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PELAGIC SHARK IN THE INDIAN OCEAN

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PELAGIC SHARK IN THE INDIAN OCEAN

(with particular reference to the Bay of Bengal region)

by K. Sivasubramaniam
*(Senior Fishery Biologist, **BOBP**)*

The major resources of commercial varieties of fish in the offshore and oceanic ranges of almost all the Bay of Bengal countries are the Tuna (Skipjack/Yellowfin), Bilifith and pelagic Shark. There is reasonable understanding and knowledge of the fisheries and the state of the Tuna stocks in the Indian Ocean as a whole, but hardly any such information is available on the pelagic Shark, except for some taxonomic and basic biology of the animals. Little attempt is being made to improve the situation. This artide attempts to throw some light on pelagic Shark and hopes it will lead to a greater effort to obtain more information on the species.

Shark, Ray and Skate are members of one of the most primitive groups of fish, Elasmobranchs, which probably came into existence about *350* million years ago. Though most of them are marine in their habitat, some of them, like the Ganges Shark ***(C. gangeticus)***, still thrive in freshwater. Their skeletons are of cartilage, which is elastic and unlike the hard bones of other fish.

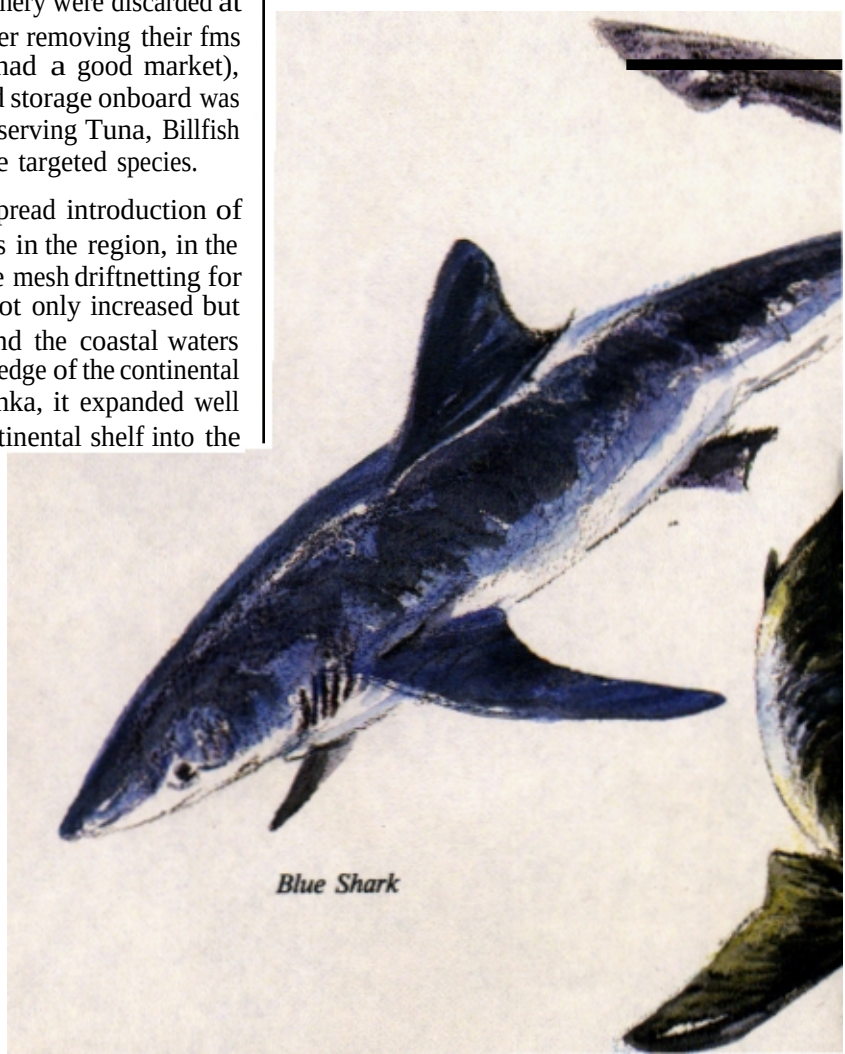
Shark are slender-shaped, like most fish, but Skate and Ray are round and flat in shape, have broad wings and whip-like tails which may be very short or very long. Some Ray, like the Devil Ray/Manta Ray, inhabit the pelagic zone and feed on the plankton; many of them, however, live close to the bottom, feeding on shellfish and other organisms there. Shark too inhabit the pelagic and demersal zones, but the demersal Shark are relatively more localised in their distribution and are, on average, smaller than pelagic Shark.

Shark in the Bay

Shark, primarily demersal Shark, have always contributed to the marine fish production of all the countries around the Bay of Bengal (BOB). When the popular varieties of fish were under-utilized, Shark were not a preferred variety. But as the popular varieties became depleted, Shark began coming into their own. The expansion of the bottom trawl fisheries in all the BOB countries, except the Maldives, helped to significantly increase the Shark catch. Large mesh driftnetting and some hook-and-line fishing also caught small quantities of the coastal/inshore pelagic Shark, though the catch statistics tend to include these as demersal Shark.

The Tuna longline fishery of distant nations, like Japan, which was introduced into the Bay of Bengal region in the mid-50s, made significant catches of pelagic Shark. Most of the Shark caught in this fishery were discarded at sea, perhaps after removing their fms (which always had a good market), because the cold storage onboard was required for preserving Tuna, Billfish and Wahoo, the targeted species.

With the widespread introduction of synthetic gillnets in the region, in the late Sixties, large mesh driftnetting for large pelagics not only increased but expanded beyond the coastal waters and towards the edge of the continental shelf. In Sri Lanka, it expanded well beyond the continental shelf into the oceanic range, and catches of offshore/oceanic pelagic• Shark increased significantly. In the Maldives there are bottom longline and gillnet fisheries for Shark within the atolls and a specialised fishery for Tiger Shark, using massive hooks with chain, and Dolphin flesh as bait. A longline fishery has also developed for oceanic pelagic Shark outside the atolls. Even



Blue Shark

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on the east coast of India is anewly growing fishery for pelagic Shark.

In other Bay of Bengal countries, pelagic Shark catches are generally incidental to, or a by-catch of, fisheries mainly targeting Tuna and Seer. In Sri Lanka, the driftnet-cum-longline combination fishery targets both Tuna and pelagic Shark because of the equal value and demand for both. However, there is a shift to Shark longlining prompted by the difficulties of obtaining cheap and good quality wholebait-fish for Tuna longlining, which had been initially attempted. There are indications too of a drop in driftuet catches of Tuna and Shark in Sri Lanka (De Bruin, 1970; Sivasubramaniam, 1977; Maldeniya and Suraweera, 1991).

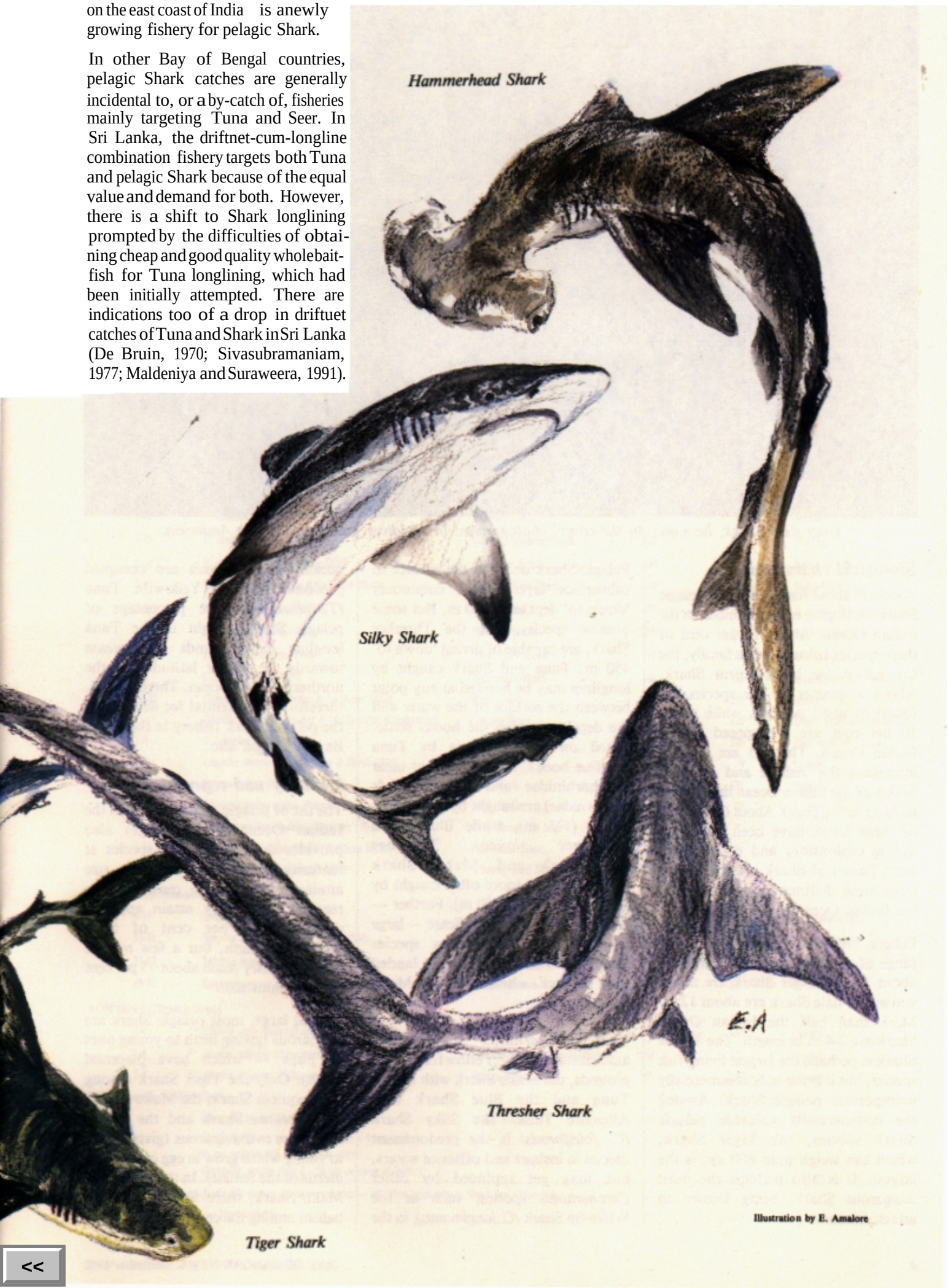

Illustration by E. Amalore

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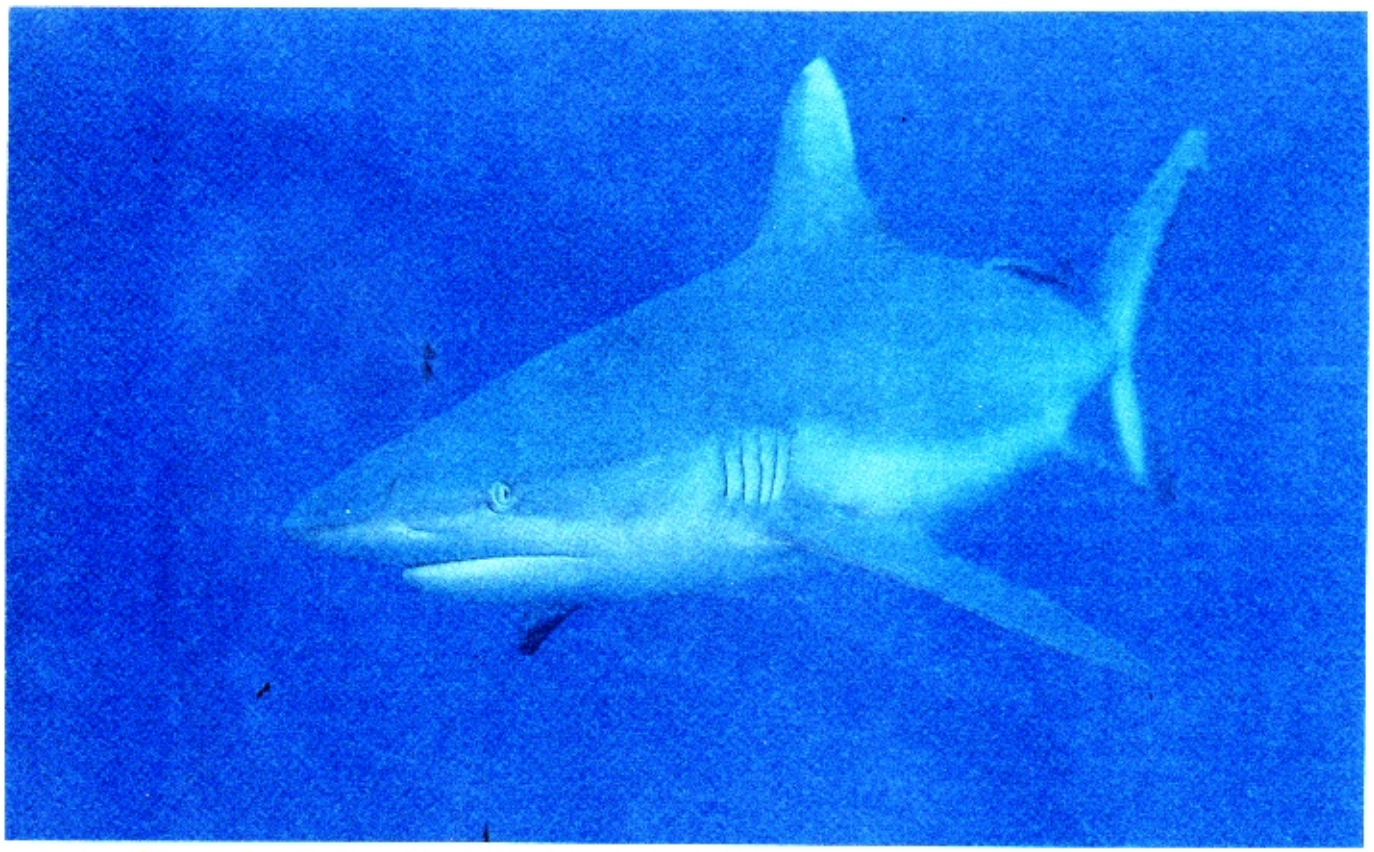


Grey Reef Shark, here and on the cover, photographed in Maldives waters by Charles Anderson.

Biological characteristics

There are about forty species of pelagic Shark, belonging to five families, in the Indian Ocean. About 75 per cent of these species belong to one family, the Carcharhinidae or Requiem Shark. About a quarter of the species are found in small pockets, while about 30 per cent are widespread in the Indian Ocean. The rest are insular, inhabiting the inshore and offshore waters of the Indian Ocean littoral (see table on facing page). About 60 per cent of those listed have been identified during exploratory and commercial-scale Tuna and Shark longlining and large mesh driftnetting operations in the Indian Ocean.

Pelagic Shark are found in a wide range of sizes – Thresher Shark are about 3-5 m, Tiger Shark are about 9 m and Whale Shark are about 12 m. More than half the Indian Ocean Shark are 2-4 m in length. The Whale Shark is perhaps the largest living fish species, but it is the only commercially unimportant pelagic Shark. Among the commercially valuable pelagic Shark species, the Tiger Shark, which can weigh upto 600 kg, is the largest. It is also perhaps the most dangerous Shark, being known to attack humans.

Pelagic Shark occur in the surface to subsurface layers, most commonly 'down to' depths of 300 m. But some oceanic species, like the Thresher Shark, are capable of diving 'down to' *450* m. Tuna and Shark caught by longlines may be hooked at any point between the surface of the water and the depth at which the hooks settle. Based on catches made by Tuna longline hooks, it appears that most Carcharhinidae and Hammerheads (Sphyrmdae) are caught by the shallow hooks (125 m), while Blue Shark *(Prionace glauca),* Thresher (Alopiidae) and Mako Shark (Lammdae) are more often caught by deeper hooks (175-200 m). Further – and it would appear significant – large numbers of *Carcharhinus* species caught on Tuna longlines are landed alive on deck, whereas Blue or Mako Shark are not.

The *Carcharhinus* species are associated with Yellowfin Tuna grounds, the Mako Shark with Bigeye Tuna and the Blue Shark with Albacore Tuna. The Silky Shark ***(C. falciformis)*** is the predominant species in inshore and offshore waters, but may get replaced by other *Carcharhinus* species, such as the White-tip Shark (C *longimanus),* in the oceanic areas, which are occupied predominantly by Yellowfm Tuna (T. *albacares).* The percentage of pelagic Shark caught in the Tuna longline fishery tends to increase towards the higher latitudes of the northern Indian Ocean. There should, therefore, be potential for developing the pelagic Shark fishery in the upper Bay of Bengal also.

Maturity and reproduction

The list of pelagic Shark species in the Indian Ocean (facing page) also provides the size of each species at maturity, and the maximum size attained. Maturity in most cases is reached when they attain approximately 50-60- per cent of their maximum length, but a few mature only when they reach about 75 per cent of maximum size.

By and large, most pelagic Shark are viviparous (giving birth to young ones – pups – which have placental cords). Only the Tiger Shark among the Requiem Shark, the Mako Shark, the Thresher Shark and the Whale Shark are ovoviviparous (giving birth to young which grow in egg cases in the uterus of the female). In the case of the Mako Shark, there is uterine cannibalism among the embryo. Among the

Pelagic Shark of the Indian Ocean

No/litter	Scientific Name	Common English Name	Length maximum (cm)	Length maturity (cm)	Distribution
L4MMDAE (Mackerel/Mako Shark)					
9	*Cwrhanzdon carcharias* (Linnaeus 1158)	Great White Shark	640	240	Primarily **SE.** Africa & west coast **of Australia**
5 **or 6**	*Isurus oxyrhinchus* (Rafinesque **1809**) **(1.** glaucus **synonym) (all Lamnidae are uterine cannibals)**	**Short Fin Mako**	394	280	
CARCHARHINIDAE **(Requiem Shark)**					
1-11	*Ca,vharhinus albimarginatus* **(Ruppel 1837)**	**Silvertip Shark (600-800m)**	300	160	**Inshore & offshore**
	C. altimus **(Springer 1950)**	Bignose **Shark (200-400m)**	**300**	**220**	**Offshore**
	C. amblyrhinchoides **(Whitely 1934)**	**Graceful Shark**	160	140	**Offshore**
	C. amblyrhinchos **(Bleeker 1856)**	Grey **Reef Shark**	**235**	140	**Inshore/offshore**
1-6	** *C. amboinensis* (Muller **& Henle 1839)**	**Pigeye Shark**	280	**N.A.**	**Inshore**
13-20	*C. brachyurus* (Gunther **1870)**	**Copper Shark**	300	**200**	**Inshore/offshore**
3-15	*C. brevipinna* (Muller **& Henle 1839)**	**Spinner Shark**	**270**	160	**Offshore**
	C. cautus **(Whitely** 1945)	**Nervous Shark**	**150**	120	**Off Australia**
2	*C. dussumieri* **(Valen 1839)**	**White** Cheek **Shark**	**100**	**65**	**Inshore & offshore**
2-14	*C. falciformis* **(Bibron 1839)**	**Silky Shark**	**270**	180	Oceanic
	C. hemiodon (Valen **1839)**	**Pondicherry Shark**	150	**N.A.**	**Mainly** Indian **inshore**
	C. leucas **(Valen 1839)**	Bull **Shark**	**340**	**157**	Marine **inshore, confused with Ganges Shark**
1-10	*C. limbalus* **(Valen 1839)**	**Blacktip Shark**	**220**	**135**	**Inshore & offshore**
1.15	*C. longimanus* **(Poey 1861)**	Oceanic Whitetip **Shark**	**300**	180	Oceanic
1 **or 2**	*C. macloti* (Muller **& Henle 1839)**	Hardnose **Shark**	100	**76**	**North of Equator**
2-4	*C. melanopterus* **(Quoy &** Gaimard **1824)**	**Blacktip Reef Shark**	**200**	100	**Inshore/offshore**
3-14	*C. obscurus* **(Le Sueur 1818)**	**Dusky Shark**	**400**	**257**	**S. Africa,** Madagascar **inshore**
1-14	*C. plumbeus* **(Nardo 1827)**	**Sandbar Shark**	**230**	**145**	Arabian Sea
1 **or 2**	*C. seali* (Pietschman **1916)**	**Black Spot Shark**	**95**	**68**	Coastal
3-6	*C. sorrah* (Valen **1839)**	Spot-tailed **Shark**	160	**110**	**Inshore/offshore Africa**
10-82	* *Gakocerdo cuvieri* (Perim **& Le Sueur 1822)**	**Tiger Shark**	**900**	**250**	Insular
	Glyphis gangeticus (Muller **& Henle 1839) (Freshwater)**	Ganges **Shark**	**200**	**170**	**Upper** BOB **& Arabian Sea**
1-4	***C.*** *wheeleri* **(Garrick 1982)**	**Blacktail Reef Shark**	**175**	120	East **coast of Africa**
2-4	*Loxodon macrorhinius* (Muller **& Henle 1839)**	**Sliteye Shark**	**90**	**79**	**Coastal**
4-135	*Prionace ghwc* (Linnaeus **1758)**	**Blue Shark**	380	**175**	**Oceanic**
1-8	*Rhizoprionodon acutus* **(Ruppell 1837)**	**Milk Shark**	**170**	**76**	Coastal
3.5	*Rhizopnonodon oligolinx* **(Springer 1964)**	**Grey Sharpnose Shark**	**70**	**32**	Coastal N. **of Equator**
1.14	*Scoliodon laticaudus* (Muller **& Henle 1838)**	**Spadenose shark**	**74**	**35**	Coastal
1-5	*triaenodon obesus* **(Ruppell 1837)**	Whitetip **Reef Shark**	**210**	105	**Insular**
SPHYRNIDAE **(Hammerhead Shark)**					
6-11	*Sphyrna blochii* **(Cuvier 1817)**	**Wingehead Shark**	**150**	104	**Continental shelf**
15-31	*Sphynuz lewini* **(Griffith & Smith 1834)**	Scalloped **Hammerhead Shark**	**370**	**212**	Semi-oceanic
13-42	*Sphyrna mokarran* **(Ruppell 1837)**	**Great Hammerhead Shark**	500	**250**	semi-oceanic
29-37	*Sphyrna zygaena* **(Linnaeus 1758)**	**Smooth** Hammerhead **Shark**	**370**	**240**	Semi-oceanic
ALOPIIOAE (Thresher Shark)					
2-4	** *Alopias superciliosus* **(Lowe 1839)**	**Bigeye Thresher (ovovivipamus)**	**450**	**330**	**Oceanic**
2-4	** *Alopias vulpinus* (Bonnaterre **1788)**	**Thresher Shark (ovoviviparous)**	500	**376**	**Oceanic**
2-4	** *Alopias* (Nakamura 1936)	Pelagic Thresher	**330**	**270**	Oceanic
** Rhinodoutidse (Whale Shirk)					
	Rhinodon typhus **(Smith 1828)** **(Egg** 30 cm long **14 wide x 9 cm thick, 36 cm embryo, 16** egg cases in **uteri. Generally, young** ones 0-50cm **or more** at birth.)	**Whale Shark**	1800	1200	Oceanic

* Only **ovoviviparous** carcharhinids among **the large** pelagics — all other **large** pelagic **Shark are** viviparous

*Ovoviviparous **N.A.** = **Not available**

viviparous Shark, 43 per cent of the species have upto 8 pups per litter, 35 per cent have upto 14 per litter, 17 per cent upto 34 per litter and 5 per cent upto 135 per litter (Compagno 1984). The numbers and the size of the embryo tend to increase with the size of the mother Shark (Olsen 1984). The Tiger Shark is reported to have a gestation period of 13-16 months, while the Mako Shark's is 8-12 months. It is probable that these Shark do not produce pups more than once a year. On the other hand, a large number of these Shark are capable of living well over 25 years – some even over 50 years – but the number of pregnancies they can have, during their life, is not known.

Compared to the thousands. or hundreds of thousands of eggs per spawn produced by small and large bony fish, the number of young produced in each litter by pelagic Shark are very, very small. This is Critical from the viewpoint of exploiting Shark.

The Shark catch

The present level of production of pelagic Shark in the Bay of Bengal region is guesstiniated at 11-13,000 t/yr. of which more than half is taken by Sri Lanka, some 15 per cent by distant nations operating Tuna longlines in this area (mainly Taiwan and South Korea) and the rest by other nations bordering the Bay. The Silky Shark, much of it immature, contributes to more than half the Sri Lanka catch.

Pelagic Shark catches by Japan, Korea and ikiwan in Tuna longline fisheries are not fully recorded, so any indication from the records can only be an underestimation. Catches by ikiwanese and Korean vessels operating in the Indian Ocean indicate their Shark catch might be about 1000 t/yr. The percentage of Shark with Tuna longline catch composition increases from 2 to 20 per cent from latitudes 30° S to 20°N. If, on the average, even ten per cent of the Tuna longline catch in all latitudes are Shark, then for a total production of about 100,000 t of all Tuna, in the Indian Ocean, the Shark catch would be about 10,000 t/yr, The Tuna longline catch of Shark from the Bay of Bengal is expected to be 1500 t and catches by gillnet and other hook-and-line methods around 9-11,000 t.

Bait and feed

Shark longlining can be effectively and more efficiently conducted with cut pieces of Bilifish, Tuna etc, which accounts for the growing popularity of Shark longlining in Sri Lanka (Sivasubramaniazn 1963).

Pelagic Shark are omnivorous and non-selective feeders. Their stomach contents include Turtle, Shark, Crab, Squid, birds, sea snakes, fish and various non-living materials such as fishing nets, plastic bags etc. Considerable economic loss is incurred in the Tuna longline fishery as a result of predation of hooked Tuna by oceanic pelagic Shark. Tuna caught in driftnets are also eaten by these Shark and pieces of the webbing from the gillnets have been found in their stomachs.

The rate of predation changes with latitude and so does the catch rate of Shark. Predation of hooked Tuna on Tuna longlines is more in tropical watps, where the catch rate of Caftharhinus species are higher, and declines in the subtropical and temperate waters, where ***Carcharhinus*** species are fewer and Blue Shark and Mako Shark are predominant (see Figure 1) (Sivasubramaniam 1969). *Carcharhinus* species are, therefore, an undesirable atch in the Tuna longline fishery, and Tuna longline fishermen have an aversion for them.

Resources and management

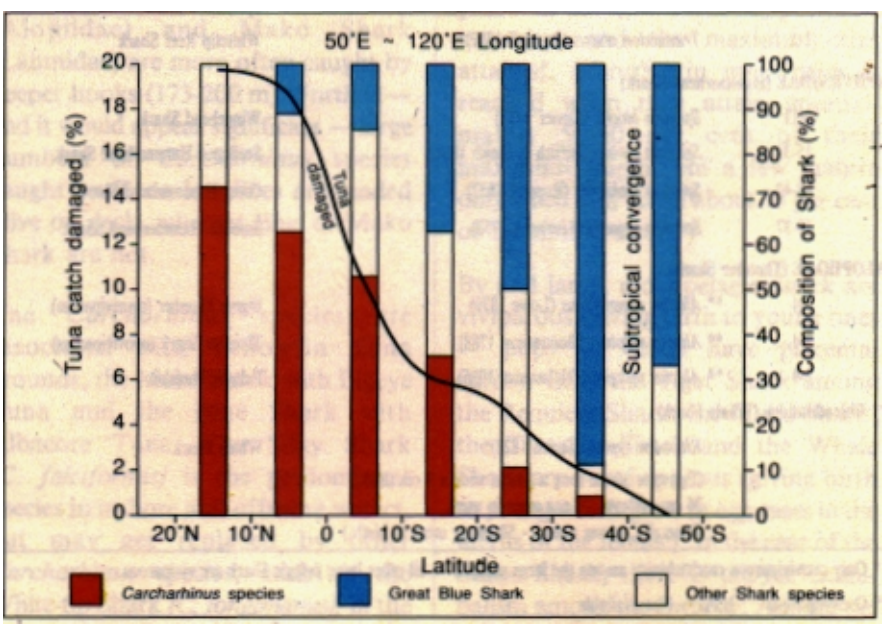
Gulland (1971) indicates that the world potential for pelagic Shark is about 100,000 t. Statistics, most of which deal with bottom and near-bottom species of Shark, do not allow for a better estimate.

The low Shark birth rate and the fact that long-living Shark reproduce after several years make them more vulnerable to overfishing than other fish, for this leads to insufficient numbers to produce enough young ones to maintain the population size for a sustained fishery (Garcia and Majkowski 1990).

On the other hand, pelagic Shark, primitive animals, have certain special qualities that enable them to survive in today's conditions, such as:

- Being apex-predators, they are not preyed on significantly. [Someof them, however, have a tendency to prey on the juveniles of the species (Olsen 1984)];
- Their bio-chemical qualities, which make them incapable of developing tumours and allows them, if injured, to heal rapidly. (Significantly, they can live in harmony with highly pathogemc bacteria in their body tissues, except in the blood (Grimes 1990), thus suffering little infection due to pathogenic bacteria in the seawater); and
- The wide distribution of the offshore/oceanic species over such large areas of the oceanic province that they will require

Fig 1. Latitudinal changes in the percentage composition of the main Shark groups in the Tuna longline catches and the percentage of Tuna catch damaged by Shark



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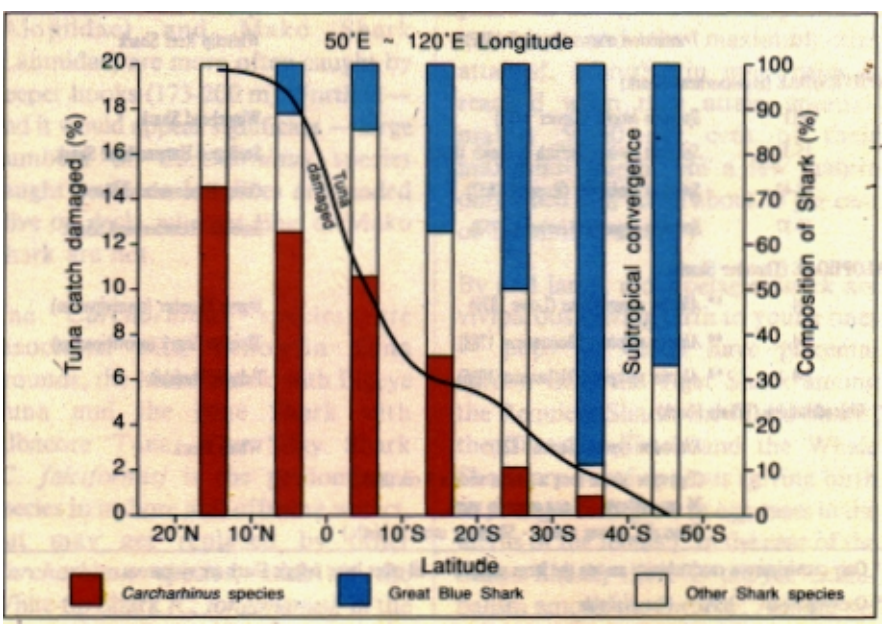


Shark-fishing & Shark-watching in the Maldives

by R.C. Anderson and Hudha Ahmed

Shark-fishing is a traditional Maldivian activity, but it has always taken second place to Tuna-fishing. Over the last 30 years, the lure of expanding overseas markets, has led to a boom in Shark-fishing in the islands. But overfishing of Sourist sites has led to a call for bans on Shark-fishing in some atolls.

The Maldives is justly renowned as a Tuna-fishing nation. Despite the recent growth of tourism, pole-and-line Tuna-fishing remains a major source of employment, of export earnings and of food for the Maldivian people. Although the paramount importance of this fishery remains undisputed, Maldivian fishermen are quite capable of turning their hand to other fisheries when the opportunity arises. The recent booms in Beche-de-mer and Giant Clam fishing (see ***Bay of Bengal News*, Nos. 42 and 43),** triggered by export demand, amply illustrate this fact. Shark-fishing is another activity that has grown tremendously in recent years. However, while there is no local demand for Beche-de-mer or Giant Clam, there has always been a demand for one Shark product: liver oil.

Maldivian boats are made of wood, and they naturally require regular maintenance to keep them in good condition. Boats are hauled onto the beach every two weeks or so for their hulls to be cleaned and painted with Shark liver oil. The interiors of the boats are soaked with oil every few months. With a national fleet of some 4-5000 vessels, there is clearly a substantial demand for Shark liver oil in the Maldives.

Fishing patterns

Traditionally, there used to be two related forms of Shark-fishing in the Maldives, both targeting large Shark with enormous livers. These were a ***maa keyolhu kan*** (literally **'big line fishing'), which targeted Tiger Shark *(Galeocerdo cuvier)*** and ***madu miyaru keyolhu kan*, which targeted the deepwater** Six-gill **Shark *(Hexanchus griseus*, known locally as *madu miyaru).*** Both fisheries used gigantic, locally-made iron hooks to catch their prey. The hook was set fairly shallow for Tiger Shark, and baited with an irresistible lure for this species: Dolphin meat. For Six-gill Shark the hook was baited with reef fish and set in water 200 m or more in depth on the outer atoll reef slope.

This ages-old pattern of fishing started to change in the early 1960s, with the introduction of longlining. The entry of Japanese Tuna longliners into the central Indian Ocean, and the opening of a boatyard on Huihule (now the site of the country's International Airport) which built small workboats, including some for longlining, were the triggers for this development. Pelagic Shark longlining started to spread through the Maldives, replacing ***maa keyolhu kan*** in the process.

The next big change came in the mid-1970s. The widespread mechanization of fishing vessels, the introduction of Reef Shark gillnetting (alter fishermen found drifting pieces of gillnet from overseas fisheries) and an increase in prices paid for Shark fms all occurred during this period. Together, they led to a boom in Shark catches in 1976, which has been maintained since then.

The fmal development came at the very end of the 1970s. Japanese buyers visited the Maldives looking for supplies of high-value Shark oil, rich in squalene. This oil is used in cosmetics and pharmaceuticals, and is easily extracted from the livers of deepwater 'spiny dogfish' or Gulper Shark *(Centrophorus* spp.). Maldivian fishermen were easily able to convert their single massive hook fishing technique for Six-gill Shark to a multiple hook longline for Gulper Shark.

Cutting up Silky Shark on a beach in the Maldives.

Thus, by the beginning of the 1980s, the current pattern of Shark-fishing had been established: longlining and some handlirnng for oceanic Shark; gillnetting and some handlining for reef Shark; and vertical longlining for deepwater Shark. It is difficult to follow the progress of these fisheries since then, because no catch and effort data are available. However, detailed export data are available for two Shark products: dried fins and liver 'oil.

Oil and fins

The only Shark liver oil exported is the high-value squalene-rich oil from deepwater Guirer Shark. As there is virtually no local consumption of this oil (only minor quantities are used in local medicine), the export data provide a useful index of the size of the fishery. In fact the fisherq seems to have peaked soon after it started (see Figure 1). The reason appears to be overexploitation. Fishermen, especially in the northern Maldives where the fishery started, report greatly reduced catch rates arid having to fish deeper and deeper to fmd Shark. Now they fish at 800 m and more, but catch rates are only a fraction of what they were to start with. In the southern Maldives, where this fishery developed later, the situation does not appear to be so bad, but the same trends of diminishing catch rates and deepening fishing zones are apparent. It is notoriously easy to overfish stocks of Shark because of their slow growth rates, late maturity and low reproductive rates. These rates may be even less in deepwater Shark, making them especially vulnerable to over-exploitation.

The status of the other two major Shark fisheries is not quite so easy to determine. There is no consumption of Shark fms in the Maldives, and fins are taken from almost all the shallow-water Shark caught but not from deepwater ones. Exports of dried Shark fins do, therefore, provide a useful index of the size of these fisheries. However, they provide no information about the relative importance of the inshore and offshore Shark fisheries, nor of any trends within these two multispecies fisheries. Nevertheless, Shark fin exports have remained at roughly the same level since 1976, so it is unlikely that any major overfishing has occurred. This is borne out by interviews with fishermen. Longline fishermen report no obvious changes in catch rates over the last 10-20 years. Gillnet fishermen report that Reef Shark catch rates have declined over the last 10-15 years, especially in the most intensively fished atolls, but that reasonable catches are stifi being made everywhere, and high catches can be made in the little-fished southern atolls.

In summary, the little data available suggest that the deepwater Gulper Shark stocks are heavily fished, reef Shark stocks are fished moderately intensively, and oceanic Shark are fished at a low level. This is consistent with the probable initial stock sizes, which might be assumed to be in some proportion to the size of the available habitat. The deepwater Shark are confined to the outer atoll slopes. This is a thin ribbon of habitat that, although something of the order of 1000 km long, is probably little more than 1 km wide in most places. In contrast, Maldivian reef Shark inhabit an area of some 21,000 km^2 ***(i.e.*** **the** area of the atolls), and the stocks of offshore Shark are spread over millions of square kilometres of ocean.

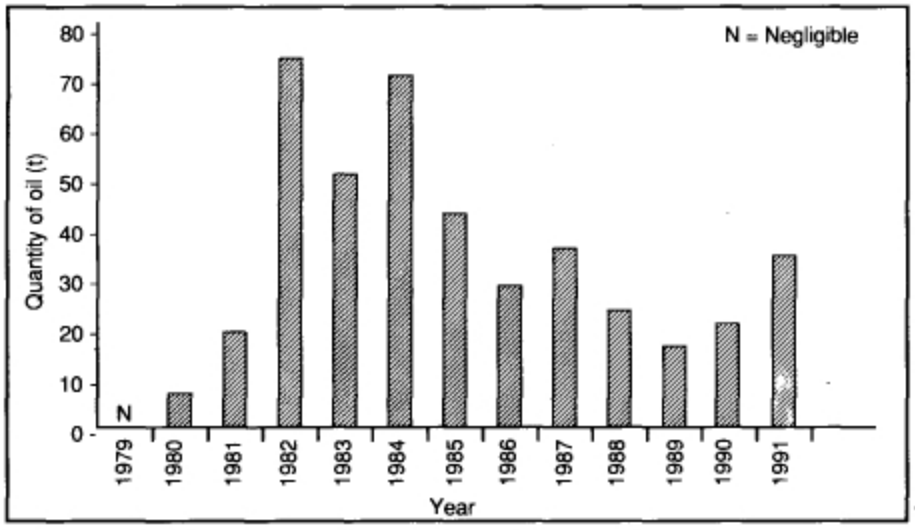
It would clearly be desirable to restrict fishing of the deepwater Gulper **Shark** stocks, and to increase fishing of the offshore oceanic Shark. **The** Ministry of Fisheries **and** Agriculture is **now** looking at ways in which these changes can be encouraged. The case of the reef Shark fishery is **somewhat more complicated** because of its interaction with tourism.

Ultimate *thrill*

Over the last two decades, tourism has developed dramatically in the Maldives, to the extent that it is now by far the most important economic sector in the country. A major attraction for tourists are the beautiful coral reefs. An estimated 35 per **cent of all visitors to** Maldives go diving, and 80 per cent go snorkelling. For divers, in particular, a special attraction is the presence of many reef Shark that can be seen underwater in complete safety. At several sites, groups of four to ten or more Grey Reef Shark ***(Carcharhinus amblyrhynchos)*** can be regularly seen. These are large, **powerful Shark and, for most divers, a** close encounter with them is the 'ultimate thrill'.

Although Shark-watching undoubtedly attracts divers to the Maldives, it is difficult to put a monetary value on such activities. However, as a crude first measure, the amount of money spent by divers directly on dives at Shark-watching sites has been estimated. This exceeds US $2 million a year. While profit accruing to the Maldives will be only a fraction **of this,** the financial interest that diving operators have in maintaining healthy reef Shark populations is obviously considerable. A single Grey Shark at a popular dive site may be worth many thousands **of dollars** in terms of diving revenue generated over several years. The same Shark is worth about US $30 to a fisherman. As a result, reports of reduced numbers **at** some sites following visits by fishermen have led **to** recent calls for bans **on** fishing at such sites. Given the fact that tourism is the major source **of** Government revenue **for** health, **education** and **other social development** programmes, **these** calls are receiving the Government's full attention.

Fig 1. Annual exports (tonnes) of high-value shark liver oil from the Maldives



Source: Customs data

Shark longlining catches on, on India's east coast

by Thomas Dahigren,
(Fishing Technologist, APO)

Shark fishing, mainly with different kinds **of** longlines, is spreading **fast along the** east coast of India. **In the** Kakinada area, **for example, the** number **of** drift longlining ***nava*** **(a** traditional, plankbuilt boat – *see box)* **has** increased **several fold in two** years. In Vishakhapatnam, in the face of declining shrimp catches, several owners **of** trawlers ***(sona*** boats) in the large fleet based plankbuilt begun to equip their vessels for bottom Shark longlirnng. Not less than 500 **craft, traditional as well as recently introduced, are involved in the Shark fisheries in the states of Orissa,** Andhra **Pradesh and** Tamil **Nadu.** Only West Bengal **on this coast, with its** limited access to deep sea **waters, has not** taken to the lucrative **fisheries further offshore** and **in deep waters.**

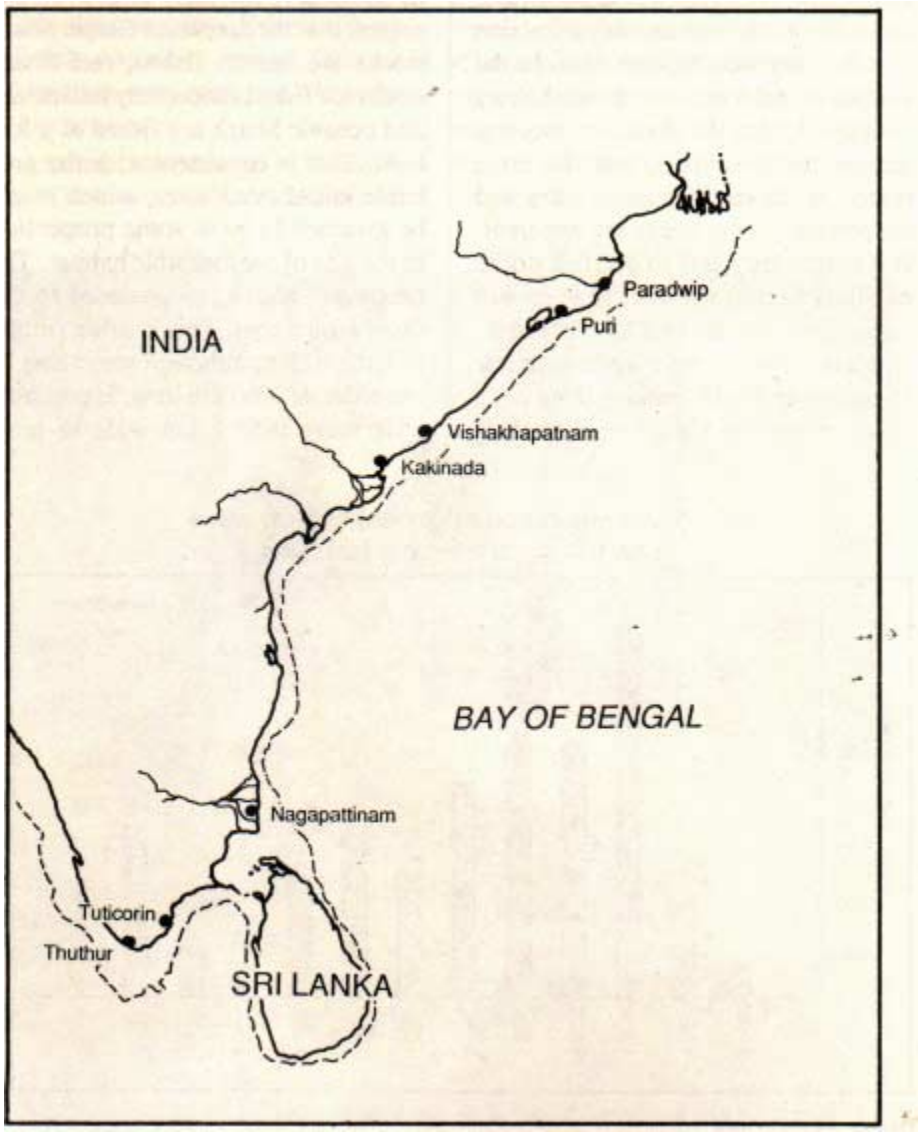
Two kinds of fishing gear are generally used **in these fisheries,** drift longline (DLL) and bottomset longline (BSLL). While drift longlining **for** pelagic Shark **is a relatively new fishery here,** bottomset longlining **for demersal Shark has** most **likely evolved from the** widespread **and** decades-old traditional **use of longlines for demersal species. The** influence **of a well-established and** traditional **large** demersal **Shark fishery on the west coast has also played an** important **role. Fishermen from the** village of Thuthur in south Tamil **Nadu regularly** migrate **along the west** coast as far north as Gujarat, using **the pablo** type **boat with their version of the BSLL to catch demersal Shark.** They **have had some impact on spreading this fishery in the southern** part **of** Tamil **Nadu. Some of them have also travelled as far as** Vishakhapatnam, **to work as** crew **on** trawlers longlining **for bottom Shark, and** introduced **their** techniques **there as well.** This type **of** bottom longline is set at depths **of** 80-150 m, but is sometimes set **as deep as** 500 m, according **to the fishermen of Thuthur.**

Some **fifty *sona* trawlers *(13-15* m)** based in Vishakhapatnam have picked **up the idea of** using **bottomset long-**lining **for demersal Shark by shooting the** longlines **at** dusk **and** hauling **them in at daybreak. The idea has** appealed **to them as they do not trawl at night** anyway. **Up to four hundred** hooks are **used on the** longlines **and revenues are reported to be** good. Fins **valued at** IRs.75,000 **have** been **landed by some boats in 15-day trips. The meat is** salted **on board and brought ashore with the rest of the catch.**

Juticorin, in Tamil **Nadu, is another fishing harbour where trawlers have started using BSLL for Shark. BSLL is also used by large *kattumaram,* both motorized and sail-powered ones operating from several villages on the Coromandel Coast, a few BLC** and **about 30 of the 650 Nagapattinam-based** small **trawlers.**

During the last six years, drift longlining up to 35 n miles offshore has been demonstrated by the Bay of Bengal Programme (BOBP), at a few places on the east **coast, as a fishing method to be** used **with** beachianding **craft (BLC) developed by the Programme to give small-scale fishermen greater access to deep sea**

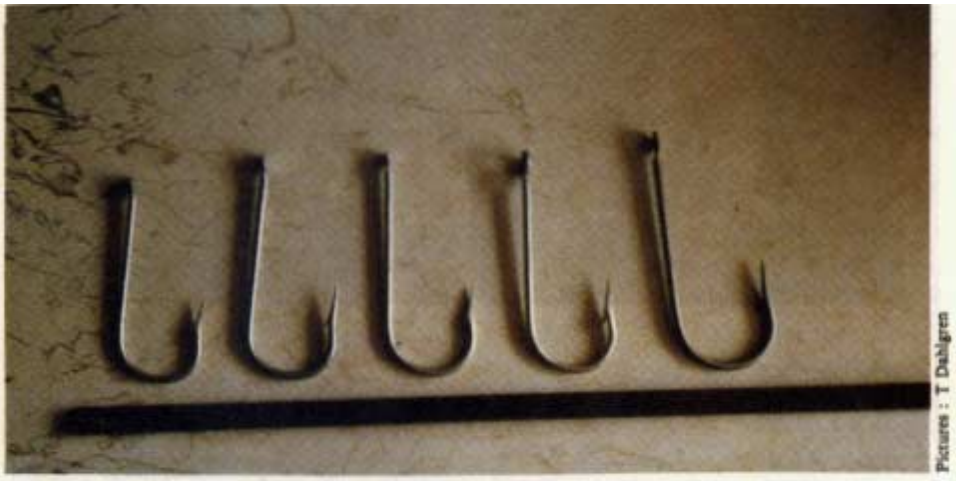
Shark fishery centres on India's** east **coast.



resources. A few years back, Tamil refugees from troubled northern Sri Lanka proved to be extension workers for this fishery when they arrived in Nagapattinam with their fishing gear and experience of drift longlining from small craft. Such fishing was also demonstrated in Kanniyakumari, Tamil Nadu, during the last two years when multiday, deep sea fishing trials were con4ucted by BOBP with a new small craft *(SRL-15),* targetting pelagic species such as Tuna, Billfish and Shark.

Drift longlining can now be considered an established, and quite important, small-scale fishery, at least in Andhra Pradesh and Orissa. In Kakinada, where the BLC was demonstrated in the Eighties to catch pelagic Shark, the drift longlining was a big hit. In the last few years, many large *nava* have been motorized and equipped for this fishery. Five years ago, the fishery had not been heard of in Orissa, now about 200 boats, mainly BLCs, are seasonally involved in this fishery. The main centres in Orissa are villages close to Puri and Paradwip (Shark fishing in Purl was described in the Bay of Bengal *News* No 46). During the best season for deep sea drift longlining in this area, December to March, the fleet increases by another hundred or so

Nava*with longlines aboard, in Kakinada harbour,* Andhra Pradesh, ***above, and*** *below, hooks used* ***in the*** *longline fishery there.*



Pictures : T Dahlgren

The *nava* that follow the Shark

An important reason for the success of longlining in the Kakinada area in Andhra Pradesh is the *nava*, a traditional fishing craft which, according to the fishermen, is suitable for the deep sea fishery. The fishermen here have, for years, been used to long running hours to distant fishing grounds.

Only the biggest *nava* (32-36') are today involved in the fishery and they are all motorized. The smaller *nava* stick to other gillnets and hook-and-live fishing in inshore areas.

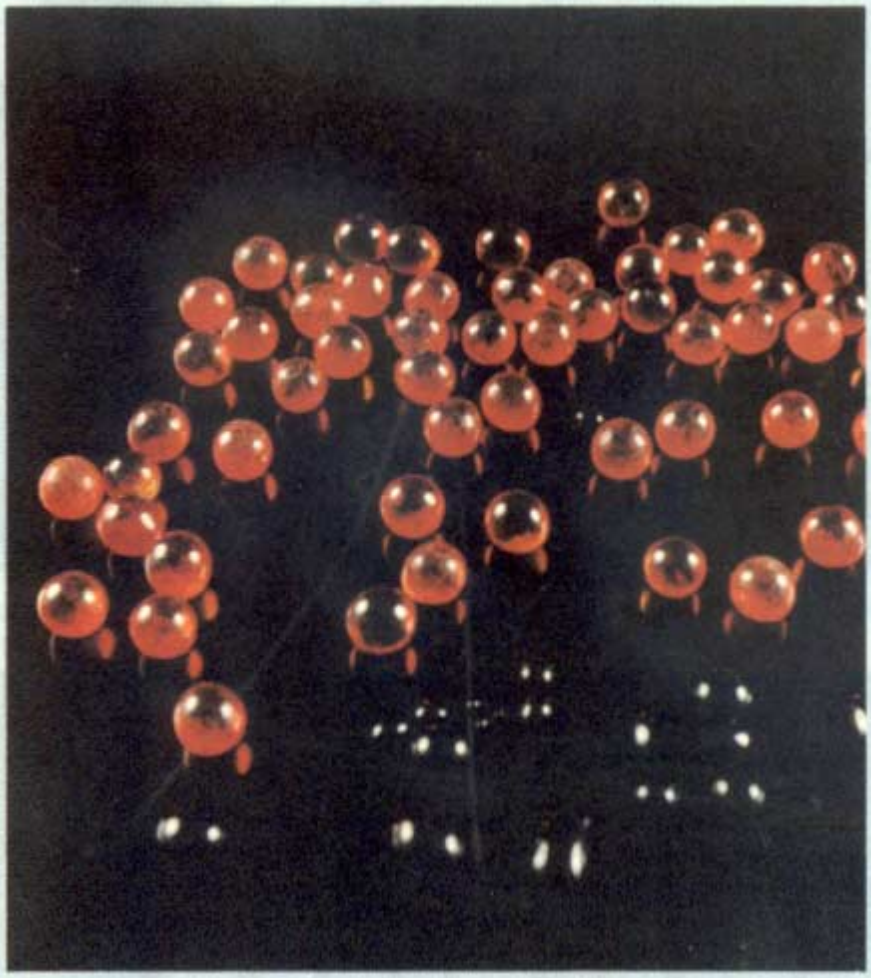
The *nava* is an open craft, with only a small aft deck and a roof-like protection for its engine. At night, the crew, numbering eight or nine, roll out a bamboo 'deck' over the sturdy thwarts midship, for sleeping. As protection against wind and rain, a tent is erected, using bamboo arches and heavy cotton material.

A small insulated ice box of 50-70 kg capacity is often used to keep the bait fresh, but the Shark are simply kept at the bottom of the boat. The fishing gear is stored midship.

Most of the larger *nava* are fitted with secondhand six-cylinder Ashok Leyland engines. They are relatively cheap to purchase, but use around six litres of diesel oil per running hour, which is considered high for this size of craft. A few of the 32' *nava* use a Leyland engine cut in half. This extraordinary technique leaves the engine with three cylinders and reduces fuel consumption by half.

T.D.

Shark on the beach after being landed from nava.



Valuable 'sparklers' from Shark liver

Shark fishermen in Kakinada have the opportunity to literally squeeze some extra paise out of their catch.

The Andhra Pradesh Fisheries Corporation (APFC) offers five Rs/Kg for Shark liver delivered to their oil refinery plant located next to the better-known boatyard in Kakinada. The livers are chopped into small pieces in a large mixer in the factory. The porridge-like mixture is then cooked in a steam boiler and, in a third stage, the refined oil is separated from the solid contents.

The well-equipped factory that is run with a minimum of manpower has a capacity to handle about 200 kg of liver a day. Last year, 21t of liver were purchased for over IRs 100,000.

Working in collaboration with a company in Bombay, the factory converts the refined oil into Vitamin A and D capsules. Quite surprisingly, the natural vitamin content of the liver bought is considered too low and, so, some synthetic vitamin A and D are added.

The end products are small, droplet-like capsules, red and sparkling like gems if held in the sun. It takes one kg of refined oil to produce 10,000 capsules, which sell at a retail price of Rs. 50 for a pouch of 1000 capsules.

There are also a few private companies buying Shark liver for oil extraction. This activity is a revival of a decades-old one which had slowed down after fishermen had begun to concentrate on Shrimp. With Shrimp being over-fished, attention is turning again to Shark — and their livers.

T.D.

longlining *nava* from the Kakinada area.

In most areas of Tamil Nadu, small-scale driftlonglining is still a new fishery. There are only a few small (BLCs and pablo type boats) seasonally engaged in this fishery on the Coromandel Coast. To boats catching Shark in Indian waters off Tamil Nadu, an unknown number of Sri Lankan boats drift longlining must be added. More escape the Indian Coast Guard net than are caught and the catch of pelagic Shark in their driftnets and DLL are believed to be considerable.

In some areas, such as Paradwip, Kakinada and Nagapattinam, the same longline may be used for drift longlining and bottomset longlining by removing the floats and attaching stones.

The most commonly used bait for BSLL is different kinds of Eel, usually obtained from the by-catch of trawlers. Dolphin meat has also been used with good results, but it is less easily available than Eel and is, therefore, more expensive. For drift longlining, cut pieces of Mullet, small Tuna and Dolphin are used. When available, whole Indian Mackerel may also be used.

The Shark caught by BSLL, as well as DLL, are mainly of the *Carcharhinus* species. The most common species caught by DLL are Silky Shark *(Carcharhinus falciformis)* and Hammerhead Shark, especially the Scalloped Hammerhead *(Sphyrna lewini)*. BSLL usually yields Bull Shark *(C. leucas)*, a popular species amongst the fishermen, as it grows big (commonly, up to 260 cm), has relatively large fins and, therefore, fetches a high price in the market. The Tiger Shark *(Galeocerdo cuvieri)* is also commonly caught with BSLL.

But while the Shark catch has been increasing and the small-scale fishermen are happy over these developments, the state of the resource has been causing concern to scientists and officials alike. There is, however, little data available and this is a situation that will have to be resolved sooner than later.

HARD CASH IN THE SOUP BOWL

The Shark Fin Trade in the Bay of Bengal

What is the significance of hearing once again from the waiter at a Chinese restaurant in Madras, in Tamil **Nadu, India, that the "Shark Fin Soup is not available today, sorry", even though India produces more than** *150* **t of** dried **fm every year? Both question and answer are symbolic of the** pattern **of the Shark fm** trade **in the Bay Of Bengal, where there is a clear delineation of roles** between the eastern **and western shores.**

While Bangladesh, India, Sri Lanka and the Maldives produce, Thailand, **Malaysia and Singapore consume. Indonesia alone of the** eastern **nations produces more than it consumes. The** main consumer **countries** also re-export **unprocessed** and processed **fin in various forms to Western markets as well as trade extensively with Hong Kong further to the** east.

Wholesale Shark fm prices **in the Eastern consumer markets, stable for the past few years, have recently shot up.** This **might be partly due to supply shortfalls from traditional producers like Australia, and partly to increased** demand **due to increasing standards of income in ASEAN countries.** Retail prices **are** said **to seasonally vary,** peaking **during the Chinese New** Year **celebrations in** February.

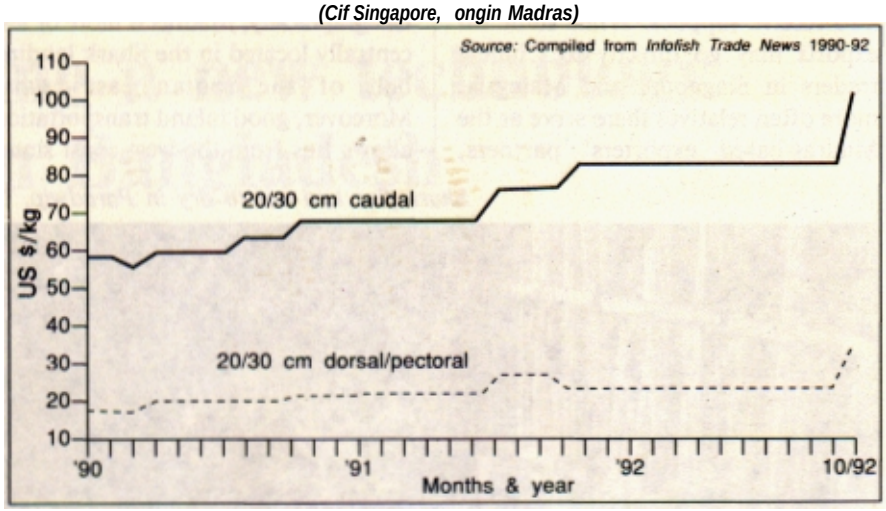
This, however, does **not seem to** affect **prices at the producer level. For the producer, the white or golden** fins **of the Skate are prized as well as the caudal (tail) lower lobe of the Shark. The bigger the fm, the higher the** kilo price. Selling **in sets of four** fins **from the same Shark, or in shipments of correct percentages of the four different marketable** fins, **is common practice. It is only from very large Shark that** fins **other than the first dorsal, left and right pectoral** and **caudal are utilized.**

Secrecy shrouds the trade in the region, as smuggling of money and fins, ethnic **barriers** and **family cohesion prevent outsiders from** encroaching **on or fully monitoring the exclusive industry.**

Take the Indian trade, for instance. While **India boasts of numerous ports which export marine products, Madras**

Fig 1. Price development in Shark fins 1990-92

(Cif Singapore, ongin Madras)



LOCAL **PURCHASING** PRICES **FOR DRY** SHARK FIN IN SOUTH INDIA (IN IRS/KG)

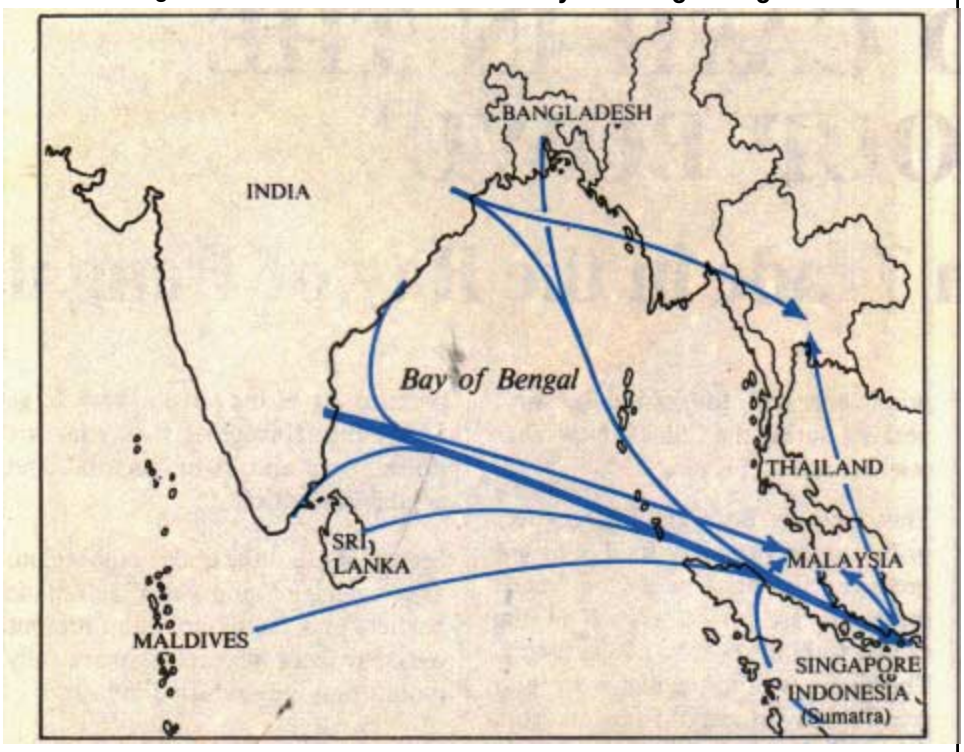
Type	*Black (Dorsl/Pactoral)*			*Black (Caudal)*			*White (aL9*		
Size	*Early*	*Late*		*Early*	*Late*		*Early*	*Late*	
(in cm)	*19%*	*1992*	*Change*	*19%*	*1992*	*Change*	*19%*	*1992*	Change
0.5	—	—	—	—	475	—	—		—
5-10	—	250	—	—	750	—	—	450	—
10-15	175	450	+257	—	1500	—	225	1000	+444
15-20	175	850	+486	—	2300	—	225	1100	+489
20-25	375	1375	+367	—	3500	—	475	2000	+421
25-30	375	1375	+367	—	3700	—	475	2000	+421
30-35	425	1650	+388	—	4200	—	650	2900	+446
35-40	425	1650	+388	—	—	—	650	2900	+446
40.	475	1850	+389	—	—	—	875	3200	+366

1990: US $1 = IRs 18 appx. (official), IRs 25 (unofficial)

1992: US $ = IRs 27 appx. (official), IRs 33 (unofficial)

Source: Frej and Gustafsson (1990) and interviews

Fig 1. Shark Fin Trade in the Bay of Bengal Region



plays the leading role in the export of Shark fins. Singapore, the main market, is the usual destination, though Penang and Kuaia Lumpur also receive supplies. While some fin exports may go directly to Chinese traders in Singapore and Malaysia, more often relatives there serve as the Madras-based exporters' partners, assuring the smooth completion of business transactions in a unique Madras-Singapore trade.

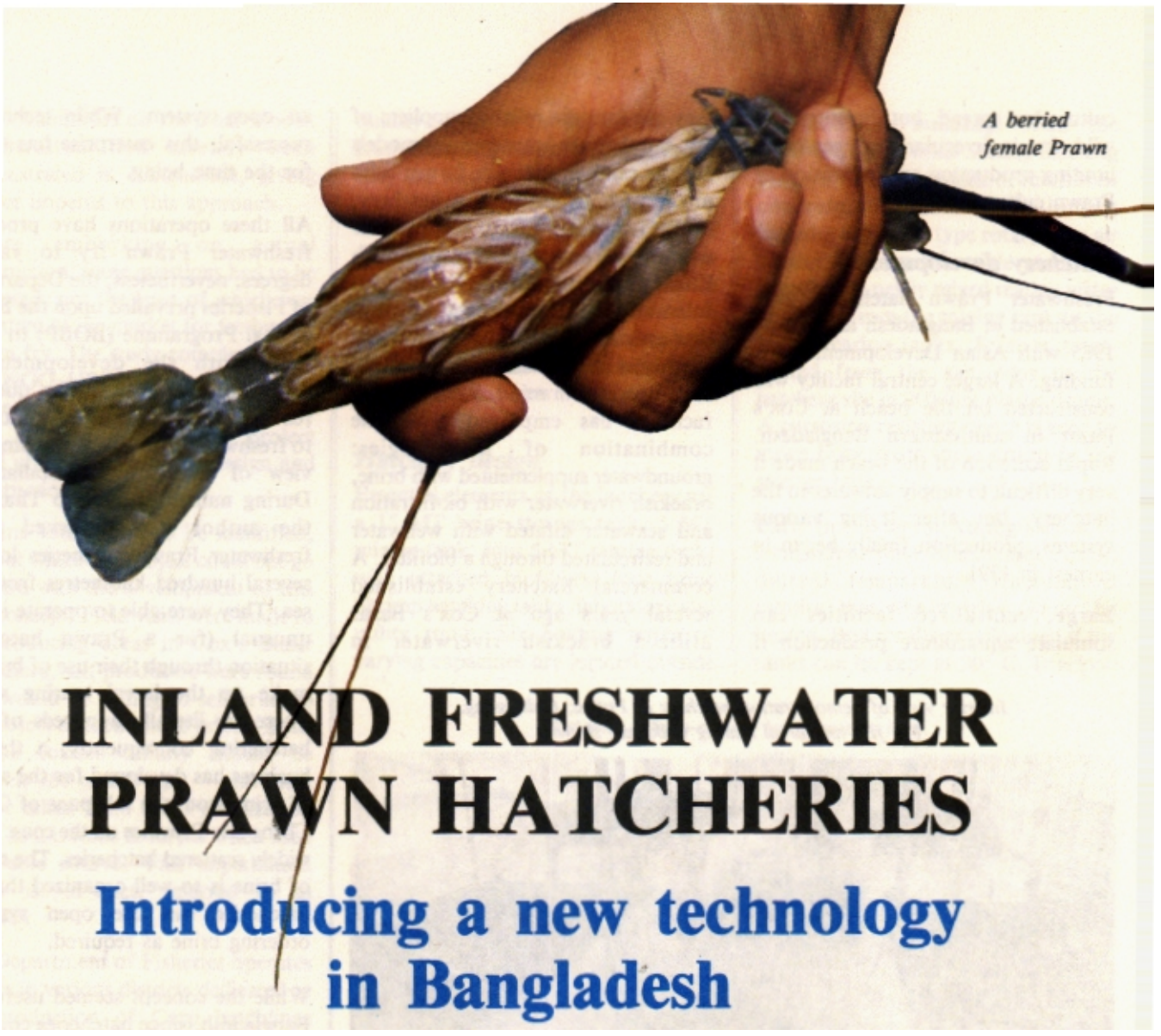
Geographically, Madras is more or less centrally located in the Shark landing belt of the Indian east coast. Moreover, good inland transportation allows fins from the west coast states of Kerala and Karnataka to reach Madras easily. And the city has both a large commercial port and a well-connected international airport. But what gives Madras the edge is the people, Tamils and Tamil Nadu Muslims who have their kin in Malaysia and Singapore.

The dried Shark fin, one of the most highly valued marine products from the Bay, is generally traded from Madras through unsanctioned export channels, making data collection difficult. It is believed that as much as 500 kg of fm, valued at US $ *25,000,* leaves Madras daily, mostly by air.

In this trade, while Singapore fin prices are only slightly depressed due to the large influx of Indian fins, Madras prices tend to be abnormally high, 'subsidized' as they are by the value of the hard currency 'paid' in Singapore. A fm is thus often worth *25* per cent more in rupee prices in Madras. A portion of this higher rate is passed down through the market chain and eventually some of it reaches the fishermen. If the rupee becomes fully convertible, the extra-bonus the Shark fin industry provides the fisherfolk will disappear.

R.H

Shark fins laid out to dry in Paradwip, *Orissa.*



A berried female Prawn

INLAND FRESHWATER PRAWN HATCHERIES

Introducing a new technology in Bangladesh

by Charles L. Angel
*(Senior Aquaculturist, **BOBP**)*

Four great rivers, the Meghna, Brahmaputra, Jamuna and Padma, course through Bangladesh, ultimately finding their way to the sea through a vast deltaic region. The drainage basins of these rivers and their estuaries are the habitat of the giant freshwater Prawn, *Macrobrachium rosenbergii.* It is truly a 'giant' among prawns, reaching 250 grams, although most of the catch ranges from 20 to about 100 g.

Freshwater Prawn migrate to the estuaries as the spawning season approaches. The first gravid females appear in late March and spawning goes on until the end of September or early October. Unlike the penaeid Prawn, which spawn myriad small eggs directly into the sea, the giant freshwater Prawn carries her eggs in a brood pouch under the abdomen for about 12 days before they hatch. After that, the larvae are left to their own devices and luck for survival. After about a month in the estuary, surviving larvae metamorphose into juveniles and begin their journey upstream to repeat the life cycle.

Little was known of the life cycle of *M. rosenbergii* until Dr. S.W. Ling, on an FAO assignment in Malaysia in the mid-60's, successfully reared its larvae in brackishwater. From that day on, interest grew in the culture of the giant freshwater Prawn. The development of hatcheries would assure a steady supply of fry to prospective farmers.

Experimental freshwater Prawn farming has been widespread, but commercial culture is limited to a few countries. Small industries can be found in the United States, a few Central American countries and islands in the Caribbean, Malaysia, Indonesia, India and Bangladesh. By far and away, Thailand leads in the extent of development of its freshwater Prawn culture industry. In contrast to the export-based penaeid Shrimp farms, the development of freshwater Prawn farming in Thailand was led by domestic demand.

Bangladesh is a major exporter of freshwater Prawn caught artisanal fisherfolk in the rivers, lakes and flooded depressions of the country. Fish farmers were quick to realize the income-generating potential of Prawn farming and began stocking juvenile Prawn caught by fisherfolk. Polyculture of Indian Major Carp is widely practised and farmers have found it easy to integrate *M. rosenbergii* into the system. The freshwater Prawn harvest adds significantly to cash income. The demand for stocking materials has increased as integrated fish-Prawn

culture has spread, but the supply of wild fry is irregular and seasonal, limiting production and expansion of Prawn culture.

Hatchery development

Freshwater Prawn hatcheries were established in Bangladesh as early as *1985* with Asian Development Bank funding. A large, central facility was constructed on the beach at Cox's Bazar in southeastern Bangladesh. Rapid accretion of the beach made it very difficult to supply seawater to the hatchery, but after trying various systems, production finally began in earnest in 1991.

Large, centralized facilities can stimulate aquaculture production if they can become reliable suppliers of fry, but they are inappropriate models for the small investor or farmer who might wish to establish a hatchery. Model freshwater Prawn hatcheries of a small-scale nature were established in Khulna and at Cox's Bazar with International Development Association assistance. DANIDA has funded hatcheries at Noakhali with the small-scale operator in mind. Each of these facilities has employed a unique combination of technologies: groundwater supplemented with brine, brackish riverwater with biofiltration and seawater diluted with wellwater and recirculated through a biofilter. A commercial hatchery established several years ago at Cox's Bazar utilized brackish riverwater in an open system. While technically successful, this enterprise has closed for the time being.

All these operations have produced freshwater Prawn fry to varying degrees; nevertheless, the Department of Fisheries prevailed upon the Bay of Bengal Programme (BOBP) to assist them with the development of 'backyard' hatcheries. The question remained, how could BOBP contribute to freshwater hatchery development in view of the existing installations? During numerous trips to Thailand, the author had observed small freshwater Prawn hatcheries located several hundred kilometres from the sea. They were able to operate in this unusual (for a Prawn hatchery) situation through their use of brine to make up the larval rearing water. There are literally hundreds of such hatcheries; consequently, a thriving business has developed for the supply of brine from the salt pans of Chang Cheng Sao Province on the coast to the widely scattered hatcheries. The supply of brine is so well organized that the hatcheries can use open systems, ordering brine as required.

While the concept seemed useful for Bangladesh, since hatcheries could be located adjacent to farming regions, rather than far away on the seacoast, there would be no regular source of brine to make rearing water. Employing the concept of a recirculating system could reduce, or eliminate, the need for frequent water changes, while allowing the establishment of

Interior view of demonstration hatchery at Potiya, Chittagong. The five-ton larval rearing tanks are shown.

Sand filters used to filter rearing water after chlorine treatment

Decapsulating Artemia cysts

inland hatcheries on the Thai model. Biofiltration had already been demonstrated in Bangladesh, giving further impetus to this approach.

Before embarking on actual construction, some questions had to be answered, not the least of which was the extent of the market for freshwater Prawn fry. The study completed by a local NGO, UBINIG, was reported on in the *Bay of Bengal News* No. 38. With demand assured, the project could proceed with siting, design and construction.

A brine source had to be identified, without which the project could not go forward with the development of this new concept. Field visits were made to salt-producing areas in Cox's Bazar and, there, salt producers were found who would be willing to sell brine to the project at economical prices. Brine of the correct salinity should be between 180 to 250 ppt – and must not be taken from the crystallization pans, as it is toxic to larvae when used as a sole source. This supernatant liquor is, in fact, referred to as 'bitters'.

The Department of Fisheries operates centres in various districts dedicated to the production of Carp hatchlings which are supplied to local nurseries and pond operators. The centres are equipped with tube wells of varying depth and many had installed deep bores with ADB assistance. While such 'fish seed multiplication centres' would be feasible sites, the water from their wells would have to be of sufficient quality to satisfy the requirements of freshwater Prawn larvae, in as far as they are known.

Potiya, just south of the port city of Chittagong, was selected on this basis and for its proximity to Cox's Bazar with its brine sources. Construction began in mid-1990 and was completed early this year. Larval rearing begarn in April of last year.

Hatchery design

Essential elements of the hatchery are a 15 MT brine storage tank, 5 MT mixing tank, four 5 MT rearing tanks with attached biofilters, four brine Shrimp hatching tanks, laboratory and utility room. Six holding tanks of varying capacities are located outside the hatchery building. With the exception of the brine Shrimp hatching tanks, all these are made of reinforced concrete. Mechanical equipment includes a 'Roots' type rotary lobe air blower and a submersible pump for transferring newly mixed rearing water at 12 ppt from the mixing tank to the larval rearing tanks. Brine is transported from the salt pans to the hatchery site in 200-litre plastic drums. A corrosion resistant pump is used to move brine from these drums to the storage tank.

Early in the larval rearing season in Bangladesh (late March and April), diurnal temperature fluctuations require that the rearing water be heated. Best results are obtained if the tanks can be kept at 30°C. Brackish

Plastering a ferro-cement larva! rearing tank.

***Outdoor holding tanks for** brood **stock** and post-larvae.*

rearing water is highly corrosive, as well as being an excellent conductor of electricity. If electric immersion heaters are used, they must be of the highest quality and, hence, imported (at least for the present), which adds considerably to the equipment budget. Solar energy is an alternative, but during much of the rearing season skies are cloudy for extended periods. Fossil-fuel fired heat exchangers could be tried, but any material in contact with the culture water must be non-corrosive and non-toxic. Fabrication of an exchanger using such materials is also costly.

BOBP has contracted two biologists and a technician to operate the hatchery with backstopping from BOBP aquaculture staff. Prior to startup, Rafiquel Chowdhury, one of the biologists, spent more than a month at the private hatchery belonging to the Allah Wallah Company, learning larval rearing techniques. A study tour to Thailand to see backyard hatcheries in operation capped the training. Hironmoy Battacharjee joined after startup and has benefited from on-the-job experience. Standard rearing procedures for ***M. rosenbergii*** larvae are used in the pilot hatchery. Rearing water is recirculated through the 4-chamber biofilter by an airlift. The turnover rate is about five tank volumes per 24 hours. No build-up of ammonia has been measured and only occasionally does nitrite reach a barely detectable level.

A good inventory of gravid females must be kept to ensure that sufficient numbers of larvae will hatch simultaneously. Early in the season, considerable effort is needed to collect adequate numbers of these egg-bearing spawners over a relatively wide geographic area. It was observed that the earliest maturing females tend to be rather small, 20-40 g, and do not produce very many larvae.

The experience

A small 200-litre ***Artemia*** hatching tank was used for the very first brood, since there were too few larvae to stock in one of the 5 MT tanks. Diurnal temperature changes were too extreme and no larvae made it to the juvenile stage. A devastating cyclone at the end of April knocked out the air supply during the second batch; again no larvae survived to make it through metamorphosis.

During this first season, high mortality of unknown origin plagued three of the batches, while the fourth suffered mortality which followed the pattern of mid-cycle disease (MCD), peaking about one third of the way through the 35-day larval rearing period. The remaining larvae survived well through metamorphosis to postlarvae (PL). In a few cases, heavy mortality occurred during the first few days after hatching. Survival improved as the season progressed and the best results were achieved with the last few batches before the end of the larval rearing season in October.

The unsuspected toxicity of untreated deep wellwater devastated about 35,000 PL's which had earlier been affected by MCD. Bioassay indicated that the source of the toxicity was indeed the deep wellwater. Its origin remains unknown, but treatment with calcium hypochlorite eliminates the problem.

While there was disappointment over the poor survival of the first trial runs, it was confidently felt the technology would work. It was also felt that there was a lot to learn and that the lessons would only come through experience!

The 1992 season, the project's second, was embarked on with considerably more confidence. Three important modifications were made to the rearing procedures. EDTA (ethylene diamaine tetracetic acid) was dissolved in the larval rearing tanks at 10 ppm. EDTA is a chelator of heavy metals and often seems to have a beneficial effect in hatchery production. Two partial water changes were incorporated into the rearing protocol – 20 per cent on Day 10 and another 20 per cent on Day 20. Two batches were produced with much better results. There were no serious disease problems and production of PLs ranged from 12 to 17 per litre, with a total production of about 518,000. An attack of epiparasitic protozoa did affect one batch, but it was quickly arrested with the application of antibiotic and formalin treatments. Brood stock collection and management was considerably improved by making better use of the outdoor holding tanks to keep up a steady flow of berried females. This helped to fill all four of the rearing tanks with larvae within a relatively short time.

The project's problems are not over, though! The outdoor PL holding tanks are of limited volume and it was found that PLs can be held for only a few days. Delays in fmding customers early in the rearing season caused the loss of quite a large number of marketable PL's. Advertising in local newspapers quickly solved this problem and the project was soon deluged with orders.

Broodstock became very hard to find around Potiya in late May and early June. The second rearing cycle was very much delayed as a result. Furthermore, the larvae produced by this second 'wave' of spawners took much longer to metamorphose into PLs than had been the case earlier. Here is another illustration of the pressure put on hatchery operation by the seasonal cycles of Prawn breeding in Bangladesh.

Simultaneously with routine hatchery operation, the project conducted short, 10-day training courses for seven fisheries officers. Next year it hopes to involve the private sector in the programme.

The major operating costs are for brine Shrimp ***(Artemia salina)*** and electricity. It is unlikely that either of these can be significantly reduced. It is possible to produce brine Shrimp cysts in Bangladesh, but this is unlikely in the near future. Adequate quantities of brine Shrimp nauplii must be made available to the larvae to ensure good growth and survival. While feeding density can be reduced during the latter half of the rearing period, artificial feeds cannot completely replace brine Shrimp in the larval diet.

PL production in terms of the output per litre was very encouraging this season. Unfortunately, the scarcity of broodstock alluded to earlier, as well as prolonged development to metamorphosis, restricted the project to only two batches this year. Preliminary economic models suggest that five cycles are required to achieve an adequate return on investment. The project has its work cut out for its next year!

Malaysia's 'Sleeping Giant' could wake up on the wrong side

Lisa Durante looks at Malaysia's commitment to developing Shrimp aquaculture as a priority area.

Malaysia has the potential to export M$ 5000 * million worth of Shrimp if it successfully develops the 110,000 ha coastal area (mainly mangrove swamps) set aside for this purpose by the Government in the Sixth Malaysia Plan. This is the dubious claim (Malaysia suffers with high investment and labour costs, as well as labour shortages, acid sulfate soils and market saturation) made by Dr. Chingchai Lohawatanakul, President of a leading Thai aquaculture company – Charoen Pophand (CP). He was speaking in Ipoh at a recent seminar hosted by the Bangkok-based Asian Shrimp Culture Council, a promotional organization set up to boost intensive Shrimp aquaculture farming in the region, as well as related technology transfer.

This estimate is based on the harvesting of 240,000 t of Shrimp in the areas earmarked for aquaculture expansion by the Malaysian Government. It does not, however, evaluate commercial Shrimp culture in Malaysia in economical, environmental and social terms.

Economic viewpoint

Several studies show that intensive farming – (100,000-300,000 ha stocking density) – is not, in economic terms, the optimal choice. While production curves indicate an overall growth in Asia, from 210,000 t in *1985* to an estimated 800,000 t by the year 2000, consumption trends charted in major markets, such as Japan, project an oversupply in the medium term. If the global market is entering a phase of saturation, the prospects of the intensive farmer on the one hand and the traditional farmer – utilizing tidal water óxchange and natural feed – on the other, are clearly not good.

INTENSIVE farming on a per kg basis is characterized by low fixed costs, because of its high productivity per area, but incurs heightened variable expenses due to feed costs and non-stop water quality maintenance. Therefore, intensive farming, thanks to its sheer production volume, can only remain profitable if market prices are favourable. If not, profitability will plummet because of excessive production and/or variable costs.

EXTENSIVE farming (any system with a yearly production of less than one t/ha) will likewise suffer if prices decrease.

SEMI-INTENSIVE farming, which enjoys a relatively higher productivity (2-3 t/ha) as well as scaled-down production costs, will survive,

Why then do companies, of which there are several aside from CP mentioned above, aggressively tout intensification and technological upgrading as the only answers to Shrimp aquaculture development? Quick returns and a tendency to pursue total profits per ha as opposed to per kg are possible answers.

Ecological impact

What about the ecological impact of intensive farming? In a mangrove-rich country such as Malaysia, blessed with some 600,000 ha of mangroves of which almost half grow in Eastern Sabah, the threat of reclamation for intensive systems (compounded by industrial and tourist development) is as real as it is dangerous for the entire ecosystem – not least for Shrimp seed sources. The *Malaysian Wetlands Directory* claims that possibly as much as 25 per cent of peninsular Malaysia's remaining mangroves may be cleared for aquaculture. This may not be necessary if the numerous disused paddy fields and palm oil estates, either close or adjacent to the mangroves, are utilised instead – thus avoiding the main obstacle encountered in the mangrove areas, excessive acidity, which takes between 18 months and three years to be washed out before the Shrimp farms became fully productive. (The large-scale operator is nowadays aware of this time span, and is prepared to see profits grow only after this initial lapse.) Another potential 'aquaculture-land' is the green belts directly behind the mangroves. These could well suit Shrimp culture, retaining as they do all the obvious benefits of

• US $ 1 = MS *2.5* **appx.**

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being close to a mangrove forest – **such as availability of Shrimp seed. Soil** salinization **is, in fact, a constraint on expansion into this area.**

Erroneous perceptions **that swamps** are **"merely mosquito-infested** areas **that serve no economic or ecological purpose" must be changed,** insists an **aquaculture expert; if not, mangrove destruction will spell disaster for the entire socio-economic stabifity of the region.** Besides **supporting Shrimp** and **fisheries, sustaining timber exploitation, protecting coastlines from erosion and providing at least *:50* different products of use to** local **inhabitants, mangroves are rich, indispensable habitats for marine and wildlife, especially migratory birds.**

In Taiwan and, to a lesser degree, in the Philippines and Thailand, the widespread conversion of mangroves **into culture ponds has caused groundwater withdrawal,** leading **to rapid land subsidence, while toxic** byproducts pumped into coastal waters **have** caused **far-reaching damage.** Will **these mistakes be repeated in Malaysia? According to Malaysian fisheries officials, the fears** are **not "entirely tenable", as Malaysia has an Environment Impact Assessment (EJA).** This **is a legal procedure enacted in 1987, whereby all land development projects of *50* ha or more started after 1988** warrant **Government** vetting **before** getting **underway. There is, however, ample room for evasion, if not downright** illegal **practices; a common ploy is either to divide a project into segments below *50* ha, or to plagiarise a** local **approved EIA and use it for another pond in the same district. Moreover, consultants** are **hired by project investors and can, therefore, have mixed** allegiances. **More important, there is no post-project monitoring or comprehensive baseline data on resource biodiversity.**

Despite the ecological lacunae associated with intensive Shrimp culture, there ia a "mad rush" by several states in Malaysia to "scramble into the lucrative business without considering the onus on traditional fishermen as well as environmental impacts", claims a fiery editorial in *Utusan Konsumer,* a nation-wide consumer protection and green weekly.

The social cost

Agriculture Minister **Datuk** Sen Sanusi Junid recently claimed that the development of aquaculture as a "priority area" would not only boost export markets, it would also enhance local markets. **(At 20 M$/kg – double the cost of the same quantity of beef – which Malaysian household can afford Shrimp?)**

This **prioritization** has **led to an aquaculture onslaught by large companies, the majority foreign, who are** turning **to Malaysia to** sell fry, **aerators, pumps, chemicals** and **all the paraphernalia** necessary **for intensive Shrimp farming. The shift in several cases** has been **the result of having suffered losses in their** own countries, **either because of** unwise **systems planning,** ecological **'retribution' or** tightened **government guidelines to safeguard resources.**

How do small-scale fisherfolk fare in the face of this onslaught? According **to one** infonned **source, "very badly". The social costs of intensification are multi-faceted: reduction of domestic and** agricultural **water supplies,** decline **in the quantity of food fish, displacement of** labour, and **marginalization of those subsistence fisherfolk who depend on mangroves – working at fuel wood collection,** wax **and honey production, paper production and other** activities – **for survival.**

MANGROVES – The unparalleled natural provider

Mangroves, a common feature of both tropical and subtropical coastal habitats, are a group of taxonomically varied trees that flourish in the upper intertidal area of sheltered tropical shores. With their aerial roots and salt regulation capacities, they are capable of withstanding this stressful environment.

Down the ages, mangroves have been considered a vital economic resource for coastal people. Their ecological contribution is manifold. For instance, by producing organic matter – mainly in detritus form from leaf fall – they prove to be an excellent nutrient source, and provide primary energy for adjacent marine estuarine ecosystems. And by acting as nurseries and shelters for many species of commercially important fmfish and crustaceans, they boost offshore fisheries.

Natural safeguard

Mangroves protect the coast from both high waves and tropical storms as well as sea-level rises caused by global climatic changes. They also aid in stabilizing shorelines by dissipating wave energy, strengthening the substrate and increasing sediment deposition. Mangroves are a natural and, therefore, cost-effective answer to many of the coastal environmental challenges caused by pollution and other disruptions.

Bountiful nursery

Mangroves act as a nutrient-rich habitat for the juvenile stages of numerous commercially prized species of fish and Shrimp. Malaysian mangroves, in particular, support several endangered wildlife species, such as the Estuarine Crocodile *(Ovcodiluspoiusus).* Milky Stork *(Mycteria cinerea)* and Proboscis Monkey *(Nasalis larvatus)* amongst others.

Varied products

Asian mangroves are especially bountiful in the diverse range of products they supply. Nipa, for instance, which grows in abundance, is excellent for roofthatching. Here are sOme products that can be obtained from mangrove forests or which benefit from them:

Agriculture – fodder, green manure.

Construction materials – timber for scaffolds, railroads ties, mining pit props, boatbuilding materials, beams and poles, clapboard, panelling, thatch and matting, clipboards, glue.

Fishing equipment – poles for traps, fishing floats, fuel for fish smoking, tanning for net and line preservation, fish-attracting shelters.

Foods, drugs and beverages – alcohol, tea substitute, cooking oil, sugar, fermented drinks, bark condiments, fruit, vegetables, cider substitute.

Fuel – firewood for cooking, heating, smoking sheet rubber, brick burning, charcoal.

Paper – paper of several types.

Textiles and leather – synthetic fibres such as rayon, cloth dye, tannins for leather preservation.

Other products – incense, rice mortar, medicines, wax, honey, fish, birds, crustaceans, mammals.

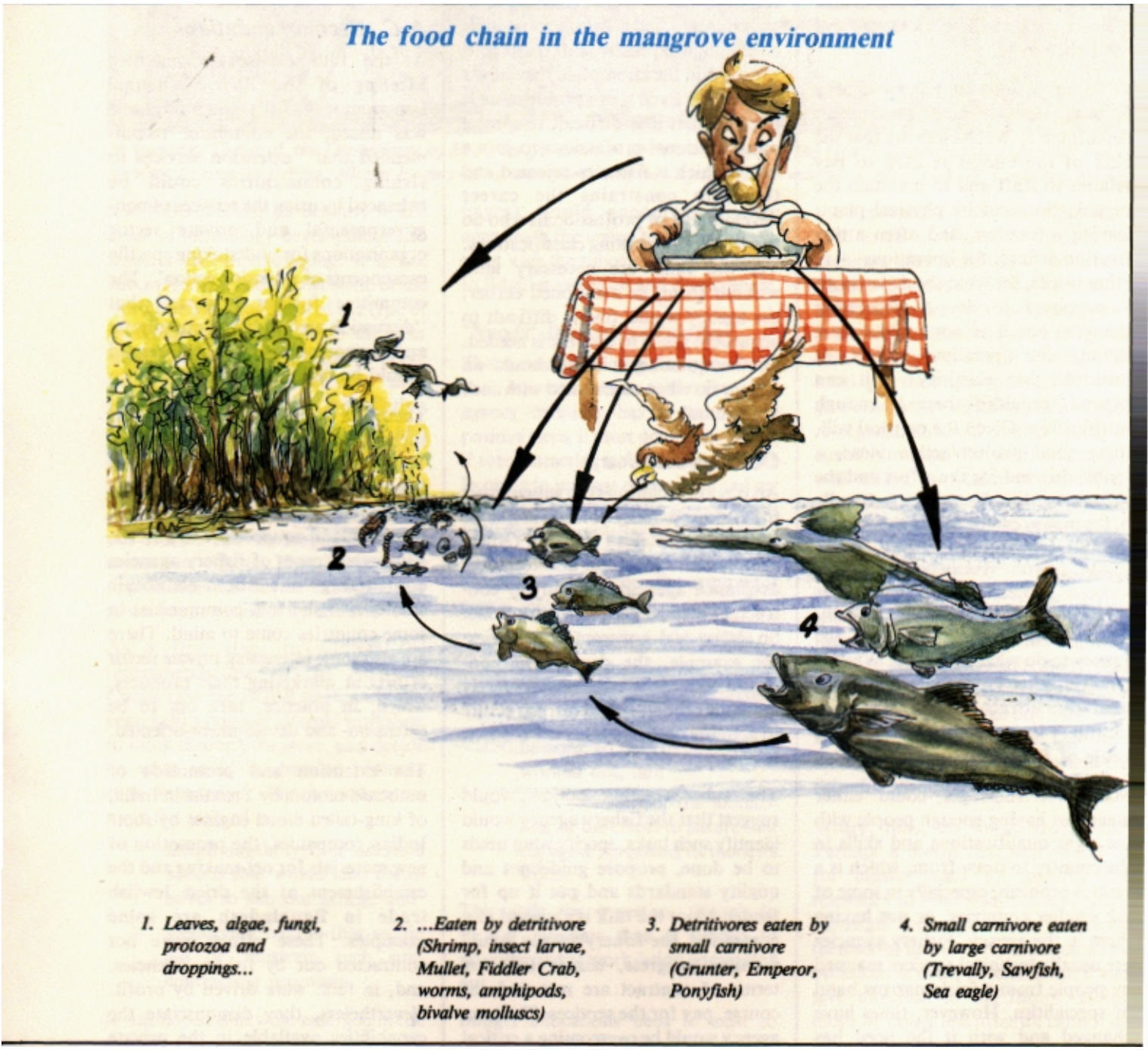
Despite this contribution, there is a misplaced belief that mangrove swamps need to be reclaimed in the name of "more advanced development". Fishery estates, ports, intensive aquaculture farms and other industrial projects threaten the livelihood of innumerable small-scale fishing communities who depend on mangroves for economic sustenance. Also threatened is this sole refuge of many migratory birds and other endangered species whose survival depends on the existence of the habitat.

The mangrove swamps of Asia cry for protection from large-scale exploitation by big industry.

While the communal benefits of a resource, such as mangroves, are being rapidly lost to privately-owned, single-purpose development, the central and state administrations are forging ahead with grandiose plans for aquaculture in Malaysia: A M$300 million investment over the next five years is predicted from intensive Shrimp producers, local and multinational, as well as in the development of fishery estates and cockle-cleaning A government fisheries official states that "Malaysia is set to become the world's fifth largest producer of Tiger Shrimp by 1993".

The 'sleeping giant' may be roused, but few benefits accrue to the small-scale sector. "With its high capital cost, intensive Shrimp farming clearly suffers from a poor employment-to-investment ratio," explains an aquaculture scientist. Moreover, she adds, "big businessmen have their own collateral, so enjoy a monopoly on the industry as well as on fmancial credit".

The tide must turn in favour of the smaller-scale Shrimp farmer engaged in semi-intensive farming if true development – beyond the fruits of short-term gain – is to respond to both a society's needs and its ecological sustainability. Inteffigent development and co-operation between the small-scale sector and multinational aquaculture concerns can and "should take place", claims an aquaculture expert. The example of the British Petroleum-owned Aquastar Company is a case in point: The promotion of sateffite, semi-intensive farming, with an emphasis on high quality, and effective, equitable marketing chains have reaped benefits to both farmers and the mother-concern in Songkhla, Thailand. Clearly then, if these criteria are respected and efforts are made to work in unison with the coastal environment and not against it, then the Malaysian giant could wake up on the right side after all.



Doing More by Doing Less

Some thoughts on subcontracting fisheries extension and development

by Rathin Roy
(Senior Extension AdvLwr, BOBP)

Ask any fishery agency in the region to list their top five headaches and the chances are that budget and manpower shortages would be in every list. Not very surprising, given the economic situations around, but even so, it would be worth our while to take a closer look at these shortages and what they mean.

First, let us look at fishery agency budgets. As in most government departments, the chances are that the bulk of the budget is used to pay salaries to staff and to maintain the organization and its physical plant, leaving a fraction, and often a tiny fraction at that, for operations – in other words, for what the department is supposed to do. A depressing thought, but it is not as bad as it sounds: the operations budget, in principle, has elasticity – it can expand, provided there is enough justification. Given the political will, some good project/action ideas, a visible demand for the effort and the capacity within the agency to handle it, the money can be found either from the government or from donor agencies.

Which brings us, in a circular fashion, to the issue of the capacity of the agency to do what is needed. While it is reassuring to know that priority and need can attract funds, manpower shortages are an entirely different kettle of fish.

Manpower shortages could either mean not having enough people with the right qualifications and skills in the country to draw from, which is a serious problem, especially in some of the smaller countries, or not having them in the agency. Fishery agencies are usually technical services manned by pegple from a fairly narrow band of specialities. However, times have changed and with it the need has arisen for a variety of skills, in fields as different as social sciences, community development, communications, resource management and so on. What makes this more troublesome is that several of these skifis are required only on occasion and governments fmd it fiscally impossible to maintain expensive staffon its rolls for the odd occasion when they might be needed. Even more problematic is the fact that it is difficult to attract non-traditional professions to join a tadre which is fisheries-oriented and therefore constrains the career development of professionals who do not fit into the existing classifications. Yet the skills are necessary and, without them, as mentioned earlier, the agency would find it difficult to attract the funds to do what is needed. So the question is what should an agency do when confronted with such a dilemma?

Obvious solution

An obvious solution is to subcontract the task or activity to individuals or other agencies. This is not as radical as it sounds. Most aid and technical assistance agencies depend on contractual help to get their work done. So do several government agencies; for example, the department concerned with roads and highways rarely maintains the staff and infrastructure to actually design and lay the roads... It contracts the tasks out.

The subcontracting option would suggest that the fishery agency would identify such tasks, specifywhat needs to be done, propose guidelines and quality standards and put it up for tender. Once the task is assigned to a contractor, the fishery agency would monitor progress, ensure that the terms of contract are met and, of course, pay for the services. Thus, an agency would be overcoming a critical constraint of manpower and, in doing so, would also be able to attract funds to do more. In other words, it would do more by actually doing less, which is an intriguing thought that needs to be explored.

A.C. Recommendations

At the 15th Advisory Committee Meeting of the Bay of Bengal Programme (BOBP), when this issue was raised, the committee recommended that "extension services to fishing communities could be enhanced by using the services of non-governmental and private sector organizations for undertaking specific components of extension action". The committee further proposed that "discussion and studies of experiences and opportunities in this regard should be facilitated" by BOBP.

There are surprisingly few cases of such phenomena in the BOBP region. The Department of Fisheries in Bangladesh allocating responsibility for fmgerling production and extension of inland aquaculture to a NGO, and several cases of fishery agencies contracting out socio-economic studies of fisherfolk communities in some countries come to mind. There are also some interesting private sector efforts at marketing their products which, in practice, turn out to be extension- and development-oriented.

The extension and promotion of outboard motors by Yamaha in India, of long-tailed diesel engines by some Indian companies, the promotion of new materials for net-making and the establishment of the dried Jewfish trade in Bangladesh are some examples. These efforts were not contracted out by fishery agencies, and, in fact, were driven by profit. Nevertheless, they demonstrate the capabilities available in the private

S.R. Madhu

In Ranong, Thailand, the Department of Fisheries got another government agency, the Health Department, to provide health services to remote fishing villages by providing transport, and paying travel allowances to staff and for medical supplies.

and NGO sectors, particularly in the areas of technology development and transfer and in marketing. It is not subcontracting in the strict sense of the word but is an extension of the type of thinking: getting others to do your work, for a price, and better to boot! Fishery agencies could ease their responsibilities, while benefitting fisherfolk more, by facilitating and promoting such efforts.

BOBP itself, like most other technical assistance agencies, routinely contracts out studies and development implementation efforts. Here again, such approaches can act as examples for government agencies to follow.

As a first step, to address the recommendations of the Advisory Committee, the BOBP staff, early this year, held a one-day internal workshop to think through the issue, and decide on what could be done to promote such approaches. The workshop set itself the task of

identifyingthe types of tasks and actions that would lend themselves to subcontracting; and

— identifying factors that would aid or constrain such subcontracting processes.

It was hoped that what emerged in the process (presented in the subsequent pages) would encourage fishery agencies in the region to at least experiment with the subcontracting approach to fisheries extension and development.

*'Needs' **for** subcontracting*

The statement 'doing more by doing less', however, can be misleading. The agency certainly has to take some positive steps, it must do certain things, if subcontracting is to be implemented. In order to manage contractors and get the best from them, the agency needs to have the knowledge and capacity to handle the subject matter. For example, even before the contractor comes into the picture

- needs have to be identified,
- the task to be contracted clearly defmed in a terms of reference,
- the specifications of what is to be expected need to be carefully worked out, and
- steps planned for the monitoring of the effort to ensure that the agency is getting its money's worth.

This calls for expertise, though in smaller numbers than is needed to actually do the work being contracted out.

Budget allocations need to exist to enable contracting. More important, the appropriate rules and regulations need to be established or modified to facilitate easy handling of contracts. Fishery agencies will have to identify qualified contractors for each type of job and establish criteria to select the best amongst them in addition to looking at the lowest quotes. However, given the policy direction, this kind of re-organization and strengthening of agencies to cope with subcontracting is well within the realm of possibility. And the dividends of such investment may well justify the expense and effort.

The workshop clearly showed that, if agencies met these 'needs', subcontracting clearly defined tasks in fisheries extension and development could be an efficient and cost-effective way-for agencies to cope changing times and needs, on the one hand, and with manpower and bUdget shortages on the other. Both the agency and the fisherfolk would thereby stand to gain.

Where, then, do we go from here? Perhaps a useful first step would be for agency staff to consider the relevance in their own context, think through the approach amongst themselves and then try it out on a few occasions in order to learn from it and give direction to the future. Doing more by doing less after all cannot be completely wrong.

SUBCONTRACTING TO MEET WIDENING RESPONSIBILITIES

Broadly speaking, fishery agencies create policies regarding the exploitation of living aquatic resources, which then guide the development of the sector The policies also generate regulation, laws and rules which need to be enfthced The other major task of fishery agencies is to generate or create knowledge, which it does by undertaking or supporting research development and evaluations. Lastly, it develops technologies and helps to extend them

More recently, fishery agencies have begun to concern themselves with fisherfolk community development, and this has increasingly led them mto community development, welfare actions and even provision of social services The direction for the future is undoubtedly the responsibility of conserving resources to enable sustainable resource exploitation There is a trend towards widening the responsibilities of fishery agencies, with the resultant need for a wider range of skilled manpower And this most agencies just do not have Subcontracting becomes the answer

But what types of tasks can be subcontracted?

The BOBP staff in their discussions came up with a long list *(see **box,** facing page),* which, of course, is incomplete, but is definitely indicative of the variety of tasks that lend themselves to be subcontracted. What is perhaps more useful is how the staff came up with this list. What criteria did they use to choose from among the tasks that agencies need to do?

Here are ten criteria that could be used to classify tasks:

1. Short-term, occasional and one-shot tasks are better suited for subcontracting than those that need to be implemented over extended periods, The latter would justify the agency building up their capacity to do so.

2. Tasks which have clear and definable terms of reference are easier to subcontract.

3. Where there is a lack of particular needed skills, agencies would find it fruitful to go outside to get the tasks implemented.

4. The key to successful subcontracting is to ensure that the output of the task contracted out measurable. This enables easier control and monitoring and makes sure the contractor is accountable

5. Urgent tasks that need rapid response do not give agencies an opportunity to gear up for them and encourage going to more prepared agencies outside.

6. Contracts can be expensive, but there is need to look at them with a long-term perspective, Building up capacity to handle a task and supporting the capacity even after its use can be more expensive in the long run.

7. Contradictory to the first criterion, there are tasks, particularly those that need participation of, and interaction with, communities, which are better handled by NOOs who can then build up rapport and offer the long-term commitment. Most agencies, with their policy of transferring personnel, just cannot manage the long-term commitment and rapport that community development and organization require.

8. Agencies who are constantly competing with each other for contracts can only survive through excellence and building up their speciality skills and experience. Contracting is one way to get access to the best in the field.

9. Appraisals and evaluations often require an unbiased view of things and this would be difficult to achieve with in-house skills.

10. Finally, there is political sensitivity of the content of the task. Interestingly, this can cut both ways. On the one hand, an agency might prefer to use in-house manpower to deal with politically sensitive subjects. But, on the other, when the agency wants the political leadership to address certain sensitive issues, an outside view may actually help rather than hinder.

What kinds of tasks/activities lend themselves to subcontracting?

The BOBP workshop on subcontracting held in Madras listed, under five broad headings, the following tasks and activities that were felt would lend themselves to subcontracting

I Preparatory and learning tasks

- Socio-economic surveys and benchmark studies.
- Participatory needs analysis in fisherfolk communities.
- Rapid rural appraisals - both exploratory and topical.
- Organizing the community.
- Participatory problem analysis.
- Participatory planning and project formulation.
- Opportunity analysis.
- Technical, economic and social feasibility analysis.
- Economic and social impact assessment of technologies and projects.
- Environmental impact assessments of technologies and projects.
- Market research.
- Project appraisals and formulation.

II Research and development tasks

- Technical design of craft, gear, engines and other equipment.
- Technology development.
- Technical and ecpnomic testing of equipment.
- Technology devefbpment for aquaculture.
- Product development for value adding.
- Exploratory fishing.
- Market development.
- Scientific research in various disciplines.

IH Implementation tasks

- Development and production of awareness building and extensic n materials.
- Design and development of media packages and their dissemination.
- Training design, materials production for staff and fisherfolk.
- Training.
- Technology demonstration.
- Participatory project management support.
- Technology extension and transfer.
- Provision of on-line consultation to beneficiaries.
- Micro-enterprise development.
- Implementation of savings and credit schemes.
- Timely implementation of projects.

IV Monitoring and evaluation tasks

- Environmental impact analysis.
- Economic impact analysis.
- Social impact analysis.
- Project monitoring.
- Extended data collection and census studies.
- Evaluation of projects.
- Process documentation and analysis.

V Agency support and management tasks

- Upgradation of staff skills through training.
- Process consultation to improve organizational efficiency.
- Development of Management Information Systems.
- Development and running of information services, such as database, libraries and archives.
- Accountancy services.
- Conservancy services.
- Transportation services.

What's the answer to the problems of the Besant Nagar fish market?

by Lisa Durante

The Besant Nagar fish market in Madras is the tangible outcome, after several vicissitudes over the last five years, of persistent community development at work. Today, this reasonably well-functioning organization, run by a fisherwomen's group which is now capable of thinking through difficulties on its own, is faced with several problems. A look at these suggests the pitfalls to be avoided if this developmental model, with moderate financial inputs, is to be successfully duplicated in different contexts.

Orur and Olcott *kuppams* are twin fishing villages on the beach-front of Besant Nagar, a comparatively new residential area in South Madras, Tamil Nadu, India. During the Seventies, the city's rapid expansion and changing urban environment had unfavourable repercussions on the traditional fishermen living here; essentially rural people, they found their lives sorely affected by the mushrooming urban growth. Poverty, pollution, overpopulation and diminishing catches, partly due to the uncontrolled expansion of mechanised fisheries and the proximity of Madras harbour, began to take their toll of these already marginalised communities. Illiteracy and lack of appropriate employment opportunities in this milieu isolated them and led to a demoralization born of a powerlessness.

In May 1987, the Bay of Bengal Programme's (BOBP) beachianding craft project started technical trials from Elliot's Beach, a part of the Besant Nagar seafront. BOBP sought the cooperation of the *kattumaram* fishermen from both villages. And a new relationship was established between BOBP staff and the villagers.

Shortly after the trials began, the villagers asked BOBP to make a donation to the vifiage temple fund. BOBP said 'Sorry' to this, but, instead, offered the services of a community worker to carry out a participatory survey to pinpoint the problems and needs of the villagers. The Orur and Olcott women were particularly vocal in response. The women's marketing drawbacks and their inability to fmd a suitable facility – a market – where they could sell their produce emerged in these discussions. This represented a challenge BOBP could, in fact, help overcome.

Forty four fisherwomen from the Orur and Olcott *kuppams* became involved in the new BOBP activity to establish a market for them. The women were enthusiastic about the possibility of running their own fish market, but they needed help in organising

themselves as a group capable of tackling the difficulties which would inevitably arise. When Valli, the BOBP's community worker, started her intensive group mobilisation and workshops to instruct on management and promote savings, the women of the two villages could hardly believe the unprecedented attention they were suddenly receiving. At last, said Vail, "they had started to hope"..,

From January 1989 to April 1990, BOBP held 11 one-day training programmes in the village to help mould the women into effective market operators. Aside from this formal training, BOBP maintained practically daily contact with the women's group, who had grown to trust Valli and her helpers. Group dynamics and the rudiments of book-keeping and business management were coupled to role plays, simulation and case study exercises aimed at depicting potential situations they might encounter in the market that the Madras Municipal Corporation had agreed in June 1988 to build for them. "Even though the Corporation is highly bureaucratic, procedure-oriented and audit-conscious, with little inclination towards innovation, it reacted favourably in this instance," explains a Corporation official, "because Government is keen to encourage self-management in various activities, and a market for these women represented a legitimate demand." Constructing a fish market for the exclusive use of fisherwomen was a novelty the Corporation had never experimented with. Says Rathin Roy of BOBP, "The Corporation went out of its way to promote this project for women. It took a big risk in favouring this group; in fact, officials even bent some rules to ensure that the women got the market they wanted".

All this is now history and has been reported in detail (in the *Bay of Bengal Newsletter*, No. *35*, and Working Paper No. 66. The Besant Nagar fish market run by the women from the Orur and Olcott *kuppams* became a reality when its 80 stalls, in a four-winged concrete building situated in the heart of this South Madras residential suburb, was inaugurated in August 1990. The Mahalir Mandram (MM), or fisherwomen's registered society, decided to run twenty stalls to start with in the market and devised a common development fund to help attract institutional credit. Under this fmancing scheme, IRs. 5 * per member per month served as kitty money or for small loans to the group. To pay the Corporation's rent, the rationale was, "Whoever sells, pays daily rent". Speaking at the market's opening ceremony, 34 year old Anjalai, one of the MM group, said, "Now we can have stabifity, infrastructure, reduced spoilage and dignity too".

* IRs.28appx.

Fish vendors on the roadside (facing page) pose a challenge to the women's group selling fish in their Besant Nagar Fish Market (below).

S. Jayaraj

Two years later, Anjalai's perceptions of her market are tempered by experience and good-humoured stoicism. "Our society has shrunk to roughly fifteen permanent members," she narrates. "One of the women has died, several are too old to be actively involved." And the rest? She laughs, "We are still very much here, but business could be better".

The several problems facing the market, which have been documented in two separate studies the BOBP commissioned, include:

- Relatively inconvenient location and marketing timings,
- Lack of adequate transportation from landing centres,
- A prevalence of vegetarians in the area,
- Too many surrounding empty stalls,
- Price fixing by auctioneers,
- Insufficient credit supply,
- Aggressive competition from pavement vendors, and
- Lack of collective fish purchasing by the women.

All these difficulties have, in effect,, resulted in a weakening of the group's ties and in a growing difficulty to meet their day-to-day marketing expenses – the Corporation's rent, for instance. "That there is a limited and narrow perception on the part of the women themselves,, to view the market as nothing more than a convenient place to sell fish, instead of appreciating it as a centre of community activity, does not help the situation," explains M. Elias, a social worker involved in the project.

There is now a diminished sense of togetherness in the MM. Some of the women, in fact, have reverted to door-to-door seffing or mobile vending, because, they claim, "income in the market is sometimes irregular". As a result of this, or possibly as a cause, the weekly MM meetings, "a linchpin of continuity and strength", are held irregularly. Some of the members, obvious victims of the "dependency syndrome", also continue to harbour erroneous expectations about the role of NGOs, such as BOBP, for example, as non-stop purveyors of funds. The bottom line for the sellers, therefore, is stagnant or even decreasing sales, and for the consumer, reduced selections of fish in what has become a fairly unexciting outlet.

Parallel to this scenario are the *25* or so women fish vendors in neighbouring Odaimanagar. They sell fish on the busy Seventh Avenue pavement in Besant Nagar and, for several reasons, will not join forces with the MM group. Theirs is a "prize location", they claim. Also, for 12 years they have done business in the same spot, and customers are both regular and not overly concerned about the unsanitary conditions their fish is subjected too. "So why should we shift?" asks 47-year-old Vaijendi, one of the older members of this group.

The pavement market vendors buy fish communally, sell a fairly extensive variety of produce and, because of a healthy turnover, are able to offer competitive prices. In addition to the confidence that brisk business inevitably fosters, these women are a well-integrated cog in one of the many larger networks of political patronage in the city. In a word, they feel "strong", says a well-informed BOBP consultant. Paradoxically, their legal position, as illegal street vendors, is equally strong. A stay order was given by the Madras High Court against the eviction proceedings initiated by the Corporation in 1990. So, "as things stand today", says R. Poornalingam, Madras Corporation Special Officer responsible for the market infrastructure, "the Seventh Avenue women are set to stay. It's best to get along without them."

If the Besant Nagar fish market is to respond to community needs, as well as generate a decent livelihood for those involved in it, a two-tiered development approach is advocated. On one level, the MM must strengthen itself as a single body capable of facing outside competition. Collective purchasing, transportation and credit support would clearly be natural results of greater group cohesion (there are several government subsidy schemes available for small entrepreneurs). On another, the market must be in position to offer "just a little more", in terms of "cleanliness, variety, timings and overall convenience", explains Poornalingam. BOBP technical inputs, such as icing, headloading devices and other post-harvest technology, for instance, can pave the way for improvement, on the one hand; on the other, added training to reinforce the fisherwomen's skills and promote their collective consciousness would enable them to assume greater responsibility for their market and their future.

No matter how active NGOs are in their efforts to train and empower, ultimately it is local institution's actions and the concerned group itself that either makes or breaks a project. As it stands today, the Besant Nagar market is too big to merely house 20-odd women seffing fish. For this reason, the Corporation has decided to modify the existing market lease provide the MM women with half the market —40 stalls which they can also sublet to meat and poultry vendors – and let the remaining half to general grocery sellers. The "supermarket effect", characterised by the irresistible temptation to buy, will ensue, feels a hopeful Rathin Roy. If "natural market forces are anything to go by", and this market is made "attractive enough, convenient enough and a little bit of money is spent on targeted local promotion", then, thinks Poornalingam, the threat of the nearby street vendors will just "fade out of the picture".

Roy agrees, but points out that neither BOBP nor ODA can continue infinitely to "hand-hold" the project. Which other agency or institution will be able to act as a mediating force betweeen the Corporation and the MM? As yet, no alternatives have been found. Although the Department of Fisheries is interested, for instance, it has no "appropriate mandate" to deal in marketing activities, says Roy. The future of the market, therefore, despite added inputs and general goodwill, may be jeopardised in the long term. Perhaps what is needed is a "revolution in organisational culture", suggests Roy. This means a streamlining and re-directing of the interaction channels between individuals, groups and institutions at large. The aim of the process is to eradicate the need for intermediaries, fostering a more mutually "user-friendly" organisational system.

A 'how-to' manual to help group enterprises

A colourful training manual, for extension staff helping to develop small-scale group enterprises, has recently been published in Indonesia Bahasa by the Director-General of Fisheries, Indonesia, and the Bay of Bengal Programme (BOBP).

The publication had its genesis in Langkat District in North Sumatera Province, Indonesia, where BOBP had a subproject which set out to improve the earnings and socio-economic status of fisherfolk by improving their managerial capacity and by emphasizing group action. The Provincial Fisheries Service (PFS), who were implementing the project, realized that the key ingredients of such a venture, at least to begin with, would be to

- help the fisherfolk to organize themselves into viable groups,
- enable them to start saving in order to generate capital, and
- get them to systematically go about selecting enterprises to set up.

At the same time, they realized that, as a professional technical service, they did not have the necessary skills to do all this. However, they were confident that with training, and some experience, the junior staff of the PFS and of BIMAS, the agency concerned with extension, would be able to do the needful.

Early in 1989, a well-established non-governmental agency, Bina Swadaya, was contracted to implement a campaign which would, in cooperation with the PFS and BIMAS, help the fisherfolk to

- organize themselves,
- start and manage savings, and
- learn how to select enterprises.

The idea was that Bina Swadaya staff, while doing this, would not only train PFS and BIMAS staff, but also give them the hands-on experience of putting their training into practice.

A husband and wife training team, Limawan P. and Setyawati H., joined the subproject and spent seven months, on and off, in the field. They used a varied repertoire of techniques, which included group discussions, posters to stimulate discussion and information transfer, group exercises to raise critical issues, games to bond groups and, in the process, generate learning, and even stories to get people to start thinking afresh.

While NGO trainers are well-versed in such activities, it became obvious that the PFS and BIMAS staff, in addition to training, would require some sort of manual to help them along. Setyawati and Limawan started to document their approach and tools, and by the end of the activity there was the draft' of a manual which could prove to be a valuable tool for extension staff.

The manual, which is well illustrated and easy to use, focusses on:

- how to enable people to form groups and manage themselves and their activities;
- how to motivate people to save and then to manage their savings; and
- how to help people to systematically go about selecting enterprises, while keeping resource availability, market demand, economic viability and available skills and manpower in mind.

The success of the groups and their enterprises in Langkat, and the proven ability of a few of the PFS and BIMAS staff in supporting the groups and expanding the activity, gave the PFS, the Director-General of Fisheries (DGF) in Indonesia and BOBP confidence in the manual. It was at the suggestion of the DGF that it was decided to print the manual for distribution to all extension staff of the DOF, Indpnesia.

The manual, in colour and in Bahasa Indonesia was designed and developed by Setyavati and Limawan of Bina Swadaya. The illustrations, page design and layout were later modified and improved upon by a consultant artist in Madras, before the manual was jointly published by the DGF and BOBP.

The manual ideally should be used by trained staff, but is easy to follow and comprehensive enough to allow motivated extension staff to use it on their own as a learning tool.

RNR

Life on the Beach

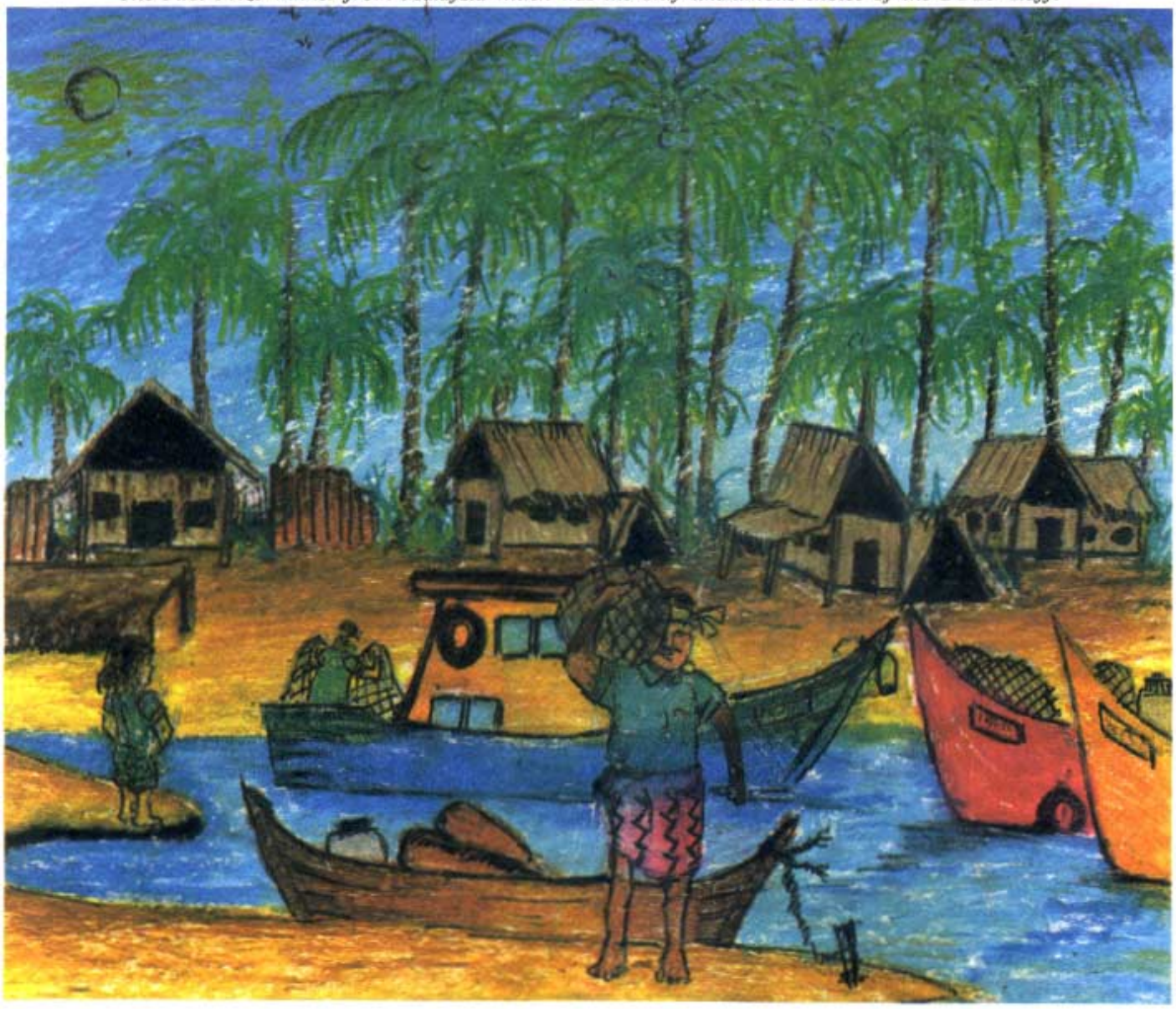
BOBP conducts a children's drawing competition to select pictures for its 1993 calendar

The Bay of Bengal Programme's (BOBP) calendars grace hundreds of desks the world over. In 1991, selected photographs from the Programme's seven member countries were printed in colour and gave a visual appeal to the programme's direct involvement with coastal communities in the region. The previous year, Signar Bengtson's sketches captured — at the stroke of a pencil — the processes of timelessness and change in this same environment. For its 1993 calendar, the BOBP's Information Service has tried something completely different and involved the fishing villages where its extension units work in the countries of the BOBP region.

People's participation becomes more than development jargon when you organise over a thousand fisherfolk children, in the 8-12 year age/class group, to draw you their impressions of 'Life on the Beach'. This was the title of the competition BOBP sponsored in these villages to discover the alternative realities of coastal living trapped in a child's imagination.

Standard A4 size drawing paper and individual crayon boxes were sent to 150-200 children enrolled in the coastal primary schools selected to participate in the competition in each country. The drawing material, the open-ended theme and the promise of attractive cash prizes for the winners were the inputs. What came out of the

The First Prize winner from Malaysia which was the only unanimous choice of the BOBP staff.



Geeta Doctor, chairperson of the panel of judges, and the other judges' make their choice.

exercise represented a great deal more than what the four judges had bargained for.

"Explosions of colour", "Intriguing use of perspective", "Stark variati9ns between the overall ranges from the member countries" and "I simply love it" were some of the comments made by the judges, headed by Geeta Doctor, art critic of an Indian national daily.

The different educational approaches from country to country were also evident from the drawings BOBP received. In Thailand and Malaysia, for instance, where schoolchildren have a certain familiarity with design, artwork and colouring instruments, the results were generally polished and highly idealised. In Bangladesh, where the children said they had never seen or used coloured wax crayons before, and India, where there is an obvious dominance on absract verbalism as opposed to more sensitive visual literacy, the results were artistically unstructured, two-dimensional thematic portraits of life on the beach. This lack of formal artistic training, however, does not imply that their efforts were any less accomplished or beautiful. On the contrary, the Indian, Bangladeshi and Sri Lankan artists all showed a canny eye for accurate detail – dry fish laid on racks, for instance, as well as the sheer abundance of people, and women in particular, bursting out in colour from their drawings.

Besides the winner and two runners-up from each country being awarded prizes, there were consolation prizes too for children whose work was of a standard very close to the winners. In all, 32 prizes were awarded. All winners received cash prizes except in the Maldives, where the children opted for hand-picked gifts – knapsacks, stationery and so on – which they would not find in their own area.

To select the 14 pictures for the calendar, two pictures from each country, the first three from each country and three others from each country recommended by the judges were shown to BOBP's professional staff and theywere polled on their choice for the calendar. The guidelines to them were that, besides visual appeal, the fmal 14 chosen from 42 should reflect, as much as possible, the totality of 'life on the beach' in the region, independent of the picture's prize-winning status. L.D

Congratulations to all the prize-winners, who are:

BANGLADESH
(Nazirpur Village, Patuakhali)

1st Prize: *Tajnehar Begum* (12), Nazirpur High School; 2nd Prize: *Babul Hossain* (11), Nazirpur Primary *School, 3rd Prize: Zesmin (9),* Nazirpur Primary School; Consolation *Prizes: Md. Mazibur Rahman (11), Nazirpur High School; Tahmina Begum* (11), Nazirpur High School.

INDIA (Tuticorin)

1st Prize: J Arun Kumar (10), Subbiah Vidyalaya; 2nd Prize: *A Arul Selvan Prakash (10), Johnson* English School; 3rd Prize: J Jetuliavay (12), St. Joseph's Girls Hr. Sec. School; Consolation Prize: S *Soniya* (12), Das Nays School.

INDONESIA
(Kab Langkat)

1st Prize: *Sri Yanti* (12), P Sembilan K.C. Pul Susu; 2nd Prize: ***Nurlela*** *Abbas* (12), P. Sembilan, K.C. Pul Susu; 3rd Prize: Y S Sabaruddin(12), P.Kampai K.C. Pul Susu; Consolation Prizes: Dedi Sahputra (12), Kebunubi, Pal Siata K.C. Pul Susu; *Rivinawati* (12), P. Kampai K.C. Pul Susu.

MALAYSIA

1st Prize: Shaharul Fazlan *Razali (11),* Sek Keb Ayer Hitam, Kuala Kerpan, Kedah;2 nd Prize: Muhamad Rizal B *Mohmud* (12), Sek Keb Tg Sawai, Bedong, Kedah; 3rd Prize: *Mohd.* Rosidi Bin Ismail (11), Sek Keb Angsaan Yan Kechic, Yan, Kedah; Consolation Prize : *Umfin Hool* (12), S.R.J.K. (C) Hwa Lian, Pangkor Island, Perak.

MALDIVES
(Maafushi)

1st **Prize:** ***Ahmed Fazeem*** (12), Maafushi Madharsa; 2nd Prize: ***Hassan Saamir*** (12), Maafushi Madharsa; 3rd Prize: ***Ibrahim Shareef*** (12), Maafushi Madharsa; Consolation Prize: ***Mariyam Nasira,*** (12), Maafushi Madharsa.

SRI LANKA
(Negombo)

1st Prize: ***Rangana*** *Duthantha* (12), St. Nicholas Sinhala Mixed School, Munnakkaraya; 2nd **Prize:** *Sebastian Poliness* (12), St. Nicholas Sinhala Mixed School, Munnakkaraya; 3rd Prize: ***Ranil Suranga*** (8), St. Mary's Sinhala Mixed School; Consolation PrizesAjitha *Dharmacena* (11), St. Mary's Sinhala Mixed School; *Nimalka Roshani (12), St. Mary's* Sinhala Mixed School.

THAILAND
(Ranong)

1st PrIze: *Akekachai Wanramahn* (12), Ban Somnak, Tambol Muang Kluang, Kaper District; 2nd Prize: *Vaireeda Salee* (11), Ban Pukhaotong, Amphoe Suksomram; 3rd Prize: *Maitree Wanramahn (12), Tambol* Muang Kluang, Kaper District; Consolation Prizes: *Vanera A-Lee,* (10), Ban Kosinhai, Ampermuang; *Parinva Punchang* (12), Ban Chaklee.

BOBP pictures at the World Food Day exhibition in Thailand

Dr Yuwat Vudhimethee, Governor of Phulcet, Arthon Tongwatana, Pres,aent of Phuket Provincial Council and Udom Bhatia, Director of the Phuket Marine Biological Center, look at the BOBP pictures displayed at the World Food Day exhibition at the PMBC.

As part of its celebrations on World Food Day (WFD), 1992, the Marine Biology and Fishery Research Institute (internationally known as the Phuket Marine Biological Center or PMB) of the Thai Department of Fisheries, in cooperation with FAO's Regional Office for Asia and the Pacific (RAPA) and the Bay of Bengal Programme (BOBP), organized an Exhibition of photographs on Food and Nutrition at the Phuket Aquarium. The exhibition was open from October 16th to December 5th.

At the Opening Ceremony, the Governor of Phuket Province, Dr. Yuwat Wuthirnaythee, who presided, said that the WFD exhibition would be beneficial to all those who visited the Aquarium, bbth local visitors as well as foreign tourists, as it would enable them to learn about the need to accelerate agricultural and fishery development in order to ensure adequate food supplies for an increasing world population.

Vêravat Hongskul, FAO's Regional Fishery Officer, who also spoke on the occasion said:

"World Food Hongskul, organized since 1981, brings to the attention of the international community the serious problems of hunger, poverty and malnutrition that still exist in many parts of the world and the need for international cooperation to eliminate these problems...

"The theme chosen for 1992, 'Food and Nptrition', has been specially selected to precede International Conference on Nutrition (ICN) to be held in Rome in December 1992. This will be the first global inter-governmental meeting on nutrition and will focus world attention on the world's nutritional problems and needs...

"Despite significant improvements in global food supplies, 15-20 per cent of the world's population still do not get sufficient food to meet the minimum energy needs for a healthy and productive life. In Asia and the Pacific region alone, more than five hundred million people are still under-nourished due to lack of sufficient energy and protein in their diet. In addition, malnutrition in the form of deficiencies in iron, iodine and vitamin A continues to cause severe illness or death to millions worldwide...

"The task of creating greater awareness of the problems of hunger and malnutrition and to institute effective action remain tasks of great urgency...

"The exhibition on food and nutrition in Phuket is one of the WFD activities in Thailand this year to create such awareness... The photos exhibited... demonstrate the need for more food, especially in the rural areas, and the necessity for both public and private sectors to work together to fmd ways and means to... eradicate hunger, malnutrition and poverty in our communities." The photographs exhibited were part of a photo-contest organized by FAO, in cooperation with Fuji Film (Thailand) and the Press Foundation of Asia, while the photo exhibition of fishenes activities in the Bay of Bengal was provided by the Bay of Bengal Programme of FAO, at the invitation of Plodprasop Suraswadi, Director General, Department of Fisheries, Thailand.

Besides the Exhibition there was an agricultural fair in front of the Aquarium, in which the Provincial Offices of the Department of Fisheries, Agriculture, Livestock as well as the private sector (Phuket Fisheries Association, Phuket Shiimp Farmers Group, Makham Bay Discount Marketing Group) and the Kasetsart University Alumni participated. Exhibition and fair together drew big crowds.

BAY OF BENGAL NEWS

Bay of Bengal News is a quarterly publication of the Bay of Bengal Programme (BOBP), a regional fisheries programme which covers seven countries around the Bay of Bengal — Bangladesh, India, Indonesia, Malaysia, Maldives, Sri Lanka, Thailand. The Programme plays a catalytic and consulative role : it develops, demonstrates and promotes new techniques, technologies or ideas to help improve the conditions of small-scale fisherfolk communities in the member-countries. The BOBP is sponsored by the governments of Denmark, Sweden and the United Kingdom, by member-governments in the Bay of Bengal region, and also by AGFUND (Arab Gulf Fund for United Nations Development Programme). The main executing agency is the FAO (Food and Agriculture Organization of the United Nations).

Danida IMO ODA AGFUND

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