FISHING GEAR DEVELOPMENT 1965–67

BY M.P. GILBERT & J.M. GEE

The commercial fisheries of Lake Victoria are based principally on a number of species of *Tilapia* although considerable tonnages of other genera are landed, namely *Clarias*, *Bagrus*, *Protopterus* and *Mormyrus*. Gillnets and longlines, worked from native canoes, are the principle fishing methods employed in the capture of these types of fish. Certain smaller genera, such as *Labeo*, *Barbus*, *Synodontis* and *Schilbe*, are of local importance, particularly in the affluent rivers, but even here floating gillnets have largely replaced the traditional trapping methods. Some of the smaller lacustrine genera are caught in beach seines occasionally used in various localities. In recent years it has become apparent that there are large unexploited fish stocks in the lake, particularly represented by such genera as *Haplochromis*, *Alestes* and *Engraulicypris*. These are all small fish and gillnets have proved to be a very inefficient method of capture. More modern techniques of fishing with moving gear have, therefore, been investigated, tested and modified to suit local conditions.

TRAWLING

(a) Surface.

Echo-sounding observations (Gee 1966) suggested that there was possibly a considerable upward movement of fish at night after a dispersal phase at dusk. In mid 1966 a unique rig for surface trawling was therefore devised. An old, cotton, bottom trawl (21ft. overall length) with a 45ft. head rope was inverted and the new head rope fitted with five wooden trough-like lifting kites as well as extra corks. The footline was of medium weight chain and a single metal depressor was attached by twin chains to either side of the centre of the footrope. 50ft. towlegs were attached to 2ft. x 3ft. otter doors and flotation was obtained by bolting each board to a 5ft. mine sweeping paravane. The net mesh sizes were 2.5 in. in the wings and square, 2in. in the belly, and lengthened with a 0.75in. codend. A flapper was provided in the codend as the whole rig was hauled by hand. The net was towed as far as possible behind the boat (warp length immaterial) and a good mouth opening was obtained. Although the gear fished well the catches were disappointing. They consisted almost entirely of *Haplochromis*, but produced only about 21 lbs/hr.

(b) Bottom.

From August 1966 onwards our main efforts have been directed towards bottom trawling. No. 1 launch was fitted out as described by Gee & Gilbert (1967) and a Vigneron-Dahl trawl of the dimensions shown in Fig. A1 was

rigged. The unusual feature of this trawl was the bobbin line. The bobbins were 6in. wooden rollers on a wire line weighted to give very slight negative buoyancy. The object of this was to ensure that the bobbin and foot lines did not dig into the very soft mud bottoms of the lake and at the same time enable the net to traverse stony ground (where the echo-sounder gave no indication of a rocky bottom) without snagging on partly embedded boulders. During August the crew were trained to use and handle standard trawl gear, and to rig, set and haul the gear using the small winch available.

In September 1966 this rig was fished more extensively in the Damba/Kome region where moderate to good catches were obtained in certain areas. The gear was modified slightly by adding a 0.5in. codend outside the 1in. codend and a 1.5in. strengthening bag outside this. From the operational aspect it was seen that No. 1 launch was not suitable for extensive trawling operations and that in order to speed up the trawling operations (and cut down on the number of crew required) better facilities for mechanical handling of the warps and net were needed. With the present rig only one 20 minute haul was being made about every hour. After consultation with the Uganda Fisheries Department (UFD) it was decided to combine forces and completely refit *Darter* as a stern trawler, because there was obviously going to be some delay in the commissioning of the new UNDP fishing vessel.

Plans for the alterations were made by Mr. T. Bjerke of UFD and EAFFRO staff and *Darter* brought to Jinja for the refit owing to the lack of shore facilities at Entebbe. The boat was stripped to deck level, a new wheelhouse and accommodation fitted, the after cabin decked over and the cabin converted into a hold. A four speed Fifer trawl winch with belt drive from the engine was fitted and duplicate engine controls were mounted at the winch position, Gallows, mast, chinaboom, boom, topping lift and a starboard purse davit were also fitted and provision was made for the installation of an electric speed log. These alterations and tests were completed by mid- January 1967 and the boat returned to Entebbe.

Fairly extensive trawling operations were carried out in the Entebbe/Kome/Damba region from February to September 1967 and the boat and gear worked well. In March underwater observations were carried out on the trawl net in operation. It was found to set well and had a mouth opening approximately 5 metres wide by 2–2.5 metres high. In April, trawling in over 200ft. of water was tried and proved successful although catches (mainly *Haplochromis)* were small. The original trawl was lost in 230ft. of water when it jammed on an underwater obstruction and with a moderate swell running both the towlegs (manilla rope) snapped and only the otter doors were recovered. A second net of the same dimensions as the first, but in better condition was obtained from UFD. This was rigged as for the first net but with all wire towing gear and 8in. wooden bobbins.

In July 1967 a large otter trawl with a 78ft. headrope was obtained from EAMFRO. It was rigged with 6in. plastic floats made from toy balls cased in netting bags as no other floats of this size were available locally. Two 60in. x 30in. otter doors were specially made for the net as no doors of this size were available. Four EXOCET type stabilizers and flying panels were attached to the doors and net respectively. These were made from plywood with the aerofoil section packed with expanded polystyrene for buoyancy. The net was laid off *Darter* and set well but as no hauling legs were available, difficulty was encountered when getting the body of the net over the narrow stern of *Darter*. The boat towed this net, although fairly high engine revolutions were required. If the net could be made of nylon cordage instead of coir and hemp, the drag would be greatly reduced and a net of this size could easily be pulled by *Darter*.

Since the beginning of the trawling experiments it has been obvious that the quantity of fish caught did not compare favourably with the number of crew involved in the fishing operations. Alterations to gear and methods have continually been made in order to speed up the fishing procedure and reduce the number of operational crew. The first major step was the alteration of *Darter* which reduced the number of crew required from 8–9 to 5. The additional of a poke line to the net, enabling the main body of the net to be left in the water and the codend heaved up on a boom and block, reduced the crew to 4. It was still found that the bigger catches fouled the stern rail and were difficult to bring aboard. This difficulty was solved by extending the boom by 4ft. and adding a sliding track. The codend is now winched in by the poke line to the boom sheave, clear of the stern. The boom sheave is then winched along the slide until the codend is over the deck weighing area. After emptying, the codend can be lowered back clear of the net float line and reset in the standard manner. With this new arrangement 3 crew can handle the boat and gear with ease and a very much quicker turn round could be achieved. Except for hooking up the boards the winch is used to handle the whole operation from start to finish.

(c) Midwater.

Echo-sounding observations have shown that considerable quantities of fish are to be found in mid-water at certain times and it was felt that mid-water trawling might be very productive. This type of trawling, however, is a much more difficult operation than either surface or bottom trawling. A small mid-water trawl with matching sized wing boards was made by EAFFRO staff in 1966 (see Gee and Gilbert 1967). In subsequent trials the boards were found to be unstable. Nets and boards of this size have been successfully used elsewhere (Houser and Dunn 1967), but then small British Columbian fin boards were used which are probably more stable than similar sized wing boards. It was suspected that the most common type of mid-water echo-sounder trace was produced by shoals of *Engraulicypris*. Although the mid-water trawl was obviously not fishing efficiently, only *Engraulicypris* were caught when these echoes were fished.

In March 1967 a very old mid-water trawl was obtained from UFD. This had a mouth 52ft. square and mesh sizes ranging from 2in. in the wings to 0.5in. in the codend. The net was repaired and then rigged, and full size wing boards were constructed complete with self-draining centre compartments, adjustable chain rigging and depth regulating rings (see Kristjonson 1959, page 341. figure 7). This net was tested from *Darter* in the Jinja area in July. The gear appeared to work very well and only minor adjustments were needed to keep the rig very stable. Although the net would not stand up to high towing speeds and only faint echoes were fished at 25ft, *Engraulicypris* again constituted most of the catch.

LIGHT FISHING.

As far as is known light fishing for *Engraulicypris* has never been used on Lake Victoria by local fishermen, although the method is extensively used on Lake Tanganyika for *Limnothrissa* which is the pelagic equivalent in that lake of *Engraulicypris* in Lake Victoria.

As no small mesh purse seine was available it was decided to try the boxnet method in conjunction with lamps. A 20ft. x 12ft. x 12ft. boxnet of 0.5in. mesh was suspended by rings on two floating poles over the port side of No.1 launch. The net was set by pulling it out along the poles by means of lines over pulleys at the seaward end of the poles. The end of the boxnet nearest the boat constituted a flap which was lowered below the bottom of the boxnet when the net was set, and raised again, so closing the box, before the net was hauled. Electric power was supplied by a 230V, 3KW generator and the lamps were attached to a boom on the starboard side of the boat. Two 150W mercury vapour lamps were used, one above the water and the other underwater. The latter lamp was switched on first and after about 15 minutes slowly raised to the surface. This was then switched off and the surface light switched on for a further 15 minutes. The light boom was then swung over to the port side of the boat over the boxnet, the idea being to attract the fish under the boat and into the net.

In practice this did not work very well as the *Engraulicypris* appeared to disperse as soon as the light was moved from the starboard side. They congregated again on the port side of the boat but most of them were *under* the net. What fish were caught were gilled in the net from the outside rather than being enclosed in the box. Further tests were done using different wattage lamps and illumination times but the results were the same. It was felt that this method would probably work if a more elaborate lamp boom was made whereby the lamp could be drawn along the boom towards the boat, a separate lamp immediately on the port side of the boat switched on when the boom was to be swung across and then when the lamp boom was in position again that lamp switched on and moved over the net. However it was also thought that the use of 2–3 drifting lamp boats and a 0.25in. mesh purse seine would be a more productive method of lamp fishing and until this type of gear is available the experiments should be held in abeyance.

ELECTRIC FISHING.

This is a simple sampling device for use in shallow water amongst reedbeds or rocks where fishing with nets is impossible. Two 8ft. poles with deadman switches were constructed and attached to 15in. square mesh electrodes. Each pole had 20ft. of cable connecting it to either the positive or negative terminal of a 1000W generator. This generator was not quite powerful enough, giving only about 4 amps. at the poles. Nevertheless encouraging results were obtained in collecting samples from a shallow rock shoreline. It is possible that a modified system of electrofishing could be used in conjunction with lamp units.

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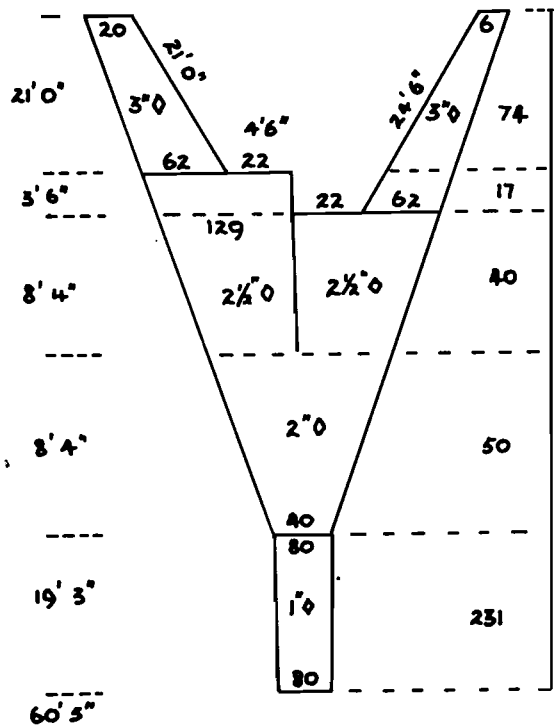
Fig. A1. TWO SEAM FISH-TRAWL 46'6" ON HEADROPE USED BY EAFFRO FOR EXPERIMENTAL FISHING IN LAKE VICTORIA.



MATERIALS.

UPPER WINGS – COTTON $20^{3}/60$

LOWER WINGS – COTTON $20^{3}/60$

SQUARE – $20^{3}/45$ BELLY $20^{3}/45$ (COTTON)

COD-END NYLON 210/18

HEADROPE.

1½ INCH CIRCUMF. KURALON LINE.

GROUNDROPE.

2 INCH CIRCUMF. MANILA FASTENED TO $^{3}/_{16}$" DIAM. CHAIN. 3/8 DIAM. WIRE IS ROVE THROUGH THE OTHER END OF THE CHAIN. 4 BOSOM BOBBINS 9" x 6" ARE ATTACHED.

BREASTLINE

1½ INCH CIRCUMF. MANILLA.

WEIGHT GROUND ROPE 46 LBS. DRY TRAWL 170 LBS.

BUOYANCY ATTACHED 45 LBS

CROP YIELD RESPONSE IN MAIZE TO PILKINGTON BAY MUD ADDITIONS.

BY J.C.D. WATTS.

Samples of dried mud from Pilkington Bay, whose chemical composition is given in Table B1, were added to samples of the local lateritic soil in the following proportions, expressed as percentages by weight:-

Soil Mixture	*Mud*	*Soil*
A	–	100
B	15	85
C	25	75
D	50	50
E	75	25
F	100	–

Two maize seeds were planted in each pot containing the various proportions of dried mud and soil, and the crop was harvested 30 days after the seed had germinated. The experiments were carried out in duplicate

Table B1. Chemical composition of dried Pilkington Bay mud. (Data kindly provided by the Chemistry Division of the East African Agriculture and Forestry Research Organization).

pH in water (1:5)	5.8
pH in M/100 $CaCl_2$ (1: 2.5)	5.6
Moisture content (%)	12.6
Organic Carbon (%)	24.1
Total N (%)	3.32
Mineral N (ppm)	576.6
Mineralised N during:-	
14 days incubation (ppm) Δ	495.2
28 days " (ppm) Δ	1270.7
Soluble P (ppm Truogs)	169
Exchangeable *Cations:*	
K me/100g	2.08
Na "	1.80
Ca "	15.31
Mg "	4.40