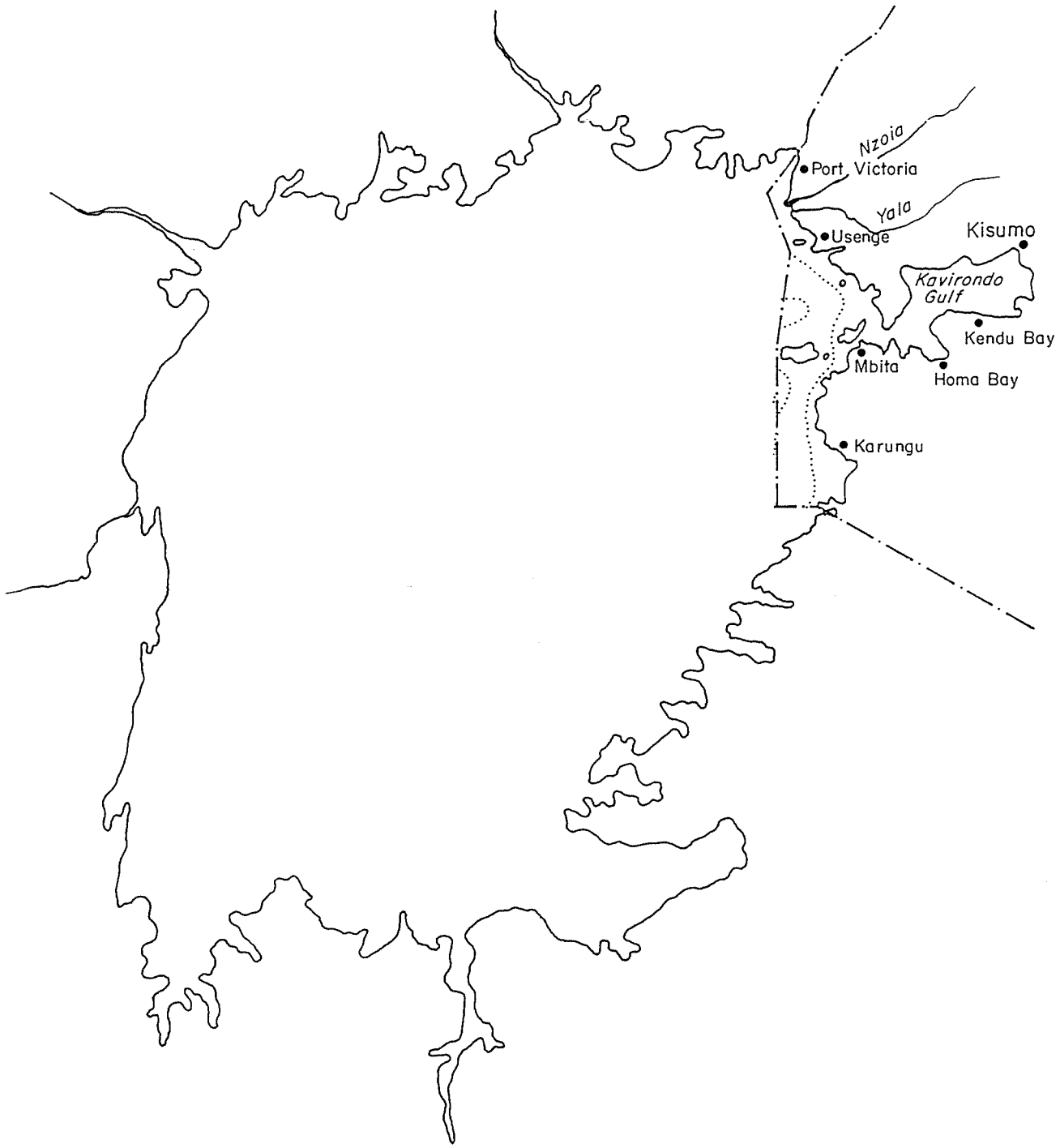




FISHING GEAR AND METHODS OF CAPTURE IN THE KENYAN WATERS OF LAKE VICTORIA

CONTENTS

KENYA


Nzoia
Port Victoria
Yala
Usenge
Kisumo
Kavirondo Gulf
Kendu Bay
Mbita
Homa Bay
Karungu

1. FISHING CRAFT OF THE KENYAN SECTOR OF LAKE VICTORIA

Canoes used for fishing are mainly planked either "sese" type (Fig. 1) or "mataruma" type, overall length: 8-10 m for day trips. In some areas (Kendu Bay) another type of canoe, flat bottom, is used, called "mashwa", around 8-9 m (inside which crew members can sleep when on longer, overnight, fishing trips) (Fig. 3). These canoes are built locally from various local wood, e.g., "sese" canoe from mukoto or murele, "mataruma" from ceder or cemphor.

For transport, larger canoes of the "sese" type are employed (up to 13 m) or bulky, old fashioned, "dhow" boats.

Some FRP boats have been introduced by the private sector to collect fish.

As far as propulsion is concerned, there are very few engines (only outboard), but sails (lateen type) are much in use in many places (Port Victoria, Sori Karungen, Mbita and other places); these are usually made of cotton, manufactured locally (Kisumu); dimensions: 5 x 6 m or larger, their expected life duration is around 2 years.

2. TYPICAL FISHING GEAR DESIGNS AND METHODS OF OPERATION USED IN THE KENYAN SECTOR OF LAKE VICTORIA

Now over 90 percent of the landings come from gillnets.

2.1 Gillnetting for Nile Perch (Fig. 4)

The gillnets for Nile perch have a mesh size from 152 mm (6 in) to 305 mm (12 in), the most common is 178-203 mm (7-8 in).

The nets are made from factory manufactured PA netting imported from Uganda or produced in Kisumu by the Kenyan Fishnet Industries, or often (for 80% of the nets according to a recent survey by Siwo Mbuga, 1990) the net webbing is handmade with strands of PE R 400-600 tex procured from untwisting three strands of PE rope.

Over the last few years there has been a general tendency to utilize smaller meshes and at the same time a decrease in the twine size of the nets. The thickness of the PA twine has gone from 0.75 mm (210/21) to 0.65 mm (210/15-18) and 0.5 mm (210/9) so the nets are becoming cheaper and more efficient. However, to save money, PA twine has been replaced by PE strands 0.8-1.0 mm diameter (still slightly twisted for the reason given above) making the gillnets less efficient.

Most of the gillnets are 26 meshes deep or sometimes 22 or 18 meshes only.

The net webbing is hung, around 0.5 hanging ratio, on one single PE line Ø 2 mm or two PE 600 m/kg (which makes around 3 mm diameter).

Floats used are often made of Polystyrene, expanded = Ø 60x40 mm (around 20 g floatability each). Sinkers are usually stones.

The fishing units utilize from 20 to 100 nets, the most common being between 40 and 70 nets per canoe.

To handle the nets two or more often three crew members are required.

The gillnets for Nile perch are anchored on fishing grounds, mostly muddy/sandy at a depth of 10-20 m. They are set either close to the surface during the phase of the new moon or not far from the bottom during full moon.

The nets are hauled in with the catch in the morning and generally set again either immediately or in the evening (often the nets are set repeatedly for a month and then brought ashore for cleaning and repair).

A good catch is said to be around 0.5 t of fish per day using 40-50 nets.

2.2 Gillnetting for Tilapia

The most commoon nets used are 102 mm (4 in) and 127 mm (5 in) to 178 mm (7 in), even 229 mm (9 in) for the bigger fish.

As far as the fishing operations are concerned, these nets are used as ordinary set gillnets or sometimes as driftnets, surrounding or drive-in nets.

2.3 Fishing with Longlines for Nile Perch (Fig. 5 and 6)

Use of longlines is more recent and very often carried out in combination with gillnetting.

The longlines are anchored, up to 80 m deep, either close to the surface, in midwater during the phase of the new moon, or during the full moon, close to the muddy/sandy bottom (big Nile perch are more likely to be found in proximity to a rocky area but this is avoided because of the risk of the entangling the net).

Very short snoods are used (fishermen fear that larger snoods will twist on the mainline), very distant from each other.

Only live bait is efficient, haplochromis or small clarias caught with beach seines made of mosquito net webbing. The bait fish, which must be kept alive for one day, is hooked by the tail.

From 150 hooks on a very small canoe, up to 1 200-1 500 hooks on larger canoes, are used per fishing unit. Crew members are often three, or up to six on board a large canoe (an average would be 250 hooks per man on board).

The best catches are reported to be in the rainy season, March-July or September-October, and depend on the level of the water in the lake. The utilization of this method is, strictly speaking, linked to the availability of the live bait, and its efficiency depends on the quality and life duration of the bait fish: in the rainy season haplochromis are easier to catch and abundant; a strong current can kill the bait fish and the line then becomes unattractive.

A good catch of Nile perch is said to be around 50 to 100 fish (3 kg or more) per 1 250 hooks and an expected average catch would be 70 to 100 kg/canoe/fishing day.

2.4 Dagaa Fishing with Boat Seines (Fig. 7 and 8)

This fishing method used with light attraction was introduced twenty years ago from the Tanzanian side of the lake. The demand for dagaa is now high and increasing, so more and more fishing units take part in this fishery.

The boat seine for dagaa is made of netting with hexagonal knotless mesh, 7 mm (4 mm opening) mosquito net. The dimensions of the mounted seine are 20 m long x 4 or 5 strips of webbing (350° meshes each) and these are hung on a line 7 to 8 m deep.

The net is operated from a canoe, around 9 m long, with 4 to 5 crew members.

Four to six lamps (petrol, "Anchor" type) are used to attract the fish. These lamps are lit in a line, spaced 50 to 100 m from each other.

The catching operations are: encircling the fish attracted by the light, closing the seine, concentrating the fish in the mid upper part of the net and boarding; these manoeuvres take 20 to 30 minutes. Each lamp is visited one after the other, which can take from 1½ to 2½ hours, depending on the total number of lamps operated. Each lamp can be visited up to three or four times in one night.

Based on light attraction of the fish, this fishing method can only be utilized during dark lunar phases (new moon period).

Dagaa fishing with a boat seine is carried out all year round, for 1-2 weeks during the new moon phase of each month. The best catches, up to 600-900 kg/canoe/night, are reported in September during the windy season (May-October).

2.5 Beach Seines (Fig. 9 and 12)

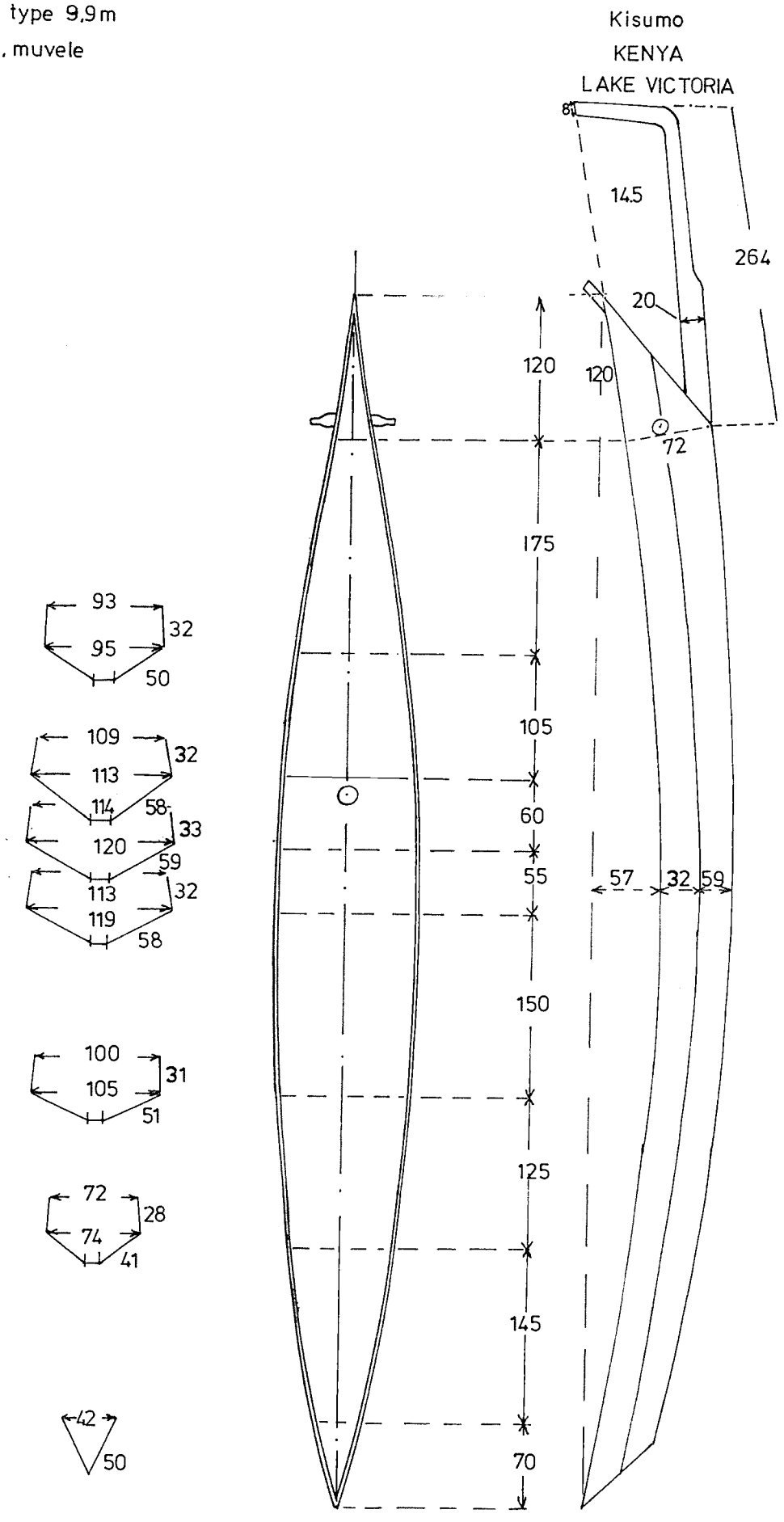
These are banned but nevertheless used very often in rather isolated spots. Some of these are quite short, around 100 m long, without a bag made with small mesh net webbing (mosquito net 7 mm hexagonal mesh); the longer ones of more than 100 m (up to 150 m) have a bag in the central part with various mesh sizes in the wings ranging from a few mm (mosquito net) to 40 mm or more (most common observed was 28 mm mesh size).

The beach seines are used mainly at night, giving better catches during the full moon periods.

2.6 Other Fishing Gear

Various other fishing gear are used mainly for tilapia (which is the most popular with the Kenyan consumers): handlines, pole and line, traps (barrier type) in estuaries, especially during the rainy season, cover pots or baskets.

Fig. I Canoe "SESE" type 9,9m
wood: mukobo, muvele



mast 3.00m

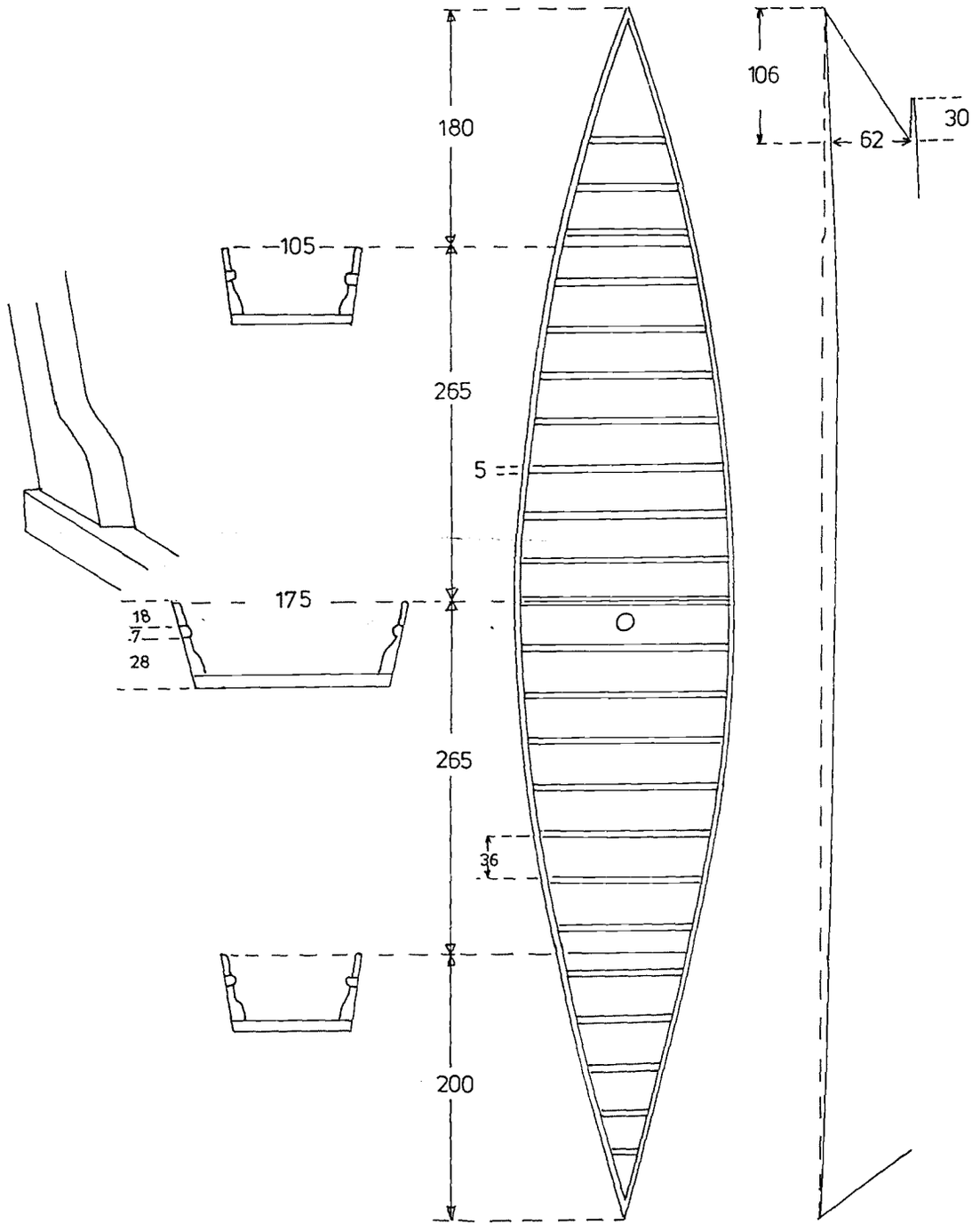
Fig. 2 Canoe " MATARUMA " type

wood : cedar, cemphor

Sori Karungu

KENYA

LAKE VICTORIA



mast 3.00

yard 11.00

Fig. 3 boat "MASHWA" type

Kendu Bay
KENYA
LAKE VICTORIA

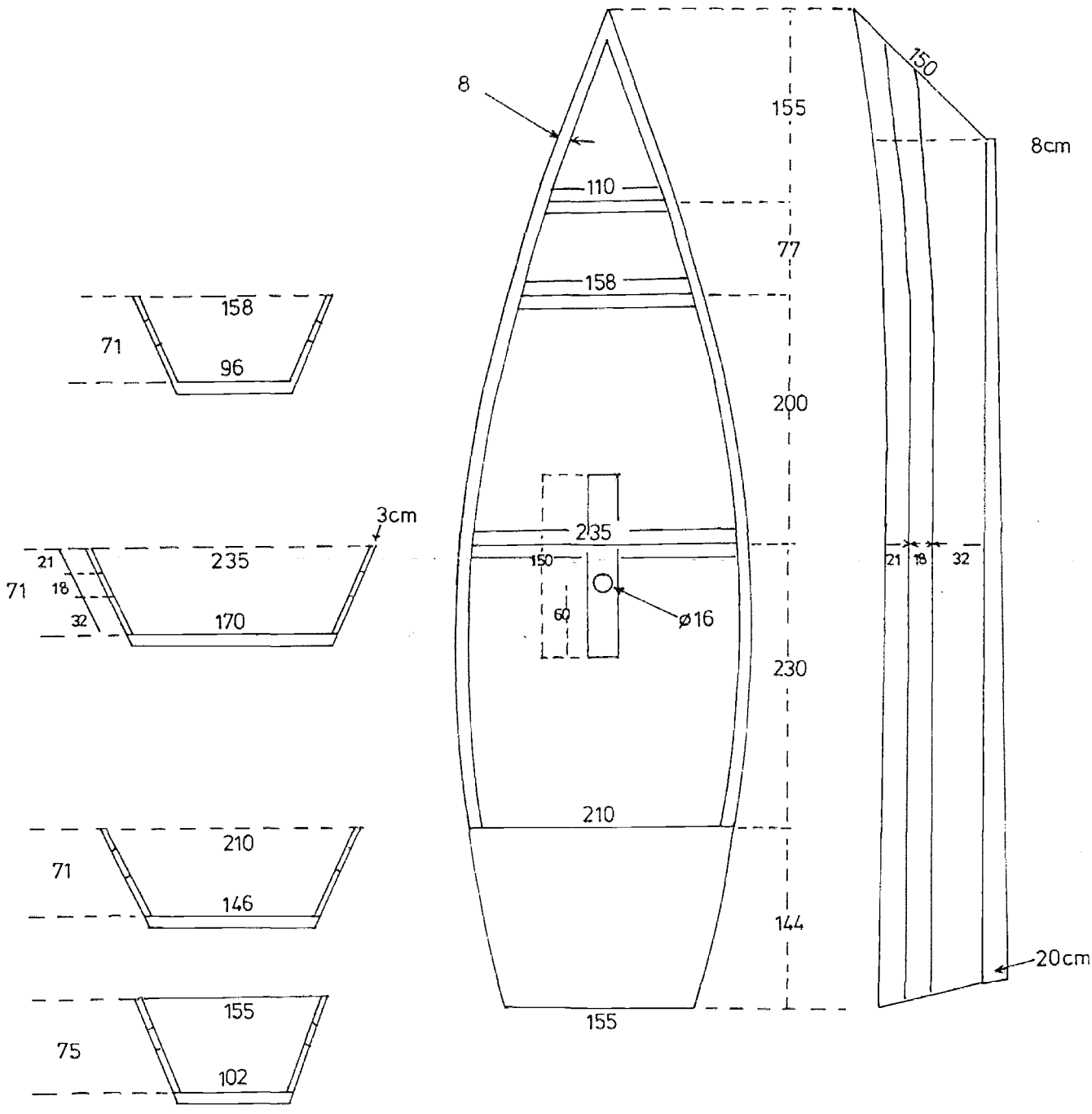
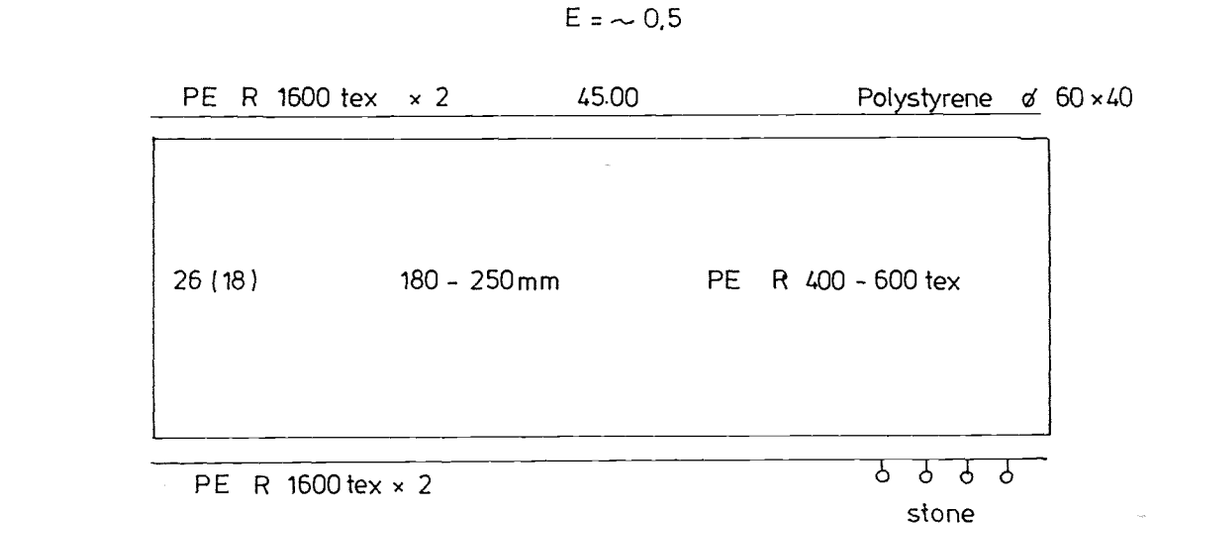


Fig. 4 SET GILLNET FOR NILE PERCH

Usenge, Sori Karungu
KENYA



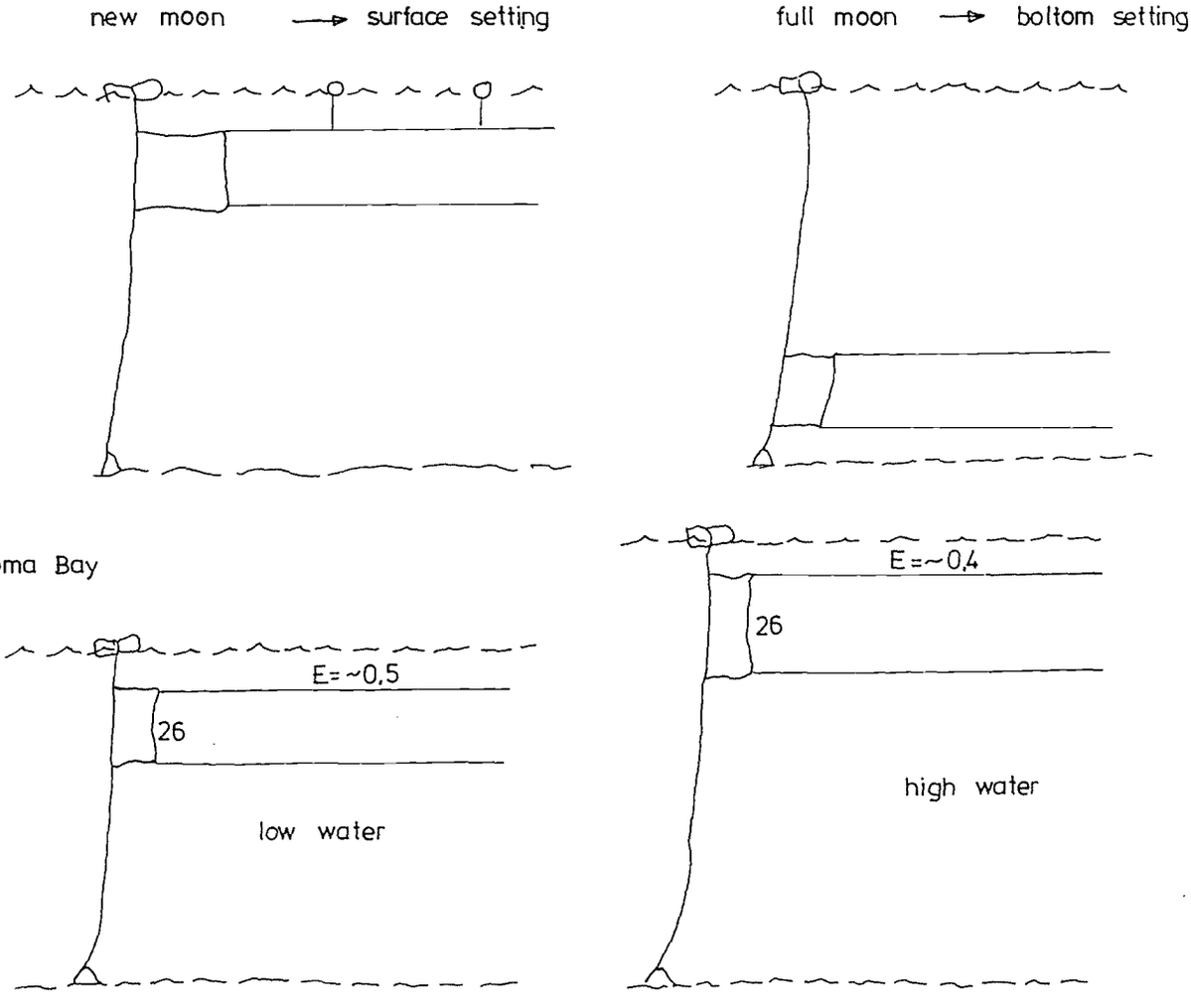
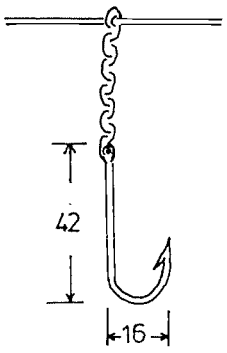


Fig. 5 LONGLINE FOR NILE PERCH

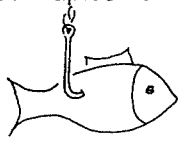
Sori Karungu
KENYA

Canoe sese or mataruma type
8m paddle and sail
3 crew members
up to 1200 hooks / canoe.

LAKE VICTORIA



life bait: haplochromis, clarias



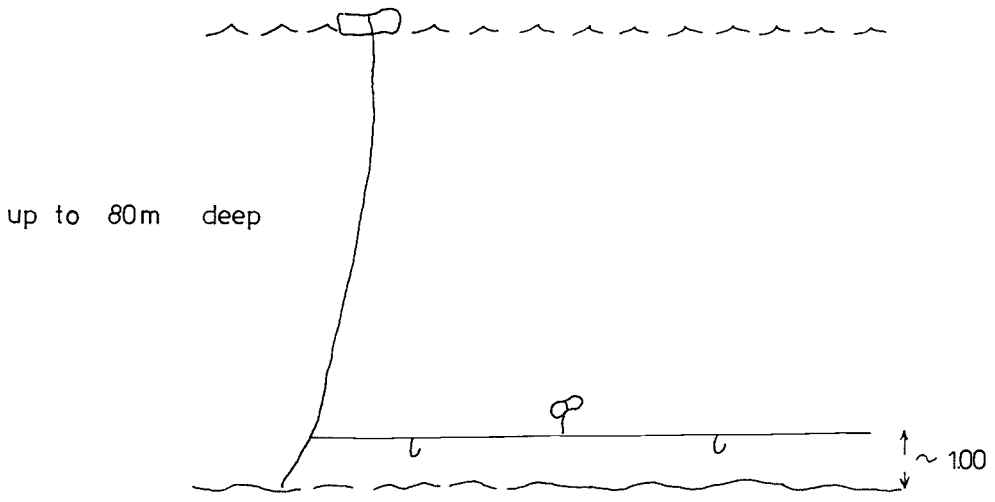
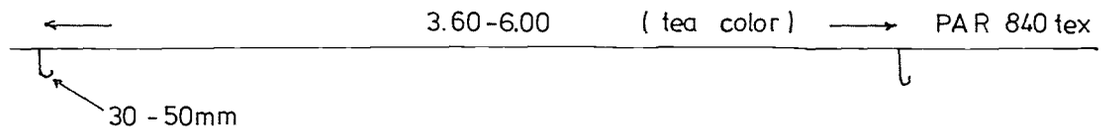
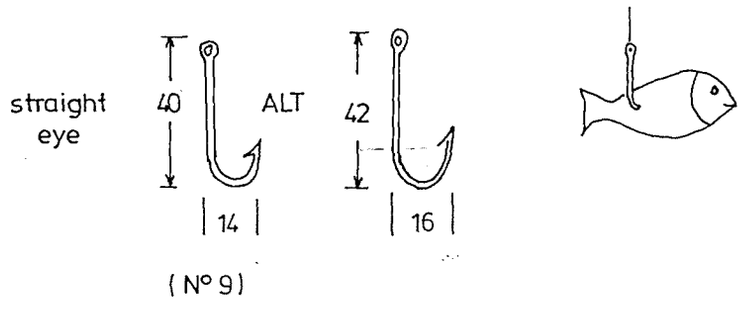


Fig. 6 LONGLINE FOR NILE PERCH

Mbita
KENYA
LAKE VICTORIA

1200 up to 1500 hooks/canoe
250 - 300 hooks/crew members





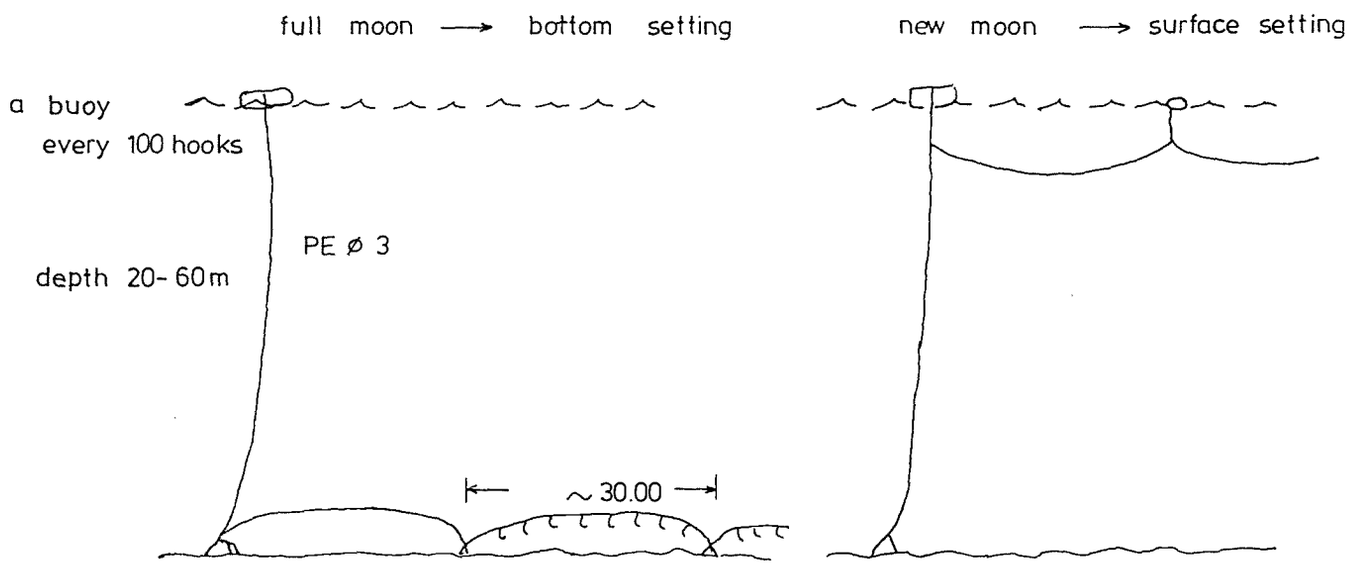
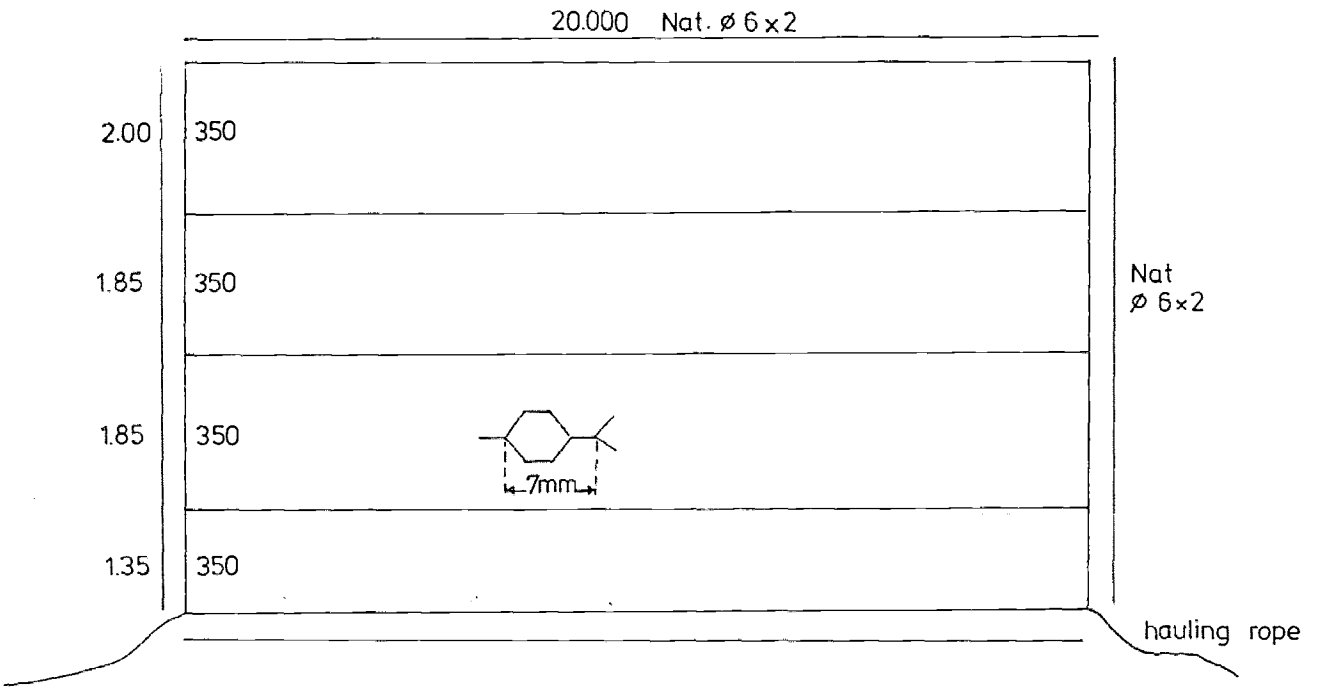


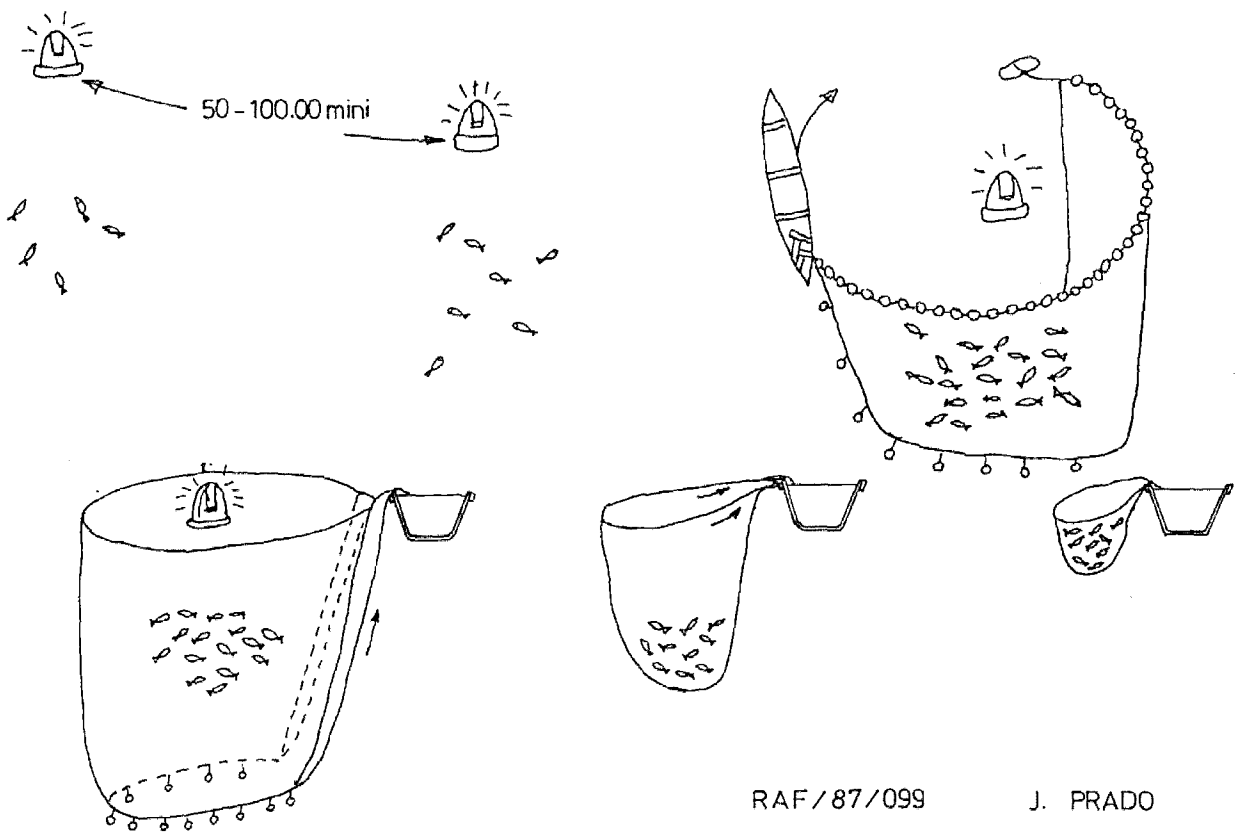
Fig. 7 BOAT SEINE FOR DAGAA

Usenge
KENYA
LAKE VICTORIA

Sese canoe 10,50x1,45x0,75 deep
4-5 crew members
with light (4-6 lamps)
around new moon period



each lamp is encercled every 1.30-2.30h, after the other; duration of the fishing operations: 20-30min



RAF/87/099 J. PRADO 5/90

Fig. 8 BOAT SEINE FOR DAGAA
Sese canoe 4-5 crew members
(with light (4-6 lamps)
around new moon period.

Port Victoria
KENYA
LAKE VICTORIA

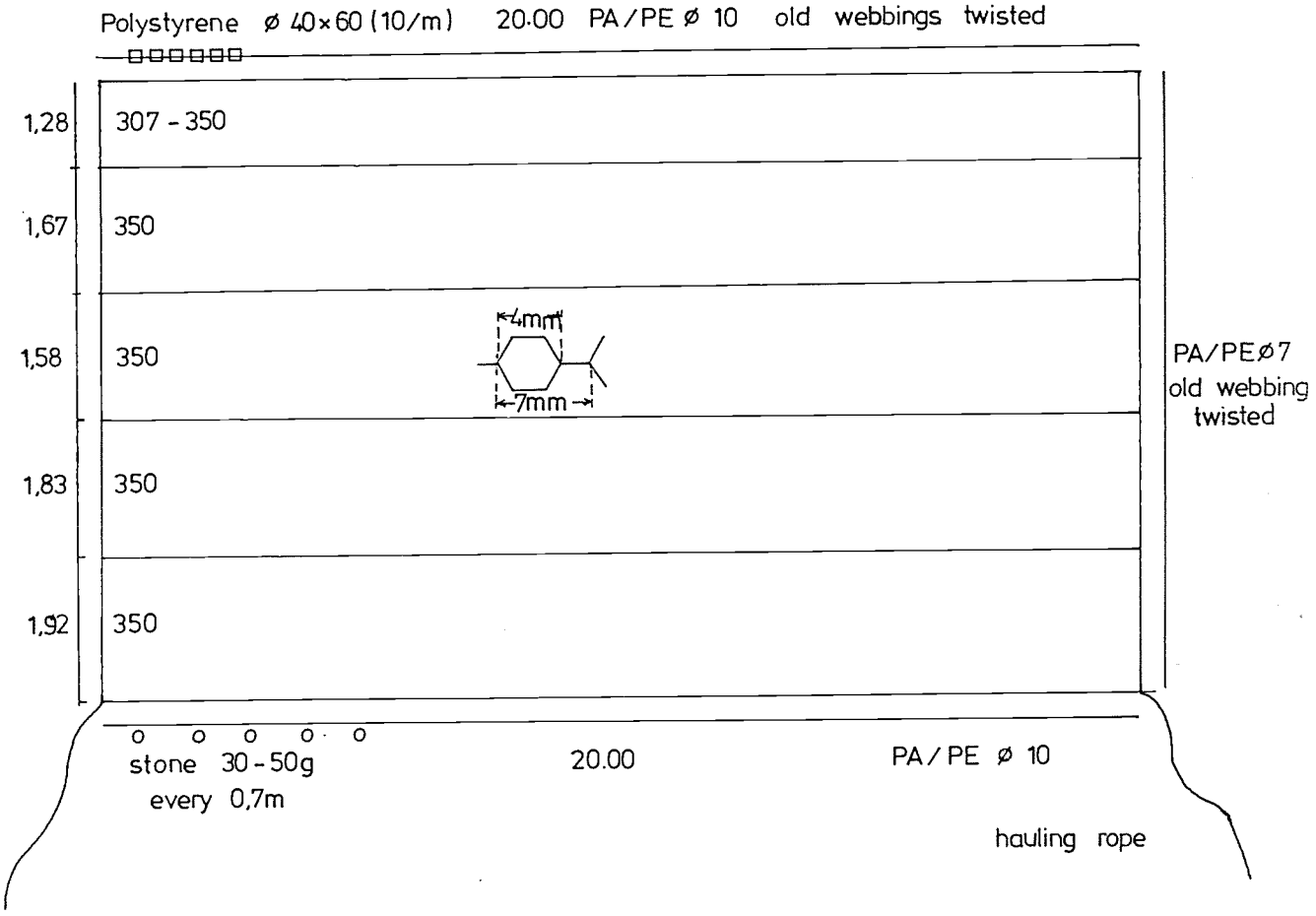


Fig. 9 BEACH SEINE

90 x 3.70 m

Bala Rawi beach
KENYA
LAKE VICTORIA

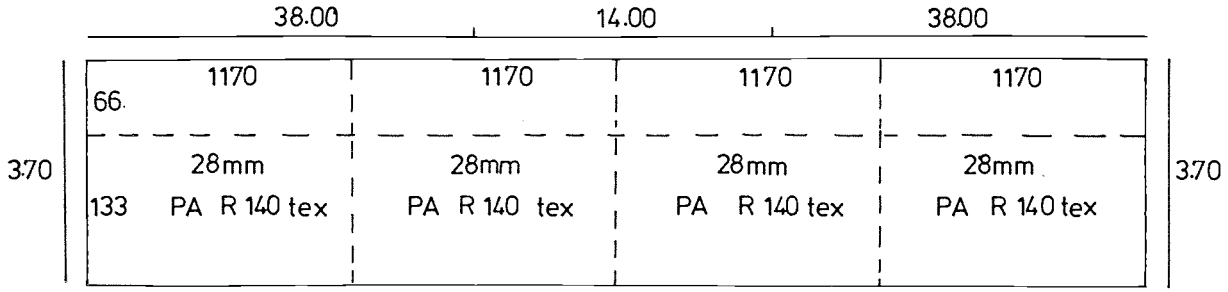
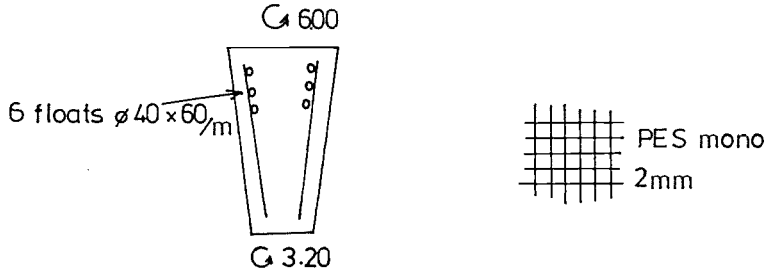


Fig.10 BEACH SEINE with bag

Mbita
KENYA
LAKE VICTORIA

details of the bags



ALT

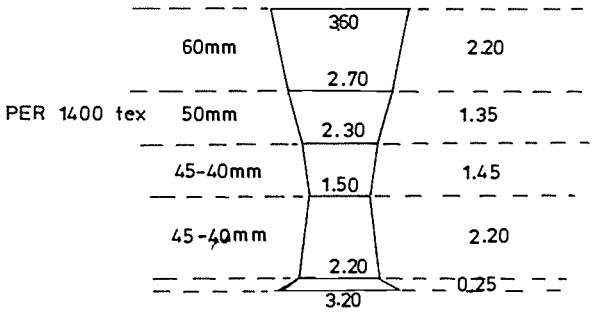


Fig. 11 BEACH SEINE
Operation at night

Mbita
KENYA
LAKE VICTORIA

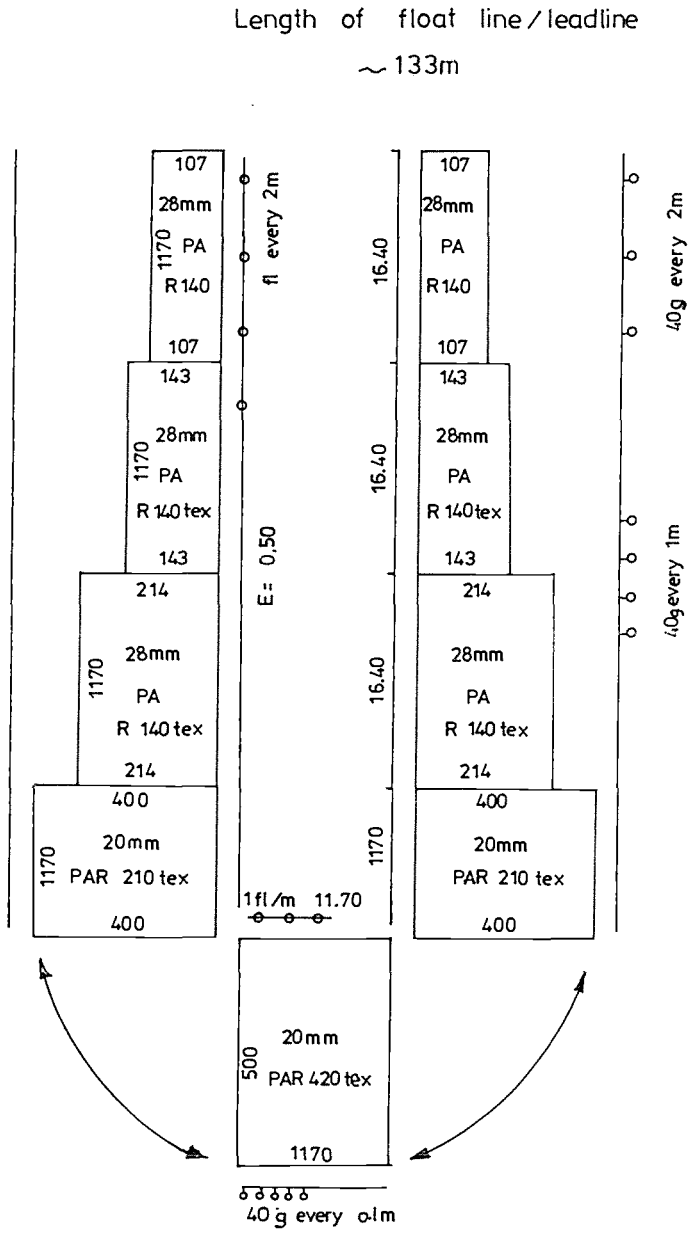
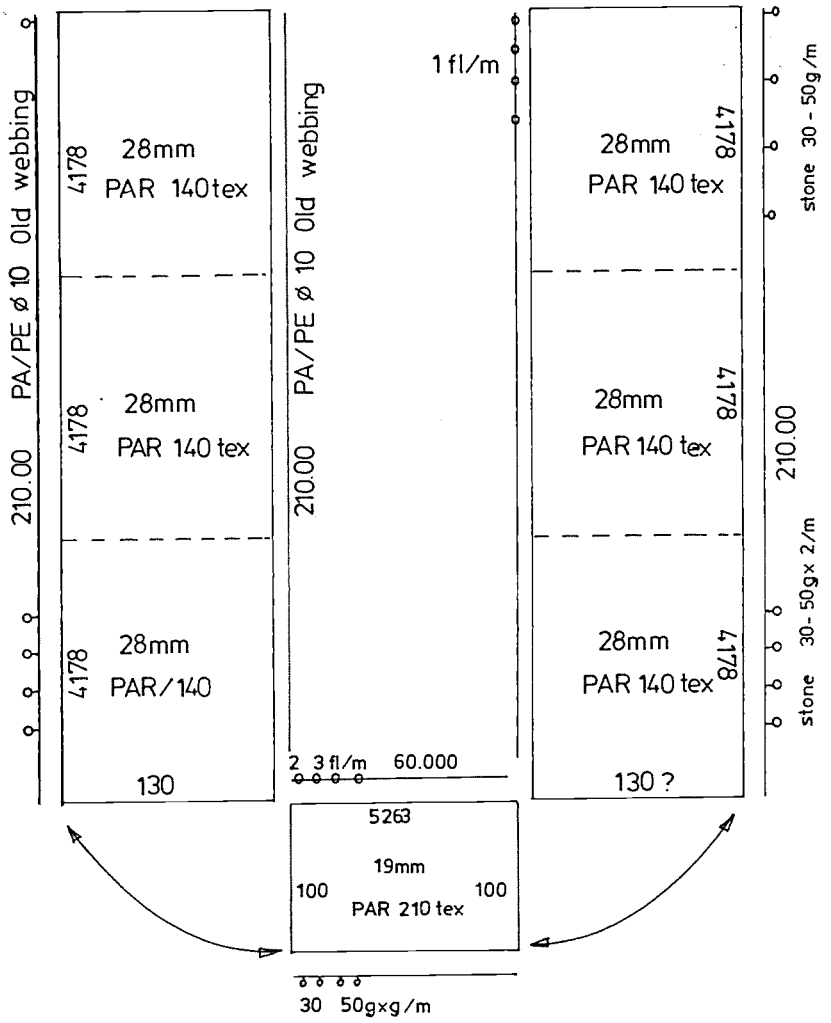


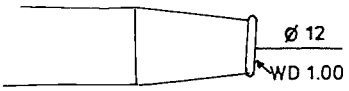
Fig. 12 BEACH SEINE
for nile perch, tilapia, any other fish
operated mainly night by 7men

Usenge
KENYA
LAKE VICTORIA

Length float line / lead line
480m



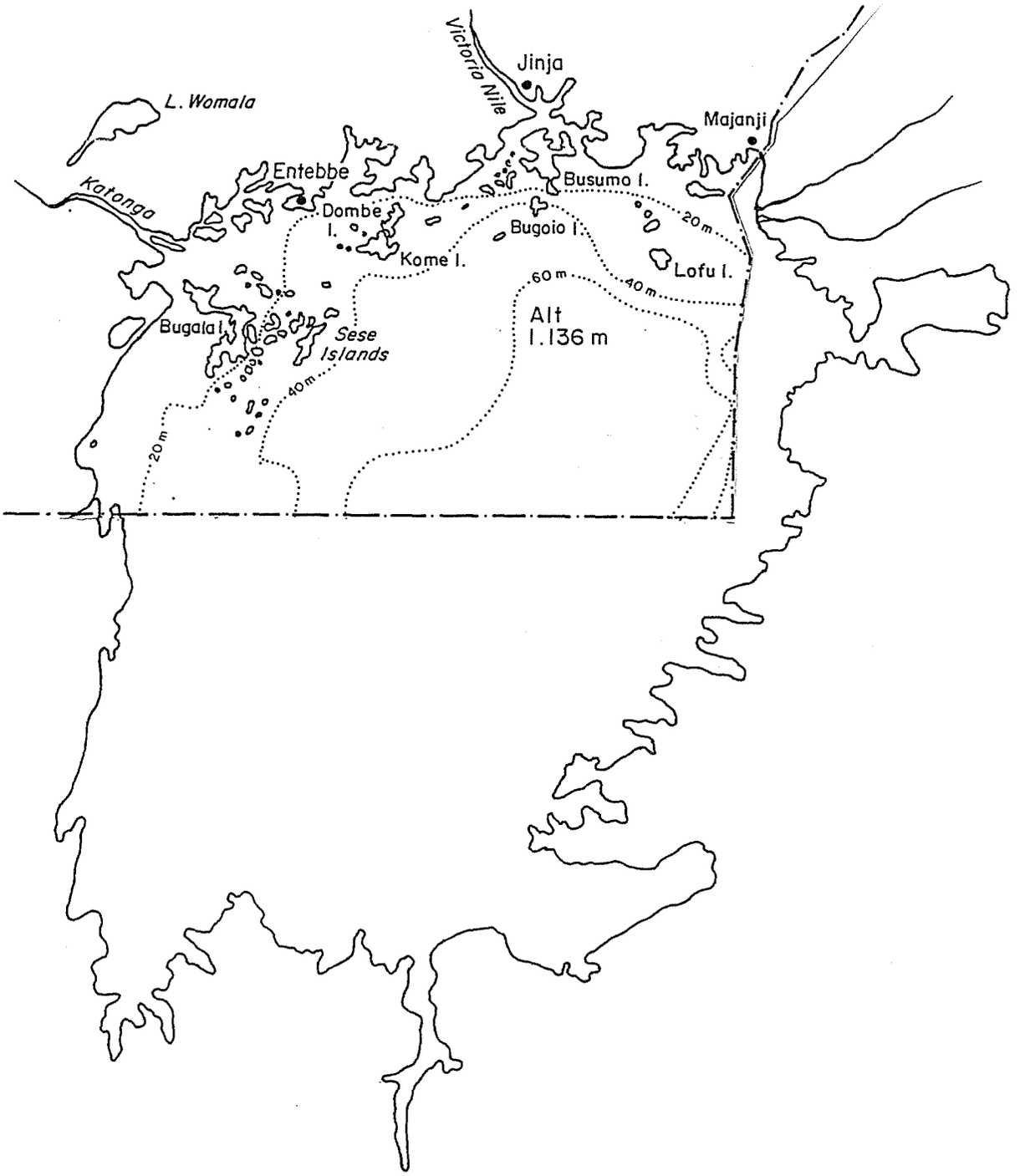
central part
with cover 90mm
PAR 1120 tex



FISHING GEAR AND METHODS OF CAPTURE IN THE UGANDAN WATERS OF LAKE VICTORA

CONTENTS

UGANDA


Victoria Nile
Jinja
L. Womala
Majanji
Entebbe
Busumo I.
Katonga
Dombe I.
Bugoio I.
20 m
Kome I.
Lofu I.
60 m
40 m
Alt
1.136 m
Bugala I.
Sese Islands
40 m
20 m

1. FISHING CRAFT OF THE UGANDAN SECTOR OF LAKE VICTORIA

Boats used for fishing, apart from some dugout canoes still used for very small-scale fisheries, are planked canoes, mainly "sesse" or "mataruma" type, less often "kabalega" type. Lengths are from 6 to 7 m up to 8.5 m. Transport boats are often larger: canoe "sesse" type or boat "dhow" type with larger capacity.

These canoes are locally built of wood, mainly "mukebo" which is a softwood, long-lasting, and the best, or "murule" which is a hardwood but less resistant. Other types of timber used are: mululu, musizi or podo. The durability of boats, therefore, depends chiefly on the type of timber used and the kind of handling or maintenance given to them during their life-time. The use of dug-out canoes is discouraged as these boats are unstable, hence, not sea-worthy in rough weather.

The Boat-building Division at the Fisheries Training Institute, Entebbe, runs a certificate and a diploma course in yatch and boat-building technology and consistently improves designs of traditional boats.

The carvelchine constructions, e.g. the "Wave-master", have proved good for the Lake Victoria fisheries. The "Kabalega" type with a "double chine" and about 9 m long, 1.4 m of the beam is also being improved. The construction of the fibreglass reinforced plastic boats is a recently introduced technology.

Some FRP boats have been introduced recently by an Italian bilateral project either for fishing (6 m long) or to transport fish (5 t capacity).

As far as propulsion for fishing canoes is concerned, mainly paddles are usued. Only transport boats are equipped with sail (lateen type) or outboard motors. However, some larger fishing canoes are using small outboard motors of less than 10 HP. Many different trade marks of motors are used, e.g. Evinrude, Johnson, provided by an EEC project, Mariner by ADP (Agriculture Development Programme), Yamaha or Suzuki by UCB; other engines used are Seagull and Selva.

At the main landing place there are mechanics in small private enterprises who have been trained on-the-spot and can repair outboard engines. However, they suffer from lack of spare parts (with the exception of parts for Yamaha and Mariner engines) and tools.

2. FISHING GEAR DESIGNS AND METHODS OF OPERATION USED IN THE UGANDAN SECTOR OF LAKE VICTORIA

2.1 Gillnetting for Nile Perch (Fig. 1, 2 and 3)

The gillnets have mesh sizes of mainly 179 mm (7 in) to 254 mm (10 in); in fact some larger meshes of 254 to 305 mm (12 in) are used when fish is abundant.

The nets are made of twisted multifilament PA R 210 to 280 tex (210/9 - 210/12) up to R 350 tex (210/15) for meshsize 203 mm (8 in) and R 560 tex (210/24) for meshsize 254 mm (10 in); of course the expected life duration of these gillnets depends on the strength of the twine they are made of:1 year for nets of 179 mm mesh size made of R 180 tex up to 2 years for nets of R 250 tex, 254 mm mesh size, generally 6-9 months or even less for nets made of R 140 to 210 tex.

Utilization of monofilament is banned.

To make these gillnets the webbing (26 meshes deep) is bought either factory-made by the Uganda Net Factory in Entebbe or, as is generally the case, imported, e.g. from Korea, Japan, China, Taiwan but also Zaire and Indonesia. Netting is available at most of the larger landing places and demand is very high during the good fishing season (July-November). White netting is mostly used but some "golden kaki" colour or light blue is also in demand. Imported ropes PE or less PA, Ø 1.5 - 2 mm are also availale for the floats and leadlines. The Uganda Commercial Bank Rural Farmers' Credit Scheme provide inputs at moderate prices.

Floats used are either of imported PVC Ø 90 X 45 mm or more often wooden made from "bark tree". Plastic cans and corks are also used.

Sinkers are either stones, cement, or small plastic bags, or ½-litre milk packets filled with sand.

The hanging for the webbing is made by the fishermen with a hanging ratio of 0.5 to 0.6, 2 meshes on one staple.

The smaller canoes carry 8 to 10 nets. The larger canoes, which are mostly based on the islands in the Masese area, carry from 100 to 200 nets. The most common would be 40-70 nets/canoe. To handle these nets 2 or sometimes 3 crew members are needed.

The gillnets used for Nile perch are anchored on fishing grounds up to 20 m depth. They are set either close to the surface, in midwater or near the bottom (mainly on sandy or muddy bottom in spite of the fact that good catches of big fish are more likely on a rocky bottom but then there is a risk of entanglement), depending on the phase of the moon.

The nets are set in one fleet in the evening and hauled in in the morning. The canoes often return to shore after setting but in some places the fishermen prefer to stay by their nets either because of the risk of theft or in order to save fuel if they have motorized boats.

In some areas, e.g. Jinja, the operation is different: the gillnets are used with "tycoon", i.e. large wooden poles with ballast at their extremities, to disturb the sea water and push the scared fish into the set gillnet. For this method, which is illegal, several shorter fleets of nets are set up to five times per night.

Catches are good from July to November but best during the rainy season (September-October). A good catch is considered to be around 40 fish/50-70 nets/set or night.

2.2 Gillnetting for Tilapia (Fig. 4 to 6)

The gillnets are made from the same material as those for Nile perch; the mesh sizes are 114 to 127 mm (4.5 - 5 in) up to 152 mm (6 in); the twine sizes are R 70 - 140 tex (210/3-210/6).

The fishing operation, mostly in the more coastal areas, is usually the same as that for Nile perch, i.e. bottom setting during the full moon or when the lake is rough (May-June, November-January), midwater setting during the new moon; fish are caught in the nets overnight.

In some places gillnets for tilapia are set in a circle in shallow water as surrounding gillnets (which is illegal).

2.3 Gillnetting for Other Species

Gillnets with large mesh of 152-179 mm (6-7 in) are used for catfish and bagrus. Twine sizes are R 140 - 200 tex (210/6-210/8). Some small gillnets are used to catch Mormyrus kannume as live bait (Fig. 6). These use to be around 76 mm (3 in) meshsize in R 47 - 70 tex (210/2 - 210/3) twine size.

2.4 Fishing with Longlines (Fig. 7 to 11)

In the past longlines were used for protopterus and clarias, the utilization of longlines for Nile perch is more recent and becoming increasingly popular.

They are mainly used from small, unmotorized canoes, 5 - 6.5 m. Some canoes use both longlines and gillnets.

The longlines are demersal, midwater or surface set depending on the phase of the moon and the nature of the bottom.

Short to very short (3.5 to 6 cm) snoods are used; snoods are knotted on the mainline and fishermen are afraid that they will twist (swivels are not available).

The hooks used for Nile perch and protopterus are galvanized eyed hooks, either Kirby or straight, 48 x 23 x Ø 1.5 mm (No. 4 or 5) or smaller 45 x 14 mm (No. 7); for clarias straight eyed 81 x 21 mm are used.

Live bait is used: small tilapia, small clarias, haplochromis or mormyrus; these are caught either with gillnets with 63-89 mm (2.5-3 in) mesh size mainly in the evening after being set for two hours or sometimes ashore in traps. Availability of live bait is a major constraint.

Fifty to 400 hooks per fishing units are used.

Fish caught with longlines are often large (more than 60 kg); a good catch is said to be around 1 fish for 4 hooks. Catches are reported to be lower during the full moon but there is no net variation according to season.

2.5 Fishing with Drop Line (Fig. 12)

A thin line of monofilament or multifilament nylon twine carrying a baited fish-hook at the distal end is tied onto a papyrus reed growing in the swampy lake shore. This gear is dropped into water, thus sinking to a required depth. The drop line is left to fish passively and unattended to either during day-time or night-time.

These are used for fishing Protopterus, tilapia and clarias.

2.6 Other Line Fishing (Fig. 13)

Some handlines for tilapia are used, mainly off Jinja. The bait used is earth worm or insects.

Utilization of pole and line (with earth worm as bait) is common but mainly for pleasure fishing by youths.

2.7 Dagaa Fishing with Boat Seines (Fig. 14)

Small boat seines made of mosquito net are used with light for dagaa, mainly around the islands offshore from Jinja.

The boat seine fishery is carried out only during the new moon when light attraction is efficacious.

2.8 Fishing with Scoopnets (Fig. 15)

The scoop net, made of mosquito net (hexagonal mesh, knotless, 5 mm) has 1.3 to 1.5 m diameter handled with a long wooden pole. These are used either with light attraction all year round for dagaa (Kisimi island) or even for tilapia and protopterus in the rainy season.

2.9 Cast Net Fishing (Fig. 16 to 18)

The utilization of cast net is normally prohibited but it is used in many places in shallow waters, near rocky spots, along the sandy beaches, especially on dark, calm nights.

These have different size (circumference of periphery or leadline length; stretched length) and are made of various netwebbing with different mesh sizes (25 to 130 m) and twine sizes (R 140 - 280 tex, 210/6-12).

2.10 Fishing with Beach Seines (Fig. 19 to 22)

Beach seines are illegal since 1987 but used in many places. These seines are with or without bag in the middle. Some beach seines with a bag (25-50 mm mesh size) with larger mesh size in the wings, 100 m, 200 m or longer. Other smaller seines without bag are made entirely of mosquito net.

2.11 Trap Fishing (Fig. 23)

Fish traps exist in different forms and vary in design from area to area, depending on local traditional fishing practices and needs. The funnel-shaped basket trap is a common type.

The trap is set in shallow waters of the lake shores where fish regularly move or congregate.

2.12 Trawling (Fig. 24)

Trawling activities are so far very limited.

The Uganda Freshwater Fisheries Research Organization (UFFRO) is operating a small stern trawler (125 HP), especially for resource surveys with a bottom trawl (made of PE); for the same purpose UFFRO soon plans to do some bottom pair trawling using two motorized canoes (15 HP).

As far as commercial trawling is concerned, this is limited to the activities of a Sino-Uganda Fisheries Joint Venture. This company has four steel trawlers (built in China) 20 m, 80 HP, with large propeller and nozzle, capacity 10 t of fish, 6 crew members. Only two of these are now in operation for bottom pair trawling for Nile perch.

The trawls used are made of PE, floatline either 18 or 21 m, groundrope steel wire Ø 16 mm with rubber bobbin 100 mm, mesh size in the wing 160 mm, in the codend double mesh size 70 mm.

Sweeplines are of combination rope Ø 30 mm, 50 m long and warps are steel wire Ø 8 mm.

The fishing grounds are muddy/sandy, on average 10 m deep. The trawling operations are carried out in day time, towing 1 to 2 hours at 2.5 - 3 knots speed.

The target species is Nile perch but the catch is always mixed with tilapia, a good catch is said to be around 0.5 t/hour.

3. REGULATIONS CONCERNING FISHING GEAR AND METHODS

The regulations concerning fishing gear and methods were published in the "Fish and Crocodile Act".

Some gear are banned: beach seine and castnet.

Utilization of certain material is prohibited: monofilament twine and mosquito net.

Some ways of operating are not allowed, e.g. setting the gillnet in a circle as a surrounding gillnet, scaring the fish and then pushing them into the gillnet (with typoons), light attraction with gillnet or any other gear.

This regulation is very restrictive and practically impossible to enforce because it goes against all traditional fishing practices (beach seining, fishing with castnets).

Fig. 1 :GILLNET FOR NILE PERCH

Kigungu
UGANDA
LAKE VICTORIA

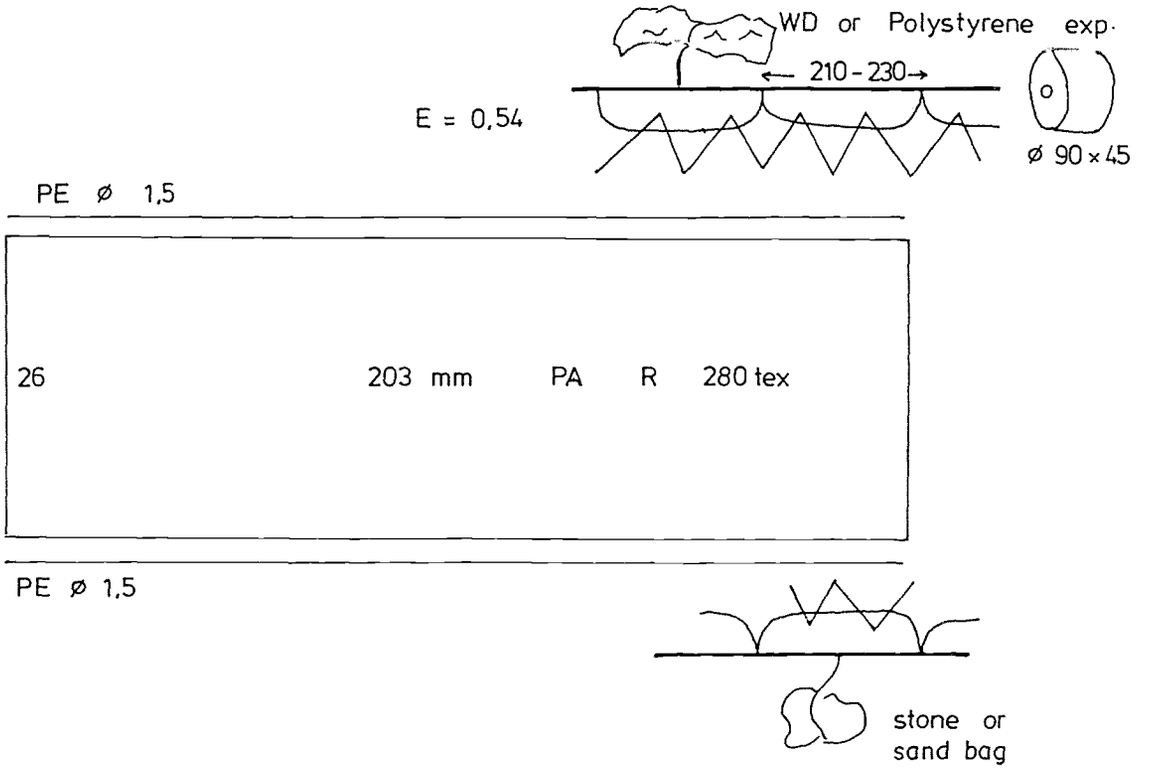
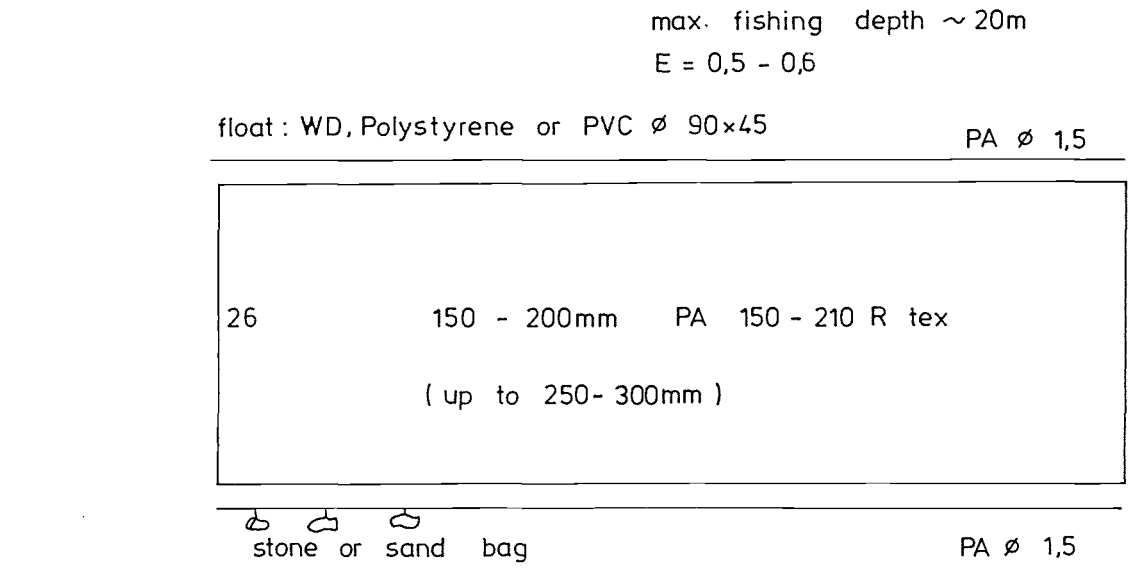


Fig. 2 GILLNET FOR NILE PERCH — UGANDA

"sese" canoe ~ 6,5 - 8,5m with paddle 3 crew members — LAKE VICTORIA

~ 50 - 70 nets (up to 100 - 200) / canoe



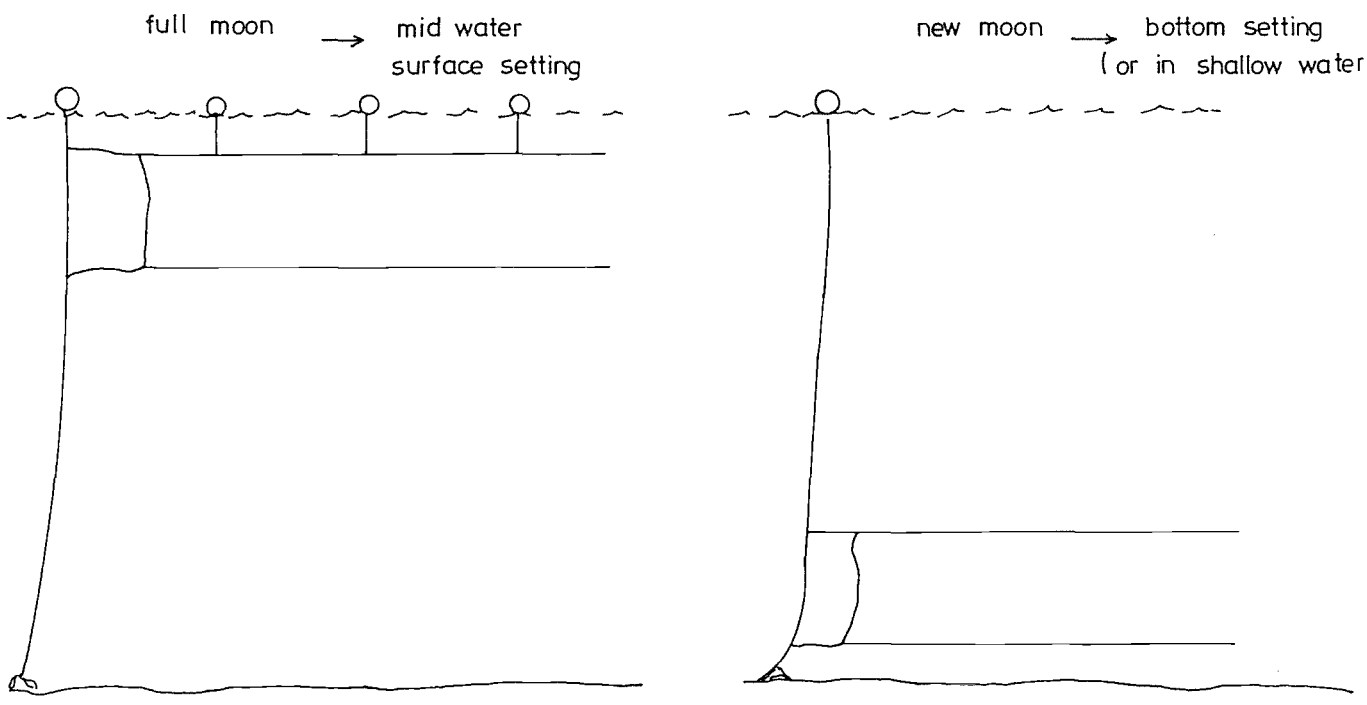
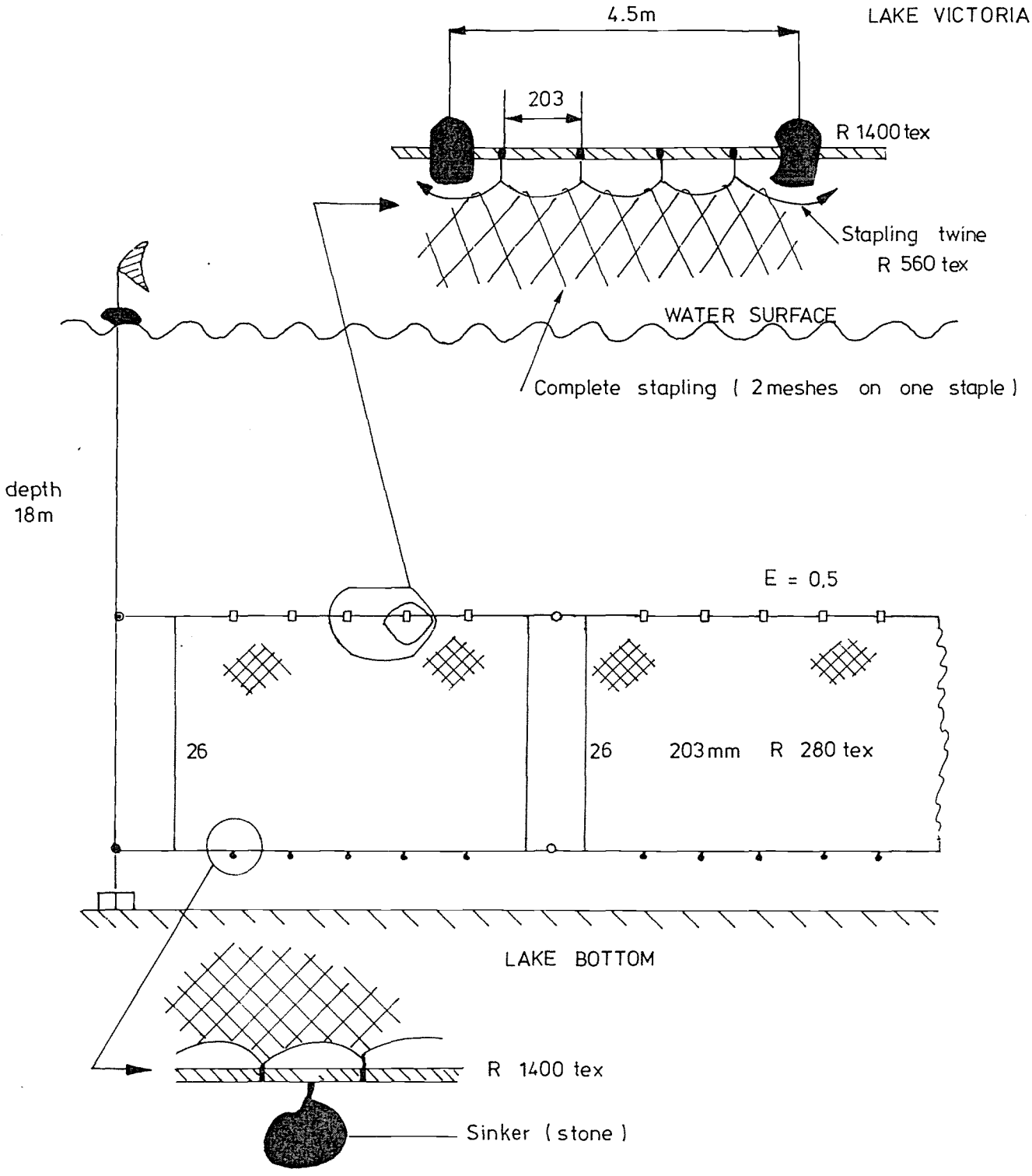


Fig. 3 :BOTTOM SET GILLNET FOR NILE PERCH

Kome Islands
UGANDA
LAKE VICTORIA



Best catches - during new moon
Period: - Sept - Nov.

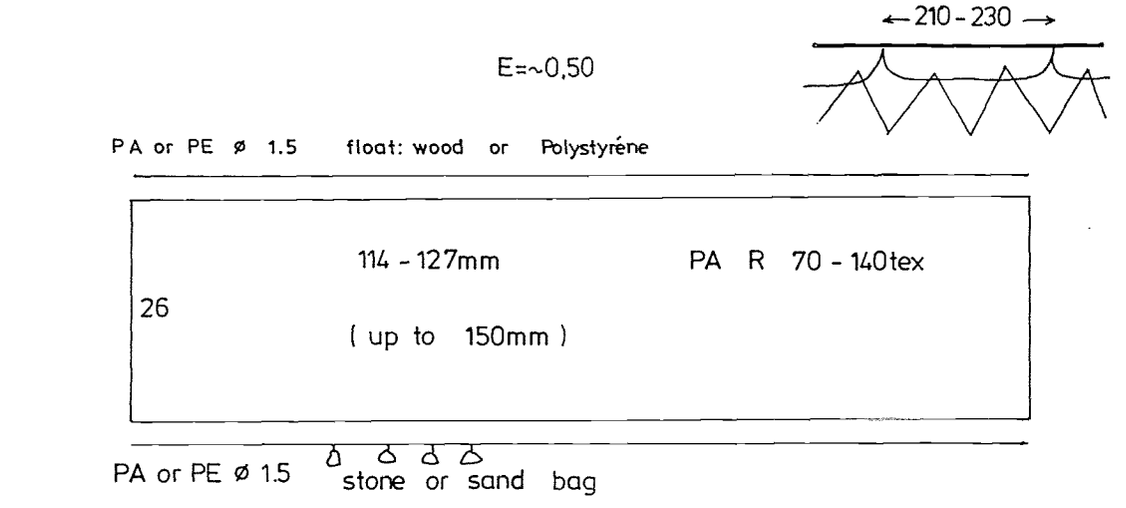
Canoe and its capacities : Sesse canoe
: L.O.A = 8.0m
: Out-board engine - 15 H.P
: 3 crew
: 40 gillnets aboard

Gillnet fleet - setting at dust (≈18 h)
toward wind site
- hauling at dawn (≈06 h)

RAF / 87 / 099
L.E. OLUKA
11 / 90

Fig. 4 : GILLNET FOR TILAPIA

UGANDA
LAKE VICTORIA



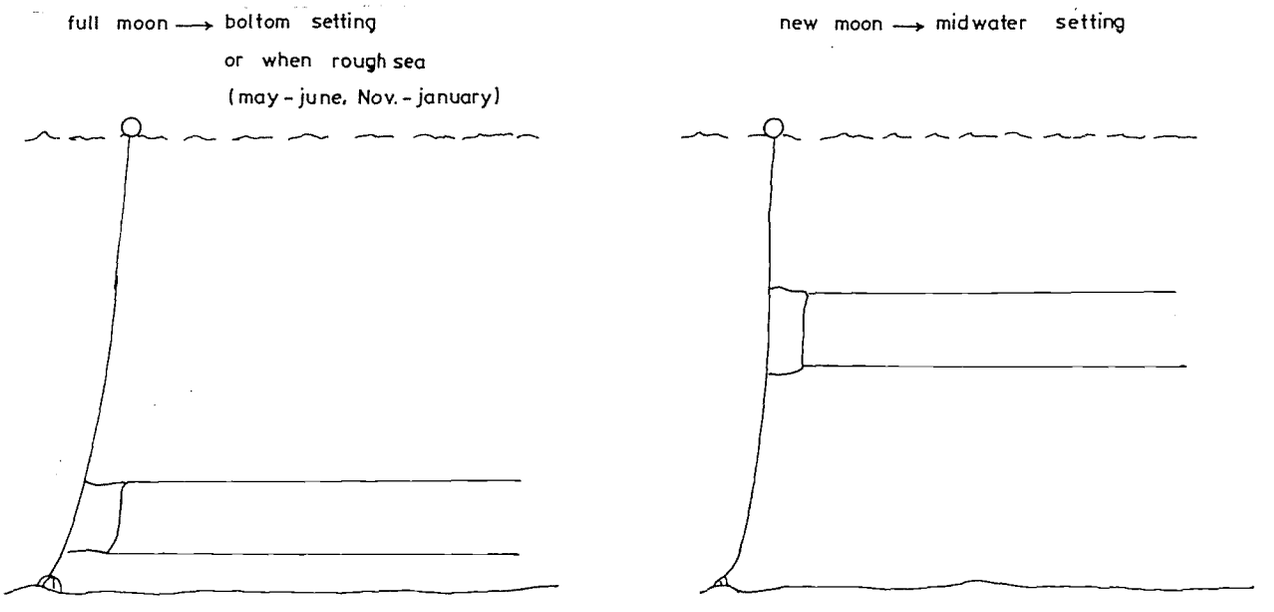
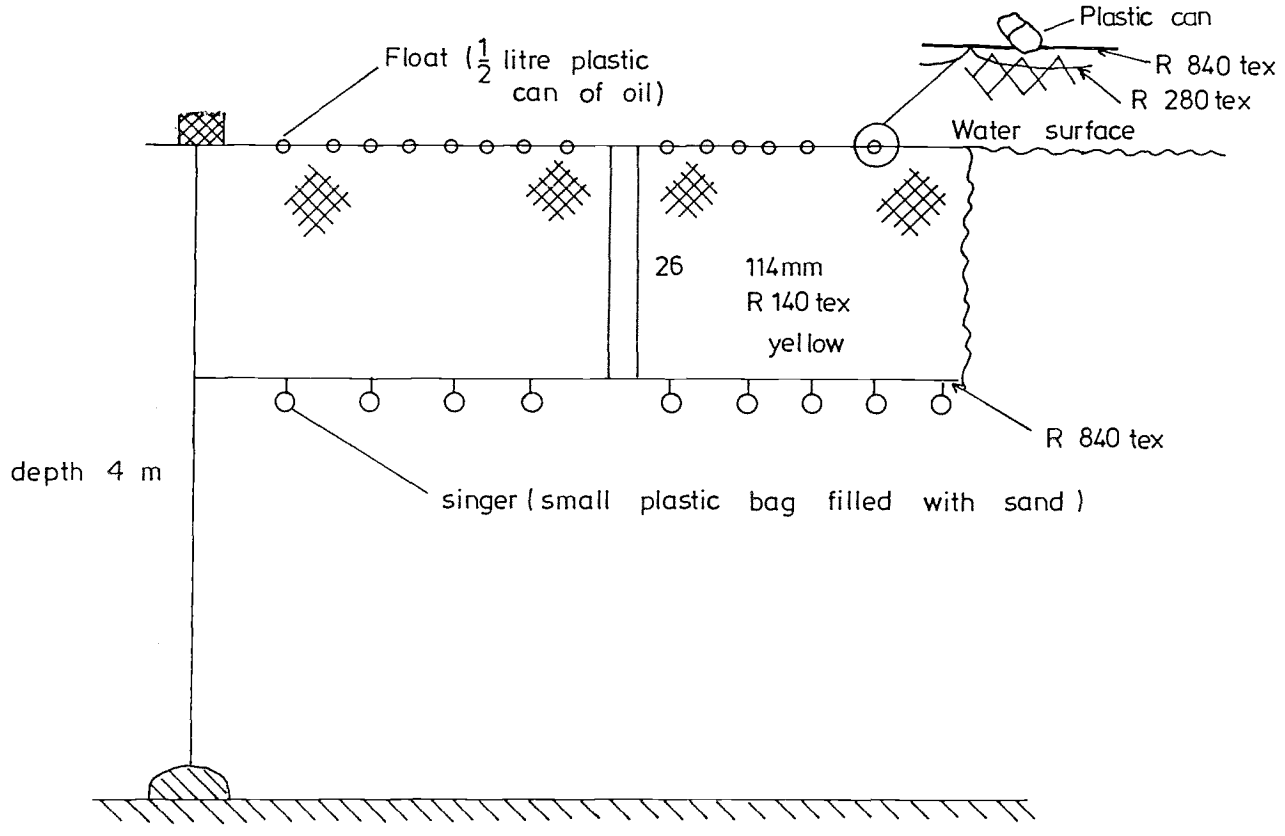


Fig. 5 : SURFACE GILLNET FOR TILAPIA

Kasenyi
UGANDA
LAKE VICTORIA



Canoe : sesse wooden planked canoe
: L.O.A. = 5·5m
: Paddled
: 2 crew
: 8 gillnets on board

Fig. 6 : GILLNET FOR LIFE BAIT : Mormyrus Kannume small tilapia

UGANDA
LAKE VICTORIA

fishing in the evening
hauling every 2 hours

26	63 - 89 mm	PA	R 47 - 70 tex

Fig. 7 : SET LONGLINE FOR NILE PERCH, (Clarias, Protopterus)

Jinja
UGANDA
LAKE VICTORIA

small canoe 4.5 - 6m paddle

bait : life haplochromis

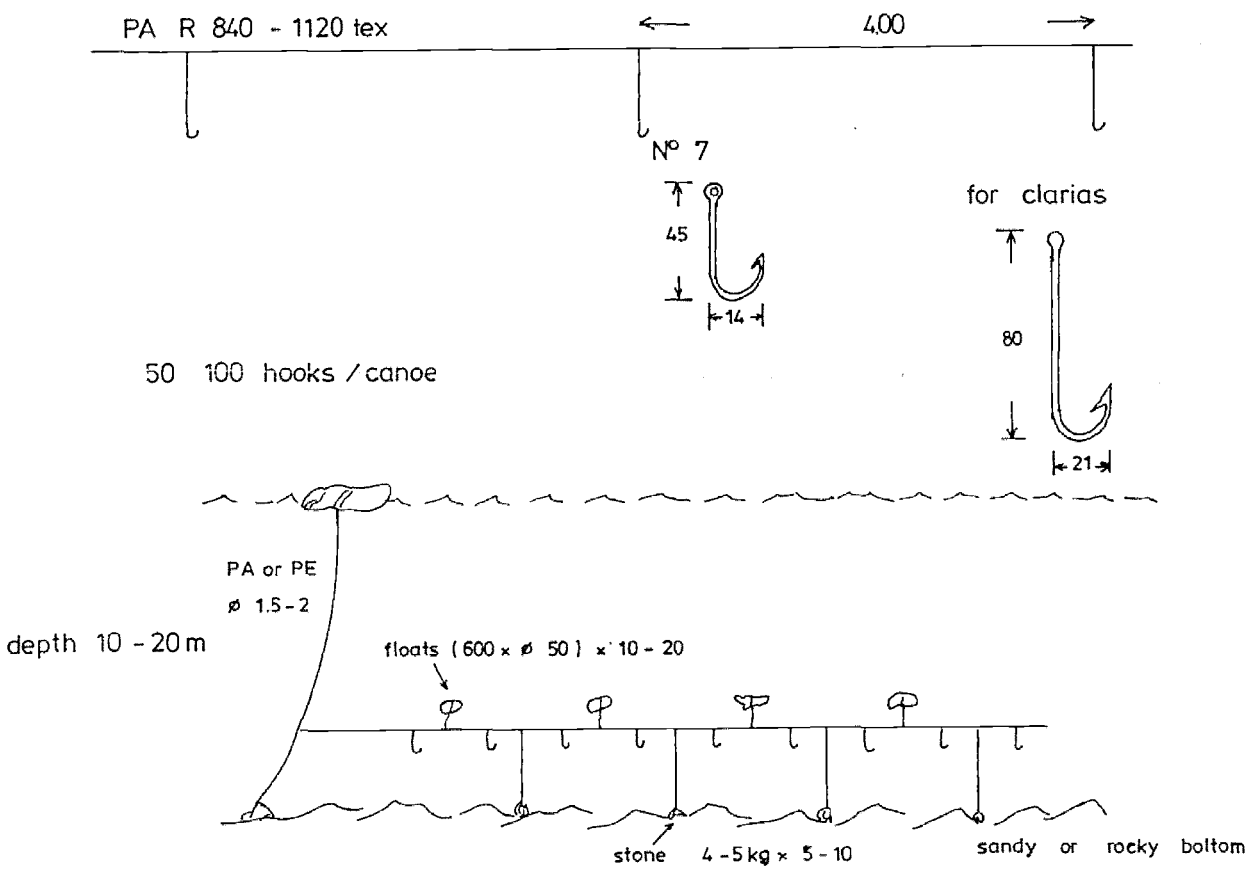
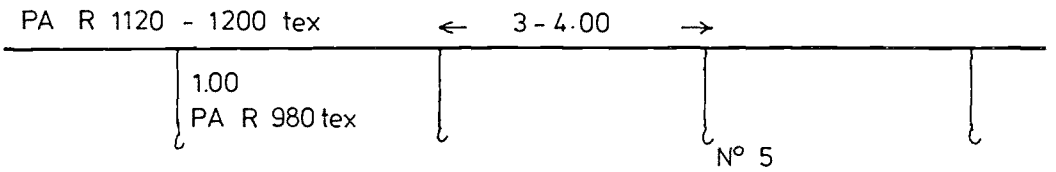


Fig. 8 : SET LONGLINE FOR NILE PERCH

Kiimi Island (NSADSI)
UGANDA
LAKE VICTORIA



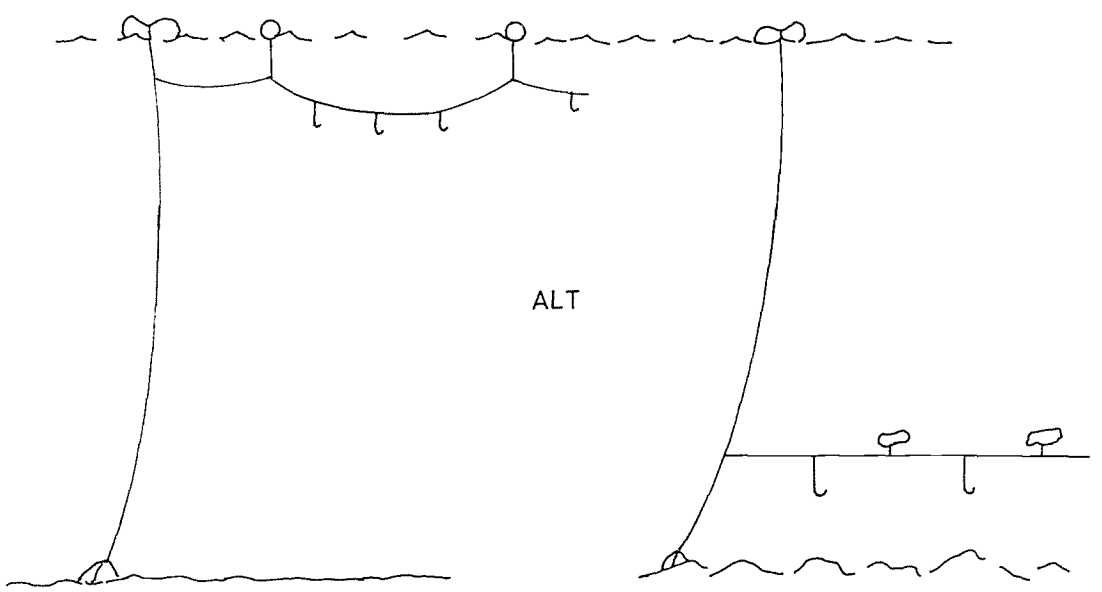


Fig. 9 :SET LONGLINE FOR NILE PERCH (and Protopterus)

Kigungu
UGANDA
LAKE VICTORIA

"sese" canoe ~6.5m with paddle

bait : life small tilapia

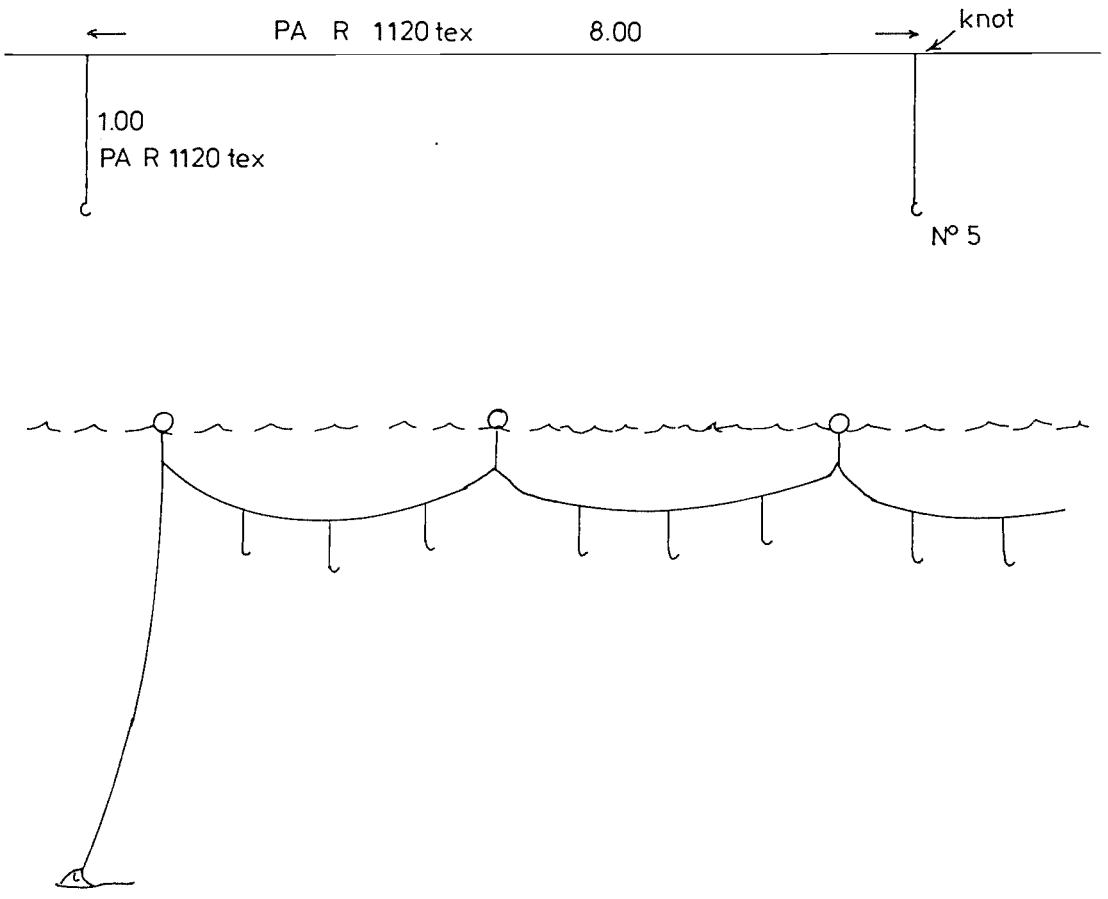
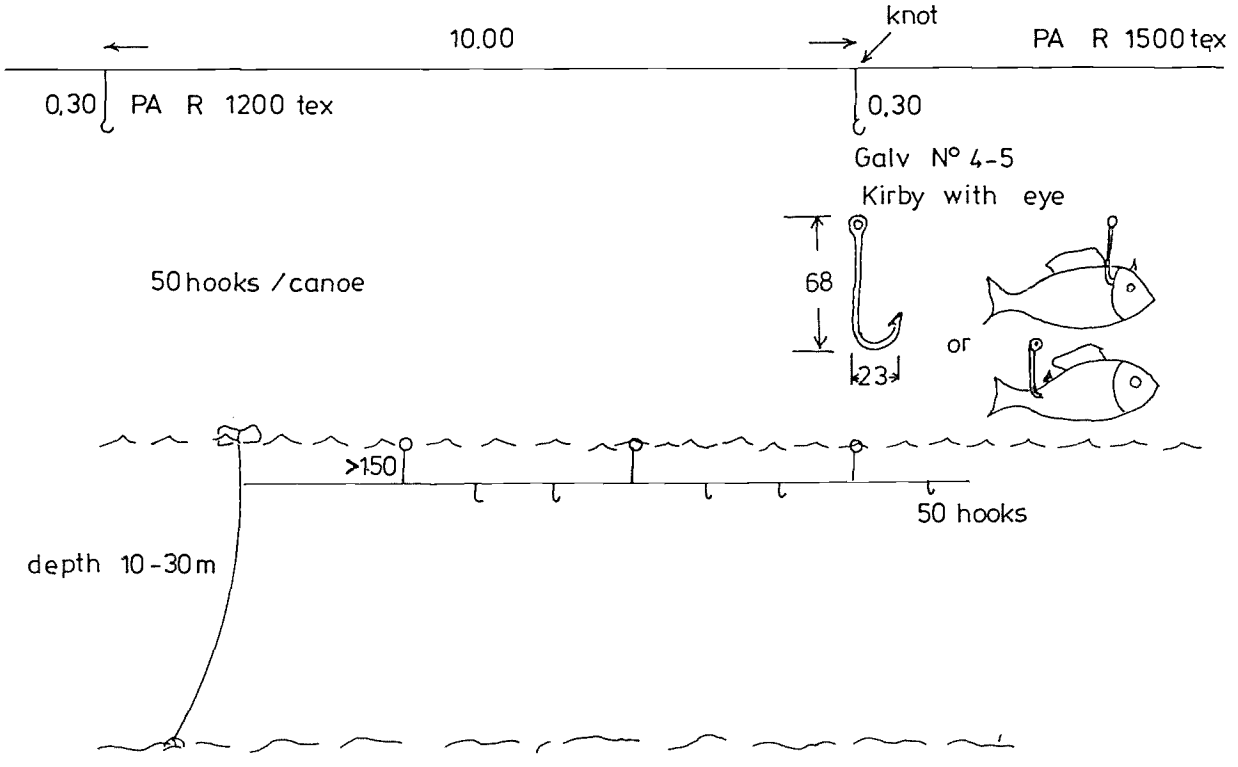


Fig. 10 : SET LONGLINE FOR NILE PERCH

Entebbe
UGANDA
LAKE VICTORIA

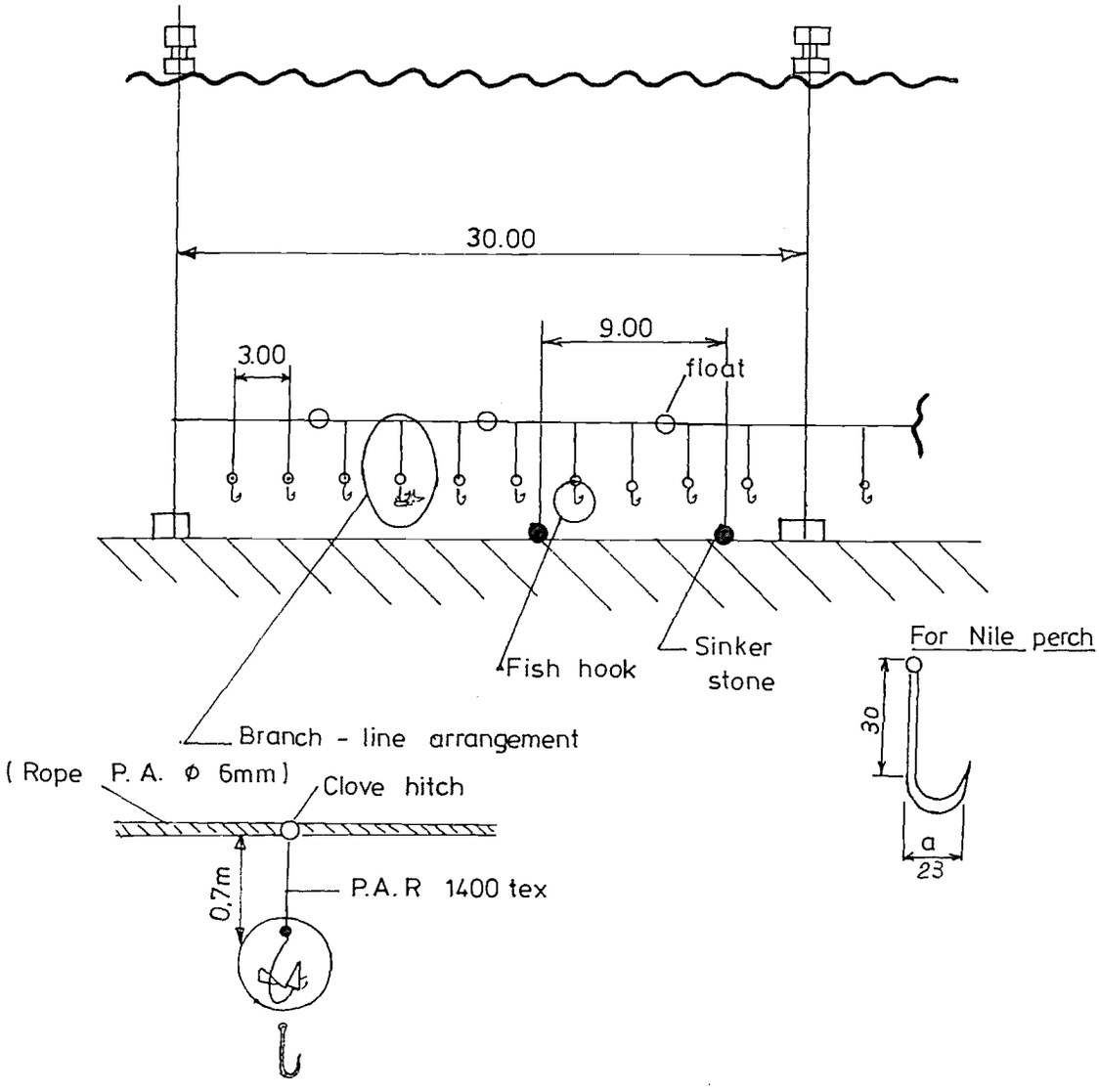
"sese" canoe 5m paddle
night fishing
bait : life mormyrus, small tilapia or clarias



Note : when full moon ⟶ less intermediate buoy to let the longline fish deeper

Fig. 11 : BOTTOM - SET LONGLINE FOR NILE PERCH

Jana fishing ground
UGANDA
LAKE VICTORIA



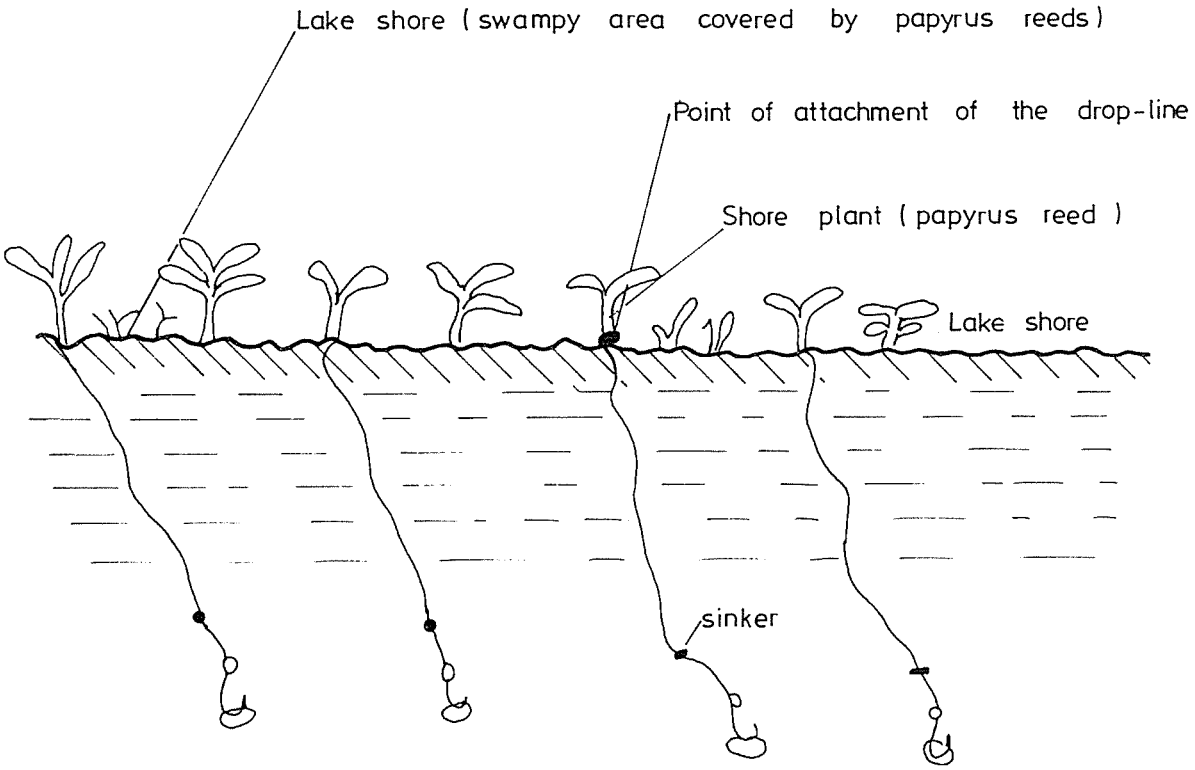
Hook baited with life Mormyrus

Hook : with flattened shank
: Size N° 4 or 5
: or round bent straight ring
: tinned size N° 4 or N° 5 or N° 7
: model - Mustad steel hooks

hooking the bait such that it struggles freely as although swimming normally

Fig. 12 : FIXED DROP LINE

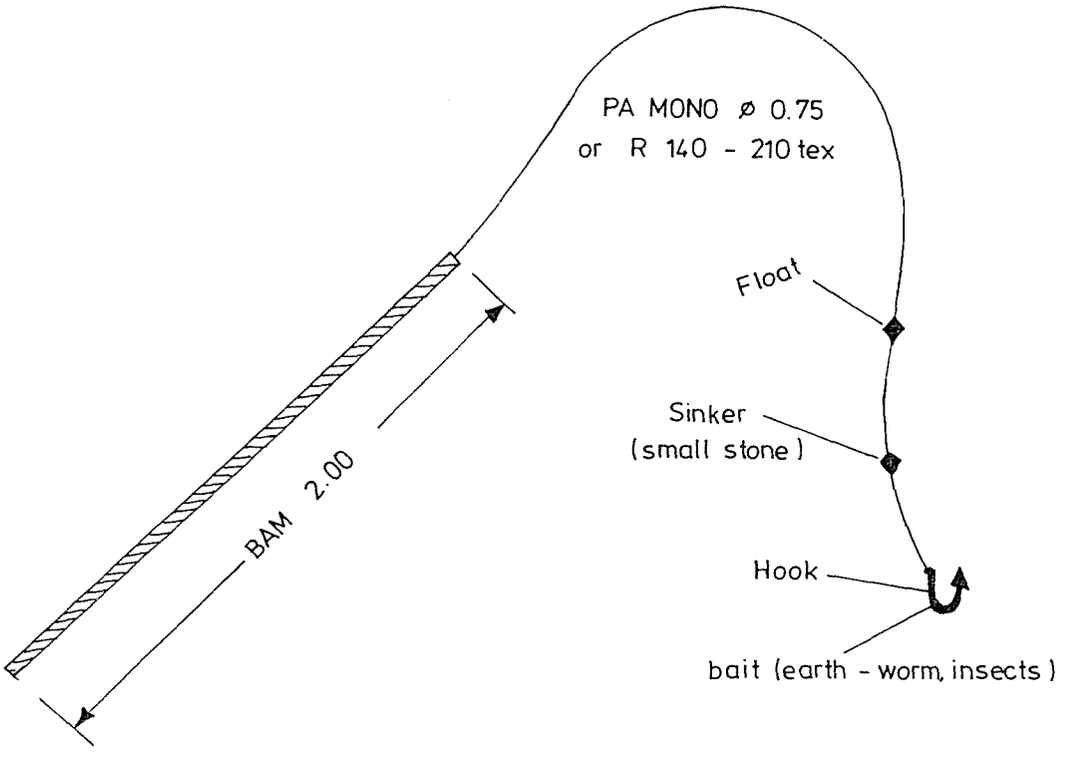
Zinga Island
UGANDA
LAKE VICTORIA



Main fish spp caught : Protopterus , Oreochromis niloticus, clarias
Hook sizes : N° 8 , 9 , 10 , 12 , 14
Bait : meat, pieces of Haplochromis, earth worms, insects

Fig. 13 : HANDLINE

Entebbe pier
UGANDA
LAKE VICTORIA



Fish-hooks for hand-line fishery
Hook for Tilapia, Haplochromis,
"Mustad" model: size N° 8, 9, 10, 12, 14, 16, 20.
For Nile perch: size N° 7, 5.

Fig. 14 :BOAT SEINE NET (mosquito net)

Engraulicypsis

Masese, Jinja
UGANDA
LAKE VICTORIA

canoe 6 - 9m crew 8 - 10
with light attraction

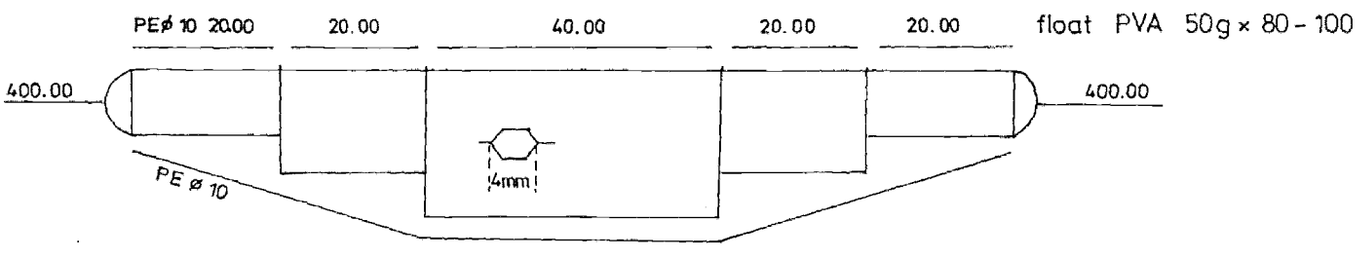
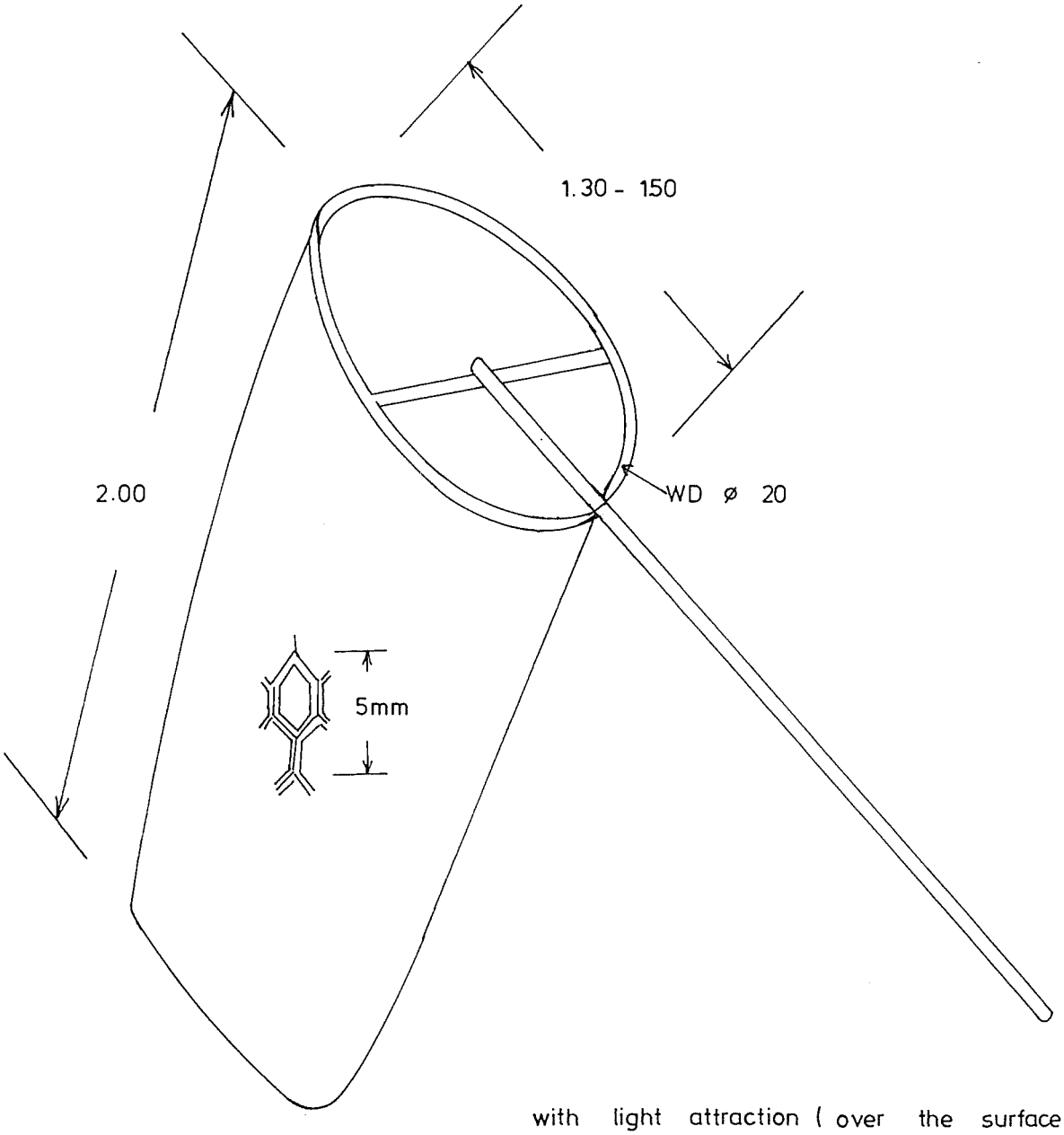


Fig. 15 :SCOOPNET FOR DAGAA

Kiimi Island , NSADSI
UGANDA
LAKE VICTORIA

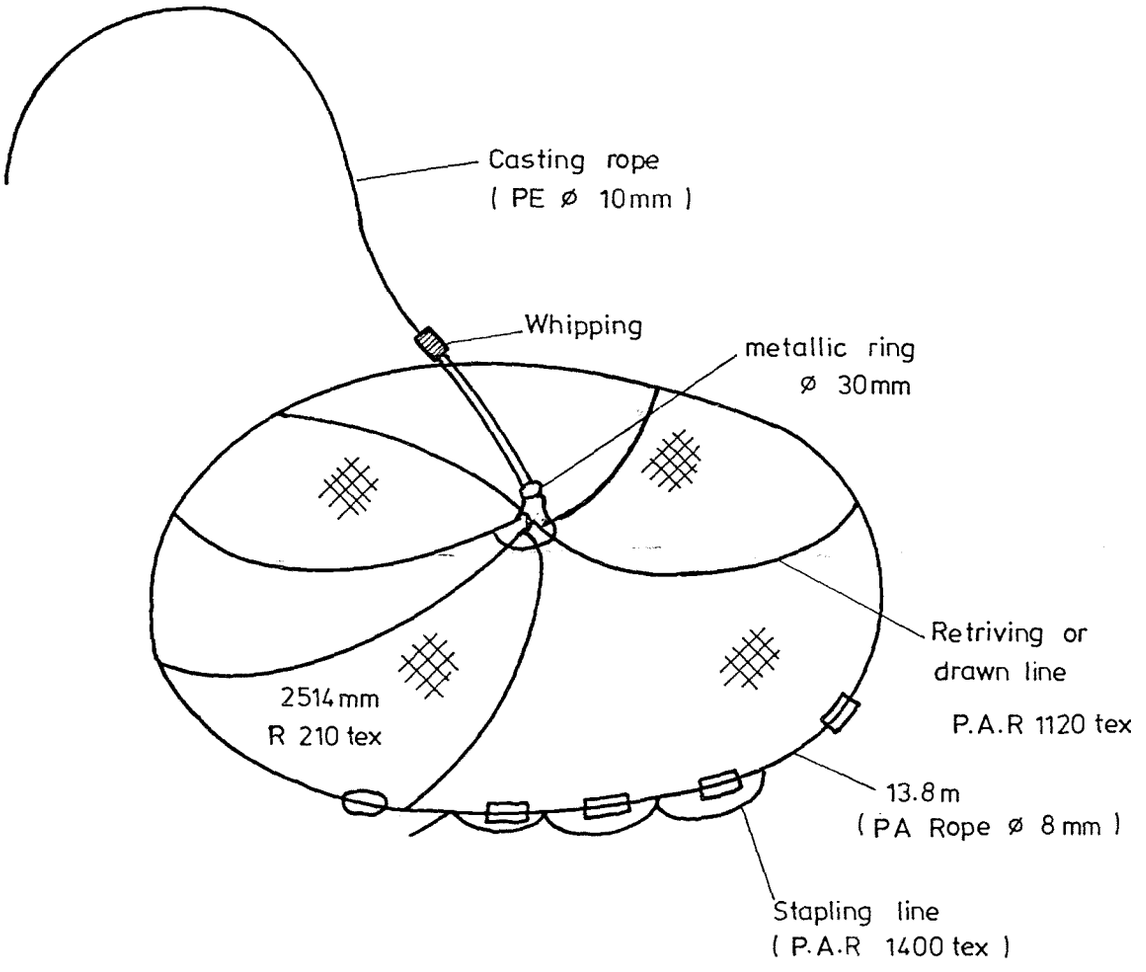


with light attraction (over the surface)

light on for ~ 2hours

Fig. 16 : CAST NET

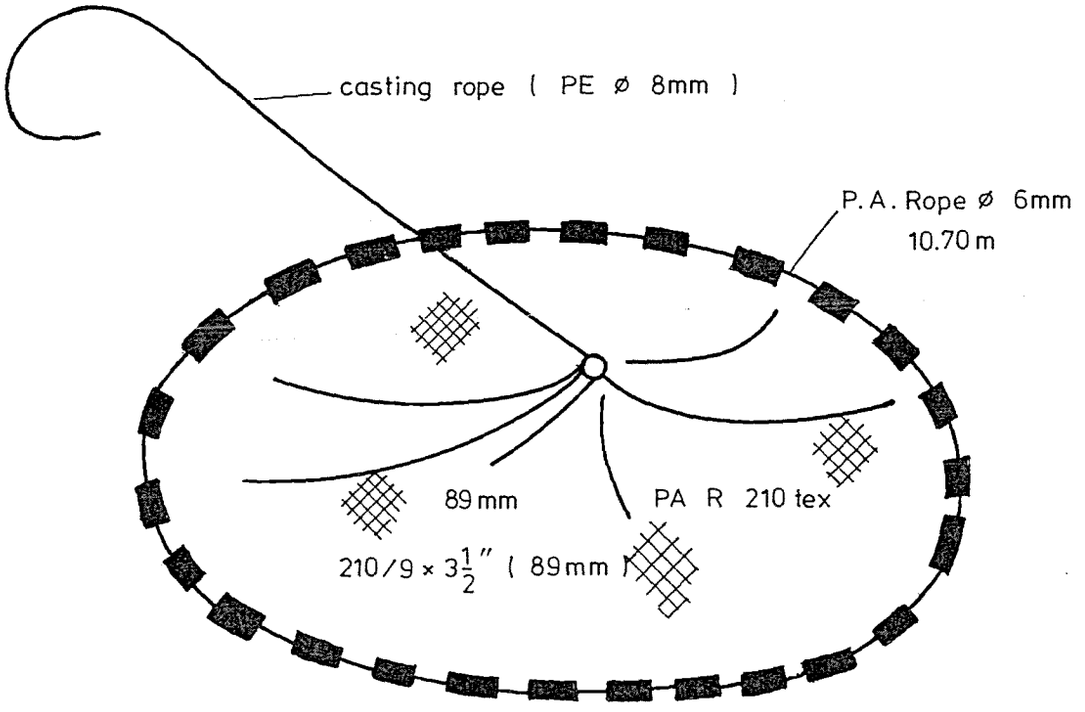
Bugonga
Bugonga Beach Resor
ENTEBBE - UGANDA
LAKE VICTORIA



Stretched lenght (or cast net radius : 2,2m)
Total weight of the lead sinker : 4.1kg
Main fish caught : Tilapia

Fig. 17 : CAST NET

Kigungu Lake sho
Entebbe - UGANDA
LAKE VICTORIA



Stretched length (or cast - net radius) : 1,7m
Total weight of the lead sinker : 2,7 kg
Main fish spp caught : Tilapia .

Fig. 18 : CAST NET

Kiimi Island
UGANDA
LAKE VICTORIA

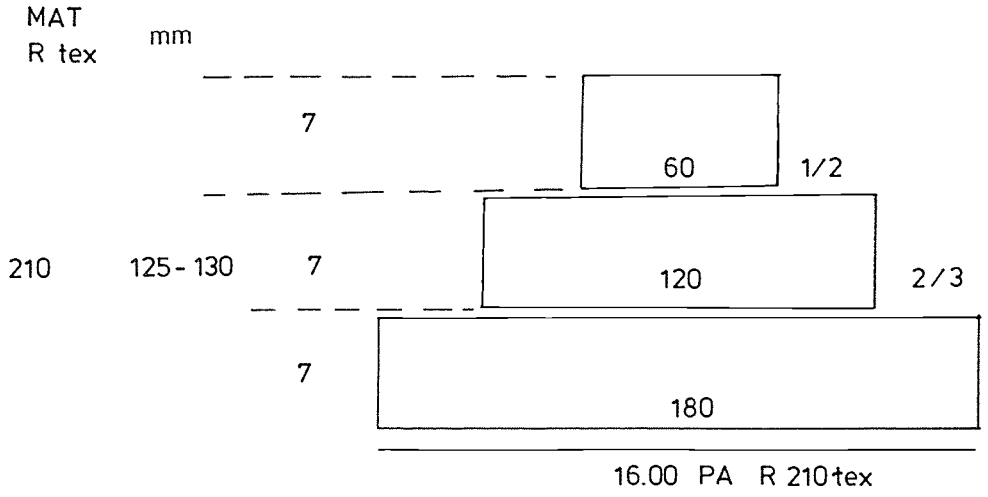
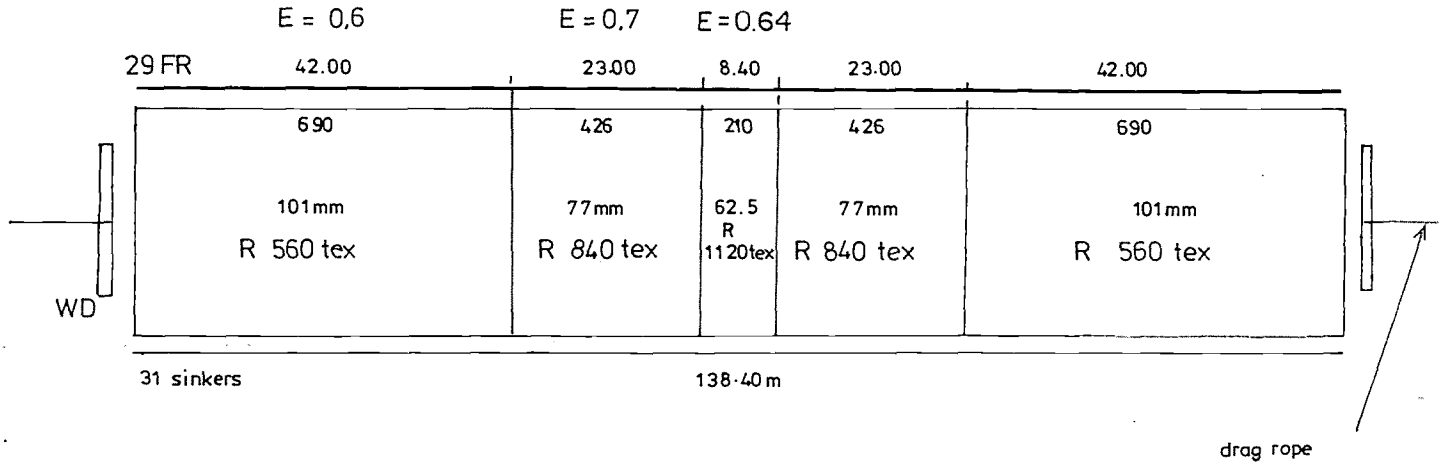


Fig. 19 :BEACH SEINE

Bubeke
Sese Islands UGANDA
LAKE VICTORIA

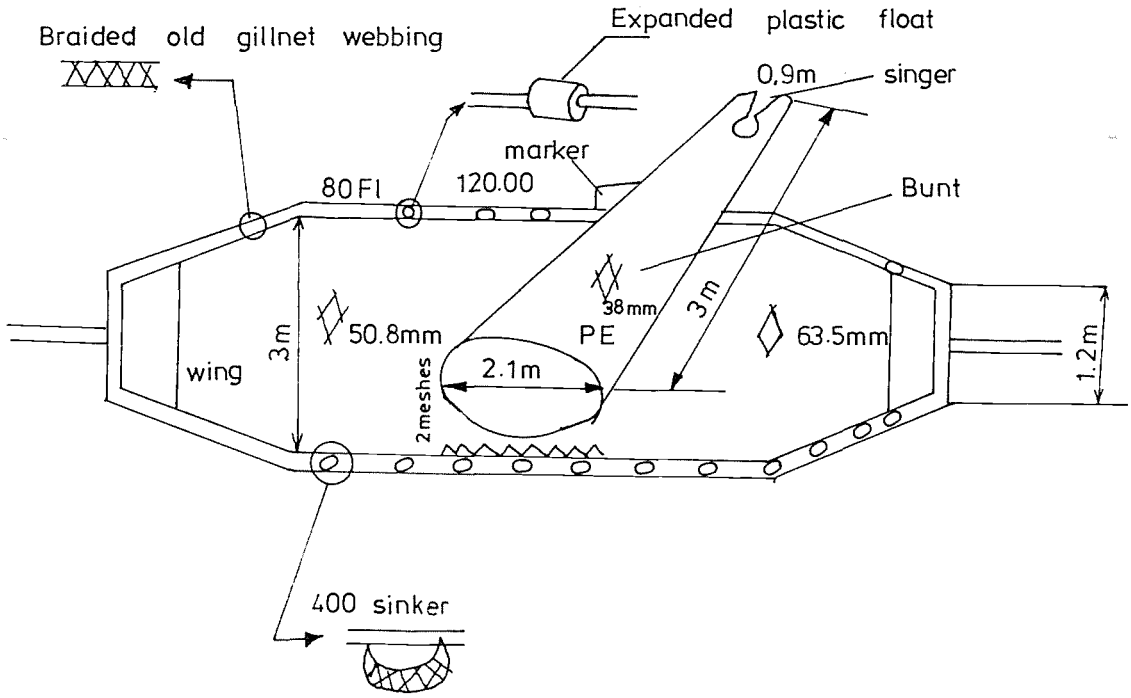


Fish caught : tilapia, Nile perch

for the manoevering : 6 - 10 men

Fig. 20 : BEACH SEINE

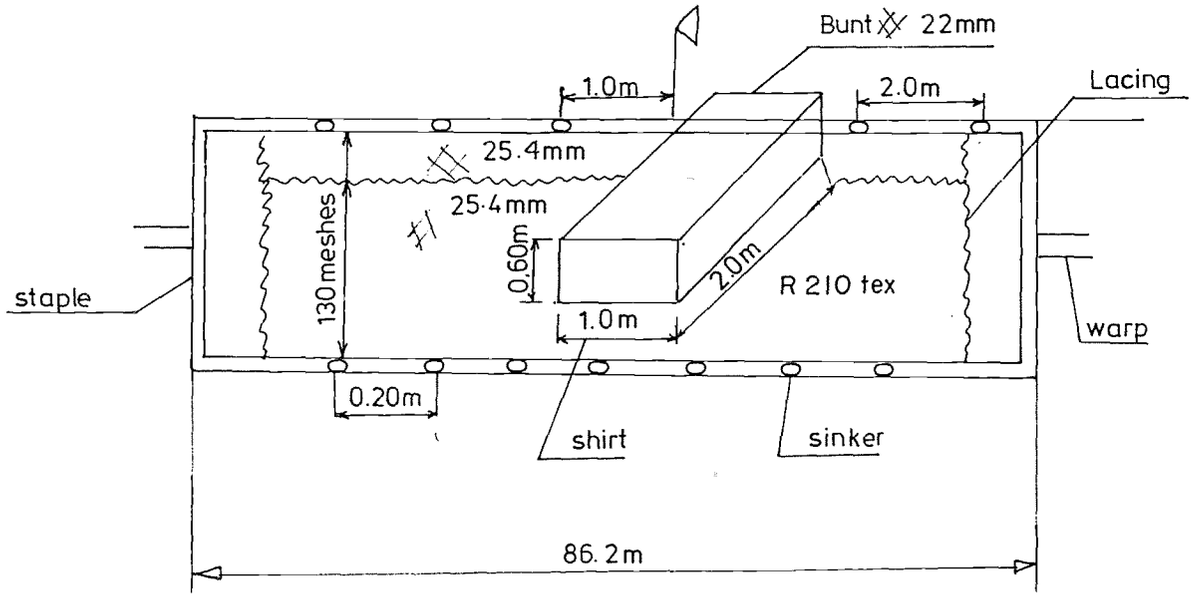
Majanji
UGANDA
LAKE VICTORIA



Main fish spp. caught: Nile perch, Tilapia

Fig. 21 : BEACH SEINE

Kiyindi
UGANDA
LAKE VICTORIA



Main fish spp caught : Nile perch, Tilapia

Fig. 22 : BEACH SEINE WITH BAG

Masese
UGANDA
LAKE VICTORIA

for nile perch, barbus
setting with 6 - 9m long canoe
manoeuvre by 6 - 8 men

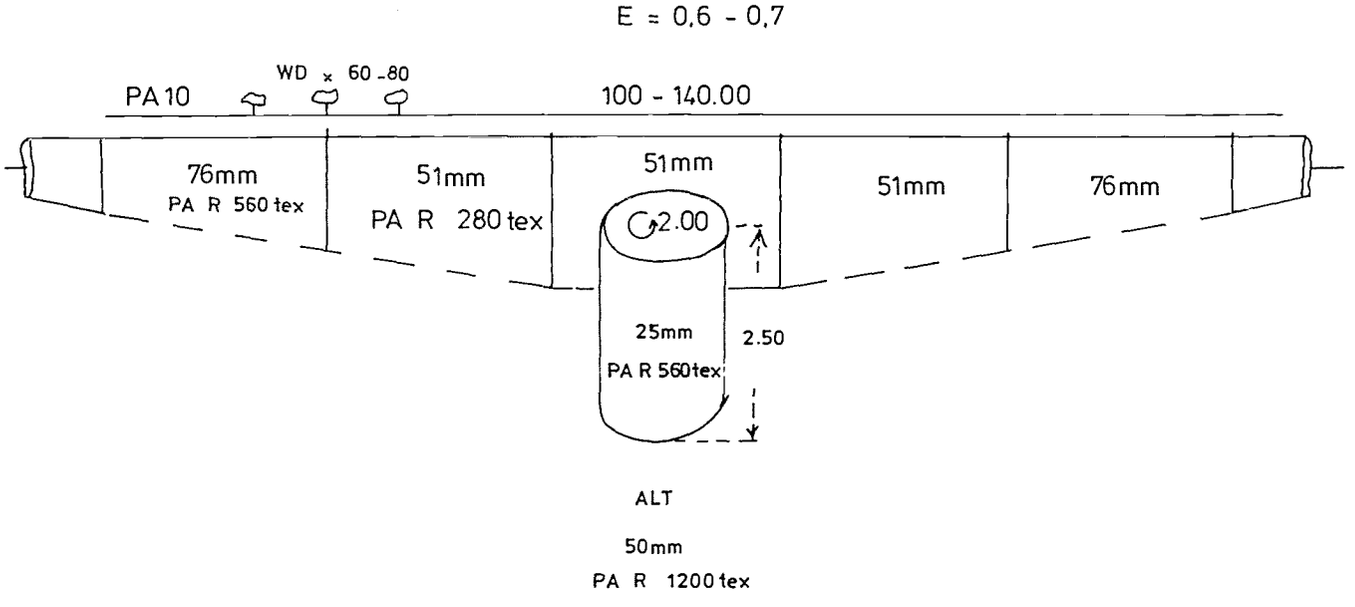
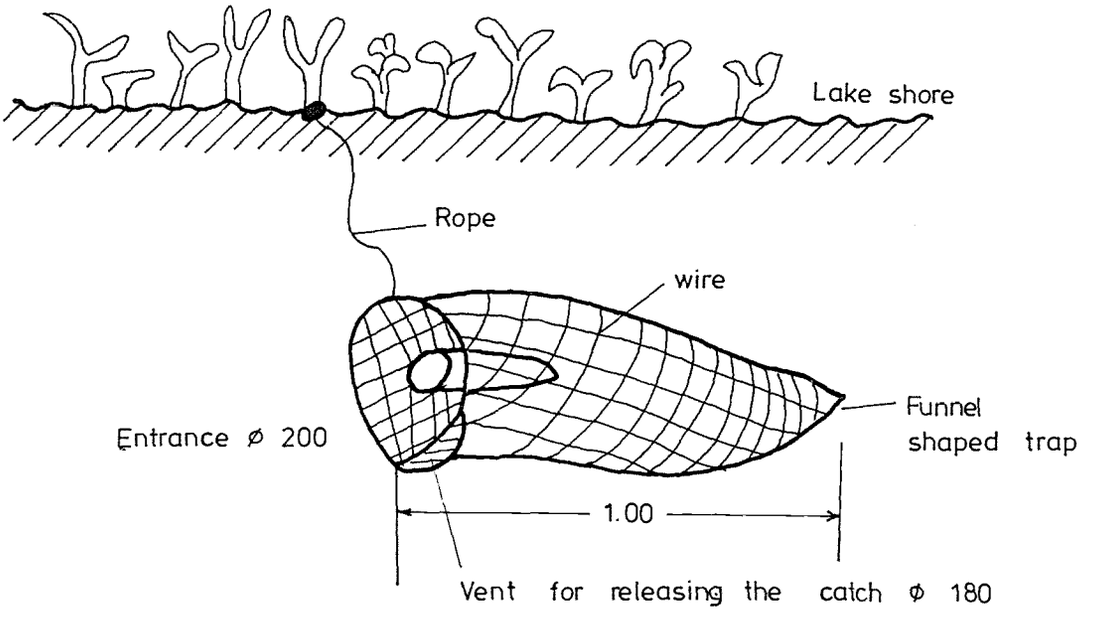


Fig. 23 : FUNNEL - SHAPED BASKET TRAP

Nakalanga
UGANDA
LAKE VICTORIA

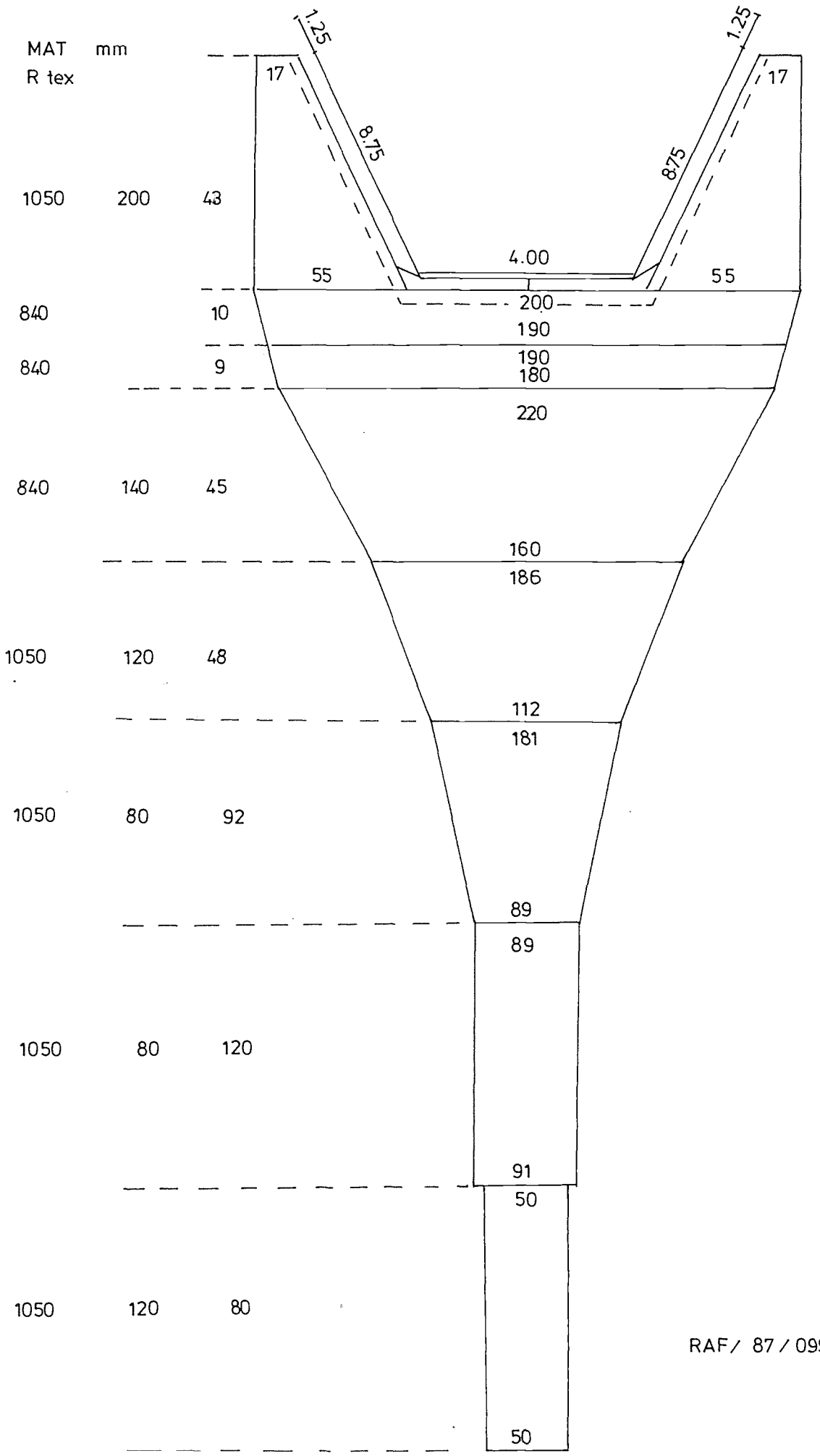


Fish species : Tilapia spp. (Oreochromis niloticus)
Schilbe mystus
Barbus

Fig. 24 : BOTTOM TRAWL FOR PAIR TRAWLING

Entebbe, UGANDA

LAKE VICTORIA



RAF/ 87 / 099 L.E. OLUKA

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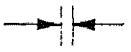
ANNEX 1

ABBREVIATIONS AND SYMBOLS USED FOR THE DESIGNS

BR	brass
Fe	iron
L	length
MAT	material
MONO	monofilament
PA	polyamide
Pb	lead
PE	polyethylene
PL	plastic
PP	polypropylene
PVA	polyvinyl alcohol
∅	diameter
	upper panel
	lower panel
	side panel
	N-direction in netting

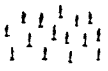


thickness

approximately

mesh

current



fish

ANNEX 2

LAKE VICTORIA MAJOR SPECIES REFERRED TO IN TEXT

Scientific Name	English Name	Local Names
Lates niloticus	Nile perch	sangara
Rastrineobola argentea	sardine	dagaa
Oreochromis niloticus	tilapia	ngege, perege
Oreochromis esculentus	tilapia	ngege, perege, sato
Oreochromis leucostictus	tilapia	ngege, perege, sato
Oreochromis variabilis	tilapia	ngege, mbiru, perege, sato
Tilapia zillii	tilapia	ngege, perege, sato
Tilapia rendalli	tilapia	ngege, perege, sato
Haplochromis spp.	haplochromine	furu*
Bagrus docmac	catfish	mbofu
Charias mossambicus	catfish	kambale
Protopterus aethiopicus	lungfish	kamongo, mamba
Synodontis victoriae	squeaker, grunter	ngogo, gogogo
Barbus altianalis	-	kuyu
Mormyrus kannume	elephant-snout fish	domodomo, kasulu mbete
Schilbe mystus	butterfish	membe
Alestes jacksoni	-	osoga
Labeo victorianus	-	ningu
Caridina nilotica	shrimp	-

* Also used to describe small fish of other species.

ANNEX 3

POLYAMIDE (PA) TWISTED ROPES AND TWINES: EQUIVALENTS OF NUMBERING SYSTEMS, BREAKING STRENGTH, DIAMETER

Denier	R Tex	Breaking strength (kg)	Approximate ø mm
210/2	50	–	0,24
310/3	75	4,5	0,30
210/4	100	6,0	0,33
210/6	165	9,0	0,40
210/9	250	19,5	0,50
210/12	333	19,8	0,60
210/15	465	22,5	0,65
210/18	500	27,5	0,73
210/21	580	33,0	0,80
210/24	666	37,0	0,85
210/27	750	39,0	0,92
210/30	830	48,0	1,05
210/33	915	51,5	1,13
210/36	1 000	53,0	1,16
210/39	1 080	59,0	1,20
210/42	1 165	63,0	1,27
210/45	1 250	66,0	1,33
210/48	1 333	75,0	1,37
210/60	1 666	93,5	1,43
210/72	2 000	106,0	1,60
210/96	2 666	146,0	1,90
210/108	3 000	159,0	2,00

Number of "denier" is the weight in grammes of 9 000 m of fibre.

Number of "tex" is the weight in grammes of 1 000 m of fibre.

ANNEX 4

MESH SIZE: CORRESPONDENCE INCH/MM

inch	mm
2	51
3	76
3.5	90
4	102
4.5	114
5	127
5.5	140
6	152
6.5	165
7	178
7.5	190
8	203
8.5	216
9	229
10	254
12	305