

TRADITIONAL LAGOON FISHERIES IN NEGOMBO

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ABSTRACT

Negombo lagoon is a bar-built estuary with a surface area of around 3,200 ha. The lagoon has a high productivity (150 kg/ha/year) and is rich in aquatic resources and biodiversity. Fishing takes place all year round using a total of 22 methods, of which 13 are entirely traditional. The latter include staked seine nets, brush piles, castnets, kadippu nets, angling and scoop nets. Shrimp is the target species of most of these methods. Most of the traditional fishing gear is simply designed, easy to operate, resource friendly and causes little damage to the lagoon environment whereas modern fishing methods are efficient but are not always resource friendly. Except for the staked seine net and brush pile fisheries, the lagoon fisheries are open access. As almost all traditional fishing methods are confined to the lagoon mouth or to shallow sea grass areas and mangrove fringed banks, it would be difficult to impose strict regulations preventing fishing in these areas. The capital investment required to enter into fishing activities is low, so it is essential and urgent to bring all lagoon fishermen under a licensing scheme. When the multidisciplinary nature of fishing activities and strategies in implementing existing regulations are considered, community based management seems to be well suited to the Negombo lagoon ecosystem.

1. INTRODUCTION

Negombo lagoon, which is one of the most productive estuaries in Sri Lanka (Pillai, 1965) is situated in the Gampaha district on the western coast, about 20 km north of Colombo, at 7°7'N and 79°50'E. It is 12 km in length and 3.75 km at its widest point. The greatest recorded water depth is 2.6 m but 10% of the lagoon has a water depth of less than 0.5 m. The lagoon covers an area of approximately 3,200 ha and opens to the sea at its northern end. To the south, it is connected to the Muthurajawela marsh which covers an area of approximately 3,100 ha and together the lagoon and marsh constitute a conjoined, tidally influenced coastal wetland. The main fresh water input comes from the rivers Dandugam Oya and Ja-ela but the lagoon is characterised by a brackish water flora (seaweeds) and some mangrove forests in the northern part. These zones are very important ecologically as well as economically. Their productivity is high and they act as a silt trap and provide spawning, nursing, feeding grounds and shelter for a variety of economically important fish and shrimp species.

Sea grass beds cover 22% of the lagoon area and are highly productive, providing habitats for a variety of brackish water organisms including many economically important species (e.g., prawns). Seven sea grass species of four genera have been recorded from the lagoon. They are *Halodule* sp., *Holophila* sp., *Potamogeton* sp. and *Ruppia* sp. The sea grass beds in Negombo lagoon constitute the single most important habitat type supporting the exceptionally high fish productivity (150 kg/ha/year) of the wetland.

Negombo lagoon was a thriving sea port during the period of the Kotte kingdom under the Portuguese. Its importance as a port declined under the Dutch, simultaneously with the development of Colombo as the capital city and the main sea port. Negombo today is a marine fishing centre of great national importance. However, the lagoon fishery, which is of high socio-

economic importance, is over exploited and lacks proper management.

Surrounding the lagoon are the houses of more than 80,000 villagers, more than 10% of whom earn their living from some form of fishing (Ward & Wyman, 1975). The population in the lagoon area has increased rapidly since 1980, a situation aggravated by the ethnic problems in the north.

2. FISHING ACTIVITIES

Various fishing activities in the lagoon are carried out by three categories of fishermen:

- those living around the lagoon
- those living in the Muthurajawela Marsh who regularly fish in the lagoon
- those who do sea fishing but come to the lagoon during the southwest monsoon months.

There has been a clear trend towards over exploitation of fish and crustacean stocks in recent decades. This trend is reflected by:

- i. the increased number of fisherfolk now operating,
- ii. the decrease in size of some fish and crustaceans captured by different types of fishing gear,
- iii. the increase in value of ornamental fish and their exploitation level,
- iv. the multiplication of fishing gear types and the addition of new destructive types of gear to the lagoon fishery,
- v. the progressive decrease in mesh size of nets used,
- vi. the progressive decrease in CPUE of brush piles.

There are 22 fishing methods now used in the Negombo lagoon of which numbers (i) to (xiii) are entirely traditional. They are: (i) cast net, (ii) stake seine net, (iii) Katta, (iv) brush pile, (v) Kadippu dela, (vi) angling, (vii) crab pots, (viii) scoop nets, (ix) Karakgediya, (x) Irati, (xi) Ja-kottu, (xii) Kemana, (xiii) dip net, (xiv) Gok ran dela, (xv) hand trawling net, (xvi) gilinet, (xvii) drift gill net, (xviii) polychaete worm digging, (xix) cross nets (Haras dela), (xx) drift net, (xxi) trammel net and (xxii) Gawana dela.

2.1 Traditional fishing methods

Cast nets (Visidela)

This net is operated in all parts of the lagoon mainly during day time. There are places called "Visidel pola" where this fishing method is concentrated. Sometimes, the fishermen wade and cast the net or they may use a canoe to reach "Visidel pola" and cast the net from the canoe. Fishing at "Visidel pola" is successful when strong tidal currents go out to sea. Sometimes, when the canoes are anchored, fishermen go into the water to use their cast nets. In Negombo lagoon

an average of 350—550 cast net fishermen operate every day, catching generally in the range of 0.5—3.5 kg/day. This fishing gear does not cause much damage to the lagoon environment other than catching immature fish and crustaceans.

Stake seine nets (Kattudel)

This fishery has existed in the lagoon for centuries, with deeds dating back to 1721. It is highly managed in such a way that user rights are well defined and the Kattudel fishermen's association is guided and supervised by the Catholic Church. Available statistics on the Kattudel fishery show that 8% of the fishermen population control the fishery and will not allow others to enter. This is an important aspect in fisheries where property rights determine the number of entrants. A place where stake seine nets operate is called Kattudel paduwa, where user rights are in force. These nets are mostly operated from 18.00 to 06.00 hrs of the following day, throughout the year. Because of the time of operation and the frequency with which each fisherman has the right to fish, many Kattudel fishermen are engaged in other activities such as carpentry, office work and teaching. The Kattudel fishery is regulated and disputes are settled by the Ministry of Fisheries and Aquatic Resources assisted by the Negombo church. One tenth of the income obtained from fish/shrimp sales from this fishery is donated to the Church by the fishermen.

The stake seine is passive, with two wings and a cod end. It is operated in narrow channels close to the lagoon mouth. The net is fixed to the bottom using sticks and as the tide flows out, Kattudel fishermen set the net against the water current. When the strong currents go out to sea, all varieties of prawn, crab and fish get entangled in the net irrespective of their size. High production is observed using these nets around full moon and after periods of heavy rain, mainly a result of the increased tidal influence.

Katta

This is a fish aggregating device. A large number of coconut trunks (around 30—40) are fixed to the lagoon bottom in certain areas (e.g., Thaladena) at a depth of 1.5 m. Mangrove twigs are also fixed among coconut trunks to create a more protected area for fish. Katta owners conduct rod and line fishing operations from these structures. The average catch of a fisherman ranges from 1.0 to 3.5 kg/day and this fishing method could be considered as harmless. The main drawbacks of this fishing method are (a) the danger to navigation (especially at night) and (b) interference with other nets.

Brush pile (Athu kotu)

This consists of a pile of mangrove brushwood being placed in the shallow areas of the lagoon and pegged down so that the wood will not be scattered by water movement. When the mangrove twigs rot, they are replaced by new branches so that a single brush pile exists in the same place for a long time. As all this work is done by a single person, the brush pile and its site is considered as his property. This fishing method has a long history and the first reference dates back to 1910. As an Athu kotu site may be handed down from father to son, no other fisherman will trespass as long as any evidence of a brush pile exists. Many sites presently being used have been in the control of a given family for generations. The initial cost needed to enter this fishery today is

around Rs.8 500—10 000. Major species occurring in brush pile catches are *Signaus* sp., *Mugil* sp., *Etroplus* sp., *Lutjanus argentemaculatus*, *Lutjanus* sp., *Lates calcarifer*, *Monodactylus argenteus*, *Scaptohagus argus*, *Ambassis* sp. and *Hemiramphus* sp.. In Negombo lagoon today the number of Athu kotu ranges from 1,800 to 2,200. Although it has been suggested that the brush pile fishery accounted for more than 80% of the catch in the Negombo lagoon, other estimates suggest that, although the brush piles are the main contributor, they account for around 36% of the total fish production, with sizeable contributions also coming from encircling gillnets (28%) and modified set nets. A brush pile is harvested at two to four week intervals. An individual or a family unit may own and operate 20—30 brush piles. As they harvest one per day, this provides income throughout the year. Athu kotu fishermen also contribute considerably to the ornamental fish industry as they collect live fish from these devices.

Kadippu Dela

This is a traditional drag net with poles and bag type cod end. Poles help to keep the net mouth open, while the fish and crustaceans collect at the cod end. The best season for this fishing is from September to March of the following year. Fishing is done both during the day as well as at night. Target species are cichlids, prawn and grouper. The net is dragged along the bottom by two people who maintain a suitable speed to prevent fish already collected from escaping. This speed is sufficient to cause considerable damage to the lagoon environment in two ways: (i) by uprooting sea grass and (ii) catching immature fish/crustaceans. Although 20—30 such nets were operational during 1985—88 only three or four now remain. Hence the environmental damage from these nets is relatively low.

Angling (rod & line)

This is one of the most simple and ancient types of fishing gear and is used in calm water bodies such as lagoons and estuaries. Its popularity is mainly due to the simplicity of construction. The dried mid-rib of the Kitul palm leaf is used as the rod with cotton/hemp rope or monofilament line carrying a hook with or without bait.

Crabpots (lift net for lagoon crab)

This is a simple but ancient fishing method dating back to the last century. This gear is used day and night and throughout the year. About 40—60 of these lift nets are transported in a lagoon canoe to the fishing grounds. Pieces of skate and shark gut are fixed to the centre of the pots as bait. The gear consists of a bamboo or metal circular ring 40-50 cm in diameter with a net or with a plastic bucket attached to it. The frame is attached to a 3-4 mm diameter rope to which a buoy is attached. Crabs are attracted to the bait, get entangled in the net and are trapped.

Scoop nets

These nets are traditional and extremely popular among lagoon fishermen. They are used to catch lagoon prawns, crabs and bat fish. There are several types of scoop net: (i) scoop nets for prawns with light attraction (relatively new); (ii) scoop nets for crabs (relatively new); (iii) scoop nets for bat fish (relatively new); and (iv) scoop nets for prawns without light (traditional). This last method is one of the oldest of fishing gear types and has a very simple design. Almost all

lagoon fishermen use scoop nets to collect a variety of species.

Karakgediya (coverpot)

This is a very old but an active type of fishing gear used in the extreme southern parts of the lagoon. Due to the introduction of more efficient gear such as trammel nets, Karakgediya is now used only occasionally. This trap is used round the year in very shallow waters up to 0.5 m depth and is mainly operated at night, with a light to attract the fish. Target species are crab, prawn and mullet. Fishing is mainly done close to the mangrove fringed bank and on sea grass meadows. When a crab or prawn is seen, it is covered by the cone shaped trap very quickly and the animal is taken out through the opening at the top by hand.

3. ORNAMENTAL FISH COLLECTING INDUSTRY

This industry is a thriving one during certain months of the year (May – August). *Cephalopis* and *Epinephelus* species are collected in large numbers. In Negombo, ten fish collecting centres are located around the lagoon, mainly along the Pamunugama Road at Aluthkuruwa and Sarikkuwa. The number of fish brought to these collecting centres during the peak season was as high as 5,000—10,000 individuals per day. These fish are mainly collected from brush piles, scoop nets and push nets (NARA, 1988). Especially the lower income group among the fishing community has benefited considerably from this industry. Numbers of grouper (*Epinephelus*) generally increase dramatically soon after periods of heavy rain, the exact reason for which is not known. Some exporters have exported 12—15 million fish fingerlings during the grouper season. Due to the voracious predatory nature of the grouper, the harvest may have prevented a grouper explosion which could have otherwise been detrimental to the other economically important species such as shrimp (NARA, 1988). Groupers as well as other ornamental fish are caught in very shallow areas where sea grass beds and algae are located. The thickly matted algal strands and the sea grass beds provide the fingerlings with food and shelter.

4. DISCUSSION

Negombo lagoon today has a moderate scale shrimp and finfish fishery. The present fishery is thought to have declined from a more sustainable fishery that existed prior to 1970 but the available statistics are confusing. A more recent investigation published by the Greater Colombo Economic Commission (GCEC) (1991) reported that 73 teleost species are available from the marsh, of which 51 are indigenous to Sri Lanka. Of the indigenous species, 42 are believed to be typically riverine and the rest are marsh-dwelling. Seventeen of these species are endemic to Sri Lanka. A much higher fish diversity was reported from the lagoon and according to the same report, at least 133 different species inhabit Negombo lagoon. More than half of these are marine species that move into the lagoon from the sea to feed or to spawn.

The fish productivity of Negombo lagoon wetland is outstanding by international standards as its annual yield exceeds 150 kg/ha (excluding ornamental fish). According to Kapetsky (1981), highly productive estuarine and lagoonal systems have a productivity of 100 kg/ha/year. The estimated number of fish collected for live export exceeds 10 million a year and their estimated annual value is Rs.35 million.

Insofar as the fisheries are concerned, the lagoon functions as (i) a breeding/nursery ground for a number of commercially important finfish and shellfish species; (ii) a source of protein supply to the community; (iii) a source of employment; and (iv) an anchorage for marine and lagoon fishing craft

Shrimps, crabs, food fish and ornamental fish are the most important organisms to the lagoon fishery. Today they are exploited in a manner that is not sustainable. Therefore, the development of fisheries based upon enhanced production is not possible. Management should include the prohibition of all fishing methods that destroy nursery areas such as sea grass beds. Most of the existing fisheries are exploited and some of the critical habitats (sea grass beds) are destroyed in the process. The major issue is adequate fishery management. The elements of a fishery management model would have to include (i) relevant ecosystem characteristics, (ii) features of fish stocks, (iii) protected areas and (iv) gear regulation. It is also important to note that implementation of a successful fishery management plan will depend entirely on adequate participation by the resource users. A community based fisheries management plan seems to be well suited to the Negombo Lagoon ecosystem.

5. REFERENCES

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