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NIGERIA

METHODS OF HARVESTING CLUPEIDS AND TILAPIA IN LAKE KAINJI

A report prepared for the Lake Kainji
Research (Man-made Lake) project

By

K.E. Stride
Fishing Technologist

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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This is one of a series of reports prepared during the course of the UNDP project identified on the title page.

The conclusions and recommendations given in the report are those considered appropriate at the time of its preparation. They may be modified in the light of further knowledge gained at subsequent stages of the project.

ACKNOWLEDGEMENTS

The Food and Agriculture Organization is greatly indebted to the following individuals and institutions for their valuable contributions to the research on this projects

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Thanks are also extended to the following fishermen and boatmen whose local knowledge and hard work was greatly appreciated:

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Mr. Ibrahim Yaro, counterpart fishing technologist, received on-the-job training in the design, construction and operation of these small mid water trawls and will continue to work in this field at Kainji after completing a fellowship course in fishing gear technology.

The following fishermen of Kainji Lake Research project participated in the construction of trawls and received training in trawl handling and maintenance. Mr. Abdulahi Musa, Mr. Musa Ekpoki, Mr. Mohamed Ibrahim, Mr. Thomas Adjan, Mr. Idrisu Mohamed, Mr. Audu Seriki, Mr. Dickson Eraboghene, Mr. Nark Omofiedo and Mr. Danjuma Muhamed. The trawling team also included two boatmen, Mr. Mohamed Urufu and Mr. Mohamed Umoru.

The trawl sampling programme is to continue on a monthly basis to provide data for biological studies, under the direction of the fisheries biologist.

SUMMARY

Over the past few years there has been a significant increase in the abundance of tilapia and clupeids in Kainji Lake.

Landings of tilapia by commercial fishermen are comparatively small, while the commercial fishery for clupeids does not extend beyond the more riverine section of lake near Yelwa.

Experimental and exploratory fishing with small mid-water trawls and seine nets are described and the results of comparative tests made with monofilament and multifilament gill nets are given.

Recommendations based on these studies have been made with a view to the future establishment of successful fisheries for these under-exploited species, capable of substantially increasing the total annual production of the lake.

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1 INTRODUCTION

1.1 TERMS OF REFERENCE

The Government of Nigeria, assisted by the United Nations Development Programme and the Food and Agriculture Organization of the United Nations are engaged in a project whose main purpose is to assist in the comprehensive development of man-made lake resources through research and surveys, the results of which will be made available in all regions of Nigeria.

The project became operational on 12 August 1968 and, as part of the project operation, FAO assigned Mr. K.E. Stride from September 1973 to August 1974 with the following terms of reference: "Under the direction of the Project Manager and in collaboration with other project staff,

1) participates in the programme of fish finding and location of fishing grounds;
2) designs and tests the suitability of different fishing gears, methods and techniques;
3) trains fishermen and counterpart staff in boat handling operations and maintenance and in the use of improved fishing gears, methods and techniques;
4) carries out other related duties as assigned by the project manager."

1.2 BACKGROUND INFORMATION

Kainji Lake was formed by the impoundment of the Niger River waters at the completion of the Kainji Dam in 1968. It is situated approximately 1 000 km upstream from the river mouth between 9^{o} 30' N and 10^{o} 35' N. At its highest level, the lake measures 136 km (85 miles) in length and 24 km (15 miles) in width.

There is an annual drawdown of approximately 10 m which exposes large areas, particularly along the eastern shore and in the centre of the main basin, reducing the area of the lake by some 20 percent.

The lake can be divided into three main sectors. The northern part, for about 40 km, is narrow and for most of its length has a more riverine character at low lake level. The middle sector contains the main basin representing about 70 percent of the total surface area and covers the submerged Foge Island which was mostly cleared of trees before inundation. At low water level large areas of Foge Island are exposed as sandbanks upon which migratory fishermen build temporary camps.

The southern sector of the lake is deeper and narrow with fairly steep stones terminating at the dam site where the greatest depth of 60 m is to be found.

2. THE CLUPEID FISHERY

A clupeid fishery has existed for many years in the Niger River system. The traditional fishing method is by "Attala" net, a type of lift net, measuring 5 m^2 , operated from the side of a canoe and moved slowly through the water with the aid of paddles. The technique requires expensive equipment and is effective when used at night in sheltered places, for harvesting clupeids in the top 1-2 m of water.

After impoundment of Kainji Lake in 1968, a thriving clupeid fishery continued below the dam at Faku and at the northern extremity of the lake near Yelwa. Operations did not extend into the lake due mainly to the fact that here the open water conditions are hazardous to the safe operation of canoes at night and also the fish tend to lie at a greater depth than in the river.

Since that time, notable increases in the clupeid population of the lake have been observed through the regular sampling of this stock by Kainji Lake Research project teams using a lift net in conjunction with light attraction, (Otobo in press).

The efficiency of this method is adversely affected by the extremely turbid condition of the lake during the period of the white flood, the effects of which do not allow the lake to attain a very high degree of clarity at any time.

Two species of clupeidae occur in Kainji Lake: Pellonula afzeliusi standard length 20 - 75 mm; Sierrathrissa leonensis standard length 13 — 34 mm. Because of the small size of the latter, a very small mesh size is necessary for their capture.

2.1 INITIAL EXPERIMENTS WITH A MIDWATER TRAWL

The expert arrived at Kainji in September 1973 and in view of the turbid state of the lake, a small mid-water trawl was constructed for use while conditions for this type of gear were most favourable.

Designated No. 1, the net had a designed vertical and horizontal opening of 8 m and mesh sizes ranged from 200 mm at the wings to 12 mm at the cod—end, Fig. 1. Sufficient floats were attached to the headrope to ensure that the net floated at all times and was thus prevented from sinking during the shooting and hauling operation or when towing speed was reduced for any reason.

This was necessary to avoid fouling the many obstructions on the lake bottom. The net was rigged in the manner shown in Pig. 2. The net was used in conjunction with two flat bottomed boats of 9 m length, powered by 33 hp outboard motors. The boats were not well suited to this type of work and proved difficult to control whilst towing the trawl due to the absence of any kind of keel or skeg.

The experiment continued with the construction of a second trawl of the same overall dimensions but mesh sizes were reduced throughout, starting at 87 mm in the wings and terminating in 9 mm at the cod-end. Fig, 3.

Smaller boats with 15 hp outboard engines were used in an attempt to reduce the fuel consumption. These engines each produced a static bollard full of approximately 100 kgs and when used in the fishing operation proved powerful enough to produce some good catches of clupeids, although the number of larger fish caught was noticeably less.

The cod—end mesh size was later reduced to 6 mm as the escape rate through the meshes was still high.

Tables 1 and 2 show the catches obtained during this period of experimental fishing, most of which was carried out in the southern part of the lake near the project headquarters.

The effect on catches of reducing the cod—end mesh size can clearly be seen when the figures are reproduced as an average catch rate per hour.

Net 1 fitted with 12 mm cod-end -15 kg per hour

" 2 " " 9 mm " " - 55 " " "

" 2 " " 6 mm " " - 117 " " "

The twine sizes of netting used for trawl construction may be increased to produce a stronger and more durable net. Fig. 4.

Echo sounder recordings made between September and February show an almost continuous band of echoes appearing between 3m and 6 m depth. From February to June the water becomes gradually clearer, with the result that the band of echoes widens and occurs at progressively greater depth.

There was some doubt regarding the origin of these echoes and an experiment was conducted to determine whether the source was fish or some other organism in high concentration.

By removing the six inflatable floats and replacing these with 37 rigid plastic gill net floats, equal in buoyancy to the weight of the leaded footrope (0.5 kg), it was possible to operate the net at any required depth by adjustment of the length of towing warp or the size of towing weights.

An area of deep water near the dam site was selected to reduce the risk of damaging the gear on the lake bottom.

Three pulls were made with varying amounts of towing weight or warp length, while the trawl in action was monitored by an echo sounder from above. Both headrops and footrope were clearly recorded, showing the vertical gape of the trawl and its position relative to the surface and the other supposed fish echoes. Figs. 5, 6, 7.

While it is accepted that not all the echoes received are from fish, the results of this experiment indicated that clupeids are found in quantity only within the main band of echoes recorded.

Results also confirm earlier beliefs that the smaller Sierrathrissa leonensis are prevalent in the upper levels while Pellonula afzeliusi prefer the lower levels of this band.

Throughout the programme of experimental and exploratory fishing with the mid-water trawl, there was found to be a correlation between echo sounder trace intensity and fish abundance, with the exception of a period in March and April when good traces were recorded at times but poor catches were made. At this time, quantities of jelly fish were also present in the catch and it is thought that these organisms were responsible in part for the strong echoes received.

2.2 EXPLORATORY FISHING

A programme of exploratory fishing was initiated in January. Seventeen stations were established around the lake, to be sampled at two weekly intervals. Fourteen of these stations were located at approximately eight kilometre intervals over the old river bed, while the remaining three were situated in shallower areas.

The programme had two main aims:

a) To locate areas that may support a commercial fishery and

b) Produce catch data for stock assessment analysis.

In addition to the regular sampling of stations with the trawl, random echo-sounder surveys were carried out in areas where it was impossible to fish due to the presence of submerged trees or where the water was too shallow to operate the net safely.

A standard pull for this programme was set at thirty minutes duration but in some areas it was impossible to tour for this period of time due to concentrations of gill nets or insufficient clear area in which to tow a trawl for 1\frb\1/2\fre\ km which was the approximate distance covered in the time. The standard pull was therefore reduced to fifteen minutes, for all stations to minimize the chances of net damage.

During his brief visit to the project, Dr. Bazigos made a rapid assessment of this programme and on his recommendation the number of stations was reduced to eleven. (Fig. 8).

Table 3 gives a summary of catches, presented as a catch per unit effort measured in kilograms per hour.

These figures give an indication of the areas which may support a future fishery. In addition to an adequate abundance of fish, an essential prerequisite for any proposed clupeid trawl fishery is a large area of open water, sufficiently clear of obstructions to allow the net to be operated without risk of damage. The presence of trees severely restricts and largely precludes the use of any type of moving gear in many areas. (Fig. 9).

The main basin of the lake has a large area from which the trees were cleared before impoundment, but the stumps remain and at low water level these are unavoidable. This area also, at times contains large concentrations of gill nets.

The deep southern part of the lake appears to be the most suitable area for the introduction of a clupeid trawl fishery, as here all the requirements are met, including easy access to fuel supplies at New Bussa and to well established marketing facilities for the species at Faku.

Villages such as Oroba and Monai in Kwara State and Anfani in N.W. State are well sited as bases from which to participate in a fishery in this locality. This part of the lake which, in the open water areas most convenient for trawling operations is virtually unexploited by any other type of gear, presents an opportunity to introduce a new fishery without interference with the activities of the present fishing community.

3. TILAPIA FISHERY

For the first two years after impoundment, catches of Cichlidae were less than one percent of the total fish production of the lake.

Regular shoreline sampling with electro-fishing equipment and fleets of graded gill nets since that time, indicate a substantial and consistent increase in the tilapia population.

The four species of Tilapia presently recognized in Kainji Lake include, T. galilaea T. nilotica. T. zillii and T. dugeti; with T. galilaea predominating. The main methods of harvesting these species is by oastnet and gillnet**.**

Cast nets at present account for the largest proportion of tilapia landings. All the castnets observed were constructed of nylon twine and in the hands of experienced fishermen are quite efficient in shallow waters, especially where clear spaces can be

found among the floating grasses. Because of the small area required for each cast this method is also used successfully among rocks and tree stumps.

Results from various, earlier gill net programmes suggest that tilapia are not easily caught in gill nets unless driven.

The driving or beating method is already known and has proved to be very effective in Kainji Lake but unfortunately has caused a great deal of friction between the fishermen operating this method and the owners of static gill nets. In many cases disputes have been taken to the local authorities who, in general, have disapproved of the practice of active gill netting. This method was not included in the tilapia fishing programme.

No seine nets were observed on the lake despite the fact that the method is used in the the Niger River system.

3.1 GILL NETS

Comparative trials to determine the relative efficiency of monofilament and multifilament gill nets were carried out. For this purpose three monofilament nets and two multifilament nets were constructed. Each net was mounted by halves (50 percent slack) to 5 mm diameter braided nylon ropes of 100 metres length. Plastic floats were attached to the headrops at three metre intervals and lead weights were used to sink the footrope.

Specification of monofilament nets were as follows:

33 meshes deep x 112 mm mesh x .28 mm twine

30 " " x 128 " " x .28 " "

30 " " x 128 " " x .33 " "

Multifilament nets were of similar mesh sizes, all of 210/3 twine. Nets were set in the late afternoon and hauled the following morning.

Results so far indicate the superiority of monofilament nets, which are outfishing multifilament in the ratio of 5:1 in the case of the smaller 112 mm mesh size and between 2:1 and 3:1 when comparing the 128 mm sizes.

Delivery of the monofilament netting was delayed and conclusions therefore are based on only 23 settings. The experiment should continue until the nets are worn out in order to assess the relative durability of these types of netting. At the time of reporting the nets were still in good order and it may be sufficient to compare the costs of the two types of net with the relative catches to date to produce some conclusions regarding their commercial potential.

3.2 SEINE NETTING

The absence of seine nets on Kainji Lake is explained by the predominantly rocky or tree studded shoreline, where this method of fishing might be used.

As this same littoral zone is the favoured habitat of tilapia, beach seining was considered to hold great potential as a harvesting method for this species.

A number of suitable sites as selected and clearing operations were commenced at the time of lowest water level. A programme of regular seine net sampling will be carried out as soon as the water level rises sufficiently and these areas become flooded (Fig. 10 and 11).

Because of the difficulty of removing tree stumps and other obstruction from below low water level, the effectiveness of cleared sites reduces as the lake approaches its lowest level. At this time however large areas of Foge Island are being exposed in the form of sand banks, providing beaches which, although not completely clear of tree stumps, may be used for seining as the surrounding water is shallow and the footrope of the net can be lifted carefully over the few obstructions encountered.

It is convenient that as the fishable areas of mainland sites become smaller with declining water level, fishing areas of the Foge Island complex become larger, thereby allowing the fishing effort to be sustained throughout the year.

Clearing areas of Foge Island may not be beneficial as these sand banks are subject to a considerable amount of scouring by wave action during the covering and uncovering periods. The movement of sand at these times is therefore likely to expose more roots and other debris at each low water season.

A schematic diagram of the seine net used for experimental fishing is shown in Fig. 12.

A summary of seine net catches landed at Shagunu and various parts of Foge Island is shown below.

No of Hauls	Tilapia		Others		Total		Average
	Ho.	Kg	No.	Kg	No.	Kg	per Haul Kg
	1958	755	21	31	1979	786	30

A rowing boat with provision for net stowage, suitable for beach seine net operations is shown in Fig, 13.

4 CONCLUSIONS AND RECOMMENDATIONS

1 Echo sounder traces indicate that clupeids are present in all parts of the lake in varying degrees of abundance but due to the presence of trees and other obstructions many areas are unsuitable for trawling on a commercial scale.

The highest catch rates were recorded in the southern part of the lake which also contains other requirements necessary for successful commercial operation, i.e. a large area of open water, clear of obstructions, close proximity to an established market, fuel supplies and sheltered landing points.

The open water area is at present relatively unexploited and therefore interference with the existing fishery would be minimal.

This area is recommended as the most suitable for the introduction of a clupeid trawl fishery.

2 Boats for this fishery should be built with adequate beam and fitted with diesel engines for reasons of economy of operation, safety and reliability. Power units may be as small as ten horsepower if fitted with suitable reduction gears to give maximum pulling ability.

If through non-availability of diesels, outboard engines have to be used, boats should he fitted with keels to improve handling characteristics when towing a trawl and reduce sideways drift. (Fig. 14).

Boats should be as evenly matched as possible, preferably with identical engines to ensure that an equal pull is exerted to each side of the trawl. Revolution counters or tachometers fitted to engines give a useful guide to the amount of power being applied and enable engines to be run accurately at the desired speed.

3. The trawling programme is to continue at Kainji Lake Research project, on a reduced scale. A nucleus of trained personnel is therefore available for running courses in trawl construction and handling.

4. The cleared beaches should be sampled regularly, both for data collection and for demonstration purposes. Local fishermen interested in beach seining may be given assistance with regard to net construction and encouraged to use the beaches at all times.

5. Monofilament/multifilament gill net trials may continue but at this point it seems doubtful that the increased catches of monofilament nets are sufficient to offset the high initial cost of this material. The North West State Government, through the fisheries division is about to distribute numbers of monofilament gill nets to fishermen as part of a compensation programme. This exercise should provide a satisfactory assessment of the ability of this material through direct use by the commercial sector.

Table 1

MID-WATER TRAWL WITH 12 mm COD-END WEIGHT IN GEAMMES

Catch in Weight of Fish Captured by 12 mm Mesh Cod-end during the Month of October 1973

Stations	Jetty Water Intake A	Jetty Water Intake A	Jetty Water Intake	Shagunu	Foge Island	Foge Island	Old Bussa	Jetty Water Intake	Jetty Water Intake	Jetty Water Intake	Total
Dates	3.10.73	4.10.73	5.10.73	9.10.73	10.10.73	11.10.73	12.10.73	19.10.73	22.10.73	23.10.73	
No. of Fulls	5	4	3	2	2	1	2	2	2	1	
Clupeidae	23 570	8 436	5 275	70	1 900	7 000	620	8 410	2 990	1 345	59 616
Schilbeider	13 400	11 679	3 955	2 401	3 825	5 000	2 100	5 785	2 895	3 510	54 550
Mochocidae	-	-	-	13 900	4 470	8 500	-	-	-	-	26 870
Others	6 885	808	814	1 925	3 698	3 200	2 260	1 235	501	2 402	23 728
Lates niloticus	20 000	-	-	-	-	-	-	-	-	-	20 000
Total	63 855	20 923	10 044	18 296	13 893	23 700	4 980	15 430	6 386	7 257	184 764

Table 2

MID-WATER TRAWL WEIGHT IK GRAMMES

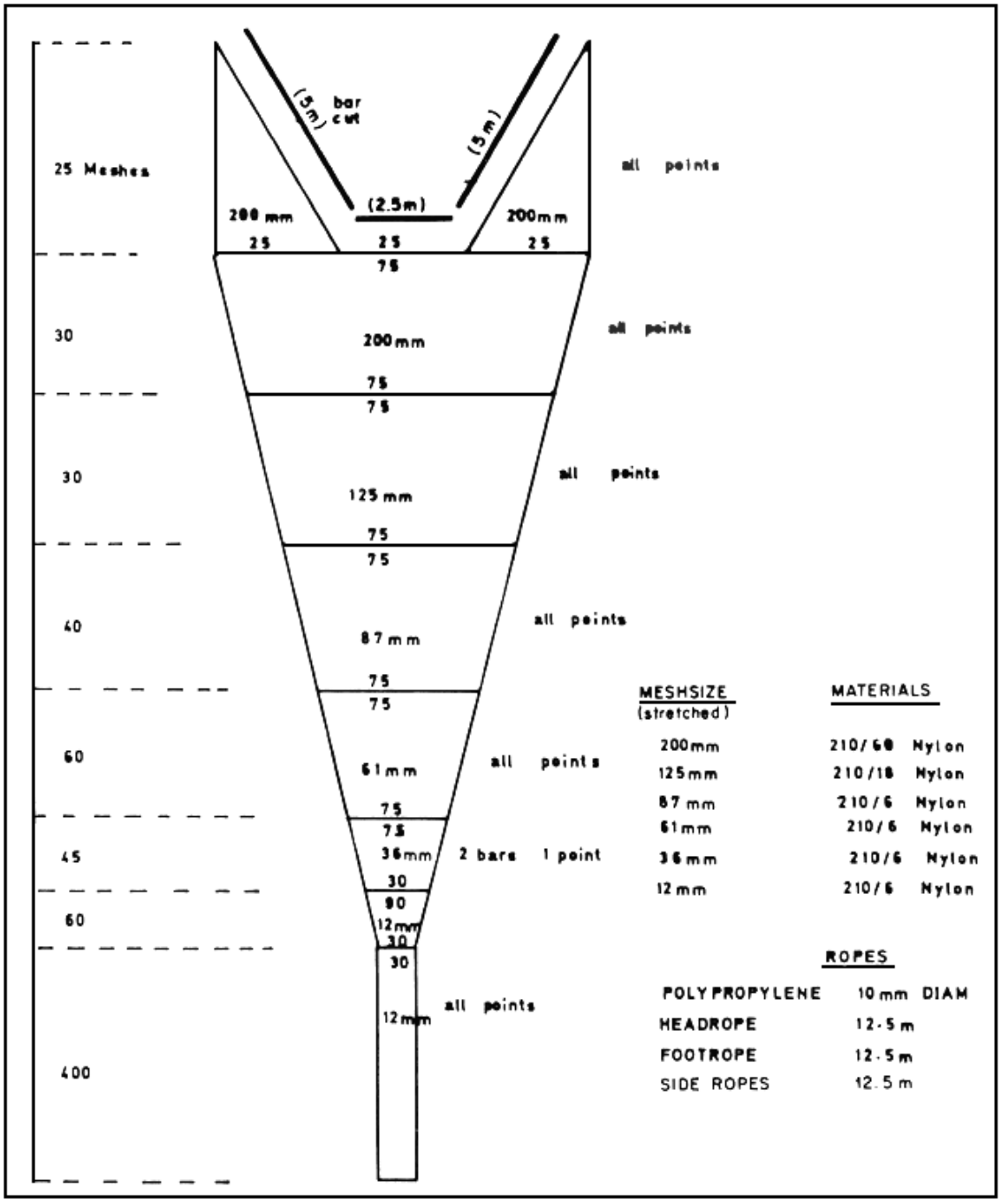
Catch in Weight of Fish Captured by 9 mm & 6 mm Cod-end during the Month of December 1973

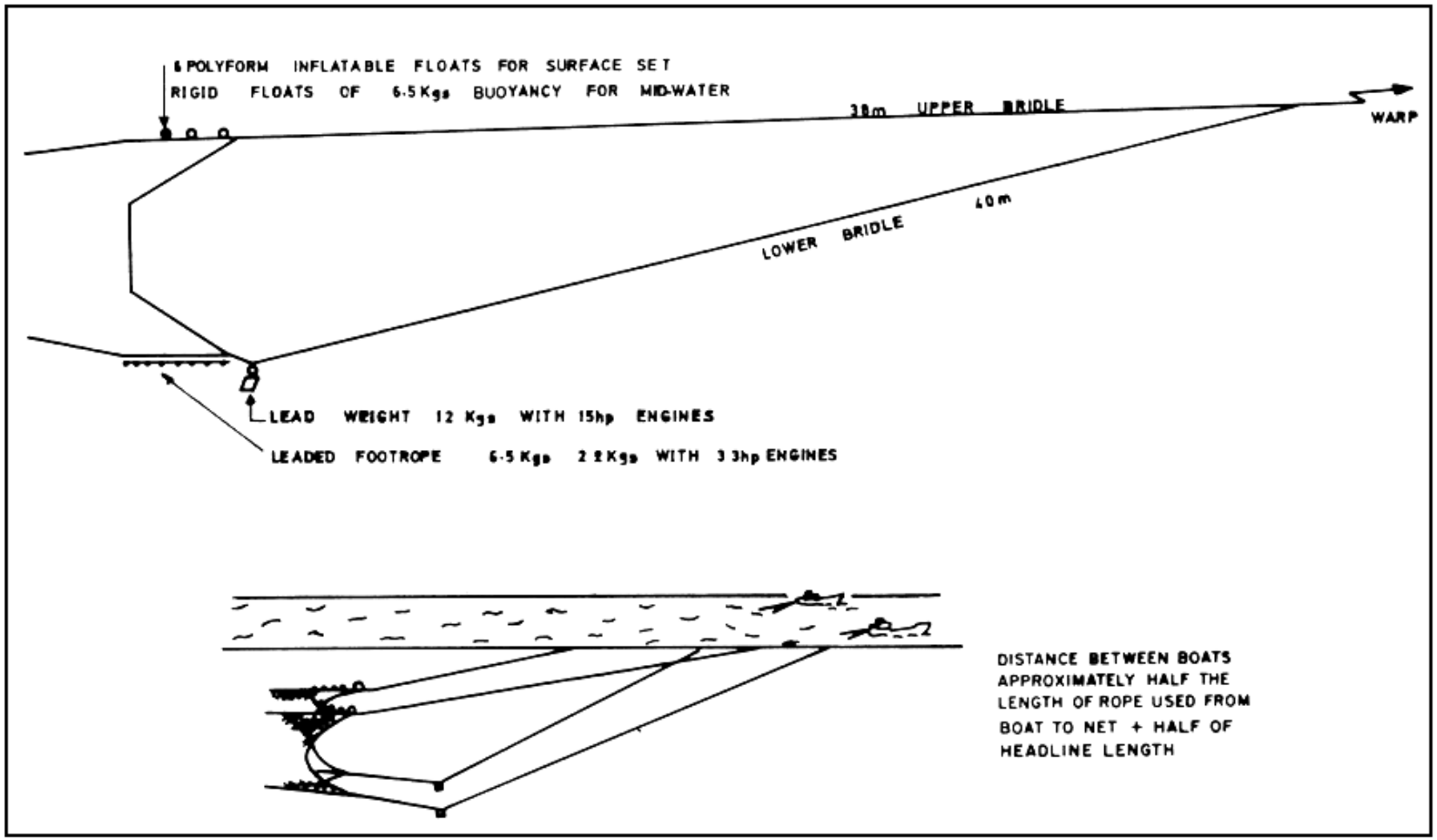
Stations	9 mm	Cod-end					6 mm	Cod-end		
	Jetty	Amfani	Amfani	Jetty	Amfani	Jetty	Jetty	Coffer	Amfani	Amfani
	Water	Bay	Bay	Water	Bay	Water	Water	Dam	Bay	Bay
	Intake		Water	Intake		Intake	Intake			
			Intake							
Dates	4.12.73	5.12.73	6.12.73	7.12.73	11.12.73	12.12.73	13.12.73	14.12.73	19.12.73	20.12.73
No. of Pulls	2	3	3	2	2	3	2	1	2	1
Clupeidae	17000	80 000	139 000	34 500	164 000	162 340	87 000	58 500	86 500	87 000
Schilbeidae	-	-	-	-	300	430	426	160	-	-
Others	1 500	2 500	4 250	2 775	1 920	70	460	140	-	-
Total	18500	82 500	143 250	37 275	166 220	162 840	87 886	58 800	86 500	87 000

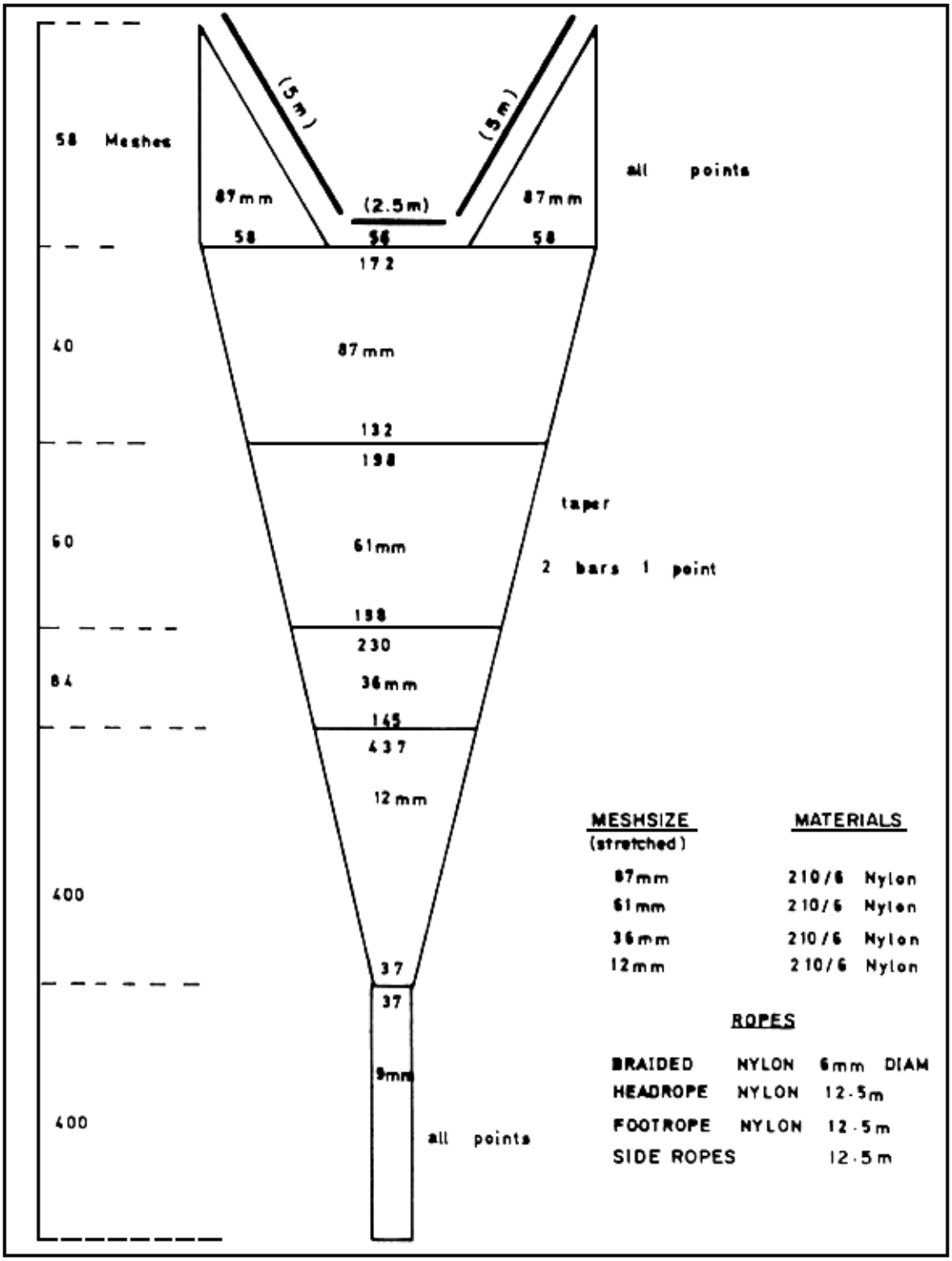
Table 3

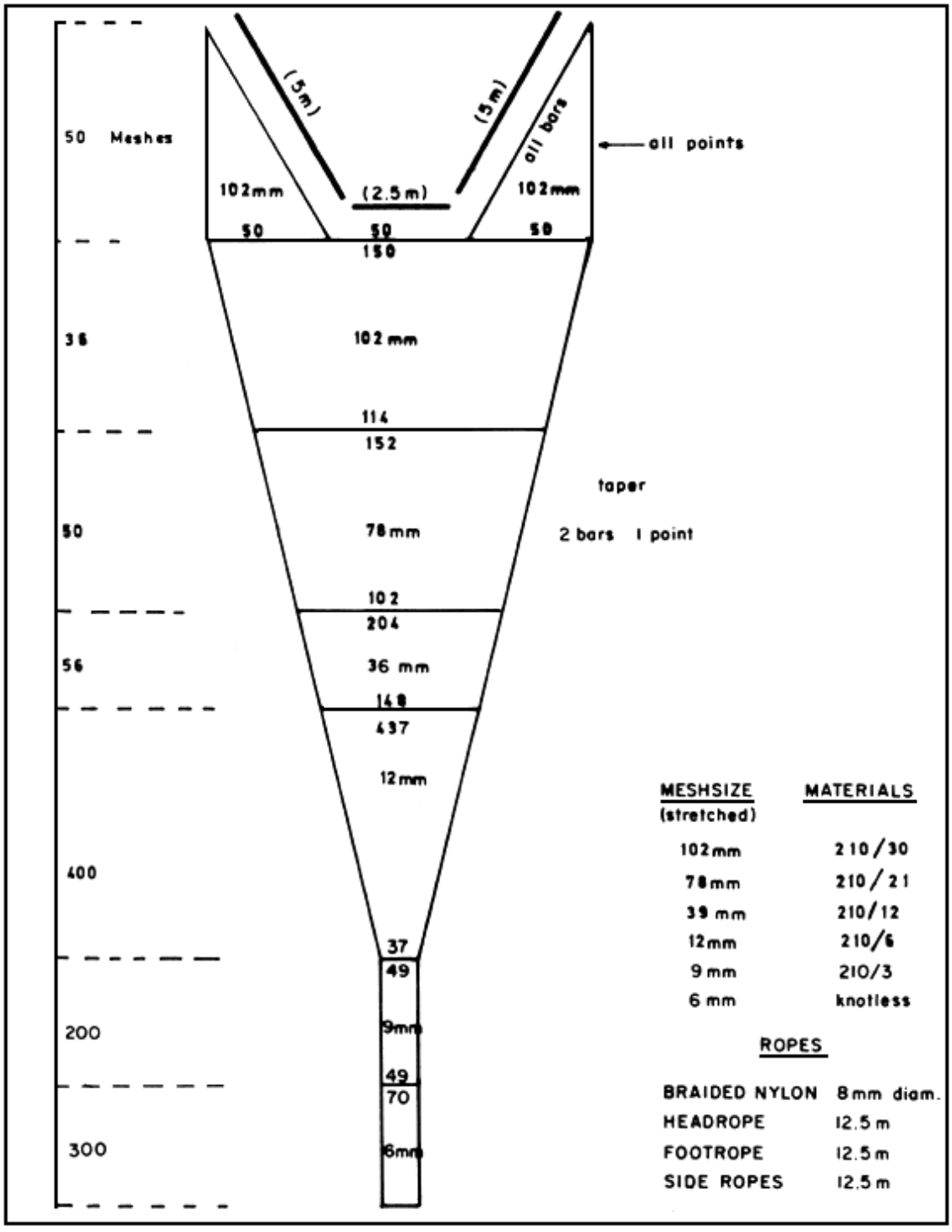
RESULTS OF THE EXPLORATORY MID-WATER TRAWLING PROGRAMME

Station	kg per hour	
Jetty/water intake	83	
Amfani Bay	94	Southern Sector
Garafini	50	average 70 kg/hr
Old Bussa	53	
Gafara	50	
Middle	42	Main Basin
Ulahira	48	average45 kg/hr
Shagunu	45	
Papiri	40	
Mahuta	30	Northern Sector
Rofia	64	average47 kg/hr


25 Meshes
30
30
40
60
45
60
400
(5m) bar cut
(5m)
(2.5m)
200 mm
25
25
200mm
25
75
all points
200mm
75
75
all points
125 mm
75
75
all points
87 mm
75
75
all points
61mm
75
75
all points
36mm
2 bars 1 point
30
90
12mm
30
30
12mm
all points
MESHSIZE (stretched)
MATERIALS
200mm 210/60 Nylon
125mm 210/18 Nylon
87 mm 210/6 Nylon
61mm 210/6 Nylon
36mm 210/6 Nylon
12 mm 210/6 Nylon
ROPES
POLYPROPYLENE 10 mm DIAM
HEADROPE 12·5 m
FOOTROPE 12·5 m
SIDE ROPES 12·5 m


6 POLYFORM INFLATABLE FLOATS FOR SURFACE SET
RIGID FLOATS OF 6·5 Kgs BUOYANCY FOR MID-WATER
38m UPPER BRIDLE
WARP
LOWER BRIDLE 40m
LEAD WEIGHT 12 Kgs WITH 15hp ENGINES
LEADED FOOTROPE 6·5 Kgs 2 ± Kgs WITH 3 3hp ENGINES
DISTANCE BETWEEN BOATS APPROXIMATELY HALF THE LENGTH OF ROPE USED FROM BOAT TO NET + HALF OF HEADLINE LENGTH


58 Meshes
(5m)
(5m)
87mm
(2.5m)
87mm
all points
58
56
58
172
40
87mm
132
198
taper
60
61mm
2 bars 1 point
198
230
84
36mm
145
437
12mm
400
37
37
9mm
400
all points
MESHSIZE
(stretched)
MATERIALS
87mm 210/6 Nylon
61mm 210/6 Nylon
36mm 210/6 Nylon
12mm 210/6 Nylon
ROPES
BRAIDED NYLON 6mm DIAM
HEADROPE NYLON 12.5m
FOOTROPE NYLON 12.5m
SIDE ROPES 12.5m


50 Meshes
(5m)
(5m)
all bars
all points
102mm
(2.5m)
102mm
50
50
50
150
38
102 mm
114
152
taper
50
78mm
2 bars 1 point
102
204
56
36 mm
148
437
12mm
400
37
49
9mm
200
49
70
6mm
300
MESHSIZE (stretched)
MATERIALS
102mm 210/30
78mm 210/21
39 mm 210/12
12mm 210/6
9 mm 210/3
6 mm knotless
ROPES
BRAIDED NYLON 8mm diam.
HEADROPE 12.5 m
FOOTROPE 12.5 m
SIDE ROPES 12.5 m

5.(a) MIDWATER PAIR TRAWLING (The codend is thrown into the water and the remnant of the gear shot while the two boats maintain a straight course)

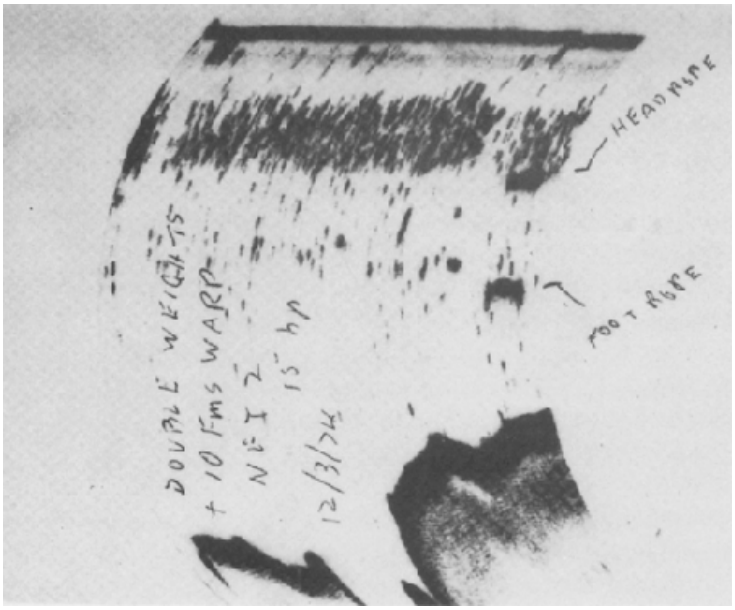
5 (b) MIDWATER PAIR TRAWLING (The boats are separating just after shooting the net)

5. (c) MIDWATER PAIR TRAWLING (Last phase of shooting. The headline is still visible at the surface)

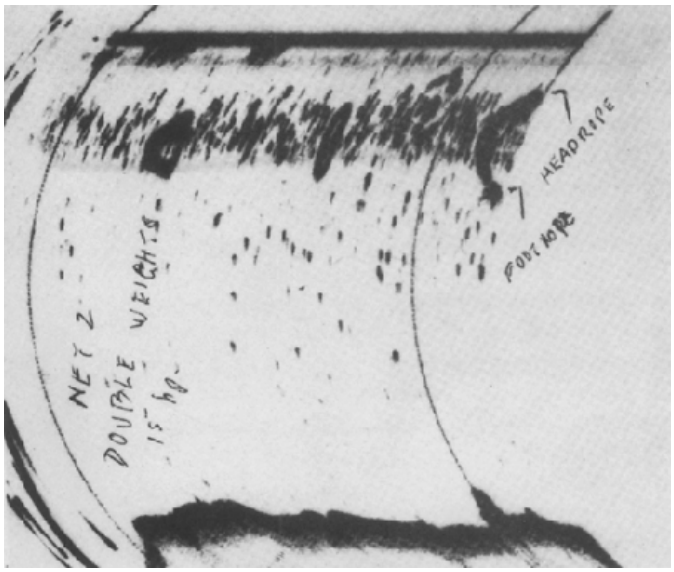
6. (a) MIDWATER PAIR TRAWLING (15 hp units towing midwater trawl. One wooden planked boat built at project. One glass fibre Yamaha 18 ft)

6. (b) MIDWATER PAIR TRAWLING (Hauling the midwater trawl - 15 hp units - the two big floats mark the upper wing tips

6. (c) MIDWATER PAIR TRAWLING (Last phase of hauling. The codend with catch is hoisted overboard)

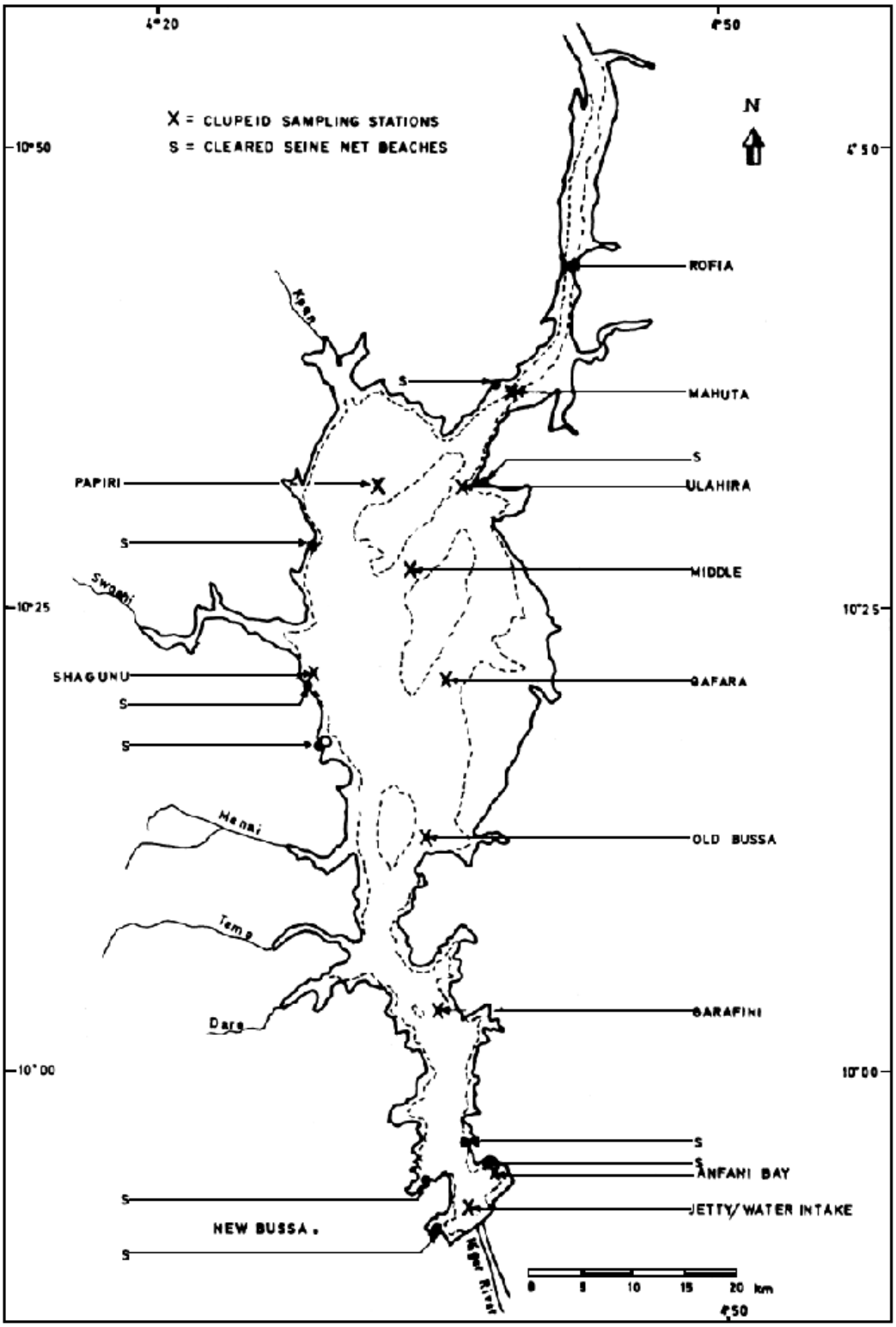


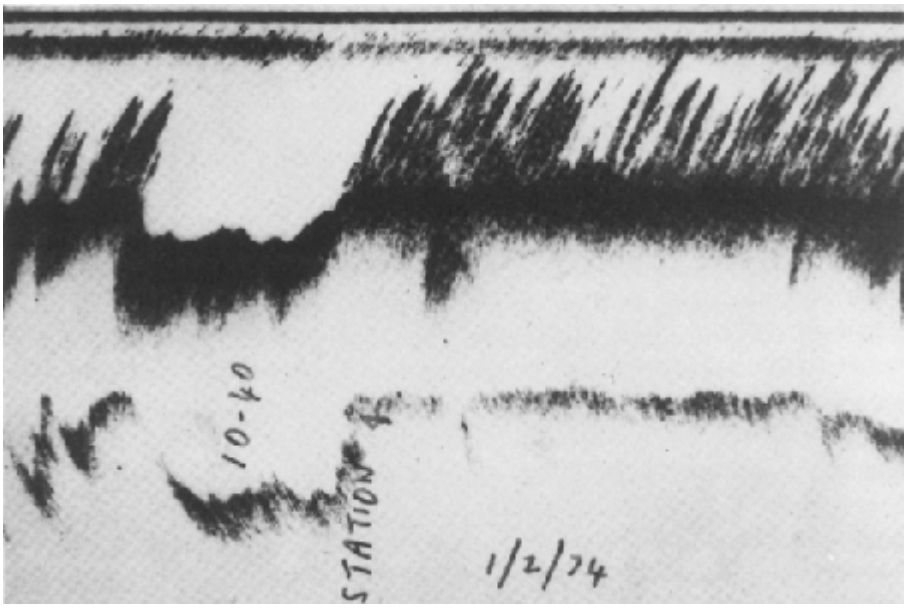
7. (a) MIDWATER PAIR TRAWLING (Echo sounder of SEA ROVER passing over trawl in action. Head- rope at 11 m. Foot- rope at 18 m. Net opening height is 7 m)



7. (b) MIDWATER PAIR TRAWLING (The warp length is adjusted so as to maintain the midwater trawl at the level of the fish traces)

Fig. 8 MAP OF KAINJI LAKE





9. UNDERWATER TOPOGRAPHY - as recorded by echo sounder showing old river bed and submerged trees (indicates narrow section of old river bed with tree-lined banks; fish echoes between 3 m and 7 m approximately)

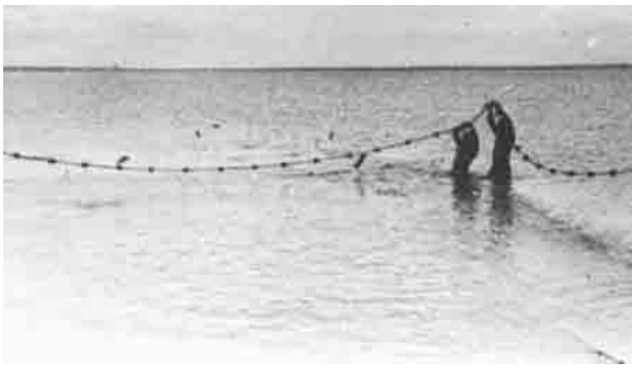
10.(a) BEACH SEINING (Beaches cleared at low lake level may be used for beach seining as the water level rises)

10.(b) BEACH SEINING
(Rowing bost with net board across transom simplifies the work of shooting the beach seine which when operated from a canoe required the work of four men).

10.(c) BEACH SEINING
(Exposed sand banks in the Foge Island area provide suitable sites where beach seines may be used during the low water period)

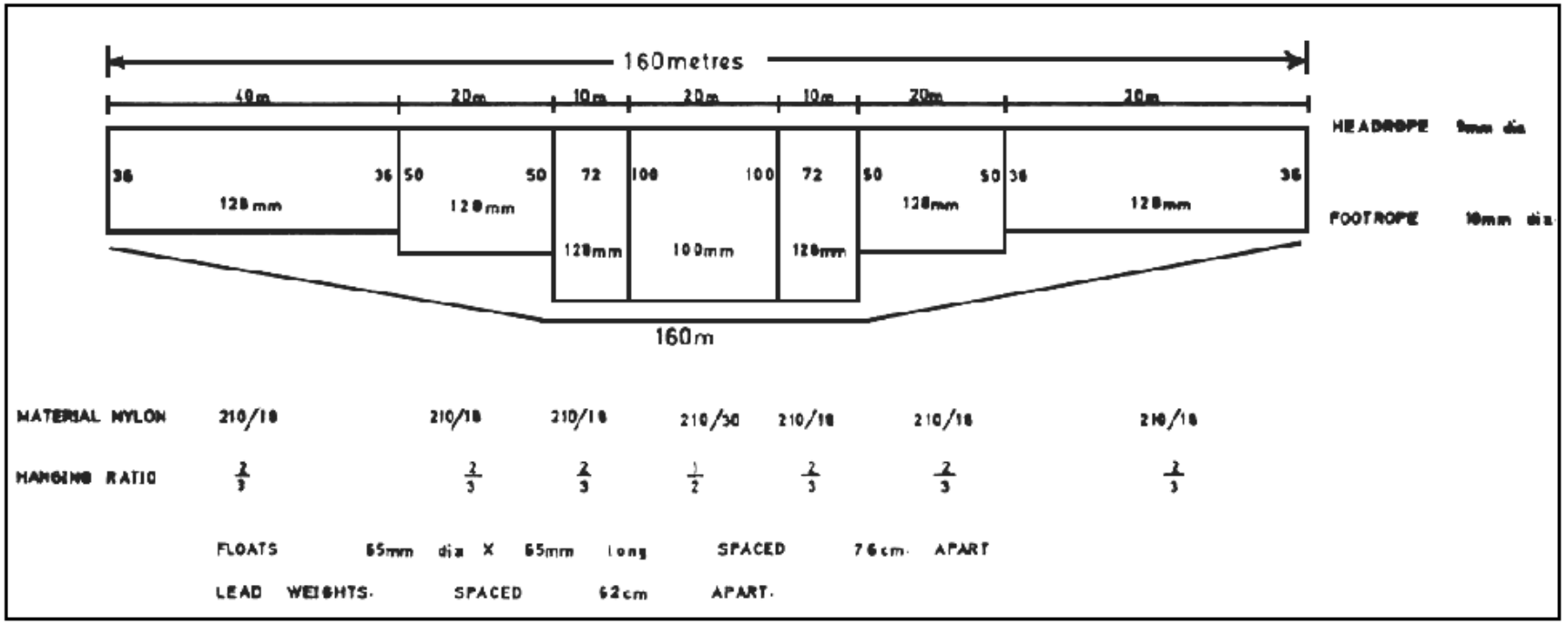
11.(a) BEACH SEINING (In the later stages of the haul, many fish are lost over the headrope)

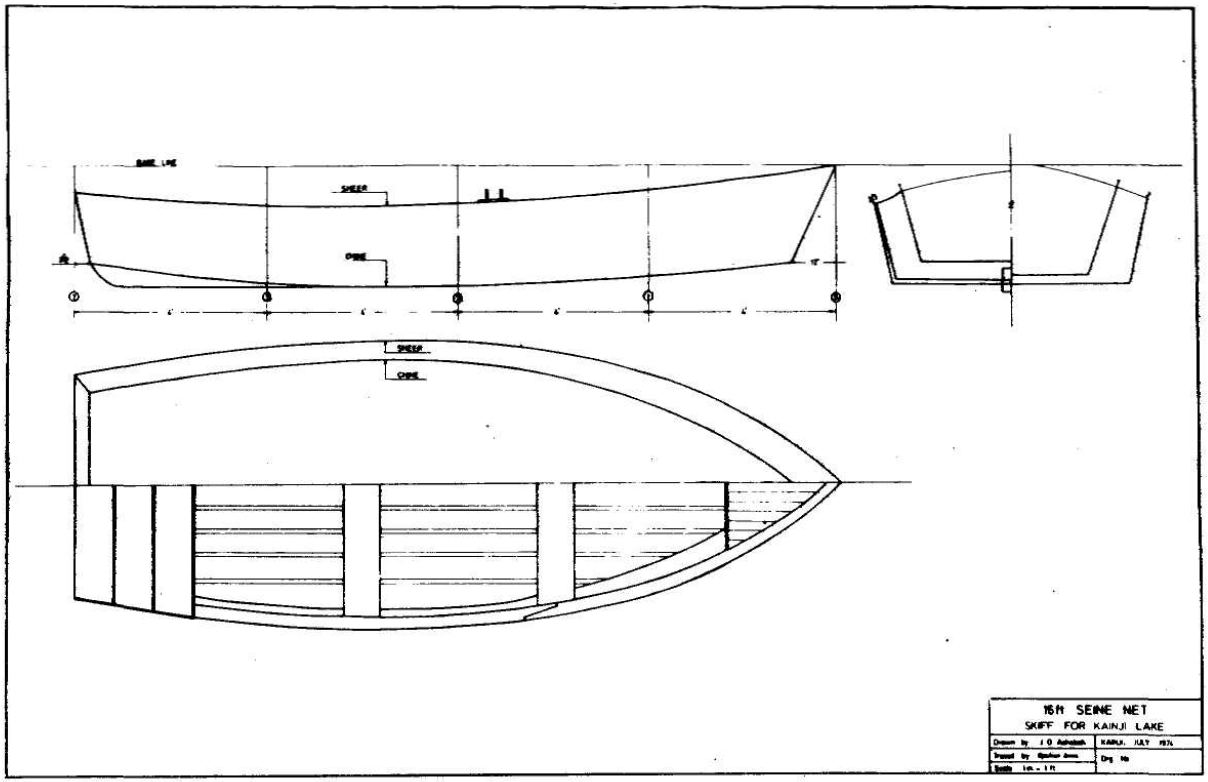
11.(b) BEACH SEINING (The headrope is lifted above water as an attempt to prevent loss of fish



11. (c) BEACH SEINING (Typical catch of Tilapiaat Foge Island beach seine with 100 mm mesh size in bunt).

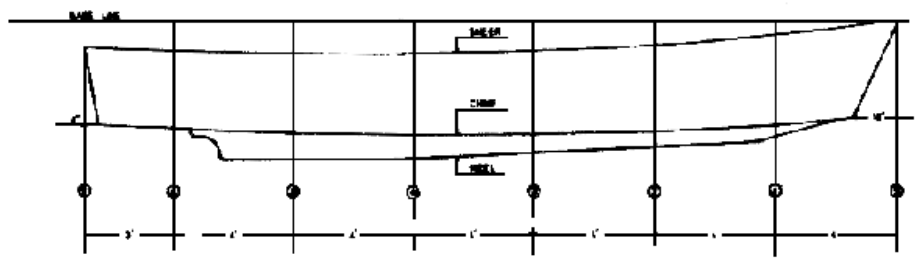
Fig. 12 TILAPIA BEACH SEINE

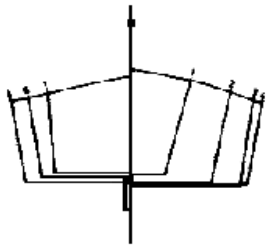


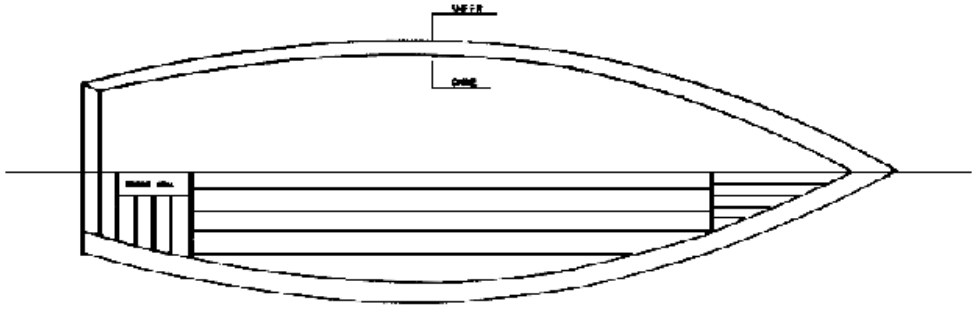


16ft SEINE NET
SKIFF FOR KAINJI LAKE

Drawn by I O Ashiabah	KAINJI, JULY 1974
Traced by Ibrahim Amin	Drg No
Scale 1ch = 1ft	







27ft FISHING BOAT
FOR NAINI LAKE

Drawn by	Date
Traced by	Drg No.
Scale	