

# Bottom longlining in the south-west lagoon of New Caledonia

by Michel Kulbicki

NEW Caledonia is surrounded by a reef structure which is similar to the Great Barrier Reef (GBR) but on a smaller scale (Figure 1). In particular, in both instances the nature of the bottom between the coast and the barrier reef changes considerably. The fish species composition in New Caledonia is also very similar to the one found on the GBR.

In a study of the fish populations of the south-west lagoon in New Caledonia, scientists from the French Institute of Scientific Research for Co-operative Development (ORSTOM) used bottom longlining as a technique for fish capture.

This method was found to be effective for fishing in untrawlable areas and gave fewer technical problems than gillnets or traps, indicating that bottom longlining could be used in some instances by the artisanal fishery.

## Method and gear

A 10-metre aluminum catamaran with a three-man crew was mostly used for the bottom longlining operations. The gear used is illustrated in Figure 2.

Nylon leaders were used in order to keep the catch of shark, which tend to tangle the line, to a minimum. Also it has been proved in several bottom longline fisheries that trace leaders catch less fish than nylon

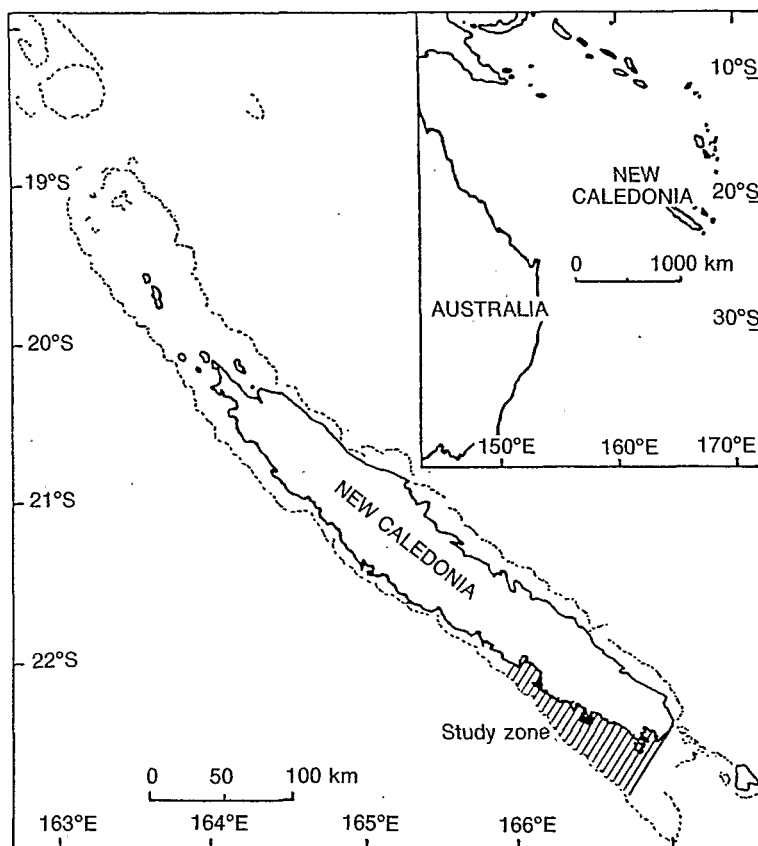


Figure 1. Map showing position of New Caledonia in relation to Australia; the reef surrounding New Caledonia; and the area of the ORSTOM study.

ones. The leaders had a breaking strength of 30 kilograms.

Hooks used were Mustad circle hooks (39960ST; no 9).

The bait was frozen New Zealand squid, *Notodarius sloanii*. Both mantle and tentacles were

used, best results being obtained with bait pieces of approximately 3 cm long by 1 cm wide, hooked twice as indicated in Figure 2.

Hooks were systematically rebaited every three sets. The amount of bait necessary was 1.5

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kg/100 hooks, based on weekly averages. Soak time was 70 minutes on average. It was found that a longer soak time did not necessarily increase catch and could result in loss of fish to sharks.

A limited number of commercial trials were performed with removable leaders of 70 kg breaking strength using clips (JVI set line clips from Gourock, New Zealand.) This allowed for easier storage and handling of the line and the possibility of baiting hooks in advance (for instance, while a line is already fishing).

During scientific trials sets of 100 or 200 hooks were used. Commercial trials were performed with lines of 300 hooks. While longer lines save time in the setting and retrieving operations they can pose a problem in snaggy areas.

## Results

For the 289 longlines (34 000 hooks) set in the south-west lagoon of New Caledonia an average yield of 8.2 kg/100 hooks was obtained.

This may seem rather low but it must be kept in mind that all areas were fished even those known to have low fish densities. Maximum yields were 38kg/100 hooks. Preliminary information from commercial trials indicates that professional fishermen were able to get yields of over 50kg/100 hooks in the north-west lagoon of New Caledonia.

The average size of the fish caught was 1.6 kg with a maximum size of 12 kg and a minimum of 200 gm. While the use of stronger leaders may help in the catch of bigger fish the effectiveness of the gear could be decreased.

In a normal day of fishing (6 am to 5 pm) 1200 hooks would be set. Setting a line of 100 hooks took on the average seven minutes and nine minutes for a line of 200 hooks. Retrieving time depended much upon the catch, sea condition and snags. On average 15 minutes were necessary

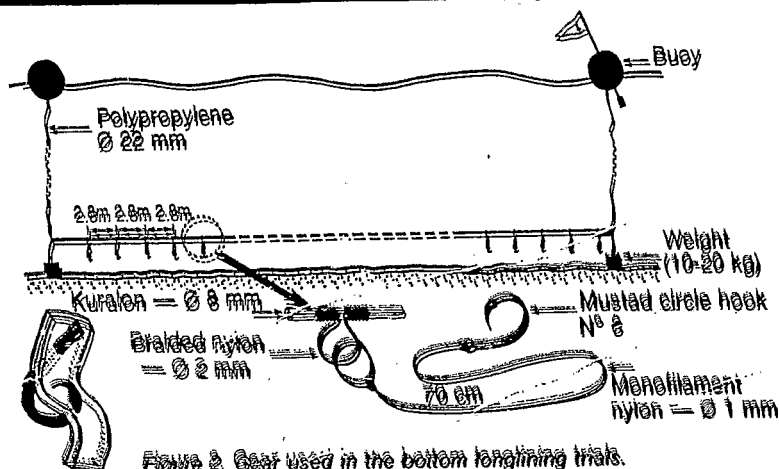
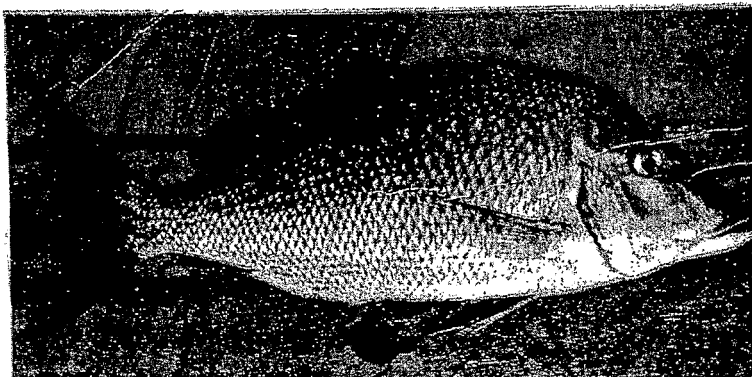


Figure 2. Gear used in the bottom longlining trials.



Spangled emperor (*Lethrinus nebulosus*).

ary for a line of 100 hooks and 20 minutes for a line of 200 hooks.

While there were three men in the research crew it may be possible to run this type of fishing with two men only.

Despite the high coral cover of some of the areas fished, there was only a four per cent hook loss. In comparison, trials in the Caribbean on smooth bottoms had hook losses of two per cent (Nelson and Carpenter, 1968). It is estimated that sharks and giant goado (*Gastrophysus scleratus*) accounted for 50 per cent of the hook losses. Serious snags occurred only on three per cent of the sets.

Catch consisted of 72 species belonging to 15 families. Only 30 species were taken on more than 10 sets. Three groups dominated the catch: groupers, 18.6 per cent;

snappers, 10.3 per cent; and emperors 34.5 per cent.

Groupers and snappers are caught mainly near the barrier reef or in coralline areas whereas emperors are usually found on coarse sand, preferably with a few scattered coral heads.

In New Caledonia a number of species such as sweetlip emperors and red bass are ciguatera and cannot be sold. Combined with those species of no commercial value these trash fish represented 18 per cent of the catch.

This catch composition is very different from that of landings in the GBR region by handline fishermen (Craik 1985). In particular, coral trout accounted for only two per cent of the ORSTOM catch compared to a catch of 34 to 40 per cent on the GBR (Craik 1981).

Fish caught by longlining were on average larger than those caught by handline or seen during visual census in the same areas — a difference probably due to the large hook size used.

Yields and catch composition were influenced by a number of factors, including depth, time of day and distance to the barrier reef.

### Effect of depth

As Figure 3 shows, catch rate did increase significantly with depth down to 35 metres. Below that depth catch rate decreased, mainly because the nature of the bottom changes drastically, in particular silt levels tend to increase. The increase of yields with depth was mainly due to an increase in the average fish size with depth (Figure 3).

There was also a shift in the species composition with depth. Snappers and groupers became more abundant in the catch as depth increased. On the other hand sharks and trevalley were caught in shallow waters. (It should be noted that only juvenile sharks were caught as nylon leaders were used.) Emperors and sweetlips were essentially taken in the 15 to 30 metre depth range.

### Time of day

The longlines were set between 6 am and 5 pm. Lines were not set at night mainly because sharks become more active at that time. The results indicate that except for a slight increase in catch between 3 pm and 5 pm, there was no effect of time of day on total catch.

However, some species, especially emperors and hussars, were generally caught in the afternoon. These fish are mainly nocturnal feeders according to observations made during handlining trials. Longlines proved to be far more effective than handlines in catching these species during the day.

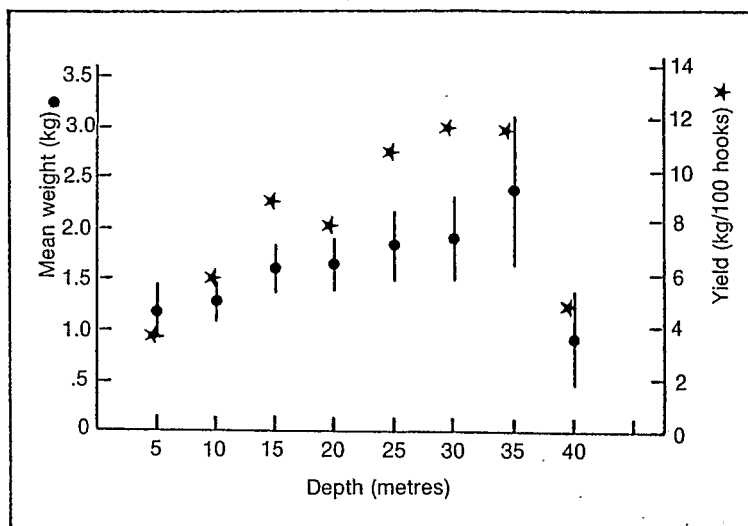
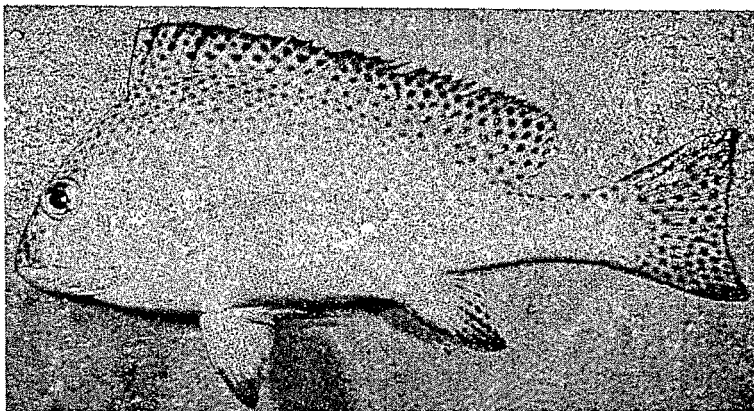


Figure 3. Mean weight and yield in relation to depth.



Painted sweetlip (*Diagramma pictum*).

### Effect of distance

For research purposes the lagoon was categorised into three parts: the coastal zone, middle reef and barrier reef.

In the coastal zone water is usually turbid and very little of the bottom is covered by coral and rocky areas. It is in that zone that catches were the lowest (5.3 kg/100 hooks) and the amount of trash fish the highest (25.1 per cent of the catch).

The main commercial species found there were trevallies (*Caranx* sp.) — 8.8 per cent of the catch; painted sweetlip (*Diagramma pictum*) — 8.0 per cent; spangled emperor

(*Lethrinus nebulosus*) — 21.3 per cent; and green job fish (*Aprion virescens*) — 6.6 per cent.

Trevallies were captured mainly near shore. These fish generally feed on small pelagic fish (anchovies, sprat, sardines, atherinids) which tend to stay in sheltered areas such as bays, mangroves and leeward parts of the reefs.

In the middle reef, which has much coarser sand than the coastal zone and where coral becomes more abundant, yields were of 8.3 kg/100 hooks. Emperors and sweetlips, which tend to be found near coral heads on sandy areas, were the dominant species in the catch.

The barrier reef zone is characterised by very clear water, coarse coralline sand and a high coral cover. The average yield for this area was the highest with 10.4 kg/100 hooks. Groupers, sea bream and wrasses were the dominant species.

Fish tended to be larger the further from shore they were caught.

### Comparison with handlining

While the longline was fishing, some handlining was undertaken on the same site (163 fisherman hours) in order to compare yields of both methods.

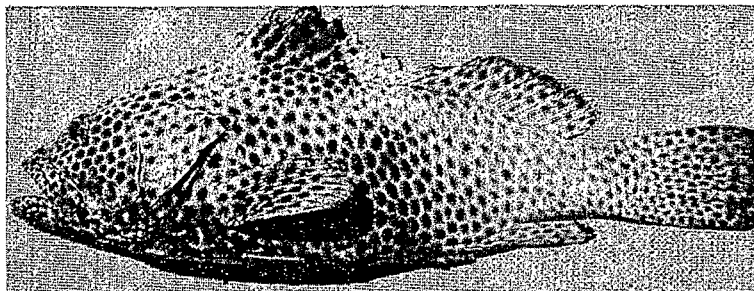
Bottom longlines caught larger fish, less trash fish and had on average better yields (see table).

The catch rate per fisherman per day for each type of gear was estimated.

For handlining, we found that real fishing time (time with the hooks on the bottom) was 6 hours/day/fisherman. Since the handlining catch rate was 2.63 kg/fisherman/hour, the catch per fishermen per day can be estimated at 15.8 kg.

For longlines, in the boat used and with three fishermen, an average of 1200 hooks/day could be set. The longlining catch rate was 8.2 kg/100 hooks, that is, an estimated catch of 32.8 kg per fisherman per day, which is twice the catch by handlines.

However, caution should be used when interpreting these results because the data is for daytime fishing only. Handlining, at least in New Caledonia, gives far better results at night than during daytime (Loubens 1978). Unfortunately there is no information on night longlining.



Brown spotted rock cod (*Epinephelus maculatus*).

### Diving on the lines

The team dived on 45 sets in order to collect information on the fish habitat, to estimate densities and to see how the line operated.

The line takes a few minutes to reach the bottom. During that time swarms of small fish such as mackerel scad (*Decapterus* sp.) or whiptails (*Pentapodus* sp.) nibble on the bait. Once the line is on the bottom, these bait stealers usually leave their bait.

The line should not be too tight for at least two reasons. First, a tight line on coralline or rocky ground will often not be directly upon the bottom but will hang between corals or rocks with the hooks dangling above the bottom. Underwater observations indicated that bottom fish prefer the bait to lie on the ground.

Second, large fish will more easily snap the leaders if the main line is too tight. On the other hand, if the line is too slack fish will more easily snag the main line in their attempts to take refuge in crevices.

The dives offered the opportunity to observe fish biting and see how the circle hook operated. It was seen that the fish very seldom swallows the bait. Usually it will pick up the bait, chew it a

little then spit it out. This operation is repeated two or three times. The fish gets caught when, feeling the sting of the hook, it darts away thus setting the hook. For this reason, if the main line is too slack the hook may not set itself.

### Conclusions

While bottom longlining may not give sufficient yields to be a worthwhile year-round activity in coralline lagoons such as those in New Caledonia, in some instances it could be a good secondary activity. The yields are usually more regular than those of handlining and the fish larger.

It is a method best suited to small fishing units with a crew of two or three. While the gear could certainly be considerably improved, the experience of local fishermen using bottom longlines on the outer reef shows that the simplest gear is often the most effective.

### References

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### Comparison between longline and handline results.

|                        | Bottom<br>longline | Handline |
|------------------------|--------------------|----------|
| Yield/fisherman/day    | 32.8               | 15.8     |
| Percentage trash fish  | 18.0               | 21.5     |
| Fish average size (kg) | 1.60               | 1.05     |