

# GILLNET FISHING IN MACUATA, FIJI

## INTRODUCTION

The purpose of this trip to Fiji was to review the effectiveness of the banning of commercial gillnet fishing in Macuata Province on Vanua Levu. We were also asked to make recommendations on whether the ban should be maintained, and to advise on any other management measures relating to commercial and subsistence fishery in Macuata Province.

The gillnet fishing ban was imposed by the Macuata chiefs in 1990. Unfortunately, there was no survey conducted at this time, so no estimates of stock abundance were available for future assessment and comparative analysis.

In 1995, the chiefs of Macuata requested Fiji Fisheries (through the Macuata Provincial Office) for an assessment of the effectiveness of the ban. Fiji Fisheries then requested technical support from the South Pacific Commission through the ICFMaP project. The Commission agreed to this request, and the ICFMaP team left for Fiji in February 1996 to conduct this work.

The ICFMaP personnel that took part in this survey include Tim Adams, Paul Dalzell, Sione Matoto and Esaroma Ledua. Paul, Sione and Esaroma left Noumea for Fiji on the 6th of February, and were joined by Tim two weeks later.

After meeting senior Fisheries Officials in Suva on the 7th and 8th of February, the team travelled to Labasa, Macuata on the

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9th of February for the start of the survey work. Three Fiji Fisheries Research Officers were assigned as full-time counterparts to this project. They were Apisai Sesewa (team leader), Saiyasi Yabakivou and Jovesa Korovulavula.

Considerable support was received from the Fisheries Division, especially the provision of support staff, fishing gear and vessels. Apart from the three research staff, Extension Officer Matai Kolinisau spent two full weeks with the ICFMaP team.

The Research Officer based at Labasa, Mr Indar Dev Raj, was also assigned to the team to assist in collecting information on commercial landings. The Fisheries vessel *Gonedau*, with nine crews, was assigned to this project for a full four-week period.

The commercial fishery operation in the Macuata Province has a lot of things to offer to other countries in the region. It is organised in a simple professional way, which has the potential to be successfully duplicated by other neighbouring countries.

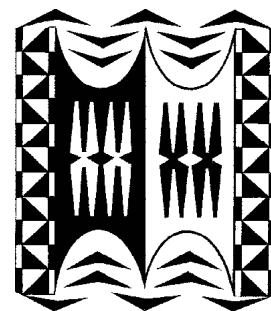
This includes the marketing system, the storage system, the contract system of catching fish and the system of paying wages. All these aspects of the fishery should be of interest to neighbouring countries in the region.

## BACKGROUND OF MACUATA

The land and coastal boundaries of the Macuata Province lie between latitude 16°5'S to 16°35'S and longitude 178°50'W to 179°45'W, on the second largest island of Fiji, called Vanua Levu. The island of Vanua Levu is composed of three large provinces: Macuata, Bua and Cakaudrove. Macuata is made up of the northern portion of Vanua Levu and five other small islands to the north. Labasa Town is the capital of Macuata Province.

Since Macuata is a dry area (average rainfall of 4,050 mm/year), it has a climate favourable for growing sugar cane, and Macuata is one of the leading sugar producers in Fiji. The province of Macuata is also known for its timber and fishery resources. Sugar is the main source of income, followed by timber and fish respectively.

Fish resources in Macuata coastal waters appear to be more in abundance compared to other areas in Fiji, especially Viti Levu. This may be attributed to the establishment of good traditional management systems, the presence of large areas of mangroves, an extensive shallow lagoon and the Great Sea Reef that provides shelter to the whole of Macuata's coastal zone (important as a source of nutrients, refuge and spawning grounds for many fish species).



Management of fishery resources in Macuata is jointly controlled by the Fisheries Division office in Labasa, as well as the chiefs in the various districts. The Labasa Fisheries Office is the headquarters for the Northern Division of the whole of Vanua Levu.

A total of twelve officers are currently serving the province of Macuata. The Fisheries Officers provide resource management and development advice to provincial councils, district councils and village councils.

They also provide fishermen with services such as sales of gear and ice, vessel licensing, hull and engine repairs, preparation of bank loan applications and law enforcement. The chiefs, through traditional management systems, may declare and enforce bans or taboos, in most cases through prior consultations with the Fisheries Division.

#### GILLNET BAN

The chiefs of the Macuata area imposed the ban on gillnet fishing in 1990. Although this is technically illegal due to government ownership of all resources and the seabed, the chiefs used their traditional powers to impose the ban. The government recognises the traditional systems in Fiji, and therefore endorsed the ban on gillnet fishing.

Among the reasons why the government endorsed the gillnet ban were the numerous complaints about the negative effects of commercial gillnetting on subsistence-fishery catch requirements. Subsistence fishermen were experiencing difficulties meeting their subsistence requirements.

Though the chiefs were receiving and benefiting from substantial amounts of money as goodwill payments from commercial fishermen, strong opposition from the people forced the chiefs to declare the ban on gillnet fishing.

#### MACUATA SUBSISTENCE FISHERY

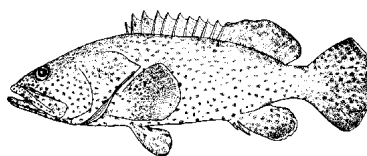
Villages along the Macuata coast rely on fish as their main source of protein. Handline fishing is the most common method of catching fish. Free diving, using rubber-propelled spears, seems to be the second most popular method of catching fish in Macuata.

Reef gleaning is also common, combined with the use of hand nets. This type of fishing method is practised mainly by women. Some fishers use hand spears or knives to fish on reef flats at low tide.

Spear fishers and reef gleaners prefer to go out at low tide. They try to reach selected or favourite spots before the flow of the incoming tide. They wait for fish which come in schools with the tide to feed in shallow water.

Fishermen prefer early morning tides or late afternoon tides. Our observations while visiting villages in Macuata showed that invertebrates, mainly molluscs, constitute about 17 per cent of the subsistence landings.

Groupers and coral trout accounted for about 30 per cent of the total catch, with other significant contributions from



surgeonfish (18 per cent), trevallies (10 per cent), emperors (6 per cent) and parrot fish (5 per cent).

Subsistence fishers fish harder when there are village functions such as church gatherings, district meetings, weddings, the birth of a first-born baby, deaths in the village, or other festivals. Subsistence fishers in Macuata prefer to do handline fishing at night, especially when the tide is turning on the ebb tide.

Handline fishing is mostly conducted in deep areas of the lagoon or reef channels during dark nights, targeting rock cods, snappers and other bottom fishes. When the moon is full, subsistence fishers prefer to use handlines in the shallow sandy areas of the barrier reef, targeting Lutjanids and Lethrinids.

Subsistence fishing trips in Macuata usually last for 8 to 12 hours at sea. On special occasions, fishing trips may last more than 12 hours. In such cases, fish are smoked or cooked in earthen ovens on uninhabited islets nearest to the fishing grounds.

This is done to preserve fish in order to allow fishers to stay longer at sea. Ice is rarely used in Macuata for subsistence needs. This is due mainly to the unavailability of proper ice boxes and the problem of accessibility to ice plants.

Although gillnet fishing has been banned in Macuata since 1990, the chiefs continue to grant exemptions to subsistence fishermen whenever there is a big village function, particularly when large volumes of fish are required.

It is estimated that gillnets are deployed in each village on an

average of about 10 times per year only. Subsistence gillnet fishing in the Macuata area does not, therefore, appear to be excessive.

Gillnets used by these subsistence fishermen are usually around less than 300 m in length, and therefore much shorter in length than those used by commercial fishermen, who deploy nets of more than a kilometre in length. It was also noted that nets used for subsistence purposes were much shallower in depth compared to the ones used by commercial fishermen.

The frequency of subsistence fishing is variable and dependent on the weather conditions, social occasions in the villages and seasonality of targeted species. For example, people fish harder for their subsistence needs when mackerel (*R. brachysoma*) aggregate in coastal zones to

prepare for spawning. At this time it is not unusual for fish to be served for all three meals in most village homes.

#### COMMERCIAL FISHERY

Since gillnetting is banned in Macuata, commercial fishermen have shifted to handline fishing for demersal reef stocks on the Great Sea Reef. There were a total of 289 commercial fishermen licensed in 1995 and a similar number is expected for 1996.

Most of the commercial fishermen use the FAO-designed 28-foot (8.5 m) wooden launches for fishing. These boats were built by the Fisheries Division when their boat yard was operational. Fishing periods usually last 4–7 days for this type of boat.

The commercial fishermen in Macuata are quite satisfied with

handline fishing and are generally not in favour of lifting the ban on commercial gillnet fishing. This is due mainly to economic reasons, as the commercial fishermen have converted their operations to handline fishing.

It would be costly to convert back to net fishing, and they believe that if commercial gillnetting was permitted again, it is most likely that it would again be banned in a few years' time.

The average catch rate of commercial handline fishermen using FAO launches was about 342 kg/trip during the month of February. Overall, all vessels landed an average of 260 kg/trip with landings ranging from 12 to 500 kg/trip. It was observed during the survey that the commercial handline fishery is usually dominated by



**Figure 1: The above picture shows three subsistence fisherwomen catching fish using handlines in Nukunuku lagoon, Macuata. Handline fishing is the most common subsistence fishing method in the Macuata Province.**

barracuda, trevallies, spanish mackerel, groupers and coral trout, snappers and emperors. Current trends in the fishery suggest that there is no resource limitation at the current level of fishing.

The commercial fishery operation and set-up in Macuata is simple but effective. The fish catching systems are based on contracts that require boat captains of the FAO-designed vessels to catch a minimum of 300 kg/trip.

Therefore, the boats only return to port after exceeding this target. Fishermen catch sardines at night using lights placed on the side of the boat to attract them, and fish are then hauled into the boat using small mesh nets. This idea of catching bait originated from the tuna pole-and-line baiting techniques.

The wages given to the captains and crews by boat owners differ between boats, and are dictated by the fishing skills of the captains. Boat captains select their own crews, and every fifth trip is the captain's trip: that is, the profits from the trip belong to the captain and crew. Rations, fuel and kava are paid for by the boat owners, except for the fifth trip which the captain himself provides, but marketing of fish is conducted by the boat owners. The majority of boat owners sell their catch to fish buyers or middlemen.

In 1995, a total of 21 middlemen were licensed by the Fisheries Division for Macuata. The same number is expected again for 1996. Of interest was the organisation of the fish marketing system. When the boats come into port, boat owners inform the middlemen who send in a truck to collect fish.

The fish are then graded, weighed, cleaned and iced at the storage facility of the middlemen. The boat owner is then paid after the fish are weighed. Of the 21 middlemen in Macuata, four were selling most of their fish to Suva, whereas the rest retailed their fish in Labasa Town.

Middlemen selling fish to Suva are very well organised. They have trucks loaded with ice boxes, as well as freezers and ice bunkers for storage. Ice is normally purchased from the Fisheries Division Ice Plant, but one of the middlemen also has his own ice plant. Fish transported fresh to Suva are preserved in ice.

The trucks travel from Nabouwalu landing to Suva by ferry once a week with 2 to 5 tonnes of fish. The volume of fish sold to Suva markets constitutes approxi-



**Figure 2: Picture of Mr Ali's storage facility at Labasa. Bags of fish are being offloaded from the small truck on the right. The big truck loaded with the ice box is for transporting fish to Suva. The ice bunker on the left, with bags of ice on top, is for storage purpose.**



**Figure 3: Three FAO-designed vessels offloading fish at Mr Khalil's storage facility. On the left is his storage house and ice plant. Further back is his bouser, which supplies fuel to the boats.**



**Figure 4: Mr Khalil (centre) holding a bundle of fish at his storage facility and helping in sorting fish landed by fishermen. On the right are the ice bunkers and at the back is his house**

mately 91 per cent of the total landed catch in Macuata.

Markets in Suva are fixed, and therefore Macuata fish dealers merely offload, get paid and travel back to Labasa. Fish buyers in Suva include restaurants, butcher shops, supermarkets, and other middlemen.

The middlemen in Suva may then sell their fish at road-side stalls, or sell it to hotels and restaurants or the Nabukalou creek, whereas butchers and supermarkets have set up facilities to retail their fish.

#### MACUATA GILLNET SURVEY FIELD ACTIVITIES

It was not an easy task for the ICFMaP team to review the effectiveness of the banning of commercial gillnet fishing in Macuata Province from 1990–1996. This was mainly due to the absence of information on

the fish stocks prior to the imposition of the ban.

Field activities during this survey involved trial gillnet fishing between 16 February and 6 March 1996 to obtain accurate estimates of catch rates and selectivity of gillnets used in the former commercial fishery. Collection of catch-and-effort data from commercial and subsistence fisheries in Macuata Province was also conducted.

We held discussions with fishermen and villagers on the effectiveness of the commercial gillnet ban to try and gauge opinions about lifting or keeping the ban in place.

The ICFMaP team also tried to find whatever historical data was available on gillnet fishing in Macuata Province prior to the ban, for comparison with trial fishing conducted during the survey.

The Fisheries vessel *Gonedau* was used as the base for the gillnet fishing during this survey. Gillnets of mesh sizes 2, 3, and 4 inches were used (dimensions of each mesh size were 360 m x 50 mesh x 75% hanging ratio) to investigate catch rates, selectivity and species composition. Three fishing teams were formed and each team was briefed on netting procedures. The nets were deployed at high tides during both nights and days and soaked for six hours, and when nets were hauled in, the fish were separated in buckets according to mesh sizes. As soon as fish arrived on-board the *Gonedau*, they were sorted into species, identified, lengths measured and then weighed.

We were blessed with good weather in the first two weeks of the survey, but the third and fourth weeks were very wet and windy.



**Figure 5: Fisheries staff helping the ICFMaP team in sorting, weighing and measuring fish onboard the *Gonedau*.**

Though the wet conditions made life miserable on board *Gonedau*, the field activities continued as planned.

The *Gonedau* has only 9 bunks, but unfortunately there were 14 of us on-board the vessel. Sleeping was not so bad in the first two weeks because people without bunks were able to sleep outside on deck, but in the third and fourth weeks, life was difficult at night because of the wind and rain.

The team was no longer able to sleep outside but was forced to crowd into the small wheel house. I managed to secure a good spot between the sounding machine and the boat compass. Fisheries Officer Apisai Sesewa grabbed the chart table to sleep on, but unfortunately the table was only half the length of his height. Sione Matoto and two others shared the floor of the wheel house which is only about 9 x 3 feet in size.

#### OUTCOME OF THE SURVEY

Information from villagers in the Macuata area obtained from interviews conducted during this survey supports the conclusion that coastal fish stocks have improved markedly since the imposition of the ban on commercial gillnet fishing in 1990. Villagers do not need to travel far or fish for very long to obtain good catches. They also noted an increase in abundance of mullets and mackerels, which had previously been seriously depleted by commercial fishermen.

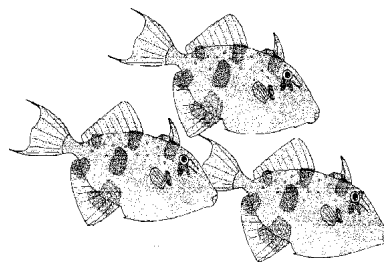
Though we managed to retrieve some catch data collected between 1982 and 1983 by the Fisheries Division, it was difficult to compare the catch data from this survey with previous

information on catch rates from commercial fishing. However, these records from the early 1980s show that average daily catch rate per vessel ranged between 53 and 97 kg, with an average of 73.1 kg/day. The average catch from this survey during February 1996 was 75.6 kg/day.

In terms of weight of fish caught, the principal components of gillnet catches were sharks and rays which collectively formed about 34 per cent of the catch. This may be indicative of low fishing pressure, as predatory species such as sharks are usually among the first group of fishes to be depleted when fishing pressure is high. Snappers and travellies each constituted about 9 per cent of the catch, while mullets and mackerels each contributed about 8 per cent of the total weight.

The current ban on gillnet fishing has had very little effect on the people of Macuata. The people most affected by the ban were commercial fishermen from outside the Macuata area, particularly those from Viti Levu. Commercial and subsistence fishermen in Macuata are not in favour of relaxing the ban on commercial gillnetting.

On selectivity tests, it was observed during the fishing trial that 2-inch-mesh-sized nets were catching a large number of juvenile fish.



This would, therefore, mean that the use of 2-inch mesh size should be restricted. It was also observed in this survey that 3-inch mesh size was the most appropriate minimum mesh to be used by subsistence fishermen with a hanging ratio of no less than 75 per cent.

#### RECOMMENDATIONS

In summary, it was recommended to Fiji Fisheries that the ban on gillnet fishing be extended, because of the marked improvements in subsistence catches and because commercial fishermen in Macuata have adopted handline fishing on the Great Sea Reef. Since subsistence gillnet fishing in Macuata does not seem to be excessive, there was no reason to seek any limitation on subsistence fishing, apart from discouraging the use of 2-inch mesh.

Concerning handline fishing, the Fisheries Division was advised to continue collecting information on fishing effort, notably catch composition, trip length, days spent fishing, hours fished per day and crew size.

#### FISHERIES DIVISION RESPONSE TO SURVEY OUTCOME AND RECOMMENDATIONS

The Fiji Fisheries Division was very pleased with the success of this survey. The recommendations were well received by the Fisheries officials, especially key people like Mr Apolosi Turaganivalu (Senior Fisheries Officer – Northern), Mr Krishna Swamy (Acting Principal Fisheries Officer – Resource Assessment & Development) and Mr Maciu Lagibalavu (Acting Director of Fisheries).

The report will be used to advise the Provincial Council

and Tikina Councils in the Macuata area.

### CONCLUSION

The support given to us by the Fiji Fisheries Division greatly contributed to the success of

the field activities during the four weeks in Macuata. We were pleased with the professionalism of Fiji Fisheries staff who were involved in the survey, including boat crews and Resource Assessment & Development staff, especially the

leadership of Mr Apisai Sesewa. The support from the Labasa Fisheries office in terms of provision of rations, boat preparations, net repair, vehicle provision for field trips and many other activities were similarly excellent.



**Figure 6: Happy faces of Sione Matoto and Esaroma Ledua during the first field trip on the *Gonedau* deck, with little expectation of what is coming in the next two weeks.**

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