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Exploitation of Fin Fish Resources of Lagoons and Estuaries in Sri Lanka

— M. J. S. Wijeyaratne

Introduction :

Lagoons and estuaries which represent about 15% of the coastal zones of the world are among the most productive ecosystems in the biosphere (UNESCO, 1982). These coastal resources are of great importance to human populations in many ways. They provide nursery grounds for fish and crustaceans whose adults are either marine or freshwater. Some euryhaline species live permanently in the lagoons. In addition, these brackishwater environments lie within the migratory routes of catadromous and anadromous fish species. Because of this, the lagoon environment not only affects other large scale fisheries in coastal and off-shore regions but may also support small scale fisheries within the lagoon itself. Lagoons also provide environments for brackishwater aquaculture and commercial and recreational fisheries.

Lagoons and estuaries are subjected to natural modifications and are vulnerable to disturbances made by human populations. However, these can play an important role in the production of food, especially protein for the increasing human populations. These waterbodies therefore, if properly managed could provide employment and selfsufficiency in protein for people living around them.

Over the last 20 years there has been a continuous and growing interest in estuarine and lagoon environment and considerable research has been carried out on various aspects of these brackishwater habitats. The areas of recent investigations on brackishwater environments include origin and evolution, sedimentation, geochemistry, heat budget, hydrobiology, plankton and benthic fauna, primary and secondary productivity, fin fish and prawn fisheries, aquaculture, pollution and management. Much knowledge regarding the physico-chemical and biological aspects on tropical lagoons and estuaries has come from work carried out in India (Anon, 1982).

In lagoons and estuaries, salinity, pH, dissolved oxygen content and water temperature vary diurnally due to the effect of tide. With high tide, water temperature, pH and salinity increase and dissolved oxygen content decreases. These physico-chemical parameters show a seasonal pattern of variation due to the influence of monsoons. Usually temperature, salinity and pH decrease and the amount of dissolved oxygen increases during monsoons due to inflow of freshwater into the lagoon or estuary (Anon, 1982).

Sri Lanka has about 120,000 ha of coastal brackishwater areas of which about 40,000 ha consists of shallow lagoons, tidal flats, mangrove swamp and saline marshes while the rest are deeper lagoons and estuaries (Pillai, 1965). Very little research has been carried out on the lagoon and estuaries in Sri Lanka. Studies carried out so far include the physico-chemical parameters, plankton, epifauna, marginal fauna, benthos and limnology of Colombo (Beira) lake which is partly brackish (Costa and De Silva, 1969, 1978a, 1978b, 1978c, 1978d, 1978e; Thiagarajah, 1983), topography, physico-chemical parameters, phytoplankton and fish fauna of puttalam lagoon (Durairatnam, 1963); topography, substratum and physico-chemical factors of Jaffna lagoon (Sachithanandan, 1969.) and hydrobiology and fish fauna of Negombo lagoon (Ward and Wyman, 1975; De Silva and Silva, 1979; Silva, 1980; Costa and Fernando, 1981).

In developing countries, fisheries of coastal lagoons and estuaries have received very little attention compared to marine and freshwater fisheries. This is because these fisheries are of a small scale nature consisting of many species and also because they do not easily fit into marine or inland categories under which most national fishery departments in these countries are presently organised (Kapetsky, 1981).

Brackishwater fishery resources in Sri Lanka have been studied by very few workers (Schuster, 1951; Pillai, 1965; Ward and Wyman, 1975; De Silva and Silva, 1980; Silva, 1980; Costa and Fernando 1981). In 1951, Shuster estimated the total fish production of brackishwaters in Sri Lanka to be less than 20 kg/ha per annum. Pillai (1965) estimated the brackishwater fish production to be about 3.7% of the total fish production of the country. It is possible to increase this production with proper management to a greater value than the present by scientifically exploiting the natural fish populations and employing aquaculture practices.

Out of 125 fish species found in brackishwaters of Sri Lanka, according to Pillai (1965), 38 are autochthonous, 7 are allochthonous freshwater and 80 are allochthonous marine. Of these, only 100 species are edible of which 30 are autochthonous, 5 are allochthonous freshwater and 65 are allochthonous marine.

Fishing methods :

Several methods are employed to catch fish in lagoons and estuaries. These include encircling nets, brush parks, gill nets, drag nets and set nets in addition to angling.

The mesh size of encircling nets usually range from 1.25 cm to 2.5 cm stretched mesh. These are operated during daytime and at night. Depending on the size of the net, 3 or 5 men are involved in the operation. Of these, one man stays in the craft while the other two or four drag the net encircling the fish. The net is hauled into the craft several times and the whole operation takes about six hours. In Negombo lagoon, about 29% of the total fish catch is obtained from this gear while in other lagoons also this is practised to a great extent.

The cast net is a circular, cone shaped net with varying mesh size ranging from 1.25 cm to 2.5 cm. The mesh sizes decrease towards the circumference of the net where lead weights are attached. This is operated by a single person from a craft or in waist deep water. The average period of operation is about 6 hours. These are widely used in the day time and at dawn. About 16% of the total catch of Negombo lagoon is caught by this method.

Brush parks or brush piles are piles of mangrove wood placed in shallow areas less than 1.5 m in depth. The outermost wood of the pile are driven into the mud bottom so that these will not be scattered. Most of these circular piles of mangrove wood have a diameter of about 2-3 m. However, some can be larger with a diameter of 4 m. These brush parks create an artificial mangrove habitat which provide shelter for fish and other animals. In addition, these brush wood act as substrates for epifauna and epiflora. The fish aggregated in the brush parks are generally harvested one month after implantation. However, when fished for prawns, these are harvested almost every day (Senanayaka, 1981). When harvesting, the brush park is encircled by a net supported by 12-14 mangrove poles. The mesh size of the net is 1.875 cm. To prevent escaping of fish such as grey mullets by leaping, the poles and net are extended about 1 meter above the water level. Then the fisherman enters the brush park and the brush wood is casted out over the net. This is done in a methodical manner so that the pile of wood casted out becomes the brush park for next harvest. When all brush wood is removed, the debris is removed and the bottom line of the net is slowly drawn in. The trapped fish in this bag of netting are then scooped up with hand nets. Generally only one person is involved in the operation which takes about 3 hours. Harvesting of brush parks is done in the morning, especially at dawn. The yield of fish from brush parks is very high compared to that of other fishing types which are operated in open water. It has been observed that about 36% of the fish catch in Negombo lagoon comes from brush parks.

The gill nets are usually laid at night and are hauled about six hours later, at dawn. Generally a single person is involved in the operation. Some of the gill nets are laid at bottom while the others in surface layers. The height of a bottom laying gill net is about 4 m while that of floating gill nets is about 2 m. The mesh size of gill nets range from 2.5 cm to 8.75 cm. In Negombo lagoon about 11% of the total fish catch comes from gill nets.

The set nets with a small mesh size of 1.25 cm are also used in lagoons. These are set at night across the channels connecting the lagoon to the sea using several poles. Usually two men are involved in the operation of this type of gear. A modified type of set net which is called 'Hulu Dela' in vernacular is operated in Negombo lagoon. After the net is set, one man walks towards the stretched net, carrying a light in one hand and beating the water with a paddle. The light is a burning torch made up of dried coconut leaves. The mesh size of this net is 2.5 cm to 3.75 cm. In Negombo lagoon, about 5% of the fish are caught by this method.

Management :

It appears that the present fish catch from lagoons and estuaries in Sri Lanka which is about 16-21 kg/ha/year is very low compared to the fish yield from brackishwater bodies in other parts of the world. Generally the maximum sustainable yield from shallow lagoons has been calculated to be around 120-150 kg/ha/year (Saila, 1975). In the lagoons of Togo and Dahomy, catch from brush parks alone have been calculated to be 82 and 127 kg/ha/year respectively (Welcomme, 1972). In Sri Lanka the yield is poor and therefore, proper management measures have to be adopted to enhance the present fish catch. These may include the operation of set nets in such a way that they do not block the migratory routes of fish into the lagoon from sea. In addition, the increase of density of brush wood and an increase of time period between implantation and fishing of brush parks from the present period of 1 month to at least 2 months may increase the present production further. This has been already observed in Bennin (Welcome, 1972) where the yield from brush parks increased exponentially with the length of time between implantation and fishing and linearly with the density of branches within it. However, in this type of management, if the density of brush wood is to be increased, new mangrove forests may have to be cultivated.

Other management measures which can be carried out to improve fish production include hydraulic management such as channellization (Ben Tuvia, 1979), predator control (Edward, 1977), fish transplantation and stocking (Winstanley, 1981), creation of artificial nursery areas (Honma, 1980), controlled artificial enrichment and control breeding (Saila, 1975). Further investigations are necessary and have to be scientifically carried out to determine whether some or all of the above mentioned methods are practicable and feasible in the lagoons and estuaries of Sri Lanka.

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