

Bay of Bengal Programme

Environment

**CLEANER FISHERY HARBOURS
IN THE BAY OF BENGAL**

BOBP/WP/82



FOOD AND AGRICULTURE ORGANISATION OF THE UNITED NATIONS

BAY OF BENGAL PROGRAMME
Cleaner Fishery Harbours

BOBP/W P/82
IMO

Cleaner Fishery Harbours
in the Bay of Bengal

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BAY OF BENGAL PROGRAMME
Madras, India
1992

This report summarizes the proceedings of a regional consultation on Cleaner Fishery Harbours in the Bay of Bengal, held in Penang, Malaysia, 9-11 December 1991. It also includes summaries from reports on the status of fishing harbours in India, Indonesia, Malaysia, Maldives, Sri Lanka and Thailand.

The Consultation was held to review the findings of surveys conducted in BOBP member countries and recommend follow-up action.

The surveys, the Consultation and the report on it were jointly sponsored by the International Maritime Organization and the Small-Scale Fisherfolk Communities project of the Bay of Bengal Programme (BOBP).

The Bay of Bengal Programme (BOBP) is a multi-agency regional fisheries programme which covers seven countries around the Bay of Bengal — Bangladesh, India, Indonesia, Malaysia, Maldives, Sri Lanka and Thailand. The Programme plays a catalytic and consultative role — it develops, demonstrates and promotes new techniques, technologies or ideas to help improve the conditions of small-scale fisherfolk communities in 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 Organizations) and UNDP (United Nations Development Programme). The main executing agency is the FAO (Food and Agriculture Organization of the United Nations).

The International Maritime Organization under its Global Programme for the Protection of the Marine Environment concentrates on activities of a catalytic nature, designed to support national and regional action to enhance marine environment protection.

This document has not been cleared by the governments concerned or by the FAO.

April 1992

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The two commonest causes of pollution in fishery harbours: (1) lack of reception facilities for garbage, resulting in it being dumped into harbour waters (above), and pumping of oily bilge water into harbour waters (below).



1. INTRODUCTION

The substantial development in the fisheries of all countries in the Bay of Bengal region can be primarily attributed to the increase in the fishing fleet in general and motorized boats in particular. This fleet generally comprises of small day-boats exploiting the inshore waters as well as larger boats for harvesting fish resources in offshore and distant waters. Though a large portion of the overall fish production is from traditional boats operating from beaches and small fishing centres, the increasing number of motorized boats has resulted in the creation of fishery harbour complexes to provide facilities for berthing, handling of fish catches, bunkering and boat supplies.

Some larger harbours have been integrated with main ports, while several of them have been established exclusively for fishing boats. The main ports are required to comply with international and national regulations and measures with regard to pollution and the infrastructure to deal with it. Such measures and regulations are neither acceptable nor enforced in many fishery harbours and landing places.

The main activities in such places, viz, fish handling, bunkering, fish marketing and boat repairs, generate pollutants in proportion to the size of the fleet and the number of people using the harbour. Pollution can be in the form of oil leaks, bilge discharge, fish waste and garbage. In many cases, effluents from nearby industries and sewage discharge into the harbour exacerbate this problem. Such pollution can have a detrimental effect on the quality of fish handled at such centres, besides creating an unhygienic environment.

It was to study how serious the problem of pollution is in the fishery harbours of the region that the project 'Cleaner Fishery Harbours in the Bay of Bengal' was undertaken. The project has the development objective of creating an environment in fishing harbours/landing centres conducive to hygienic handling of fish. The immediate objectives were to

- (a) conduct surveys of selected fishing harbours/landing centres to obtain baseline information on pollution factors and how they affect the port environment and fish quality; and
- (b) organize a regional consultation to discuss the findings of the surveys and recommend follow-up action.

The Project was sponsored by the International Maritime Organization (IMO) and the Bay of Bengal Programme (BOBP), both of whom are concerned with cleaner harbours. The IMO's Global Programme for the Protection of the Marine Environment concentrates on activities of a catalytic nature, designed to support national and regional action to enhance marine environment protection. Improvement of the port environment, and collection of baseline information for pollution problem identification and assessment are two issues which are also of concern to the BOBP, with particular reference to fishing harbours and landing centres.

Under the Project, country surveys were conducted in selected fishing harbours in India, Indonesia, Malaysia, Maldives, Sri Lanka and Thailand by teams of national experts in the fields of marine pollution and post-harvest technology. Bangladesh did not participate in the surveys. These findings were discussed in a regional consultation organized in Penang, Malaysia in December 1991. The valuable information obtained from the surveys was appreciated by all at the Consultation, as such surveys had not been conducted before.

Besides the national consultants involved in the surveys, a representative connected with the management of fishing harbours in each BOBP member country participated. Other delegates included representatives from IMO, FAO and BOBP.

This report contains summaries of the proceedings of the Consultation and of the country survey reports.

2. SUMMARY OF CONSULTATION PROCEEDINGS

Status reports on selected fishing harbours were used as working documents for the Consultation. These reports contain information on the size of the fishing fleet, quantities of fish landed per annum, available infrastructure and facilities. Pollution factors affecting the port environment and fish quality were categorized as vessel-generated, user-generated and from external sources. The findings were well supported by visual records in the form of slides and video recordings.

The participants presented their findings and highlighted the main pollution problems in each centre. They also made their recommendations on how to improve the situation.

The presentations showed that fishery harbours could be polluted in many ways. It was noted that nearly all activities, such as fish landings, fish marketing, bunkering, boat supplies, boat repairs and fish processing, generate pollutants and if the infrastructure to handle them is inadequate – which is the case in most places – the port environment and harbour water quality suffers. The problem is exacerbated by sewage and other effluents flowing into the harbour in many cases. In addition, some harbours suffer from specific problems such as siltation and overcrowding that further aggravate environmental degradation.

The delegates viewed with concern the fact that harbour water is used to clean the fish at some stage after landing, in nearly all fishing harbours.

The main conclusions of the discussions were :

- Harbour water pollution is mostly organic in nature.
- Garbage collection and disposal facilities must be improved.
- Toilet facilities must be improved.
- Users lack awareness on the importance of a clean environment.
- Standards are required for water quality acceptable for cleaning fish.
- Guidelines are required for suitable disposal of sewage, effluents, fish waste and toilet waste.

While discussing suitable follow-up action, some important issues that needed to be



Organic pollution



Garbage disposal



Toilet maintenance



Environmental pollution



Water degradation



Waste disposal

considered were brought out. For example, while user-generated pollutants causing localized pollution could be remedied by providing the necessary infrastructure and facilities, pollution from external sources was beyond the control of harbour managers. Another was the importance of taking due note of the economic loss that may result through non-compliance with good standards and practices.

The Consultation noted that two distinct follow-up actions were required : — in the short term, to address pollution aspects and other shortcomings causing localized harbour pollution, and, in the long term, to consider the overall affects on small-scale fisheries of environmental degradation beyond the confines of fishery harbours.

Recommendations were made, after further discussions, for national, regional and international agencies to consider.

2.1 *Recommendations*

2.1.1 SHORT TERM

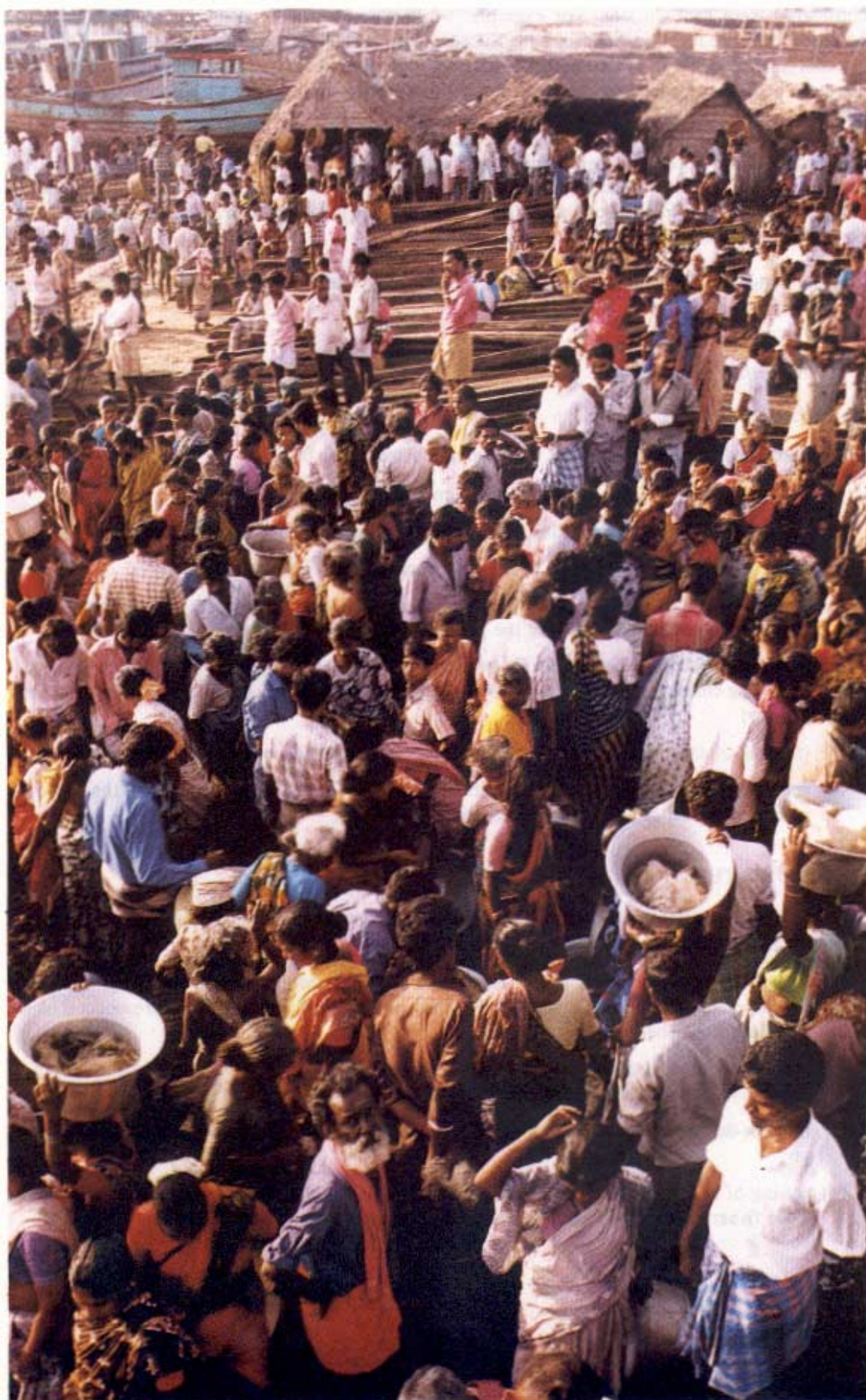
Ensure the immediate improvement of the port environment by

- (a) improving facilities for garbage collection and disposal;
- (b) providing and/or rehabilitating basic toilet and fresh water facilities in the harbour;
- (c) using appropriate technology to improve facilities and fish handling;
- (d) providing guidelines and promoting extension activities to organize the various groups involved to collectively address the problem;
- (e) awareness-building for fisherfolk, traders, harbour administrators and others involved, including children, on the importance of a clean environment for better hygiene and food quality;
- (f) training of managers and education of users in the proper use of facilities; and
- (g) achieving voluntary acceptance by users of guidelines for the use and upkeep of the harbours where rules and regulations do not exist.

2.1.2 LONG TERM

To achieve better management of the pollution problem, considering its adverse effects on the small-scale fisheries sector, due consideration should be given to

- (a) integrated planning by all those responsible for environment, urban planning, industrial development, health and fisheries, so that they could collectively address environmental issues affecting the fisheries sector;
- (b) establishment of acceptable standards for water quality, disposal of waste from industry, disposal of domestic sewage and treatment of solid and liquid wastes from the fishing industry;
- (c) more in-depth surveys, including the socio-economic aspects of future harbour development; and
- (d) zoning of industrial areas and land reclamation in relation to existing and planned small-scale fishery operations and aquaculture activities.



The Madras Fishery Harbour: The kattumaram land their catch in this open stretch where every activity from cleaning the fish to retail sales, then takes place.

3. *SLJMMAR V OF COUNTRY REPORTS*



Fish drying on the wharf at Kakinada



The kattumaram use the crowded beach, not the fish landing area in the Madras Fishery Harbour

3.1 INDIA : *The fishery harbours of Kakinada, Madras and Tuticorin*

(by V K Pillai and P A Perigreen)

General : Among the major fishery harbours on the east coast of India, Kakinada, Madras and Tuticorin, in the states of Andhra Pradesh and Tamil Nadu, are important ones, where substantial quantities of marine fish are landed. Kakinada harbour was commissioned in 1988, Madras in 1985 and Tuticorin in 1981. All three ports mainly service India's large fleet of shrimp trawlers, which range from 10 m dayboats to 23 m multiday boats. Fish landings, including shrimp, are of the order of 15,000 t/year at Kakinada, 20,000 t/year at Madras and 7,000 t/year at Tuticorin. All three are open sea, man-made harbours. On an average, 200 boats operate from Tuticorin and 500 from Kakinada and Madras.

Management of harbours : Kakinada fishery harbour is maintained and managed by the Port Office of the commercial port. Madras fishery harbour is managed by a committee comprising of officials from the main port, members from various government departments, members representing the fishery committee and fishing boat operators. And Tuticorin port is managed by the Tamil Nadu Fisheries Development Corporation. Port dues are charged in all the harbours, based on vessel size. No special rules are in force at present with regard to pollution.

Infrastructure : Concrete landing and berthing jetties are provided in all three harbours. A covered area for fish handling, sorting, icing and auction is also a standard feature. Boats can be repaired in all three harbours as slipway facilities are available. Diesel fuel supply from storage tanks within the complex is also available. While fresh water is available in sufficient quantity at Kakinada, it is very limited at Madras and Tuticorin. However, private vendors cater to boat needs. Toilet facilities exist at Kakinada and Madras. At Tuticorin refuse is removed by the Municipality from time to time. Ice is available in sufficient quantity.

Fish handling : Catches from trawlers comprise of shrimp, fish species such as sciaenids, clupoids and trichiurus, and trash fish. Shrimp are sorted, iced and packed after auction and transported to peeling sheds or processing factories. Due to their high value, care is taken to use fresh water to wash the shrimp. Fish, on the other hand, are often washed using harbour water, then packed in baskets with ice for local and distant markets. Fish drying for human consumption and for fish meal is carried out within the harbour premises in Kakinada and Madras. At Tuticorin, fish is dried outside the harbour.

Pollutants : Pumping of bilge water contaminated with oil and fish waste from boats is a common feature in all the harbours. The degree of pollution is less in Kakinada, as the harbour is not fully operational as yet and most boats still moor in the town canal. Kitchen waste and deck washings also contribute to boat-generated pollution.

Most of the major pollution in the three harbours is organic and generated by users of the harbours. Garbage invariably finds its way into harbour water. In Madras, the harbour complex has been encroached on by several temporary tenements. With toilet facilities inadequate, this has resulted in a high level of fecal pollution. The careless handling of trash fish and the dumping of shrimp

Fig. 1. Locations of fishery harbours surveyed on India's east coast



heads into harbour waters causes further deterioration of water quality. City sewage discharged in the vicinity is likely to add to organic pollution. Effluents emptied into the sea in Madras and Kakinada, close to the harbours, are also a cause for concern.

Recommendations

- Provision of adequate freshwater.
- Provision of reception facilities for garbage and oily wastes.
- Education of fishermen to prevent fish being washed with harbour water.
- Awareness-building for users on the importance of a clean environment.
- Provision of toilets.
- Improvement of fish drying facilities and methods.
- Strengthening security arrangements to prevent unauthorized entry.
- Implementation of a pollution monitoring programme.

For further information

1. Harbour Project Engineer
Fishing Harbour Project
New Port Area
Kakinada 533 007.
2. Executive Engineer & Manager
Madras Fishing Harbour Project
Royapuram
Madras
3. Assistant Director of Fisheries
Fishing Harbour Complex
Tuticorin
Tamil Nadu



The fish landing area in Madras Fishery Harbour is used to sort trashfish etc.



Pumping oily bilge water from a vessel in Madras Fishery Harbour



Waste from plywood industry at Bungus



Private jetties in Belawan

3.2 *INDONESIA . The fishery harbours of Bungus, Belawan and Lampulo* (by A M Samosir and I Setyaningshi)

General : The fishery harbours of Belawan on the east coast of North Sumatera, Lampulo on the northern tip in Aceh Province and Bungus on the west coast, close to Padang, are examples of the different types of landing centres found in Indonesia. Belawan, an important commercial and fishery harbour, is the base for larger purse-seine boats exploiting the offshore. Lampulo is a typical inshore fishery harbour for smaller boats engaged in purse-seining. And Bungus is a new enterprise for small trollers and seiners. The small boats range from 6 to 20 GT and the larger purse-seiners from 20-80 GT. Catches in Lampulo and Bungus are mostly yellowfin tuna and skipjack, whereas the catch is more varied in Belawan.

Management of harbours Belawan and Bungus are termed Pelabuhan Perikanan Nusantara (PPN), or National Fisheries Harbours, while Lampulo is termed as Pelabuhan Perikanan Pantai (PPP), or Inshore Fisheries Harbour. They are managed by the local Port Authority under the overall supervision of the Directorate General of Fisheries.

Revenue for the port is generated by collecting berthing fees, licensing and taxes on trade. Rules and regulations at present deal only with port dues and security.

Besides the main landing jetty, several privately owned wooden jetties exist, making it difficult for the authorities to control and manage the harbour complexes.

Infrastructure : Concrete jetties are provided by the government. Privately-owned jetties are of wooden construction. Pier space is not adequate in Belawan. Heavy siltation near the wharf in Lampulo has denied access to the larger boats. They are usually anchored in deeper water and catch and boat supplies are made by smaller boats.

A covered receiving hall is provided in all three ports for handling, sorting, icing and packing the fish. Marketing by auction is conducted in this area in Belawan and Lampulo. In Bungus, there is a separate shed for the auction. Fuel is supplied at the dockside from the main tanks situated within the complex. Municipal fresh water is supplied in limited quantities at Lampulo and Bungus. At Belawan, freshwater is drawn from an artesian well.

Garbage bins are provided in all three harbours, but they are insufficient during the peak season. Toilet facilities are also limited. Toilet waste from private jetties is discharged directly into the harbour.

Fish handling : The catch is brought to the receiving hall in baskets. Here, the fish are sorted and washed using harbour water if fresh water is not available, Fish for the local market is not iced. Processing of fish into fish meal and fish drying are carried out on the private jetties, particularly in Belawan.

Fig. 2. Locations of fishery harbours surveyed in Sumatera, Indonesia



Pollutants : Oily bilge discharge, garbage, waste from toilets and fish holds are the main boat-generated pollutants. Dumping of trash fish, non-degradable garbage, waste oil from repair facilities, drainage from the jetties and the receiving hall further add to the deterioration in water quality and the port environment.

Organic pollution, due to domestic waste from villages located nearby, is heavy in Belawan. Treated and untreated industrial effluents from waterfront industries in Belawan (palm oil) and Bungus (cement, plywood) are other external sources of pollution.

Recommendations

- Biological monitoring of harbour water to assess level of pollution.
- Establishing standard parameters and limits to control pollution.
- Treatment plant for waste water.
- Awareness building among users of the harbour.

For further information

1. Belawan Fishing Port Authority
C/o Fisheries Services of North Sumatera
Belawan
2. Lampulo Fishing Port Authority
C/o Fisheries Services of Aceh
Aceh
3. Bungus Fishing Port Authority
C/o Fisheries Services of West Sumatera
Bungus



Service and repair activities in Lampulo Fishery Harbour



Fishermen's housing that contributes to organic pollution in Belawan



Pier-side facilities at Batu Maung



River laden with piggy waste near Batu Maung

3.3 MALA YSLA . The fishery harbours of Batu Maung and Kuala Kedah

(by Ismail Bin Haji Ishak and Liong Pit Chong)

General : The Batu Maung and Kuala Kedah

fish landing complexes are typical examples of fish landing centres in Malaysia. The former is a major landing centre located in the island of Penang, serving not only the local fishing fleet but also boats from the neighbouring states of Perak, Kedah and Selangor. Kuala Kedah, on the other hand, is located at the mouth of the Sungai Kedah river.

Over a hundred boats of 25-75 GT operate from Batu Maung. Trawlers form a majority; the rest are either purse-seiners or driftnet vessels. Landings are of the order of 4000 t/year and nearly a quarter of the catch is low value fish used for *surimi* production and fish meal.

Kuala Kedah is the base for over a thousand fishing vessels, but only half of them are motorized with inboard diesel engines. The rest are small craft, usually powered by outboard motors. Sizes range from 10 to 100 GT, the majority being trawlers. Annual landings at Kuala Kedah are estimated at 50,000 t. Besides the jetty operated by the government, there are many privately owned jetties offering berthing and landing facilities to the fishing fleet here. Kuala Kedah harbour also serves cargo vessels and ferries to Langkawi island.

Management of the harbour : The two main landing centres are managed by the Malaysian Fisheries Development Authority. Rules are generally concerned with the use of facilities and port dues. Some revenue is generated for the complex management by collecting a levy on fish sales. Facilities at private jetties are offered free of charge to vessels which sell their catch to the jetty owners.

Infrastructure : The Batu Maung complex is well equipped with modern facilities, which include a T-shaped jetty, two cold rooms, a bay for grading, icing and boxing, an auction bay, workshops, an ice crunching machine, a fork lift and winch facility for fish handling, toilets and bunkering facilities for diesel and fresh water. Garbage is collected daily by the local Municipal Council. A privately owned slipway and dry dock for boat repairs is located nearby. Similar facilities are also available at Kuala Kedah.

Fish handling : Fish are usually washed, sorted and iced on board the fishing vessels. The iced fish are carried in baskets to the handling area for grading, boxing and despatch after re-icing. Trash fish for fish meal plants are, however, left in a heap at Batu Maung, within the complex, for collection in due course. A fish processing plant for fish cakes, fish balls and fish crackers is located within the complex. Fish is also sun dried within the complex premises. Fish processing and fish meal plants in Kuala Kedah are located in the village.

Pollutants : The main source of pollution from fishing vessels is the occasional pumping of oily bilge water, waste water from the cleaning of boat decks and kitchen waste. At Kuala Kedah, discharge from cargo boats and ferries also contribute to this category of pollution. Direct flushing of toilet waste from boats into the river also cannot be overlooked at Kuala Kedah.

Fig. 3. Locations of fishery harbours surveyed in Malaysia



The sorting, grading and packing operations generate some solid and liquid fish waste, which finds its way into the harbour when the area is cleaned. Waste from fish processing plants in Batu Maung also enters into the harbour.

The main pollution is from external sources at both centres. The Nipah river in Batu Maung carries untreated piggery waste into the bay at present. There is a move, however, to relocate the piggery industry on the mainland. Sullage and domestic waste from households are other sources of pollution. The Sungai Kedah river at Kuala Kedah drains several urban centres. Untreated domestic waste, treated sewage (from septic tanks) from major urban centres and food waste from seafood restaurants are also discharged into the river.

Destruction of the mangrove area in Batu Maung, due to land reclamation for industrial purposes, needs special mention.

Though cockle beds have disappeared, the presence of fish cage culture here and successful prawn farms in Kuala Kedah indicate that the water quality is still within acceptable limits.

Recommendations

- Pilot treatment plant for piggery waste at Batu Maung.
- Improved temporary storage for trash fish at the Batu Maung complex.
- Promotion campaign for a cleaner environment

For further information

1. Manager
Malaysia Fisheries Development Authority
Kompleks Perikanan LKIM
Batu Maung
Penang
2. Manager
Malaysia Fisheries Development Authority
Kompleks Perikanan LKIM
Kuala Kedah
06600 Kuala Kedah
Kedah



An overflowing drain during high tide at Kuala Kedah



Floating debris carried in and out by tidal water at Kuala Kedah



Overcrowded Male harbour



Dead baitfish dumped into harbour waters in Male

3.4 MALDIVES. *The fishery harbours of Male and Felivaru*

(by Hassan Shakeel, Mohammed Thoufeeq and Ahmed Moosa)

General : The Maldives has for long used natural lagoons of islands as harbours. However, with many of them becoming shallow, man-made harbours to service the growing fleet of motorized boats, including fishing boats, are being developed. Two such harbours are Male, in Maté Atoll, and Felivaru in Lhaviyani Atoll. The Male harbour is used by many boats, such as inter-island ferries, cargo boats and fishing boats, whereas the Felivaru harbour is used nearly exclusively by fishing and collection boats supplying the tuna processing plant located there. About 95 local fishing *dhonies* and other boats that fish near Maté Atoll land 500 metric tons of fish a year on an average. Fifty fishing *d'ionies* and four collection boats operate from Felivaru, which exports nearly 2800 metric tons of canned tuna yearly.

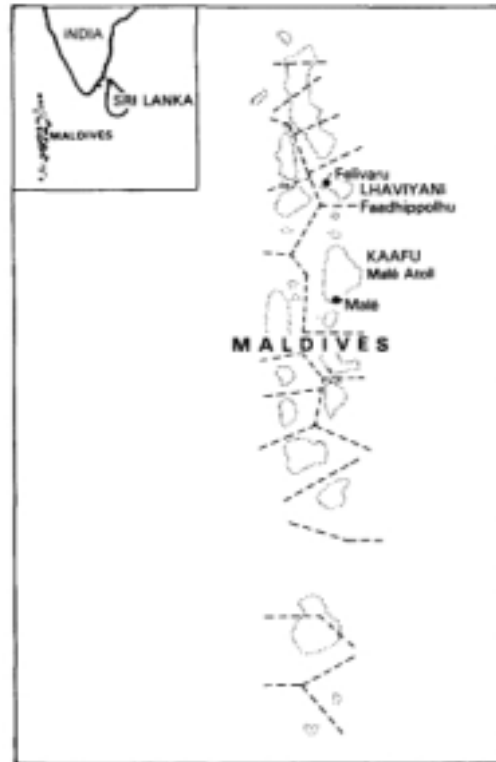
Management of harbours Male harbour is managed and controlled by the Ministry of Public Works and Labour, while the fish market is managed by the Male Municipality. Harbour rules preventing pollution exist, but are seldom enforced in the case of boat-generated pollutants. Felivaru harbour is well managed by the tuna processing plant. Control is also easier, due to the limited number of users.

Infrastructure : Male harbour has ten small jetties for mooring. The Felivaru harbour has a long jetty with four fish landing stations. Fresh water is a scarce commodity in the Maldives and the supply from desalination plants is very limited. Fuel supply is not organized in Maté harbour. Reception points for garbage are inconveniently located and there are no public toilets in the vicinity of the harbour. Felivaru harbour, on the other hand, is well organized, with fuel and water supply at the jetty, garbage bins at suitable locations and toilets for crew of Felivaru-based vessels. Repair facilities are available at both the ports.

Fish handling The Male fish market is located in the harbour and fish from the boats are taken there for gutting, skinning and eventual sale. Drainage from the fish market complex is connected to the main drainage system of the island. At Felivaru, the fish are processed at the tuna processing plant.

Pollutants : Bilge water contaminated with oil, fish blood and unwanted dead bait fish are the fishermen's contribution to harbour water pollution at Male. The large resident boat population in Male harbour pollute the harbour waters with garbage, kitchen waste and toilet waste. Untreated sewage from nearby buildings was discharged into Male harbour until 1989, but is now discharged into deep water away from the island. It is possible, however, that some sewage washes in. The presence of relatively high fecal coliform counts and the presence of raw sewage in Male harbour indicates that the harbour water quality is low. In Felivaru, large amounts of seaweed accumulate and decompose in the harbour, encouraging algae and sea grass growth.

Fig. 4. Locations of fishery harbours surveyed in the Maldives



Recommendations

- Construction of public toilets near the Maté harbour.
- Conduct a broad pollution study beyond the confines of the fishery harbour.
- Adaptation of reasonable standards of water quality.
- Guidelines for maintaining environmental quality.
- Provision of freshwater supply at convenient locations within the Male harbour.
- Improvement of garbage collection and disposal systems.
- Setting up a harbour users' committee to monitor and upgrade environmental standards.
- Enforcement of rules.

For further information

Ministry of Fisheries & Agriculture
Marine Research Section
Male
Maldives

2. Felivaru Tuna Processing Plant
Felivaru
Maldives



In parts of Male harbour, there is much garbage and high BOD values have been recorded



Well-maintained facilities at Felivaru fishery harbour



The heavily silted fishery harbour in Beruwala



Animals have free access to the fish handling area of the Beruwala harbour

3.5 SRI LANKA – The fishery harbours of Tangalle, Galle and Beruwala

(by S Y Namaratne and H Dassanayake, NARA, Colombo)

General The fishery harbours of Tangalle, Galle and Beruwala are important landing centres in south and southwest Sri Lanka. All three are man-made harbours, created to provide landing and related infrastructure facilities to the motorized fishing fleet comprising of 18-32 m boats fishing in near and offshore waters. The majority of the boats are engaged in driftnet fishing for large pelagic species like tuna, shark, sailfish and marlin. Some boats in Beruwala are engaged in purse-seining for small pelagics like sardine. Nearly 250 boats operate from Beruwala and 100 each from Galle and Tangalle. Landings are the maximum at Beruwala and amount to nearly 6000 t/year.

Management of harbours : All three harbours are managed by the Ceylon Fishery Harbour Corporation (CFHC), an autonomous body under the Ministry of Fisheries. There is a move to hand over management responsibilities – except for dredging and maintenance of marine structures – to cooperative societies.

No port fees or other levies are charged at present, in keeping with government policy.

Infrastructure : Each harbour provides a concrete jetty for mooring of boats and landing the catch. While the pier space is adequate in Galle, heavy siltation in Beruwala and Tangalle has denied access to the bulk of the fleet. The problem is so acute in Beruwala that fish and boat supplies are transported from the boats to the landing area (beach) by small non-motorized craft. Basic facilities like fresh water and ice are inadequate to meet the needs, especially during the peak season. Garbage collection and disposal is grossly inadequate in all three ports. While diesel fuel is available from a pump at the jetty in Galle, it is supplied in barrels to vessels in Tangalle and Beruwala. Toilet facilities are also inadequate.

Fish handling : The catch is sorted and gutted at the landing spot. Harbour water is used to wash the fish, which are later iced and transported by truck to the main markets. Fish offal is invariably dumped into the harbour, or left to decompose on the beach.

Pollutants : **Water** quality and the port environment in all three ports suffer from pollution generated by boats and users of the harbour. In addition, inflow of untreated sewage and other effluents into the harbour, from external sources, exacerbates this problem. The main sources of pollution are

BOAT-GENERATED Oil spillage while refuelling, pumping of oily bilge water and waste water from washing boats. Solid waste from boat repairs is also washed into the harbour during the rainy season.

USER-GENERATED Dumping of fish offal and garbage into harbour waters, defecation within the premises and untreated waste from toilets contribute to pollution which is mainly organic.

Fig. 5. Locations of fishery harbours surveyed in Sri Lanka



EXTERNAL SOURCES : Drainage from a hospital and prison in Tangalle, effluents from a coir fibre processing plant and domestic waste in Galle and light and domestic waste from the town in Beruwala adversely affect the water quality.

Recommendations

- Dredging of Tangalle and Beruwala harbours.
- Provision of adequate facilities to receive and dispose garbage.
- Provision of toilet facilities and suitable measures to treat waste.
- Promoting an awareness among users on the importance of hygiene and a clean environment (by sign boards and leaflets, for instance).

For further information

1. Chairman
Ceylon Fishery Harbours Corporation
Rock House Lane,
Colombo 15
2. Maintenance Officer
Ceylon Fishery Harbours Corporation
Tangalle
3. Chief Engineer
Ceylon Fishery Harbours Corporation
Galle
4. Civil Supervisor
Ceylon Fishery Harbours Corporation
Beruwala



Decomposed fish offal in Beruwala. Maggots and worms are seen in abundance in such refuse



Loading of fuel onto fishing boats. Tangalle



Overcrowding in Phuket Fishery Harbour



Garbage left on the jetty after fish handling in Phuket

3.6 THAILAND: The fishery harbours on the Andaman Sea coast

(by Prawin Limpsaichol and Dr Poonsap Virulhakul)

General : The Andaman Sea coast of Thailand is an important fishing area for **Thailand**, contributing nearly 250,000 tonnes of pelagic and demersal catches and accounting for nearly 22 per cent of marine fish production. The fishery harbour complexes of Satun Province in the south, Ranong Province in the north and Phuket in between are the main harbours providing landing and related facilities to the motorized fishing fleet which comprises of boats 10-40m long. These boats are engaged in trawling and purse-seining in the Andaman Sea.

All three harbour complexes are located at river mouths — near the Bumbung in Satun, Tajean in Phuket and the Thar Darn in Ranong. The estuarine area has dense mangrove vegetation and several small villages are located upstream. The mangrove ecosystem is important for the breeding and nursing of marine life.

Management of harbours : In all three centres, boats use private jetties as well as facilities provided by the government. The Fish Marketing Organization, an autonomous body under the supervision of the Ministry of Agriculture and Co-operatives, manages the landing centres provided by the government besides being involved in the marketing of fish. Privately run jetties provide facilities for their own fleet. Revenue is usually generated by charging a commission on fish trade. Service charges are very moderate and, therefore, do not cover costs of maintenance or upgradation of facilities.

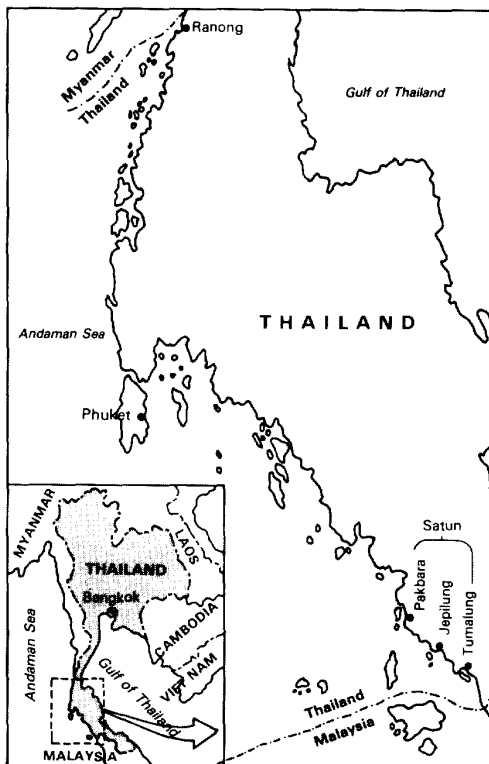
Infrastructure : Each of the three FMO ports provides a concrete jetty for berthing of vessels. In Ranong and Phuket harbours, separate jetties are provided for unloading trash fish for the fishmeal factories located in the complex. A covered area adjoining the jetty is provided in each harbour for handling, sorting and icing of fish prior to despatch to market. Fresh water supply from the municipality is limited, but privately operated water tankers meet the need in each harbour. Toilet facilities in all three ports is inadequate; most of those in the privately owned jetties drain directly into the rivers.

Slipway facilities for boat repairs are available at Ranong and Phuket. Diesel fuel is readily available from dockside outlets. Reception facilities for garbage, however, are inadequate.

Fish handling : Landed fish are sorted, then cleaned with river water and packed with ice in plastic tubs for transport by cold storage trucks. In bigger vessels, the catch is sorted and iced on board. Trash fish is usually landed at the jetties belonging to the fishmeal plants.

Pollutants : With no reception facilities for oily bilge and used engine oils, vessels invariably discharge these into the river. Some amount of garbage, kitchen waste and toilet wastes are also boat generated.

Fig. 6. Locations of fishery harbours surveyed on the Andaman sea coast Thailand



Fish handling activities involving cleaning, icing and packing generate a large amount of non-degradable garbage, such as plastic bags and polystyrene containers. Though some of it is collected, cleanup operations at the end of the day, using pumped river water, invariably washes some amount of such garbage, together with fish waste, into the harbour waters. This garbage eventually collects in the mangroves. Domestic waste from villages upstream also discharge into the river, adding further to organic pollution.

Recommendations

- Provide reception facilities for oily bilge water and used engine oil.
- Provide more garbage collection bins and improve disposal systems.
- Create user-awareness of the problem of pollution.
- Train harbour managers to implement guidelines for maintaining a clean environment.

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Accumulated garbage in the mangroves at Phuket



Harbour water pollution due to dumping of oily waste at Jepilung

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PUBLICATIONS OF THE BAY OF BENGAL PROGRAMME (BOBP)

The BOBP brings out the following types of publications:

Reports (BOBP/REP/...) which describe and analyze completed activities such as seminars, annual meetings of BOBP's Advisory Committee, and subprojects in member-countries for which BOBP inputs have ended.

Working Papers (BUBP/WP/...) which are progress reports that discuss the findings of ongoing BURP work.

Manuals and Guides (BOBP/MAG/...) which are instructional documents for specific audiences.

Information Documents (BURP /INF/...) which are bibliographies and descriptive documents on the fisheries of member-countries in the region.

Newsletters (*Bar of Bengal News*) which are issued quarterly and which contain illustrated articles and features in non-technical style on BURP work and related subjects.

Other publications which include books and other miscellaneous reports.

A list of publications from 1986 onwards is given below. A complete list of publications is available on request.

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82. *Cleaner Fishery Harbours in the Bay of Bengal* (Madras, April 1992)

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