

BAY OF BENGAL NEWS

The journal of



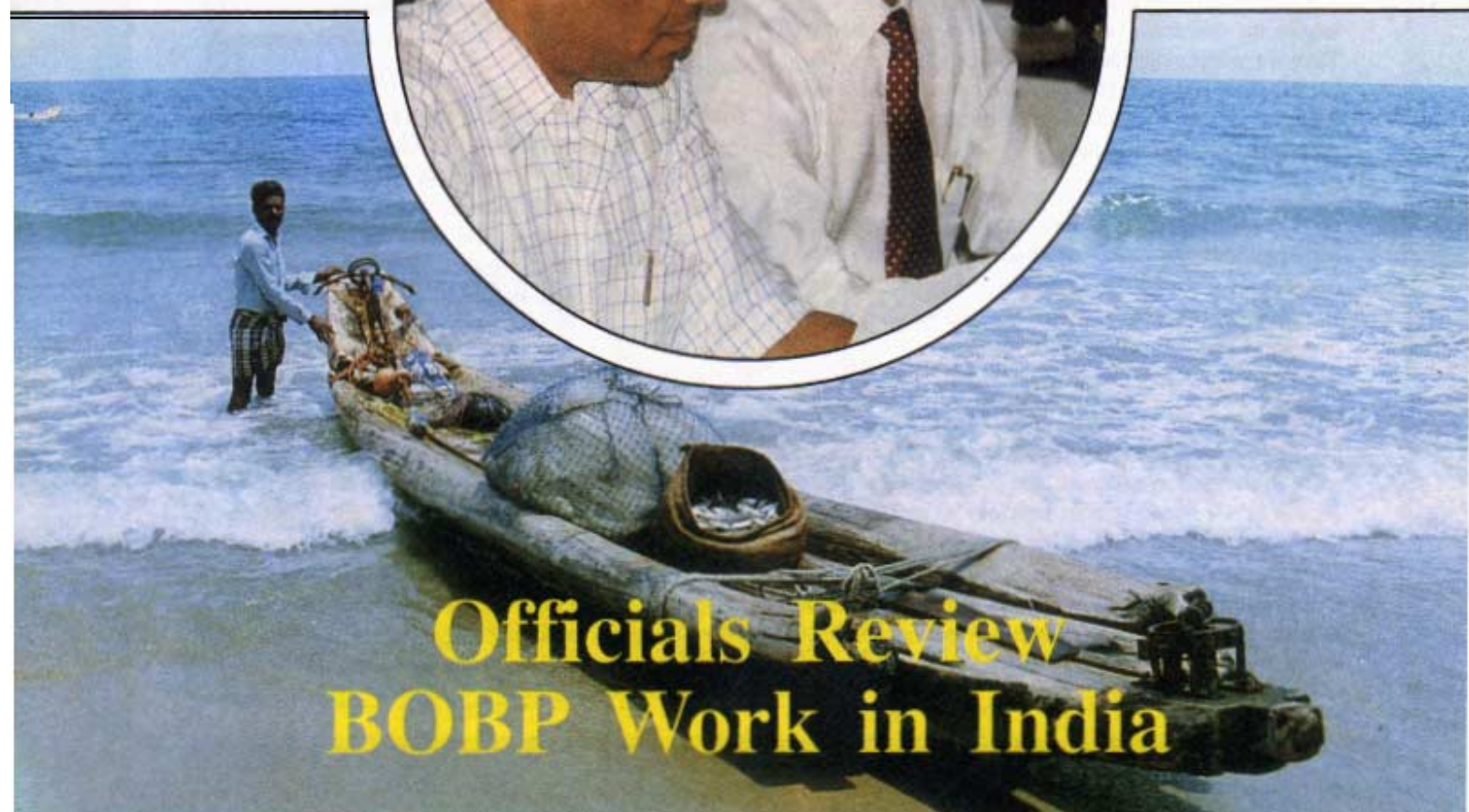
For Fisheries Management

BAY OF BENGAL PROGRAMME

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**Officials Review
BOBP Work in India**

Tapping the power of the media to promote fisheries management

Fisheries management calls for restraint on the part of fish harvesters big and small.

The principle is simple: avoid practices that damage the resource and its habitats.

We need to persuade fishers that restraint is in their personal interest, not just the community's interest. Fisheries management is not a philosophical ideal or an abstract concept, it is a practice essential for survival – not only of fishers but of everyone. Fish has no equal as protein-rich food; annual global demand for marine fish, for example, is expected to grow in a few years to as much as 130 to 160 million tons, while supply may not exceed 85 to 100 million tons. Given its health attributes, the demand for fish can only go up.

But advising restraint is easy, practising it isn't – particularly when the fisherman on whom we urge restraint depends for his very livelihood on his next haul.

Further, transforming deeply ingrained attitudes, and changing traditional behaviour, are both difficult. Resistance to change is universal.

To make fisheries management possible, we need help from the media, at two levels,

The mass media – particularly newspapers, magazines and television – can spread awareness among the educated – the policy-makers, the decision-makers, the housewives – about fisheries management and the need for it. *Newspapers and magazines*, the daily reading fare of the educated, are ubiquitous in urban homes. They are getting flashier and glitzier all the time. Why not use their power to bring fisheries management into the glare of the public eye, and convert callous inattention to positive action?

Promoting fisheries management among the educated calls for a pro-active approach to press relations. Fisheries planners and managers should take every opportunity to tell the press why fisheries management is urgent and crucial, and how the press can help the process. They should strive not merely to build awareness but also induce action.

At the same time, the media should strive to project a balanced view of fisheries management – the nature of today's problem, its genesis, the solutions. The media should be on guard against attempts to manipulate it and promote a one-sided or prejudiced viewpoint. Communication mischief or manipulation is unfortunately widespread – on environment, on fisheries as well as on other issues. Some newspapers are quick to join the populist bandwagon on development issues

without taking the trouble to investigate or analyse them. Shrimp aquaculture offers an example.

At the grassroots level, a variety of media – the radio, video, comics, posters, exhibitions and demonstrations, and street theatre, supported by interpersonal communication – could be tapped to induce and influence the conservation ethic among fisherfolk.

Audio-visuals and video films impact all the senses. Their appeal is visual, aural, emotional and cerebral. BOBP hopes to produce a video film on fisheries management. It could be translated and distributed widely. We do hope this film will lead to others that contain more specific and localized messages. Besides using such films, fisheries administrators should reach out to television news channels as well, as part of the pro-active approach mentioned earlier.

Posters on fisheries management, particularly those in local languages, can make their point tellingly. BOBP

has produced several posters (see page 24), and they are available to governments and fisheries projects, and any one else who is interested.

Comics, professionally produced, can convey messages with clarity and force. But preparing and producing comics call for skill, effort and time. The agency producing comic books must research the facts and spend time with the experts and the fisherfolk, to understand what fisheries management is all about and what fisherfolk think about it. It must then use its knowledge to create and illustrate a simple fictional tale set in a fishing village, which fisherfolk empathize with.

To be effective, the comic book must have a strong local flavour. A comic book set in Andhra Pradesh (AP), India, for example, must show AP fishermen, to be credible. If it is set in Indonesia or Malaysia, it must recreate that environment and show the fishermen who live there. However, a single story theme can serve as the basis for comic books in several languages and countries.

BOBP during its second phase produced two comics – “Our fish, our wealth” and “Our shrimp, their lives.” Feedback and evaluation confirmed their impact.

Radio is another useful medium in remote villages not regularly accessed by newspapers and magazines. Fishermen out at sea can be reached only by radio. During their long trips to the fishing grounds, and as they return ashore from the grounds, they have time to listen. They are in fact a captive audience. Good radio programmes on fisheries management can convey

messages that will be remembered long after the fishermen return home,

Radio is an excellent medium with which to inform fishermen in the Bay of Bengal about the Code of Conduct for Responsible Fishing (CCRF). (This is a code evolved at various global FAO and U.N. conferences which most countries are signatories to. It lays down do's and don'ts concerning fishery practices.) They should also be familiar with the Precautionary Approach to Fisheries Management or PA2FM. (This urges stakeholders in fisheries to act immediately on fisheries management without waiting for a resource crisis or the data to back it up.)

Some readers may remember BOBP's earlier efforts concerning a radio programme for Sri Lankan fisherfolk. The authorities responded with enthusiasm to BOBP's initiative for the radio programme. Professional training organized by BOBP helped make the radio broadcasts more interesting and useful for fisherfolk.

BOBP is considering the possibility of workshops and training activities on the use of radio to promote fisheries management.

While the media mentioned above have great potential, nothing equals the power of inter-personal communication for impact on rural audiences. Workshops, exhibitions and demonstrations in rural areas with the active participation of fisherfolk can be more effective than "delivery-oriented" media such as newspapers and magazines that are more suitable for the urban educated.

Street theatre – a medium of information, conscientization and entertainment popular in villages – has exciting possibilities. It is an inter-personal medium. BOBP is experimenting with the use of Street theatre as a tool to popularize fisheries management. A beginning was made recently in Tamil Nadu (see story on page 13). If the experience here is rewarding, street theatre can be tried out elsewhere as well.

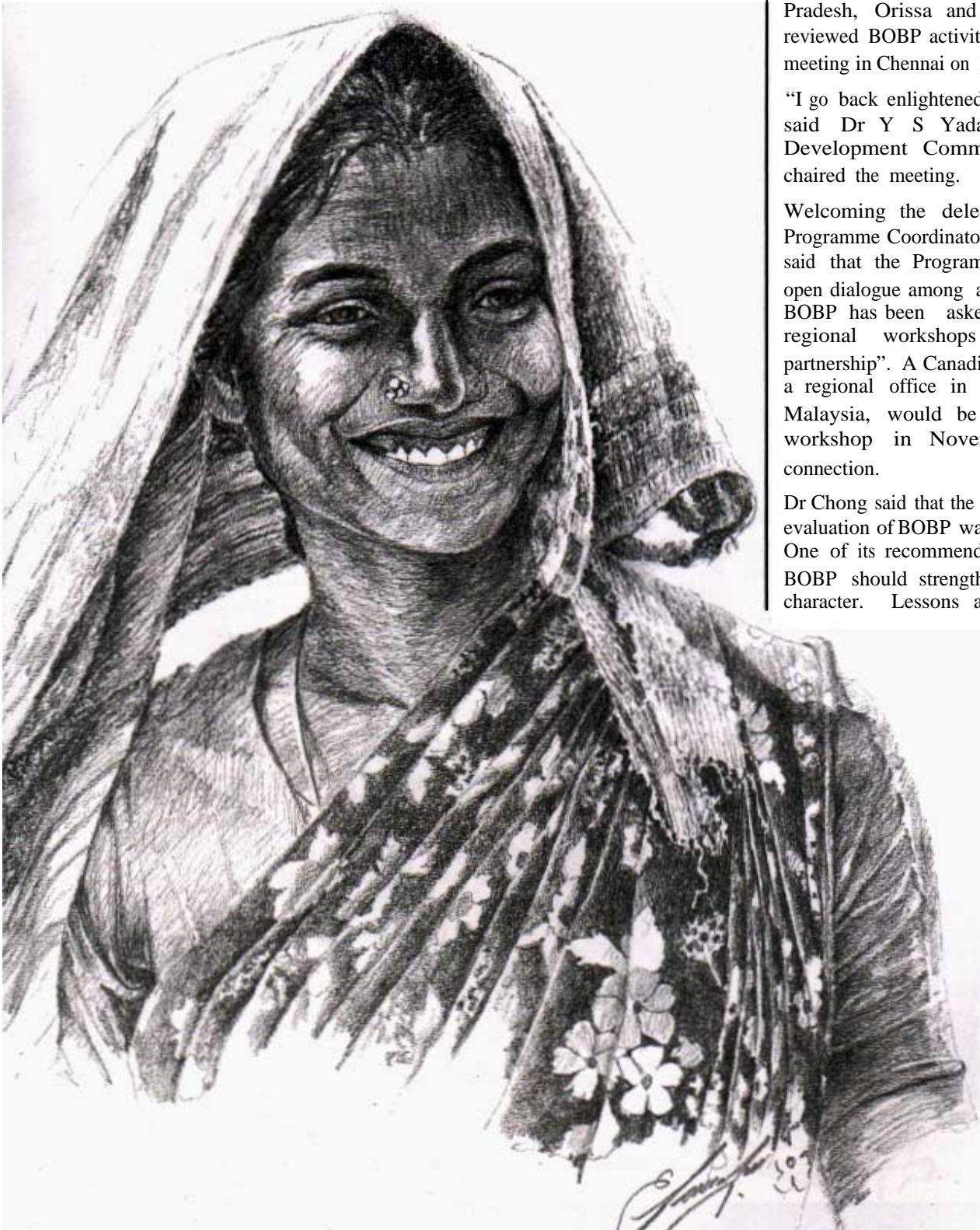
The various media have their distinctive strengths, opportunities and drawbacks. No single agency can succeed in tapping all the media. A co-operative effort is needed – by Departments of Fisheries, organizations such as the BOBP that carry out pilot activities, and NGOs active in fishing villages – to ensure the best utilization of all the media to promote fisheries management.

- Kee-Chai Chong



Officials Review BOBP Work in India

A unit of the Indian Army for fishermen! Training for young men from fishing communities in car maintenance, air-conditioning and refrigeration. These were just two of the suggestions that emerged at a wide-ranging review of BOBP activities in India held in Chennai on August 19. A detailed report appears on these pages.



“Twenty senior fisheries officials from New Delhi, as well as from the east coast states of Tamil Nadu, Andhra Pradesh, Orissa and West Bengal, reviewed BOBP activities in India at a meeting in Chennai on 19 August, 1997.

“I go back enlightened and enriched,” said Dr Y S Yadava, Fisheries Development Commissioner, who chaired the meeting.

Welcoming the delegates, BOBP Programme Coordinator Dr K C Chong said that the Programme wanted an open dialogue among all stakeholders. BOBP has been asked to convene regional workshops for “smart partnership”. A Canadian agency with a regional office in Kuala Lumpur, Malaysia, would be sponsoring a workshop in November in this connection.

Dr Chong said that the recent mid-term evaluation of BOBP was very positive. One of its recommendations was that BOBP should strengthen its regional character. Lessons and experiences

would have to be shared among member-countries. A trade-off would be essential between national and regional activities.

Dr Yadava said that fisheries and coastal aquaculture in India were at present in an evolutionary phase. A basic objective of the two types of BOBP activities in India-coastal fisheries management and coastal aquaculture management-was to build awareness, strengthen capacity and provide technical assistance.

Talking about coastal aquaculture, Dr Yadava said that it began in India only during the early 1980s. Real development started during the 1990s, and an increase of a few hundred per cent had been recorded in a few years. No government could keep pace with this fast growth. Environmentalists raised issues, there was misinformation. He expressed the hope that BOBP work would help improve the image of aquaculture, which had been tarnished by vested interests.

BOBP has embarked on a silent campaign to promote aquaculture as a self-cleaning industry by asking key questions on what went wrong with aquaculture, and how such wrongs can

be redressed by building awareness on cause-and-effect relationships and suggesting action that can be taken through means-ends analysis.

Mr Rathin Roy, BOBP's Communication Adviser, said that coastal fisheries management was the goal of BOBP work in Tamil Nadu and Orissa; coastal aquaculture management was the mandate in Andhra Pradesh and West Bengal.

Summarizing the present status of fisheries on the east coast, he said the catches and earnings of small-scale fisherfolk were declining, and they seemed to have few other livelihood options. Conflicts erupted often between trawler operators and small-scale fisherfolk.

As for the trawlers, average sizes of catch species were falling, while the species composition was changing. Both trends reflected the urgent need for management.

The project strategy in all four states was similar and consisted of the following steps:

- Train fisheries officials to identify stakeholders, get to know them, and

understand their perceptions of problems and solution options.

- Field work by fisheries officials to meet and hold discussions with all the stakeholders
- Analysis of the findings of the field work (stakeholder analysis).
- Draft a workplan for fisheries management on the basis of these findings. Also include needs for technical assistance if any.
- Implementation of the agreed plan, in which all stakeholders have a part to play.

It adds up to a strategy that is "process-oriented rather than goal-oriented", and based on people's participation, Mr Roy said.

In accordance with this strategy, the first step — workshops to provide training in stakeholder identification, consultation and analysis, as well as in stakeholder communication and perception analysis — had been taken in all four states. As for the other steps, progress was as follows.

- In Andhra Pradesh, trained staff carried out field work on stakeholder studies and discussed their findings

Kanniya Kumari fishermen who took part in the stakeholder analysis exercise, made several recommendations on fisheries management



Pic. V. Rene



Fisheries officials of Andhra Pradesh take part in a stakeholder analysis workshop.

at a follow-up workshop. Workplans were defined for the future. A cluster of shrimp farms and aquaculturists was identified who would help work toward sustainable aquaculture. (The area of operation in Andhra Pradesh consists of three districts: East Godavari, West Godavari, Krishna).

- In West Bengal, work is being carried out in North 24 Parganas, South 24 Parganas and Midnapore East districts. Stakeholder analysis has been completed in North-24 Parganas and an excellent report has been prepared. Staff in all three districts are to develop district-wise budgets and workplans.
- In Orissa (Cuttack and Baleswar districts), field work for stakeholder studies has been completed.
- In TamilNadu, a follow-up workshop to discuss the findings of stakeholder analysis has been held in both Chennai and Kanniya Kumari districts. Fishermen of the volatile Kanniya Kumari district have prepared a list of recommendations on fisheries management. Strong government support is reflected by an allocation of Rs 1 million from the State treasury to supplement project work for 1997-98.

The findings of stakeholder analysis in each state throw interesting light on problems and solutions in coastal fisheries management and coastal aquaculture management. Here's a summary of the findings for Andhra Pradesh and the discussion that followed.

Discussion on Andhra Pradesh

A cluster of problems was identified during an early - 1997 workshop that followed stakeholder studies in the field.

Quality of seed: Fish farmers felt they had no inkling about the quality of seeds they received – worrying, because seed is an important factor in disease. They felt they needed to get brooders from further offshore. (Seed availability was not a problem. 130 hatcheries have been set up already, eliminating the need for wild catch.)

Feed quality: Farmers usually bought feed from intermediaries who offered credit, and were not in a position to reject the feed. Credit links locked the farmers into a single mechanism. Concern was expressed about second-rate and contaminated feed. Even if we knew that feed was bad, “we had to buy it.”

Culture practices: Many farmers felt they had no technical support. One problem, ironically, was an explosion

of experts. In Kakinada, there was a consultant in every street. “Can anybody tell us about sustainable practices?” was one plaintive call for help.

There was a big question about farming systems analysis. What was past culture practice and water exchange practice? Some farmers said they avoided disease by avoiding water exchange, contrary to established practice.

Effluent control: Fish farmers released effluent into the creek. Even inflow water was already polluted, because of drainage from agriculture and industry. In East Godavari, water at fish farms was brownish and smelly. Effluent control was not satisfactory.

Some of the recommendations following the stakeholder analysis:

- Consultations should be held with experts to suggest a package of culture practices. The package that's decided and approved should then be publicized strongly through comic books, travelling exhibitions, radio and group meetings.
- Small fish farms – most farms are only 1 or 2 ha in size – are too small for separate water treatment. A community-level water treatment system may be necessary.

- Subject-matter experts at district level: They'll be responsible for addressing problems. The staff (DOF) want regular and intensive meetings with them, plus large-scale awareness programmes. They have requested the DOF to fund such meetings.

Mr OS RC V Prasad Rao, Commissioner of Fisheries, Andhra Pradesh, made the point that very few shrimp farmers of Andhra Pradesh were as rich as made out to be. For many of them, their small farms were a matter of life and death. There are as many as 17 or 18 categories of stakeholders in coastal aquaculture. Different people defined the same problem differently.

Mr Prasad Rao said that testing of seed and feed was essential. (A participant said that buyers could exercise their consumer power to drive suppliers of inferior seed and feed out of business.) A chain of cold storage facilities was also necessary all along the coast to cater to fish other than shrimp.

Dr Yadava said that tips from BOBP about simple tests for good shrimp seed and good shrimp feed would be useful. A prawn farmer would then be able to judge whether what he had was good or bad. Attractive publicity material should be developed on such subjects and developed in local languages. Consultants could take advantage of such materials.

Dr Yadava also said that state-level quality control plants were possible. But legislation would be necessary to define certification procedures.

Dr Chong referred to a proposed seminar on low-input sustainable aquaculture (LISA) planned for 1998. He said that often, the organisms under culture are greatly stressed; there is indiscriminate use of external inputs for higher production, pushing the pond's carrying capacity to the extreme. Such stress can be minimized in low-external-input aquaculture.

Discussion on West Bengal:

A clear workplan emerged from the field work in North 24 Parganas and the follow-up workshop.

The culture system in West Bengal is different from that in Andhra Pradesh. There is heavy tidal variation. There are few attempts at semi-intensive aquaculture.

Seed availability was a serious problem. Result: heavy dependence on wild catch using push nets. The wild catch of *P monodon* was destructive, the bycatch loss being as much as 99%. One interesting suggestion was that of an extra pot for seed collectors – bycatch could be transferred to the pot.

Despite 15 private hatcheries and a government hatchery, West Bengal obtained shrimp post-larvae from Orissa and Andhra Pradesh.

Feed wasn't much of a problem. Very little artificial feeding was being done: local snails and clams were used as feed. The Ninth Plan must focus on a study of seed and feed for aquaculture, plus information on culture practices.

Referring to the controversy over shrimp culture, the West Bengal Director of Fisheries, Mr B K Roy, said that it was indeed essential to preserve the environment for future generations. But what about saving today's generations? It wasn't socially or politically feasible to ban aquaculture and thereby imperil the livelihood of people who were engaged in it.

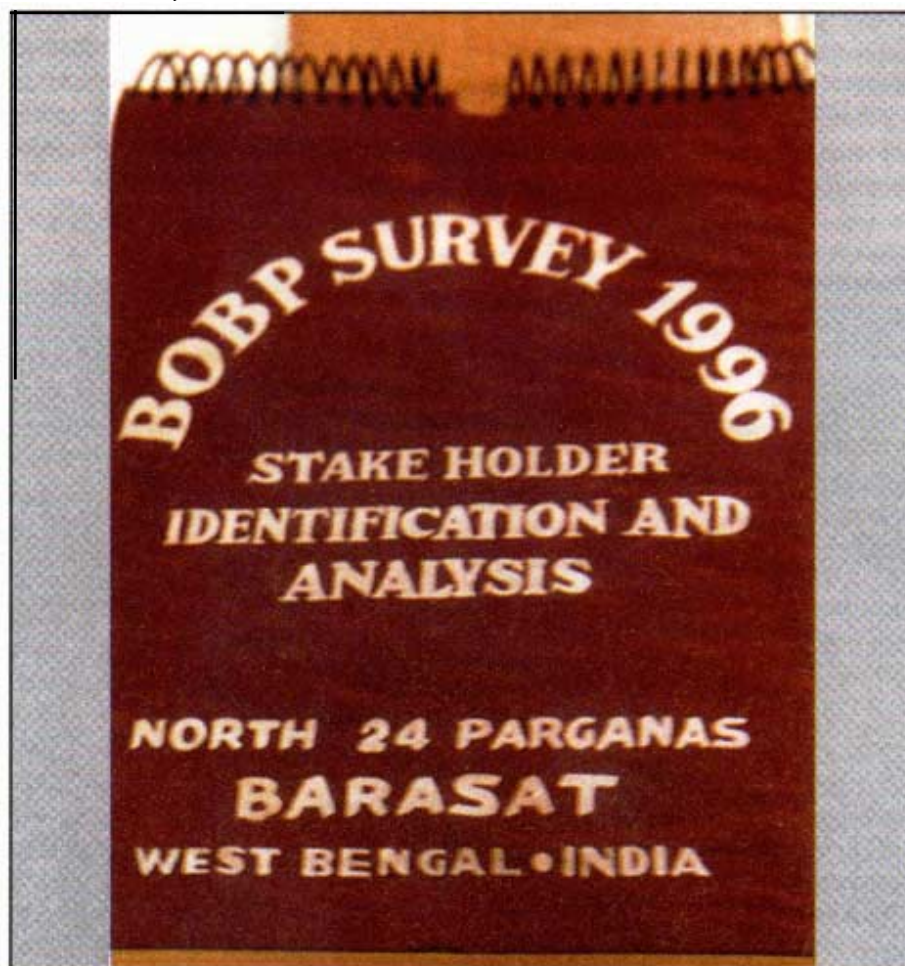
Fisheries staff of North 24 Parganas district, West Bengal, prepared on excellent report on stakeholder analysis.

There was a certain amount of pollution in shrimp farms. Disease had spread. Aquaculture exchange tours for officials of Andhra Pradesh and West Bengal might be useful.

About training workshops, Mr Roy said that training centres at the district level could be made use of. Funds were available for transport and subsistence for such training.

Mr R N Roy of BOBP suggested that as the project made progress, the time would be ripe for the Department of Fisheries to call senior officials of other departments for a meeting. This would ensure co-operation and understanding between different departments.

Such meetings were useful because the solutions to fisheries problems often lay outside the fisheries sector. In Bangladesh, a meeting will be held in November of all coastal Members of Parliament (MPs) to discuss the problems of set bagnet and push net fisherfolk. It is hoped that the MPs can bring their clout and their authority to bear to provide fisherfolk with other job options.



In West Bengal itself, BOBP had during an earlier phase suggested an integrated fish culture project in the Sunderbans. It envisaged a combination of fish culture and mangrove forestation. This excellent project could not be implemented for want of co-operation between the Department of Forestry (which owned the land) and the Department of Fisheries (which had the fish culture expertise but did not control the land.)

Discussion on Tamil Nadu

Introducing BOBP work in Tamil Nadu, Mr Rathin Roy said the sons of the soil concept was being practised with extreme rigour in the state. Its fisheries officials spent quite some time getting their fishermen released from police custody in Andhra Pradesh. There was territorial conflict even between Tamil Nadu fishermen — those from Chennai and those from Cuddalore, for instance.

Artisanal fishermen of Chennai were desperate. Their catches were dropping, and they couldn't access offshore resources. However, they did have a few alternative options since they were based in the state capital.

In Kanniya Kumari district, the level of conflict had to be seen to be believed. It was inter-religious, inter-caste and inter-village. There were three types of fleets — *kattumarams*, *vallams* and trawlers. Resources and catches appeared to be falling, yet the fleet was increasing in size. The Superintendent

of Police and the District Collector figured high among the list of stakeholders.

Fortunately, the Coastal Peace and Development Committee, a fishermen's initiative, was working. Under its auspices, *vallam*, *kattumaram* and trawler fishermen came together and agreed on who could fish where. The *vallam* and *kattumaram* unions had on their own contributed as many as 10 boats with crew to monitor the agreement. The committee sometimes tackled as many as four or five complaints of violation of the agreement per day.

Awareness of fisheries management was high. One of the biggest fish traders in the district said: "You tell me which fish species is endangered. We'll stop buying it. Fishermen will then stop catching it."

Kanniya Kumari district offered fewer alternative job options than Chennai district. Among the young, there were some well-educated people — a few with master's degrees — who were jobless. Most new investment in Kanniya Kumari went into schools, colleges and residential buildings rather than into manufacturing.

The stakeholder analysis in Kanniya Kumari district resulted in several lists of recommendations. A sampling of the list put up by *kattumaram* and *vallam* fisherfolk:

- Bottom trawling is the main cause for fishery resource depletion. Restrict it to waters beyond 25 fathoms on the west coast of Kanniya Kumari and beyond 18 fathoms on the east coast; and to the period between 6 a.m. and 6 p.m.

- Restrict bottom trawling to six months a year (suggested by *kattumaram* fisherfolk)

- Conduct studies on spawning and lifespan of all exploited fishes, to stop fishing during the spawning season in all breeding areas. Build artificial reefs.

- Ban deep sea fishing by foreign vessels; ban light fishing (some *vallam* fishermen were not in favour of this ban); impose size regulations for both *kattumaram* and trawler fishermen; ban use of explosives; ban fishing of lobsters smaller than 100 grams in weight, and ban export of lobsters of this size (suggested by *kattumaram* fishermen); stop fishing of cuttle fish and prawns (suggested by *kattumaram* fishermen).

- Dredge river mouths, thereby enriching fishery resources in backwaters.

Some of the recommendations that followed a meeting of *vallam*, *kattumaram* and mechanized trawler fishermen:

- Ban deep-sea fishing by foreign vessels.

- Provide walkie-talkies to mechanized trawlers and *vallams*.

- Legalize local agreements concerning fishing.

- Construct fish drying platforms and artificial dryers to dry fish during the rainy season (suggested by anchovy fishermen).

- Install a mothership facility at the Wadge Bank for fishing and for purchase of fish catches at sea by government agencies.

Some recommendations made by Kanniya Kumari fisherfolk on welfare measures:

- Provide a coastal information and welfare centre for each zone;

- Just as farmers get free power supply, offer fishermen fishing gear free of charge;

- Provide kerosene at subsidized rates for motorized craft.

Mr Abhay Rath, Principal Secretary (Fisheries and Animal Husbandry), Orissa, with BOBP's Rathin Roy and West Bengal's R N Choudhury at the meeting.



- Provide fishing villages with link roads and transport facilities; give them residential houses; requisition land for fishermen dwellings; provide at least one police station for every three fishing villages; continue Government of India contributions to a savings-cum-relief fund for fisherfolk.

- Develop alternative income-generating activities (such as assembly of electronic spare parts, tailoring for garments etc) for fisherfolk; set up banks to finance fisherfolk; extend to fisherfolk the concessions due to Scheduled Tribes.

Responding to the presentation, Tamil Nadu's Director of Fisheries, Mr Hans Raj Verma, came up with a remarkably original suggestion. "How about a unit of the Indian Army built up entirely from the fishing community?"

Mr Verma said that fishermen were courageous and adventurous, two qualities one expected from soldiers. In any case, activities had to be designed for fishermen to help them join the mainstream economy; fisheries could sustain fewer and fewer fishermen.

Mr Verma said that the mechanism of middlemen was exploitative but efficient. The Department of Fisheries was planning to establish a marketing network of women to help free them from the hold of middlemen.

Since Marine National Parks and mangrove areas come under forestry, it is essential for the departments of fisheries and forestry to meet and sort out differences, Mr Verma said. (Dr Yadava drew attention to the procedure in some states – a Committee of Secretaries discusses and resolves contentious inter-departmental issues.)

Discussion on Orissa

Mr R N Roy said that the situation in Orissa was in general similar to that in Tamil Nadu and Andhra Pradesh. A notable resource development was the phenomenon of shark fishing in Puri. It was lucrative, particularly the shark meat that was sent to Kerala. This resource needed watching. Sharks are a vulnerable resource; all over the world, flags are going up cautioning against overfishing.

Mr Abhay Rath, Principal Secretary of Fisheries, Orissa, said he was familiar with earlier BOBP work in the state, and

India Review Participants:

1. Dr Yugraj Yadava, Fisheries Development Commissioner, Govt of India
2. Mr G S R C V Prasad Rao, Commissioner of Fisheries, Andhra Pradesh
3. Mr Radha Kant Tripathy, Secretary of Fisheries, Tamil Nadu.
4. Mr Hans Raj Verma, Director of Fisheries, Tamil Nadu
5. Mr Abhay Rath, Principal Secretary, Fisheries & ARB, Govt of Orissa
6. Mr Sk Md Jamil Ahamed, Director of Fisheries, Orissa
7. Mr B K Roy, Director of Fisheries, West Bengal
8. Mr Rabindra Nath Choudhuri, Senior Project Engineer., West Bengal Fisheries Corporation, Calcutta.
9. Mr Rama Mohan Rao Ghanagam, Director, CIBA, Chennai
10. Mr K Dorai Raj, Officer-in-Charge, Madras Research Centre of CMFRI
11. Mr E Vivekanandan, Senior Scientist, MRC of CMFRI
12. Mr R Paul Raj, Senior Scientist, CMFRI, Chennai
13. Mr S Durairaj, Joint Director of Fisheries, Tamil Nadu
14. Dr Hanumatha Rao Lakkavajhala, Senior Scientist, Chennai

was impressed by BOBP's presentation on coastal fisheries management.

Dr Yadava raised the question of migration of Olive Ridley turtles. Last year, the population was estimated at 5,00,000, despite an assumed migration of 6,00,000 over 10 years. Contrary to apprehensions, the population of Olive Ridley turtles had not fallen.

Mr K. Dorai Raj (from the Madras Research Centre of CMFRI) said CMFRI had studied the question of incidental catch of Olive Ridley turtles over a fixed period. The conclusion: 85% of the catch was from gillnetters, 15% from trawlers. CMFRI consequently suggested a ban on gillnetting for about two weeks during December-January, the nesting period for the turtles, and a similar ban for a short period in March.

In his concluding remarks, Dr Kee-Chai Chong described the one-day "meeting of minds" as thought-provoking. The idea of more frequent meetings of this kind, suggested by several participants, was sound. He thanked the Government of Tamil Nadu for its co-operation with BOBP, including its allocation of Rs one million to implement activities in the state.

Talking of job opportunities for fishermen outside fisheries, Dr Chong said that the number of vehicles on Indian roads boggled the mind. "I am checking on training fees for youths from the fishing community. They could be trained in car maintenance, airconditioning, refrigeration".

He also made the following points:

- * Community-Based Fisheries Management or CBFM was complementary to the Precautionary Approach to Fisheries Management (PA2FM). Fisheries staff at all levels should not only be sensitized to both CBFM and PA2FM, but also to the Code of Conduct for Responsible Fisheries (CCRF).

- * The potential of marine parks in providing necessary shelter to the fishery resource and allow it to flourish and grow, should be tapped. Malaysia has 38 marine parks. Their impact has been very good.

Dr Y S Yadava, in his concluding remarks, warmly acclaimed the meeting's usefulness, and urged BOBP to keep the deliberations of this meeting in mind while implementing workplans.

S.R.M.

INFLUENCE OF COMMERCIAL FISHERS ON RESOURCE MANAGEMENT

A LOCAL VIEW

By Richard K. Wallace

Extension Marine Specialist, Marine Extension and Research Centre, Auburn University, Alabama.

The author argues that the public interest is best served by science-based fisheries management based on accurate stock assessment and determination of safe harvest levels – rather than by emotional campaigns that result in excessive regulation. Example: Fishers in Alabama provided scientific information that a ban on nets was not necessary, because prevailing mesh-size regulations were enough to ensure a continuing mullet fishery. They won their case; a ban was averted. (Article Courtesy: Fisheries Magazine)

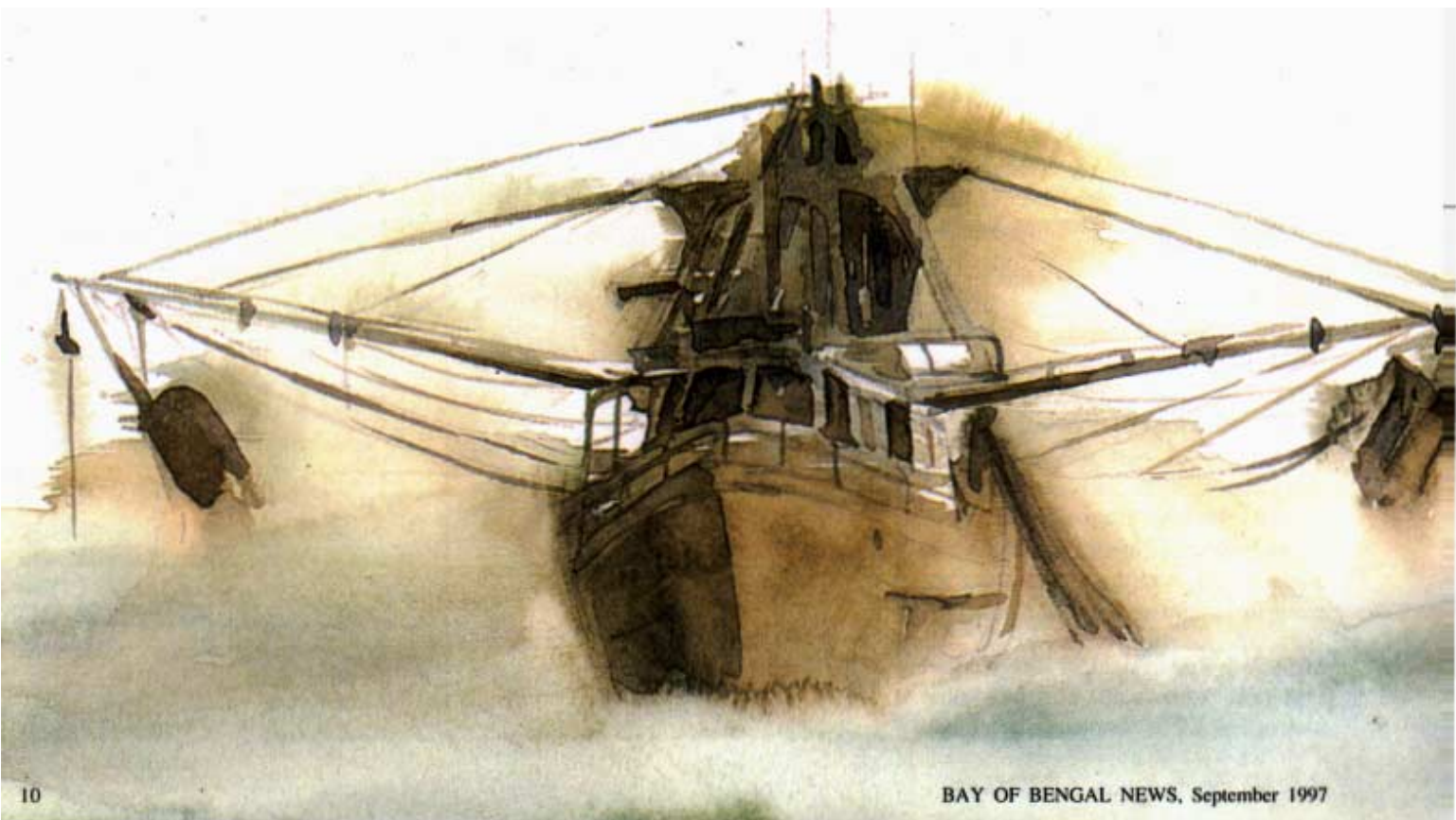
Are commercial fishers providing an effective voice in fisheries management discussions? The answer depends on whom you ask and what you mean by *effective*. For many commercial fishers along the Gulf Coast, *effectiveness* would include staving off unnecessary regulations and obtaining management actions they support. However, in most cases being effective does not include compromising to accommodate unreasonable proposals initiated by other stakeholders. As some fishers say, a compromise is when we give up something we already had while the other side gains something it wanted. Imagine being offered a 75% reduction in your salary by your boss and

“successfully” negotiating only a 50% reduction. While an observer might see this as an equitable compromise, you would certainly believe you have suffered a serious setback. Fishers usually feel forced to react to proposals that in their views are unwarranted and sometimes unsupported by fisheries science.

Effectiveness should also be considered in the light of our current cultural need to win. Policy battles, whether they be about health care or red drum management, are often fought at the extremes of emotion and opinion. It is more important to win than to be right. It is more important to win than to reach

a solution based on the available information. In this atmosphere, commercial fishers may not judge themselves effective because they seldom win. They are nearly always forced to accept a moratorium, a gear regulation, or some other restrictions that give them less opportunity to harvest fish.

Fishery biologists and managers would probably define *effectiveness* differently. Fishers could be judged effective if they are influential in bringing about rational management that results in sustainable harvest and a stable industry. Rational or science-based management depends on accurately assessing stocks, determining safe harvest levels, and



implementing enforceable regulations that achieve the desired harvest. Returning to the example of the boss offering a salary reduction, we now ask the following questions: What valid information suggests that the reduction is necessary? If it is, will the new salary be stable and perhaps more dependable than the old salary? Can a raise in salary be expected in the future as a result of taking a cut now? Recent events along the Gulf Coast suggest that these kinds of questions are not well answered and that commercial fishers who are in conflict with recreational anglers have not been effective in obtaining equitable allocations within a fisheries science framework.

For example, in Florida, fishery assessments indicated overfishing problems with some inshore stocks. Traditional management measures were slowly moving forward. Sport fishers and other concerned citizens, frustrated by the slow pace of management implementation, bypassed the management process and sought a constitutional amendment to ban entangling nets from inshore and near shore waters and to severely restrict trawl nets (Sport Fishing Institute (SFI) 1992a). An emotional media campaign addressed general concerns about the use of gill nets and trawls (Fritchey 1994). Commercial fishers responded with their own

emotional arguments about employment, community, economics, and family traditions (Wickstrom 1993). The voting public sided overwhelmingly with the sportfishing industry alliance. Commercial fishers lost not only the public relations battle but more importantly were ineffective in achieving fishery resource allocations that might have been available to them through the established management process.

Louisiana commercial fishers found themselves in a somewhat different situation, a situation in which they might have been winners and been effective within the management process. Red drum have been recovering along the Gulf Coast, particularly in Louisiana, since the gulf states initiated strict recreational limits and eliminated most commercial harvest in conjunction with a federal moratorium on all harvest in federal waters. Louisiana biologists have twice reported to the Louisiana Wildlife and Fisheries Commission that the state is meeting its goal of 30% escapement for red drum from state waters and that the harvest of red drum could be increased. This information was presented in the form of a table, which gave different combinations of recreational bag limits and commercial harvest for 30% escapement and for even more conservative escapement of 40%

and 50% (LDWF 1995). But the commission instead voted to keep the current limits and to continue the moratorium on commercial harvest in state waters.

Falling on the heels of the drum decision, Louisiana commercial fishers faced the net ban fever that swept westward out of Florida. Although details are different from the Florida experience, fishers again encountered a battle that was based primarily on emotions and political influence. *Times Picayune* outdoor writer Bob Marshall wrote, "This campaign was not about science-based management... it was a popularity contest based on raw political power and, to a large extent, misinformation. Science was not embraced, it was suppressed. Instead of using fact, proponents used public opinion polls. That was wrong, and it is bad for the future of hunting and fishing" (Chauvin 1995).

Louisiana fishers were not subjected to a total net ban, but the use of gill nets can only be used to harvest striped mullet and pompano for three months each year. No biological assessment was offered to justify these restrictions. According to Louisiana's governor, who let the bill become law without signing it, "It is bad, it is not necessary, it ought to be vetoed, but I gave my word... There is no biological evidence to support the ban...

I am afraid we are legislating on fisheries by politics and not by biological facts.” (Chauvin 1995).

Alabama commercial fishers, on the otherhand, had some success influencing the outcome of their net ban battle. Fishers used science-based information from the Alabama Marine Resources Division to effectively demonstrate to the public and legislators that no biological basis existed for a net ban (Boatright 1995). Fishers made the case that current mesh size regulations and other restrictions were allowing an escapement rate that would ensure a continuing mullet fishery. They also were able to neutralize claims that they were inflicting significant mortality on game fish. As a result, some adjustments were made by the commission of conservation to existing net laws without eliminating valuable mullet and bait fisheries. More significantly, fishers also agreed to a limited-entry system that reduced the number of licensed gill netters by almost 70% and prevented a potential influx of out-of-work netters from Florida.

In this case, fishers were effective in retaining management regulations that result in a sustainable fishery. Unfortunately, some fishers still did not believe they were very effective. Commercial fishers who devoted hundred of hours to the negotiations were

gratified that a net ban was avoided, but in the end they wondered why they had to spend so much time and effort defending themselves against what they saw as an irrational proposal (P. Barber, Alabama Seafood Association, personal communication). Others felt ineffective because they could not qualify for a gill net license under the limited entry system.

In response to a query about whether commercial fishers are increasing their political clout and using it to influence fishing regulations and laws, I detected an implied assumption that fishers are more organized and more effective in the political process now than in the past. Recent regulatory changes along the Gulf Coast suggest that whether or not fishers are better organized, they are currently not very effective in the political process. They have not “won” many management battles lately, even when the biological facts were on their side. In the past, managers and other user groups have suggested that commercial fishers have been too effective and that politically powerful fishers have subverted management efforts, in some cases to the detriment of the resources (SF1 1992b). Commercial fishers believe the tide has turned along the Gulf Coast, and other stakeholders now hold greater political clout to influence fisheries management

decisions (Fritchey 1993). Regardless of who appears to hold the political clout, public interest and the health of fish stocks are best served by science-based management and thoughtful allocation.

References

- Boatright, A. 1995. The war is over. *Outdoor Alabama* 67(4):12-15.
- Chauvin, W.D.** 1995. New Orleans sports writers' views on Louisiana net ban. *Shrimp World, Inc./SHRIMPCOM* 29 June.
- Fritchey, R. 1993. Wetland riders. *New Moon Press*, New Orleans, LA.
- , 1994. Anatomy of a well-oiled campaign to ban the nets. *National Fisherman* 75(8):24, 26, 99.
- LDWF (Louisiana Department of Wildlife and Fisheries)**, 1995. Fourth annual report on the status of red drum. *LDWF - Red Drum 1995*, Baton Rouge, LA.
- SF! (Sport Fishing Institute)**, 1992a. Nets, politics and conservation. *SF! Bulletin* 436:1-3.
- , 1992b. Southeast marine fisheries continues downward slide. *SF! Bulletin* 439:2-3.
- Wickstrom, K. 1993. Net-ban amendment can win—but you're the key to victory. *Florida Sportsman* (11:34-36).

Commercial fish landings in Tamil Nadu, India



Pic. E. Amalore

Advisory Committee Meeting in New Delhi

The 22nd Meeting of the BOBP's Advisory Committee (AC) was held in New Delhi September 23-24, 1997, in conjunction with the Tenth Session of the Indian Ocean Fishery Commission's Bay of Bengal Committee.

There were 28 participants, both delegates and observers. Delegates represented Bangladesh, India, Indonesia, Maldives, Malaysia, Sri Lanka and Thailand, also the FAO, DFID (UK) and World Bank. Observers came from Myanmar, NACA (Network of Aquaculture Centres for Asia and Pacific), SEAFDEC and the Department of Ocean Development, Government of India.

Mr Bhagat Singh, Additional Secretary in India's Ministry of Agriculture, inaugurated the meeting. Mr K M Chadha, Joint Secretary (Fisheries), addressed the inaugural session and chaired the meeting of the Bay of Bengal Committee. Dr Y S Yadava, Development Commissioner (Fisheries), chaired the AC meeting of the BOBP.

Some of the meeting's comments and recommendations:

- * The need for trained manpower in fisheries management was stressed.

The meeting suggested that BOBP should focus on training of trainers, in co-operation with other regional agencies such as SEAFDEC, NACA and INFOFISH.

- * Bangladesh and India stressed the need to involve NGOs in management efforts through government agencies. Indonesia requested priority for the development and dissemination of awareness materials including a manual on stakeholder fisheries management.
- * Malaysia said assistance was needed to facilitate pilot efforts in fisheries management through training and technical assistance inputs. Malaysia also requested assistance in formulating a national fisheries management plan.
- * The Committee said the question of safety and security of fishermen who drift into the territorial waters of neighbouring countries should be addressed urgently. The FAO could play a facilitative role if the governments concerned wanted conventions to be evolved through discussions.

- * The Committee called for a concerted thrust to develop sustainable and equitable mariculture and coastal aquaculture options to provide food and livelihood security in coastal communities.
- * The Committee called for a review of statistics and fisheries management information systems in the region so that they could be harmonized, and databases developed on transboundary fisheries management needs.
- * The Committee said coastal fisheries must be looked at in an eco-system and environmental context to ensure its sustainability. Efforts must be taken to incorporate fisheries into coastal area management and environment protection approaches. The Committee also highlighted the vulnerability of shark resources and their increasing exploitation in the region. It said there is an urgent need to "promote and enable management of shark resources in a concerted manner."
- * The Committee urged that besides national pilot projects, BOBP should make special efforts to focus on regional issues and concerns.

Promoting fisheries management through street plays

The potential of street theatre for impact on rural populations is being increasingly realized worldwide, particularly in Asia. Development agencies are using street theatre to convey messages on health, family planning and gender issues.

BOBP is experimenting with street theatre to promote fisheries management among fisherfolk. A beginning was made recently, when a group of about a dozen women from the fishing community at Kasimode, north of Chennai, put up a performance before an enthusiastic audience of fisherfolk.

Most of the women – who are undergoing a non-formal education course at Kasimode conducted by Fr Kurien of the Kasimode church – had had no exposure earlier to street theatre. But they underwent a one-week BOBP-supported training course in street theatre. It was conducted by Pralayan Chandrasekaran, 38, a journalist and street theatre activist, who has during the past decade helped script and direct more than 35 street plays on health, family planning, women's empowerment, female infanticide etc.

During the one-week course, Pralayan trained the women on street theatre concepts, on voice culture, physical exercises, self-expression, body movements, music and dance. He also

helped the participants evolve a story for a street play set in a fishing village.

The play is about a fisherfolk household. The husband serves on the crew of a mechanized boat. His earnings (thanks to dwindling fish resources and catches) are erratic, less regular than his intake of alcohol. The problem is aggravated when the trawler crew are jailed for intruding into Andhra Pradesh waters. They are released after a week. With no job and earnings, the husband's drink problem gets worse. When he roughs up his wife because she refuses to part with some money she has saved, she throws chillie powder into his eyes and runs away.

The village *panchayat* (council of elders) tries to resolve the problem, but the wife refuses to go back to the husband. The play highlights the plight of fisherfolk and the need for fisheries management.

Considering that the entire "cast" were new to street plays, the performance was quite effective. The audience in the fishing village at Kasimedu enjoyed the play, which was replete with folk songs and action.

"We will promote such experimental street plays in member-countries to induce social change and provide entertainment as well," says Dr Kee-Chai Chong, Programme Coordinator of BOBP.

MARINE RESERVES

A BRIEF GUIDE FOR DECISION MAKERS AND USERS

by Callum Roberts

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The sea cannot be left to look after itself. Active management is needed to prevent habitats and species from disappearing. Marine reserves result from such a policy of active management. In this article, the author answers some basic questions about the administration of marine reserves.

Introduction

For at least the last 30 years it has been clear that the sea, like the land, cannot just be left to look after itself. Active management is needed to prevent habitats and species alike from disappearing. Management of the sea has borrowed much from principles developed for terrestrial resource protection. Protected areas have come to play a central role in management efforts. However, fundamental differences between the biota of land and sea mean that marine reserves are unlikely to function in the way that terrestrial ones do. Marine organisms are characterised by much greater dispersal capabilities than those that live on land, making marine reserves leakier than terrestrial ones. Consequently, you cannot just throw a barrier around an area and expect to be able to protect the organisms living there. However, it turns

out that far from being a disadvantage, dynamic exchanges of organisms between marine reserves and unprotected areas can offer many benefits.

For small island states, the demands of resource management and development often come into conflict. Consequently, proposals for reserve establishment are always controversial, generating heated debate. These debates are often fueled more by passion than reason and it is clear that sound information on reserves often fails to reach those who need it most: decision makers and resource users. Here I offer a brief guide on the benefits and costs of reserve establishment, based on the best scientific information currently available.

There are numerous and far-reaching benefits to be reaped from protective management. The most important are discussed below. In answering frequently

asked questions, I will show that marine reserves offer a powerful means of reconciling resource protection with sustained fishery harvest and economic growth.

Benefits of Marine Reserves

1. **Protection of habitat and shift towards a more natural ecosystem**
2. **Increased abundance and size of fishery species**
3. Increased production of eggs and larvae and export of these to fishing grounds
4. Emigration of fishery species from reserves to fishing grounds
5. Increased or maintained biodiversity
6. Insurance against management failures and stock collapses in fishing grounds



This article was presented as a paper at the Workshop on Coastal and Ocean Resource Management, which formed part of the UN Global Conference on the Sustainable Development of Small-Island Developing States, Barbados, from April 25 through May 7, 1997. The author then represented the Eastern Caribbean Center, University of the Virgin Islands, USA.

7. Populations of species especially vulnerable to fishing protected

8. Genetic diversity of stocks of fishery organisms protected

9. Greater ease of enforcement of regulations than conventional fisheries management

10. Improved public understanding of management

11. Opportunities for development and economic diversification through tourism

13. Increased recreational and educational opportunities

Costs of Reserves

1. Possible small reduction in fishery landings during 2-3 years

2. Set-up costs, including establishment of management body, mooring buoy installation, boundary marking, public awareness campaigns etc.

3. Operation and maintenance costs (usually recouped through user fees)

Fishery replenishment

There are few island nations with significant human populations which have not seen recent declines, or even collapses in their fisheries. Foreexample, fisheries in the Philippines and Jamaica have declined drastically during the past 20 years. People in these countries are forced to eat smaller and fewer fishes as the production capacities of the fisheries have been pushed to their limits and beyond (McManus 1988, Sadovy 1989). The most important reasons for these declines have been habitat loss or degradation, and overfishing.

The potential benefits of reserves in support of reef fisheries have probably become the most powerful argument for their establishment. Fishing is a potent force for change in marine ecosystems. Many species are very easy to capture and populations can be depleted swiftly. Top predators such as groupers and snappers, which are among the most highly valued species, can be virtually eliminated by fishing (Russ 1991, Roberts 1993). Key predators of other species, such as sea urchins, can also be reduced to such low population levels that they lead to population explosions of their prey (McClanahan and Muthiga 1988). Fishing can thus cause shifts in the structure of communities which may

have effects on organisms and habitats extending far beyond the species which are harvested (Roberts 1993).

Two important consequences of heavy fishing are loss of target species and reduced species diversity. The latter results from the loss of target species, also from use of fishing techniques which can damage the habitat, as people **try harder and harder to wring the last drops of productivity from declining fisheries.**

Fishery management approaches based **on regulation of catch and effort for** each species in a fishery have often been very unsuccessful. There are numerous instances where despite the best efforts of managers, fisheries have gone belly up. The reasons for management failures can be traced to several roots: (1) inadequate understanding of the biology of the species and its linkages with others (2) inadequate political will to implement recommended measures (3) ineffective enforcement of regulations and (4) unexpected problems, such as mortality of animals dumped when quotas have been exceeded. The latter is a particular problem in multi-species fisheries where a single method is used **to capture many different species.**

The above problems apply to a greater or lesser extent to all fisheries. For the complex, multi-species, multi-gear, widely dispersed fisheries of the tropics,



Fig. E. Annular



Pic. S.R. Madhu

Pulau Pa'ar Marine Park, Kedah State, Malaysia.

they make it almost impossibly difficult to devise effective management measures. Marine reserves offer a very promising new tool in the manager's armory, both in the tropics and elsewhere.

How do reserves benefit fishers?

The first reaction of fishers to proposals for reserve establishment is usually horror. They perceive reserves as something that reduces the area of their fishing grounds. Paradoxically, reserves will actually benefit fishers, although there will be a short-term cost. When stocks of fish are protected from fishing, the animals live longer, grow larger and become more numerous. Such effects have been thoroughly documented throughout the world and are reviewed in detail elsewhere (Alcala 1988, PDT 1990, Roberts and Polunin 1991, 1993, Dugan and Davis 1993, Bohnsack in press). For example, Polunin and Roberts (1993) found that the standing stock of fishes was 1.9 times greater in the no-fishing zone of the Saba Marine Park in the Netherlands Antilles. This was due to both larger and more numerous fishes.

Reserves will benefit fishers in two ways, both of which depend on their boundaries being 'leaky'. First, more and larger fishes produce many more eggs than exploited populations. The larvae of almost all marine fishes have

a dispersal phase in which they drift in open water for a period of days to weeks before changing into juveniles of fish larvae which will replenish populations in fishing grounds.

Second, juveniles and adults are expected to move across the boundaries of reserves. Higher population densities within reserves suggest that there will be net emigration into fishing grounds. Studies of the Sumilon Island marine reserve in the Philippines showed that catches in the unprotected part of the island were supported through emigration from the reserve (Alcala and Russ 1990). In Barbados, Rakitin (1994) found a gradient of decreasing abundance of fishes from the center of the marine reserve outwards into unprotected areas, suggesting movement of fishes from reserves to fishing grounds. These movements will compensate for loss of fishing grounds within the reserve and the magnitude of compensation will increase as stocks build up. After a time, stocks may increase to such a great extent that fishers are attracted to reserves and preferentially fish their boundaries – 'fishing the line'. Examples of fishing the line come from reserves in New Zealand (Ballantine 1989), around areas protected from shrimp fishing in Florida, and by conch harvesters in Belize around the Hol Chan reserve.

Do reserves protect the habitat and promote biodiversity?

Recreational users and **conservationists** are most interested in reserves as a means of protecting habitats and increasing biodiversity. When fish stocks decline, fishers respond by increasing effort and using more effective methods for catching fish. In many regions, this has involved use of destructive methods that damage the habitat, such as dynamite and poisons. Increasing use of areas by boats, both recreational and commercial, can also degrade habitats through anchoring and pollution. Effects of reserve protection on habitats have been less well documented than responses by fish populations. However, a number of studies have found increased fish diversity with protection (e.g. Clark et al 1989, Polunin and Roberts 1993), and in Saba in the Netherlands Antilles, increases in fish diversity from 1991 to 1993 were accompanied by increased coral cover and habitat complexity (Roberts, unpublished data). These studies support the intuitive prediction that protection will result in habitat recovery and increased diversity.

What level of protection will provide the greatest benefits?

Marine reserves are most effective when the resources within them are protected from damaging and extractive activities.



Left : Tourists at Pulau Payar Marine Park, Malaysia. Right : Clean-up campaign at Pulau Payar Marine Park, Malaysia.

For most areas, this means protection from anchoring, fishing and pollution (from land or sea). Such protection will allow ecosystems within the reserve to recover from human impact and over time, come to approximate a more natural condition. In short, the greater the protection afforded, the greater the benefits.

In some places such as Florida, reserves offer only partial protection from fishing. In the Looe Key National Marine Sanctuary, for example, a ban on spearfishing resulted in expansion of fish populations, and species especially vulnerable to spearfishing such as the hogfish (*Lachnolaimus maximus*), have reappeared in the reserve (Clark et al 1989). However, the reserve still lacks significant populations of species which are easily caught by hook and line fishing such as the larger groupers and snappers. By contrast, full protection from all forms of fishing has been strikingly effective. Populations of species targeted by fishers have built up to extremely high levels within the Hol Chan marine reserve in Belize (Roberts and Polunin 1993, in press) and similar effects have been observed in areas as widely separated as the Red Sea and Philippines (Russ and Alcala 1989, Roberts and Polunin in press).

Restricting fishing alone is not enough to maximize benefits. An increase in use of reserves by others, such as recreational divers, often follows

protection and consequent resource enhancement. Unrestricted recreational activities can slow down or reverse habitat recovery. Recreational diving, for example, can destroy habitats, especially where anchoring is allowed. Installation of mooring buoys is a simple way of eliminating anchor damage, as has been done in the Bonaire Marine Park (van't Hof 1983). Divers themselves can inadvertently damage the environment that attracted them (Hawkins and Roberts 1992 a, b) and placing a cap on their numbers may be necessary to prevent habitat degradation (Dixon et al 1993, Hawkins and Roberts in press).

Protecting marine reserves from pollution is the most difficult aim to achieve. Most important among pollutants are sediments, nutrients and toxic chemicals carried into the sea with rainfall run-off or sewage discharges. These represent perhaps the greatest long-term threat to the integrity of marine ecosystems, and will require a major effort of political will to address. Without effective controls on pollutant inputs, marine ecosystems will continue to degrade, regardless of whether reserves have been established or not.

How long will it take before reserves produce benefits?

Benefits begin to accrue immediately an area is protected. However, like compound interest on a bank deposit they grow slowly at first, building up more and more rapidly as time goes on.

Studies in the Florida Keys and Caribbean have shown very rapid responses by fish populations to reserve protection. Both the Saba Marine Park and the Hol Chan Marine Reserve showed roughly a doubling in standing stocks over a period of only four years (Polunin and Roberts 1993). In Saba, populations of fishes have continued to expand, with further increases in standing stocks of between 60 and 320% between 1991 and 1993 (Roberts, unpublished data). In the Florida Keys, standing stocks of snappers and grunts increased by 93 and 439% respectively over a two – year period (Clark et al. 1989) and have continued expanding since Bohnsack et al. 1992. Rapid increases have also been demonstrated in Philippines reserves (Alcala 1988, Russ 1991).

How large must a reserve be?

Based on present information it seems certain that reserves will start providing substantial benefits to fisheries within a period of as little as five years. Benefits will continue to grow thereafter for a period of 10 to 20 years as slower processes of habitat recovery and effects on longer-lived animals build up.

Reserves must be large enough to protect significant areas of habitat and populations of organisms. They have to be big enough that exchange of organisms into unprotected areas is not so fast that populations fail to build up. To

protect large and mobile animals will require larger reserves than are necessary for smaller creatures with more restricted ranges of movement. Consequently, reserves would be inadequate in themselves to protect turtle populations, for example, although they might be used to protect important turtle feeding and breeding areas. Fortunately, the majority of fishes associated with reefs are relatively sedentary, remaining in a small area for most of their lives. For most of these animals, even small reserves can protect significant populations.

Studies of coral reef fishes have revealed that populations can build up fast in very small reserves. Most reserves established to date have been small. Of the examples given so far, the Sumilon Island reserve supported fisheries around the island despite covering only 0.4 km². The Looe Key National Marine Sanctuary in the Florida Keys is only 18.6 km², the no-fishing zone of the Saba Marine Park only 0.9 km², and the central part of the Hol Chan Marine Reserve in Belize covers only 2.6 km². All of these showed increased abundance and size of fishery species including conch and lobsters at Hol Chan. At most of these locations, reserves have been implemented on a pilot scale and efforts are presently being directed to expanding their size and numbers (for example in the Florida Keys National Marine Sanctuary). It is probable that sizes of 1-3 km² represent the minimum viable size.

How much area needs to be protected?

Marine reserves act as reservoirs of high quality habitat and spawning stocks of aquatic organisms. The benefits they provide to fisheries can be expected to increase at first as the total area protected expands, and then decrease as less area becomes available for fishing. A balance has to be struck between resource protection and exploitation. Theoretical considerations suggest that reserves will provide a very effective fishery enhancement function when 20% or more of the total area is protected (PDT 1990). Benefits of fisheries will probably begin to be outweighed by reducing fishing grounds when more than 30-35% of the total area is protected. Benefits to habitat and biodiversity can be expected to continue increasing as a greater and greater proportion of the area is protected.

What are the costs of marine reserves?

Compared to the benefits, reserves have few costs. Over the short term, reducing the area of fishing grounds is a cost, since catches may fall. However, a reduction in the area of fishing grounds of 10-20% will probably hardly even be noticed in terms of yield, since catches normally vary considerably from year to year. Even if catches are reduced, it is a cost which few fishers can afford not to pay! In the face of declining fisheries, marine reserves may be the least painful way for fishers to safeguard their livelihoods. The economic hardships of fishery collapses are much greater.

Other costs of marine reserves can arise from demarcation, installation of buoys and visitor facilities, and enforcement. However, these costs can often be recouped from fees levied from visitors. For example, the Saba Marine Park charges recreational divers and yachts for use of the park. Result: it has become the first self-financing marine park in the world (White 1993). The Bonaire Marine Park is also on the point of becoming self financing from user fees (Dixon et al. 1993)

Economic benefits from tourism

Environmental tourism is burgeoning throughout the world, and can provide a powerful engine for economic development in small islands. Improving the quality of marine resources in reserves would make them a magnet for tourists, especially scuba divers and snorkellers. Greater tourism can more than compensate for any short-term economic hardships resulting from area closure and can open up many new opportunities for fishers. In Belize, the huge abundance and size of fishes in the Hol Chan reserve attracts increasing numbers of tourists to Ambergris Cay. Many fishers have given up fishing and moved into tourist service activities such as operating dive tours and hotels. Reduced fishing pressure outside the reserve through economic diversification has further improved the quality of the marine environment, reinforcing the effect of the reserve.

In Bonaire, the economy is based to a great extent on tourist revenues from recreational divers. Dixon et al. (1993) estimated that by protecting the rich marine resources of the island, the Bonaire Marine Park contributed US\$32 million annually to the island's economy.

Community involvement and reserve effectiveness

When marine reserves are proposed there is often a great deal of controversy, with different user groups seeking to protect or promote their own interests. Fishers are initially almost universally hostile toward closing areas to fishing since they perceive reserves as a threat to their livelihood. In the face of declining fisheries, management approaches often focus on restricting catches first, even though causes of decline might also be traced to degradation of the marine environment from land-based pollution. As a result, fishing communities often develop a 'bunker mentality', feeling that they have been unfair victims of Government interference and regulatory prejudice. These attitudes have to be overcome before marine reserves can be effective. Reserves have been most successful where the full support of the local community has been gained.

Overcoming hostilities between regulatory agencies and user groups is an essential first step to creating functional reserves. In the U.S. Virgin Islands for example, there has at times been open hostility between fishers and fishery management agencies. This has made it almost impossible to implement effective management measures, including the designation of marine reserves. The failure of natural resources management measures can usually be traced to a lack of co-operation between regulators and users in the designation process.

A good example comes from St. Lucia where a system of 19 marine reserves was established in 1986 but without fully consulting with fishers. They felt singled out for regulation while other users were unaffected. As a result the system was a failure until the Department of Fisheries completely rethought their approach in 1992. They involved all user groups in a dialogue which has culminated in a revised system of reserves, more equitable regulations among different users, and broad support within the community (S. George pers. comm.).

There is now a wealth of information and experience concerning the use and effectiveness of marine reserves. People must be given the opportunity to examine the costs and benefits of reserves elsewhere before they can be expected



to lend support to local initiatives. Through public education and involvement, fishers may come to see that reserves are intended not to take away from them, but to safeguard their living. They will also see that they may offer alternative ways of making a living, such as tourism.

Education is the key to gaining the support of user groups but is often the first victim of communication breakdown. In these circumstances, disinterested groups such as universities or certain NGOs may be able to provide a forum for exchange of views and help broker agreements.

Getting started with reserves

Establishing a few small reserves is probably the best way to get a reserve program off the ground. In this way, local communities can observe for themselves the changes in marine habitats which science predicts. This gains local acceptance of reserves and increases trust in management authorities, making expansion of protected areas more easy. In New Zealand, the support of fishers for marine reserves increased as they began to see the benefits of a single reserve (Ballantine 1989).

Enforcing reserve regulations may be hard to begin with but should become easier overtime. Bohnsack (pers.comm.)

suggests the following sequence based on anecdotal evidence from reserves scattered throughout the world. Initially, reserves may be poorly received and enforcement agencies must be vigilant. However, some people will comply with regulations and although there may be many violations during this period, reserve areas will benefit from greater protection than non-reserve areas. As stocks begin to build up, people who violate the rules will be subjected to strong peer pressure from those who resent their cheating. A greater proportion of violations will be reported to regulatory authorities. Compliance will continue to increase in this way until reserves can become almost self-policing. However, a final stage may be reached when stocks have built up to such an extent that the rewards of poaching may be great. Consequently, mature reserves still need active protection. Reserves will always be easier to police in small and stable communities, such as those present on small islands, than in mainland coastal areas with larger populations.

Reserves on small islands as models for the world

Small islands have contributed much to our understanding of the use and effects of marine reserves. Most of the examples in this paper derive from islands,

whether they be nations unto themselves or parts of larger countries. Perhaps the preponderance of marine reserves around islands is due to the closer relationship between island peoples and their marine resources. Perhaps it is because island communities have risen to the challenge of resource protection more effectively than the larger, more diffuse populations which characterize mainland coasts. Whatever the reasons, small islands look set to continue at the forefront of efforts to manage marine resources and in doing so provide valuable information and experience to inform decisions in other countries.

Acknowledgements

This paper has its origin in frustration at the endless arguments about reserve establishment among decision-makers, fishers and other users of the marine environment. All of them, I have found, could do with a single simple source to answer their many questions about reserves and make their arguments more productive. I owe a debt of thanks to all people who have shouted, raved and stamped, both for and against reserves in meetings I have attended. I especially thank Jim Bohnsack for the many discussions we have had, for sharing with me ideas developed in this paper and for his persistence and optimism in educating others about reserves.

The Growing Need for Fishing Harbour Engineers

by J.A. Sciortino, BOBPIFAO Fishing Harbour Consultant

Although the bulk of fish landed in fishing harbours in developing countries is destined for local markets, it is every country's wish to improve the health-hazard-free quality of its landed catch in order to increase exports of seafood products to more lucrative overseas markets. The fishing industry as a whole can ill-afford the economic losses from lower prices received for contaminated fish. Recent EU rulings have even gone one step further by banning outright all fish imports from certain countries. In the not-too-distant future, the growth in local consumer rights advocacy will also increase demand for health-hazard-free fish.

HACCP : The Hazard Analysis and Critical Control Points programme is now an industry standard for seafood exporting countries. From 1996, to comply, such countries will have to invest substantially in upgrading and improving the overall sanitary conditions of the entire fishing industry. The fishery process is a series of activities starting

with the capture of fish and ending with the distribution of a whole range of seafood products — ranging from fresh fish on ice, through frozen fish up to processed and canned products. For the HACCP programme to be effective, it has to be applied over the entire fisheries process, which basically consists of

- *The individual work environments* onboard the fishing vessel, inside the fishing harbour, inside the auction hall, the cold rooms, the processing hall, the transport vehicles, the market stalls, etc.
- *The working medium* — potable water is required at nearly every stage in the chain of events. For example, water is required for ice, rinsing of fish and hosing down the work environments.
- *The surrounding environments* — each of the work environments sits inside an outer environment which may or may not be influenced (polluted) by outside factors.

The above, in turn, are affected by operational factors inside the fishing harbour and it is here that the HACCP programme has the greatest power to influence sanitary conditions because

- Fishing boats are moored, serviced and victualled inside a harbour and if a harbour is polluted, the pollutants may enter the food chain through fish contaminated inside the harbour or indirectly, from the vessels themselves;
- Fish is offloaded inside harbours and again may be easily contaminated;
- The auction hall is traditionally inside the harbour perimeter, as are most cold rooms;
- Transport vehicles call at harbours where they may pick up or leave contaminants behind them;
- Middlemen buy their fish (sometimes off the floor) from auction halls inside harbours.

Fishing harbour Kedah, Malaysia



Pic. K.C. Chong

A cursory examination of most fish landed in many local markets, irrespective of its freshness, shows that in many cases the fish only becomes a health hazard when contaminants found in the work environment, the working medium or the surrounding environments find their way into the fish during the handling process. These contaminants may be divided into two main groups, chemical and biological contaminants.

For both groups of contaminant, the common denominator for the contaminants to jump across into the food chain may be traced back to faulty infrastructure. In the present context, faulty infrastructure may include any one of the following

- Poor design standards (outdated or geographically incorrect design criteria, bad design and poor material specifications);
- Sub-standard construction (especially materials, methods of construction, lack of construction supervision etc.);
- Lack of adequate harbour management (lack of funding for a harbour management body, lack of funds for

proper maintenance, absence of legislative tools for enforcement, etc.).

Enter the Engineer: The difference between a conventional harbour engineer and a fishing harbour engineer when it comes to designing fishing harbour infrastructure is that whereas the former considers the harbour as his objective, i.e. the well-being of the vessels, the latter considers the end to be a functional seafood factory operating at the peak of its sanitary efficiency sitting in an environment compatible with the end-use, i.e. seafood production.

Because of his understanding of the seafood industry, the fishing harbour engineer is perhaps the best person to integrate HACCP recommendations directly into the facility's infrastructure; hence the need for specialised engineers.

Poor design standards: Water is the industry's working medium and it is required at practically every stage of the fisheries process; yet in many countries not enough thought is given to water supply, water storage and water treatment.

A fishing harbour cannot operate without an adequate supply of potable water

and in the interests of economy, many harbour engineers tend to underestimate the amount of water required for the daily operation of a fishing harbour. Not so the fishing harbour engineer. In cases where a harbour cannot be connected to a steady town's supply, a fishing harbour engineer would ensure that the infrastructure be equipped with a multi-redundant system.

A multi-redundant supply is a system whereby every drop of water available is employed for a specific function with the least amount of waste. In a bid to save potable water, seawater is also utilised for certain functions. Typical components of such a system could be:

Extensive and secure (very deep and away from sources of ground pollution) borehole fields;

a) Reinforced concrete underground storage reservoirs to cater for extreme shortages of water;

b) Rainwater collection systems linking all roof surfaces to storage;

c) Separate seawater system for secondary operations (floor washing or fish box cleaning);

d) Water-saving measures or appliances, such as high pressure cleaners;

Harbour pollution at Mallipatnam, Tamil Nadu, India.



Pic. E. Amalore



Trawler landings in Madras fishing harbour.

e) Metred water hydrants to eliminate waste;

f) Good quality pipes and fittings to eliminate leakage losses;

g) Standby desalination equipment;

h) Employment of outside contractors for the supply of ice.

Depending on the particular site and taken as a whole, the above generally yield very good results if integrated into the infrastructure at the design stage. For instance, if a harbour is planned in between other structures, with no opportunities for expansion, retrofitting an underground reservoir when the dire need arises may prove impractical at a later stage. Siting dirty smoke-stack industries in the vicinity of a fishing harbour or *vice versa* may deprive a fishing port of valuable rainwater: rain water polluted by industrial emissions is not suitable for use in a fishing harbour.

If a harbour basin is allowed to foul up with sewage, then seawater for secondary purposes would have to be piped-in from a greater distance or eliminated altogether, thereby increasing the load on the potable water supplies.

Another example of poor design standards is auction hall floors. Engineers not conversant with fisheries operations traditionally specify the cheapest flooring system available, generally plain concrete. A fisheries harbour engineer, on the other hand, would ask himself the following questions before deciding on what to specify:

a) What kind of fish is landed (oily fish, shrimps, white fish) and what state is the landed fish in? Is it fresh and iced properly, is it frozen fish or is it already partly rotten with no ice, leaching blood and fish oil onto the floor?

b) What is the water supply situation like? Is it abundant or is it very scarce?

c) What is the ambient temperature and humidity? Is the fish unloaded at night or during daytime when temperatures are very high?

d) Is the auction held very quickly or does it take a long time to organize and execute?

The answers to the above questions enable a fisheries harbour engineer to decide on the type of specification to employ. For instance, concrete flooring is relatively cheap but its surface is easily attacked (pitted) by fish oils and is hence not suitable in cases where fish is of a poor quality and is generally handled during daytime with high ambient temperatures and humidity.

Though the concrete floor may be structurally sound, the pitting in the surface caused by the fish oils harbours bacteria which in turn cannot be dislodged easily, rendering the entire hall very smelly and requiring copious amounts of water for hose-down. A concrete floor on the other hand would be suitable for a country with low ambient temperatures, or a facility which handles frozen or non-oily fish like shrimp. A ceramic tile floor would be suitable only if good quality iced fish is handled, dripping very little blood. Plenty of water though would still be needed to keep the joints between the tiles clean. Poorly constructed joints are always a cause for concern, and if the facility is to handle high quality products for export, even this type of flooring is not suitable. In most cases, then, a seamless waterproof epoxy floor would be the most suitable as this would totally eliminate all problems associated with hygiene and maintenance.

As can be seen from this example, the seemingly cheapest solution is not only not the most suited for its purpose, it is also not the cheapest in the long run when one has to consider maintenance; water is also a cost (a resource which has monetary value) and the more water that is needed to achieve the same standard of hygiene the costlier the maintenance.

Similarly, another example where a fishing harbour engineer's expertise is required is in personal hygiene. Port administrators not conversant with food industry requirements may think nothing of this item when it turns up in a specification. Closer examination of

many fishing harbours in developing countries, however, paints a very dismal picture to a would-be importer of seafood preoccupied with the personal hygiene of the workers handling the seafood products. The following observations are very common

- a) Toilets are sometimes totally absent from the harbour infrastructure;
- b) Toilets do not have an adequate water supply to flush;
- c) Toilet drains are often uncovered and full of rubbish like plastic bags, fruit, etc. causing blockages;
- d) Toilets open out onto work areas and when drains get blocked, sewage floods into the processing/handling area;
- e) Toilet and wash-hand basin fittings are often out of order, broken or missing;
- f) Doors are often unserviceable and removed off the hinges because the timber from which they are manufactured absorbs too much moisture and renders them inoperable
- g) Toilet and shower blocks are often unattended and abandoned;
- h) Toilets are often flooded from leaking pipes or roofs;
- i) Sewage disposal or treatment is either absent or totally inadequate.

All of the above generally lead to toilets of opportunity usually spread around the fishing harbour. Needless to say, this is a health inspector's nightmare come true as the potential hygiene trouble spots multiply and fester.

And so the list of poor design standards goes on, encompassing just about every aspect of the fishing harbour.

Sub-standard work is the result of a lack or improper site supervision. Lack of experienced site supervision often leads to

- Porous concrete which absorbs moisture, spalls easily and does not retain finishes;
- Rapid corrosion of metal fittings due to bad site practices;
- Improperly laid pipes and fittings leading to frequent leaks and flooding;
- Poorly laid paving surfaces and drains prone to rutting and blockages;
- Leaking roofs.

When one adds poor design specifications to sub-standard construction work, the result is often infrastructure whose useful operating life is measured in months instead of years.

Harbour management in many fishing harbours is totally lacking. Many developing countries, in fact, expect the fishermen to run fishing harbours. For fishing harbours to function effectively they must first of all have enough funds (locally generated or from central/local government sources) to operate, and to operate, a harbour needs

1. A harbour management body (from a single harbour master in the case of a small artisanal landing to a full management team in the case of a large harbour);
2. A set of operating rules and regulations custom-made for the fishing industry;

3. The legislative tools for enforcement.

Designing or proposing a new fishing harbour without considering how the above mentioned three requirements are going to be funded is a futile exercise if export quality products are expected to be handled at the facility.

Conclusions: Site inspection of fisheries harbours from which seafood is exported will soon be mandatory under the US Food and Drug Administration's HACCP programme.

Under HACCP, importing countries will also impose more stringent sanitation requirements in the overall handling and processing of seafood.

To comply with these requirements, it is envisaged that developing countries will have to invest substantially in upgrading and improving current fishing harbour infrastructure.

Misuse of harbour area for fish drying



New Fisheries Officials - Welcome Aboard!

There are many new hands at the steering wheels of fisheries in the Bay of Bengal region. The BOBP welcomes them and wishes them luck and success. The new leaders include:

Mr Ayub Quadri, Secretary for Fisheries and Livestock, Bangladesh

Mr Liaquat Au, Director-General, Department of Fisheries, Bangladesh

Mr Mohammed Azizul Karim, Joint Chief (Planning), Ministry of Fisheries & Livestock, Bangladesh

Mr N 'Rama Rao, Joint Secretary (Fisheries) Department of Agriculture and Cooperatives, Ministry of Agriculture, Government of India, New Delhi

Mr Mohan Verghese Chunkath, Secretary of Fisheries, Tamil Nadu, India

Mr Hans Raj Verma, Director of Fisheries, Tamil Nadu

Mr D K Ghosal, Director of Fisheries, West Bengal

Mr Abhay Rath, Principal Secretary (Fisheries and Animal Husbandry, Orissa

Mr Md Jamil Ahmad, Director of Fisheries, Orissa

Bapak Felix X Murdjijo, Director-General of Fisheries, Indonesia

Dato Mazlan Jusoh, Director-General of Fisheries Malaysia

Mr George Chong, Chief, Resources Management Branch, Department of Fisheries, Malaysia

Mr Ahmed Hafiz, Deputy Director, & Acting Chief, of the Marine Research Section, Ministry of Fisheries and Agriculture, Maldives

Mr Mahinda Rajapakse, Minister for Fisheries and Aquatic Resources, Development, Sri Lanka

Mr M T K Nagodawithana, Director, Department of Fisheries and Aquatic Resources, Ministry of Fisheries and Aquatic Resources Development, Sri Lanka

Dr Plodprasop Suraswadi, Deputy Permanent Secretary (Fisheries), Ministry of Agriculture and Co-operatives, Thailand

Mr Dhammarong Prakobboon, Director-General of Fisheries, Thailand

Mr Somsak Chullasorn, Director, Marine Fisheries Division, Ministry of Agriculture and Co-operatives, Thailand



Bay of Bengal News is a quarterly publication of the Bay of Bengal Programme (BOBP), a regional multi-agency 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 methodologies, 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 and Japan, by member governments in the Bay of Bengal region. The main executing agency is the FAO (Food and Agriculture Organization of the United Nations.)