

BOBP/REP/72

**SRI LANKA/FAO NATIONAL WORKSHOP
ON DEVELOPMENT OF
COMMUNITY-BASED
FISHERY MANAGEMENT**



Report and Proceedings of the

**SRI LANKA/FAO NATIONAL WORKSHOP ON
DEVELOPMENT OF COMMUNITY-BASED FISHERY MANAGEMENT**

Colombo, 3-5 October 1994

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PREPARATION OF THIS DOCUMENT

This document contains the report and proceedings of a National Workshop on Development of Community-Based Fishery Management. It was organized by the Department of Fisheries and Aquatic Resources Development (DFARD), Ministry of Fisheries and Aquatic Resources Development (MFARD), in Colombo, Sri Lanka, on 3-5 October 1994, in co-operation with the UN Food and Agriculture Organization. Funds for the Workshop were made available through the Japan Trust Fund GCP/RAS/138/JPN. Publication of the document was facilitated by the Bay of Bengal Programme.

The document comprises the final report of the Workshop as approved by the participants; a list of participants, the prospectus and agenda; and a list of documents followed by the papers presented at the Workshop.

Dr Masamichi Hotta, Senior Fishery Planning Officer, Fishery Policy and Planning Division, FAO Fisheries Department, served as technical secretary of the workshop. Technical editing was done by Dr Hotta along with Dr Anton R Atapattu, Director of the Department of Fisheries and Aquatic Resources Development, Sri Lanka. Ms Mary J. Morris, Consultant, was Editor-in-Chief.

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 in developing integrated coastal fisheries management in the Bay of Bengal to help improve the conditions of small-scale fisherfolk communities in member countries. The BOBP is sponsored by the governments of Denmark, Japan, and United Kingdom, and the International Maritime Organization of the UN (IMO). The executing agency of BOBP is the FAO (Food and Agriculture Organization of the United Nations).

ABSTRACT

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In Sri Lanka, traditional fisheries management has been implemented for many years in certain areas. The concept of participatory approaches in fisheries management where target beneficiaries are involved in the planning, decision-making and implementation of management measures is, therefore, not new in the country. The Government is keen to introduce and actively promote community-based management for the sustainable use of fisheries resources. The Workshop examined the possibilities of strengthening participatory approaches in fishery management and identified a number of conditions to be met, and made recommendations for the government and other institutions to follow.

FOREWORD

Sustainable resource management in general and fisheries management in particular is one of the hottest development topics of today, but it is not new to Sri Lanka. As this workshop held in October 1994 showed, self-regulatory management systems have evolved over the years in several places such as Chilaw, Puttalam district and Galle district. The workshop indicated that “community-based management” means collaborative management – the close co-operation between government authorities, resource users and the people.

Fisheries management cannot be imposed from above; it has to get internalized and evolve, with active local community participation. Otherwise we could end up with a management mechanism that can be likened to a “cat-and-mouse” relationship. Collaborative management is a softer approach and necessarily less punitive than a top-down approach, and encourages local community participation. One of the main reasons for the workshop was to promote the idea and the practice of participatory fisheries management and develop guidelines in this context. The workshop’s discussions and recommendations and the papers presented, which we are happy to publish, certainly furthered its objectives.

The workshop’s 75 participants spanned an entire gamut of professionals, managers, administrators, extensionists, scientists and industry representatives concerned with fisheries. No wonder discussions at the workshop, and the package of recommendations that resulted, reflect varied aspects of a complex subject. They should be regarded as a useful contribution to fisheries management knowledge in Sri Lanka.

Let me highlight just a few of the workshop’s recommendations. One of them related to effective mechanisms for monitoring, control and surveillance and law enforcement. This is essential – unless laws are enforced energetically, fisheries management will remain a concept rather than a practice. The best practice is possibly self-policing by resource users and the fishing community – this would be more cost-effective than any other kind of enforcement, and place the least burden on public funds. Education of fisherfolk, about fish stocks and potential yields, is equally vital. Even school-children in coastal communities should be made aware of the value of the environment, fisheries management and sustainable production.

The workshop made several valuable suggestions about strengthening data collection in fisheries. A system should be developed to analyse data on lagoon fisheries, and on catches of ornamental fish by species, areas and gear used. Future statistics should cover more fisheries and species, including effort and indicative prices. Duplication of data collection between the Department of Fisheries and Aquatic Resources Development and NARA should be avoided.

The workshop urged stronger links between economic activities and fisheries management. Better coordination, for example, should be developed between banks and fisheries officials. Informal and formal credit sectors must be integrated to bring down the usurious interest rates charged by money lenders. There should be relocation programmes to transfer labour and capital to offshore fisheries.

The workshop further urged improved awareness-building among resource users, government authorities, the private sector and the general public about environmental

degradation of coastal ecosystems. It suggested an imaginative use of FADs as part of fisheries management schemes, and a continuing impact assessment of existing community-based management systems.

Highly useful for reference value would be the 21 papers presented at the workshop. They covered traditional fisheries; socio-economics; community-based fisheries management; coastal zone management; the environment; aquaculture; fishery resources: conflicts in small-scale fisheries; case-studies past and present. Together, these papers are not merely a valuable contribution to knowledge; they offer pointers for action.

We would like to compliment the Department of Fisheries and Aquatic Resources Development in Sri Lanka, and in particular Dr Anton R. Atapattu, Director of the Department, for organizing and hosting this important workshop, and for giving the FAO an opportunity to be a part of it.

Kee-Chai **CHONG**
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**REPORT AND PROCEEDINGS OF THE
SRI LANKA/ FAO WORKSHOP ON DEVELOPMENT OF
COMMUNITY-BASED FISHERIES MANAGEMENT**

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PART 1. REPORT OF THE WORKSHOP

OPENING OF THE WORKSHOP

The Sri Lanka-FAO National Workshop on the Development of Community-based Fishery Management Systems was held at the Inter-Continental Hotel, Colombo, Sri Lanka from 3 to 5 October 1994. The Convenor was the Honourable Indika Gunawardena, Minister of Fisheries and Aquatic Resources Development (FARD). The Chairman of the Workshop was Mr. A.R. Atapattu, Director of FARD. Dr. Masamichi Hotta (FAO) was Technical Secretary and Dr. Kee Chai Chong (World Bank), Resource Person. The List of Participants is given in Appendix A. The Prospectus is given in Appendix B, the Provisional Agenda and Timetable is given in Appendix C and the List of Documents is in Appendix D.

The participants were welcomed by Mr. Indika Gunawardena, the Minister of FARD, Mr. K.H. Camillus Fernando, the Secretary of FARD and Mr. A.R. Atapattu, the Director of FARD. Mr. I. Kimoto, FAO Representative was invited to address the Workshop. The addresses of the above persons are in Appendices E-H.

The purposes of the Workshop were:

- a. To analyse the process as to how self-regulatory management systems have evolved in Chilaw, the Puttalam District, Wathuregama, and the Galle District;
- b. To assess the socio-economic impact of fishery management measures in the above areas and to identify the validity and risks of such management.
- c. To establish guidelines to facilitate development of community-based approaches in fishery management throughout the country, with particular reference to the legal and institutional framework, strengthening of fishermen's participation through community organisations, awareness building and educational activities.

Socio-economic consequences of excessive fishing effort

The fishery sector contributes only 2% to GDP but 65% to animal protein consumption.

It is also an important industry in terms of employment and foreign exchange earnings.

Coastal fisheries, which are mainly small-scale, contribute 85% to total annual production. Main characteristics of the coastal fisheries include open access which has led to pressure on resources. Entry limitation appears to be difficult and therefore relocation of surplus fishermen to other sectors of the economy is necessary.

Socio-economic features of coastal fisheries in Sri Lanka are: (i) the influence of religion (important for management is the fact that fishers are mostly of the Catholic religion); (ii) multiple resource users, which could lead to conflicts (tourism and fishery are expected to be complementary but experience shows that there are conflicts, for example between beach seiners and hotel construction); (iii) positive experiences with participation of fisheries cooperatives in management.

A major problem identified is that legislation is not geared toward management. There is a licensing system and special management areas, i.e. areas to be managed by local organisations. Although licensing applies to all types of operations, the main problem is with enforcement capabilities. Management areas are confined to critical areas.

The institutional and administrative set up is not appropriate to deal with conflicts between resource users at district and national levels. There are organisational committees such as the Coast Conservation and Advisory Council with representation of different organisations, and the Cabinet Sub-Committee on Coastal Affairs, that address coastal area management issues. At provincial level, information is required.

In the 1950's, introduction of new technologies, e.g. synthetic gear and motorised boats, was a government initiative but geared towards traditional fishers who adopted the new fishing techniques after some initial conflicts. Those who did not were only temporarily displaced.

Problems have been observed with migrating fishermen and their settlements in certain areas. This is a problem of open access and management should be considered on a consultative basis. On the question of whether a licence system for aquaculture with annual permits is necessary, it was mentioned that permits need to be obtained under the new Act.

To relocate fishers to other sectors has proved difficult but transfer to other fisheries-related activities has been shown to be more successful although it has not been studied in depth. There are indications that incomes in coastal fisheries were decreasing, while incomes of relocated fishers went up. Fifty percent subsidy was given to cooperatives but due to limited funds, government would not be able to meet all the requirements. However, for banks, fishery does not represent a preferred investment field.

Law enforcement in the districts is not always successful. There is some coherence in the activities of extension – development – law enforcement. An in-depth analysis of prawn farms has not yet been conducted but is recommended in the new Fisheries Act regarding fish farming. It is desirable that environmental impact assessments be conducted before allocating land for prawn farms.

Other coastal resource user industries such as tourism have their own development plans and legislation under the Environment Act. There is no information on the number of fishers but a system of fisher identity cards exists. The coming census is expected to provide more information on the subject. In terms of market policies, subsidies are not considered to have a positive effect, but subsidies should be available for the introduction of new technologies.

Legislation cannot cover activities beyond the EEZ so an international forum should do that. With respect to this, the meeting was informed of the work in progress to establish a code of conduct for responsible fisheries. With regard to dynamite fishing, problem areas have been identified but prevention has so far not been very successful. Dynamite fishing is now conducted by professional divers, who are easy to detect but the violators seem to be organised in gangs and scare the local fishermen. This practice also affects scuba-diving tourism.

Community involvement in special area management should include all resources users and not only fishers. It was mentioned that management responsibilities should be decentralised and that cooperatives should be provided with authority to undertake management. In some instances, resource users have worked out self-regulatory measures although a 100% coverage

has not been attained. The Sri Lanka government seems favourable to decentralisation of authority to communities or cooperatives.

The functions of extension work and law enforcement are often combined in the same person. This should be avoided in order not to confuse the responsibilities and not to put extension workers in a difficult position in the villages where they are based. In the past, there was a separate preventive service and separation of duties regarding enforcement and extension, but later they were amalgamated. It may be advisable to rethink these management practices now.

Information requirements

Conflicts generally arise due to shrinking fisheries resources. There is a need for intervention to manage the fisheries in order to resolve the conflicts among different groups of resource users. Management intervention requires the information and knowledge necessary to analyse the issues and situation in order to develop appropriate management measures. The information needed should cover different aspects of the resources and the resource users.

The objectives of the Sri Lanka National Fisheries Development Plan were reviewed in order to shed light on the required information to develop management systems. The current status of information and data collection, limitations of data collection and ways and means to overcome such problems, including improvements to collection, compilation and analysis, were highlighted. Under the present system of data collection, not all the fisheries are covered, nor the whole country. There is now a standing committee to review the present data collection system with a view to improving it.

More specifically, the following categories of information are required to manage fisheries in Sri Lanka: (a) Biological information; (b) Technical information; (c) Economic information; (d) Social information; (e) Environmental information; (f) Institutional information.

The required information for developing fishery management presented above can be classified into three categories: for managing the resources, for managing the resource-users and for managing the introduction of technology.

Fishery resource managers have to be more knowledgeable about the resources and resource-users for whom she/he has responsibility. She/he is, in essence, a knowledge worker and her/his action/decision should be research-based. It was suggested that the use of indigenous knowledge, including traditional or modern community-based management systems or models of self-regulation of the resources should also be incorporated into the information to be collected. The fishers need to be educated in the importance and value of such data for fisheries management. They should be made to understand the benefits of improved management.

Reliability and accuracy of information to be collected was emphasised with a view to improving its value. It was pointed out that in the past there had been a tendency to concoct data without going out into the field. The pressure on data collectors to report increasing production trends must be checked or discouraged because if the data do not support an increasing trend, they should then be reported as such. Data to be collected should be simple, straightforward and prioritised in some order of importance.

There is an urgent need to strengthen data collection co-ordination and co-operation between NARA and DoF on the one hand and between and among other agencies with an interest in and responsibility in fisheries and aquatic resources on the other.

The lack of data collectors or enumerators and lack of greater community involvement in data collection were continuing problems. Present data collectors are overloaded with work; in addition to their fishery extension and enforcement responsibilities, they are required to assist in data collection. The ratio of Fishery Inspectors to number of fishing households is 1 400:1 500. More data collectors are clearly needed.

Institutional credit needs

In the past, banks and other lending institutions have attempted through various means and management measures to lend to the sector. Two such are the “Fisheries Banks” and Regional Rural Development Banks (RRDB). Overall they have not been very satisfactory and failed to meet the needs of the poorer sections of the fishing community. Their operations were unable to compete with the informal lenders.

Fishery cooperatives are units that could be considered to be community based institutions for the purpose of lending to the sector. The participation of lending Institutions has had a positive effect in enforcing better financial practices and sector management, thereby creating a greater awareness of the need for management and conservation of the fishery resources as they have a direct bearing on lending criteria, e.g. source of earnings, etc. Lending has tended not to include NGO's because many NGO's do not have legal status. However, some NGO's have had a very positive impact in promoting good financial practices.

In the future, the tendency should be for investment to be directed mainly to the private sector, except infrastructure development which is presently limited to mainly fishery harbour facilities and anchorages.

The PNN scheme (community credit system) was a happy combination between the informal money lenders and credit institutions and was successful in stabilising lending rates and improving loan recovery through the introduction of a more ethical code of conduct.

Institutional credit has been used in recent times as a means of controlling overfishing problems associated with over capacity in coastal areas by offering credit for multi-day fishing craft thus diverting the excess fishing effort to exploit the off-shore fishery. A study by World Watch, an International NGO indicated that off-shore fishing would become uneconomic in the long run. Hence the government's present policy of encouraging the off-shore fishery should be viewed with caution. In Sri Lanka, the off-shore fishery is still small in scale as it is carried out by small scale fishing vessels that have ventured off-shore. The fishermen are still the same small scale boat owners and fishing companies as such, have still not evolved. Monitoring of the off-shore fishery should be pursued aggressively in order to evaluate the trends in catch per unit effort. Cost and benefit analyses should be undertaken to facilitate effective management of the fishery.

Maximising technical efficiency, which has been the focus of fishery development schemes in the past, tends to cause overfishing problems and over exploitation of resources. Hence, this has now to be balanced by economic efficiency considerations in order to correct any imbalances and ensure sustainability and profitability.

Community-fishing management practices

The fishery in the Chilaw lagoon is mostly for prawn and shows signs of overexploitation. Catches of big prawns are decreasing and by-catches are increasing. Problems that also occur are

waste water effluents and problems created by motor boats. The impact of the ban on trawling since 1992 has been very limited as incomes of the fishers have not increased over this period. In Chilaw, where community based management is in practice, fishing groups are organised in a federated association.,

Although there are environmental problems, the federated association has not undertaken activities to build awareness among fishermen. Apparently a law exists that prohibits encroachments by coastal construction but this law is not respected. There has been some protest against cutting of mangroves – productive breeding grounds – but not very successfully. Caution and education may be needed to raise the interest of the fishing community of Chilaw in changing to an environmentally sound, higher intensity of fishing, for example, by restocking waters based on fish culture. Caution and education may be needed. Short-term profits could be raised through water-management measures in the lagoon but the question remains whether the community would support such activities. Space for fishing is limited and clashes between traditional and modern fishing methods have been observed. The potential of the prawn fishery resources and that of other fisheries is limited and any expansion of the industry should be absorbed by the existing fishing community which is, in itself, limited.

The lagoon holds a considerable potential if considered as a nursery and could be made more productive if fishermen were made more aware of the potential. However, regarding the lagoon as a nursery should not be over-simplified. Breeding and flow of larvae in and out of the lagoon is complicated. Also diversification is needed and over emphasising shrimp production should be avoided. Kattudel fishing is for the moment the only technique really managed by limiting fishing efforts in the lagoon and the question is how to replicate this self-management system to other fisheries.

But management also means a full exploitation of available resources. Ownership of resources is unique for this situation and the issue was raised whether the question of equity and privileges does not lead to dissatisfaction in the community. Other job opportunities should also be investigated since fishing has proven to have a negative social (economic?) connotation and other opportunities are often preferred. Other possibilities/potentials within the sector should also be exploited.

Negombo Lagoon is a bar-built shallow estuary, highly productive and exposed to constant fishing effort throughout the year. At least 22 types of gear or methods of fishing are in use. Most of the traditional methods are simple and environmentally friendly. The two most important are also the only two traditionally closed fisheries, that is the stake seine net (Kattudel) and the brushpile (Masathudel) fisheries. The Katta (Angler FAD) and Jakottu (Kraal) are also a form of traditional user rights fisheries (TURF's) since they are inherited, owned and operated by specific individuals.

All other fisheries are open access which has led to over exploitation of finfish and crustaceans. In Negombo Lagoon, this trend is evident from: increased numbers of fishermen, decreased size of animals caught, increased value of ornamental fish, increased types of gear used, decreased mesh sizes and decreased CPUE of brushpiles.

A licensing system should be brought in to regulate gear and protect sensitive areas (e.g. seagrass), possibly using a people participation approach.

The push net, considered a highly damaging gear, yields finfish seed for exports to

Malaysia. While it may increase shrimp production by harvesting grouper fingerlings, on balance the disturbance caused may be detrimental to the ecosystem in the long run.

NARA studies have confirmed that the Negombo Lagoon's total area has shrunk, though at a slower rate than studies have suggested. On the impact of the proposed harbour in Negombo on the lagoon ecology it was remarked that Negombo Lagoon already has a harbour. The Morawala location proposed was the best techno-economic alternative. Fearing an expanding fleet made up of absentee boat owners, the local stakeholders oppose any new construction. The Ministry of Fisheries & Aquatic Resources Development supports popular opinion to stop plans for a new unwanted facility. The town drains, the export trade zone industry, agriculture pesticide run off and kerosene and oil-leaking motorised vessels were polluting the lagoon and damaging the fish. The natural flushing of the lagoon was important but it has constantly been reduced. In reference to Environmental Impact Assessment, no major study has been conducted as no major developing project had been planned in the area. Some studies of a short-term nature have been conducted as well as long-term data collected. NARA has established that CPUE in the lagoon has been erratic, falling during the 1980's by 20% only recovering in the early 1990's.

The main concern, about the decreasing size of the lagoon due to illegal construction and development, was difficult to address. There was a proposal for a Muthurajawella Authority but it was not funded. The ensuing proposal to gazette the lagoon as a wildlife sanctuary would inappropriately give the Department of Wildlife Conservation the sole authority to licence fishermen. Now the hope is that the lagoon can be declared a fisheries management area under the proposed Fisheries Act. This would allow the Department of Fisheries to deal effectively with the shrinkage problem.

For comparison, it was noted that the ban on trawling in neighbouring Chilaw Lagoon had resulted in an increase in the trammel net fishery which took advantage of the increased amount of unharvested shrimp. The relationship between the shrimp stock in the lagoon and the grouper population in the open sea had been the subject of speculation but no data on the matter had been analysed. The lack of "ownership" of natural resources was at the root of misuse and lack of action. In Chilaw, the Forestry Department does not see the mangroves as their mandate and thus no one is active in their protection.

In Batticaloa Lagoon, thousands of displaced sea fishermen had come into the lagoon due to civil disturbance. The lack of sea anchorages forces larger sea vessels to moor in the lagoon. Prohibited gears were being used in the sensitive mouth area where only cast nets are allowed.

It was questioned whether the fisherfolk organisations were able to come together for a community-based approach. While the stake seine fishermen were well organised, the brushpile fishermen were not. Regarding traditional conflict resolution, the District Officer has been involved in improving the rules after internal conflicts in the Stake Seine Federation. It was noted that the stake seine groups have conflicts with those using new technology such as cross nets (Haras del) and trammel nets (Disco del). In these conflicts, the police are the first source of help, thereafter the Ministry of Fisheries and Aquatic Resources Development are brought in. The role of fishermen's cooperatives in some foreign countries was discussed and examples were given of how those cooperatives were able to co-operate with the state authorities in fisheries management.

In the past, fishermen have not been able to defend their interests. The diversion of the Gal Oya into Batticaloa Lagoon is an example of the better organisation of the local paddy farmers than the lagoon fishermen. Similarly, the Valachenai Lagoon fishermen were not able to organise

themselves sufficiently to prevent the construction of the Paper Mill there.

There were other situations where the fishermen have been able to organise to meet the challenge of community-based lagoon management. The people of Rekawa Lagoon have been able to meet on a weekly basis and develop an integrated management plan with the Coast Conservation Department for that lagoon covering all aspects including alternative employment and coral mining. NARA has similarly worked on a management plan for Puttalam Lagoon and hopes to continue. Popular participation was seen as key to the success of this work. The people need to be kept informed from inception to implementation.

Stilt fishing is a unique form of fishery. Presently there are about 80—100 fishermen engaged in these fisheries at any one centre. Normally, 800—1 000 fish are caught by a fisherman per day. Fishing is carried out for about 5 or 6 hours per day in two periods 10.30—12.30 p.m. in the morning and in the afternoon 3.30-6.30 p.m.

The fishermen erect individual stilts by fixing a wooden pole in a hole made in the coral bed. The seat is then made on a horizontal cross bar tied to the pole as high as possible, with a small part of the vertical pole left free to serve as a hand hold. The stilts are normally erected within walking distance of the beach generally up to about the level of the hips of the fishermen.

Stilt fishing is a limited form of fishing and its production is very low. Purse seine fishing would be a more productive but the stilt fishery is presently also a tourist attraction due to its unique nature and the fishermen earn extra money by charging the tourists.

Stilt fishing is an example of community based fishery management as it is a fishery managed by the fishermen themselves. On the other hand, the beach seine (madal) and purse seine fishery are regulated by the central authorities rather than the community. Beach seine Fishing Regulation 1984 and Purse seine Net Fishing Regulation 1986 were made by the Government in order to better manage these fisheries.

Madel fishing (beach seine) is also a very important fishery and it is also a community-based fishery but due to ethnic disturbance these fishing operations were disrupted during recent years, in the north and east. Beach seine fishing in South Sri Lanka, specially Waturagama in Ahungalla is managed by the fishermen themselves. There are about 26 beach seines and operated without any problems as they are managed by a community-based system.

It is possible to promote fisheries, specially beach seining (land-based fishing) in conjunction with the development of the tourist industry in Sri Lanka. North of Colombo, at Negombo, Chilaw and Puttalam, there are a number of boats which are engaged in fishing with tourists. Even multi-day boats are engaged in this and both the fishermen and tourist boats were able to get good income. There are two Anglers Clubs in Sri Lanka.

The Workshop confirmed that the term “community-based management” as presently used, means collaborative management; the close co-operation of government authorities and the people. The government plays a crucial role supplying technical data, giving legal guidance as well as assisting in the fair implementation of plans.

In most cases, there is considerable vagueness about which government authorities have the leading role in the management of a particular area. It is necessary for all these agencies to co-ordinate their sectoral efforts in order to succeed with the integrated approach required for the

special area management process. The workshop noted the need for co-ordination of all those involved in coastal resources management through a “clearing house” forum.

The proposed Fisheries Act which proposes Fisheries Management Areas, needs a broader orientation toward management of the environment and aquatic resource habitat so as not to preclude involvement of non-fisheries aspects.

The situation in Negombo Lagoon is unique in that the fishing sector is predominant over other industries. The organisation there will need to be led by the interests of that sector but other groups will have to be involved for an effective management. Most other coastal areas in Sri Lanka have a better balance of stake holders representing the various interests and sectors.

CONCLUDING SESSION - RECOMMENDATIONS

Topic 1. Socio-economic consequences of excessive fishing effort and the need for fishery management

- I. Management measures should be based on long-term national objectives and targets to ensure the sustainability of fishery resources exploitation and the equitability of benefits distribution. Such measures should be designed to involve fishermen from the start.
2. Development of participatory approaches to fishery management and conservation should be incorporated into national legislation.
3. Effective mechanisms should be established for monitoring, control and surveillance and law enforcement. Adequate financial resources should be made available to this end. The possibility of establishing a separate unit for enforcement of regulations should be considered.
4. In order to facilitate the exit of fishermen from coastal fisheries, fishermen's relocation programmes should be developed to transfer excess labour and capital to offshore fisheries which have a potential for development.
5. Possibilities should be sought to establish an association of offshore fisheries for tuna, billfishes and sharks in order to ensure that such fisheries will be carried out in a responsible manner.
6. Where reliable information is available, fishermen should be properly educated on the state of fish stocks and their potential yields and environmental status in order to ensure their collaboration which is essential for effective fishery management.

Topic 2. Information needed for strategic planning of fishery management

7. The present system for collection of data and information for management should be strengthened and expanded to include adequate biological and economic aspects of all types of fishing.
8. A system should be developed for the collection and analysis of the data on lagoon fisheries in order to assess the magnitude of lagoon resources and the components of adjacent waters for management purposes.

9. A system should be established to collect information on the catches of fry and fingerlings (exported as ornamental fish) by species, areas and gear used. Similar information should also be compiled for marine organisms exported for culture purposes.
10. There should be District Fisheries Inspectors who will be exclusively engaged in data collection at landing sites. An adequate number of District Fisheries Inspectors should be allocated.
11. The field staff should be motivated to carry out the data collection with the provision of the facilities required, such as motorcycles and other incentives.
12. The potential contribution that fisheries cooperatives could make in strengthening data collection (production and prices) should be recognised and appropriate mechanisms should be established for timely reporting of information.
13. Future statistics collection for production estimation should cover more fisheries and species and look into the possibility of island-wide coverage. Efforts should also be made to avoid duplication of data collection between the Department of Fisheries and Aquatic Resources and the National Aquatic Resources Agency. An annual fishery statistical report should be published by the Ministry of Fisheries and Aquatic Resources Development.
14. The results of data collection surveys should be shared with the community in which the survey was conducted so that they are informed of the outputs of the survey. In this way, the respondents who were interviewed will feel that they have contributed in a meaningful way toward solving their problems. The sense of participation will heighten their sense of belonging or ownership of the development and management intervention.
15. Since children are a potential source of information to parents in creating awareness in families, an effort should be made to develop awareness among school children in coastal communities of the value of the environment, fishery management and sustainable production. In this context, extra-curricular school activities such as sea scouting, involving both girls and boys, might be developed.

Topic 3. Strengthening linkages between economic activities and fisheries management

16. A review of the current credit programmes should be carried out in order to develop suitable strategies for strengthening linkages between credit and management planning and implementation. The investment and credit requirements for development of community-based fishery management should be analysed within the framework of the National Fisheries Development Plan.
17. Credit schemes should be established taking into account the emerging needs of fishery management and environmental protection. It was noted that credit and subsidy schemes for motorisation in the past had caused deterioration of inshore water resources.
18. Linkages between credit and marketing should be strengthened in order to improve the recovery performance of fishery credit schemes. Fish auctions by fisheries cooperatives should be promoted to this end.

19. There should be better co-ordination between banks and fisheries officials at field level in order to improve the recovery rate of loans.
20. Efforts should be continued to integrate informal and formal credit sectors for the purpose of bringing down usurious interest rates charged by informal money lenders.
21. The financial standing and management capabilities of fishery cooperatives should be improved in order to expand their credit activities. Proper guidance and training should be provided by appropriate institutions including banks.
22. The recovery rate of loans has proved to be high when there is no subsidy component in credit programmes. However, it is necessary to provide subsidies for promoting pioneering activities such as transfer of coastal fishermen to offshore fisheries and non-fishery activities.

Topic 4. Community-based fishery management practices

23. Awareness building is needed among resources users, government authorities, the private sector and the general public with regard to the environmental degradation of coastal ecosystems.
24. Possibilities should be investigated of developing stocking programmes in the lagoons to enrich the resources and improve the incomes of fishermen. Expanded activities in the lagoons may provide alternative employment opportunities for displaced fishermen.
25. Use of fish aggregating devices (FADs) should be considered as part of management schemes and the construction and deployment of FADs be included as a fishery input in government subsidy programmes.
26. An impact assessment should be carried out to determine whether the existing community-based management has brought about increased incomes and well-being to the fishermen concerned. Such a study may also include an analysis of the relationship between socio-cultural and kinship aspects and management practices.
27. All types of fishing gear operators should be brought together in apex or primary organisations to avoid territorial conflicts. Marine fishermen need to be aware of the lagoon management practices as well, since there is considerable interdependence among marine and lagoon fisheries. As regards the Hikkaduwa Marine Sanctuary, the various interest groups should be organised under the umbrella of the Divisional Secretariat, which is in a position to address the multitude of aspects associated with the protection of the Sanctuary.
28. Traditional fishery management systems are often exposed to external threats (e.g. encroachment of outsiders into fishing grounds; market forces). Action should be taken to control outside fishers' encroachment into the local fishery management areas. This may be done through strengthening licensing systems and reinforcing horizontal co-ordination among fisheries cooperatives.
29. The stilt fishing should be allowed to continue in its present form as it is eco-friendly and is community-based and in addition is a tourist attraction. Other types of eco-friendly fishing should also be similarly encouraged in connection with tourist industry promotion programmes.

Topic 5. Legal and institutional-framework for fishery management and the role of community organisations

30. The new Fisheries Act which will be promulgated in the near future should have a provision in relation to information collection, analysis and dissemination which is essential to increase the strength of fishery management planning and implementation.

31. The new legislation should place stronger emphasis on participatory approaches in fishery management in order to ensure the active participation of fishermen in all stages of management development.

32. Suitable local organisations to be involved in the design, implementation and surveillance of management measures should be identified and their staff be trained.

33. Due consideration should be given in the new Fisheries Act to the protection of traditional community-based fisheries management practices.

Topic 6. Coastal Zone Management and Development

34. Various government authorities, research institutes, private sector and coastal management projects should meet frequently and systematically in order to exchange information. In this context, a mechanism should be established to improve cross-sectoral co-ordination and co-operation in the development and management of the coastal areas.

35. The management of coastal ecosystems should involve non-fisheries sectors, particularly industry and environmental groups, in order to come to a consensus on major issues.

36. The consultative process between the government as catalyst, and the people as stakeholders, should involve the whole community, not just those subgroups directly involved.

Topic 7. Prospects for Developing Community-Based Fishery Management in Sri Lanka

37. The government should translate into action its political will and commitment by devolving and delegating more and more management responsibility and authority to the fishers. Tangible support should be extended, comprising financial allocation, human resources development, services and physical facilities.

38. Government at the national level should closely work and co-ordinate with local or provincial councils to develop community-based fishery management systems.

39. The appropriateness of fishery cooperatives participating in the fishery management on behalf of fishermen should be evaluated. Further development and strengthening of fisheries cooperatives should be supported as a means of implementing community-based fishery management systems.

APPENDIX A

LIST OF PARTICIPANTS

1. **Mr.A.R.Atapattu**, Director, Department of Fisheries & Aquatic Resources Development, New Secretariat, Maligawatta, Colombo 10.
2. **Mr.M.T.K.Nagodawithana**, Deputy Director/Fisheries Industries, Department of Fisheries & Aquatic Resources Development, New Secretariat, Maligawatta, Colombo 10.
3. **Mr.H.V.C.Fernando**, Deputy Director, Management & Social Welfare, Department of Fisheries & Aquatic Resources Development, New Secretariat, Maligawatta, Colombo 10.
4. **Mr.H.S.G.Fernando**, Assistant Director/ Fishing Industries, Department of Fisheries & Aquatic Resources, Development, New Secretariat, Maligawatta, Colombo 10.
5. **Mr.D.K.Fernando**, Assistant. Director/ Management & Social Welfare, Department of Fisheries & Aquatic Resources Development, New Secretariat, Maligawatta, Colombo 10.
6. **Mr.R.D.Warnadasa**, Assistant Director/ Technical, Department of Fisheries & Aquatic Resources Development, New Secretariat, Maligawatta, Colombo 10.
7. **Mr.T.L.De Aiwis**, Acting Assistant Director, Department of Fisheries & Aquatic Resources Development, New Secretariat, Maligawatta, Colombo 10.
8. **Mr.H.A.B.Rodrigo**, Statistician, Department of Fisheries & Aquatic Resources Development, New Secretariat, Maligawatta, Colombo 10.
9. **Mr.L.M.Ariyadasa**, DFEO/FM, Department of Fisheries & Aquatic Resources Development, New Secretariat, Maligawatta, Colombo 10.
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12. **Mr.Alexander Korala**, District Fisheries Extension Officer, DFEO's Office, Katukurunda, Kalutara.
13. **Mr.A.D.P.C.Wijegunawardana**, District Fisheries Extension Officer, DFEO's Office, Maggale, Galle.
14. **Mr.S.W.Pathirana**, District Fisheries Extension Officer, DFEO's Office, Matara.
15. **Mr.K.M.D.Sathyapala**, District Fisheries Extension Officer, DFEO's Office, Tangalle.
16. **Mr.R.A.Seneviratne**, District Fisheries Extension Officer, DFEO's Office, Maligawatta, Mahawewa.
17. **Mr.D.M.S.C.Dissanayake**, District Fisheries Extension Officer, DFEO's Office, Goodshed Road, Puttalam.
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19. **Mr.N.Radhakrishnana**, District Fisheries Extension Officer, DFEO's Office, Mullaithivu.
20. **Mr.S.Srikantharajah**, District Fisheries Extension Officer, DFEO's Office, Mannar.
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22. **Mr.S.A.Joseph**, District Fisheries Extension Officer, DFEO's Office, Jaffna.
23. **Mr.K.Selvaraj**, District Fisheries Extension Officer, DFEO's Office, Kalmunai.

24. **Mr.Asoka Ekanayake**, Executive Manager, Ceylon Fisheries Corporation, Rock House Lane, Mutuwal, Colombo 15.
25. **Mr.W.S.C.J.Wanasinghe**, Manager Operation, Ceylon Fisheries Corporation, Rock House Lane, Mutuwal, Colombo 15.
26. **Mr.T.De Silva**, Engineering Manager, Ceylon Fisheries Harbours Corporation, Rock House Lane, Colombo 15.
27. **Mr.Sarath Bandara**, Superintendent Engineer, Ceylon Fisheries Harbours Corporation, Rock House Lane, Colombo 15.
28. **Dr.(Mrs) P.Dayaratne**, Director National Aquatic Resources Agency, Crow Island, Mattakkuliya, Colombo 15.
29. **Dr.(Mrs) Padmini De Aiwis**, Director National Aquatic Resources Agency, Crow Island, Mattakkuliya, Colombo 15.
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32. **Dr.K.P.Sivakumaran**, Research Officer, National Aquatic Resources Agency, Crow Island, Colombo 15.
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34. **Mr.Gunaratne**, P.R.D.B., Chilaw
35. **Ms. Nirufa Naleem**, Janasakthi Bank, Women Development Federation, District Secretariat, Hambantota.
36. **Mr.Bandula Butathsinhala**, Assistant. General Manager, Fisheries, People's Bank Head Office, Sir Chittampalam A Gardiner Mawatha, Colombo 10.
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38. **Mr.W.A.C.Tissera**, Agriculture Credit Department, Bank of Ceylon Head Office. Colombo 01.
39. **Mr.W.D.Premachandra**, National Development Bank, Nawam Mawatha, Colombo 02.
40. **Mr.B.S.Kahawita**, Director, Coast Conservation Department, New Secretariat, Colombo 10.
41. **Dr.Fedrick Abeyratne**, Programme Officer, UNDP, Baudhaloka Mawatha, Colombo 07.
42. **Mr.K.Nissanga**, Fisheries Project Manager, IRDP, Hambantota
43. **Mr.G.W.Kaveendraraja**, Programme Officer, JICA Office, P.O.Box 2068, Colombo.
44. **Mr.W.P.P.Abeydeera**, Programme Director, Sri Lanka Canada Development Fund, 5/3A, Police Park Terrace, Colombo 05.
45. **Mr.Mohan Siribaddana**, USAID, P.O.Box 106, Colombo 03.
46. **Mr.Ajith Rodrigo**, Central Environmental Authority, Maligawatta, Colombo 10.
47. **Mr.Gamini Hewage**, Central Environmental Authority, Maligawatta, Colombo 10.
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50. **Dr.K.C.Chong**, FAO, Project Coordinator, Bay of Bengal Project.
51. **Dr.M.Hotta**, FAO, Senior Fishery Planning Officer.
52. **Mr.Kees Leendertse**, FAO, Associate Professional Officer.
53. **Rev.Fr.Sixtus Kurukulasuriya**, Director, Paul VI Centre, Front Street, Colombo 01.

54. **Mr.M.D.Fernando**, Secretary, Sri Lanka National Federation of F.C.S.Ltd., 127, Grandpass Road, Colombo 14.
55. **Mr.George J.Perera**, Secretary, Abu-Dhabi Boat Operators Union, 40/14, Lewis Place, Negombo.
56. **Mr.J.P.Jayaratne**, Secretary, Matara Multiday Cooperative Society, c/o. DFEO's Office, Matara.
57. **Mr.W.Iwan Christy, President**, Inboard Boat Operators Cooperative Society, No. 1010, Pitipana South, Negombo.
58. **Mr.U.G.M.Rupasinghe Banda**, Manager, Multiday Boat Owners Cooperative Society, DFEO Office, Mahawewa.
59. **Mr.Cecil Fernando, Pitipana** Deewara Kala Kendraya, Pitipana, Negombo.
60. **Mr.Merman Kumara, Director**, SEDEC, 133, Kynsey Road, Colombo 08.
61. **Mr.D.T.Hettiarachchi**, All Ceylon Madel Owners F.C.S. Ltd., Ranmal, 110/5, Chilaw Road, Negombo.
62. **Mr.Robert Hall**, Census Officer, UNDP Marine Fisheries Management Project, Department of Fisheries & Aquatic Resources, Development, New Secretariat, Colombo 10.
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APPENDIX B

SRI LANKA/FAO NATIONAL WORKSHOP ON DEVELOPMENT OF COMMUNITY-BASED FISHERY MANAGEMENT COLOMBO, 3-5 OCTOBER 1994

PROSPECTUS

1. BACKGROUND AND JUSTIFICATION

In Sri Lanka, the fisheries are essentially small-scale and coastal in character, some 75% of national fish production being taken in coastal waters. The total annual marine catch increased from 90,000 tons in 1972 to reach a peak of 185,000 tons in 1983 and then gradually declined to 146,000 tons in 1990. This decline reflects the disturbances in the North and the East which started in the latter part of 1983.

Within the overall economic development programmes, a series of schemes for fishery development have been implemented, such as the promotion of motorisation of traditional craft and the introduction and extension of new types of fishing craft and nylon nets. As a consequence, the fisheries have evolved from being entirely artisanal to more semi-industrial. These developments, together with rapidly growing consumer demand for fish both in the domestic and international markets, led to a rapid increase in the production of fish until the mid-eighties.

The total number of craft is now estimated to be around 28,000, giving employment to approximately 120,000 persons in fishing and post-harvest activities. The drift gill net is most widely operated, while long lines, troll lines, trawl nets, purse seines, rod and line are also used.

Most inshore fishery resources are now fully exploited and some such as shrimp are over-fished because of intensive trawling. Management measures have been taken in the form of trawling restrictions in certain areas. For example, trawling is completely banned in Chilaw and permits to operate purse-seines are not issued at present.

With a few exceptions there is open-access to the coastal fisheries. Beach seine (Madel) and stake net (Kattudel) fisheries are among the few instances where territorial use rights are in force. They are comparatively better managed with a definite system of limited entry into the fishery. In these fisheries, management measures restrict access, controlling the area of residence of resource users (e.g. resident fishermen of a given village), time of operation, number of fishing units, inheritance (e.g. rights being handed over from father to son), etc. Due to these management measures, there is no immediate danger of depletion of coastal resources. However, in the majority of coastal fisheries there are no such limits on entry.

Due to the open access nature of operation, fishing effort has increased over the years. This has led to conflicts among groups of fishermen engaged in different types of coastal fisheries. The history of conflicts among fishermen over fishery resources can be traced back to the late 1950s when there was intense friction between the fishermen using traditional craft/gear and those innovative fishermen who took up the challenge of using motorised boats and nylon nets. In the mid-1980s there was strong resistance from fishermen using other types of gear against management measures which attempted to limit sizes and numbers of nets, area of operation and the imposition of a high licence fee. As a consequence, the government had to suspend the licensing system.

Disputes between coastal trawl fishermen and groups engaged in other types of fishing led to the complete banning of trawling in spite of an effective management system introduced by trawl fishermen themselves. As a result, the government has been implementing a massive programme for the relocation of these fishermen to other fisheries. With a view to limiting entry to the coastal fishery, some concrete measures have been taken. For instance, the emphasis of the government allocation of producer subsidies (up to 50%) for fishermen to purchase boats, engines and gears has been changed from coastal fisheries to off-shore and deep sea fisheries.

In addition, various steps have been taken by the government, on the basis of the new fishery legislation formulated with the assistance of FAO, to solve management problems. These include the designing of a licensing system for all active fishing methods, demarcation of fishery management and conservation areas, introduction of bigger fines and jail terms for violators. In certain fisheries, for example purse seining, a high resource fee is being introduced to limit entry.

In order to encourage participation by resource users in the management process, some of the management measures have been organised under the umbrella of the cooperatives. A programme to educate fishermen in the importance of fisheries management has been implemented. Community-based fishery management systems have been practised in Chilaw, the Puttalam District and in Wathuregama, the Galle District with the initiatives taken by fishermen themselves. The former relates to the development of a shrimp fishery using 3.5 t motorised vessels. Realizing that conflicts with the traditional beach seine fishery for shrimp might lead to a ban on trawling, the trawler fishermen established an Association to control the orderly operation of trawl fishing. The Association laid down rules governing the timing, frequency and areas for trawl operations. The latter case concerns the self-regulation by the community of a traditional beach seine fishery on the South West coast of Sri Lanka. Partly because of social traditions regarding the transfer of ownership of fishing equipment, there had been a considerable growth in the number of seine nets and net setting craft owned in a community exploiting privileged rights to a foreshore area of less than 800 m. The community itself therefore introduced and administered a fishing system based upon an equitable rotation of the seines and craft.

Although government policy accords high priority to the implementation of regulatory measures, a number of important issues remain unresolved. These, for example, include whether to retain the privileges accorded to traditional beach seine operations or to encourage more efficient types of fishing methods which could make a more substantial contribution to the overall objectives of increasing fish production.

The importance of managing the coastal fisheries is now being realised more than ever before, mainly because most of the fisheries still enjoy free and open access with no limits on the growth of fishing effort. There are thus many problems with regard to the income generated by fishing operations with diminishing marginal returns and the effect on the environment due to over-exploitation. Although there are commendable examples of community-based planning and implementation, participatory approaches to fishery management are still in their infancy.

It would therefore be useful to hold a national workshop to review overall policy and strategies for coastal fisheries management to ensure maximum benefits to and participation by local communities, to build local and national institutional mechanisms for implementation of fishery management schemes.

2. OBJECTIVES OF THE WORKSHOP

- (a) To analyse the process as to how self-regulatory management systems have evolved in Chilaw, the Puttalam District and in Wathuregama, the Galle District, in order to define criteria and conditions which may promote community-based resource management systems in other parts of the country.
- (b) To assess the socio-economic impact of fishery management measures in the above areas to identify the validity and risk of such management measures.
- (c) To establish guidelines to facilitate development of community-based approaches in fishery management throughout the country, with particular reference to the legal and institutional framework, strengthening of fishermen's participation through community organisations, awareness building and educational activities.

3. AGENDA ITEMS

Issues to be addressed will include the following:

- (a) National policy and strategy to achieve sustainable development of fishing industries.
- (b) Community-based fishery management practices in Chilaw, the Puttalam District, including socio-economic impacts of the management measures adopted.
- (c) Community-based fishery management practices in Wathuregama, in the Galle District including socio-economic impacts of the management measures adopted.
- (d) Determination of criteria and conditions needed for introducing participatory approaches in fishery management and formulation of guidelines for facilitating development of community-based fishery management systems in Sri Lanka.
- (e) Identification of possible sites and review of their potential, and possible constraints as well as actions to be taken and preparation of action programmes.

4. PARTICIPANTS

Participants of the Workshop will be fishery policy makers and planners, fishery managers and extension officers, as well as representatives from fisheries cooperatives, NGOs, and the private sector.

5. DOCUMENTS

The following documents may be solicited from the government agencies, relevant organisations, on-going projects and external consultants.

- (a) Case studies on community-based fishery management systems (CFMS) in Chilaw and in Wathuregama.

- (b) A study on the socio-economic impacts of fishery management in Sri Lanka.
- (c) Information requirements for initiating fishery management measures.
- (d) Role of provincial, district and local government and non-governmental agencies including fisheries cooperatives in designing and implementing of fishery management plans.
- (e) Absentee boat owners and enforcement of regulatory measures for the conservation of fishery resources.
- (f) Creation of alternative employment opportunities for displaced fishermen.
- (g) Cost-effectiveness of CFMS in terms of enforcement of regulations.
- (h) Integration of promotion of CFMS in national legislation for facilitating participatory approaches in fishery management
- (i) Emerging conflicts between fisheries and tourism.
- (j) Integration of fishery management schemes in Coastal Area Management Plans.

6. EXPECTED OUTPUTS

- (a) Improved awareness and understanding among policy makers, fishery managers and fishermen of effectiveness and positive impacts of CFMS for the improvement of the state of fishery resources and the socio-economic conditions of fishermen involved. Recognition of the need to impart knowledge and experience on CFMS from successful sites to areas with similar situations.
- (b) Formulation of guidelines on procedures for CFMS plans and their implementation.
- (c) Proposals for development of CFMS at specific sites seeking external sources of finance for implementation.

7. ROLE OF FAO

- (a) Assist the Government of Sri Lanka in the preparation and organisation of the workshop.
- (b) Participation in the workshop in order to provide technical advice and fill information gaps;
- (c) Provision of a resource person from the region who will carry out a field survey and present a paper at the Workshop.

8. NATIONAL INSTITUTIONS AND DONORS TO BE INVOLVED

The Department of Fisheries and Aquatic Resources will be the focal point for the organisation and conduct of the Workshop. Close collaboration will be established with FAO/UNDP Marine Fisheries Management Project SRL/91/022 in the preparation and conduct

of the Workshop.

Representatives from relevant institutions such as the National Aquatic Resources Agency, the Ceylon Fisheries Development Corporation, the National Federation of Fisheries Cooperatives, as well as those from donor agencies and on-going fisheries projects in Sri Lanka are encouraged to participate in the Workshop.

APPENDIX C

SRI LANKA/FAO NATIONAL WORKSHOP ON DEVELOPMENT OF COMMUNITY-BASED FISHERY MANAGEMENT COLOMBO, 3-5 OCTOBER 1994

PROVISIONAL AGENDA AND TIMETABLE

MONDAY 3 OCTOBER

Morning

08:30 Registration at the Hilton Hotel, Colombo

09:00 Opening Ceremony

The Workshop will be opened with a welcome address by the Minister of Fisheries and Aquatic Resources. The statement by the UNDP Representative in Sri Lanka will follow. The FAO Representative will then address the Workshop.

09:45 Coffee break

10:15 Session 1. Socio-economic consequences of excessive fishing effort and the need for fishery management (NARA)

12:30 Lunch break

Afternoon

14:00 Session 2. Legal and institutional framework for fishery management and the role of community organisations (DOFAR)

15:30 Coffee break

16:00 Session 3. Strengthening linkages between economic activities and fisheries management (FAO)

TUESDAY 4 OCTOBER

Morning

09:00 Community-based fishery management practices

Case 1: Kattudel in Chilaw

10:30 Coffee break

11:00 Case 2: Traditional lagoon fishery in Negombo

12:30 Lunch break

Afternoon

14:00 Case 3: Madel in Wathregama

15:30 Coffee break

16:00 Case 4: Stilt fishing in Katholuwa and Ahangama

WEDNESDAY 5 OCTOBER

Morning

09:00	Session 5.	Information needed for strategic planning of fishery management (NARA)
10:30	Coffee break	
11:00	Session 6.	Coastal zone management and development (USAID)
12:30	Lunch break	

Afternoon

14:00	Session 7.	Prospect for developing community-based fishery management in Sri Lanka (SRI/92/022)
15:30	Coffee break	
16:00	Session 8.	Concluding session: Recommendations and action programmes
17:00	Adoption of report and closing of the Workshop	

APPENDIX D

SRI LANKA/FAO NATIONAL WORKSHOP ON DEVELOPMENT OF COMMUNITY-BASED FISHERY MANAGEMENT COLOMBO, 3-5 OCTOBER 1994

LIST OF DOCUMENTS

Main papers:

1. Session 1: Socio-economic consequences of excessive fishing effort and the need for fishery management (Dayaratne)
2. Session 2: Legal and institutional framework for fishery management and the role of community organisations (Atapattu)
3. Session 3: Strengthening linkages between economic activities and fishery management (Ruckes)
4. Session 4: Community-based fishery management practices
Case 1: Kattudel in Chilaw (Kurukulasuriya)
Case 2: Traditional lagoon fishery in Negombo (Jayacody)
Case 3: Madel in Wathregama (Sivakumaran)
Case 4: Stilt fishing in Katholuwa and Ahangama (Maldeniya)
5. Session 5: Information needed for strategic planning of fishery management (NARA)
6. Session 6: Coastal zone management and development (White)
7. Session 7: Prospect for developing community-based fishery management in Sri Lanka (Harrison)
8. Session 8: Guidelines for promoting community-based fishery management in Sri Lanka (Hotta)

Reference papers

9. Establishment of a monitoring system for catches of artisanal driftnet and longline fishing (Williams)
10. Absentee fishermen (Harrison)
11. Environment, tourism and development (Pietersz)
12. Fishery management and aquaculture (Piyasena)
13. Marine sanctuaries and conservation of fishery resources (NARA)
14. Displaced fishermen and their migration (Tilak Chandrasekara)
15. Changes in strategy from development to management in Southern Sri Lanka - a case in Norad development approaches (Munasinghe/ Nissanka)
16. Case study on marketing of under-sized crab/lobster and management restrictions (NARA)
17. Integration of fishery management into coastal area management plans in Sri Lanka (H.V. Fernando).

APPENDIX E

SRI LANKA/FAO NATIONAL WORKSHOP ON DEVELOPMENT OF COMMUNITY-BASED FISHERY MANAGEMENT COLOMBO, 3-5 OCTOBER 1994

INAUGURAL ADDRESS

THE HON. INDIKA GUNAWARDENA Minister of Fisheries and Aquatic Resources Development

Distinguished Guests, Ladies & Gentlemen,

I am happy to be associated with this Workshop on the subject of Community-based Fisheries Management as it is very close to my heart since it is the key to our wider development goals. Sri Lanka needs stable growth and development. The fishing industry has to do its part in this national quest and we at the Ministry of Fisheries and Aquatic Resources Development are to see that this sector is allowed to contribute to these higher goals. We need to offer our domestic consumers fish at an affordable price, and for this we need more production. We need to create more employment opportunities, and this will lead us to more production. We need to invest in our fishing industry with capital and we need to invest in our fishermen with training in modern techniques, for only in this way can we raise the overall production, and importantly, the productivity of the individual fishermen. This increase in productivity is the only viable way we can more equitably distribute the fruits of development to the people and eradicate poverty in the fishing communities.

However, the development scenario is not that simple. Our aquatic resources, including fish, are a limited natural resource with open access. Unplanned, uncontrolled development will lead to abuse of our resource base. And in the end, our goals of higher production and higher productivity will be defeated. We will have failed to eradicate poverty and instead worsened it. This is why sustainable fisheries management must go hand-in-hand with fisheries development. This is a great and demanding task and we must realise that the Ministry of Fisheries and Aquatic Resources Development is not in a position to succeed at this task in isolation. We must work with the fishermen for they know the fisheries, they are there to monitor, they are the ones with the most at stake. Fisheries management, far more so than fisheries development, demands a participatory approach at the grassroots level. Only through self-regulation by the fishing communities themselves can we hope to evolve effective control over the use of these common resources.

Japan is a remarkable example where community-based fisheries management has succeeded. As far back as the ninth century AD, it has been documented how the Emperor awarded fishing territorial rights to specific fishing communities. One village near Kyoto has retained the same unchanged territory for over 900 years. Today the planning, management, and sustainable development of each community's sea tenure is in the hands of its local democratic Fisheries Cooperative Association. Through these popular organisations, the central and provincial authorities can efficiently manage the nation's fish resources. If we in Sri Lanka can learn from this and strengthen and democratise our local fishing community organisations, we too will succeed in both fisheries development and sustainable fisheries management. For our part we will introduce legislation shortly to licence all major fishing operations with a view to managing these.

It has been said that Sri Lanka is close to overfishing its resources especially in the coastal waters; we need to rethink this whole matter. It may be true that in the past we have subsidised and encouraged development of the gillnet fishery and done the same for our lagoon and coastal shrimp fisheries. Our fisheries managers, biologists and planners must examine this situation and find out the resource limitations. But my point is that we must diversify. We must modernise our offshore / deep sea fleet' with navigational and communication equipment like radios, satellite navigators and use remote sensing data. But more importantly, the offshore fleet must be mobile and we must see that there are the basic infrastructure facilities so that they can base their operations from any coastal district. There may also be opportunities to develop a deep-sea fleet that can fish in the high seas for tuna as other countries have been doing just outside our waters. Sri Lanka has also a strategic position to exploit the resources of the South Indian Ocean, where some species remain untouched. While these possibilities need to be looked into, our overriding concern must be exploitation in our EEZ and adjacent waters.

The resource density, as you well know, is richest where the sea and the land meet and it is here our immediate opportunities lie. I am not suggesting the main coastal fisheries be intensified, but to the contrary, they be diversified. Our demersal finfish are not well exploited and some larger demersals on the shoulder of the continental slope are not exploited at all. Many demersals can fetch top prices in neighbouring countries such as Singapore and Malaysia if our fishermen know how to handle them properly. We have other traditionally untouched resources in our lagoons and along our coasts such as edible oysters, mussels, clams, jellyfish, octopus, sea urchins and seaweeds which command high prices in East Asia as well as at our own tourist establishments. Even possibilities exist with our traditional catch, like tuna. If we could teach some of our fishermen to catch "Sashimi" grade Yellowfin and Bigeye Tuna for export to Singapore, Hong Kong and Japan, we would see a radical increase in the fishermen's productivity without an adverse impact on the resource base. What is needed for all of these is applied research, practical training, extension and access to capital to allow fishermen to get involved in these export-oriented activities. Through research and training at the proposed Fisheries University Institute and through the Ministry incentive programmes, I think we can see progress in this area. The viable opportunities we create will offer alternatives for poor fishermen with low productivity.

If we cooperate with the fishing community we can stop degradation of our resource base in the coastal and brackish waters by stopping environmental pollution, destructive fishing methods and overfishing. In co-operation with fishermen we can also actually enhance what is incorrectly seen as the absolute ceiling of productivity by constructing artificial reefs and sea-lagoon openings in key locations. Furthermore, we must not forget to look inland to our freshwater bodies where we have potential to create employment and increase production through capture fisheries in tanks and aquaculture in ponds. These measures will enable us to dissipate or divert pressure from stressed marine resources.

I would like to thank all of you for coming to this Workshop today and showing your interest in the future of our country's fishing and aquatic resources industry. I want to especially thank the Resident Representatives, Mr. Robert England of the UNDP and Mr. Tsukasa Kimoto of the FAO for their support for this Workshop. I hope that in the next three days we will be able to have some very constructive deliberations on the future direction of fisheries management in this country. Through these deliberations, we are sure to achieve our goals, namely, sustainable development, provision of essential animal proteins for our people and socio-economic development of fishing communities. Community-based fisheries management, if it is to succeed, must offer the fishermen concrete benefits. It must go hand-in-hand with Community-based

fisheries development. The fishing communities must be prepared for these roles, through training and through institution-building at the village level. I hope the UNDP-funded, FAO-implemented Marine Fisheries Management Project can help us to perform these duties. But we need your input first. So the awesome task set out for this Workshop is to illuminate the prospects of community-based fisheries management, to identify what hinders it and to give practical guidelines on how we can move forward and facilitate popular participation in fisheries management here in Sri Lanka.

Thank you.

APPENDIX F

SRI LANKA/FAO NATIONAL WORKSHOP ON DEVELOPMENT OF COMMUNITY-BASED FISHERY MANAGEMENT COLOMBO, 3-5 OCTOBER 1994

ADDRESS

MR. K. H. CAMILLUS FERNANDO,
Secretary, Ministry of Fisheries and Aquatic Resources Development

Rev. Sirs, Hon. Minister, Hon. Deputy Minister, FAO Rep.,
Ladies & Gentlemen, Esteemed Colleagues,

I welcome all of you to this workshop and thank you in anticipation for the hard work and fruitful discussion I know you will contribute to during the next few days. The Ministry of Fisheries and Aquatic Resources Development has been entrusted with an enormous duty, the sustainable management of one of Sri Lanka's greatest renewable resources, its fish and living aquatic resources. Thus it is not without good reason that we are going to sit down here, put our heads together and concentrate on finding a practical and pragmatic road to a system of fisheries management which is workable for Sri Lanka.

Our Ministry has been fortunate to receive UNDP funding for a Marine Fisheries Management Project that we are executing with assistance from FAO. This project will allow us to prepare our field staff for new management-oriented work, it will build public awareness on resource conservation, and it will give us the data we need to as stewards of our nation's aquatic resources. But most important, the project is to give us a functioning Fisheries Management Unit which can help the rest of us in the Ministry collect the data needed, analyse the data we have collected, and draft plans and guidelines with us so that we can implement resource-sensitive development schemes, regulations and training programmes.

The point I want you all to remember, however, is that this small unit cannot and should not be the Ministry's sole player in the field of Fisheries Management. Fisheries Management is not just another square to be added on to our organisational chart in the form of a new unit... No, it is a new way of thinking for all of us. We all must participate in Fisheries Management by thinking in new terms. We need NARA's research on fish stocks, levels of exploitation, and on opportunities for effort diversification to other species. We need the efforts of NARA, Ceynor, NIFT, and DFARD to develop, give training on and introduce environmentally-sound craft and gear. We need DFARD's and Planning Division's efforts to develop the industry in a planned, sustainable manner. We need the efforts of DFARD and CCD to protect the destruction of marine habitats. We need DFARD, NIFT and the Fisherfolk Radio to build public awareness, especially the fishing community on the importance of resource management and the cessation of destructive activities. Fisheries Management requires us to pull together and co-ordinate our activities so that one division is not issuing craft while the other is introducing a scheme to buy back the same.

With all this said on the Ministry and Fisheries Management, I will be the first one to admit that even the whole ministry united cannot do what has to be done. We do have a good field staff but they are not ever-present in the villages. Some Fisheries Inspectors cover vast areas while others have thousand of families to serve. A bigger field staff is not the most efficient solution. We must entrust a great deal of the responsibility for detailed decision-making and

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enforcement to the chief stakeholder, the fishing community. We must train the fisherfolk, serve them, and support them, because they can help us do our job properly.

So let us begin the workshop with this in mind. I remain optimistic about the prospects of Community-based Fisheries Management. We have few other avenues on which to proceed. So let us make good use of these three days and I hope this workshop will make a deep impression on each of you that you will carry back with you.

Thank you.

APPENDIX G
SRI LANKA/FAO NATIONAL WORKSHOP
ON DEVELOPMENT OF COMMUNITY-BASED FISHERY MANAGEMENT
ADDRESS

MR A.R. ATAPATTU
Director of Fisheries and Aquatic Resources
and
National Project Director, UNDP Marine Fisheries Management Project

Ladies and Gentlemen

You are gathered here today at the inauguration of this important Workshop on community-based fisheries management. This is jointly organised by the UNDP Marine Fisheries Management Project of the Department of Fisheries and Aquatic Resources and FAO.

The idea of having this workshop was conceived in 1992, when an Expert Consultation was held on the Development of Community-based Coastal Fisheries Management in Kobe, Japan. At the end of this Consultation, I requested Dr Hotta of the FAO for a Workshop in Sri Lanka in view of the importance of community participation in fisheries management. I am happy to inform you, Ladies and Gentlemen, that the FAO, through the good offices of Dr Hotta, readily accepted our request to conduct the first ever community-based marine fisheries management Workshop in Sri Lanka.

Although fisheries account for only 2% of Sri Lanka's GDP, the sector is very important in terms of employment, food supply and the generation of foreign exchange. The fisheries industry is essentially small-scale and coastal in character but steps are being taken to introduce new technologies and new types of vessels and to develop offshore/ deepsea fisheries. Among the major constraints being faced are the conflicts arising between fishermen using traditional craft and gear and those taking advantage of new methods and motorised vessels. Multiple-use problems, arising especially from tourism, have become serious issues in coastal area management. Above all, the open-access nature of most of Sri Lankan fisheries is a major impediment to more effective management of the resources and has led to serious over-fishing in certain areas. Considerable encouragement can, however, be drawn from the successful re-orientation of the fisheries co-operative movement which now gives emphasis to village-level organisation and the involvement of women. Further, the introduction of new legislation for licensing of fishing operations and declaration of fishery management areas is now under consideration.

The Workshop consists of nine sessions. There are main sessional papers and reference papers relevant to fisheries management. Resource persons have been selected carefully and they are the best available expertise in their respective fields. Since the field of fisheries management is comparatively new, it is intended to discuss Workshop papers thoroughly at the sessions with a view to examining all relevant aspects and, more importantly, with a view to determining their acceptability. This is essential as fisheries play a major role in the lives of the people of Sri Lanka.

The major emphasis during the last several decades in many countries engaging in fishing was to increase fish production. With increased fishing effort using efficient fishing gear, it was

possible to increase fish production. The unfortunate consequences of unlimited entry into open access fisheries were soon felt. Depletion of resources, lower incomes for resource users, environmental degradation, and over exploitation became evident in many fisheries, especially in the coastal and inland fisheries.

To arrest this situation, immediate remedial measures have been sought during the last few years. Many countries adopted a “top-down” method to impose regulations for control of fisheries. Legislation was enacted to control fishing activities. In most instances this did not work. With fishing communities, this approach is usually unsuccessful and unacceptable. Based on this unsuccessful experience, ways and means of rectifying the situation were given high priority, it was really during this period that the participation of the fishing communities in the management process was given serious consideration.

Community-based fisheries management is not entirely new to Sri Lanka. In several cases, where territorial use rights in fisheries (TURFs) existed, self-regulating management measures are observed. Examples have been seen in the beach-seine fishery, the stake-net fishery etc. They have been in existence for over a century. The participation of the community is also seen in the procedure followed in conflict resolution under the Fisheries Ordinance. Once the management process is formulated through the community it is comparatively easier to implement it.

We are encouraged to have with us Hon. Indika Gunawardena, Minister of Fisheries and Aquatic Resources Development today at the inauguration of this Workshop. We have seen the Hon. Minister's concern over the participation of the community in the management process. In fact, it was just a few days back in Negombo and Kirinda that he declared the importance of the participation of the fishing communities in the planning and management of fisheries.

While welcoming the Hon. Minister, Hon. Deputy Minister, Distinguished Guests, Participants and Colleagues, I take this opportunity also to thank especially the UNDP and FAO for providing financial assistance for the Workshop and Dr Hotta of the FAO, Rome for providing us with the first National Workshop and for his untiring efforts in the preparation of the programme and a project proposal. I also wish to thank Mr Robert England, the Resident Representative of the UNDP for his support and Mr Kimoto, Resident Representative of the FAO, for all his assistance. I wish to thank all those who helped to make this Workshop a success.

Thank you.

APPENDIX G

SRI LANKA/FAO NATIONAL WORKSHOP ON DEVELOPMENT OF COMMUNITY-BASED FISHERY MANAGEMENT

STATEMENT FOR THE INAUGURATION

TSUKASA KIMOTO

FAO Representative

His Lordship Reverend Dr Malcolm Ranjith, The Honourable Indika Gunawardena, Minister of Fisheries and Aquatic Resources Development, Distinguished Guests, Ladies and Gentlemen,

First of all I would like to thank you, Sir, Dr Ranjith and Your Excellency, Minister Gunawardena, for your personal presence here this morning at the inauguration of this Workshop. The Honourable Minister, Sir, you have given us the honour not only by your presence this morning but also by your leadership and guidance, and by your personal involvement in the organisation of the Workshop. We are therefore most and sincerely grateful to you, Sir.

This is a joint Workshop organised by the Government of Sri Lanka and FAO. We, FAO, feel very fortunate that we have been given this opportunity to work together with the Ministry of Fisheries and Aquatic Resources Development, particularly with the Secretary, Mr Camillus Fernando, Director of the Department of Fisheries and Aquatic Resources, Mr Anton Atapattu, and their staff. We are satisfied with, and in fact grateful to, their technical competence and devotion which they have demonstrated in organising this Workshop.

I also take this opportunity to thank the Government of Japan and UNDP for their financial support of the organisation of this Workshop, and look forward to their continuing support for future undertakings which might follow this Workshop.

I believe that the Workshop is a timely one because the theme of the Workshop, namely "Community-based Fishery Management", coincides with the fundamental philosophy of the People's Alliance, that is, the involvement of the people, say, fisherfolk, individually or through cooperatives, for the aspirations of the nation to achieve a higher stage of economic development. I am confident that through lively deliberations and discussions by the participants, the Workshop will clearly identify the issues confronting us and indicate possible policy alternatives which we need to follow. As for FAO, we will be ready to follow up, in collaboration with the Government of Sri Lanka and other donor partners, whatever sensible recommendations the Workshop might put forward.

The deliberations, conclusions and recommendations of the Workshop will be widely shared by the Member Nations of FAO, particularly the countries in this part of the world, through FAO's publications network. I am sure that the participants' deliberations and recommendations will be highly appreciated by the policy-makers of this Government and other nations.

With this in mind, I wish to welcome you all, the participants, and thank you in advance for your constructive participation and contribution. I wish you all a successful Workshop.

Thank you.

PART 2
PAPERS PRESENTED AT THE
SRI LANKA/FAO NATIONAL WORKSHOP ON DEVELOPMENT
OF COMMUNITY-BASED FISHERIES MANAGEMENT
Colombo, 3–5 October, 1994

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SOCIO-ECONOMIC CONSEQUENCES OF EXCESSIVE FISHING EFFORT AND THE NEED FOR FISHERY MANAGEMENT

Anton R. Atapattu

Director, Department of Fisheries and Aquatic Resources
Department of Fisheries & Aquatic Resources,
Colombo 10, Sri Lanka

ABSTRACT

Although fisheries account for only 2% of Sri Lanka's GDP, the sector is very important in terms of employment, food supply and the generation of foreign exchange. The fisheries are essentially small-scale and coastal in character but steps are being taken to introduce new technologies and new types of vessels and to develop offshore fisheries. After a period of state control and regulation, the present economic policy aims at stimulating market mechanisms and liberalisation. A National Fisheries Development Plan for 1990/94 has been elaborated. Among the major constraints being faced are the conflicts arising between fishermen using traditional craft and gear and those taking advantage of new methods and motorised vessels. Multiple-use problems, arising especially from tourism, are another serious issue in coastal area management. Above all, the open-access nature of most Sri Lankan fisheries is a major impediment to more effective management of the resources and has led to serious over-fishing. Considerable encouragement can, however, be drawn from the successful re-orientation of the fisheries cooperative movement which now gives emphasis to village level organisation and the involvement of women. The paper concludes by presenting a number of suggestions to promote the sustainable development of the coastal resources, notably by limiting entry to the fisheries and by increasing the participation of the fisherfolk, through cooperatives, in the management process.

1. INTRODUCTION

Sri Lanka's sea area is approximately 23 times its land area. It comprises a territorial sea extending up to 12 —24 nautical miles and an Exclusive Economic Zone (EEZ) extending up to 200 miles from the baseline covering an area of approximately 230,000 sq km. There are nine provinces embracing 24 districts. Below the district level, there are 245 sub-divisions with clusters of villages headed by an Assistant Government Agent or Divisional Secretary. There are 25,451 villages in total.

The coastline, 1800 km long, meanders along sandy beaches, extensive lagoons and estuaries, mangroves, coastal marshes and dunes. Seawards lie reefs of sandstone or coral and shallow beds of coastal and estuarine seagrass.

The total population of Sri Lanka is about 17 million of which about a half live in coastal districts. The population is still predominantly rural in character. The average population density is one of the highest in the Bay of Bengal region. The most populated areas lie in the southwest, roughly corresponding to the major climatic region known as the Wet Zone.

Although fisheries account only for 2% of Sri Lanka's GDP, the sector is important in terms of employment, protein supply to the population and foreign exchange earnings. The main protein source for the Sri Lankan population is fish, 7.7 g/day while meat provides 1.5 g/day and vegetables 4.5 g/day. Fish contributes 65% of the animal protein and 13% of Sri Lanka's total

protein intake. The present per capita consumption of fish is about 15 kg per annum.

The Sri Lankan population consists of Sinhalese (74%), Tamils (19%), Ceylon Moors, Burghers and Malays (7%). The majority of the population is Buddhist (70%) while the balance is constituted by Hindus (15%), Christians (8%) and Muslims (7%). A recent socio-economic survey carried out along the west coast by the Ministry of Fisheries and Aquatic Resources (MOF) showed that Sinhalese, 87% of households, were the fishing community. The Matara district and the Chilaw areas were found to be almost exclusively Sinhalese. In the Puttalam district 34% of households were Tamil and 14% Muslim. The religion practised by the fisherfolk reflects the ethnic dominance in Matara, where 98% of the households are Buddhist. In contrast, in Chilaw 98% of the households are Christian while in Puttalam the figure is 56%. The majority of them are Sinhalese but there are also some Tamils in Chilaw. In the northern districts, the majority are Tamil except for migrant fishermen. In the eastern districts all three communities are present in varying proportions.

Prior to 1977 the State played the major role in economic activity, with a heavy accent on social welfare and income redistribution. The result was a slow growth rate (only 3.2%). Since 1977 economic policy has been shifted to stimulating the market mechanism and liberalisation. This is being achieved through unification of the exchange rate and adoption of flexible exchange rate policies, liberalisation and dismantling of import and exchange controls, reduction or removal of administrative and price controls, relaxation of state monopolistic controls and encouragement of private sector competition, introduction of liberal tax incentives for the private sector, investment and savings, and reform of subsidy policies.

Fisheries in Sri Lanka are basically small-scale. The objectives of fisheries development, as outlined in the National Fisheries Development Plan, 1990 – 94, are as follows:

- i. To increase the production of fish in order to raise the nutritional status of the people through a higher per capita consumption of fish.
- ii. To promote the rational and optimum exploitation of Sri Lanka's fisheries and aquatic resources based on the application of modern science and technology.
- iii. To support the national programme for Alleviation of Poverty by increasing incomes and standards of living of those dependent on fisheries and fisheries related activities.
- iv. To increase employment opportunities through fisheries and fisheries-related activities.
- v. To increase foreign exchange earnings through exports of fisheries and aquatic products.

Over the years, fish production has increased, especially that of the coastal fishery. In the open access coastal fisheries, excessive fishing effort was applied, thereby depleting resources, and lowering incomes for small-scale fishermen. Under these circumstances, fisheries

management is an immediate requirement. In this management process the participation of the resource users is essential for successful implementation.

2. GENERAL CHARACTERISTICS OF COASTAL FISHERIES

2.1 Coastal fishery resources

Natural limitations on the marine fish resources around Sri Lanka are imposed by rather a narrow continental shelf along the 1700 km long coastline, with an average width of 14 miles and rarely extending beyond 25 miles. The Sri Lankan part of the shelf is 28,000 km². There is no upwelling with significant impact on the fish resources.

The “Fridtjof Nansen” survey in 1978 – 1980 estimated the potential yield from coastal fish resources within the continental shelf to be 250,000 tonnes per year of pelagic and demersal species. Pelagic fish were estimated to have a maximum sustainable yield of 170,000 t per year and demersal species 80,000 t. The present yield from demersal species is around 35,000 t. Inshore demersal resources of shrimp (5000 – 7000 t) and spiny lobster (600 t) are the most valuable.

Preliminary estimates of Sri Lanka’s offshore resources indicate that 50,000 – 90,000 t per year could be taken without risk of over exploitation. The species include yellowfin tuna, skipjack tuna, bigeye tuna, bill fishes and pelagic sharks. The total marine fisheries resources, including Sri Lanka’s offshore area, could thus perhaps yield up to 350,000 t per year.

2.2 Exploitation of coastal resources

The coastal subsector is the most important, accounting for some 75% of total fishery production. In the last two decades, exports of marine and aquatic products have developed into one of the fastest growing export subsectors. More importantly, since all exports are 100% local resource based, the net foreign exchange earnings are higher in comparison with other sectors.

Table 1. Fish Production in 1985— 1993 (mt)

Year	Coastal	Offshore and deep sea	Inland	Total
1985	140264	2400	32743	175409
1986	144266	3400	35390	182056
1987	149278	4259	36465	190002
1988	155099	4425	38012	197536
1989	157411	8155	39720	205286
1990	134 132	11666	31265	177063
1991	159 151	15080	23832	198 063
1992	163 168	22000	21 000	206 168
1993	169900	33000	18000	220900

Source: Department of Fisheries and Aquatic Resources

Since 1950, the fisheries have changed from entirely artisanal to more semi-industrial as a consequence of motorisation of traditional craft and the introduction of new craft, permitting more effective fishing methods. The total number of craft is now estimated to be around 28,000, giving employment to approximately 120,000 persons in fishing and post-harvest activities. The major type of fishing gear is the drift gillnet. Long lines, troll lines, trawl nets, purse-seines, pole and line are also used.

The total yearly marine catch increased from 90,000 mt in 1972 to reach a peak of 185,000 t during 1983 and then declined to 146,000 t in 1990. The decline in fish catches reflects the disturbances in the north and the east which started in the latter part of 1983. Better data (e.g. catch per unit effort for different types of vessels and gear) is needed before sustainable fishing levels can be estimated and used as a basis for effective fisheries management plans.

In almost all coastal towns along the southwest coast, fisheries are of fundamental importance as most of the people in these areas are engaged in fishing and fishery-related activities. Over fishing of coastal shrimp stocks has occurred outside Negombo and Chilaw because of intensive trawling. Management measures have been taken in the form of trawling restrictions in certain areas. Trawling is completely banned in Chilaw and permits to operate purse-seines are not issued at present.

Since independence fishing has been promoted and assisted by the state. In the overall economic development programmes, a series of schemes for its furtherance have been implemented, such as the promotion of motorisation of traditional craft and introduction and extension of new types of fishing craft and nylon nets. These developments, together with rapidly growing consumer demand for fresh fish, led to a rapid increase in production until the mid-1980s.

2.3 Aquaculture

According to the MOF, the maximum area for coastal aquaculture development is about 120,000 ha of brackish water bodies of which two-thirds is large lagoons and estuaries. Approximately 6000 ha of this brackish water is estimated to be suitable for aquaculture. Appropriate environmental impact assessments have to be prepared, before these areas can be utilised showing that the development will not damage the environment or prove unsustainable in the long term.

The existing 100 intensive and semi-intensive shrimp farms located along the Dutch Canal, close to brackish water lagoons in the coastal district of the Northwestern Province, have become an environmental problem for the Mundal/Puttalam lagoon system. The problem is mainly a result of poor site selection of the individual farms and bad management of the present culture systems. These farms are at present using the same limited brackish water from the Dutch Canal. The water supply problem could be solved by dredging the old canals connecting the Dutch Canal to the sea.

Sustainable fish culture systems for local communities have still not been developed. Marine cage culture, crab fattening, extensive polyculture of fish and shrimp, seaweed culture and mollusc culture are possible areas for development. There is a need for integrated and applied research. Cooperation between environmental and resource use researchers is needed to achieve sustainable aquaculture development in the coastal zone.

2.4 Multiple use of the coastal areas

In addition to fisheries, other industries such as tourism make demands upon the coastal areas. Tourism has developed rapidly during the last 20 years. The beaches are Sri Lanka's most important tourist attraction. They cover more than 11,000 ha and vary greatly in size and type. Diving and snorkelling on coral reefs are popular tourist activities and other forms of nature-oriented tourism in the coastal zone might be considered and developed.

It is often said that tourism and fisheries are complementary. However, experience has shown that inappropriate tourism planning has caused many conflicts between these two major economic activities in the coastal zone. Disputes have arisen between hotel authorities and local fishing communities. In many cases the beach frontage of the hotel is fenced, sometimes against the provisions of the Coast Conservation Act, obstructing access for the fishermen.

There are few other significant employment opportunities in the coastal areas. The coconut industry is widespread and in some areas, industries for food processing, textile manufacturing and building materials have been established. Family-based agriculture and cattle farming are carried out, but very few of the poor coastal families have access to suitable land because of the limited available land area.

The fisheries industry in Sri Lanka is basically small-scale in both the coastal and offshore subsectors. In the coastal areas, there are about 100,000 active fishermen using traditional craft. There is an open access system in the coastal fisheries although some fisheries have limited access, e.g. the beach-seine fishery and stake-net 'Kattudel' fishery in the Negombo and Chilaw lagoons. The main target is pelagic species and the exploitation of demersal species is limited.

2.5 Fish marketing

The demand by consumers is mainly for fresh fish and therefore the bulk of the catch is marketed fresh. Fish marketing is competitive and daily auctions are conducted at landing centres. Wholesalers purchase fish and retailers, especially bicycle vendors, purchase fresh fish from wholesalers or sometimes directly from producers. These bicycle vendors usually have a set of customers who are supplied daily with fish. The unsold catch is frozen. Supermarkets stock processed fish but the amount marketed in this form is limited.

2.6 Fisheries cooperatives

The organisation of fishermen in Sri Lanka started in the 1940s with the introduction of cooperatives. The fisheries cooperative movement has had periods of progress and of problems. The reorganisation of small, village level fisheries cooperative societies (FCSs) in 1972 into large primary societies proved to be unsuccessful due to the removal of local leadership which hitherto ran these FCSs. Further, the successful FCSs felt that their resources were being used by the unsuccessful FCSs. Capital inputs in the form of boats, engines and gear were issued under producer subsidy schemes/institutional credit schemes to these FCSs but recovery of loans was poor.

The latest experiment in organisation of fishermen was undertaken in 1989 with emphasis on

the establishment of village level FCSs. During a short span of three years, over 760 fisheries cooperatives were established with a membership of 83,000. Among the important features of these newly established FCSs is that they are open to all the members of a fisherman's family; the membership of the spouse has proved particularly important and there are now 20,000 female members in the FCSs. Most of these new cooperatives seem to be functioning satisfactorily and at present they have a total share capital of Rs. 7 million (\$US 1 = Rs. 49.50) and savings amounting to Rs. 19 million. Under a producer subsidy/bank credit scheme, they have been provided with loans up to Rs. 121 million. The FCSs are vertically integrated to a national level Fisheries Cooperative Federation through District Fisheries Cooperative Unions.

The participation of women is clearly evident in these village level cooperatives. When women are made co-borrowers in credit schemes, it has been observed that repayment rates are improved. Women members are given credit facilities to engage in self-employment activities such as fish marketing, coir-rope making, poultry farming and sewing.

3. SOCIO-ECONOMIC ISSUES IN COASTAL FISHERIES MANAGEMENT

Most of the 100,000 fishermen engaged in fisheries in Sri Lanka are dependent on coastal fisheries as their sole source of income. Some 10,000 persons are employed part-time and a further 5000 are indirectly employed by the industry. The dependent population is about 500,000.

With few exceptions, there is open access to the coastal fisheries. Beach seine (Madel) and stake net (Kattudel) fisheries are among the few instances where territorial use rights are in force (TURF). They are comparatively well managed with a system of limited entry into the fishery. In these fisheries, limited entry is based on criteria such as area of residence of resource users (e.g. resident fishermen of a given village), time of operation, number of fishing units, inheritance (e.g. rights being handed over from father to son), etc. In these fisheries, because of the above management measures, there is no immediate danger of depletion of coastal resources. However, in the majority of coastal fisheries, there are no such limits on entry. Because there is open access, fishing effort has increased over the years. This has led to conflicts among groups of fishermen engaged in different types of coastal fisheries.

Major conflicts took place following the introduction of new technology in the coastal fisheries. In the late 1950s, there were conflicts between the fishermen using traditional craft and gear and those enterprising fishermen who took up the challenge of using motorised boats and nylon nets. In the late 1960s, many fishermen wanted to procure motorised boats with nylon nets and in the 1970s purse seines were introduced. In the mid 1980s, there was so much resistance from fishermen using other types of gear, that measures were taken to limit sizes and numbers of purse seine nets and their area of operation. A high licence fee was introduced and eventually the issue of licences was suspended. Disputes between coastal trawl fishermen and groups engaged in other types of fishing led to the complete banning of trawling in Chilaw in response to the representations of fishermen who were against trawling in spite of an effective management system introduced by the trawl fishermen themselves. As a result, the Government is implementing a massive programme for the relocation of these fishermen to other fisheries. Some concrete measures have been taken with a view to limiting entry to the coastal fishery. For instance,

allocation of producer subsidies (up to 50%) for fishermen to purchase boats, engines and fishing gear has been changed from coastal fisheries to offshore/deep sea fisheries.

The various types of fisheries in Sri Lanka face major management problems. Fortunately, these problems were identified in time and the Government is taking long term remedial measures. First, it was found that the existing legislation, enacted in the 1940s, was inadequate to deal with the vast development in coastal fisheries during the last few decades. With the assistance of FAO, new fisheries legislation has been prepared to promote the sustainable development of coastal fisheries. Among important management measures which will soon become law, are a licensing system for all active fishing methods, the introduction of fisheries management areas and conservation-based exploitation, together with bigger fines and jail terms for violators. In certain fisheries, for example purse-seining, a high resource fee is being introduced to limit entry.

In order to encourage participation by resource users in the management process, they have been organised under the umbrella of the cooperative movement. A programme to educate fishermen in the importance of fisheries management is being undertaken. With the assistance of the UNDP, a Fisheries Management Project at a total cost of Rs. 106 million is being implemented. Major components include a census of fishing communities to collect and analyse socio-economic data, a craft and gear survey and preparation of legislation for management of specific coastal fisheries. A Fisheries Management Unit is being established in the Department under this Project.

4. EXPERIENCES IN IMPLEMENTATION OF MANAGEMENT MEASURES

Since certain controls have to be introduced to manage an open-access fishery, implementation of management plans is not easy and there are many practical difficulties. The purse-seine net fishing regulations introduced in 1986 show the difficulties encountered in the management process. Although area, number of nets and type of nets have been specified along with other equipment, purse-seine operators violate these regulations. Recently, enhanced fines, jail terms and confiscation of boats, nets and other equipment of those engaged in purse-seine fishing have been proposed to make management of this fishery effective. The failure is mainly due to the specification of the nets which cannot be operated in prescribed areas of the sea (between 7 and 10 miles from the shore). The comparatively low prices of fish due to increased supply in areas where purse-seines are operated, and higher income from this fishery, are also contributory factors. The small-scale fishermen using other craft and gear object mainly for these reasons.

Fisheries where there are TURFs (eg. the beach-seine fishery and stake-net fishery, management measures are usually successfully implemented.

5. CONCLUSIONS AND SUGGESTIONS

The importance of managing the coastal fisheries is now being realised more than ever before, mainly because most of the fisheries in Sri Lanka still enjoy open access and there are no limits on the growth of fishing effort. There are thus many problems, for instance the diminishing marginal returns of fishing operations and the effect on the environment as a result of over-exploitation. The following suggestions and notes are provided regarding sustainable development of coastal resources.

- i. For any management measure to be successful, fishermen must be properly educated about the magnitude and nature of the available resource. Thus it is very important to have correct information on the stocks or at the very least there should be indicators where there is maximum or over-exploitation.
- ii. When planning and implementing management measures for the coastal fishery, the participation of fishermen is essential. In this regard, fishermen's village organisations are a definite advantage.
- iii. Many active fishermen are employed by 'absentee' boat owners who are not interested in conservation of resources in a given coastal area.
- iv. It is usually difficult to limit the entry of fishermen to a given type of fishery. However, it may be possible to transfer them to another type of fishery (rather than to a completely new industry). In Sri Lanka, the coastal fishermen are being transferred to offshore fisheries with some success.
- v. Legislation, with licensing arrangements for all major types of fisheries including resource fees depending on the income generated, should be introduced together with effective enforcement mechanisms. When drafting legislation for the management of coastal fisheries, the participation of the fishing community is essential.
- vi. Provision of infrastructure and other facilities to those fishermen of the community who adhere to management measures, should be considered with a view to limiting entry to certain fisheries.

INFORMATION NEEDED FOR STRATEGIC PLANNING OF FISHERY MANAGEMENT IN SRI LANKA

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ABSTRACT

With the development of the fisheries sector, coastal fish production in Sri Lanka has reached an optimal level during the past few years. Management of the resources has therefore become an urgent need. Incompatibility of some management objectives in Sri Lanka's fisheries, together with the natural limits of the resources and open access, has necessitated consideration of special management measures based on sound scientific advice which must be based on scientific information, biological, technical, economic, social, environmental and institutional. The acquisition of all this information can be costly and therefore it is necessary to identify which data are of prime importance for a wide range of management decisions.

The statistical division of the Dept. of Fisheries and Aquatic Resources and the Marine Biological Resources Division of NARA are the two institutes responsible for the collection of this information. These two institutions have two independent but complementary systems for gathering the information needed for the assessment and management of fisheries resources. The Dept. of Fisheries has an island-wide data collecting system through a network of fishery inspectors. NARA's sampling programme covers the west, southwest, south, east and northeast coasts. In addition to the catch and effort data, NARA collects length frequency data for the purpose of fish stock assessment. Several other governmental and non-governmental institutions and fishermen's organisations, specifically the recently established Fisheries Cooperative Societies, have been identified as potential sources of information.

Several improvements to the existing data collecting systems at DFAR and NARA have been suggested with improvements to strengthen the cooperation between the two institutions. Lack of training, facilities and motivation for the field staff and lack of awareness among the fisheries officials and the resource users of the benefits of fisheries management are some of the constraints confronting the government in obtaining the necessary information for community based fisheries management.

1. INTRODUCTION

With the declaration of the Exclusive Economic Zone in 1976 the Government of Sri Lanka obtained sovereign rights over an ocean area of 536,000 km² and the natural resources therein (Anon., 1988). Fishing has been carried out since time immemorial and has been one of the important economic activities along the coast. Marine fisheries have developed considerably during the past few decades and the fish production has increased from around 40,000 tonnes in the 1950s to a present production of 180,000 tonnes (Anon., 1992). The backbone of the fishing industry in Sri Lanka is still the coastal fisheries, which contribute more than 90% of the total marine fish production. Coastal fish production has remained more or less stagnant over the past few years and it is now generally believed that the Sri Lankan coastal fishery has reached optimal levels of production although there are a few identified under utilised resources. Therefore, if Sri Lanka is to have sustainable development of the marine fisheries sector, the management of these resources is of prime importance. Realising the need and urgency the Ministry of Fisheries and Aquatic Resources has now established the Fisheries Management Unit in the Department of Fisheries and Aquatic Resources. Past experience in fisheries management has shown that entry

limitations and other centrally imposed regulations have not been very satisfactory. Therefore, the government is now encouraging the establishment of fishermen's cooperative societies at village level in order to promote a self regulatory approach to management and conservation of fisheries resources.

The choice of the objectives of fisheries management for the Government of Sri Lanka is not yet clear. The Government seeks to manage the fisheries in order to protect or enhance employment opportunities, increase fishermen's incomes, maximise net economic returns, increase fish production to provide a protein supply to the increasing population, achieve higher export earnings, conserve resources, etc. (Anon., 1990). These objectives are not entirely compatible and some can only be achieved at the expense of others. Further, unlike other natural resources, fisheries have special characteristics such as the natural limits to their yield, and the open access to the resource, which require special management measures. Whatever the management objective is, it has been generally accepted that the management of a fishery should be based to a large extent on scientific advice. This advice should be based on a reliable source of continuous and timely data. This paper attempts to describe the type of information needed for the management of fisheries, the current status of acquisition of this information, the constraints involved in such activities and the solutions proposed to overcome such problems in assessing and managing the marine fish resources in Sri Lanka.

2. TYPES OF INFORMATION NEEDED FOR FISHERIES MANAGEMENT IN SRI LANKA

As in other tropical countries the fisheries in Sri Lanka are multispecies, multigear fisheries and therefore the direct application of resource assessment methods available for single-species, single-gear fisheries is not possible. The involvement of around 100,000 fishermen in activities that are mostly small scale in nature has forced the government to consider improving the socio-economic status of these fishermen as an important management objective. In addition, fast development of industry and tourism along the coastal belt of Sri Lanka seems to have had negative impacts on the natural critical habitats such as estuaries, coral reefs, mangroves, and seagrass beds on which the fisheries resources depend at one stage or another.

Past experience has shown that biological assessment alone has not helped much in the management of the fishery resources in Sri Lanka. The management problems are highly localised and the information needed is of many kinds and will depend on the type and state of the fishery concerned and the kind of decisions to be made at different levels in the government hierarchy in different fisheries situations.

Therefore, the management of fisheries resources in Sri Lanka is not purely based on biological considerations but a complex mix of technical, biological, economic, social, political as well as environmental issues. The acquisition of this information is considered as one of the basic needs of management.

2.1 Biological information

A clear understanding of the fishery itself is the most important requirement in managing a

fishery. Biological information such as status of stocks, present yields, trends in catch per unit effort, changes in catch composition and length frequencies is important and fundamental information that has to be derived from a collection of statistical data from any fishery.

Identification of the major fish species caught in a fishery is of prime importance as misidentification of fish species would lead to many problems at a later stage of stock assessment analysis. In multi-species fisheries a catch may be made up of many species but at least the dominant species have to be identified to species level by using a published species catalogue and not by referring to the local names. In Sri Lanka the same local name is sometimes used in two locations for two different species and the same species at different locations is referred to by different local names.

The biological information has to be collected through stratified sampling to cover all the major fish landings, all types of craft/gear combinations, all major species and all the fishing seasons. The latter is an important factor as almost all of Sri Lanka's fisheries are affected to some extent by the seasonal monsoonal changes.

Recently there has been an increase in interest in length-based methods of assessing fish populations particularly in tropical waters where age-based assessments are not easy to carry out. The increased availability of computers among scientists and the development of computer packages such as ELEFAN, LFSA and MULTIFAN have increased the use of length-based methods of assessing fish stocks. The data needed for such assessment should come from an unbiased representative sample of the fish population. Most often the fisheries are selective and obtaining an unbiased sample from a fish population by sampling the commercial fish catch is out of the question. However, all attempts have to be made to get a least biased sample. A sampling scheme has to be designed in such a way that the length data of all the important species are recorded from all the fisheries which take that species of fish and all these fisheries are sampled adequately to get a representative sample. As the sampling has to be carried out at fish landing sites, at the fish markets or even on the deck of a fishing vessel, the design of such a programme has to be in accordance with local needs. Generally the opportunity to design a good sampling scheme comes when investigations have been carried out for a few years. Therefore at the initial stages it would be useful to study the chance of bias, sampling errors, the contribution of these errors to the final output from the assessment studies and how the sampling can be modified to reduce variance. Some practical points need to be carefully considered in length sampling. These are the type of length to be taken (standard, total or fork), what units are to be used and with what precision, what fish are to be measured and how many fish, etc. (Gulland and Rosenberg, 1992). Together with these length measurements other information about the source of the sample has to be recorded such as date, place of sample, type of craft and gear, total catch of the vessel by species etc. These are needed to raise the sampled lengths to the total production.

In addition to these data, statistics of a more biological nature are needed. These include length/weight data, data on reproductive biology such as sex ratios, fecundity, size at maturity and gonadal index for the identification of spawning areas and seasons, otolith collection for age and growth studies and stomach content collections to study the feeding biology. Data needed to study

the migration pattern and stock identification has to be collected when the stocks under study are migratory. Data on oceanographic parameters such as plankton distribution, currents and change of physical parameters such as temperature, salinity, thermocline etc. would also be useful in understanding the distribution and abundance of fish stocks.

2.2 Technical information

Some of the technical information such as the numbers and kind of fishing craft and gear, their seasonal operational patterns with the details of fishing such as area of operation, fishing depth, specifications of gear used, the bait used if any, could be collected together with the biological information through the same sampling programme.

Other technical information such as the availability of infrastructure facilities such as harbours, anchorages, ice plants, water supply, fuel supply and repair facilities needs to be collected as this is essential information for some management decisions.

The seasonal nature of the fishing affected by the monsoonal changes has established a migratory pattern of the fishermen from one coast to the other. The number of fishermen and the craft that migrate during the seasons have to be counted in estimating the fishing effort.

2.3 Economic information

Economic information such as the trends in fish prices, cost and earnings of various craft/gear combinations, additional income from the incidental catches (ancillary fisheries), distribution of assets and income, capital investment and the returns in relation to changes in fishing effort is needed for economic assessment of the fisheries. The monthly variations of these economic data are useful as all the fisheries in Sri Lanka show seasonal variations affected by the monsoonal changes. The information on alternative employment opportunities available in different fishing communities is also useful especially when there is a need to reduce the fishing effort.

Among cost factors, the investment cost, the operational cost – consisting of the cost of fuel, food, water, bait and ice, the loan instalments, the insurance and repair and maintenance cost – are generally considered important. The cost of salaries of the skipper and the crew and their sharing system is needed to consider the income of the owner, skipper and the crew separately. In Sri Lanka the usual sharing system is that the owner gets 50% of the net income and the balance is shared among the skipper and the crew with the skipper getting 50% more than a crew member.

2.4 Social information

Social information includes the present number of full time and part time fishermen, their movement trends into and out of fisheries, conflicts among different groups of fishermen, functioning of formal and informal fishermen's organisations, etc. Fishing household could be taken as the sampling unit in collecting this information and the selection of households should represent boat owners, gear owners, boat/gear owners, crew members, skippers and others conducting fishery-related and non-fishery-related activities. The information on the social structure could be obtained by sampling the households for the family structure (age, sex, income earning group), level of education of the members of the family, facilities available such as water

and electricity, ownership of the house, ownership of craft/gear, loan information, family expenditure and other family income. There is considerable social heterogeneity in many fishing communities so information on religion and ethnic group also has to be collected.

The local customs and traditional concepts of property rights to fishing grounds are of prime importance in considering the introduction of community based management systems. This type of information is available among the fishermen involved in traditional fishing practices such as those using beach seines along the coast and stake net fishermen in the estuaries and lagoons.

Marketing information could also be useful in fisheries management in Sri Lanka. The involvement of middleman in marketing has resulted in fishermen getting low prices for their catch and the consumers paying high prices for their fish. Information on the use of fisherwomen in fish marketing and in other post-harvest operations which have been traditionally practised has to be given some consideration. The involvement of fisheries cooperative societies in fish marketing and market information such as the minimum size of lobsters and crabs could be used to implement the management regulations already available. The use of marketing information in fisheries management has proved successful in Japan (Anon., 1993).

2.5 Environmental information

The increase in human settlement and industrial development in the coastal areas of Sri Lanka have increased the pressure on the coastal environment leading to degradation of natural habitats and resources. The use of explosives (dynamite), the use of destructive fishing gear such as trammel nets on coral reef areas and the developing aquaculture industry are causing degradation of coastal ecosystems. The developing ornamental fish trade also seems to be having a negative impact on the coral reefs as the ornamental fish collectors use destructive fishing methods in collecting these organisms. Industrial development in the coastal areas and the use of agro-chemicals in upstream areas is also becoming a threat to the quality of water in coastal areas, particularly the waters in the estuaries and lagoons.

Therefore information on human activities and coastal habitats, and the monitoring of water quality in the coastal and estuarine systems should be given priority.

2.6 Institutional information

This is basic information needed for community-based fishery management in any country. The research institutions together with the statistical divisions are responsible for the establishment of the objective data base and as such bear an important responsibility in the process of development and management. The functions and profiles of the fisheries scientists and the structure of the fishery research institutions should evolve together with the management concepts and this evolution should be at national, regional and international levels.

Apart from these institutes there often exist a variety of other potential sources of information for fisheries management, not all of which may be effectively utilised at present. Such sources may include the universities, individual fishermen and fisherwomen, fishermen's groups or organisations, marketing organisations, data from fishing licences, etc. Information on the

physical and institutional infrastructure such as enforcement power, existing management skills, rules and regulations, available management facilities and research facilities is basic information needed for planning fishery management. To promote community-based management systems information on the institutional structure of these fisheries cooperative societies and their scientific, technical and administrative capabilities are of vital importance.

3. CURRENT ACQUISITION OF INFORMATION AND ITS LIMITATIONS

In Sri Lanka, the management and development of aquatic resources comes under the purview of the Ministry of Fisheries and Aquatic Resources Development. The statistical division of the Department of Fisheries and Aquatic Resources and the Marine Biological Resources Division of the National Aquatic Resources Research and Development Agency (NARA) are the institutes under this ministry which are responsible for collecting this information. Among other organisations the universities, non-government organisations, the recently established fisheries cooperatives and other fisheries organisations also collect some information on fisheries.

The collection of information on fisheries in Sri Lanka is mainly carried out by the following two institutions under the Ministry of Fisheries and Aquatic Resources.

3.1 Department of Fisheries and Aquatic Resources

There are 15 District Fisheries Extension Offices in the marine sector with a total of 143 Fishery Inspector (FI) Divisions (Anon., 1992). Each of these divisions has a Fishery inspector who is responsible for the collection of fisheries statistics. At present there are about 80 Fishery Inspectors collecting fisheries statistics, from two landing sites each (Rodrigo, pers. comm.) using the following procedure.

Sampling for catch statistics is only one of many duties the FIs have to attend to, such as registration of craft, loan recovery and other administrative matters. Two selected landing centres in each FI subdivision are sampled by the FI once a month. Ten predetermined craft of 3.5 GT class, out-board engine craft and non-mechanised craft are sampled. The type of gear used, catch by species, the number of craft operating on a sampling day, information on migratory fishermen, fish prices and information on processed fish are recorded by the FI at each sampling site (Rodrigo, pers. comm.).

The FRP boats and traditional craft with outboard engines have been grouped together irrespective of their fishery and landings. The number of craft sampled is the same irrespective of the fact that the fleet sizes are significantly different between landing centres. Stratification of the sampling by type of gear is not being attempted. The ten selected craft of each category may have different combinations of fishing gear in different centres and this may even change seasonally. Moreover, the stratification of the area is based on DFEO divisions which do not take into account fish distribution or the fishing conditions around the island. There is no proper sampling system for beach seine landings because of practical difficulties in sampling. Fish production was grouped under 11 'varieties'. These were increased to 30 in 1983, but discontinued later. Estimation of production is made by eye as the catch is not weighed in many landing places.

3.2 National Aquatic Resources Agency (NARA)

NARA, being the research arm of the Ministry of Fisheries and Aquatic Resources is responsible for conducting research needed for the management and development of fisheries and aquatic resources. The Marine Biological Resources Division of NARA which deals with marine fisheries resources, has a system of collecting information on fisheries that has two distinct components.

3.2.1 *A continuous data collecting system for two major fisheries* - *large pelagic and small pelagic*

This system of continuous data collection on fisheries was formalised through the establishment of a sampling programme in 1987 which was initially meant for the collection of data on the large pelagic fisheries targeting tuna and tuna-like species. This programme now collects data on both the large pelagic and small pelagic fisheries (mainly the small-meshed gill net fishery).

There are 12 data collectors (samplers) placed at the major fish landing sites along the west, southwest, south, east and northeast coasts of the island. These samplers are advanced level qualified personnel who were initially trained at NARA as well as in the field. They are engaged full time in data collection and they conduct sampling for around 20 days a month (10 days for small pelagic and 10 days for large pelagic). On each sampling day a total of 25 boats are sampled from a landing site proportionately covering all the craft/gear combinations for the fishery. Technical information such as the type of gear (number of panels in gill nets, mesh sizes, the number of hooks on long lines, bait used, etc.) for each boat sampled and the number of craft of each category operated on the sampling day is also recorded.

The catch of each boat is recorded by species (for small pelagic there are 23 species and species groups and for large pelagic, 25 species and species groups). For small pelagic the catch of each species is taken by counting the number of baskets or by eye estimation and the large pelagic catch is recorded by numbers with three size categories for two species (yellow fin tuna and skipjack tuna). The length measurements of about five dominant species in the small pelagic catch and all tuna species, billfish and seerfish in the large pelagic catch are taken from around 20 fish of each species from each craft sampled (when the numbers are small all fish are measured). This sampling programme does not cover the north and northwest but all the major large pelagic landings are covered.

The beach seine operations are monitored only at a few selected sites due to practical problems. The data collected by the samplers are brought to the NARA head office once a month and are clarified and screened by the research officers in charge of the sampling programme before being entered into the computer data base. Monitoring of the activities of the samplers is carried out by the NARA research staff, who make surprise visits to each of the landing centres at least twice a month.

This sampling programme gives estimates of the monthly effort, catch rates and production for each craft/gear combination and the length frequency data of the important species.

3.2.2 A short term data collecting system (1-2 yrs) for other fisheries to address specific management problems

These data are mainly for studies that NARA has to conduct, at the request of the Ministry of Fisheries, to address the conflict situations in fisheries. This also covers the other important fisheries such as those for demersals, prawns and lobsters and the lagoon fisheries, which are not covered by the main sampling programme. The information on these fisheries is also used in providing the necessary management recommendations.

In addition, more detailed biological data such as length/weight data, data on reproductive biology and feeding biology of some commercially important species are collected by the research staff of NARA under various research projects. Information on social, economic, technical and environmental aspects of fisheries is collected by NARA under various projects. However this information has been limited to geographical areas covered by those projects.

4. POSSIBLE IMPROVEMENTS IN DATA COLLECTION AND ANALYSIS

The two existing systems of data collection for fisheries are complementary as the NARA sampling programme collects detailed biological information needed for fish stock assessments in addition to the catch and effort data. However, several improvements could be made to both these data collecting systems and cooperation between NARA and the Statistical Division should be strengthened so that reliable catch statistics are collected and the data can be used with confidence in assessing and managing the fisheries resources of Sri Lanka.

4.1 Suggested improvements to the data collecting system in the Department of Fisheries and Aquatic Resources

- i. The distribution of fishing effort along the coast should be the basic criterion in order to stratify the sampling area. The number of craft sampled should be proportional to the total fishing fleet at a particular landing site.
- ii. Production should be estimated on the basis of craft/gear combinations. At present only three categories of craft are identified and no reference is made to the type of gear.
- iii. The efficiency of the FRP boats and traditional craft with outboard engines differs greatly and therefore should be treated separately.
- iv. Although around 30 species are listed in the data sheets used by the FIs in the field the fish production is given only by 11 species and species groups. Analysis should be carried out for each of these species separately. The rock fish category should be broken down into at least five species and/or families.

4.2 Suggested improvements to the data collecting system at NARA

- i. The sampling programme should be extended to the north and northwest areas to obtain data on the important fisheries in those areas. eg. small pelagic, demersals and prawns.

- ii. Economic data on fishing activities should be recorded. This could be done to a limited extent by the samplers of NARA.
- iii. Socio-economic data on fishermen engaged in different fisheries and fish marketing data should be collected. This could be done by the proposed Socio-Economic and Marketing Division to be established in NARA.
- iv. To address the multi-disciplinary issues related to fisheries NARA should collect more environmental information, particularly that relating to fisheries.
- v. As oceanographic parameters are also important to an understanding of fish distribution and abundance more fishery-related oceanographic data should be collected.

4.3 Suggested improvements to data collection and cooperation between institutions

- i. The field staff of the Department and NARA should be given in-service group training.
- ii. Field sampling manuals should be prepared to assist the field workers in identifying fishing craft, fishing gear and fish species.
- iii. Catch/effort data available from the NARA sampling programme could be used in estimating the production figures for at least the large pelagic fisheries. Discussions on this have already been initiated at the Statistical Sub-Committee. To get more reliable information from the developing offshore fisheries, attempts are being made by the ADB Fisheries Project and the UNDP/Management project to introduce a system of log books for the collection of data.
- iv. NARA research staff should get involved in discussions and meetings concerning data collection and management decisions.
- v. Data collected by these two institutes should be published jointly at least quarterly in the form of a statistical bulletin.
- iv. More and more community organisations could be involved in the collection of information on fisheries. DFAR and NARA could make use of the fisheries cooperative societies for this purpose.

5. CONSTRAINTS CONFRONTING THE GOVERNMENT IN OBTAINING INFORMATION AND PROPOSED SOLUTIONS

- i. The fishery inspectors attached to the different DFEO divisions are the key people engaged in the process of island wide data collection. However this is just one duty they have to perform among many others; indeed other administrative duties have more priority. At least two FIs from each DFEO divisions should be released for full time data collection so that they can be at the landing sites when the fish are landed, sampling days could be increased and more landing sites could be covered. The number of FIs in the Department of Fisheries has to be increased.
- ii. No separate production estimates are available for the lagoon fisheries. The data collected by the FIs are added to the coastal fish production. As the management of the lagoons in Sri Lanka is becoming increasingly important a system has to be developed to collect and analyse data on the lagoon fisheries.
- iii. Recent development of the ornamental fish trade has increased the exploitation of marine ornamental fish and other invertebrates. Although export figures are available, there is no system for collecting the data needed for assessment and management of these resources. A monitoring programme is suggested.
- iv. As stock assessment and ongoing monitoring of resources is essential for management, the sampling programme carried out by NARA needs further strengthening, with more data collectors and more research officers to analyse the data.
- v. Some of the field staff probably do not know the value of accurate information. Therefore training should be provided to all staff engaged in field work about the value of accurate data and the responsibility they have in this task.
- vi. The field staff are not motivated to carry out the data collection reliably. They should be given the required facilities such as motorcycles and other incentives such as subsistence and overtime payments.
- viii. Most of the fishermen who provide the information to the field staff are not aware of the purpose of the continuous data collection. They should therefore be educated through extension programmes. This would be very useful in securing their cooperation and in getting accurate data.
- ix. Information on the success stories of traditional community-based management systems and the indigenous knowledge of fisheries in resource management has to be collected. This information should be passed to the fisheries cooperative societies to encourage communities to become involved in participatory management approaches.
- x. Since community based management is a new concept, there is lack of awareness among government officials such as fishery managers, planners, scientists,

administrators and even the politicians and also the fishing communities of the benefits of adopting participatory approaches to increasing the sustainability of coastal resources. This hinders the collection of information needed for fisheries management. More awareness programmes are needed.

6. ACKNOWLEDGEMENTS

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INSTITUTIONAL FISHERY CREDIT AND COMMUNITY-BASED FISHERIES MANAGEMENT

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ABSTRACT

Since the Government of Sri Lanka started to implement free market economic policies, the current National Fisheries Development Plan includes strategic objectives for fisheries development but no specific financial targets or mechanisms. These are to be left to private enterprise and government will only be concerned with such support activities as infrastructure development, training and research.

In this paper the failures of previous fishery credit and subsidy schemes, operated through the then state controlled banks and other institutions, are reviewed, as are the reasons why commercial banks have until recently been reluctant to undertake fishery credit business. Nevertheless, there is an urgent need, and desire on the part of government, to make reasonably priced credit available at local level to small scale enterprises and all sections of the fisherfolk communities and to link financial arrangements to community based management of fishery resources, exploitation and marketing. This is most likely to succeed if credit is channelled through commercial banks to groups such as the fisheries cooperative societies who would then lend on the small sums required by individuals and small enterprises. Close monitoring and supervision would be required of such a scheme if loans are to be successfully recovered and the confidence of banks retained. Strategies for the implementation of these ideas are set out and discussed, as are aspects of marketing and credit availability specific to the needs of community based management. The financing of the processing, marketing and aquaculture sectors of the industry are also described and discussed. A number of possible developments to increase exports of, and add value to, fishery products are suggested.

1. THE ROLE OF INSTITUTIONAL CREDIT IN THE NATIONAL FISHERIES DEVELOPMENT PLANS

1.1 Government policy objectives for fisheries development in Sri Lanka

The first half of the 1990s has witnessed several important developments concerning the fisheries of Sri Lanka. Among these are (i) the rapid expansion of the offshore fishery into extensive areas of the Exclusive Economic Zone, which is now popularly called 'multi-day' fishing, (ii) the formal recognition of the need to have a management regime for marine fisheries of Sri Lanka as reflected in the Government's request for and receipt of UNDPs assistance for marine fisheries management, (iii) the resurgence of fisheries cooperative societies and their utilisation as the foremost vehicle for fisheries and fisher folk development, (iv) the implementation of an investment programme with external financial assistance to upgrade the physical and social infrastructure to support fisheries, and (v) a major change of policy (withdrawal of direct state patronage) in regard to inland fisheries.

In 1990, the Ministry of Fisheries and Aquatic Resources formulated a Five Year Plan for Fisheries Development 1990—1994 with the following objectives:

1. To increase the production of fish in order to increase the nutritional status of the people of Sri Lanka through a higher per capita consumption of fish.
2. To promote the rational and optimum exploitation of Sri Lanka's fisheries and aquatic resources based on the application of modern science and technology.
3. To support the National Programme for Alleviation of Poverty by increasing the incomes and standards of living of all those dependent on fisheries and fisheries-related activities.
4. To increase employment opportunities through fisheries and fisheries related activities.
5. To increase foreign exchange earnings through exports of fish and aquatic products.

The Ministry has also prepared a draft of the plan for the period 1995—1999, which has yet to be finalised. Its objectives are as follows:

1. To bring about a rational and optimum exploitation of Sri Lanka's fisheries and aquatic resources.
2. To facilitate improved efficiency of the fishing industry.
3. To provide better infrastructure to support the fishing industry.
4. To ensure the maximum utilisation of fish harvested and reduce post-harvest losses.
5. To increase foreign exchange earnings by exporting value added and high quality products.
6. To facilitate the improvement of the living standards of fisherfolk.
7. To rehabilitate the fishing industry in the northern and eastern areas of the country.

With regard to investments in the fisheries sector the following are noteworthy:

- The country's ability to increase and sustain domestic fish production in the future will depend upon: (i) the intensified development of its offshore fisheries which have been hardly tapped, (ii) the reduction of pressure on its coastal fisheries through the implementation of sound fisheries resource management and the monitoring programme, and (iii) the provision of support and incentives to the private sector.
- A strategic shift in public investment is needed away from providing fishing vessels and accessories and towards the construction and rehabilitation of the sector's supporting infrastructure such as harbours and anchorages, and marketing facilities.

- There is a need for a full technical assessment of all project components at the design stage and for a clearer understanding of the perceptions and requirements of end-users of goods and services.

1.2 Investment and supporting credit arrangements envisaged in the National Fisheries Development Plan

Sri Lanka now has an open economy as a result of the major economic adjustments which took place in the late 1970s and does not have centralised planning. Consequently the Fisheries Development Plan, like the other sectional development plans, is purely an 'indicative' plan which reflects the basic tenets of fisheries development within the overall framework of national economic policy. Thus, the National Fisheries Development Plan merely sets out the development objectives, attempts to target very broadly the production, employment, foreign exchange earnings expected to result from the implementation of the plan and estimates on a very 'indicative' and broad basis the types of investment which ought to take place for the achievement of the objectives.

In relation to investments for fisheries development the most important principle underlying the plan is that the state sector will not undertake any new commercially oriented investments nor any major expansion of any existing commercial ventures. Such investments are left exclusively to the private sector. Thus, direct investments in fishing such as in boats, engines and gear and other supporting investments such as ice plants, cold storage facilities, boat and engine repair workshops, fish processing, marketing and transport, and activities such as culture/fanning of fish, shrimp and other aquatic organisms will be undertaken exclusively by the private sector. In pursuance of this policy, most of the assets/facilities required for commercial activities conducted by the Ceylon Fishery Harbour Corporation (such as ice plants, cold rooms, workshops and slipways) have been leased or rented out to the private sector. Most of the assets of the Ceylon Fisheries Corporation have also been leased out to the private sector. The fishing-gear manufacturing enterprise Ceylon Development Foundation, which earlier functioned as a state agency, has been converted into a company.

State sector investments have thus been limited to the construction and maintenance of physical infrastructure such as harbours and anchorages, and social infrastructure such as roads, common amenities and allied marine structures, and the basic services needed to support the fishing industry such as research, extension and training.

1.2.1 *Types and magnitude of investment*

There is no single official document which indicates the planned or projected investments in the fisheries sector for the ten year period 1990-1999. However, a projection prepared by the Ministry as an accompanying document to the draft Fisheries Development Plan 1995—1999 (referred to in Section 1.1) revised to include the investments envisaged under the biggest investment project, viz. Fisheries Sector Project, funded with Asian Development Bank assistance, is summarised in Table 1.

The projected investment indicated in Table I will be undertaken by the private as well as the public sector. Based on the current economic policies of the Government referred to above it

Table 1.
Projected investment 1995 – 1999

Category	Amount (Rs. million)
1 Fishing craft and engines	1 063
2 Fishing gear	296
3 Fish marketing and processing	665
4 Shrimp/ fish culture/ farming	401
5 Micro-enterprises	300
6 Fisheries management and regulation	239
7 Harbours, anchorages and coast protection	1 683
8 Fishermen's welfare	190
9 Training and extension	111
10 Fisheries research	342
Total	5 290

is certain that investment covered by categories 1 to 5 (relating to fishing craft and engines, fishing gear, fish marketing and processing, shrimp/fish culture and farming, and the micro-enterprises) will be undertaken entirely by the private sector. This will account for roughly Rs. 2725 million or 51 percent of the total projected investment. These private sector investments will depend heavily on the supply of credit, both formal and informal.

The other investments in groups 6 to 10 such as infrastructure development, fisherfolk welfare (including safety aspects), training, extension and research will be undertaken by the Ministry, the Department, and the National Aquatic Resources Agency (NARA). Fisheries management investments will be largely supported by the UNDP while in the other areas, particularly infrastructure development and research, ADB will provide extensive assistance.

The most important single item is the rehabilitation and development of infrastructure directly relating to fishing such as harbours and anchorages. Heavy investments are required in this particular area because these facilities have not been properly maintained and serviced in the past, primarily due to lack of funds. Physical infrastructure development and rehabilitation accounts for Rs. 1683 million, or nearly one third of the total investment outlay in the sector.

The next most important category, in terms of funds required, is the investment directed at relocation of the fishing effort, namely the promotion of multi-day/deep sea fishing, to be undertaken through the introduction of larger and stronger boats. This category also includes funds to modify vessels, adding insulated fish/ice holds, and install navigational and safety equipment. Investment in such craft is projected at around Rs. 760 million or 15 percent of total investment.

The replacement/ of existing fishing equipment is likely to account for around Rs. 260 million or 5 percent of total investment. Fish marketing, processing and storage is expected to take a fair slice of the total investments. Included in this category are items such as ice making equipment,

storage and freezing facilities, fish transport vehicles and processing facilities. These are now given higher priority as a result of the increasing quality consciousness among the local consumers of fish and the expansion of the marine products export sector, where an awareness of the need to add value and earn more foreign exchange by further processing and by using better methods of packaging is vital. This is likely to account for around 12 percent of the total investment.

Generation of alternative employment opportunities and increased incomes for the fisherfolk communities has been accorded very high priority in the fisheries sector as a part of the national poverty alleviation strategies. In addition to other programmes which already exist for this purpose, a direct effort is being made through a micro-credit enterprises development and promotion programme of the Sri Lanka Fisheries sector project. This is likely to result in a minimum investment of Rs. 300 million roughly 5 percent of the total sector investment.

Fisheries research, training, extension and management taken together will require around Rs. 770 million (around 14 percent of the total). One of the important research inputs will be a comprehensive survey of fish resources within Sri Lanka's EEZ (beyond the continental shelf), which is to be conducted by NARA over 24 months under the aegis of the Fisheries Sector Project.

1.2.2 Sources offunds

The public sector investments in the areas already referred to will be undertaken using the Government's annual budgetary allocations to the Ministry, which will include a considerable amount of external assistance such as foreign grants. Hence commercial credit from local financial institutions will not be used to finance these investments. On the other hand, as shown in Section 2, institutional bank credit will play a critical role in supporting most of the private sector investments. The magnitude of such investments, given the proper investment climate, will be determined by the attitude of the banking sector towards fisheries projects.

The Development Plan 1990—1994 does not provide specific details relating to credit such as the credit/financial institutions involved, or the applicable rates of interest and loan conditions. However, the policy statement included in the plan in regard to credit for fisheries is noteworthy since it focuses attention on some of the problems constraining fisheries credit in the past and the measures which ought to be taken to resolve them.

Since 1979, credit for fisheries has been channelled through commercial banks and no change is envisaged during the plan period. After being very active in providing credit until 1983—1984 the banks have reduced the amount of credit offered mainly for reasons of poor recovery during the past four years. This trend has now been arrested, and the banking system once again is geared to cater to the credit needs of the fisheries sector. Improvements both in the delivery as well as the recovery of credit are being made as the bank officers become more familiar with the attitudes and problems of fisherfolk. The FAO/BOBP fisheries credit project has contributed towards this and will continue during the plan period. The fisherfolk have also been made more conscious of their obligations and this will be further consolidated through training and extension programmes and the new cooperative societies. The banks will establish direct links with the fisheries.

One noteworthy feature of bank credit in future will be provision of working capital. Lack of working capital is known to be one of the key factors that cause small fishermen to go to the middlemen, particularly during lean fishing seasons.

The Ministry of Fisheries and Aquatic Resources and relevant organisations will provide technical and other support services to lending institutions before loans are granted and also in post-sanction recovery activities. The plan also states that loan recovery mechanisms will be improved through a series of strategies and measures which are discussed in detail in Section 2, where details of existing and proposed credit schemes which could be used by the private sector for fisheries investments, and the strategies and policies envisaged, are analysed and discussed.

1.2.3 Foreign investments in fisheries

An important policy of the Government is that foreign investments will be encouraged in all areas provided such investment is beneficial to the country. Under this policy the Board of Investment and the Ministry of Fisheries and Aquatic Resources Development have attempted to attract foreign investments primarily in the area of offshore and deep sea fisheries, culture and farming of aquatic products, processing of fish and aquatic products, boatbuilding, manufacture and assembly of gear. An analysis of the approvals given by the Board of Investments for establishment of fisheries and fisheries related enterprises during the period 1991 and 1994 (up to August) indicates that 47 private enterprises have been approved, of which only 16 have foreign investments (Table 2).

Table 2 shows that there has been very little foreign investment in the recent past. Since foreign investments, particularly in the offshore and deep sea fisheries, are coupled with export marketing further effort should be made to attract foreign investments in this area. Shrimp farming investment opportunities will increase considerably, particularly on the eastern coast when the political situation stabilises.

Table 2.
Types and number of private enterprises in fisheries and fisheries
related investments approved in the period 1991 – 1994 (August)

Type of enterprise	No. of units	Estimated investment (Rs. million)
Prawn farming/ aquaculture	10	358
Fishing/ fish processing	6	456
Totals	16	814

1.3 Relationship between fisheries management and investment/credit in National Fisheries Development Plans

The Five Year Development Plan (1990—1994) and the draft Five Year Plan (1995—1999) both refer to management of fisheries in terms of principal policy objectives for future development of fisheries and aquatic resources in Sri Lanka. Hence in the formulation of projects and development programmes the proper management of fisheries has been a major consideration.

In the public sector investment programme for fisheries the two major development projects, viz, the UNDP project and the ADB project, have a major focus on fisheries management. Marine fisheries management is in fact the sole concern of the UNDP project. It concentrates primarily on the identification and study of fisheries management issues, creating an awareness of the fisheries management and resource conservation issues among fisherfolk, policy-makers and the other stake-holders and promoting the participation of fishing communities in the management of fisheries at the local, provincial and national levels. The other major output expected from the project is improved capability of the Department to forge ahead in promoting management for sustainable development of fisheries. Considering that fisheries management is relatively new in Sri Lanka the task of promoting it will undoubtedly be a formidable one.

The Fisheries Sector Project of the ADB also has several components in support of fisheries management. These include the fish resource survey, which will result in a better understanding of the resource situation, particularly in the offshore areas of the EEZ, and of the management related issues such as the interaction between the coastal and offshore fisheries. The survey should also throw light on the feasibility of further diversifying the fisheries and thereby reducing the pressure on the coastal fish stocks.

In terms of the categories of investment referred to in Section 1.2, those that tend to support the fisheries management process, at least insofar as it concerns the coastal fishery, are the introduction of multi-day boats, and the rehabilitation and development of the fisheries infrastructure, extension and training, fisheries research and micro-enterprise development.

Introduction of multi-day boats and the conversion of day boats to multi-day boats will help to reduce the pressure on the limited coastal fish stocks and at the same time extend fishing into areas in which the stocks are less fished. This promotion of multi-day/offshore fishing is also supplemented by NARA's resource survey programme already referred to above. NARA is also involved in the monitoring and assessment of fish stocks, particularly in the coastal fisheries, where several resource conflicts have arisen between users of different types of gear (e.g. trawl nets, purse seines, etc.). This has led to social conflicts. The infrastructure development programme of the Government, particularly the harbour rehabilitation programme, will also assist the processes of off shore fishery development.

The training programmes under the Development Plan are also management oriented. The dissemination of information on resource issues such as conservation, use of resource friendly methods, and improving the awareness of fisherfolk will be a major component of both formal and informal training programmes. In addition, the training of multi-day boat crews in navigation and safety has also been given priority.

Another important management oriented investment category is the development of micro-enterprises at the village level. These will provide opportunities for members of fisherfolk families to start local, resource based, labour-intensive economic activities which can offer alternative employment to members of fishing communities either on a seasonal basis or all year round. The banking system is already implementing several credit schemes to promote such

activities among fishing communities as indicated in Section 2. To these should be added the micro-enterprises credit scheme of the Fisheries Sector Project, which envisages disbursement of Rs. 220—250 million in credit during the next four years. The project has, on the basis of earlier studies and experience, identified a series of activities which could be supported. In this programme heavy reliance is to be placed on non-Government and voluntary organisations. This scheme is referred to in detail in Section 1.4.

One particularly noteworthy aspect which has an impact on fisheries management is that some of the credit schemes under implementation have as their primary focus the strengthening of the cooperative societies. These are the most important organisations in many fishing villages and are thus capable of supporting or even initiating fisheries management within their area of operation or their communities.

1.4 Policies of international lending agencies and donors with regard to investment/credit and fisheries management

Since 1990 the Sri Lanka fisheries sector has benefited from programmes of assistance carried out by several multilateral and bilateral donor agencies, Governments and international development finance institutions. In the area of fisheries credit, assistance has come from at least two external sources. Of these, the more important is the Asian Development Bank (ADB), which provides \$US 5 million for credit within its loan for the Fisheries Sector Project. These funds are to be used for disbursement among the fisherfolk in the coastal areas of the North-Western, Western and Southern Provinces. The Bay of Bengal Programme (BOBP), a regional programme of FAO, also provided technical assistance in fisheries credit with the aim of improving its delivery system, giving it a market orientation and improving utilisation and repayments.

The Asian Development Bank provided a loan of \$US 26 million for a six year Fisheries Sector Project (1993-1999). Within this, a \$US 5 million credit scheme has been formulated to provide “credit for sub-projects of small scale, micro or selected medium scale credit to fishermen, rural women, selected private entrepreneurs and fisheries cooperatives for income generating self-employment activities as well as for diversification of their livelihood to onshore activities involving fisheries and non-fisheries activities”. This credit scheme can be said to contain two important facets: (i) the funding of boats, engines and gear has been deliberately excluded, primarily to support the management of marine fisheries; and (ii) it also supplements the fisheries management efforts by attempting to provide alternative employment opportunities to members of fisherfolk families in order to lay the foundation for a possible future movement of ‘excess’ personnel from fisheries to other economically viable activities in the project area.

The Bay of Bengal Programme also provided technical assistance by formulating a credit programme in response to a request made by the Ministry of Fisheries and Aquatic Resources in 1987. The request was for assistance to provide comprehensive banking services to the fishing community through the introduction of need-based lending schemes incorporating the principles of simplicity, timeliness and flexibility, in order to:

- i. increase the operational efficiency and profitability of fisheries, as well as non-fisheries economic activities undertaken by members of coastal fishing communities, and
- ii. facilitate the management of earnings by fisherfolk families by encouraging the savings habit through linking credit with savings.

The policies of these two donor agencies in relation to investment/credit and fisheries management in Sri Lanka are discussed below.

The ADB's policy for fisheries assistance to developing countries is guided by the five main principles of productivity, sustainability, efficiency, equity and beneficiary participation in project planning and implementation. The main features of the ADB's credit programme are as follows:

- i. It will cater to the organised sector as well as the rural informal sector.
- ii. The rates of interest will be close to market rates – the minimum will be 16 percent.
- iii. Loans for small borrowers will be supported by training and extension and a social mobilisation programme.
- iv. Security in the case of small loans will be personal integrity.
- v. Participation in group action programmes will be a pre-condition of small borrowers for obtaining loans.

The loan scheme, which will be co-ordinated and executed by the National Development Bank (NDB), will be administered through a network of PCIs (participating credit institutions). Among these are four commercial banks, seven regional rural development banks (RRDBs) and several NGOs including fisheries co-operative societies that fulfil the necessary requirements.

The PCIs shall be selected by NDBSL according to the following criteria:

- i. The PCI shall have at least two years experience in lending to the target sub-borrowers,
- ii. The loan recovery rate of the PCI during the two years preceding the sub-loan shall be at least 70 percent of the loans falling due,
- iii. The PCI shall operate with sound financial, banking and management practices, including maintaining an appropriate debt-equity ratio and making adequate provision for bad debts in accordance with the general guidelines of CBSL and, with respect to TCCSs and fisheries co-operatives, the general guidelines of the Cooperative Department of the borrower (CD),
- iv. The PCI shall establish an accounting and financial reporting system and credit monitoring procedures acceptable to NDBSL and CD, and agree to have accounts audited annually by an independent auditor, and

- v. The PCI shall, where relevant, use a group lending approach towards its sub-borrowers under the micro-credit and self-employment credit schemes under each credit sub-project, operate a savings programme for the duration of each sub-loan, and rely primarily on character reference rather than on collateral in evaluating credit applications.

Criteria used in the selection of Sub-borrowers are as follows:

- a. Enterprises in which the value of fixed assets does not exceed Rs.8 million or a member of a self-help group.
- b. Preferably a resident of the project area.
- c. A person who has been trained or followed a social mobilisation programme for a period of at least three months prior to the request for a sub-loan.
- d. A person who has agreed to participate in a mutual support group.
- e. A person who agrees to participate in a saving programme for the duration of the sub-loan.

Selection criteria relating to sub-projects are as follows:

- a. Those sub-projects in which the investment cost does not exceed SUS 200,000.
- b. Those which are productive, income generating, labour intensive, employment creating, preferably involving women.
- c. Those which use local materials.
- d. Those which provide arrangements for marketing of finished products.
- e. Those with a return on investment of 20 percent.
- f. Those which are environmentally sound.

Other particulars relating to loans are as shown in Table 3.

Table 3.
Conditions of loans made to fisheries projects by the
National Development Bank of Sri Lanka

Terms	Projects over Rs. 500 000	Projects/ activities under Rs. 500 000
Repayment	10 years	5 years
Grace period	2 years	1 year
Equity (as % of total cost)	25%	10%
Security	Security acceptable to PCI	Personal integrity or group system

It is very likely that the larger loans to the organised enterprises will be issued almost exclusively by the commercial banks while the bulk of the smaller loans for village level enterprises and individuals are expected to be held with the regional rural development banks, fisheries cooperative societies and other village level organisations. Thus while contributing to the objective of poverty alleviation, employment generation and diversification of economic activities, the credit scheme will also help to strengthen the cooperatives and other fishing community organisations which will be important agencies in any community-based fisheries management programme. Cooperatives, like the rest of the PCIs will be able to keep a margin of about 8 percent. This will enable them to meet the cost of their services and at the same time increase their financial resources, thereby adding to their prestige and recognition as leading organisations through their borrower contacts.

BOBP's aim was also to develop a credit programme which is not subsidised. The primary objective was to assist a series of financially viable and sustainable small scale enterprises rather than inefficient enterprises which cannot withstand the rigours of competition in a market-oriented economy. The lending institutions were given complete freedom to decide on the applications submitted to obtain credit. More information on the BOBP's Pilot Credit Project is given below.

2. FISHERY CREDIT PROGRAMMES IN SRI LANKA AND THE REQUIREMENTS OF FISHERIES MANAGEMENT AND DEVELOPMENT

2.1 Past institutional and informal credit arrangements for the fisheries sector

Credit is regarded as an integral component of any development plan. The National Fisheries Development Plan in Sri Lanka is no exception, and some of the reasons for this are set out below:

- a. The urgent need to increase production;
- b. The need to assimilate new technology to increase productivity;
- c. The capital intensive nature of new technology which has to be imported, e.g. engines and fishing gear;
- d. The obligation of the banking system to generate more land-based selfemployment opportunities for low income groups;
- e. The need to have relevant infrastructure facilities in place, e.g. ice plants, storage rooms, repair and maintenance workshops, and transportation.

Fisheries activities, in common with other rural activities in Sri Lanka, are funded by informal credit, formal credit, subsidies, fiscal incentives or are self financed. The extent to which each category contributes to sector financing the sector varies considerably.

Successive Governments in Sri Lanka have provided formal credit to the fisheries sector through the Department of Fisheries, commercial banks, RRDB and the cooperative banking system. The Central Bank was charged with some of these programmes on behalf of the Government and it also made the required funds available through a refinancing mechanism which

enabled lending at low or concessionary interest rates. A substantial part of the risk to be borne by the credit disbursing banks was cushioned through default reimbursement guarantee schemes and strict guidelines imposed regarding on-lending, procedures and loan sizes. Despite these efforts, it has not been possible to build up a viable and self-sustaining fishery credit system. This is evidenced by the failure of much of the disbursed credit to reach the target groups, the small number of borrowers, high default rates, large amount of subsidies given by both the Ministry of Fisheries and under refinancing schemes, and above all the reluctance of the banks to provide fisheries credit. The following comment was made in an FAO report regarding rural credit in Sri Lanka: “the lack of enthusiasm for rural credit on the part of the commercial banks is not only a symptom of the failure of formal rural credit but also one of its major causes”.

2.1.1 Fisheries banks

Fisheries banks were set up by the People’s Bank in 1978 with a view to popularising the banking habit and helping to raise the socio-economic standards of the poorer segment of the fishing community. The objective of these specialised banks was to service less privileged fishermen more effectively than the fisheries cooperatives and provide a comprehensive credit structure for those engaged in the fisheries industry. These banks were however to be housed as far as possible in buildings occupied by fisheries cooperative societies and were expected to liaise closely with the cooperatives.

A study was made by the People’s Bank in 1990 on the problems encountered by the fisheries banks. It revealed that although the intention was to set up these banks amid heavy concentrations of fishermen, some of these banks were located at sites away from the fishing centres. It also emerged that the fisheries banks, with their formal procedures and systems, found it difficult to meet the competition posed by private businessmen who had established themselves among fishing communities. One of the objectives in setting up fisheries banks was to break the dependence of the fishermen on the Mudalali, but the task proved far from easy.

Instead of maintaining separate full fledged fisheries banks, the People’s Bank, in the course of time, decided that a counterservice in a main branch of the People’s Bank would be sufficient to meet the needs of the fishermen. This service would be available with different banking hours to suit the locality. However, this programme is not being strongly pursued by the bank at present.

2.1.2 Regional Rural Development Banks (RRDB)

In 1985 the Central Bank launched the RRDBs as new credit institutions at district level. The RRDB’s also faced the same fundamental problems as the rural branches of the commercial banks, eg. difficulties in making rural lending viable under the previous conditions, having to compete for savings deposits, and the need to put funds into commercial activities. Lack of capital was another constraint experienced by the RRDB. The RRDBs’ contribution to the fisheries sector could be considered negligible at present.

2.1.3 Informal sector

The informal sector still dominates lending to the fisheries community. Fish traders and

middlemen play an important role in short term fisheries financing. The fish marketing system in Sri Lanka is also controlled mainly by the private traders or Mudalalis who procure catches at the landing site from fishermen who are under an obligation to them. These informal lenders also establish a linkage between production and marketing. There are various other informal credit sources, such as friends, relatives, landlords, traders and money-lenders. These informal loans have advantages both for the lender and the borrower such as reduced overhead costs, simple procedures, quick disbursements as well as access to credit without collateral requirements. Interest rate levels in the informal credit market are 30-40 percent per annum, which is not out of line with the financial sector when transaction costs are taken into consideration.

The relative advantages of non-institutional credit vis-a-vis the formal sector have led to the idea of integrating both sectors. The introduction of Praja Naya Niyamakas (PNNs) (community credit facilitators) was an attempt to do this. The main objective of the PNN scheme was to supplement and strengthen the financial system, particularly in rural and semi-urban areas, by introducing a host of non-banking intermediaries at hamlet level so that the usurious interest rates charged by informal monopolists could be brought down by the application of market forces. The PNN scheme has, however, not met its objectives so far, mainly owing to difficulties in identifying effective and committed PNNs. Rotating Savings Associations are another means of informal sector financing among fisherfolk. They are popularly known as Seettu, which is a blend of both savings and credit.

2.1.4 Subsidies

The main distorting elements of past fisheries financing included direct investment subsidies and concessional credit schemes. The administration of the subsidies from the inception was jealously guarded by the Ministry of Fisheries. The rationale for subsidies was based on three major objectives, viz., to encourage more investment and production in new and high risk fishery activities, accelerate the adoption of new technologies and improve the distribution of assets and income among the fisherfolk. However, owing to a combination of several factors regarding the administration of the fisheries subsidy programmes, these objectives have not been achieved.

2.2 Linkage of past Fishery Credit Programmes to fisheries management measures and their impact on management related issues

Credit programmes for the fisheries sector date back to 1947 when the Department of Fisheries provided credit to individual fishermen to acquire fishing craft and equipment, and to fisheries cooperative societies to engage in fish marketing. In 1958 the Government introduced a fisheries mechanisation programme under which the fishermen were granted loans for purchase of new boats and engines. However, by 1977 Government financing of the fishery sector faced severe problems since the loans granted for mechanised craft had not been repaid, burdening the Department of Fisheries with financial losses. Considering the high level of defaults, the Government decided to write off all fisheries credit and suspend the disbursement of credit to the fishery sector. Thereafter, lending to the sector was undertaken by the state-owned commercial banks, through the Bank of Ceylon and the People's Bank, which, as financial institutions, were better equipped to handle credit functions.

The Bank of Ceylon and the People's Bank initiated lending to the fishery sector through various credit schemes formulated by the Ministry of Fisheries from 1978 onwards. A brief description of these credit schemes is given in Appendix I.

Fisheries credit schemes in Sri Lanka, both ongoing and those implemented in the past, have had an impact on fishery management related issues and provided bankers and policy makers with valuable experience that will help them formulate and implement more effective fisheries credit schemes in the future. Points of special note to emerge from past credit schemes are briefly outlined below.

a. Improper selection of borrowers

There was no proper selection of bona fide fishermen under many credit schemes. Although a committee comprising district/Area Managers of the two state banks, a District Fisheries Extension Officer and the District Manager of Ceylon Fisheries Corporation was responsible for the selection of borrowers, many of them were not suitable candidates for credit under the schemes as the final selection of borrowers and sanction of loans did not rest with the lending bank. Many influential fishermen obtained credit under the schemes irrespective of their eligibility. This could also be attributed to the linkage of subsidies with credit, thereby making the banks passive participants in the selection process.

b. Inadequate pre-sanction, investigation and post-sanction supervision by the banks

Since the borrowers were selected by District Committees, the banks were not encouraged to undertake pre-sanction investigations prior to disbursement of loans. Furthermore, the post-sanction supervision was generally inadequate to ensure successful recovery of credit. This was mainly a result of the low priority given by the banks to the portfolio and problems connected with employment of field staff for supervision. Some bank branches did not employ field officers because of administrative difficulties.

c. Delay in the supply of project goods

Supply of project goods was the sole responsibility of the boat manufacturer. He supplied the vessels to the borrower, provided he received a request from the lending bank to hand over the boat to the customer. There was a considerable time lag between receipt of payment and delivery owing to technical and financial problems encountered by the boat manufacturers.

d. Substandard quality of goods procured under the schemes

Certain boat manufacturers did not construct the boats to the standards required under the credit scheme. The poor quality of such vessels affected operations and in certain cases has led to a complete halt to fishing activity.

e. Obligation of borrowers towards informal suppliers of credit

Informal credit is still a major source of credit for consumption and working capital

requirements among the fishermen. Such credit is granted by village retail traders (Mudalali) or fish traders. Although the rates of interest are higher than those for formal borrowing, fishermen tend to obtain informal credit since this is available at short notice without formalities and also because of the symbiotic relationship between traders and fishermen. Formal credit to the fishery sector has suffered in terms of recovery performance, because of the priority given by fishermen to repaying informal loans.

f. Poor coordination between banks and fisheries officials

After disbursement of loans to the fishermen, their recovery became the sole responsibility of the lending banks. Fisheries officials were not interested in helping the banks recover loans disbursed to borrowers, mainly because of the lack of coordination between bank and fisheries officials.

g. Lack of commitment of borrowers to repay loans

The past performance of fisheries credit schemes in recovering loans has been unsatisfactory. The overall recovery rate of all fisheries credit schemes implemented to date is less than 70 percent. The borrowers, in many cases, purposely defaulted on their loans since they had no proper understanding of the difference between subsidy and credit. The lending banks had no arrangements to recover loans at the time catches were sold to private traders or the Fisheries Corporation.

h. No link between credit and marketing

Although the banks were involved in fisheries credit, the marketing arrangements for the fish industry were very poor. However, the RRDBs established on a district basis, were able to recover loans since their field staff were present when the fish catches were sold to traders. The unsatisfactory repayment performance of the two state banks was mainly a result of the lack of post-credit supervision and linkage between credit and marketing. The poor recovery performance of the past fisheries lending schemes operated by the Bank of Ceylon (BOC) and the People's Bank (P/B) is shown in Annex II and III respectively.

Obligations and monopoly of fish traders

The fisherfolk are compelled to sell their catches to middlemen at prices quoted by the latter. This is not only because the catch has to be sold immediately to avoid physical and quality losses but also because the fisherfolk have financial and other obligations to the middlemen. The incomes of fishermen are lower than they would otherwise be because of the low prices offered by fish traders.

j. Recent experiences however reveal that fisheries credit programmes have become fairly successful in terms of overall lending recovery rates under the various credit schemes. (see Appendix V).

The recently terminated pilot credit scheme for fisherfolk under the FAO/BOBP fisheries

credit project has also thrown up important issues pertaining to fishery management measures. The main issues are as follows

- a. Many would-be borrowers seem to think that 25 percent equity participation by them in a venture, as stipulated by the credit scheme, is unfair. It is difficult to convince them that such a provision is just.
- b. Many insist on the relaxation of security requirements for larger loans (for instance, Rs. 1.5 million for a multi-day boat and equipment), in line with smaller loans, where the guarantee of two family members normally suffices.
- c. The absence in this credit scheme of subsidies, to which the sector has been accustomed over the years, seems to discourage borrowing.
- d. The demand which existed for credit at the time the project began is now being easily met by several other recently launched credit schemes, some of which offer subsidy components, lower interest rates and liberal security requirements.
- e. Some bank officials trained by the project have been transferred elsewhere, after promotion or at their own request, or for administrative reasons. As a result, the smooth functioning of the credit scheme was disrupted in some branches.
- f. Whilst lending by the participating banks progressively increased, BOBP has gradually distanced itself from the scene, confining its activities to a mere review of the progress of lending and recovery.
- g. Some officials appear to consider any work performed on behalf of the project as falling outside their normal duties. Some bank personnel have complained about the absence of refinance and the use of scarce bank funds for this lending. A few appear to feel that BOBP should provide the funds for lending.

The recommendations made at a National Seminar on the BOBP fisherfolk held in Colombo in January 1993 in relation to the below issues also merit mention.

- a. Steps should be taken to bring the various committees into operation at various levels, viz, bank branch level committees, district/provincial level committees, head office level committees and the national level committees of the project so that there will be continuous reporting and follow-up of lending activities.
- b. An officer taking over duties from an out-going trained officer should be given an opportunity to understudy the latter's work for a reasonable length of time.
- c. The quantifiable and non-quantifiable benefits of the project should be assessed periodically in order to make suitable amendments. Since the project has been designed primarily to benefit small scale of fisherfolk, large loans for single items should not be granted.

2.3 Ongoing credit programmes for capture and culture of aquatic products in Sri Lanka

Credit programmes run by the banking system have been rationalised as a result of past experience in lending to the fisheries sector; ongoing credit schemes are summarised in Table 4.

Table 4.
On-going credit schemes for the fisheries sector.

	Name of scheme	Implementing agencies	Date Launched
a.	Credit scheme to assist fisheries sector to generate self-employment opportunities for fishermen without Government producer subsidy support	BOC only	15.12.80
b.	Credit scheme to assist members of Grama Niladhari level Fisheries Cooperative Societies to engage in self-employment activities	BOC & P/B	30.4.90 in all coastal districts
c.	ADB Agriculture and Fisheries Rehabilitation Project	BOC, P/B and Hatton National Bank (HNB)	26.4.90
d.	Credit scheme to assist fish wholesale traders to purchase insulated trucks for transportation of fish	BOC only	June 1989
e.	Sethsarana Canoe Project	BOC only	September 1993

It is worth noting that all the schemes outlined in Table 4 are confined to capture fisheries and financed by the banks out of their own funds. However, the Hatton National Bank, the Development Finance Corporation of Ceylon (DFCC) and the National Development Bank are reported to be lending to the fisheries sector through the World Bank-funded Small and Medium Industry Loan Scheme (SMI IV), which also provides funding for aquaculture projects.

The People's Bank and the Bank of Ceylon also lend through SMI schemes financed out of their own funds. The main features of all schemes, mentioned above, including the purposes for which loans are granted, eligibility criteria for borrowers, collateral requirements, rate of interest and repayment periods are given in Appendix IV.

The disbursement statistics and the loan recovery rates of these ongoing credit programmes are given in Appendix V. An assessment of the performance of these credit programmes indicates that they are not posing difficulties to the banks and their portfolios at present. There is no doubt that these credit programmes have contributed to the national economy in terms of production, employment and income. However, with the recent changes in the credit scenario in Sri Lanka and the commercialisation of the banking system with special emphasis on the state banks, a review of the current credit programmes is imperative in order to develop suitable strategies to meet the investment and credit requirements of the national fisheries development plans and the needs of the community based fishery managements. The development plan already in operation recognises the need to remove the emphasis from subsidies and instead rely on credit.

2.4 Recent changes in rural credit and their impact on fisheries credit programmes

The problems of rural credit to a large extent also apply to the fisheries sub-sector, especially its small scale element. The high level of credit losses in rural agricultural lending in Sri Lanka is

caused by structural problems rather than credit process problems in the banks. The two state owned commercial banks have financed nearly 87 percent of this high risk business.

The state banks have had to play a dual role in implementing government policy on economic development whilst functioning as commercial entities. This dual role has affected the management of the loan portfolios adversely. The state banks also had to service the credit needs of large, small and less credit worthy customers, assuming high credit risks. In contrast, foreign and domestic private banks have been selective and dealt selectively with credit worthy customers, particularly financially strong multinational and other large companies.

In Sri Lanka today, the banking sector operates in a deregulated environment in keeping with international banking standards. This sector is fast progressing by absorbing new products and techniques available in the global markets a fierce competitive environment which affords the clients an opportunity to obtain maximum benefit from the banking services available in the country. At present there are 24 commercial banks and, together with the National Savings Bank, regional rural development banks, State Mortgage & Investment Bank, Development Finance Corporation of Ceylon, National Development Bank, merchant banks and finance companies, they comprise Sri Lanka's institutional financial sector. However, the two state owned commercial banks, Bank of Ceylon and the People's Bank, dominate the banking sector and account for over 60 percent of its total assets. The financial sector reforms, initiated by the World Bank/IMF in keeping with the principles of market economics, compelled the government to restructure the two state owned commercial banks. Some of the restructuring measures involved the following:

- a. Adequate provision to be made for bad and doubtful debts.
- b. Both banks to conform to the capital adequacy requirements prescribed under the Banking Act in terms of the 'Basle Agreement' (minimum of 8 percent of risk weighted assets to be retained as capital).
- c. The state banks to function as autonomous commercial organisations, as other private commercial banks.
- d. The banks to conform to international accounting and audit standards and to adhere strictly to provisioning for bad loans at branch level.
- e. To achieve agreed profitability targets at the end of each year and to yield a stipulated return on assets (ROA), comparable to the ROA of private commercial banks.
- f. A conscious effort to be made to reduce the intermediary cost of the state banks by reducing overheads and restricting certain operationally high risk areas.
- g. The most stringent stipulations were to halt the expansion of the branch network and recruitment of new staff, and retain them at December 1991 levels. It should **be noted that** as a result of the application of these stringent international norms, coupled with a requirement to maintain a minimum cumulative collection ratio of

80 percent under the covenants of the SMI IV agreement with the World Bank-IDA, the two state banks were suspended from disbursing credit under this scheme. The suspension of this scheme has had a direct impact on the provision of investment credit for multi-day boats, engines and gear. However the two state banks have responded by formulating an indigenous SMI loan scheme and implementing it using their own funds, though at a higher rate of interest.

The conceptual framework of liberalisation also took cognizance of the 'unevenness of the playing field' in banking operations. Both the state banks and the private banks made representations to the Presidential Commission on Finance and Banking and the former have drawn attention to the constraints, both direct and indirect, under state ownership. The private sector banks, on the other hand, complained about the 'favoured treatment' afforded to the state banks. However the measures that have been taken to level the 'playing field' have had certain adverse implications on developmental banking activities. Meanwhile the Central Bank is pursuing a policy of restricting refinance facilities and bank guarantee schemes provided hitherto.

The interest rate policy has been geared towards the market-oriented interest rates of the commercial banks. The objective of adopting such interest rates for the commercial banks and financial institutions was to encourage the latter to participate more actively in the rural financial market. However, with the reduction of other subsidies provided by the Government, the introduction of market-oriented rates appears to be a harsh measure to adopt in the short term. Nevertheless, it is argued in certain quarters that the poorer sector is not sensitive to interest rates and what is required is to cut down the transaction costs of lending and borrowing through appropriate measures and strategies.

Although the recent financial sector reforms were necessary to keep abreast of the changes in the international financial market, these changes have had some adverse effects on the rural financial market, aggravated by the phasing out of refinance and subsidies. These effects have been particularly felt by community-based fishery programmes, since the two state sector commercial banks are the principal players in this field of activity.

2.5 Channelling of external funds and credit intermediaries

The record of fisheries credit projects funded by the international funding agencies generally bears out the wisdom of choosing commercial banks as the appropriate conduit for credit to this sector. While further analysis will be necessary to verify that coverage has been as good as the initial reading suggests, the tentative conclusion is that these projects have been well designed to reach a certain target group generally composed of the middle size rather than very small and frequently not first time investors. This is particularly apparent in the ADB Sri Lanka Agricultural Rehabilitation Project. It may also turn out that there are potentially important target groups in the fisheries sector that cannot normally be reached by the commercial banks, in which case other models may warrant consideration or reconsideration as ways of complementing the currently preferred design are sought. The commercial banks were preferred intermediaries in the past because the development finance institutions tend to suffer from excessive centralisation (having few or no branches), which may make access difficult for small fishermen outside the metropolitan

centres. These institutions also tend to have complex appraisal procedures. On each of these counts the state-owned commercial banks have the advantage. The concerns with respect to the private commercial banks are different: their disinclination to engage heavily in fisheries lending due to the high risks and administrative cost; their lack of experience in, and reluctance to gear up to help, small fish enterprises; their limited capacity for, or tendency not to engage in, loan supervision; and a further disincentive sometimes provided by interest rate ceilings or other problematic financial policies.

The NDB has, as the executing agency, successfully implemented the SMI credit line with several participating credit institutions. While in many respects the effectiveness of the commercial banks cannot be challenged, it is apparent that their capability to execute the credit line has in general been overestimated. The NDB never absorbed the creditor risk. The supervisory mechanism was limited to a post-lending operation rather than a continuous monitoring process. However, the commercial banks at the periphery were involved throughout, from the time of appraisal to the last stage of recovery. The sudden decision of the World Bank to suspend state commercial banks from the SMI IV credit line has caused the international funding agencies to consider asking private commercial banks to act as participating credit institutions. The criteria for selection of PCIs have been clearly defined:

- a. They should have adequate experience in providing and monitoring term loans.
- b. They should have branch networks in the project area.
- c. They should be willing to participate in the project.
- d. They should agree to provide staff to ensure the required level of loan appraisal and supervision, including an adequate number of loan officers trained in term lending, supported by an adequate number of field staff.
- e. They should be prepared to continue to promote and develop their capabilities in term lending through staff training.

It is very doubtful whether the private commercial banks would be inclined to conform to the above criteria and whether they can still demonstrate the commitment and sincerity expected to implement a national fisheries credit programme of large magnitude.

2.6 Adaptation of institutional credit programmes to the requirements of community-based fishery management

Although the national fisheries development plan provides an estimate of the funding requirements for investment in the fishery sector, a financing plan indicating, inter alia, the share of bank credit has not been incorporated. The election manifesto of the new Government indicates that a special national programme will be devised to assist the development of the fisheries and water resource-based industries. It will include a special scheme to provide modern fishing boats, engines, fishing nets and implements. The manifesto also recognises the poverty among fisherfolk and their low productivity. Thus fishery related micro-enterprises will have to be promoted. There is an urgent need to formulate financing plans, setting out sources of funds, to meet the investment

cost indicated in the national fisheries development plans. The institutional credit strategy for the development of the fisheries sector in the future could be split into two main components:

- a. Credit to individuals and enterprises engaged in capture fisheries, marketing and processing.

The major portion would be set aside for replacement and the balance for expansion of capture fisheries. A phasing out of credit in conjunction with some expansion is possible for the small scale, multi-day offshore vessels which show high profitability and the ability to attract enough equity funds or venture capital without having to resort to loan financing. If it is proposed to include part of this fleet in a formal credit programme, it is mainly to distribute the ownership more widely.

- b. Institutional financing for fishery communities covering land-based, fish micro-enterprises.

Lending to communities on a group basis would be most compatible with the structure of financing needs in fishing communities without involving costs for loan appraisal, supervision and recovery, which are disproportionate to the small sums disbursed to individual borrowers. The existing credit scheme for fisheries co-operative societies needs to be strengthened. Another possibility could be the model of 'Thrift and credit cooperative Societies' adopted to serve fishing communities. Other forms of on lending through intermediary institutions such as NGO could also be explored. In this regard, the imparting of legal status to these community based organisations needs special attention.

The success of any credit scheme for co-operative societies lies in the soundness and the efficiency of the societies themselves. The following points should receive special emphasis when societies are selected.

- a. Financial viability – the capital base must be strong enough to absorb short term financial shocks.
- b. The society should have a good financial management and administration.
- c. The sub-borrowers should be selected purely on merit.
- d. The officials of the societies should be of high standing and integrity.

Providing credit successfully through fisheries cooperatives, also depends on the degree of close monitoring, follow-up and supervision, the adoption of an efficient recovery mechanism by the banks in collaboration with the Ministry of Fisheries and Aquatic Resources and the cooperatives.

To this end, the following strategies are strongly recommended:

- a. Officials of MOFAR/Department of Co-operative Development (DCOD) should be appointed as managers to supervise the overall affairs of the societies until they are in a position to manage their own affairs. These officials should be given the following responsibilities -

- i. The framing of rules and regulations to guide the societies in respect of bank credit facilities, marketing of fish, collection of sale proceeds, distribution of earnings, settlement of bank loans and other general affairs of the societies.
- ii. Training the societies' officials in management and accounting procedures.
- iii. Training/educating society members and developing their skills in the use of modern technology in fishing, storage, processing, etc..

In essence, the formation, registration and functioning of the societies should be closely monitored by the MOFAR and the DCOD. In the past, agreements of this nature existed only on paper. It is envisaged that the inclusion of these strategies in the FDP would ensure their effective implementation.

- b. The Fisheries Field Inspectors and the Inspectors of the DCOD should forward the societies' monthly progress reports to the MOFAR and the lending banks through the District Fisheries Extension Officer (DFEO).
- c. Audits should be carried out annually by the DCOD.
- d. A maximum credit limit should be fixed after carefully assessing the credit absorption capacity of the society in consultation with the relevant Government and bank officials.
- e. Bank staff should carry out independent verifications of the societies' accounts.
- f. The society should make firm marketing arrangements to ensure the sale of catches at optimum prices. Fish auctions should be organised by the societies for this purpose.
- g. To ensure expeditious loan recovery the provisions of the Debt Recovery Act should be extensively used. In the event that these cannot be used effectively it is proposed that new legislation be introduced by an act of parliament. Such legislation should contain provisions similar to the relevant provisions of the Agrarian Services Act No. 58 of 1979,
- h. The existing system of taking defaulters' boats into protective custody should be given legal strength to protect the interests of the banks.
- i. To promote the expansion of community-based fishing, the banks should evolve a rescheduling scheme for borrowers who have defaulted on previous loans. This category should include only non-wilful defaulters, with a moratorium on loans, if necessary.

The following limitations have to be overcome when adapting the existing credit scheme for the future:

- a. Since membership of fisheries cooperatives is limited to small and medium scale fishermen, large scale investors such as boat-yard owners, ice plant owners and investors in shrimp aquaculture will not qualify for bank funding under the cooperative scheme.
- b. Borrowing by cooperatives is linked to their financial viability and debt absorption capacity.

2.7 Suggestions for an efficient credit delivery and recovery mechanism

- a. In view of the aforesaid limitations in bank funding through cooperatives, it is proposed that non-member investors be provided with concessionary credit facilities, though perhaps not to the same degree as those afforded to the cooperatives. Export-oriented ventures such as shrimp aquaculture, grouper culture, seaweed culture and ornamental fish breeding merit concessionary financing.
- b. If concessionary financing is to be considered, corresponding soft credit lines should be made available to the banks directly from international funding agencies such as ADB and World Bank. Interest spreads under these credit lines should, however, be attractive to the banks. It is prudent to consider the possibility of channelling external funds without an intermediary at the apex level direct to the participating commercial banks which conform to the criteria spelt out above. The World Bank is currently reviewing the possibility of readmitting the state commercial banks under the SMI IV since both banks are capitalised and restructured organisations with clearance obtained from international auditors.
- c. Special training should be provided to bank staff engaged in fisheries lending to improve the quality of loan appraisal and granting of timely and adequate credit.
- d. The mobility of staff engaged in fisheries lending should be increased through provision of motorcycles, jeeps, etc.; these items should be negotiated under foreign assistance programmes.
- e. The lending banks should be provided with an independent technical support service panel to obtain final opinions on the quality of work done/seaworthiness of boats etc.; prior to the release of loan proceeds.
- f. It is recommended that an Investment Support Group be formed to offer technical advice to banks as well as investors. This group will carry out studies of potential investment opportunities in a range of areas such as shrimp aquaculture, cold storage, canning, deep sea fishing and international marketing of Sri Lanka fish.
- g. In keeping with the withdrawal of subsidies the lending banks should also be allowed to charge market rates of interest for fisheries lending in general.
- h. To improve the loan recovery mechanism, the following strategies are suggested.
 - i. An incentive commission scheme to those engaged in loan collection.
 - ii. Spot collection at landing points to be emphasised.
 - iii. Deployment of private debt collectors.
 - iv. Repayment schedules to be made flexible to accommodate seasonality of activity.
 - v. Implementation of realistic loan rescheduling programmes for non-wilful defaulters.

- i. Provisions should be made for the secondment of technical cadres from the Ministry of Fisheries to the banks as and when required.
- j. In order to avoid problematic scattered lending, banks should concentrate in areas with landing points. However, it may not be reasonable to limit the lending in this fashion where the landing points are situated far apart.
- k. Working capital requirements of fishermen should be taken into account when granting credit.

In order to increase the accessibility of credit to small scale fishermen, a multipronged approach is recommended. In this regard the following strategies are suggested.

- i. Project profiles to be involved in respect of small scale, land based, self-employment ventures of fisherfolk families. In this regard a cost and earnings study of small scale fisherfolk activities in the districts of Galle Matara and Puttalam undertaken by the BOBP merits mention. It was envisaged that this study would eventually lead to an inventory of small scale project profiles for fisherfolk.
- ii. Identify new areas for fisherfolk activities, eg. milkfish culture, and ornamental fish culture.
- iii. Involvement of women in bank lending and savings activities.
- iv. Collaborating with NGOs involved in fisheries community development.
- v. Aggressive marketing of bank credit schemes to be undertaken.
- vi. Fisherfolk to be educated in regard to bank credit through meetings, workshops and seminars.

Although the FDP has provided for an estimate of the fund requirement for investment in fisheries sector development 'Financing Plan' indicating inter alia the share of bank credit has not been incorporated. It is recommended that a financing plan spelling out the sources of funds to meet the total investment cost be included in the FDP.

3. FISHERIES MARKETING/PROCESSING IN RELATION TO INSTITUTIONAL CREDIT AND COMMUNITY-BASED FISHERIES MANAGEMENT

3.1 Fisheries production

Fish and fish products have traditionally been an important part of the Sri Lankan diet and a principal source of animal protein for the population. Proximity to the sea and an aversion to red meat for religious reasons, rather than the more recent health concerns, are two factors that help to explain this. With population growth estimated at 1.2 percent per year, increasing incomes and rising prices of competing protein products, per capita consumption of fish and fish products can be expected to rise. While imports of dried and canned fish will continue to meet the needs of a large segment of the population, the traditional preference for fresh marine fish and continuing improvements in preservation, processing and marketing will serve to strengthen demand and will have implications for fisheries management.

Meanwhile, enhanced export marketing efforts and a hard-won reputation for quality have resulted in a steady increase in the export of fish products from Sri Lanka. This comprises primarily shrimp to Japan, lobster and certain 'exotic' products such as beche de mer, shark fin and fish maws. The export of ornamental fish is becoming more important. In addition, exports of live crab to Southeast Asia and frozen fish fillets to the United States and Europe are growing. At the same time the current scramble to cash in on the high shrimp prices currently prevailing in the world market by opening more and more farms concentrated in one area could also have deleterious consequences for the local communities.

The prevailing high prices of raw material for export as well as the domestic market are a strong incentive for increased production. With certain rich fishing grounds in the north still largely unavailable there will be greater pressure on stocks elsewhere in the coastal fishery. Recent studies show levels of coastal fishery production, especially of pelagic species, now close to their maximum sustainable yields. While there has been a considerable increase in the number of locally built multi-day boats, the coastal fisheries still provide about 80 percent of the total catch. Inevitably, the means of generating increased production to meet the projected demand for fish must lie in accelerated exploitation of offshore/deep sea resources. The consequence otherwise would be still more increases in real prices, placing fish further beyond the reach of low income groups, and more pressure on the country's foreign exchange reserves through increased imports of canned and dried fish.

3.2 Domestic marketing and processing

With fishing still in the hunting stage, the absence of a fishing industry as such is reflected in the marketing process for fresh fish. Individuals representing three categories of middlemen dominate the marketing procedure. The small scale fishermen supply the product to the retailers who cut up large fish for sale directly to the rural and suburban consumer. The beach trader (assembler) transports fish to the metropolitan and urban markets, supplying wholesalers who in turn sell to institutional buyers and retail traders.

Most of the catch is sold at competitive auctions conducted increasingly by the fishermen themselves at the landing centres. The beach traders' margins can vary substantially depending on the price of the consignment at its destination. The wholesaler's margin is usually 10 percent as is that of the market retailer. The itinerant vendor's margin is higher (approximately Rs.10 per kg) since they usually provide highly convenient door-to-door service. It has been estimated that the consumer ends up paying from about 60 to 100 percent above the price paid to the producer.

Fish is transported by trucks, vans, rail, motorcycles and bicycles. Refrigerated or insulated trucks are not used as consumer preference is for wet fish and the travel times involved are relatively short. Operators prefer regular vehicles which can also be used for other transport purposes. Losses are negligible in quantitative terms especially for fish transported whole on ice in wooden boxes. Losses of large sized fish, which are deheaded and gutted before transport, are estimated to be 10 to 20 percent.

In the absence of a canning industry, the preparation of dry fish constitutes the main processing

activity. This is resorted to in the case of smaller varieties such as anchovy, which have greater consumer acceptance in dried form, or in glut situations, or when fish is landed in remote areas by migratory fishermen and where ice is not available. The large sized fish are salt cured and dried – they are split open and then subjected to a dry salting process. Drying time is generally about one week. Medium sized fish are split and immersed in heavy salt solution for six to eight hours. Drying time is around four to six days. The anchovy and other small fish are dry cured without salting. The north and east of the country are the main dry-fish producing areas. Meanwhile consumer preference is for fin fish species such as Spanish mackerel, jew fish and thread fin bream imported in dried form. These obviously are not processed locally because of their much greater value in fresh form. Processing of skipjack tuna for the production of maldivian fish is increasing at a cottage industry level, especially by women in fishing areas. However, as the recovery rate in its production is only around 20 percent it is difficult to compete with imports from the Maldives.

3.3 Export marketing and processing

From small beginnings, exports of fish and fishery products have grown considerably over the past two decades to reach a value of Rs.2,112 million. Shrimp continues to dominate both in volume and value (Table 5). Japan is the principal destination followed by the United States, the Netherlands and Singapore. It is estimated that the burgeoning aquaculture industry provides 75 percent of supplies with the balance coming from the capture fishery. Other important exports include lobsters to Japan and dried products such as beche de mer, shark fins and fish maws to Singapore and Hong Kong. There is a growing export of frozen fish including fillets to the United States and Europe and a considerable trade in live crabs to Southeast Asia. Exports of ornamental fish have grown steadily over the past decade, principally to Europe and more recently to the United States.

Except for relatively small quantities of packeted frozen fish distributed in the local market, frozen products such as shrimp, lobster and cuttle fish are exported in block form. Shrimp are processed into headless, shell-on form while lobster is cooked whole and frozen or tail frozen. Cuttlefish are frozen whole or as fillets. Lagoon crab meat is also frozen for export. There are currently 11 major processors of shrimp, lobster and cuttlefish, using air blast freezers and contact plate freezers.

3.4 Ongoing and planned credit programmes for fish marketing and processing

In respect of post-harvest activities the informal sector continues to play a significant role as supplier of credit, with the beach assembler providing credit to the fishermen and the wholesaler doing the same for the assembler. Meanwhile there are a multitude of past and present credit programmes for the fisheries sector. These are described and assessed in the preceding chapters. For more complex post-harvest activities, finance is usually available from a variety of institutional sources, most commonly in the form of term loans for large projects, mainly shrimp farming, which include forward integration projects for processing and facilities offered under the Small and Medium Industry Loan Scheme (SMI) operated by the NDB through various commercial banks. The overall objectives of the SMI scheme are to strengthen the private sector by assisting small and medium scale industrial and service firms and new entrepreneurs to expand output,

Table 5.
The value offisheries exports from Sri Lanka (Rs. million)

Product	1992	1993	1994 (Jan - June)
Shrimp	613	802	687
Lobster	125	209	115
Crab	66	82	80
Fish (fresh or chilled)	10	69	19
Fish (frozen)	125	526	377
Fish (diced or salted)	167	148	66
Ornamentalfish	159	204	118
Others	53	69	71
Total	1321	2112	1536

generate employment and increase exports through access to institutional sources of finance as well as technical assistance. An important purpose was to steer commercial banks, which had been geared mainly to security-oriented lending, in the direction of long term, project-based lending. The SMI scheme commenced in 1979 with a \$US 16 million line of credit from the World Bank. This was followed by a second credit line of \$US 30 million, which was fully committed by 1988 by the participating banks. The third credit line was jointly funded by the World Bank and the Asian Development Bank and amounted to \$US 35 million. At this time the maximum loan obtainable was also increased from Rs. 4 million to 8 million while the loan component could be as high as 75 percent of the cost of the proposed project. The current credit line (SMI IV) amounting to \$US 75 million is again jointly funded by the World Bank and the Asian Development Bank. Enterprises in the fishery sector are among those eligible for financing under the present line of credit.

A summary of refinance approvals for fishery sector projects under SMI III & IV (Table 6) indicates that a very high proportion are devoted to fishing activities (66 percent), with a value totalling Rs. 172 million. These loans mainly complement and augment subsidies available under the Ministry Scheme for multi-day boats operating offshore. Loans for shrimp culture (21 percent) amount to Rs. 114 million. Such projects also include post-harvest components such as vehicles for transport of the product. The setting up of ice plants predominates in the post-harvest area with 21 projects accounting for Rs. 36 million. A mere four projects, with a total loan component of Rs. 10.6 million, specifically deal with processing frozen fish for the local market, in consumer packs. Also refinanced under these lines of credit are 27 projects relating to aquarium fish.

Institutional credit programmes including provision of term loans have been geared to official policy encouraging offshore and deep sea fishing, with a view to increasing production while easing pressure on the coastal fishery, and shrimp farming and processing activities for export, which are aimed at increasing foreign exchange earnings.

Table 6.
Refinance approvals to fisheries sector projects under SMI III & SMI IV as at 30.7.94.

Sub-sector	No.	SMI III Amount	No.	SMI IV Amount
Construction of boats	3	1 893 750	2	350 000
Manufacture of fishing gear	-	-	3	1 095 500
Prawn culture	23	12283 500	76	102031 300
Inland fisheries	3	816 245	-	-
Fishing	84	38605475	234	133285634
Ice	9	7087500	12	28531 300
Fisheries - other	2	1 003 500	2	2 800 000
Aquarium fish	17	3110250	10	4900000
Total	141	64800220	339	272993734

4. ADAPTATION OF INSTITUTIONAL CREDIT PROGRAMMES AND FISH MARKETING/PROCESSING TO THE NEEDS OF COMMUNITY BASED FISHERIES MANAGEMENT

4.1 Measures outside the field of institutional credit

Encouragement of the private sector would help increase production from the inland fisheries, improve distribution systems and reduce post-harvest loss so that the protein needs, especially of the rural population, are better met. Incentives for fish processing and freezing activities would help serve the growing niche markets among the urban population for packeted convenience foods.

While exporters of fish products have shown much enterprise, particularly in developing exports of shrimp, this sub-sector has still to realise its full potential. The industry is well equipped in terms of farming and processing technology and availability of finance and other incentives, and has grown impressively over the past decade. However, there has been little diversification of market or products. Japan and the United States remain the principal markets while the product is invariably exported in bulk frozen form. Meanwhile the insistence on proper environmental impact assessments as a prerequisite for approval of farming projects is helping to reduce the environmental and social consequences of this growth. In view of supply limitations from the capture fishery, exporters need to be encouraged to add value to producing individual quick frozen shrimp, for instance, as well as supermarket packs for which both technical and marketing assistance is required.

With the development of deep sea fishing, the growth of a high value sashimi tuna industry becomes a possibility. At present there is no industrial tuna fishery and much of the catch is landed by small fishing boats. Hence the interests of the artisanal sector must necessarily be taken into account in launching commercial tuna fishing operations.

Meanwhile opportunities exist to diversify fishery based exports through, for instance, increased exploitation of cephalopod products. Squid and cuttle fish are currently harvested as by-catches in shrimp trawling, purse seining and beach seining. Despite proven resources, there is no targeted fishery for these species, hence the need for the development of appropriate fishing methods for optimum exploitation. Another interesting possibility is the processing of value added cephalopod products. Apart from expanding exports of more traditional products such as beche de mer, shark fin, lobster and crab, there are possibilities to diversify into new products such as seaweed and, in the inland fishery, cultured eel. Such profitable but relatively unknown areas for the local exporter community would require special assistance in terms of technical know-how from overseas as well as market intelligence.

As the demand for marine varieties of ornamental fish lessens as a result of environmental considerations, exporters would benefit from technical assistance in breeding freshwater varieties

4.2 Adaptation of credit programmes for marketing and processing of aquatic products

Marketing and processing activities, being one step removed from harvesting operations, are less likely to impact on community-based fisheries management issues. The absence of integrated fishing/processing industries or large scale fish marketing/processing operations means that the post-harvest sector is not in a position to exert undue pressure on resources. While credit programmes for fishing activities are being adapted to encourage offshore and deep sea fishing, such adjustments are unnecessary at present for the post-harvest sector. Indeed institutional credit has been freely available to this sector under SMI and through term loans but has had few takers. Those involved in processing/marketing operations have been content to make do with local supplies. However, at least one enterprising company has resorted to importing raw material from southeast India for processing into fillets for export. Tax incentives would further encourage the development of such a re-export trade. The export processing sector for shrimp, comprising 11 companies at present, will continue to depend on increased supplies from aquaculture in the foreseeable future to expand its business. The trend is likely to be towards value addition with a consequent interest in credit as well as grants for technology transfer, including equipment, and for market penetration.

4.3 The need for special credit programmes in support of community-based fisheries management

There has been a growing acceptance of the need for more effective fisheries management as a result of the increasingly severe depletion of coastal fisheries resources and the conflicts which have arisen among different groups of fishermen competing for the limited resources. The conventional approach to fisheries management, based on central control, national statutes and regulations, has had limited success; it calls for considerable resources for enforcement and, as with all forms of control, is often beset with corruption. Thus, it is an undisputed fact that without the participation and cooperation of the users of a natural resource such as fisheries, management has very little chance of success. Hence, alternative approaches and techniques are needed. Community-based management systems provide an approach which is capable of improving the benefits that can be derived by the fisherfolk from the coastal fishery resources.

Community-based management is not yet a reality in Sri Lanka since the prerequisite for such management is that the community should have the exclusive right to use certain stocks within a certain area, i.e. a kind of territorial use rights in fisheries (TURF). However, proceeding on the basis that community-based fishery management needs to be actively promoted and supported for the betterment of the fisherfolk and the industry in general, the measures suggested in regard to institutional credit are discussed below.

4.3.1 Credit programmes for strengthening the financial status of fisheries cooperative societies

In Sri Lanka, the most appropriate organisation to provide leadership to the fishing community is the fisheries cooperative society. However, economic viability is imperative for a cooperative society if it is to acquire the confidence of fishermen. To become economically self-reliant and self-sustaining the society must engage in income-generating activities.

Thus special credit schemes targeted at the fisheries cooperatives should provide the following:

- i. Seed funds to enable cooperative societies to initiate activities such as supplying fishermen's basic needs (eg. fuel, fishing nets, gear, salt, ice etc.) and the basic amenities and services such as storage rooms and fish and ice holding rooms;
- ii. Initial working capital and fixed capital for marketing and distribution of fish;
- iii. Credit to enable the societies to relend funds to their members for non-fisheries as

well as fisheries activities.

4.3.2 Credit Programmes for income-generating non-fishing activities

Fisherfolk are bound to consider any management measures which control or limit their access to a fishery or the expansion of existing activities as being inimical to their well-being. This is a major problem to overcome and if community-based management of fisheries is to have even a semblance of success, it will be necessary to identify and provide alternative employment opportunities for surplus manpower. Thus special credit schemes for the promotion of micro-credit enterprises targeted at the fishermen and their families, particularly the women, are considered imperative. In Sri Lanka the commercial banks have implemented many schemes for this purpose in the past. The Fisheries Sector Project funded by the ADB has earmarked an initial amount of Rs. 250 million for lending in support of such activities. This scheme will be implemented through a wide network of participating credit institutions in the project area and will be supported by training, promotion of group action and a programme of social mobilisation.

4.3.3 Selective programmes of credit linked with subsidies

In regard to certain selected credit programmes of a pioneering nature, at the initial stage linking with a well managed subsidy programme is a powerful tool in directing fisheries development. However, it should not be continued as a matter of policy. Within the fisheries sector, the planners need to identify which sub-sectors, or types of fishing, need to be encouraged

and which need to be reduced, on the basis of the state of the resources and management considerations. Particular methods, types of gear or specific species-targeted fisheries which are resource friendly or which provide opportunities for exploitation of certain highly fished species can be supported and promoted through special credit schemes. Demersal fishing methods other than trawling need to be promoted in Sri Lanka. A well designed scheme could encourage bottom long lining through the provision of credit at concessionary rates for lines and line hauling devices, the modification of boats for this purpose, etc. Another example is the use of traps to catch certain species of fish. In Sri Lanka the best example of such selective development through credit is the provision of credit to convert day boats to multi-day boats by installing insulated fish/ice holds. Where general fisheries credit schemes are already available certain types of gear or particular methods can be specifically excluded from financing in order to achieve selective development.

4.2.4 Special credit schemes to promote enhancement undertaken by communities

In recent years technologies such as artificial reefs and Fish Aggregating Devices (FADs) have been used with success in certain countries. Construction of artificial reefs is a method of increasing fish resources by providing habitats for certain species. There is still much controversy over whether increase the total resources or merely increase the resources spatially. FADs designed by NARA and deployed off Panadura have had some success with species such as Dolphin fish and Rainbow Runners caught around them in large numbers. The FADs have become quite popular with the fishermen who regularly fish around them and there are requests for more. The cost of making and deploying FADs and their productivity appear to make them good candidates for special credit schemes. However, fisherfolk community organisations that deploy them should be given the right to exploit and manage them without which there will not be much incentive for them to **take** the initiative and install FADs on their own.

4.3.5 Credit schemes based on revolving funds

The integration of credit and savings facilities is fundamental, particularly in community-based lending schemes. Revolving loan funds have been used in various countries with much success, with a few isolated success stories in Sri Lanka. The involvement of national-level financial institutions and multi-objective fisheries projects would certainly give the concept a strong boost. It would be desirable to obtain assistance from international technical assistance organisations and donor agencies at the initial stages of implementation.

4.3.6 Credit for marketing

There are hardly any well designed credit schemes to cater for the fish marketing system in Sri Lanka, which is controlled mainly by the private traders or Mudalalis. The attempt by the Government to centralise fish marketing through the state-owned Ceylon Fisheries Corporation failed miserably since the latter did not succeed in procuring fish from the fishermen. The banks could assist in the provision of credit for the development of marketing infrastructure through the private sector, as envisaged in the National Fishery Development Plan, preferably under the SMI credit line. This could also storage, processing and transport of fish. Banks should also endeavour to get the fish Mudalalis to agree a 'code of conduct', with a package of short term facilities on liberal terms to increase their liquidity and enable them to offer better prices to the

fishermen. A well defined programme of this nature could be evolved and should be monitored closely both by the banks and the Government.

4.3.6 Allocation in Lending Portfolios

The bankers are increasingly aware that the development of the fisheries sector cannot be achieved solely by financing the production of capture fisheries. Bank assistance in ensuring an efficient distribution system and the quality of the fish that reaches the table have become equally important issues. The banking sector is also alive to the need to orient the fisheries sector towards exports, particularly in non-traditional areas such as shrimp aquaculture and ornamental fish breeding.

In this context, the banks should be called upon to make specific allocations to the fisheries sector in their loan portfolios. According to the National Fisheries Development Plan (1993—1999), the total investment needs of 22 identified private sector activities, ranging from boats to boat yards and ice plants to shrimp culture and ornamental fisheries amount to Rs. 2.44 billion (see Annex VI for a detailed break-down of activities). If 20 percent of this investment is borne by the private sector as its equity participation, the bank financing required would amount to a staggering Rs. **1.952** billion. Thus there is an ostensible need for external funding in the form of a soft credit line. Such external funding would no doubt provide an adequate interest spread 7—10 percent to attract commercial banks to participate.

4.3.7 Incentives for banks

In addition, the commercial banks would require fiscal incentives in the form of concessions on reserve requirements, the payment of interest on reserves, lower statutory liquidity ratios and flexibility in loan loss-provisioning requirements in view of the hazards associated with fishery operations and their seasonality.

APPENDIX I

A BRIEF DESCRIPTION OF THE CREDIT SCHEMES IMPLEMENTED BY THE STATE BANKS IN THE PAST

A. SelfEmployment Bank Financing Scheme

Under this scheme implemented in 1979, credit facilities were provided by the two state banks for purchase of fishing craft engines and fishing gear. The Central Bank of Sri Lanka provided refinance support to the lending banks and the banks granted credit at concessionary rates of interest to the fishermen. The credit component was combined with a government subsidy of 35 percent of the cost of craft, engines and fishing gear.

B. Cyclone Rehabilitation Credit Scheme

This scheme was operated in cyclone affected areas, for cyclone affected victims on the eastern coast of the country for purchase of boats, engines and fishing gear with refinance support from the Central Bank of Sri Lanka. Since cyclone victims could not provide equity contributions, these were met from a special assistance fund.

C. Fisheries Sector Bank Financing Scheme

This scheme was introduced by the Central Bank of Sri Lanka consolidating the self-employment and cyclone rehabilitation scheme with refinance assistance for financing the purchase of fishing craft, engines and fishing gear. The executing agency under this scheme was the Ministry of Fisheries, which provided a subsidy of 35 percent out of the total cost of the craft, engine and fishing gear financed under the scheme. The balance (65%) consisted of credit and borrowers' equity. By the end of 1991 a total of approximately Rs 140 million in Central Bank refinance in respect of about 3,400 boats had been provided to participating credit institutions (PCI).

D. Credit Scheme for Fishermen's Cooperative Societies

The Central Bank of Sri Lanka introduced this scheme in 1981 to provide refinance to state banks for financing the purchase of mechanised craft by the cooperative societies. This scheme was combined with the Government subsidy scheme.

E. Asian Development Bank/Sri Lanka West Coast Fisheries Development Project

Loans were made available for any type of craft outside the original package to provide 28 and 38 ft boats. A 35 percent subsidy was available from the Ministry of Fisheries and refinance of up to 80 percent of the cost was provided by the ADB.

F. Asian Development Bank funded Southwest Coast Project

The two state banks implemented this scheme to finance the purchase of boats over 38 ft long by the cooperatives and individuals. Loan recovery performance of the co-operatives was

relatively successful.

G. Bay of Bengal Programme (BOBP) Fisheries Development Project

In comparison with the earlier schemes, this had different objectives and credit facilities were provided for a comprehensive package of need-based activities with emphasis on the improvement of the savings habit among the fisherfolk. The scheme was characterised by simplicity, timeliness and flexibility with a view to ensuring easy accessibility of credit to fisherfolk. Unlike the earlier schemes, credit to the fisherfolk was provided at market rates of interest and without government subsidies since these facilities were not available at the time of implementation of the scheme. The operation of the scheme was on a pilot basis for a period of two years commencing in December 1991. Accordingly, loan disbursements under this scheme were terminated in December 1993.

APPENDIX 2

**BANK OF CEYLON - PAST FISHERIES LENDING SCHEMES
TO THE END OF JUNE 1994 (Rs.million; Source: Bank of Ceylon)**

	No. of loans granted	Amount granted	Amount due	Amount received	Amount out- standing	Recovery %
IstADB West Coast Fisheries Development Project	105	15.766	15.766	11.146	4.620	71
Self-employment Scheme I	660	30.376	30.376	8.548	21.828	28
Cyclone Rehabilitation Scheme	512	6.949	6.949	2.068	4.881	30
Self-employment Scheme II	154	24.483	22.469	21.168	3.315	94
Cooperative Fisheries Lending Scheme	45	1.695	1.467	1.379	0.316	94
Madel Fisheries Lending Scheme	30	2.477	2.339	1.742	0.735	74
2nd ADB West Coast Fisheries Development Project	73	25.638	19.594	20.890	4.748	100
Pilot Fisheries Lending Scheme	273	1.920	1.540	1.003	0.917	65
Lending Scheme for Ice Holds	28	0.560	0.560	0.531	0.029	95
Additional Loans-Replacement of Fishing Gear	13	0.461	0.438	0.434	0.027	99
Bay of Bengal Programme	216	6.475	1.884	1.724	4.751	92
New Enterprises Credit Scheme for Self-employment	1022	14.424	9.5558	6.922	7.502	72
Poverty Alleviation Scheme	197	0.554	0.506	0.310	0.244	61
Janasaviya Credit Scheme	1088	13.897	3.958	2.928	10.969	74
NYSCOCreditScheme	85	0.821	0.631	0.511	0.310	81
General Loan Scheme	125	11.808	6.421	4.914	6.894	77
SMI Loan Scheme	60	34.472	9.010	7.995	26.477	89
TOTAL	4686	192.776	133.466	94.213	98.563	71

APPENDIX 3

**PEOPLE'S BANK – PAST FISHERIES LENDING SCHEMES
TO THE END OF JUNE 1994 (Rs.million; Source: Bank of Ceylon)**

	No. of loans granted	Amount granted	Amount due	Amount received	Amount out- standing	Recovery %
1st ADB West Coast Fisheries Development Project	125	11.218	10.989	9.316	1.902	85
Self-employment Scheme I & ii	1565	76.058	70.168	40.870	35.188	58
Cyclone Rehabilitation Scheme	587	9.220	9.220	3.094	6.126	34
Cooperative Fisheries Lending Scheme	29	4.359	4.359	3.687	0.672	85
2nd ADB West Coast Fisheries Development Project	50	11.410	1.826	1.925	9.485	100
Special Projects	151	15.074	5.345	6.278	8.796	100
Bay of Bengal Programme	25	4.016	1.112	0.987	3.029	89
TOTAL	2532	131.355	103.019	66.157	65.198	64

APPENDIX 5

**DISBURSEMENT STATISTICS AND LOAN RECOVERY RATE OF ON-GOING
FISHERY CREDIT PROGRAMMES AS AT 30 JUNE 1994
(Rs.million; Sources: BoC, PB, HNB, DFCC & NDB)**

	No. of loans granted	Amount granted	Amount recovered	Amount out- standing	Recovery rate %
Without subsidy fisheries credit scheme*	113	35.574	14.089	21.485	100
Credit scheme for Grama Niladhari Div level fisheries cooperative societies**	242	130.386	40.792	89.594	78
Credit scheme for purchase of insulated trucks for fish transport*	3	2 1.500	3.200	18.300	93
Sethsarana Canoe Project*	24	0.680	0.046	0.634	85
Prawn culture project loans and boat loans under SMI IV loan scheme* * *	451	530.700	110.600	420.100	95
Agriculture Rehabilitation Project****	1142	232.000	Large number of loans still under grace period.		

* Bank of Ceylon; ** BoC and People's Bank; *** All banks; **** BoC, P/B, Hatton National Bank & RRDBs

APPENDIX 4

ON-GOING CREDIT PROGRAMME FOR CAPTURE AND CULTURE OF AQUATIC PRODUCTS IN SRI LANKA

Scheme	Purpose	Eligibility	Security	Rate of Interest and Repayment
1.Credit scheme to assist fisheries sector to generate self-employment opportunities for fishermen without Government producer subsidy support	To purchase as a package or otherwise 1. Traditional hull 2. Day boat hull 3. Multi-day boat hull 4. Marine engine new outboard new inboard reconditioned inboard	1. Should be a permanent resident of the area 2. Should have adequate experience and/or capacity to invest in this sector 3. Should have the capacity to provide 25-50% of the total cost of items to be purchased as borrowers equity 4. Should satisfy the Bank with regard to the capacity to repay the loan out of the income generated from fishing operations 5. In the case of cooperative societies the proceeds of all shares (share capital) purchased by the members should be deposited in a Savings / fixed Deposit Account with the Bank of Ceylon in the name of the society	Cooperative societies, other societies and Groups of Borrowers. 1. Mortgage over the project goods 2. Assignment of comprehensive insurance policy obtained over the hull, engine and fishing gear etc. 3. Interse guarantee of 5 persons comprising the skipper and crew of the fishing craft financed by the bank 4. Deposit of title deeds together with a title report on immovable property (if any) owned by the members with an undertaking to mortgage 5. Deposit of Certificate of Registration of the boat with the Bank 6. Deposit of the Savings A/C, Pass book/ fixed deposit on account of share capital 7. Any other security acceptable to the Bank	21.5% p.a. Repayment period maximum 6 years
Maximum loan 50 - 75% of the cost of items to be financed	5. Fishing gear 6. Sails 7.Net hauler 8. Modern electronic communication and safety equipment used in fishing industry			
15.12.88				
All coastal districts			Individual borrowers: a. Personal guarantee of 2 persons acceptable to the bank b. The securities listed above under items 1,2,4,5 & 7	

Scheme	Purpose	Eligibility	Security	Rate of Interest and Repayment
<p>2. Credit scheme to assist Grame Niladhari level fisheries cooperative societies to enable their members to engage in self-employment activities</p> <p>Maximum loan amount 50% of the cost of two multi-day boats Limited also to 10 times the capital + savings/ grant</p> <p>30.4.90 - all coastal districts</p>	<p>a. To purchase day/ multi-day boats, engine and gear</p> <p>b. Other self-employment activities of members</p>	<p>1. Registration with the Ministry of Fisheries and Aquatic Resources</p> <p>2. Ability to provide a minimum of 50% of the cost of items to be financed as equity</p> <p>3. Minimum capital of Rs. 10,000 and savings of Rs. 10,000</p>	<p>Mortgage of boats, engine and gear and assignment of comprehensive insurance policy</p>	<p>As in Bank of Ceylon SMI scheme</p> <p>21.5% p.a.</p> <p>4-6 years</p>
<p>3. Agricultural rehabilitation project</p> <p>Northern & Eastern Provinces and other bordering districts</p> <p>Financial support extended by ADB</p> <p>a. up to Rs200,000</p> <p>b. Rs. 200,000 to 600,000</p> <p>c. above Rs. 600,000</p>	<p>1. To finance the rehabilitation and replacement of assets in agriculture, livestock, fisheries and agricultural business sectors and related support services in project areas</p> <p>2. Improvement of existing assets in fisheries sector</p> <p>3. For initial working capital requirement in respect of these projects</p>	<p>1. Bona fide farmer, fisherman, agri-business entrepreneur or enterprise operating within the jurisdiction of a selected bank branch in the project area or an entrepreneur or enterprise providing support services to the agriculture sector in the area</p> <p>2. Be able to produce a registration card issued by the Government Agent or his nominee to establish that he/she is an affected party or be able to satisfy the bank branch that he/she is an affected Party</p>	<p>Below Rs. 200,000</p> <p>Inter se guarantee of two other borrowers under the scheme or any other security acceptable to the bank</p> <p>Above Rs. 200,000</p> <p>Normal securities acceptable to the bank, immovable properties, 70% of the valuation only to be advanced.</p>	<p>a. 9% p.a. *</p> <p>b. 12.5% p.a.*</p> <p>c. 12.5% p.a.*</p>

continued on next page

Scheme	Purpose	Eligibility	Security	Rate of Interest and Repayment
		<p><i>Eligibility: continued from preview page</i></p> <p>3. Not to be a defaulter on any previous loans from the bank. In case of defaults, a moratorium on loan repayments should be granted as provided in Para 2.11 of the CBSL.</p> <p>4. Be able to provide required equity contribution</p> <p>5. Be able to produce a viable enterprise development plan</p> <p>6. be able to satisfy the bank that the proposed project has a good repayment capacity which would provide at least 125% of the required amortisation</p> <p>7. Be able to satisfy the bank that the projects involving investment of more than Rs. 600,000 have a financial internal rate of return (FIRR) on equity of not less than 15% p.a.</p> <p>8. Be able to satisfy the bank that he/she could repay the loan and the overdue loan/s if any after the period of moratorium from his/ her family income and from the increased income from the proposed investment</p> <p>9. Be able to produce collateral as required</p>		
<p>4. Credit scheme to assist the fish wholesale traders to purchase insulated trucks for transportation of fish</p> <p>Maximum loan 60-75% of the cost of items to be purchased</p> <p>1.6.89</p>	<p>To purchase 2.5-3.5 ton capacity vehicles suitable for transport of fish as described below:</p> <p>Category</p> <p>a. New truck chassis for construction of insulated bodywork</p> <p>b. New trucks with built-in insulated bodywork</p> <p>c. Reconditioned trucks with built-in insulated bodywork</p>	<p>1. Should have the capacity to invest in this sector. Preference will be given to individuals presently engaged in transportation of fish</p> <p>2. Should have the capacity to provide the required equity contribution, 25 - 40%</p> <p>3. Should satisfy the bank with regard to the capacity to repay the loan together with interest primarily from income generated from the fish transport operation</p>	<p>1. Guarantee of 2 persons acceptable to the bank</p> <p>2. Mortgage of the insulated truck to be purchased</p> <p>3. Comprehensive insurance policy of the insulated truck assigned in favour of the bank</p> <p>4. Any other security acceptable to the bank</p>	<p>Rate of interest applicable for loans granted under BOC SMI loan scheme</p> <p>Presently 2 1.5%</p> <p>Categories a & b 5 years inclusive of a grace period of 3 months</p> <p>Category c 3 years inclusive of a grace period of 3 months</p>
<p>5. Pilot project "Sethsarana Canoe Project"</p> <p>Scheme started Sept 1993</p>	<p>To purchase traditional fishing craft and ancillary equipment</p>	<p>1. Should be a permanent resident in the coastal belt within the Archdiocese of Colombo.</p> <p>2. Recommendation of the Director Sethsarana</p>	<p>A fixed deposit made by the Director, Sethsarana for Rs. 1 million</p>	<p>1. A series of loans not exceeding Rs. 850,000</p> <p>2. Interest 2% above the fixed deposit interest rate</p> <p>3. Repayment - 3 years</p>

Scheme	Purpose	Eligibility	Security	Rate of Interest and Repayment
6. SMI IV loan scheme	To purchase the following as a package or otherwise: 1. Traditional boats 2. Day boats 3. Multi-day boats 4. Other electronic communication and safety equipment at present used in the fishing industry	1. Should have the capacity to invest in this sector 2. Should satisfy the bank with regard to capacity to repay the loan 3. Should have the capacity to provide 25 - 33 % of the total cost as borrowers equity	1. Mortgage over the project goods 2. Assignment of comprehensive insurance policy 3. Deposit of Certificate of Registration of boat 4. Any other security acceptable to the bank	21.5% p.a. Repayment period - maximum 5 years

APPENDIX 6
PROJECTED INVESTMENT BY THE PRIVATE SECTOR 1993 -99
(Source: Ministry of Fisheries and Aquatic Resources)

	1993		1994		1995		1996		1997		1998		1999		Total	
	units	Rs. 000	units	Rs.000	units	Rs. 000	units	Rs. 000	units	Rs. 000	units	Rs. 000	units	Rs. 000	units	Rs. 000
Traditionalboats	240	6000	240	6300	75	2067	75	2171	75	2279	75	2393	75	2513	855	23723
FRP17-23ftboats	188	33912	204	38556	12	2381	120	25005	150	3281	150	3446	180	43420	1004	210553
Multi-day 34 ft boats	48	56640	48	59472	48	62446	48	65579	48	68846	48	72289	48	75903	336	461 175
Largerthan34ftboats	12	24960	12	26208	12	27518	12	28894	12	30339	12	31856	12	33449	84	203224
Beach seine units	5	2000	5	2 100	-	-	-	-	-	-	-	-	-	-	10	4 100
Deepseavessels	-	-	-	-	5	2000	5	21004	5	22050	5	23152	5	24310	25	110512
Boat yard (incl. expansion)	-	50	-	2000	-	1 00	-	1 000	-	1 00	-	1 000	-	1 004	-	7 500
Repair workshops	2	1000	2	1050	2	1102	2	1158	2	1215	2	1276	2	1340	14	8141
Slipways	2	6000	2	6301	2	6615	2	3473	2	3647	2	3 828	2	4 020	14	33883
Gear factories (incl expansion).																
Ice plants		33000		13 000		250 000										296000
Freezing plants	5	50 000	5	52 6000	5	55 125	3	34 728	3	36465	3	38 288	3	40 202	27	307 308
Fish/ ice transport vehicles	10	30000	10	31 500	10	33075	10	34728	10	36465	10	38288	10	40202	70	244258
Fish/ice holding rooms	3	750	3	787	3	827	3	868	3	912	3	957	3	1005	21	6 106
Fish processing factories	4	19800	1	48 000	-	-	-	10 000	-	10 000	-	10000	-	10000	5	107 800
Shrimp hatchery	-	2000	-	5000	-	5000	-	3000	-	2000	-	2000	-	2000	-	21 000
Shrimpculture	50ha	20000	50ha	20000	50ha	2000	100ha	20000	100ha	4000	100ha	40001	100ha	40000	500ha	200000
Shrimpfeed	1	10000	-	-	1	10000	-	-	-	-	-	-	-	-	2	20000
Other culture (Artemia, crab, mollusc. sea weed)																10000
Fish seed production & fish farming	-	35000	-	35001	-	3500	-	5 00	-	500	-	5000	-	500		125000
Ornamental fisheries		3000		3 000		3 000		5 000		3000		3 000		5000		125 000
Rehabilitation of current assets (harbours when leased)		13000														13000
TOTAL.		347562		350773		535156		261604		296037		307787		329364		2438 283

COMMUNITY-BASED FISHERY MANAGEMENT PRACTICES: CASE STUDY OF KATTUDEL IN CHILAW

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ABSTRACT

The Kattudel fishing industry is traditional and stake net fishing is practised in the Chilaw lagoon. The main species caught is prawn. The fishing rights are shared between three clans, who together have formed the Traditional Kattudel Owners Association. The three main groups, each closely associated with a particular church, are allocated different fishing days. Sub-groups are organised for fishing purposes. Since only male descendants of Kattudel fishermen can become owners, entry to the fishery is limited. An applicant for ownership must fulfil various requirements and obey fishing regulations. Any disputes are dealt with by the association. The areas set aside by custom for the Kattudel fishing industry have, as a result of conflict with fishermen using other methods, been demarcated by the courts. A Government commission was set up to settle a number of disputes and fix equitable fishing times and areas for fishermen living on the lagoon. Pollution now threatens the Kattudel fishery and an in-depth study of Chitaw lagoon's resources is urgently required. The participation of the community in such a study is essential.

1. INTRODUCTION

Chilaw is situated 80 km north of the City of Colombo along the coast in the administrative district of Puttalam of the Western Province. In terms of fisheries Chilaw remains a separate administrative district. Ptolemy's Coordinates (dating back to 110 B.C.) identifies Chilaw as Ostia Soana, indicating that it was a mini-harbour. The Chilaw lagoon and the Deduru Oya form one single estuary, where the sand bars shift according to the monsoons. A study of the socio-economic status of the fisheries community in the district of Chilaw was undertaken by the Bay of Bengal Programme based on a survey carried out in 1988.

The technique used is stake net fishing. Stakes are planted with open arm nets facing the current. Each arm has about four or five stakes according to need. Each stake is about 4m in height. The net, tied to the stakes, braces itself against them and stretches from the bottom to above water level. The net purses itself to become a trap. The nets and the stakes are carried to their position by a boat about 6m long. The traditional Kattudel fishing industry is restricted to Negombo and Chilaw lagoons. When the opportunity has arisen it has also been tried in Kokilai and Jaffna lagoons. The main target species is prawn while some fish and crabs are also caught if they cannot swim against the current.

2. THE FISHING COMMUNITY

I have personal experience of being a member of a Kattudel fishing family of Negombo and have been involved in fisheries community development for the last 25 years. The study on Chilaw Kattudel fisheries was made by several visits to the area and meeting the Kattudel fishermen along with the other fishermen involved in lagoon and sea fishing.

The history of the Kattudel community begins in 1816 when ten fishing families from Duwa,

near Negombo migrated to Chilaw. They all belonged to the Hihindukulasuriya clan and were Roman Catholics by religion. They built their huts at Pokkalithungaha by the side of the Dedury Oya. The Kattudel fishing rights were restricted to the descendants of this clan. Later the Jayasuriya clan and the Warnakulasuriya clan staked their claims to the Kattudel fishing rights. Today they are joined together as one federated association under the name of “Halavatha Paramarika Kattudel Pellakaruvange Sangamaya” Chilaw (Traditional Kattudel Owners Association).

2.1 Membership

There are three main groups identified according to their churches and sub- groups are organised according to the days of fishing. Each group is called a Pella; the number of members are show in brackets. The total membership is 475.

- i. The first group belongs to our Lady of Mount Carmel Church. It is identified as Chilaw-Pitipana Street Pella Group, and comprises Kurum Pella (38), Halmassa Pella (38), Kali-issan Pella (40), Aluth del Pella (45), Egoda watte, comprising Heda Alut watte (38) and Aluthkattiya (42).
- ii. The second group belongs to St. Sebastians Church, Alutwatte. Only those originally registered can claim ownership. This group is known as Kosgama Medda Pella (81). Its members are of the Jayasuriya clan. There are two sub-groups (of 46 and 35) for the purpose of fishing.
- iii. The third main group belongs to St. Bernadette’s Church. Its members are of the Warnakulasuriya clan. They are known as Wattakuliya Pella. There are three sub-groups (28, 25, 27) for the purpose of fishing. The Wella veediya contains two groups of 40 and 33.

2.2 Fishing days

- i. Chilaw – Pitipana Veediya, Sunday, Monday and Tuesday
Egodawatte: Thursday
- ii. Kosgama Hedda Pella, Wednesday
- iii. Wattakuliya – Thursday and Friday

2.3 Ownership

Only the male descendants can claim ownership. They should be christians and if married, it should be a church marriage. They should be above the age of 18 and under the age of 50. In applying for ownership, the applicant should pay the stipulated membership fee and should prepare the nets according to the traditional rules and regulations. If the nets are not made according to the accepted methods, then the application is rejected. The member of a Pella cannot engage in any type of fishing in the lagoon between 6am and 6pm. Any conflict will be resolved by the association. The member has to obey the Government fishing regulations.

2.4 Membership Fee

There is an entry fee and a monthly fee. The moneys are used to protect the rights of the Association in case of litigation, and for welfare activities. Membership fees for each Pella differ. The sub-groups have their own welfare programmes. The moneys are credited in a bank.

2.5 The Constitution

The Association has a constitution and meets annually to elect office bearers. There is an executive committee. A general assembly is held every three months.

There are special by-laws for each Pella relating to how the ownership of the Kattudel is identified. Every applicant should be able to prove that his father or grandfather was a Kattudel fisherman. Each Pella demands that certain items of fishing equipment needed for the Kattudel be owned by a person applying for membership.

3. THE FISHING AREA

Kattudel Paduwa is that part of the lagoon where the stakes are planted. There are five areas that are marked out for the planting of the stakes. The number of nets utilised is determined by the monsoonal rains.

In Chilaw Lagoon Moya the shifting of the Moya must be taken into account. There is a possibility of having five nets. Deduru Oya: Moya with its shifting sands has the Moya proper, near Palugaha, near St. Sebastian's Church, Karukupane. The other areas are, Alutwatte, near the bridge, Sudeuwella and Thani Pol gaha (near a single coconut tree).

The above areas are specifically set apart by custom for the Kattudel fishing industry. Owing to various disputes with other types of fishermen, these areas have also been demarcated by the courts and after a number of disputes, a commission was set up by the Government to:

- i. Determine the type and number of fishermen, and allocate areas for the fishermen living beside the lagoon.
- ii. Determine equitable times and areas of fishing for those fishermen living along the banks of the lagoon.
- iii. According to the present needs, sort out the Kattudel fishing industry from other types of fishing and determine a system where future clashes could be avoided.

The Commissioner was W.A.B. Oscar Fernand. The Gazette of 1989.11.27 published recommendations of the commission: (Haras delis a type of drift net)

- i. The Haras del should be laid out two miles to the south of the Chilaw bridge.
- ii. They should avoid the channels determined by the Ministry of Fisheries and should utilise the sides.
- iii. There should be a distance of 100m between two haras del.

- iv. The haras del mesh should not be less than 3 8mm.
- v. According to the new law (Vol 32 page 260) enacted by the legal department and according tottradition, the Kattudel fishermen have a right to fish between 6pm and 6am.
- vi. Cast nets can be utilised by any one during the day.

4. THE FISHING OPERATION AND MARKET

The fishing trip is ajoint venture of the members of the Pella. Around 30 members give their names for the determined day. They share the labour and divide the profits equally among themselves. Not all members own boats, nets and stakes. Therefore the group hires them. There are only six boats available to them. Each boat is hired for Rs. 50. Ten to 12 stakes are needed. A pair of stakes is hired for Rs. 50. In the early days dry coconut leaves bundled together were taken for the purpose of light. Later kerosene lamps were introduced. Today a generator with a 500 watt flasher is hired for Rs. 1,500. This is of special value because it helps other fishing craft speeding to and from the sea to avoid the Kattudel nets. While three or four help in the boats to fix the stakes and tie the nets, the others wait in a mechanised 10m boat to collect the catch. The mechanised boat is hired for the purpose. The catch is sorted and taken to the Lellama (market) for auctioning. The profits are shared equally.

The market is owned by the Urban Council of Chilaw and is rented out to a person who organises the sales mechanism. Earlier this was organised under the auspices of the church. At present the Urban Council has rented out the Lellama for 2,200,000 Rs. per annum. The renter must find this money and all extra moneys that go to himself and his staff. The members who belong to the Lellama pay 2% of their catch to the renter. Outsiders pay 3% or 5% of their income to the renter. Although in theory there is open access marketing, a non-transparent monopolistic mechanism operates. Although the Urban Council collects the rent, the welfare facilities provided by the Council are poor. When ice is not provided there is a downward trend in prices. The middlemen transport the fish and prawns to Chilaw and Colombo.

5. SOCIO-CULTURAL ASPECTS

The members of the Kattudel Community are all christians and their religious activities are centred round their churches. The church associations bring various types of fishermen into common groups. Associations are organised into different age groups. Religious values are imparted through these associations. The Sunday pulpit is used to diffuse information to the community and the Kattudel Association also makes use of this means to communicate with its members. While earlier the parish priest was the patron of the association, today this function is performed by a lay person. The Kattudel community is Sinhalese by race while a certain section of the Wamakulasuriya community speaks Tamil. The young are all educated in Sinhala.

The average family consists of five members. The families are dispersed and do not live along the banks of the lagoon. Depending on their socio-economic situation, their houses are of brick and tiles, brick without tiles, or wattle and daub with cadjan roofing. Some do not own any land.

All the Kattudel fishermen are literate and some have received university education. Their employment reflects their education. Three percent live by Kattudel fishing only and do odd jobs during the day; 60% go to sea in boats; 5% are employed by the Government or on the land.

Kattudel fishermen earn an average income of Rs. 2,000 per month. Saving habits are poor among the less educated. Women do not participate in any of the fishing activity of the Kattudel. Among the poorer families, they are involved in alternative odd job activities. The Kattudel Association provides help when accidents occur during fishing and helps with funeral expenses.

6. THE CHILAW LAGOON

The Kattudel fisheries depend totally on the purity of the lagoon water. The recently established prawn farms are a real threat to the environment. Millions of gallons of water are pumped into the ponds. With no monsoonal rains sand banks close off the lagoon and estuary and the water level falls. Reduced acreage of water affects the plant and aquatic life of the lagoon. The waste water from the prawn farms is pumped back into the lagoon. The use of lands by industries other than the allied fishing industry would affect the Kattudel industry. Increased use of mechanised boats within the lagoon has also created a number of problems.

- i. Kerosene and diesel in the lagoon water has made certain fish uneatable.
- ii. Kerosene and diesel on the lagoon bed affect the plants and the breeding grounds.
- iii. The speed boats disturb the breeding grounds.
- iv. Speed boats at night are a threat to the nets of the Kattudel fishing industry.

7. A PLEA FOR THE FUTURE

An in-depth study of the resources of the Chilaw lagoon is urgently needed. In undertaking this study community participation is essential. There should be transparency in the budget proposal and its implementation. The development studies by experts should go hand in hand with community education. The technological terms should be translated to understandable community language. Otherwise there would be a communication gap and community resistance to change would develop.

8. ACKNOWLEDGEMENTS

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TRADITIONAL LAGOON FISHERIES IN NEGOMBO

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ABSTRACT

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

1. INTRODUCTION

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

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

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

economic importance, is over exploited and lacks proper management.

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

2. FISHING ACTIVITIES

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

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

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

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

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

2.1 Traditional fishing methods

Cast nets (Visidela)

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

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

Stake seine nets (Kattudel)

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

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

Katta

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

Brush pile (Athu kotu)

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

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

Kadippu Dela

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

Angling (rod & line)

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

Crabpots (lift net for lagoon crab)

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

Scoop nets

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

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

Karakgediya (coverpot)

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

3. ORNAMENTAL FISH COLLECTING INDUSTRY

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

4. DISCUSSION

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

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

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

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

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COMMUNITY BASED FISHERIES MANAGEMENT IN EGODAUAYANA (PANADURA)

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ABSTRACT

The inshore waters around the village of Egodaunya, near Panadura on Sri Lanka's west coast, have plentiful fish resources because of the rocky environment. The live bait fishery and other fisheries depending on it —the pole and line tuna fishery and the hand line demersal fishery — are the main traditional fisheries in the area. The live bait fishery supplies the others with red bait, caught in inshore coastal waters, and prawn, caught in fish traps in the Panadura river. The community has developed its own informal self-management system, mainly to protect the red bait resource. Unwritten norms prohibit the capture of immature fish. If these are caught, the fishery may be closed for a fixed period. The use of certain types of gear is banned and sanctions are imposed on those breaking the rules. Measures are also taken to protect the prawn. However, the local management system cannot cope with certain problems, such as pollution and the use by non-local fishermen of gear that is banned by the local community. Thus the responsibility for fisheries management in Egodaunya should be shared between the local community and the Government.

1. INTRODUCTION

Locally organised informal fisheries management systems exist in different traditional fisheries in Sri Lanka. Under these management regimes the local fishermen share tacit agreements on the running of the fishery within waters which they consider 'theirs' and which they protect from 'intruders'. Most of these systems have broken down, mainly because of the introduction of new technology but in some areas these regimes still remain as an effective system of management for certain fisheries. This paper describes such an informal management system adopted by the fishing community in the village named Egodaunya (Pananura), mainly for the protection of fish resources which are used as live bait. About 65% of fish production in this area comes from fishing with live bait.

Egodaunya is a fishing village about 27 km from Colombo, close to Panadura town along the west coast of Sri Lanka. It is bound by the sea in the west and the Panadura river in the north and south (Fig. 1). The inshore waters around this village are rich in demersal fish associated with the rocky environment.

2. FISHERIES IN EGODAUAYANA (PANADURA)

There are about 262 fishing households in the village and about 283 active fishermen supporting a total population of about 960. The majority of them depend on sea fishing while the rest fish in the Panadura river and Bolgoda lake. The fishing community here is predominately Sinhalese. Only four families are Muslim. Ninety percent of Sinhalese fishermen are Buddhists while the rest are Catholic. The average size of a fishing family is four. The average number of persons engaged in fishing per household is one.

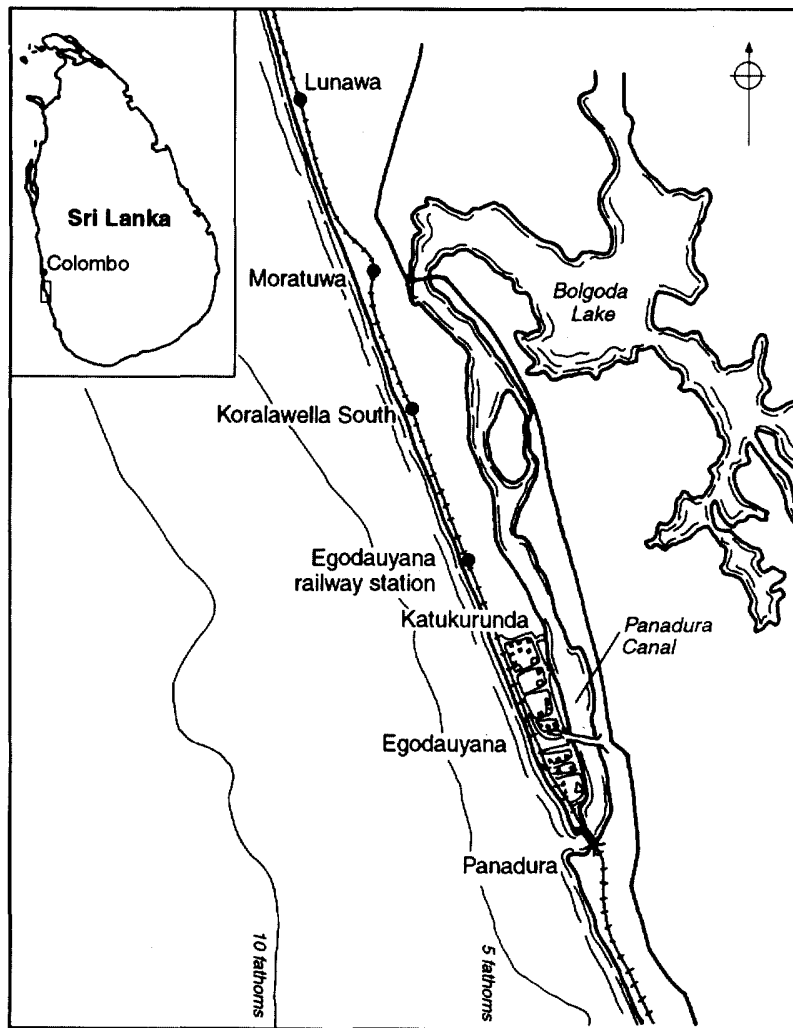


Fig. 1. The Location of Egodaunya (Panadura).

Some women in the village are employed in the fishery, repairing and mending nets and about 30 women are involved in selling fish from house to house in baskets.

The composition of the village fishing fleet in relation to type of gear and area of fishing is shown in Table 1 which shows that 30% of the total fishing fleet is mechanised. In the fishing fleet engaged in sea fishing, 48% is mechanised. The main types of fishery are described below.

2.1 Live bait fishery

This has been the main traditional fishery practised for generations. It exists as a separate

Table 1.
The fishing fleet of Egodaunya (Panadura)

Type of craft	Number	Area of fishing	Gear used
Mechanised:			
3.5 t boats fitted with inboard engines, 8.5 m length	24	sea	Drift gillnets, pole & line, hand line with live bait (bait cone fishing), bottom long line
5.5 m FRP boats fitted with outboard motors	11	sea	Small meshed gillnets, hand line with live bait (bait cone fishing), bottom long line
Non-mechanised:			
Outrigger canoes of 7.3 m length	22	sea	Lift net for live bait, hand line with live bait (bait cone fishing)
Outrigger canoes (below 6 m length)	15	sea	Hand line, lobster fishing
Small canoes (below 4.5 m length)	35	river	Line fishing
Fishing without craft - Jakotu (fish kraals)	6	river	Fish traps for prawns and fish.

Source: Department of Fisheries and Aquatic Resources

fishery for the supply of live bait for pole and line fishing and hand line fishing (cone-bait fishing) in this area. Live bait used here is red bait and prawns. The red bait locally known as 'Hingura' (*Dipterygynotus leucogrammicus*) is caught in the inshore coastal waters while the prawns are caught in fish traps usually known as 'Jakotu', constructed in the Panadura river.

Red bait is known to concentrate in large numbers over the rocks at a depth of 20 – 33m in coastal waters of the Egodaunya area and occasionally to concentrate into balls at the surface. They are caught with a special kind of lift net known locally as 'Hinguran dela'. This fishery has been in existence for more than a century and operates from November to May.

The lift net is square; each side is about 12 – 15m long and hung on a 10 – 12 mm diameter coir rope along the perimeter. Loops are provided at the four extreme points and two others, one at the centre of each of the opposite sides to facilitate the easy lifting of the net. The net is made of webbings of 3 – 4 mm mesh and 6 – 12 ply of 1m square at the bottom, 10 mm mesh of 15 ply webbing of 3m square in the middle and a webbing of 50 mm mesh and 18 ply 14m square at the top. The complete net is handmade out of Kuralon twine and is treated with an extract of mangrove bark to reduce rotting and to stain it dark brown to camouflage it in the rocky environment.

Bait fishermen go to the fishing grounds early in the morning in two outriggers 7.3 m long, locally known as 'Hadi Oru', with a 3.5 ton boat. The fishermen locate the rocky patch above which the red bait usually gather in shoals. After setting the net on the rocky patch it is allowed to settle for about 15 – 20 minutes until the frightened fish shoal together again, this time over the net. In order to keep the net at the desired point and against the bottom, two stones each of about 2 kg are attached on either side of the net. The net is then lifted up quickly and continuously by

the ropes. Both canoes come close in and collect the live fish, putting them into wooden containers, and transferring them to the wooden container attached to the 3.5 ton boat. The 3.5 ton boat leaves for pole and line fishing while the outriggers return to the shore with the lift net. Red bait is also used as live bait in cone bait fishing for trevally and rock fish.

The 'Jakotu' fish kraals are traps constructed in the estuary of the Panadura River to provide live prawns. They are made of reed and split bamboo and consist of two main parts, the trap and the fence. There are about 70 Jakotu distributed over Bolgoda lake and in the Panadura River there are 12 Jakotus, of which six belong to the Egodaunya fishermen. The catch consists of prawns and fish species such as trevally, glassy perchlet, pony fish, giant perch and silver whiting.

2.2 Pole and line fishery

This method of fishing has been practised for over 100 years in this village and, among the traditional fisheries is still important in the village. Fishing is highly seasonal and lasts from October to April. It is directed mainly towards schools of skipjack tuna migrating seasonally into the coastal waters. The live red bait is a prerequisite for the pole and line fishery.

In the past fishing for red bait as well as pole and line fishing for tuna were carried out by the same large outrigger canoes locally known as 'Hadi Oru'. The pole and line outriggers worked in pairs in the fishery since two of them are required to operate the lift net to catch the red bait and each outrigger is manned by a crew of five or six. The outriggers left in pairs early in the morning for the bait fishery. If fishing for bait was successful, the same outrigger set out for pole and line fishing for tuna. With the introduction of 3.5 ton boats in 1972 these sail driven outriggers were gradually replaced and their use became limited mainly to the bait fishery (Amarasiri, 1991). Sometimes, they are used in the hand line fishery with live bait for rock fish and paraw. At present, a pole and line fishing unit consists of two outriggers and a 3.5 ton boat. The income from this fishery is shared between the 3.5 ton boats and two outriggers equally.

2.3 Hand line fishery with live bait (bait cone fishing)

This is a long established traditional fishery for demersal fish, in this village. Usually the fishing is carried out from October to May by 3.5 ton boats, 18.5m FRP boats and outrigger canoes. The fishery requires the use of live bait – red bait and prawns. The bait is taken to the fishing ground in wooden containers perforated at the bottom and oval in shape. This is tied to the side of the craft and partly submerged. The live bait is released at the required depth by using a bait cage. It resembles a cone with a diameter of 70 – 90 mm at the bottom and a height of 200 – 250 mm. A lead ring weighing 0.75 – 1 kg is attached to the circular bottom as a sinker and to keep it upright. Bait cones used here are made of cane.

Fishermen reach the fishing grounds around six in the morning. They carry live prawns or Hingura depending on their availability. The bait cone is released regularly every 20 – 30 minutes. Once the bait is released, three or four fishermen start doing hand lining for the demersal fish coming out of the sheltered areas to feed on the bait or other pelagic fish which gather around the baited water column. The targeted species are high value demersal fish such as bream, snappers, groupers and trevally, as well as horse mackerel, reef and rock fishes.

2.4 Gillnet fishery

(a) With large mesh

The large mesh gillnet fishery targeted at large pelagic species such as skipjack, frigate, mackerel and yellow fin tuna is characterised by 3.5 ton boats using nylon drift nets with a mesh of 100 – 150 mm. There are 24 such boats. This kind of boat was first introduced to this village in 1972 through the Moratuwa Fisheries Co-operative Society under the Government subsidy programme. At present this fishery contributes about 50% of the fish production in the area.

(b) With small mesh

The small mesh gillnet fishery, targeted at small pelagic species such as 'Hurulla', where 5.5m boats fitted with outboard motors are used, is a recent introduction to this village. In 1994, eight such boats were issued to the members of the Egodaunya South Fisheries Co-operative Society under the Government subsidy and bank credit programme.

2.5. Bottom long line fishery

This fishery uses 3.5 ton boats, 5.5m FRP boats and outriggers and targets the bottom fish – rock fish and trevally. It generally starts in October and extends to March. The main bait used is 'Hurulla'.

3. COMMUNITY-BASED MANAGEMENT OF THE TRADITIONAL FISHERIES

The live-bait fishery and the other fisheries depending on it viz, the pole and line tuna fishery and the hand line demersal fishery (bait cone fishing) have been the major traditional fisheries in Egodaunya. Before 1968, these fisheries contributed over 90% of the fish production in the village including all tuna fish production. With the introduction of 3.5 ton boats and drift gillnets, the pole and line contribution has diminished, but still remains high compared to other areas.

These two fisheries are associated with the well established live bait fishery in the area. The red bait (Hingura) is used as the live bait mainly for the pole and line fishery. It is also used to some extent in bait cone fishing for demersal fish. Prawns are mainly used for demersal fish. The red bait is known to concentrate over large rocks at 11 to 18 fathoms depth. Over 10,000 such rocks are known to exist in the inshore waters around Egodaunya. Some of them have been given names by the local community such as 'Laxapana', 'Pettagala', 'Wadugala', 'Dabaraya', 'Ketagala', 'Menumgala', 'Harasgataya', 'Bimpalugama', 'Diyabagala', 'Idiwaragala'. The local fishing community has exercised its rights over the section of inshore water around the village where the red bait concentrate. In 1908 there was a dispute over the right to catch red bait in the waters between the fishermen in Egodaunya and the fishermen in Pinwatta, a neighbouring village. The dispute was settled by dividing the inshore waters between the two villages by a line drawn from the Nuga tree located between the two villages.

3.1 Current management practices

There has been a well established community-based management system mainly to protect the red bait resource. In this self management system run by the community, there are "rules" and unwritten norms governing the fishery and sanctions are imposed. These informal customary

Table 2
Fishermen's cooperative organisations in Egodaunya

Name of the Society	Membership		Total
	Male	Female	
Egodaunya South Fishermens Co-op. Society	86	21	107
Egodaunya Central Fishermens Co-op. Society	45	22	67
Egodaunya North Fishermens Co-op. Society	60	23	83
Total	191	66	257

Source: Department of Fisheries and Aquatic Resources.

regulations prohibit the capture of immature red bait and close the fishery until the fish matures. When young red bait are caught in the lift net, the local fishermen gather at the beach to stop red bait fishing for a period decided by the community itself. Usually the fishery is closed for about 15 days. The community has had to take such decisions a number times during the fishing season for the pole and line fishery.

Bottom set gillnets or any other fishing gear which damages the rocky habitat and drives away the red bait are not allowed under the traditional management regime. The breaking and removal of rocks where the red bait concentrate is also not allowed. The sanctions imposed on persons committing a breach of the 'rules' of the traditional management system are: (a) suspension of right to keep the sail, lift net and outrigger ropes in the hut (locally known as the 'Aduwadiya Baraganna maduwa') collectively owned by the community for safe keeping of accessories of the outriggers going to the bait fishery; (b) cutting threads fixing the arms of the outrigger to the dugout to make it inoperative; and (c) suspension from fishing for a week. If anyone is caught using bottom set gillnets, he will be punished by the community by not allowing him to conduct fishing operations from the village.

In the Jakotu fishery too measures are adopted by the Jakotu fishermen to protect the prawn. Under this regime the fishermen remove the reed panel and other structures during the period of larval growth to prevent larvae getting caught in the traps. Delaying the bringing of reeds for the construction of panels and other ways of impeding their construction are the sanctions imposed by the community on persons who do not obey the rules.

3.2 Regulations

Apart from the traditional informal fisheries management system described above, there are no regulations made by the Government to manage the fisheries in this area, except the regulations made by the Moratuwa Urban District Council, under local government ordinance No. 11 of 1920, in 1931 to regulate the Jakotu fishery in the Panadura river. Under these regulations, fishing by kraal is permitted only under licence issued by the chairman of the Moratuwa Urban District Council for a fee of Rs.25. Every kraal should leave a central gap 27.5 m wide for the passage of craft and a gap inshore at each end 9 m wide. No kraal shall be permitted within 45 m of any other kraal. Fishing by kraals is prohibited during the months of April, May and June. These regulations were enforced by the Moratuwa Town Council, which is now defunct.

3.3 Fish aggregating devices (FADS)

Twelve different types of surface FAD were tested on the continental shelf off the Egodaunya area from 1982 to 1986 under the pilot project run by the BOBP/FAO and NARA. Fishing was carried out around the FAD during the day and used to supplement the catch of mechanised craft during the lean season. The traditional non-mechanised craft benefited since their time and distance of travel was reduced. In general the fishing was done around the FAD on the way to the fishing ground for primary fishing or on returning home. However, if the aggregation of fish around the FAD was good, that became the primary fishing ground. The main species caught are dolphins and rainbow runners.

Although the fishermen accepted the concept of FAD and the potential benefits, the construction and deployment of FADs was not taken up by the fishermen in the village after the termination of the BOBP/NARA programme. The probable reason is the open and free access to fishing around the FAD. The fishermen from Egodaunya as well as adjacent villages fished around the FAD. Another reason is that the fishermen are unable to exercise property rights even if they are given the FAD as they are deployed about 16 km away from the coast.

3.4 Fishermen's groups and organisations in fisheries management

In the existing informal management system, the community itself, particularly the group of bait fishermen, participated in the decision-making process in designing the 'regulations' and 'sanctions' and in implementation and enforcement of the regulations. At present there are three Fishermen's Co-operative Organizations in this village formed in 1989 under the reorganisation programme launched by the Government. The membership of these organisations, shown in Table 2 represents only 67% of the active fishermen in the village. These organisations mainly function as providers of fishing inputs such as boats, engines and gear to their members under the Government subsidy programme.

In the traditional informal management system these organisations have not played a significant role except in the case of conflicts arising between 'outsiders' and the local community. In these instances, these organisations took a leading role, making representations to Government agencies such as the Fisheries Department and the Police. Conflicts with the fishermen from distant fishing villages like Negombo and Ja-ela arose for the first time in 1987 and subsequently in 1992 and 1993. There were protests against the 'outsiders' because they used bottom-set gillnets, trammel nets and small-meshed gillnets. The Egodaunya fishermen believe that such gear drive away the red bait fish shoals and destroy the rocky habitat that sustains the resource. Another important reason for the protest was the fall in the fish price due to heavy landings by the non-local fishermen. In 1993, 116 of the 5.5 m FRP boats were bought by non-local fishermen.

4. THE EFFECTS OF THE MANAGEMENT MEASURES IMPLEMENTED

The fish production of the 3.5 ton boats of this village consists of more than 50% bottom fish and less than 50% tuna. The main fishing method for the bottom fish is bait cone fishing with live bait. About 30% of tuna production comes from the pole and line fishery and the rest from gill netting. Thus 65% of fish production of 3.5 tonners in this village comes from line fishing with

live bait. Compared with other fishing methods, pole and line and bait cone fishing brings in better quality fish which can command a better price. The high percentage contribution from line fishing with live bait is due to the well established live bait fishery in this village. The success of this fishery can be attributed to the management approaches adopted by the community itself to protect the bait fish and prawns.

Although pole and line fishing has declined drastically on account of the non-availability of red bait and rapid expansion of gillnet fishing (its present contribution to the total tuna production of Sri Lanka is less than 4%), the percentage contribution of the pole and line fishery to tuna production in this village is high. This is mainly due to the availability of red bait in this area.

The protests made by the community against the outsiders resulted in them being driven away. This helped to keep the fish price high and the fish resource in rocky areas in good condition.

5. FUTURE MANAGEMENT ISSUES

The problems to be faced by the fishermen in this village can be summarised as follows.

- Use of diversified fishing gear such as bottom set gill nets, trammel nets, small meshed gill nets, use of purse seines and dynamite in and around rocks where the red bait aggregate, particularly by non-local fishermen.
- Discharge of pollutants from the factories into the Bolgoda lake and destruction of mangroves by reclamation of land for house building, thereby threatening the fishery.
- Fall of fish prices due to the heavy landings by non-local fishermen.

6. CONCLUSION

Pole and line fishing and bait cone fishing are the major fisheries in Egodaunya. They contribute about 65% (50% from bait cone fishery and 15% from pole and line fishing) of the fish production, particularly of 3.5 ton fishing boats. The main reason for this is the existence of a well established live bait fishery in this area. A community based management system has existed in this village for the protection of fish resources used as live bait, ie red bait (Hingura) and prawn.

The community takes the responsibility for all the management functions including making of rules for the running of the fishery, implementing the regulations and imposing sanctions. But these management regimes have been subject to threats during recent times. The outsiders from distant fishing villages have, on several occasions, used fishing gear not allowed under the community based management system. Moreover the Panadura River has been subject to pollution by effluent discharged from industries and the prawn (Jakotu) fishery has been threatened.

Since the local management systems alone cannot cope with these problems, Government intervention is necessary to deal with them. Sharing the responsibility of management between the community and the Government is one possibility (Jentoft, 1989). This can be done by declaring the area of the sea which the fishermen in Egodaunya consider 'theirs' as a 'local

fisheries management area' under section 30 of the Fisheries Act. In making regulations on the conduct of fishing operations and the use of different gear in this area, due consideration should be given to the regulations which are already being enforced in an informal manner by the community itself. The 'outsiders' should be controlled through the introduction of a system licences to fish in this area.

The conditions under which fishing should operate in the area can be laid down in consultation with the community through the Fishermen's Co-operative Societies. The number of permits to be issued and to whom they should be issued could also be decided in consultation with the community. As far as the Jakotu fishery is concerned, the regulations made in 1931 under the local government ordinance have become obsolete. Hence new regulations based on the measures adopted by the community should be made under the Fisheries Act. A permit fee should be increased. The pollution problem needs to be considered and acted on by the environmental authorities.

Since the construction and deployment of FAD cannot be expected to be undertaken by individuals or a co-operative society, government assistance is needed. Assistance can be given in the form of a subsidy as high as 75% of the cost of construction and deployment of FAD and training and extension. The fishermen can contribute labour and raw materials available in the village. They can also provide boats for deployment. Fishermen's participation can be organised through the Fisheries Co-operative Society. Raising a fund for the construction and deployment of FAD by collecting a fee from the fishermen who fish around the FAD through the fishermen's co-operative society is also suggested.

In short, the responsibility for fisheries management in Egodaunya needs to be shared between the community and the Government, based on the concept of Fisheries Co-management.

7. ACKNOWLEDGEMENTS

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STILT FISHING IN KATHALUWA AND AHANGAMA (HABARADUWA)

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ABSTRACT

Stilt fishing is mainly confined to a small part of Galle District, in southwestern Sri Lanka. Fishing is done with a rod and line while sitting on a cross bar tied to a wooden pole driven into the coral reef. Barbiess hooks, made by the fishermen, are without bait to catch spotted herring and small mackerel. The method has existed for about 50 years. After disputes between groups of fishermen over fishing rights, different areas were allotted to different groups. Each fishing reef is used only by fishermen from a particular village or group of villages. The fishery is managed by the fishermen. Craft and nets are forbidden, as are certain types of hook. However, the use by outsiders of small-mesh nets to catch fish approaching or leaving the reefs and the building of hotels close to stilt fishing areas threaten the fishery. These are threats which cannot be managed by the fishermen without government assistance. Regulatory measures are necessary if the stilt fishery is to survive.

1. INTRODUCTION

Stilt fishing is special to Galle district and is mainly confined to Kathaluwa and Ahangama, two villages in Habaraduwa Divisional Secretaries Division which is the eighth largest of the 16 D.S. Divisions in Galle district. There are about 500 fishing families in the coastal belt of Habaraduwa D.S. Division but their standard of living is poor. The main fishing centres are Habaraduwa and Kathaluwa each of which consists of the villages shown in Table 1 which also shows the numbers of traditional and mechanised craft operating in the area. Inland fisheries are carried out in Koggala Lagoon and Koggala Oya for prawns but only on a small scale.

Table 1
Numbers of fishermen in the fishing villages of Habaraduwa and Kathaluwa

Fishing centre	Fishing village	Number of fishermen	Number of traditional craft	Number of mechanised craft
Habaraduwa	Habaraduwa	127		
	Unawatuna	157	22	4
	Yaddehimulla	183		
	Talpe	108		
Kathaluwa	Koggala	699	10	-
	Ahangama	150	12	5
	Kathalugoda	89		
	Kathaluwa	276	20	8

Source: Investment Profile of Habaraduwa District Secretaries Division - Planning Division, Southern Provincial Council, Galle. (IPHDS)

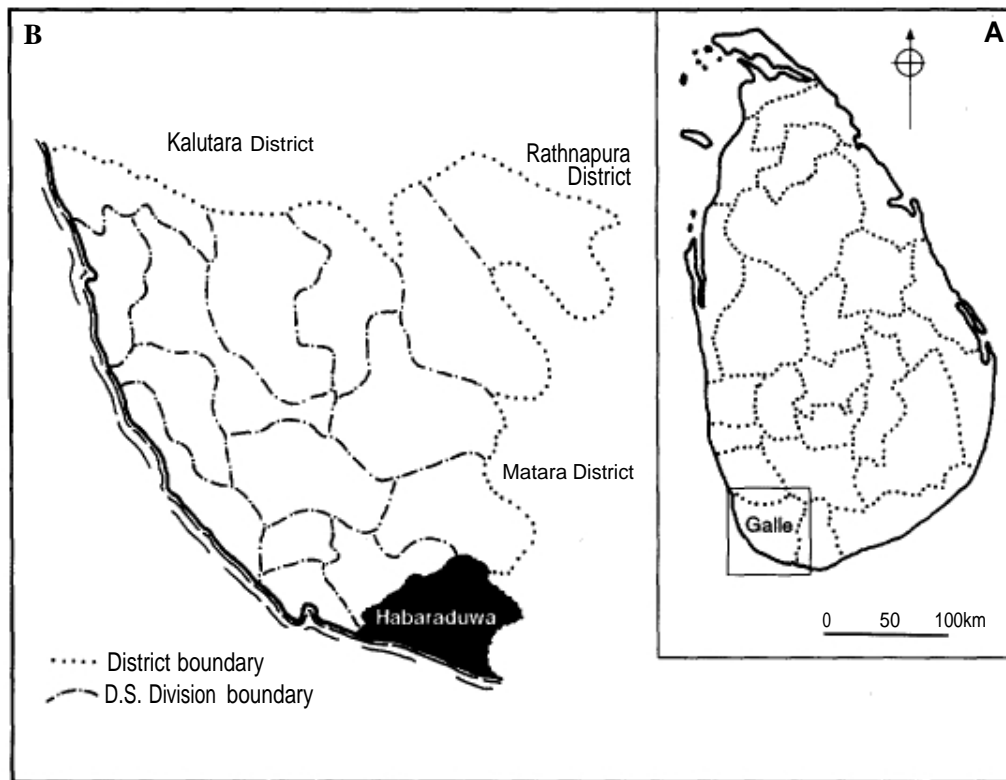


Fig 1. Maps to show the locations of Galle Province, Sri Lanka (A) and the District of Habaraduwa (B).

The following Fisheries Co-operative Societies (FCS) function in Habaraduwa D.S.D.

1. Kathaluwa F.C.S
2. Ahangama Piyadigama F.C.S.
3. Singha Fishing Village F.C.S.
4. Thalpe Kahawattagama F.C.S.
5. Duwa Malalagama F.C.S.
6. Peelagoda F.C.S.

2. STILT FISHING

The fishermen sit on a cross bar called 'petta' tied to a vertical pole planted in the coral reef and carry out rod and line fishing. Sometimes two or more stilts are joined together to form a fence or 'wata' so that more than one fisherman can fish at the same time. The fishermen hold the stilt by one hand while seated and carry out rod and line fishing with the other hand. They usually sit

against the wind. The stilt is made by tying two sticks on to a pole 3 – 4m long. These two sticks are tied at a height of about 2m. The free ends of the two sticks are tied to another stick which in turn is tied to the main pole to support the cross bar. This forms a triangular structure. One or more shorter sticks may be tied below the 'petta' to serve as steps.

The timber used for the stilt is domba (*Calophyllum innophyllum*) kaduru (*Carbera mangnans*) and kadol (*Rhizophora* sp) but the most popular variety used at present is alstonia (*Aistonia macrophylla*).

Table 2
The main fishing centres used by stilt fishermen.

Fishing centre	Used by fishermen from	Fishing centre	Used by fishermen from
Andan	Koggala	Hanagalawala	Kathaluwa
Maraduwela		Kudawala	
Moderawella		Dombagahawala	
Debaagalpara	Waihengoda	Kithurannawela	Ahangama
		Gonagalpara	
Galbokka	Ahangakanda point	Aranwala	Aranwala
Goiyapana	Goiyapana	Denuwala*	Denuwala
Midigama*	Midigama	Kalukandat	Kalukanda

* In Matara District adjacent to Galle District

2.1 History and techniques

The history of stilt fishing is not clear. According to the information gathered from elderly fishermen of the area stilt fishing started about 50 years ago after the Second World War. Earlier, fishermen fished from rocks that protruded above the sea surface. Since not enough such rocks were available for all the fishermen, some fishermen used discarded 'iron poles' or G.I. pipes to make stilts by planting them in the reef. They thought that only iron poles were durable enough to be planted in the reef. But since iron poles were scarce a few fishermen started planting pointed timber poles after making a hole in the reef with a crowbar. This was a success and other fishermen followed suit. These timber poles were more durable than the iron poles and could be shifted from one place to another easily because they were lighter. The stilt is usually driven about 0.5 – 1m into the reef. Two to three people are needed to drive the pole down. The distance between any two stilts is such that the lines of two adjacent fishermen will not get entangled.

The rod is the midrib of seasoned kithul (*Caryota urens*) which is thin, light and short (about 1.5m). The line is about half a metre longer than the rod and is tied to the upper end of the rod. Sometimes to extend the life of the pole preservatives are applied. The line used is of 0.5 mm nylon. Before the introduction of synthetic lines the fishermen used fibre made from pineapple (*Ananas sativus*) leaves.

The barbiess hook is made by the fishermen themselves though a few make them for sale. To make a hook, fine stainless steel wire of gauge 20 is cut into pieces about 3 – 4 cm in length. These pieces are placed in horizontal grooves made on a mould of squid shell. The mould is of two

rectangular halves which could be tied together to form a vertical main groove with many horizontal branch grooves. The main vertical groove is open at the upper end and closed at the lower end since the vertical groove does not extend to the bottom of the mould. After placing the wire strips in horizontal grooves molten white lead (refined lead) is poured into the groove from the opening at the top. The molten lead flows through the vertical main groove and spreads along the horizontal grooves in which the wire strips are placed. After the lead has solidified the two halves of the mould are separated by untying the elastic or string wound around them. The wire strips are separated and each strip is bent at one end to make a hook. The excess lead round each end of the hook is scraped away with a sharp knife. The bent end is sharpened and a tiny portion is kept free of lead at the upper end to tie the line.

The making of the hook is a skilled job. The size of the hook may vary according to the targeted species but the most common is about 2 cm in length (to catch Koraburuwa). When the hook is complete only the shaft is covered with lead while the bent end and the upper end are bare.

The main fishing centres are listed in Table 2. Stilt fishing used to be carried out at Unawatuna but due to the expansion of tourism and tourists bathing disturbing the fish shoals there is very little fishing now done in the area.

2.2 Targeted species

The main species targeted are ahalaburuwa (young koraburuwa), koraburuwa (spotted herring, *Herklotsichth punctatus*) and bolla (small mackerel).

The fishing season starts with the onset of the southwest monsoon (April—May) and extends till the end of the monsoon (September—October). The first species to settle on the reef is koralawa (*Allarettaforskali*) followed by ahalaburuwa and koraburuwa. Sometimes small mackerel species are associated with koraburuwa. In such cases the bolla stay below the koraburuwa. The hook has to be lowered through the upper koraburuwa 'layer' and hence the hook has to be heavier. The hook to catch koraburuwa is placed above the fish and constantly jerked to attract the fish. No bait is used. The fish is loaded into a bag tied to the waist of the fisherman. In earlier days bags woven out of coconut leaves were used. The present day bags are discarded polythene bags. When there are sufficient fish in the hag the fishermen leave the stilts to hand over the fish to the trader at the shore for sale and then return to the stilts. On a good day up to 1000 fish could be caught by one fisherman, depending on the biting rate. The foam produced by the waves breaking on the reef is said to increase the catch rate. Each koraburuwa could be sold for Rs.0.75 – 1.50 depending on the availability and the time of the day.

The fishing starts when the fish return to the reef or paraya after their nocturnal feeding to rest. Each fisherman usually fishes three times a day from about 5.30 to 8.30 am, 10.30 am to 12.30 pm and in the evenings from about 15.30 till dusk. The fish leave the reef at sunset. The reason why the fish come and stay at the reef for some time is not known. The duration of their stay also varies. According to some fishermen the fish stay for long periods, sometimes for a few years if they are not unduly disturbed. But they do not come to the same reef every year, and during the same season they may go to different reefs at different times. The fish have come to

Koggala this year after a lapse of about nine years.

A few fishermen plant their stilts beyond the reef to troll for bigger fish such as horse mackerel which follow the koraburuwa for feeding during their inward migration at dawn.

3. MANAGEMENT PRACTICES

At each fishing centre (or reef) only the fishermen from a particular village or group of villages fish (Table 2). It is evident that the areas have been designated to each group of fishermen after disputes which arose between groups of fishermen for fishing rights. According to the commission report on the Koggala Fishing Dispute (1973), areas and number of stilts have been allocated to two groups of fishermen from the same village, Koggala.

Before Independence a leading trader called “Renda Mahattaya” used to control each fishing centre, protecting the fish when they came to the reef by not allowing any prohibited practices. He used to buy the fish for sale and give part of the proceeds to the fishermen. He was assisted by the “Walle Patabendiarachchi” to solve any disputes.

At present the fishermen themselves manage the fishery. The following are prohibited:

1. Fishing with any kind of net
2. Use of foul hooks or Kahugama
3. Use of any craft
4. Bathing in the area when fish are present
5. Planting of stilts during the day time.

Rules No.17, 18 and 19 of the Talpe Pattu Fishing Rules 1912 had prohibited the use of nets or Kahugama to catch koraburuwa in certain fishing centres. It is reported that before the introduction of synthetic nets the fish used to come and stay in the parayas more often and for longer periods.

The fishermen approach the stilts one by one so that the fish are disturbed as little as possible. Any fishermen can use a vacant stilt.

Stilt fishing is not only a fishing method – it has become a tourist attraction. There are some ‘fishermen’ who earn a living by posing for photographs.

4. CONCLUSIONS

The following regulatory measures seem to be necessary to sustain the fishery.

1. To prohibit the setting of small meshed synthetic nets across the migratory path of koraburuwa at dawn and dusk.
2. To ban bathing in the area when the fish are resting.

3. To control the building of tourist hotels close to stilt fishing centres since they are not only a hindrance to fishermen approaching the parayas but the bathing tourists disturb the fish.
4. Breaking of coral and use of explosives to catch fish should be stopped.

LEGAL AND INSTITUTIONAL FRAMEWORK FOR FISHERY MANAGEMENT AND THE ROLE OF COMMUNITY ORGANISATIONS

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ABSTRACT

A new Fisheries and Aquatic Resources Act is to form the basic legal framework for fisheries management. The Act will provide for: the control of all major fishing operations through a licensing system; local community management in areas suffering from serious management problems; and conservation. Tough penalties are to be introduced for offenders. The Fisheries Act of 1979 allows management of the exploitation of resources in Sri Lanka's EEZ by foreign fishing vessels. The Department of Fisheries and Aquatic Resources (DFAR) was established in 1991 with a separate division for fisheries management. This is the main instrument of the Ministry of Fisheries and Aquatic Resources Development in enforcing legislation. The framework was strengthened by the addition of a Fisheries Management Unit in the DFAR, provided under a UNDP project. Information needed for management purposes is supplied by supporting agencies. Fisheries that operate with territorial use rights have long exemplified community participation in fisheries management. The participation of the resource users is essential for the efficient management of fisheries, and community organisations such as fisheries cooperative societies have a major role to play, for instance in settling conflicts. However, community participation in the management process is still limited and should be expanded.

1. INTRODUCTION

Traditional methods for the exploitation of fish and other aquatic resources have been in existence in Sri Lanka from time immemorial. Measures established for the management of these traditional fisheries date back to the latter part of the 19th century. The Municipal Councils Ordinance, the Village Communities Ordinance of 1889, the Small Towns Sanitary Ordinance of 1982, Local Boards Ordinance of 1898, Game Protection Ordinance of 1909 and Local Government Ordinance of 1920 contain legislation for the management of area-specific fisheries. The first piece of legislation exclusively for fisheries was introduced by the British Government in 1925; the Pearl Fisheries Ordinance, enacted on 12 February 1925, was mainly for the generation of revenue and not for the management of the resources as such. A permit system was introduced with the opening of the pearl fishery by Government Gazette notification. With the enactment of the Fisheries Ordinance No. 24 of 1940, legislation pertaining to the management of fisheries was consolidated.

The provisions of the Fisheries Ordinance are still being enforced, with some amendments. There are other related ordinances, viz, Pearl Fisheries Ordinance, Whaling Ordinance, and Chank Fisheries Act, but they are no longer enforced fully because they are obsolete. The Fisheries (Regulation of Foreign Fishing Boats) Act of 1979 for the management of resources exploited by foreign fishing vessels, is also enforced.

The Department of Fisheries was established in 1929, strengthening the process of fisheries management. Prior to this, fisheries management was carried out by the Director of the Colombo Museum who was designated the Marine Biologist. The Department was under the Ministries of

Local Administration (early 1940s), Industries, Industrial Research and Fisheries (late 1940s to early 1950s), Industries and Fisheries (from 1956), Agriculture, Land, Irrigation and Power (1960s) until a separate Ministry of Fisheries was established in 1970. In 1989, it was redesignated the Ministry of Fisheries and Aquatic Resources and in 1994, the Ministry of Fisheries and Aquatic Resources Development. In 1979, the Ministry of Fisheries was reorganised and took over the functions of the Department of Fisheries under the Marine Fisheries Division. A separate Division for Inland Fisheries was also set up. The Research Division of the then Department of Fisheries was upgraded with the establishment of the National Aquatic Resources (Research & Development) Agency (NARA) in 1982.

2. LEGAL FRAMEWORK FOR FISHERY MANAGEMENT

2.1 Principal legislation

The first piece of legislation was the Pearl Fisheries Ordinance enacted in 1925. It requires the opening of the fishery by Gazette notification for the issue of permits and this was done in 1983. Up to that time, there were some regulations framed under other Ordinances to manage particular fisheries with a view to resolving certain conflicts. The Fisheries Ordinance, enacted in 1940, gave a tremendous impetus to fisheries management from that time. Community based approaches in fisheries management are not new to Sri Lanka. Even in the Fisheries Ordinance, under Section 20, there are provisions to appoint a Commission to conduct public enquiries and obtain representations from resource users in conflict situations. Based on these representations and other relevant social and technological aspects, regulations were framed to manage the resources properly for several decades.

The Fisheries (Regulation of Foreign Fishing Boats) Act No. 59 of 1979 is for the management of the exploitation of resources in the EEZ of Sri Lanka beyond 35 nautical miles by foreign fishing vessels. In the early 1980s several permits were issued and some fishing operations were successful. During the last few years, because of opposition from small scale fishermen and as a result of the development of the local offshore fishery over the last decade, no more permits have been issued under this Act.

2.2 Subsidiary legislation

In the late 19th century, regulations were framed under several Ordinances for the management of certain fishery resources. Under the Fisheries Ordinance and the Fisheries (Regulation of Foreign Fishing Boats) Act, regulations have been enacted for the management of fisheries. Some of these regulations are area specific, mainly for management of resources where there are local situations of conflict. Others, such as regulations for the registration of fishing boats and purse-seine fishing, apply nationally. Sections 20 and 33 of the Fisheries Ordinance are very important from the fisheries management point of view in that the minister is empowered to frame regulations for management of fisheries.

2.3 The new Fisheries and Aquatic Resources Act

During the last two decades, there has been substantial fisheries development. Production increased to 205,000 metric tons in 1993 from 40,000 tons in the 1940s. It was found that the

provisions of the Fisheries Ordinance of 1940 were not adequate to meet the demands of this development. Therefore, steps were taken to formulate a new Fisheries and Aquatic Resources Act.

The proposed new Act consists of ten parts with emphasis on management of fisheries and sustainable development with due recognition of conservation measures. Some of the most important new provisions are (a) licensing of all major fishing operations, (b) declaration of areas for fisheries management and (c) conservation. For violation of provisions, enhanced fines and jail terms have been included with a view to introducing strict management discipline. The proposed Act is before Parliament at present.

3. INSTITUTIONAL FRAMEWORK

The institutional strengthening of fisheries management over the years is briefly outlined in Section 1. The present institutional arrangements are diagrammatically represented as in Fig. 1. which shows that the Department, as the main instrument of the Ministry in enforcing legislation, plays a major role in fisheries management. Supporting agencies such as the National Aquatic Resources Agency (NARA) and the National Institute of Fisheries Training (NIFT) are also engaged in fisheries management, providing information and extension.

The Department of Fisheries & Aquatic Resources (DFAR), under the Ministry of Fisheries and Aquatic Resources Development, is charged with the functions of fisheries management, development and the enforcement of the provisions of the Fisheries and other related Ordinances and Acts. To undertake these functions, the DFAR is organised as outlined in Figure 2. Other organisations under the Ministry assist the DFAR in the management process. For instance, NARA provides technical information based on research in the formulation of legislation.

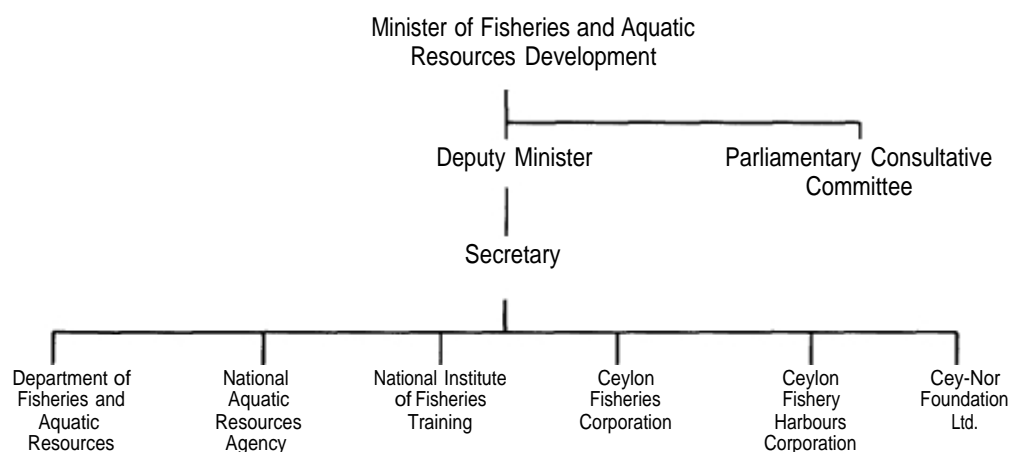


Fig. 1. Organisation chart of the Ministry of Fisheries and Aquatic Resources Development.

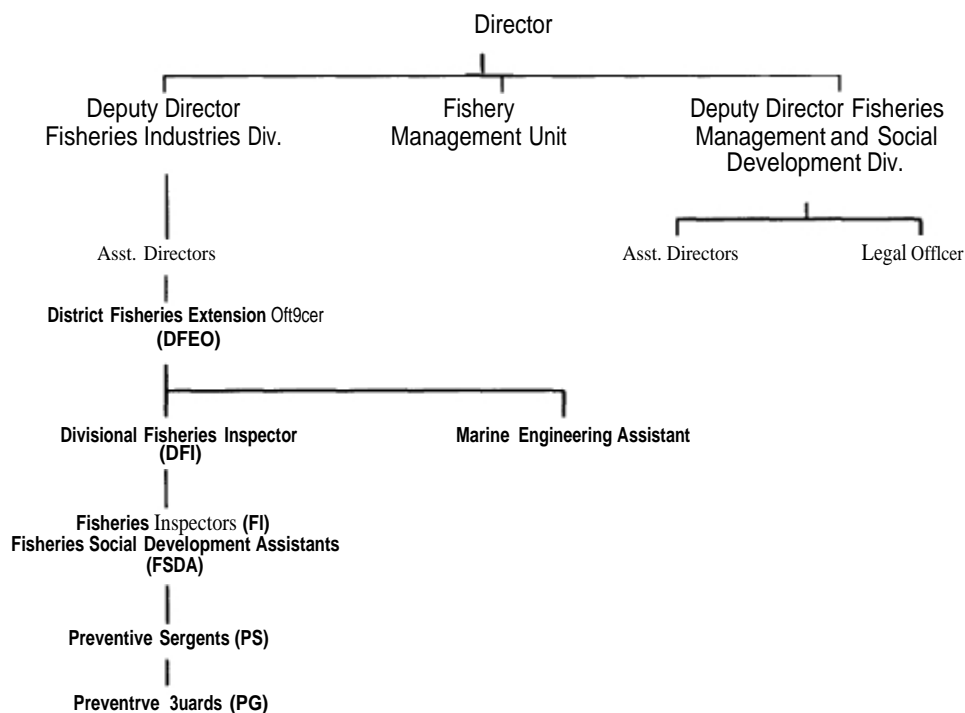


Fig. 2. Organisation chart of the Department of Fisheries and Aquatic Resources (indicating only divisions engaged in Fisheries Management).

It is through the field officers, viz. DFEO, DFI, FI, FSDA, PS and PG that the enforcement of the provisions of legislation is undertaken, once the regulations are gazetted and passed in Parliament. For instance, over 500 persons using about 80 boats illegally, were prosecuted for operating purse-seines with lights in 1993 in the Galle District.

4. COMMUNITY ORGANISATIONS AND THEIR ROLE IN FISHERIES MANAGEMENT

Fishermen have formed various community organisations in Sri Lanka. One of the oldest is the cooperative movement which was introduced to Sri Lanka in 1911. However, it was in the 1940s that the fisheries sector cooperative organisations (FCS) were formed and they are still in existence. The policy of amalgamating about 350 village level FCSs into 45 large primaries in 1972 was not successful and as a result many FCSs became defunct. In 1989, the policy was changed in order to establish village level FCSs and there are now about 760 with a membership of about 80,000, some of them functioning efficiently. In addition, there are other community organisations, some of which are fishery specific, e.g., the Stake Net ('Kattudel') Fishermen's Organisation. The village level FCSs are integrated vertically into the National Fisheries Cooperative Federation through District Fisheries Cooperative Unions.

In the management of fisheries, it is easier to deal with fisherfolk organisations than with individual fishermen. Therefore, attempts have been made to get all the fishermen and their family members in a village to join the FCS. Although many fishermen (about 70%) have become members of the FCS, there are others who have not joined.

Fishermen's Organizations, among other things, are useful in the settlement of conflicts based on rights to fish in a given area. Community-based approaches through these organisations are an important tool in the fisheries management process as the resource users themselves are involved. In Territorial Use Rights in Fisheries (TURFs), there are inbuilt mechanisms for fisheries management through the participation of the resource users e.g., the beach seine fishery and stake net fishery. Some long standing fishery conflicts have been successfully resolved with the introduction of management principles through the participation of the community. Thus, for the efficient management of fisheries, the participation of the community is essential. In the process, education and extension play a major role. If fisherfolk communities are given correct and reliable information on the necessity of fisheries management, it is not very difficult to persuade these communities to adhere to legislation which will be for their own benefit.

5. METHODOLOGY USED IN FISHERIES MANAGEMENT

With the establishment of the Fisheries Management Division under the DFAR in 1991, the basic structural framework was laid for fisheries management. This was further strengthened with the implementation of the UNDP Marine Fisheries Management Project, which set up a Fisheries Management Unit in the DFAR. Reliable data and information are required for the proper management of fisheries. A census of the fishing population is already under way and under the ADB Project, a resources survey is to be conducted in early 1995. This information is also essential for the management process.

Further, the new Fisheries and Aquatic Resources Act provides the basic framework for fisheries management. All important fisheries would be brought under a licensing scheme for the first time, effectively limiting entry to otherwise open access fisheries. An important aspect is that offshore/deep sea fisheries and related industries are available for relocation of coastal fishermen.

Another important object of the Act is to declare "Fisheries Management Areas". Areas with serious management problems could be so declared under this provision and some organisation from the local community would be designated to manage the fisheries. TURFs are already in existence in several fisheries with very effective management procedures.

6. CONCLUSIONS

1. At present the major objective is sustainable development of fisheries. The other related objectives are to expand production with a view to increasing the per capita supply of fish, and improving the socio-economic status of fishing communities. To achieve these, management of fisheries on sound principles is essential.
2. The institutional strengthening for effective fisheries management has already been done. The DFAR was established in 1991 with a separate Division for fisheries management. To

further strengthen this, the UNDP Marine Fisheries Management Project is being implemented (beginning in 1992). Supporting agencies such as NARA and NIFT provide the necessary information for the management process.

3. The historical background with TURFs in several fisheries is also important in fisheries management in Sri Lanka. The participation of the community in the management process is well exemplified in these TURFs.
4. Community organisations, whether fisheries cooperative societies or others, play a major role in community participation in the management process. To promote the involvement of the fishing community in fishery cooperative organisation, producer subsidies and other Government assistance are provided only through fisheries cooperatives.
5. The proposal for the establishment of Fisheries Management Areas under the new Act is another step towards proper fisheries management. The participation of the community is ensured with the provision in the Act for designating local organisations for the management of such areas. The participation of the resource users in the fishery management process is essential for success – management guidelines/regulations imposed from above often do not seem to work well.

Thus Sri Lanka already has the basic structure for the management of fisheries. What is needed is the strengthening of this structure, which is being undertaken under the Marine Fisheries Management Project. However, the participation of the community in the management process is limited at present. Therefore, along with the strengthening of the management capability, a more intensive participatory approach to fisheries management should be introduced.

COASTAL ZONE AND FISHERIES MANAGEMENT IN SRI LANKA: PROSPECTS FOR INTEGRATION

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ABSTRACT

Sri Lanka has a Coastal Zone Management Plan and a Coast Conservation Department mandated to protect a strip 300 m wide on land and 2 km seaward. This paper discusses the feasibility of extending this concept to integrate it with the management of fishery and other coastal zone resources which are at present excluded. It is suggested that Special Area Management might provide a means for such integration in areas of particular concern and where a local involvement in management is both desirable and possible.

I. INTRODUCTION

The broad topic of integrated coastal resources management (ICRM) can be approached from different perspectives. Agreement exists among coastal management specialists that ICRM efforts must fit within a comprehensive framework which integrates the range of activities and constitutes sustainable development in coastal areas. In Sri Lanka, most resources management approaches have been sectoral and fragmented. Thus, we will define what we mean by integrated coastal zone (or resources) management in the context of Sri Lanka. First, the existing coastal programme etc. in Sri Lanka is briefly reviewed.

Sri Lanka, unlike other Asian countries with extensive coastlines, has a national coastal zone management programme described in the Coastal Zone Management Plan (Coast Conservation Department, 1990) and by Lowry and Sadacharan (1993). This plan is supported by the Coast Conservation Act of 1981 which mandates the Coast Conservation Department to manage a coastal strip 300 m wide on land and 2 km out to sea. The thrust of the plan is to allow development within this narrow area while preventing unnecessary environmental degradation, pollution and erosion. This is accomplished through a regulatory system which governs most activities in the coastal zone. But, fisheries management is not mandated through the CZM Plan in Sri Lanka.

Thus, although Sri Lanka has a coastal programme which protects the coastal environment, mostly in a physical sense, it does not have an integrated coastal resources management plan which includes the management of coastal resources such as fisheries and forests. And, although the Coast Conservation Department is mandated to coordinate coastal management among all agencies with jurisdiction within the legally defined coastal zone, it does not have the mandate to coordinate agencies and actions to manage coastal resources in a broader and more integrated manner, for areas outside of the legal coastal zone. Nevertheless, policies which promote a broader and more integrated CRM system for Sri Lanka were adopted by the Cabinet of Ministers in 1994 through the Coastal 2000: Recommendations for a Resource Management Strategy for Sri Lanka's Coastal Region (Olsen *et al.*, 1992).

This paper explores the feasibility of integrating coastal management in Sri Lanka into the broader context of coastal areas and for resources such as fisheries. It discusses the kinds of conflicts which could be addressed by a more integrated system and suggests where cross-sectoral planning and implementation could be effective. Finally, it introduces the concept of Special Area Management as a means of integrated management for coastal resources, including fisheries, for well defined geographical areas of concern where community and local level involvement in management is desired and possible. An important point of discussion is the overriding goal of sustainability, highlighted below.

2. INTEGRATED COASTAL RESOURCES MANAGEMENT

2.1 Sustainable development and use

Since the overriding goal of ICRM is 'sustainable development', this term warrants further definition. Considerable uncertainty exists about how to achieve sustainability, but recent debate has refined the definition. A current consensus is that sustainability constitutes institutional and structural economic changes which allow for current improvement in societal welfare without foreclosing options for similar development for future generations (Fallon and Chua, 1990). Unfortunately, this effort at practical definition provides little in the way of operational guidance.

For the benefit of coastal resources management, however, there is much specific research being conducted to supply information relevant to the sustainable use or carrying capacity of a particular resource such as mangrove forests or coastal land for aquaculture. Coral reef fisheries, for example, have been sufficiently studied so that fish yields around coral reefs under particular environmental conditions and fishing effort can be predicted and set as objectives for management (White and Savina, 1987). Such information can lead to sustainable use of a reef fishery when applied correctly. Indeed, there are site-specific examples of sustainable use of a fishery resource that have benefited from fishery-related research and application (Alcala and Russ, 1990). Nevertheless, such successes constitute neither comprehensive programmes nor examples of sustainable development, both of which are larger and more complicated problems.

The widespread phenomenon of overfishing because of open access regimes throughout tropical Asia is less a problem of poor law enforcement than one related to stagnant or declining economies, poverty, and a lack of alternative sources of income. Thus, some fisheries researchers suggest that narrowly defined problems are unlikely to beget solutions to overfishing. This realisation indicates that appropriate solutions include a more holistic and integrated approach to resource and fisheries management than simply dealing with one site-specific fishery without considering the site's social, economic, cultural and other environmental aspects. Thus, based on increasing failures in the management of fisheries (Emerson, 1994, as an example), a strong argument can be made for integrated and multidisciplinary management of the resource. This assertion can be carried even further when an assortment of related resources such as mangroves, lagoons, coral reefs and beaches, typical of the coastal zone in Sri Lanka, is the subject of management and sustainable use (or development) (Tobin and White, 1992).

Drawing on poor nearshore fisheries (and access) management as an issue, the relative lack of successful management in Sri Lanka indicates a focus on the relief of symptoms rather than addressing underlying causes. For example, banning the use of certain types of gear such as 'light purse seining' or use of explosives have been ineffective because the incidence of their use is increasing in some areas. Although the government policy is to support fishermen's cooperatives at the village level to promote a self-regulatory approach to management and conservation, there are few examples of successful community-based or collaborative fisheries management (Atapattu and Dayaratne, 1992). This situation exists because of the 'common property' nature of fisheries resources.

This general failure in fisheries management highlights the need for integrated coastal resources management where all facets of the problem can be addressed within a comprehensive framework. Any strategy for integrating CRM in Sri Lanka should address:

- a) control of coastal environmental degradation caused by past development;
- b) restoration, enhancement and sustainable use of coastal resources to achieve specific development goals.

2.2 What constitutes an integrated CRM Programme

"Integrated coastal resources management (ICRM) comprises those activities which sustainable use and management of the economically and ecologically valuable resources in coastal areas and which are considerate of interactions among and within resource systems and those of humans and their environment" (White and Lopez, 1991). Although the word 'integration' is sometimes dropped from ICRM to CRM, integration is a key ingredient for effective coastal management, although it is rarely being applied in practice. As stated by Scura (1994):

"Integrated management refers to management of sectoral components as parts of a functional whole with explicit recognition that human behaviour, not physical stocks of natural resources such as fish, land or water, is typically the focus of management... ICRM employs a multisectoral, strategic approach to efficient allocation of scarce resources among competing uses, and minimisation of unintended natural resource and environmental effects. The policy options and management strategies developed and adopted within the framework of ICRM should be based on the status of the natural resources and the environment, the linkages and tradeoffs among activities, the incentives faced by resource users, and ways and means to intercede to bring private behaviour in line with social goals".

Within these broad definitions, ICRM programmes vary considerably in approach, scope, focus and degree of integration as indicated in Figure 1. There is no single model for how they should manifest themselves (Scura, 1993). But, in general, practical and implementable statements on CRM are represented in plans where issues are crisply analysed, objectives clearly stated, and implementable actions specified. A CRM programme must take a practical approach which generate tangible results in terms of sustainable uses and ecosystem condition within two or three years. The programme must focus on issues important to the users of coastal resources to maintain local interest and support and concentrate planning and policy on resolving selected issues, rather than on diluting efforts by attempting to cover every conceivable problem (Robadue *et al.*, 1994).

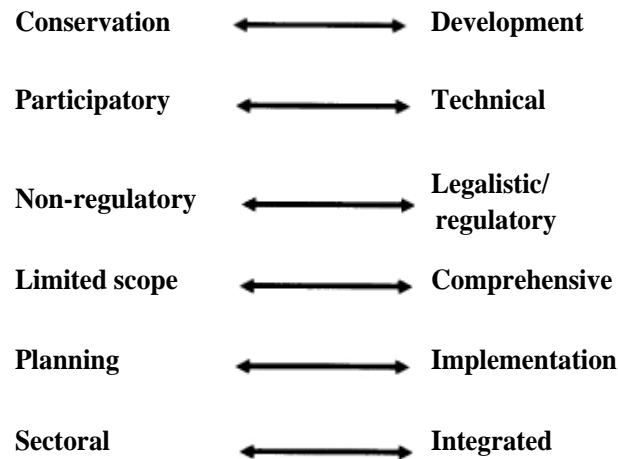


Fig. 1. Range of orientation of Coastal Management Programmes (Adapted from Scura, 1993).

A CRM programme must find efficient ways for planning, decision making and implementation, and address the question of what will happen after an initial intervention. Community organising, education, awareness raising, constituency building and training of staff can give large returns but these efforts must be focused on the problems at hand and be adequately supported to be effective within the limited time frame.

A CRM programme must be monitored and be measurable. The ultimate test of policy is whether coastal ecosystems are improving or are continuing to degrade and whether the quality of life of resource users is being maintained. Thus, a practical CRM programme can be held accountable for the status of the resources and the socio-economic situation of coastal communities where it is implemented. A well designed CRM programme for Sri Lanka, in broad terms, must address various needs and will require the following five components, or some variation thereof, to be successful.

- i. Selection and support of field implementation and intervention sites which will serve as testing grounds for strategic interventions, as potential models for replication and as rich testing grounds to inform and test national or international policy.
- ii. Build capacity of individuals and institutions through 'learning by doing' and through short term and long term training.
- iii. Emphasise programme documentation, monitoring and lesson drawing at all levels to extend the benefits of the results from field intervention sites.

- iv. Promote CRM-related national policy dialogue and reform by providing papers and discussion venues on major lessons and output from the project sites.
- v. Adopt a programme management structure and style that is integrated, efficient and adaptive, while also promoting internal programme learning.

3. LESSONS FROM PAST AND CURRENT CRM EFFORTS

One lesson which is emerging from all the CRM-related activities in Sri Lanka is that one or more successful area models are needed which produce tangible field results through sustainable management of coastal resources in one site. This is now being attempted through the 'Special Area Management' (SAM) project of the Coastal Resources Management Project, USAID in collaboration with the CCD and other national and local agencies. Although described below, first it is useful to review some lessons from a large CRM project attempting site-specific management in six Southeast Asia countries. These, as summarised by Scura *et al* (1992) are:

- i. management should be viewed as a long-term, iterative and continuous process;
- ii. it should be perceived as originating from within rather than from outside;
- iii. integration with local, regional and national development agendas should be pursued;
- iv. local participation by government and communities in policy-making, monitoring and enforcement should be encouraged;
- v. existing institutional and organisational arrangements must be fully considered;
- vi. research should be oriented toward improved information and analysis useful for the identification of management priorities and formulation of management strategies;
- vii. management actions must be matched with issues and goals.

The centre piece of a CRM programme should be field interventions with tangible results. There are certain key features which make up the field level intervention portion of an integrated effort. Those generally accepted for countries with large coastal and mostly rural populations such as Thailand, Indonesia or Philippines are:

- i. development of a coastal environmental, socio-economic and legal-institutional profile;
- ii. development of a draft management plan for the site which is accomplished early in the programme through community and non-government sector participation so that there is plenty of time for learning and refinement and so the plan becomes a living document;
- iii. collection of strategic information for management will be ongoing and focused on supplying the management plan with required supporting data;

- iv. continuing consultation with local government, communities and other relevant institutions during the course of the management programme is the basis for sustainability;
- v. feasibility studies and training of personnel for community projects and economic development alternatives;
- vi. plan and pilot project implementation;
- vii. expansion of pilot projects and plan refinement;
- viii. evaluation and full community/local and/or national government assumption of responsibilities for continuous management efforts and replication in new sites.

A framework for field level interventions and the roles and responsibilities of various participants is shown in Figure 2, which is derived from the CRM component of the Fishery Sector Programme for the Philippines. This framework highlights the need for total participation at the community level which is essential for long-term adoption of any natural resources management plan. Figure 3 shows the pattern of information flow for an integrated CRM programme which is designed to learn by doing and to refine the management plan through a monitoring and evaluation mechanism.

3.1 Community and participation-based initiatives in CRM

It is useful to emphasise the role of community projects in providing lessons for larger, more integrated and comprehensive CRM programmes. The Philippines has benefited from several, well publicised projects in the 1980s which showed that small fishing communities can and will maintain sustainable use programmes for coral reef resources if they derive tangible benefits from their efforts (White, 1989). Three or more such projects are now totally supported and continued by the communities involved without any long-term outside financial or institutional support (White and Calumpong, 1992). The incentive for this sustainable situation is the continued supply of fish, improved condition of coral reefs, increasing numbers of tourists who come to scuba dive and swim, and the pride derived from sharing the management techniques and successes with neighbouring communities with similar interests.

In Indonesia, management for the Bunaken Marine Park in Manado has been built upon lessons learned from community involvement in the Philippines. Bunaken now has a management plan which has been derived by a long process of participation and consultation among island communities, tourist operators, local and national government officials and several non-governmental organisations concerned with the park. It is reported that the effective protection of the coral reefs and island shorelines has been much improved over the past several years. It is also noteworthy that the Bunaken management project does not have any large external funding and is mostly being implemented through Indonesian government and NGO support and one outside expert.

These examples indicate possible directions for future ICRM programmes which will encompass increasingly large geographic areas for management. Lessons from the above projects also indicate what types of information are important for coastal resources management planning and implementation. These are:

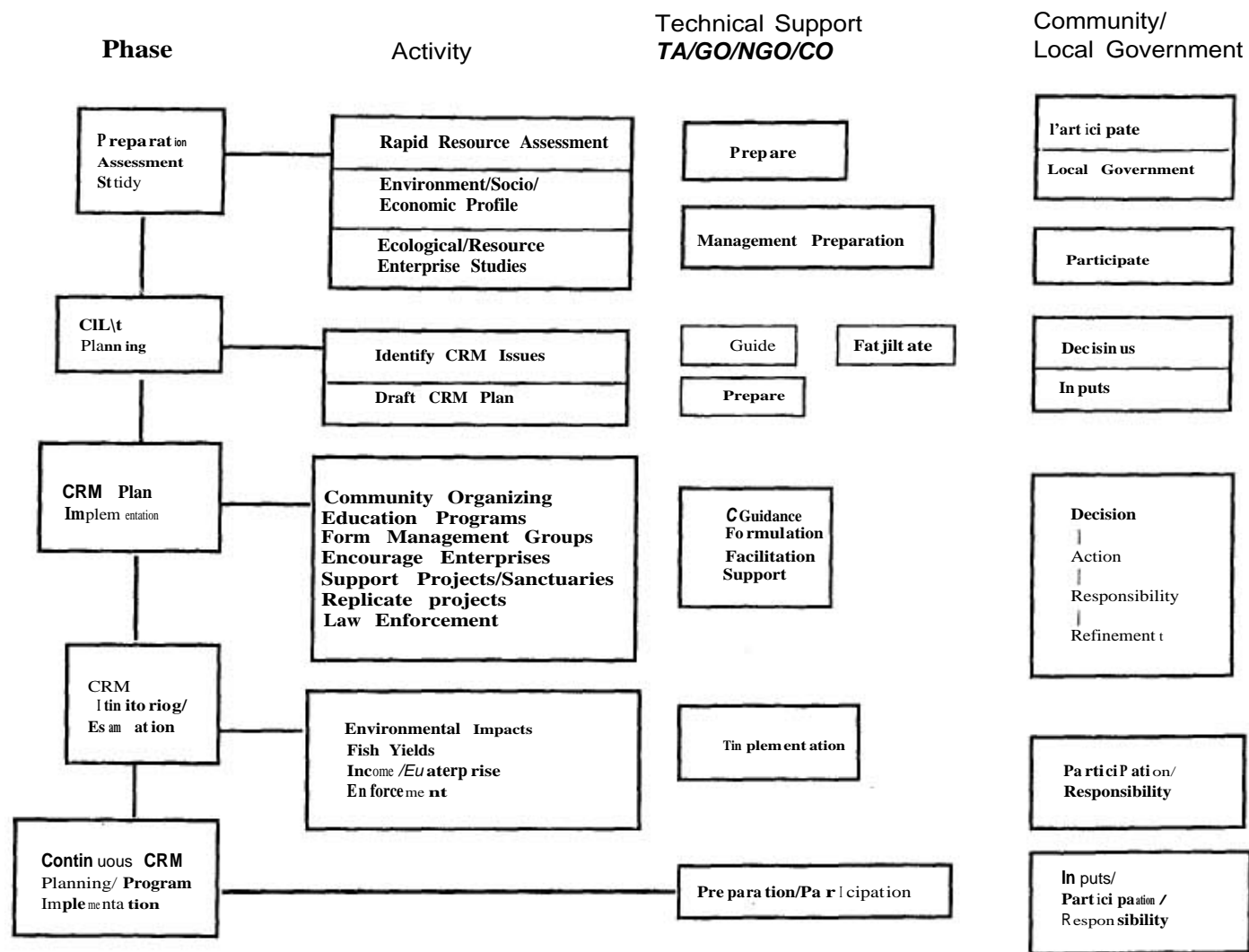


Fig. 2. Phases, activities and responsibilities in a CRM management process (Adapted from White and Lopez, 1991)

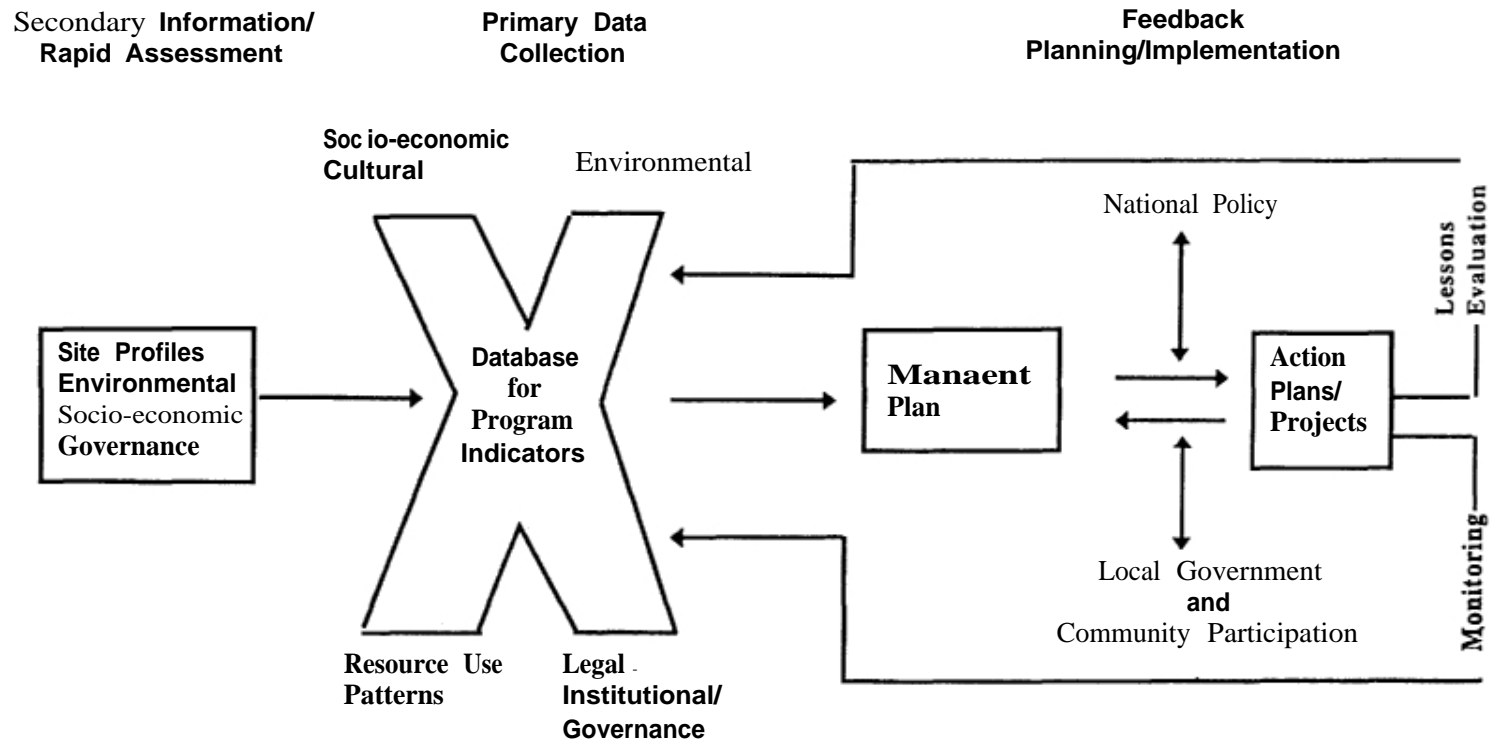


Fig. 3. Cyclical CRM data collection, monitoring, planning and implementation process. (Adapted from White and Lopez, 1991.)

- Biophysical and environmental
- Social, economic, resource use patterns, markets
- Institutional, legal and organisational
- Opportunities for management interventions

Biophysical type information needs to be complemented with more socio-economic, human use patterns, cultural and legal/institutional types of information. Collection needs to allow participation in information gathering by community groups and non-scientists in appropriate instances. These international lessons in coastal management are now being applied in Sri Lanka through two Special Area Management (SAM) sites on the south coast which have implications for ICRM which includes nearshore fisheries management in the country as a whole.

4. SPECIAL AREA MANAGEMENT FOR SRI LANKAN COASTAL RESOURCES

4.1 Introduction

The main reason coastal resources management initiatives in Sri Lanka have not been able to achieve the desired results has been the inability to mobilise the support and commitment of the local community for implementation (White and Samarakoon, 1994). Factors contributing to this situation are as stated by Wickremeratne and White (1992):

- i. There has been inadequate participation by local communities in the planning decisions and implementation processes. Local communities therefore feel that the formulation and implementation are being done by outsiders who do not understand the site realities. They are therefore antagonistic or uninterested.
- ii. The benefits of improved resource management are not immediately perceived or understood. Equally, the impact of resources management on current livelihoods based on unsustainable use practices are against those people affected and cause them to react negatively.
- iii. The means to cushion economic dislocations caused by implementation of improved resource management have not been specified and put in place as a prelude to such implementation. This creates social tensions which are articulated as political objections to implementation.
- iv. The financial and social benefits of sustainable resource use practices have not been adequately demonstrated. Hence, local communities do not perceive themselves as beneficiaries.
- v. Implementation is by state officials who do not communicate well with local leaders, hence the programme is viewed as interference by outsiders.

These problems can be equally applied to the failures of coastal zone management or coastal fisheries management and can possibly be solved by a more integrated and locally based management approach.

4.2 Special Area Management (SAM)

Special Area Management (SAM) is being tested in two project sites, Hikkaduwa and Tangalle, and includes a lagoon fishery in the case of Tangalle. Similar projects are also ongoing for management of Negombo and Muthuwarjawela lagoons and their surrounding areas. The SAM planning process is based on the recognition that existing planning, legislation and institutional implementation mechanisms alone are insufficient. It accepts the need to integrate the local community at the centre of the planning and implementation effort, thereby making them the custodian of the resources being managed (Wickremeratne and White, 1992).

As stated by White and Samarakoon (1994):

“SAM is a means to achieve resource management within a defined geographical setting. It can resolve user conflicts and provide predictability for decisions affecting conservation and development interests. The limited geographic area of concern focuses management strategies and makes them effective relative to application in a broader area with more variability. It allows integrated management which includes complex ecological and institutional settings not possible to deal with a larger context. SAM planning can use and apply criteria for management of resources which are sustainable because the cause and effect factors can be understood within the geographical, ecological and institutional scope of concern.

The basic premise of the SAM process is that it is possible to organise local communities to manage their natural resources and that they will continue to do so if they perceive that they derive tangible benefits from better management. The planner, the planning agency or the organisation group play only a catalytic **role** in organising the local community. They can provide technical and financial support for the management effort which is formulated and implemented as a local community and/or local government effort. Hence, the planning agency takes on the role of facilitator rather than that of a superior authority that imposes its will on the local community. Important aspects of such facilitation are technical inputs which provide a sound scientific understanding of the nature, scope and potential of the resource when managed sustainably and financial support for project activities...

Community participation is possible in SAM planning and implementation to a degree not possible in broader area planning. Whether SAM planning is initiated by an outside national or local government or private organisation it must inherently involve people living within the SAM site. It looks at and considers the total ecosystem including the human elements and communities and their potential role in the process of planning and implementation. For successful management of natural resources within the context of a SAM site, implementation and monitoring becomes a local responsibility and reduces the need for outside support in the long term”.

4.3 Implications of SAM projects for coastal management

The SAM planning and implementation process is ongoing for the coastal resources and areas of Hikkaduwa Town and Marine Sanctuary and Rekawa Lagoon, Tangalle. The process focuses on the collaboration of the local communities and government with national government agencies in the formulation of a management plan for the area with short-term implementation projects deemed desirable by all participants. The purpose of SAM in both sites is to resolve competing demands on resources by planning for optimal and sustainable use. The process is to mediate amongst the competing users and to build a consensus on what use or uses can be harmonious and in accordance with national policies for coastal management. It is becoming apparent that the SAM plan requires an intimate knowledge and good understanding of the social and political structure of the community, the special interest groups and stakeholders, and an identification of

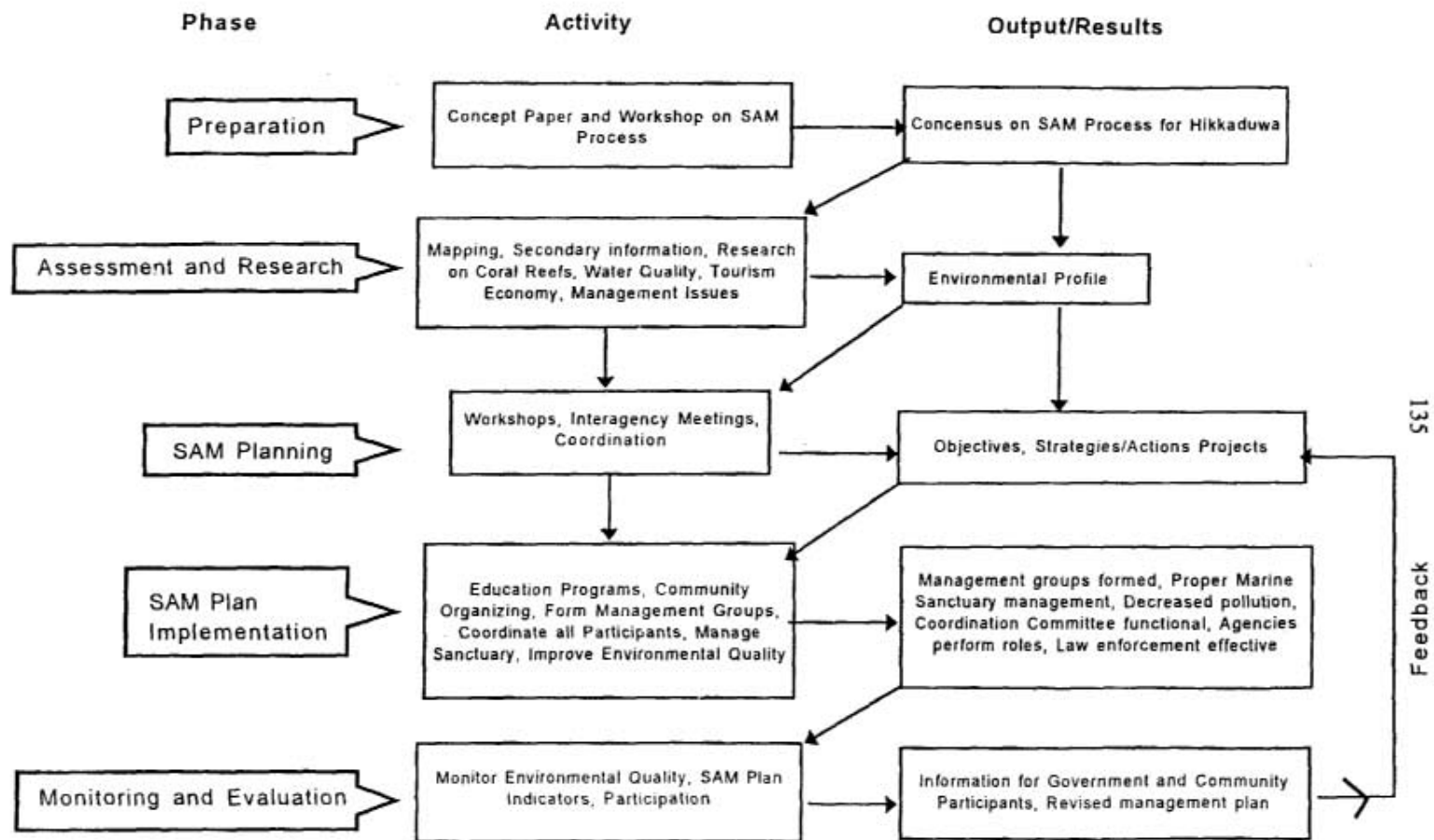


Fig. 4. Special Area Management process for Hikkaduwa.

local leaders and core groups who can become stewards for management. Steps in the process of the ongoing SAM project in Rekawa and Hikkaduwa are described below and summarised for the Hikkaduwa SAM site in Figure 4 (White and Samarakoon, 1994):

- (a) Agreement on the need for a SAM process at national level. National agencies must participate in the design and ultimately accept the SAM process before it can be endorsed for use as a planning and management tool.
- (b) Compile an environmental profile of the area and determine the priority management issues. The first step in developing a management plan is to compile all the relevant existing information on the area and the status of its resources and human communities. This information can be used as a baseline for management and serve to unify the participants as to what are the needs or priorities of management. An example profile has been recently completed for the Hikkaduwa project site (Nakatani et al., 1994).
- (c) Enter the community with full-time professional facilitators and community organisers. The primary task of these field personnel is to liaise with community stakeholders, organise education programmes, facilitate the planning process with these interest groups and to organise core coastal resource management groups on a case-by-case basis.
- (d) Conduct planning-cum-training workshops in the SAM site. Such workshops are ongoing as a means of involving the community and local government leaders in the planning process.
- (e) Organise resource management core groups. Resource management core groups are defined according to their dependence on different resources such as a lagoon fishery, small-scale beach tourism or agriculture. Such groups are the potential stabilising and institutional forces which can make the SAM plan implementation sustainable.
- (f) Draft a management plan through community involvement and determine indicators for monitoring. A draft plan reflects the management objectives of community groups, local government and key national agencies. The process of generating the plans is open and flexible so that all interested parties can have a role and express their views, which would be reflected in a plan.
- (g) Implement pilot projects while planning continues. It is important that small pilot implementation projects be started early which provide and show real results to the participants. An example could be improved management of a small lagoon fishery which shows results within one year.
- (h) Refine the management plan from experience and broaden its implementation. Plan refinement from the experience of management attempts is crucial to the long-term acceptance of the plan. The refinement process involving all stakeholders and government lets the plan constituency know that it is responsive to management needs and is effective.
- i. Review and refine institutional arrangements for implementation. The most difficult question to solve for successful coastal resources or special area management is which institutions will

ensure implementation and sustainability. This knowledge about institutional arrangements can only evolve as part of the SAM process because it will be closely tied to the local and national situation for a given place and time. In the case of Rekawa Lagoon, Tangalle, the Divisional Secretariat is playing a key role in the local coordination of the SAM plan along with the CCD.

Lessons learned from the SAM process in the two sites on the south coast, although preliminary because the project is only two years old, are substantial. They indicate that the SAM process has potential for wider application for integrated CRM in the country and that with some refinements, fisheries management could easily be accommodated. Lessons of particular relevance as highlighted by White and Samarakoon (1994) are:

- The SAM process must be open, participatory and work towards consensus. The government and non-government groups must work together and continue to have open dialogue during the planning and implementation process.
- Decisions must be clear and well documented. Any binding decisions must be very clearly communicated and abided by. Otherwise mistrust will grow and goodwill will be lost.
- National government agencies must understand and accept the process.
- Stakeholder groups must be equally represented in the management process.
- Implementation results should be apparent within three years. If results are not forthcoming within a reasonable time, all concerned lose interest in the process.
- Monitoring and feedback of results makes the programme tangible. Monitoring ensures that changes over time are recorded and understood by all concerned. In this manner, positive results will reinforce participation and further change efforts.
- In Sri Lanka, collaborative management is a more appropriate concept than community-based management for coastal resources.
- Community groups can make the difference between success or failure.

Special area management in Sri Lanka is only beginning and offers no one recipe for success. It will require much more experimentation before it can be generally applied as a management approach to fisheries and other coastal resources. Yet, it holds tremendous potential for promoting an agenda of sustainable development in coastal areas and offers a means of involving all stakeholders in a participatory process which is inherently democratic. On the down side, the SAM process is vulnerable to those who, in the facilitation role, are not sensitive about the needs and perceptions of all stakeholders concerned. Political and special interest biases must be dealt with in a manner which does not alienate people in the process (White and Samrakoon, 1994).

5. CONCLUSIONS

The theme of this paper is that linkages between sustainable development, integrated coastal resources management and the practical application of these concepts need to be strengthened in Sri Lanka. The challenge is not to advocate broadly based strategies, but rather to identify institutional barriers and to provide viable frameworks for action while recognising the diversity and the considerable different political, cultural and economic circumstances that exist in the country. We need to focus more on what works to practically maintain the natural coastal resources we still enjoy in Sri Lanka. This will mean finding out what is appropriate for site specific situations through the process of Special Area Management. We need to measure and monitor our gains so that lessons can be drawn and be used to refine our efforts. Most importantly, all lessons learned and information generated must be with and through local communities and local government personnel as partners in the process.

The potential of SAM and ICRM is that they manage complex situations and consider the whole ecosystem including its human participants and political forces. The ICRM or SAM plan can grapple with management concerns for a given geographical area in a systemic manner while maintaining a focus. When considering a whole range of potential problems, a SAM plan organises itself around a core set of issues which encourage participation and management of natural resources. Although new to Sri Lanka, the SAM process of joint efforts by national and local government working collaboratively with community groups may hold a large potential for improved coastal resources management.

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PROSPECTS FOR DEVELOPING COMMUNITY-BASED FISHERY MANAGEMENT IN SRI LANKA

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ABSTRACT

Community-based management systems are currently being considered as a substitute for the centrally controlled systems of fisheries management which have had limited success in achieving equitable access to and sustainable exploitation of fishery resources. There are already some examples of community managed fisheries in Sri Lanka and this paper is a discussion of the possibilities of implementing similar schemes in other areas and situations.

Fishermen's cooperative societies can provide the necessary focus within a community on which a management system could be based. Since the number of cooperative societies, their membership and financial resources (both internally generated and loans) have greatly increased since 1989, there is a growing base for possible community-based management. There is, however, also a need for appropriate legislation to ensure that these organisations have the authority, financial strength and broad local participation necessary for the smooth operation of any management scheme. Moreover, there will still be a role for government provided management, financial and technical advice. Some of these requirements are already available in Sri Lanka and the legal framework will be provided by the new Fisheries and Aquatic Resources Act.

1. INTRODUCTION

A problem faced by all countries, particularly the developing ones when allocating scarce resources to satisfy the needs of its population, is that of making such allocation not only in an equitable manner, but also in a way that the long term sustainability of such resources can be ensured. The position is no different when we try to exploit the fishery resources available in the sea around us to provide employment as well as the necessary protein for the population. Since the biomass is limited and the number vying to exploit it is increasing day by day, it is necessary to operate some system if we are to ensure that everybody has access to an equitable share while at the same time seeing that the resource is not over exploited to the point of exhaustion. The need for such an approach has become more and more apparent in recent years due to the increasingly severe depletion of coastal fishery resources and the growing conflicts among different groups of fishermen.

The main approach used by most countries to deal with this issue is to lay down the ground rules under which one is allowed to exploit the fishery resources. These rules take into consideration the need to exploit the resources in a sustainable manner while at the same time balancing demands made by different groups for these resources. Such an approach involves the management of fishery resources as against the traditional approach of exploiting such resources in any possible way unmindful of the effect of such exploitation on future stocks.

A new approach to the utilisation of fishery resources that is gaining ground is the community-based approach as opposed to management by the state. It is the view of many that

conventional approaches to management, based on central control have had only limited success so far and that there is a need to explore the usefulness of the community-based management system which appears to have many advantages over conventional approaches in many situations. It is appreciated that such systems are not universally applicable to all situations. Nevertheless the experience of several countries, including Japan, indicate that they can be highly effective in the right context. Experience in countries where the community-based approach is practised has shown that this approach has several advantages. It has been found that the management and enforcement costs become lower than the costs under national centralised programmes since a community approach produces a sense of ownership over the resource and makes the fishermen more responsible and accountable for long term sustainability of resources and for surveillance. Further, it provides each community with an opportunity to develop management systems which meet their own particular needs based on active participation by the fishermen.

2. COMMUNITY-BASED MANAGEMENT IN SRI LANKA

The objectives of a good fishery management system would be resource conservation, efficiency in resource exploitation and equity in the division of this resource among the members of the community. Attempts are being made to achieve these objectives not through centralised control exercised by the state as it commonly done, but through the community which is the direct beneficiary of the resource. This would involve handing over to the community exclusive use rights over the resource and motivating its members to manage it in a way that will, so to speak, achieve the greatest good of the greatest number while at the same time conserving the resource. Transference of territorial use rights in fisheries (TURFs) is facilitated by the setting up of a suitable legal framework, formation of user organisations and equipping them with the required technical and scientific know-how, establishment of arbitration and conflict resolution mechanisms and educating the political decision-makers and the general public.

The task before us is that of examining whether such a community-based approach obtains in Sri Lanka and, if not, to what extent it can be implemented given the particular socio-cultural and politico-economic context. The answer to the first question is largely provided by the results of studies by Anton Atapattu and Pauline Dayaratne presented at an expert consultation on the development of community-based fishery management systems for Asia and the Pacific conducted in Japan in June 1992. These studies reveal that community based fishery management systems have been in existence in Sri Lanka for some time. Four case studies presented in two different papers indicate the presence of at least four community-based systems. These are:

1. The Jakottu or fish kraal fishing in the Madu Ganga estuary in the Southern Province;
2. The Kattudel net fishery in the Negombo Lagoon in the Western Province;
3. The trawler and beach seine based shrimp fishery in the North Western Province;
4. The rotational beach seine fishery in the Western and Southern Provinces.

These studies have revealed that in the specific situations referred to, the fishermen have had

the good sense to organise themselves in such a manner as to avoid unnecessary as well as wasteful conflicts among themselves. The Jakottu and Kattudel examples demonstrate that the communities living close to fish resources find it profitable to establish exclusive use rights in those areas of sea, lagoons or estuaries which can be defended from the intrusion of outsiders. The original basis for the use rights had been formulated by the fishermen themselves and the unwritten rules had operated smoothly and effectively for centuries.

The studies referred to show that community based approaches are not new to Sri Lanka. However, the question here is whether such community-based approaches govern the management of a substantial part of the fishery resources of Sri Lanka. The answer, it must be regretfully admitted, is that such approaches touch only a small part of the Sri Lankan fishery industry. This leads us to consider whether the prospects for building on the existing community-based approaches to cover a substantial part of the Sri Lankan fishery industry are good or otherwise. In order to make an assessment in this regard we have to examine the facilitating factors available in Sri Lanka at present.

A prerequisite for implementing a community-based approach is the existence of a cohesive group within the community which can take charge of the fishery resources either on its own initiative or under provision made in the law of the country and manage it for the common good. However, a collection of people do not become a group merely by virtue of living in close proximity to one another. There are a number of factors which facilitate the formation of such cohesive groups. One is the presence of a common set of beliefs or a common philosophy. Another is the presence of a common threat or problem affecting the well-being of all or most of the members. Under such circumstances people tend to come together and form themselves into an integrated whole with a common focus instead of remaining a mere aggregate of persons. Associations are a powerful force that tend to bring people together and in the Sri Lankan context such an association is the cooperative movement. Membership of cooperatives has given the members of the community a common purpose through which it is possible to mobilise them towards a community-based approach in dealing with their problems. Thus where cooperatives have been set up for fishermen, it becomes possible to implement a community-based approach to the exploitation of the fishery resource needed for their livelihood. With the orientation they receive, they begin to see this resource as a common property and this brings out a desire to use systems of exploitation which also conserve.

Therefore one can say that where there is a strong cooperative movement, it becomes possible to successfully introduce and operate a community-based approach. In Sri Lanka fishery cooperative societies have registered a remarkable growth since 1989 as can be seen from Figs. 1 —3. In 1989 there were 540 societies with a membership of 25,400. While the share capital was Rs. 860,000, total funds available to the societies amounted to Rs. 1.5 million. By 1993 the number of societies had increased to 769 and the membership to 86,966, an overall increase of 229 percent and an annual growth rate of 57 percent. The total share capital rose to Rs. 8.3 million and the total funds available increased to Rs. 277.9 million.

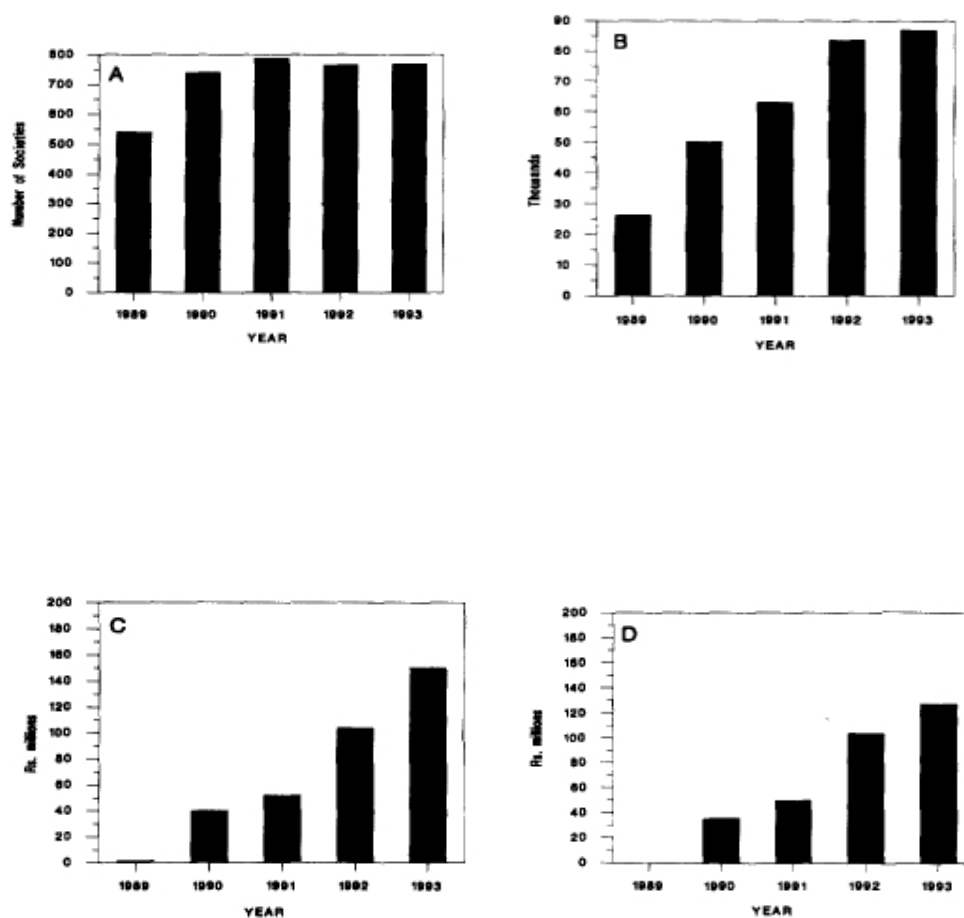


Fig. 1. The progress of village level fisheries cooperative societies from 1989- 1993. A is number of societies; B is membership of those societies; C is total society funds (i.e. the sum of shares, savings, subsidy, funds from IRDP, Provincial Councils District Budget, and income minus expenditure); D is bank loans.

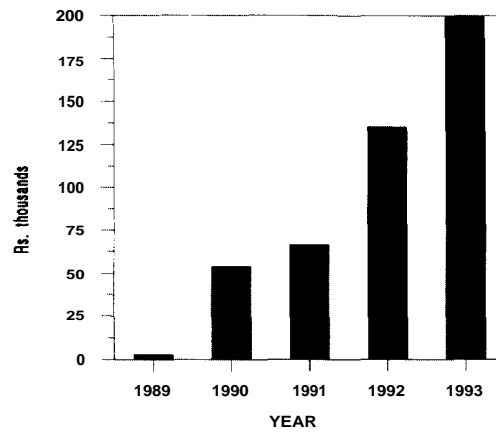


Fig. 2. Grama Niladan level fisheries cooperative societies- average total funds per society 1989 - 1993 (thousands of Rupees).

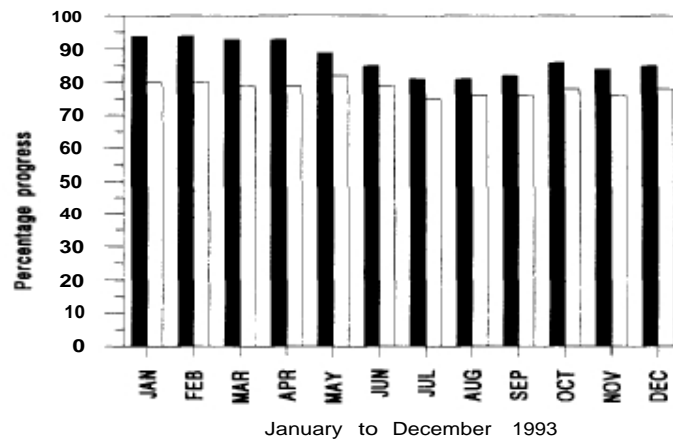


Fig. 3. Progress of recoveries by banks of loans given to fisheries cooperative societies for the procurement of craft (solid bars) and for self-employment (open bars).

3. FUTURE REQUIREMENTS

Thus, it can be seen that an important facilitating force is available for encouraging a community-based approach but to make full use of this in order to extend this approach more widely, there are several other factors that are necessary. They were identified by a panel that examined the role of community organisations in fishery management at the expert consultation referred to earlier. These are:

- i. need for legal support in order to establish legitimacy for the organisation as well power to manage;
- ii. need for all persons involved in fishery related activities to belong to the organisation;
- iii. although, homogeneity is not absolutely necessary, members should at least, have common interests and objectives;
- iv. the organisation must be economically viable in order to create confidence in the minds of the fishermen. In this regard, the organisation should be economically self-reliant and capable of maintaining itself through income generating activities;
- v. the organisation must provide for participation by all members, specially in planning implementation and evaluation. An environment must be established and maintained where the members feel able to take the initiative and develop their own rules and patterns of organisations to meet the local conditions;
- vi. The Government must establish a legislative basis for the organisation and management of fisheries. The Government should provide guidance and advice as well as financial and technical assistance as may be necessary.

While factors 1 to 6 are available in Sri Lanka to some extent, there has been no legislative basis for fishery management through fisheries organisations like cooperatives. The existing Fisheries Ordinance is based purely on a centralised approach and there is no provision to use a community based approach. However, recognising the need for promoting a community-based approach and the consequent need for suitable legislative provision to facilitate it, steps have been taken to provide for such provision in the new draft Fisheries and Aquatic Resources Act. Section 31 of this Act reads thus:

31. (1). The Minister may, by notice published in the Gazette –

- (a). designate prescribed areas of Sri Lanka Waters or land adjacent thereto or both such waters and land as local fisheries management areas for the purposes of this Act; and
- (b). designate any existing fishermen's society, association, or other body representative of the fishermen operating in that local fisheries management authority for that area, or where no such society, association or other body exists

in that area, establish such local fisheries management authority by Order published in the Gazette.

- (2). A local fisheries management authority designated or established by an Order made under subsection (1), may make recommendations to the Minister on—
- (a) the conduct of fishing operations and the use of different types of fishing gear in that local fisheries management area;
 - (b) the establishment of closed seasons for fishing or closed seasons for the taking of specified species of fish in that local fisheries management area; and
 - (c) the times during which fish may be taken.

When this Act comes into operation most of the elements needed to promote a community-based approach to the management of fishery resources would be in place and with a little support from political decision makers, it would be possible to extend this approach to cover a wider area than at present. There are salutary signs that such support will be forthcoming from the political decision makers. The Hon. Minister of Fisheries and Aquatic Resources Development declared at a meeting held in Batticaloa on 29/09/1994 that he wanted to hand over the Batticaloa Lagoon to the local fishermen for management. This is a clear sign of the will to move towards community-based fisheries management in the future. Under these circumstances one can conclude that the prospects for developing community-based fishery management in Sri Lanka are indeed good.

CONTRIBUTION OF FISH MARKETING TO FISHERY RESOURCE MANAGEMENT IN ASIA

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ABSTRACT

This paper advocates the establishment of links between fisheries management and fish marketing. The constraints and potential benefits of encouraging cooperative marketing systems, particularly auctions, are examined. Fishery cooperatives are the most likely bases for the establishment of such systems but their introduction will need careful preliminary research to ensure the cooperation of all parties involved. Recommendations for such research are made, and for the role which could be played by national and local governments and international agencies in the integration of cooperative marketing into fishery management.

1. INTRODUCTION

There has been increasing recognition that fisheries management policies should include a component of participatory approaches which emphasise the role of fishermen in the design and implementation of management measures. The creation of powerful fisheries cooperatives is the key to success for effective fishery resource management. Fisheries cooperatives are in a position to be able to strengthen linkages between marketing activities and resource management measures for protecting the state of fish resources. In the circumstance where fisheries cooperatives are involved in marketing of catches, there might be a greater opportunity for developing management methods in conjunction with fish marketing operations.

The development of efficient fish marketing systems and methods depends to a large extent on government policies and services since the problems are often beyond the control of the fishermen. The effectiveness of government assistance could be augmented through enactment and enforcement of relevant regulations, improvement of market information systems, training, research and infrastructure development.

A positive response from, and the collaboration of the private sector in the policy measures and regulations are important. Efforts should be made to enhance the capability of fishermen to use collective marketing in order to increase their bargaining position. In developing countries fishermen generally have difficulties in organising efficient collective marketing, largely due to the organisational weaknesses of fisheries cooperatives, their poor management capabilities and insufficient cohesion among the members.

The purpose of this paper is to present the concept of establishing linkages between fishery management and fish marketing, to identify constraints on cooperative marketing and to recommend auctioning as a tool for developing cooperative marketing. The paper concludes with a number of recommendations to be considered by government authorities, fisheries cooperatives and development agencies.

2. LINKAGES BETWEEN FISH MARKETING AND FISHERY MANAGEMENT

Fishermen are often well aware of the importance of resource conservation and that the existing form of unchecked competition in fishing effort will sooner or later threaten their livelihood. In some cases fishermen voluntarily establish management measures. For example, community-based traditional management systems have been practised in some countries for centuries. However, such examples are exceptions because up to a generation ago the oceans and their fishery resources were thought to be inexhaustible. The situation nowadays is such that no matter how strongly fishermen are aware of the danger of depletion of resources, they engage in competitive fishing efforts because of the necessity of earning a livelihood. If the enforcement of regulatory measures brings about decreased fishing effort, catches and income, fishermen would not comply with them. Thus in situations where a decrease in catches and income is inevitable as a result of rigorous management implementation, the management authorities must convince the fishermen that it is necessary to weather the difficult period, which may last several years, before fishery resources are restored.

It is therefore necessary to consider how to minimise the negative effects of fishery management on the economic returns to fishermen. The decrease of income may be compensated for by subsidies or credit schemes if the financial situation of cooperatives allows. On the other hand, restrictions on landings may give rise to increases in fish prices when the demand is high and the integration of marketing into fisheries management mechanisms may be effective to prevent the decrease of prices. In this case, it is essential that marketing should be carried out in a collective manner by cooperatives in order to enforce the regulations. A daily production/shipment limitation scheme designating landing sites may also be useful but such schemes would only be feasible when the majority of fishermen are members of the cooperatives and they comply with cooperative regulations.

3. COOPERATIVE MARKETING DEVELOPMENT

3.1 Constraints

Cooperative marketing is a form of collective marketing which is making slow progress in the Asia. The fish marketing sector in general has common problems in the producing areas.

- i. Apathy of cooperative members caused by heterogeneity of membership and little or no benefit to members from the cooperatives;
- ii. Inefficient management due to lack of grass-roots leadership and managerial/ technical talent plus slow decision making processes;
- iii. The strong bargaining power of fish dealers who often provide boat owners and/or crew with finance and often dictate the prices of the catches;
- iv. The prices offered by fish dealers do not always reflect the demand in consuming centres nor that at other landing sites because of lack of market information;
- v. The distance of landing sites from large consumer centres and markets;

- vi. Poor infrastructure facilities such as road access to landing sites, fuel, cold storage equipment, communications, water and power supplies which cannot meet the need for rapid handling of perishable fish products.
- vii. Lack of proper grading systems for fish by species, size and quality;
- viii. If the lion's share is taken by intermediaries and the equitable distribution of benefits among fishermen is hampered, fishing does not attract people as an occupation. Low income levels lead to an exodus of fishermen, particularly the young, from fishing. This leads to a shortage of fishermen and in some countries, boat owners inevitably have to employ foreign fishermen.

3.2 Merits of cooperative marketing

Collective marketing is an effective way to bring about increased bargaining power, leading to an increase of income to the participants. Among the possible sales systems that can be used, auctions have a number of advantages.

- i. They are an efficient and speedy way to dispose of a large amount of fish in a short period of time;
- ii. There is transparency of price information because the transaction is carried out in public;
- iii. They are flexible and allow quick adjustments to changes in demand and supply;
- iv. They can strengthen the economic basis of the cooperatives.

Transparency of price information is particularly important. In Malaysia, for example, it was observed that in the past fish were shipped by fish dealers to consuming centres on a management basis under which the fish dealers only settled their accounts with the fishermen after they had sold the fish at the consuming centres. This system was disadvantageous to the fishermen if the prices at which the dealers sold the fish was not published. In a public auction an authorised auctioneer carries out the auction and awards the fish to the buyer offering the highest price. Normally government authorities, fisheries cooperatives or marketing boards undertake this responsibility.

Proper market halls, accessory equipment (e.g. weighing machines), efficient auctioneers and supporting staff who record the results of transactions should be available for establishing auction systems. Charges for the use of market facilities and equipment will provide the income of owners of such facilities. Auctioneers will gain revenues for the services that they offer. In this way, incomes of fisheries cooperatives if they undertake the auctions will be augmented.

With this system the fish dealers pay the cooperatives for their purchases and the cooperatives pay the fishermen. Fisheries cooperatives charge handling fees to the fishermen, but all risks involved in the sales and purchases are taken by the dealers. If fishermen have taken out advance payments from the cooperative these amounts can be subtracted from the value of their sale, so that cooperatives are always assured of collecting their money. This general pattern of auction systems can be found in several Asian countries (e.g. Japan, Republic of Korea, Malaysia).

Fisheries cooperatives in these countries normally avoid buying directly from fishermen and reselling their products elsewhere because of the heavy risks involved. These risks can be minimised if the fishery products can be marketed in an oligopolistic manner by the cooperatives. An example is the Nori (seaweed) cooperative association in Japan. However, it is often more profitable to limit the functions of cooperatives to the provision of services for wholesale fish sales to fish buyers. In collective marketing, fisheries cooperatives should act as middlemen between fishermen and fish dealers.

It has been observed in these countries that when fisheries cooperatives begin to get involved in fish marketing, fish dealers are likely to intervene. But empirical experience indicates that although fish dealers are generally opposed to public auctions in the beginning, they later become quite happy with the system for two main reasons. First they will be freed from the risk and worry about not being able to collect the money for the advance payments they make to fishermen. Second, they have greater choice in the fish products they can handle. When fish dealers have made loans to fishermen they usually had to buy whatever fish the fishermen produce. With the public auction system the dealers are able to bid only for the type of fish they like and thus expand their businesses, specialising in favoured species.

Fishermen who rely on advance payments by fish dealers are often obliged to sell their catch at a big discount. If public auctioning is implemented by fisheries cooperatives it may be possible to substantially increase the value of the catch. It is also expected that incomes will increase through greater accuracy of weighing the catch in public as is common in developing countries.

3.3 Development of fish auction systems

In the implementation of management measures, close collaboration among fishermen is indispensable but such collaboration is generally weak in most Asian countries. Collective marketing of their fish may provide excellent opportunities for the fostering of greater cohesion and cooperation among fishermen and show them how they can profitably cooperate. An auction system is a useful tool for the promotion of collective marketing.

3.3.1. Procedures for the introduction of auction systems

1. Fish market regulations may be formulated to stipulate the marketing methods to be adopted. The market regulations generally designate areas of control where the auction should be carried out; specify participants who are allowed to buy fish on the market premises; determine the transaction methods to be used; specify particulars regarding licences to be issued to authorised persons; describe details regarding fees, floor prices, commissions to be charged to fishermen and fish dealers; sorting and grading of fish; use of weighing machines; hygiene regulations; mooring time; auction time; minimum amounts to be purchased.

It is important to establish a fund for the disposal of unsold fish and determine who is responsible for undertaking this function.

2. The market should be gazetted by the government as a model area where auctioning should be introduced.

3. It is important that a close dialogue among the persons concerned is established before auction systems are introduced. Such persons may include, fishermen, fish dealers, government officials, cooperative managers, etc. The objectives, merits, obligations and the likely effects of auction systems should be explained to them and candid exchanges of views should be held in order to obtain the consent of those who will be involved in the implementation of the auction system.
4. It is also important to study the present situation of the wholesale market at the landing site to which the auction methods will be introduced. The results of the study will be useful for formulating the auction regulations. the following matters may be investigated:
 - a. Who is the founder of the wholesale market? Government agency, provincial government, private companies, fisheries cooperatives? or a mixture of these? If so, what are their percentage shares?
 - b. What are the conditions for public wholesale markets in terms of the the scale, the minimum amounts of fish products to be handled. Are there any restrictions with regard to the number of wholesale markets to be established within a certain area?
 - c. Who are authorised to be the wholesalers of the market? Are they the founders of the market? Single or plural persons? What are the conditions for approval? What is the term of office?
 - d. What are the qualifications required to be an authorised buyer who can participate in wholesale transactions in the market? Can general consumers also participate in such transactions?
 - e. What are the financial conditions that authorised buyers have to meet? Is it necessary to deposit security money to obtain a fish buyer's licence?
 - f. Is it obligatory for fishermen to sell their entire catch in the market? or are there any minimum quantities they are obliged to sell to the market? or are they not bound at all?
 - g. What is the transaction method employed between fishermen and wholesalers? Is it a consignment of catch from fisherman to wholesaler? or does the wholesaler purchase the fish and resell it to a fish buyer?
 - h. What is the rate of commission that the wholesaler charges to the fisherman in the consignment sale?
 - i. What is the method of payment by the wholesaler to the fishermen? When must the payment be made to the fishermen? Is it on the same day as the transaction or by an established date; if so how many days after the transaction?
 - j. What transaction methods are employed in the market? Auction (public or secret)? tender (public or silent)? personal negotiation?

- k. Where are the fish dispatched after purchase (major destinations, and the share in the shipment by destination, e.g. local retailers, processors, wholesale markets in provincial consuming centres, wholesale markets in central wholesale markets, exporters etc.)?
- i. What proportion of fishermen sell their entire catch to the wholesale market?
- m. Where do fishermen sell their catches if not to the wholesale market? Who are the main buyers of their catch? What are the business relationships between the fishermen and the buyers? What are the main reasons why they do not sell their catch through the wholesale market?
- n. Is the wholesale market equipped with cold storage rooms and ice making facilities?
- o. Are daily transactions of fish in the market compiled in a statistical report? If yes, what are the major contents of such data?
- p. Is there established standardisation of fish with regard to species, size, freshness etc.?

4. CONCLUSIONS AND RECOMMENDATIONS

Collective marketing is effective in increasing the bargaining power of fishermen, thus leading to increases in their incomes. Such methods can be efficiently implemented by fisheries cooperatives if they represent the majority of the fishermen in a village and their talent for management is strong.

It is a difficult venture to make cooperative marketing successful. The main causes of failure include:

- i. lack of competent managers and staff at the primary level cooperatives,
- ii. lack of loyalty among members of the cooperative,
- iii. lack of strong and honest local leadership,
- iv. lack of capital,
- v. low rate of cooperative membership among fishermen,
- vi. too small scale of operation at the village level.

On the other hand, the success of many producers' cooperatives can be attributed to

- i. enlarged scale of operation through mergers or amalgamation,
- ii. successful cooperative marketing through the operation of auction systems,
- iii. proper government measures to assist cooperatives (e.g. leadership education)

- iv. determined self-help efforts on the part of cooperatives.

In order to promote producers marketing in relation to effective fisheries management, the following actions are suggested to be taken by government, community and development agencies, taking into account the institutional weaknesses of existing fisheries cooperatives.

For government

- a. Establish clear government policies and regulations with regard to transaction methods at the wholesale markets, clearly indicating what the government aims are (e.g. fair transactions, stabilisation of prices, preservation of quality of fish products, stabilisation of fish supply, etc.).
- b. Introduce and enforce policies and legal and structural reforms (e.g. auctioning, amalgamation of cooperatives) which promote more equitable access to resources and equitable distribution of benefits.
- c. Enact or amend laws to ensure the integration of marketing activities in fishery management measures aiming at easier acceptance by fishermen.

For cooperatives at community level

- a. Create awareness among fishermen as to the long-term benefits of fishery management and the merits that can be derived from the integration of marketing components into management measures.
- b. Strengthen cooperative marketing in collaboration with government and the private sector, train their staff and improve economic performance to attract more fishermen to cooperatives.

For International organisations

Assist governments, fisheries cooperatives or community organisations in conducting case studies and research on the status of marketing institutions, in preparing manuals for introducing auction systems, in formulating pilot projects to experiment with the establishment of linkages between fish marketing and fishery management.

THE IMPORTANCE OF ENVIRONMENT, TOURISM AND DEVELOPMENT IN FISHERIES MANAGEMENT

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ABSTRACT

Various human activities connected to economic development have impacted both positively and negatively on the fishing industry and marine aquatic resources. After an initial review of the industry, the resources and the legal framework, the major factors which influence the sustainable exploitation of marine resources is addressed. A combination of population pressure, industrial development and tourist development have degraded the coastal resource base, eroding the prospects of community-based management. While Sri Lanka has a right to be proud of the measures already taken to safeguard the marine resource, much more needs to be done to ensure sustainable resource management.

1. INTRODUCTION

Widespread depletion of seafood resources caused by coastal pollution, critical habitat destruction and overfishing, is a major problem faced by most developed and developing countries today. In a time of rapid increase in the demand for protein it is more than ever necessary to conserve and manage the productivity of coastal habitats for fish supply as lands are protected for livestock. This is mainly because most fisheries still enjoy open access and there are generally no limits on the growth of fishing effort.

Several decades ago, fishermen believed that the resources of the seas were essentially inexhaustible and that no husbanding of resources was necessary. By the mid 1960s fishery stocks in many areas, especially those close to the ports of the industrial nations, were severely depleted with the rapid increase of the fishing fleet and the use of modern equipment. The traditional response by fishermen to depletion of resources in an area had been to turn to other areas. The possibility of such solutions were however, rapidly decreasing with increasing effort by fishermen in all countries. In this situation most developed countries felt the need of proper management of resources with a right to benefit from them. The basic concept of fisheries management is to control the type and amount of fishing to make sure the resources are not overfished and that each fisherman can continue to get good catches of good sized fish.

Fisheries Management means:

- to know how much fish we have in our waters and where;
- to plan which fishing grounds we could fish more heavily and those which are already heavily fished and on which we ought to be reducing our fishing efforts;
- to take measures, where necessary;
- to control the amount of fishing efforts to improve the quality of fish, to stop

certain methods of fishing that destroy all fish and other aquatic life indiscriminately and to enforce appropriate management measures and to make sure that some fishermen do not spoil it for others by not complying with these measures.

Proper management helps to protect fishing grounds which are the source of every fisherman's livelihood and help to ensure that those grounds continue to support not only today's fishermen, but also their children and their children's children. Also, proper management helps to increase the number of fish available to be caught and to increase the share of each individual fisherman and the quality and value of his catch. Today, the resource base is also used for multiple economic activities, apart from fishing, such as tourism, industrial development and human settlements. Therefore, it is imperative to have a thorough understanding of the effectiveness of these interventions in making management plans for the fishing sector. This report discusses the effects of these factors on the resource base especially the Coastal Zone and proposes an integrated approach to tackle the issues

2. PRESENT STATUS OF THE FISHING INDUSTRY

The estimated fish production of Sri Lanka in 1993, broken down into three sub-sectors is shown in Table 1.

Table 1.
Estimated fish production in Sri Lanka

Sub-sector	(tonnes)
Coastal	169,900
Offshore and Deep-sea	33,000
Inland Fisheries and Aqua culture	18,000
Total	220,900

Exploitation of fishery resources is a crucial element in the country's strategy for increasing its national output in order to enhance the quality of life of its population. The total value added by fish production in 1993 was Rs 2,811 million, equivalent to 1.89 percent of the country's GDP at factor cost prices. Despite its relatively low contribution to the national economy the fishery sector is important as a source of supply of protein. The supply of fish for domestic consumption is met by local supply as well as imports. The local supply as a percentage of total domestic consumption is about 80 percent. The balance of domestic requirements is met by imports. 53,486 t (wet equivalent) of fish were imported to fulfil the domestic requirement in 1993. In addition to providing a considerable proportion of the domestic demand, the fishery sector also helps to earn much needed foreign exchange for the country through exports of mainly fishery products.

The main fish varieties that were caught in the coastal sub-sector are shown in Table 2. Besides the other varieties (small rock fish), those caught in shore seines form the predominant group, 22 percent in 1993. Others constitute relatively smaller proportions, e.g. Skip jack 11 percent; Tuna 7 percent; Rock fish 6 percent. Percentages of the production of high value fish in 1993 are Seer **2 percent**; Prawns **4 percent**; Lobsters 0.5 percent.

Table 2.
Fish Production in the Coastal Sub-sector – 1993

Species	Production (t)
Seer	3,369
Horse mackerel	8,378
Skipjack	19,316
Other blood fish	11,981
Shark	9,446
Skate	9,615
Rock fish	10,277
Shore seine varieties	37,379
Prawns	6,737
Lobsters	862
Others (small rock fish etc.)	41,859
Total	169,900

A major share of the fish production comes from the Coastal sub-sector which employs around 90,000 persons. The Sri Lankan fishing fleet consists of around 27,000 vessels of which 45 percent (12,250) are motorised (Table 3).

The coastal sub-sector which is responsible for 79 percent of the domestic fish production extends up to 40 km from the shore. Most lagoon areas along the coastline serve as fishing centres. Lagoons and estuaries are the breeding grounds for most marine fish species and the habitat of valuable shell fish species such as prawns, crabs etc. Fish production off-shore (the area within 40 to 100 km) and from the deep-sea sector (beyond 100 km and up to the limits of the Exclusive Economic Zone) is comparatively small and in 1993 was only about 11 percent of the total landings. In the early 1980s a foundation was laid for harnessing off-shore resources with the introduction of 10.5 m multi-day fishing boats under the Abu-Dhabi funded North West Coast Fisheries Management Project. Since then the new multi-day boats have consolidated the process and now production in this range is close to 22,000 t a year. However, the offshore fishery in Sri Lanka is still in its infancy due to lack of capital and technological development.

Table: 3
The Sri Lanka Fishing fleet

Type	Number
Traditional non-motorised	14,896
Traditional Motorised	1,986
Introduced vessels fitted with Out Board Motors (Day Boats)	7,934
Introduced vessels fitted with Inboard Engines (Day Boats)	1,907
Multiday Boats	429
Total	27,152

3. RESOURCES

3.1 Marine

Sri Lanka has a coastline of about 1,700 km the majority of which consists of sandy beaches. The varied coastal resources include fin fish, shell fish and several other coastal invertebrates; coastal vegetation including sea weeds, mangrove and coconut; corals and other coastal minerals. These provide the resource base for several economic activities such as fisheries, mining, recreation, tourism, coconut based industries and building construction. Fishing has been a livelihood of fishermen who live close to the sea from time immemorial. At present an estimated 500,000 people depend on it and over 90 percent of the total annual production of fish comes from marine sources. Ninety-eight percent of the marine catch is provided by the small scale coastal fishery which employ around 95,000 persons.

Fishing takes place primarily within the range of the continental shelf which is rather narrow. It rarely exceeds 40 km and averages around 22 km in width. In this area there are good resources of pelagic and demersal fish species with a sustainable yield of 250,000 t annually. Large migratory pelagic species are found in the offshore and deep sea areas extending up to the limits of Sri Lanka's Exclusive Economic Zone. The domestic annual fish production in this range has increased from 2,400 t in 1985 to 33,000 in 1993.

Trawling grounds, especially for prawns are in the northwest Palk Bay area, Portugal Bay area off Chilaw, on the east coast at Mullaithivu and on the west coast in Negombo, Mutwal. Chank fishing takes place in the Gulf of Mannar using traditional methods.

Minerals, mainly sand, heavy minerals and coral are extracted from the coastal zone. Mining for sand takes place on the west coast at Kalutara and Panadura; large quantities are also mined from the mouth of the Kelani River. Surface mining for ilmenite is carried out along the northeast coast of the Island on a relatively large scale at Pulmoddai. Coral reefs fringe many parts of the western and southern coasts, most of the north western and northern coasts and part of the eastern coast. A significant percentage of coastal population in the Akuralla, Seenigama and Hikkaduwa areas were dependent on coral mining for their livelihood until recently. The coral provides limestone from which the lime is produced.

3.2 Brackish water

Shallow tidal flats, lagoons, estuaries, mangrove swamps and saline marshes constitute nearly 123,000 ha of brackish water and form a part of the coastal wetland system. These water bodies are important as fish producing centres. The Puttalam, Negombo, Chilaw, Jaffna and the Batticaloa lagoons are well known in this country for their good catches of fin fish and shell fish. Lagoons carry sand into the sea and help to stabilise the coast. Also they provide food and nutrients for the coastal fishery.

Mangrove stands are normally associated with estuaries and lagoons. There are 14 species of true mangrove and 12 species of mangrove associates. Mangroves function as sediment and nutrient traps and are known to be the nurseries for most brackish water and marine fish. They

also help in building up new land because mangrove root systems serve as sediment traps. Most of the mangrove stands found along the west, south-west and south coasts of Sri Lanka now face extinction due to human interference.

In the north western and northern lagoons, an important fishery exists for the export of beche-de-mer. In more saline lagoons of the northwest, north and northeast, a considerable amount of china moss is available and is harvested on a small-scale.

3.3 Fresh water

The freshwater fisheries potential of Sri Lanka consists of about 162,500 ha covering large, medium and small perennial tanks (including the new reservoirs within the Mahaweli system) and around 100,000 ha of village tanks and ponds. Inland fisheries was accorded high priority by the government before a policy decision was taken to withdraw state patronage to this sector in 1989. Further expansion of this sector is essential in view of its great production potential and the other attendant advantages that it possesses such as its non-dependence on imported fossil oil, its significance as a source of cheap protein for the rural people as well as an important source of employment and income for the rural population.

Table 4.
Import of fishery products to Sri Lanka – 1993

Item	Quantity (t)	Value (Rs million)
Dried Fish	42,465.92	1,421.42
Maldiv Fish	4,011.35	348.05
Canned Fish	7,008.26	417.40
Others	0.39	0.32
Total	53,485.92	2,187.19

3.4 Imports

The fishing industry of Sri Lanka during the mid 50's produced around 27,000 tons of fish annually and provided only about 50 percent of the domestic requirements and the rest had to be imported. The underdeveloped state of the country was mainly due to the limited knowledge of resources and the continued use of primitive types of craft and gear. Also the operations had been carried out mainly as a cottage industry with no capital or credit to expand. The industry was unattractive due to the fact that it was exhausting work and physically dangerous. Its workers remained the poorest section of the community living in slums and using out-moded fishing equipment. By the end of the 1960s the position of imports had improved a bit and the import substitutes dropped to about 30 percent. Of the 53,486 t of fish products imported in 1993 dried fish accounted for 16 percent, canned fish for 3 percent and Maldiv fish 1.5 percent (Table 4).

3.5 Exports

The fisheries help to earn foreign exchange through the export of high priced fishery products, in addition to providing a significant proportion of domestic demand. In 1993, exports amounted to 5,895 t (wet equivalent) of fish and fishery products, the value of which was Rs: 2,144 million.

Table 5
Export of fishery products from Sri Lanka – 1993

Description	Quantity (t)	Value (Rs. million)
Prawns	1,426.44	808.08
Lobsters	311.57	209.21
Crabs	546.33	82.22
Beche-de-mer	37.33	25.63
Ornamental fish	290.68	204.91
Chunks & shells	121.89	19.87
Shark fins	58.60	98.93
Molluscs	154.51	47.61
Fish maws	1.75	0.82
Frozen fish	2,900.74	625.07
Fat&oil offish	45.56	21.79
Total	5,895.40	2,144.09

The most important export product was prawns: 1,426 t (24 percent), having a value of Rs: 808 million (38 percent). There seems to have been a steady increase in the export of ornamental fish during the past few years. Table 5 gives the quantity and value of exports during 1993.

4. TILE LEGAL FRAMEWORK

Legislation directly affecting the management and development of fisheries includes:

4.1 Maritime Zones Law No.22 of 1976

The law provides for the President to proclaim the limits of the Territorial Sea, Contiguous Zone, Exclusive Economic Zone (EEZ), Continental Shelf, Pollution Prevention Zone and Historic Waters. Under the law all natural resources in the EEZ both living and non-living are vested in the Republic. The Republic has the following rights in this zone.

- Sovereign rights for the purpose of exploration, exploitation, conservation and management of the natural resources, both living and non-living, as well as for the production of energy from tides, winds and currents and for other economic uses.
- Exclusive rights and jurisdiction to authorise, regulate and control scientific research.
- Exclusive right and jurisdiction for the construction, maintenance or operation of artificial islands, offshore terminals, installation and other structures and devices necessary for the exploration and exploitation of the resources of the zones, for the convenience of shipping, or for any other purposes.
- Other rights recognised by international law.

A proclamation was made by the President under the law in 1977 establishing the limits of the territorial sea at 12 nautical miles, the contiguous zone at 24 nautical miles and the FEZ and the pollution prevention zone at 200 nautical miles, or at the maritime boundary with India in the Gulf of Mannar and the Bay of Bengal.

4.2 The Fisheries Ordinance

The Fisheries Ordinance as amended by law no. 20 of 1973, law no. 46 of 1973 and law no. 7 of 1976 is the basic law on fisheries in Sri Lanka. The ordinance provides for prohibition of dynamiting or poisoning of fish or the destruction of gear and the restriction of export of certain fish and eggs. The amended Act no. 30 of 1956 made it an offence to knowingly possess or expose for sale dynamited or poisoned fish, widened the scope of matters referred for public inquiry and gave wider powers to the Minister to make regulations regarding a fishing dispute. Thus fishing laws have been steadily expanded and tightened to stop all abuses of both the fishery resources of the country and the interests of various fishing groups.

Laws to prevent the dynamiting or poisoning of fish are an urgent scientific necessity to conserve fishing stocks. Dynamiting or poisoning fish is an extremely wasteful method of fishing as it destroys immature fish and eggs and also kills large numbers of mature fish which are not collected as they scatter or sink to the bottom of the sea. Inland waters have also been subjected to this type of wanton destruction.

4.3 Fisheries Regulations

One of the earliest methods of Fisheries administration had been the necessity of making laws to settle or avoid fishing disputes and to prevent destructive methods of fishing. These laws were made under earlier enabling Acts dating back to 1898 including The Village Communities Ordinance 1889 and The Game Protection Ordinance 1908. The regulations deal separately with sea fisheries and inland fisheries. The sea fisheries regulations are concerned primarily with regulating the use of beach seines, restricting the use of certain gear in specified waters, and controlling migrant fishermen. Some of these appear to have confirmed the existence of customary practices. A community-based approach is visible in most cases.

The open access nature of fishing and the increased fishing effort over the years led to conflicts among groups of fishermen engaged in different types of coastal fisheries. As a result, the existing fisheries regulations were found in practice to be either vague or not uniform in character and so a new set of regulations were made under the Fisheries Ordinance in 1941.

Regulations adopted in 1973 specify certain conservation measures, including minimum sizes for lobsters and prawns. Exporters of spiny lobsters are required to be licensed and processors of both spiny lobsters and prawns are required to maintain records of material processed.

4.5 Other relevant Ordinances

The Whaling Ordinance, enacted in 1936, provides for the regulation of whaling in Sri Lanka's coastal waters. In general, the provisions have no practical importance as no commercial whaling operations have been established in Sri Lanka.

The Pearl Fisheries Ordinance: prohibits fishing or diving for pearl oysters or using a vessel for such purposes except under a pearl fishery licence. No regulations have been made under the ordinance and in practice no pearl fisheries have taken place since 1959.

The Chank Fishery Act prohibits the use of any vessel for chank fishing, unless it is registered under the Act.

Fauna & Flora Protection Ordinance provides for the establishment of national reserves (including strict natural reserves, national parks, nature reserves, jungle corridors and intermediate zones) and sanctuaries, in which the hunting of wild animals (including fish) is prohibited. Animals protected outside natural reserves include dugongs and leathery turtles.

Under The Forest Ordinance the use of poisons or explosives for fishing and the poisoning of water are prohibited.

Crown Lands Ordinance provides for the issue of permits for the occupation of any part of the foreshore or bed of the sea. In practice this power is being exercised to regulate the location and use of beach seines.

4.6 Legislation relating to the control of pollution

The Water Resources Board Act provides for the prevention of pollution of inland water resources and the formulation of policies for the multipurpose development and use of water resources.

Other environmentally significant legislation includes – Plant Protection Ordinance, Land Development Ordinance, Factories Ordinance, Irrigation Ordinance, The Felling of Trees Ordinance, Soil Conservation Act., Mines & Mineral Law, Urban Development Authority Law, National Water Supply & Drainage Board Act.

The National Conservation Act No. 47 of 1980 shows the government's recognition of the need for a set of comprehensive laws. This was amended in 1988 to provide regulatory powers to the Central Environmental Authority (CEA). Under the Act, a licence issued by the CEA is required to release wastes into the environment. Other provisions relate to the pollution of inland waters and of the atmosphere. Several other Acts of far-reaching environmental significance are: Control of Pesticides Act, National Aquatic Resources Agency Act, Coast Conservation Act, Marine Pollution Prevention Act, and Natural Resources, Energy and Science Authority of Sri Lanka Act.

Provisions for coastal conservation were originally found in Part viii of the Crown Lands Ordinance dealing with the foreshore. The Coast Conservation Act 1981 calls for survey of the coastal zone, preparation of a Coastal Zone Management Plan, regulation and control of activities within the coastal zone and the formulation and execution of schemes of work for coast conservation. Other features of the law are (i) broadening the definition of the coastal zone to include some portion of the water area of lagoons, estuaries and rivers, (ii) a uniform procedure for permit application for development activities in the zone, (iii) provision for collaboration

among various government agencies involved in research and development activities within the zone, (iv) control measures, and the (v) penalties for violation of the law.

5. MAJOR FACTORS THAT INFLUENCE THE DEGRADATION OF THE COASTAL RESOURCE BASE

Coastal areas are used extensively for a number of activities which may not be compatible and may result in a wide array of problems for resource users and policy-makers. Environmental degradation of the coast is caused by three major factors:

- population pressure as a result of increased human settlement,
- development of industries in the coastal zone,
- tourism development.

5.1 Population pressure

The country's population in 1994 is estimated to be around 18.9 million and the national annual increase in the population is 1.6 percent. The number added each year is thus about 400,000. There is a steady increase of pressure on the maritime water front by squatted settlements living under insanitary conditions. About two-thirds of the thickly populated urban areas are located along the coastal belt. This has led to consumption of resources at a speed which overtakes their renewability. The environment's resource capital becomes threatened, thereby compromising the ability of the state to provide food, security, health care and education. Improvement of the population's living standards also becomes difficult. Other problems arising from population pressure are:

Loss of mangrove forests due to heavy dependence of the human population on a variety of products such as timber, tannins, firewood and other products which they obtain from mangrove forests.

Coral reef destruction leading to reduced yield of fish species associated with reefs; reduced tourist attraction and loss of ecosystems due to

- dynamiting to harvest fish,
- harvesting of coral for lime production or, in the case of exotic coral species for sale to tourists,
- siltation of coral from erosion associated with deforestation,
- death of coral from deleterious effluents associated with oil spills.

Congestion and intensive use of coastal resources such as fisheries, due to high population and continuing growth, expansion of the tourism industry, and expansion of commercial and industrial activity.

Inadequacy of institutional structures to address coastal resource problems and to administer management, regulation, and enforcement where needed.

Depletion of wildlife: Depletion of species such as turtles, dolphins, whales and other aquatic life.

Pollution of the coastal environment adversely affects fisheries yield and tourism revenues due to industrial wastes, sewage, agricultural pesticide runoff, oil spills from sea going vessels and toxic contamination of fish and shell fish.

Beach and coastline erosion caused by destruction of mangrove stands; construction of coastal installations which alter current and wave action patterns; or mining of beaches for sand.

Swampland infilling reduces fish spawning and nursery habitat and reduces fisheries yields.

Over fishing leading to reduced fisheries yield and in some cases species extinction.

5.2 Development of industries

Industrial development leads to problems of disposal wastes and by-products many of which are harmful in the short or long term. Industrial wastes are often emitted into the air, dumped on to the land or released into fresh water bodies or the sea. Also, coastal factories have often destroyed mangrove or other critical habitats which are obliterated by sea walls, docks, landfills, and buildings. However, the development of industries is essential for correcting the country's balance of payments deficit and generating employment opportunities. Industrial developments up to now have been achieved at the cost of a degree of environmental pollution. Industrial pollution receives much greater attention than pollution caused by agriculture as the effects are much more visible and the source of pollution is generally traceable. Many of the industrial wastes contain a variety of toxic substances including heavy metals (lead, mercury, cadmium etc.), acids and innumerable other toxic industrial chemicals. Accidental oil spills are becoming increasingly more common as sea traffic increases, facilities are built and the dependence on fossil fuel grows. In a small island ecosystem such as Sri Lanka, the impacts can be felt even more, as important habitats are much smaller in scale and as such may have an increased vulnerability.

5.3 Tourism development

Tourism is an economic activity that was introduced to Sri Lanka in the mid 1960s. This was identified as an important source of foreign exchange earnings and for employment generation. Enactment of the Ceylon Tourist Board Act No: 10 of 1966 and the subsequent Ceylon Tourist Development Act No: 14 of 1968 and the Ceylon Hotel Corporation Act of 1968 laid the necessary institutional basis for the development of tourism.

Sri Lanka's 1,700 km. of beaches and the associated biological resources such as fish, coral reefs and shells received the main focus as tourism resources during the initial stages of development. Throughout its first stage of development this emphasis remained unchanged with about 70 percent of all the hotels and 77 percent of the rooms being located in the coastal regions by 1976.

During the mid 70s the industry acquired as added dimension in the growth of an informal low cost tourism sector. The continued increase in the number of arrivals and the resultant demand for accommodation and other services saw the growth of centres in Negombo, Hikkaduwa, Kalkuda and Arugam Bay. Facilities at these places were constructed by the informal sector as a reaction to the growing demand within a short time and did not adhere to the conceptual requirements established by the earlier tourism plans. These developments subsequently created adverse environmental problems.

The tourist industry has shown a remarkable recovery during the past few years having been severely depressed since the eruption of civil disturbance in 1983. At present over 300,000 tourist arrivals are recorded annually. According to Tourist Board sources, the gross foreign exchange earnings from this sector in 1990 was Rs. 4,800 million (SDR 88 Million), showing an increase of 75 percent over the earnings of the preceding year.

The total employment provided by the Tourist Industry is about 65,000 of which about 30,000 are directly employed in the industry, while the balance (35,000) are employed in ancillary sectors. The major impact areas in terms of accrued gains in the form of higher incomes and new employment opportunities are Colombo, Mt. Lavinia, Negombo, Bentota, Uuawatuna and Hikkaduwa. Due to the very nature of tourism, as a high income generator, this has led, in some areas, to a decline in manpower participation in the relatively more uncertain income generating, traditional activities such as fishing.

The social effects of tourism have been identified to have been both positive and negative. While tourism has widened the knowledge and understanding of different cultures of the people in receiving areas, and increased the literacy levels, it has also led to the advent and increase of some social ills. Unplanned tourism development in some areas has resulted in problems such as loss of beach fronts, the need to construct structures for protection of tourists and the reduced ability to compete with alternative facilities. Hotels constructed north of the Bentota river estuary also had to construct emergency structures due to coastal erosion in 1981.

Most coastal tourist developments added extensions and these resulted in problems of waste disposal because the increased capacity could not be contained in the limited space available after these extensions. Pollution from these sources affected the coral reefs and other biological life thus depleting the quality to the marine environment.

Due to bad planning practices, tourism has left its mark on our shores. Several large tourist hotels have been constructed on the coast sometimes at the expenses of lagoons and mangroves. Hotel construction has also pushed fishermen from their traditional fish landing sites.

6. CONCLUSIONS

- The threat to the environment is not unique to Sri Lanka alone. It is a global problem, but the Sri Lanka Government is among the first to prepare a National Conservation Strategy in order to address the problems.

- Sri Lanka has developed to a level where it is making a significant contribution to improving the national diet. Present priority needs are: quantitative data on the resources available in different zones, technological safeguards against over fishing, and a management plan to ensure sustainable yields from the country's fisheries. Therefore, a comprehensive survey of the resources should be undertaken immediately.
- A fuller assessment is required of the ill effects of activities such as tourism and industrial development on the fishing potential.
- The first preference in all conservation or resources utilisation activities which bring them socio-economic benefits should be given to the local inhabitants and to their participation in protecting resources for sustainable use.
- Pollution of the fresh water or marine environment by industrial and other effluents must be strictly controlled.
- Tourism must be developed in a manner that minimises adverse effects on the fishing industry.
- Procedures must be formulated to regulate activities of unauthorised tourism dependent establishments along the coastal belt.
- Mangroves and adjacent lands should be immediately identified for purposes of management.
- The legislation relating to the environment is scattered in a number of statutes. There are too many laws, some in conflict with each other. These should be reviewed and revised in order to ensure that they are adequate to effectively meet present day needs of resources management.

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BRACKISHWATER AQUACULTURE AND MANAGEMENT

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ABSTRACT

Sri Lanka has extensive areas of estuaries and coastal lagoons. Since the late 1950s many have seen the (largely unplanned) development of shrimp fishing and prawn culture. The most valuable of the 31 shrimp species found in Sri Lanka is the black tiger prawn *Penaeus monodon* which is cultured in earthen or concrete ponds. They are stocked with post-larvae from six hatcheries and their products form an increasing proportion of the total marine exports (in 1992 60% by value, 50% by volume). The shrimp farms and associated processing industry are an important source of employment. The outlook is of continued expansion but the existing farms are subject to several current constraints: the hatcheries are still dependent on wild spawners for the production of fry and these are in short supply; dependence on imported feed which is a large proportion of total costs; lack of expertise on the diseases which occur in intensive and semi-intensive culture; inadequate infra-structure including water and electricity supplies; lack of planned development; poaching.

The shrimp farm industry in Sri Lanka is regulated by the Ministry of Fisheries and Aquatic Resources Development which now demands an environmental impact assessment before the development of large new projects. However, the initial rapid development has led to a number of environmental and management issues, the most prominent of which are the need to control pollution and to rehabilitate the Dutch Canal, the need to halt the destruction of mangroves, the displacement of villagers from land, the salination of drinking water supplies, the need for more employment on the farms for people living locally rather than those from outside the area, the need to identify areas for shrimp farm development outside the Northwestern Province where suitable locations are already almost saturated.

1. INTRODUCTION

The brackish water area in Sri Lanka is estimated at about 120,000 ha of which 80,000 ha are estuaries and large deep lagoons and the rest comprises shallow lagoons, tidal flats and mangrove swamps. The smaller lagoons especially in the South Western, South and Southeastern regions are mostly closed by sand bars. Some have connections with the sea for a short duration during the rainy season. Some of the larger estuaries which are called lagoons such as Puttalam, Jaffna and Negombo maintain their connection with the sea throughout the year. Large expanses of tidal flats and mangrove areas exist in the Kalpitiya and Mannar regions. Most of these brackishwater bodies have been used as traditional fishing grounds by small scale fishermen for generations.

Government patronage to the brackishwater fishery industry began with the establishment of the brackishwater research station in Negombo in the latter part of the 1950s and a second one in Chilaw in the 1970s. These two stations initially concentrated on the promotion of milkfish (*Chanos chanos*) culture by collecting the fry from the northern province and nursing them up to the fingerling stage. Under the Government pond subsidy programme, pond farmers were given their fingerling requirements from these two stations. At a later stage these two stations were geared to produce post-larvae of freshwater prawn, *Macrobrachium rosenbergii* instead of milkfish for distribution among farmers. Withdrawal of government patronage to inland fisheries resulted in the closure of these stations in 1990.

Table 1.
The extent of areas suitable for shrimp culture
in Sri Lanka

District	Extent (ha)
Puttalam	1,200
Hambantota	400
Galle	200
Batticaloa	1,600
Mannar	800
JaiTha	400
Trincomalee	600
Mullaitivu	800
Total	6000

Source: Sainaranayake, 1986.

At present brackish water aquaculture in Sri Lanka is mainly confined to the shrimp culture industry due to its high profitability over the other cultured fish species. Culture of bivalve molluscs (*Crassostrea* and *Perna* sp.), seaweed (*Gracilaria* sp.) and mud crab (*Scylla serrata*) are still at the experimental stage.

1. SHRIMP CULTURE AND DISTRIBUTION OF FARMS

Thirty one species of shrimps have been recorded from Sri Lanka waters. Of these only the penaeid shrimps have commercial value. *Metapenaeus dobsonii* is the most abundant among those species that are found in both estuarine and marine waters. Being one of the smallest in size it is however not as commercially important as less abundant species such as *P. indicus* and *P. semisulcatus*. Due to faster growth, large size attained and export potential, the black tiger prawn *Penaeus monodon* has been almost exclusively used in brackishwater shrimp culture (Joseph, 1993). Out of the 120,000 ha of total brackishwater areas in the island, about 6000 ha have been identified as potentially suitable for aquaculture (Samaranayake, 1986) (Table 1).

Since the beginning of the 1980's rearing techniques for shrimps have made great progress and shrimp farming is now reaching an industrial dimension especially along the coast of the Northwestern Province of Sri Lanka. Although the first prawn farm started in Batticaloa in the late 1970s, civil disturbances in the North and East diverted this industry to Northwestern Province (Fig. 1). Recently a few project proponents have submitted their proposals to start farms in the Southern Province and these are still under consideration of the Inter-Ministerial Scoping Committee headed by the Ministry of Fisheries and Aquatic Resources Development. As at the end of 1993, a total of 91 prawn farms have been approved by the Ministry of Fisheries and Aquatic Resources and the Provincial Ministry of Fisheries of the Northwestern Province. Out of the approved land area of 1633 ha about 498 ha of pond area have been developed. Table 2 gives the details of the area developed by size and land ownership. Lands owned by the Government are leased out to the developers for 33 years at a nominal lease rent of Rs. 500 per acre.

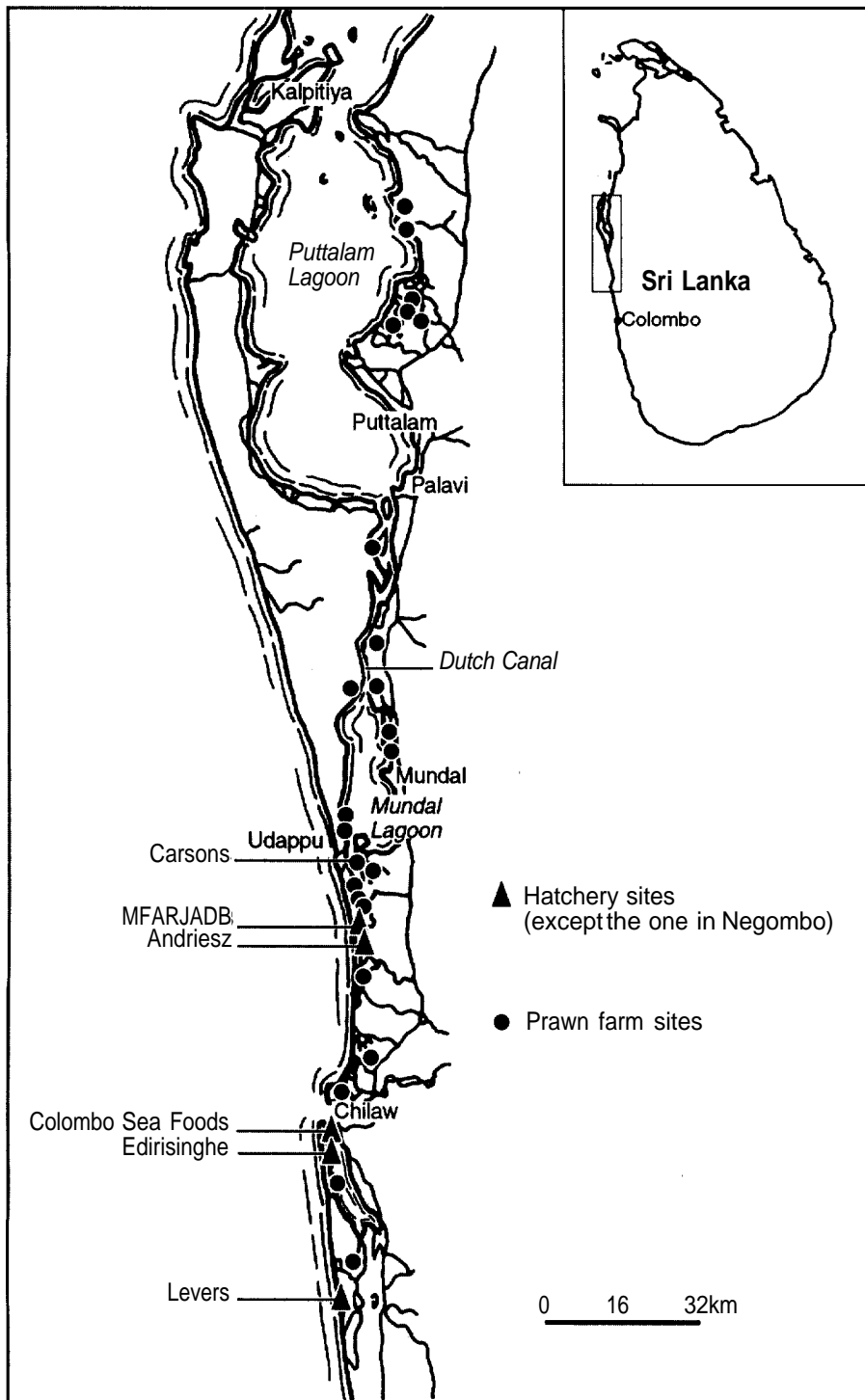


Fig. 1 The distribution of shrimp farms and hatcheries in Sri Lanka. Source: Joseph, 1993.

3. CULTURE SYSTEM

Most of the large scale prawn farm developers adopted intensive culture practices at the beginning of the commercial prawn culture industry in Sri Lanka except for the small scale farmers, who adopted extensive culture practices. The intensive culture operation is more sophisticated, requiring very high financial and technical inputs. This culture practice mainly depends on hatchery-bred fry, high stocking density, use of formulated feeds, application of aeration to increase dissolved oxygen levels in the pond water and intensive water management. The rearing facilities are either earthen or concrete ponds. Due to the outbreak of diseases in intensive culture in the 1980s, the majority of the farmers have changed from the intensive system to semi-intensive systems where the stocking density is 15–20 PL (post-larvae)/m². A few small farms still maintain extensive systems where the stocking density is 5–10 PL/m². The common stocking practice is monostocking under which all the ponds are stocked once and harvested at the end of the growth cycle. A small number of large farms follow a staggered stocking and harvesting schedule.

Post-larvae for these farms are obtained from 6 hatcheries located in the Northwestern Province and one in Negombo. All these hatcheries produce *P. monodon* post-larvae and their total production capacity is about 160 million PL per year. Although this is higher than the total demand of 120 million PL, it has been reported that some farmers do not get their requirements in time.

4. EXPORT EARNINGS AND POTENTIAL

Frozen sea food products from Sri Lanka first entered the world market in 1972. Since then, the export industry of marine products has established itself as one of the most dynamic agro-based industries in the island. There have been ups and downs in the world trade in shrimps in recent times but Sri Lankan exports have enjoyed a good market over the past few years and there is no reason to believe that this trend will change in the near future. Japan and the USA are the most important markets for Sri Lankan prawns. Exports to the European market are growing rapidly. The volume and value of shrimp exports from 1984 to 1992 are shown in Table 3. Among the sea food exports, shrimp accounts for more than 60% of the total value and more than 50% of the total volume. Although the available data does not reveal the proportion of cultured shrimp exports, it can be assumed that less and less wild (captured) shrimp and prawns are being exported in recent years (Joseph, 1993a)

Out of the 29 registered seafood exporters in Sri Lanka, nine are involved in shrimp exports and five of them also possess processing facilities. Exported shrimp comprises 75 per cent frozen/head-less/shell-on, 10–15 per cent frozen/head-on/shell-on and 10–15 per cent frozen/head-less/peeled and de-veined. Generation of huge amounts of foreign exchange, provision of employment to a large number of people in the farms and in processing factories as aquaculturists, technicians, executives and labourers (both skilled and unskilled), cultivation of areas previously unused for shrimp farming are the basic features of the shrimp industry today. The economics of shrimp farming are very attractive. The production cost of one kg of shrimps of 35–40 g average weight is Rs.200–250, of which 50–60 per cent is spent on feed. The current sale price is 350–400

Table 3.
Export earnings from shrimps

Year	Total exports of marine products		Shrimp exports	
	Volume (t)	Value (Rs.m)	Volume (t)	Value (Rs.m) —
1985	3240	453	1648	303
1986	3410	608	1973	427
1987	2376	575	1231	339
1988	3476	824	1826	526
1989	39821	137	2598	767
1990	3162	883	1855	472
1991	1827	855	942	454
1992	3734	303	1246	613
1993	5895	2144	1426	808

Source: Data Management Unit DOFARD, 1993.

Rs/kg. Most farms achieve a production of 2.5 – 3 t/ha in one culture cycle. The total cost of developing a one hectare pond (land, pond construction, equipment/machinery, seed and feed, labour etc.) up to the completion of the first culture cycle is estimated at Rs. 1 million. Such projects start to pay off from the first year.

In addition to the income generated from the exports, developers are entitled to the following tax incentives provided by the Board of Investments (BOI) of Sri Lanka.

- i. Exemption from income tax,
- ii. Partial tax-credit after the expiry of the above tax exemption period,
- iii. Exemption from customs duties and turnover tax, on the import of plant, machinery, equipment, raw materials and other project related goods, including one passenger car,
- iv. Funding and credit facilities,
- v. Exemption of duties and customs levies on the import of one motor vehicle.

World trade in prawns has gained considerable momentum in recent years. About 50% of the world shrimp catch enters the international market. Developing countries are the major suppliers of shrimps while the developed nations are the major buyers. Imports to countries such as the USA, Japan and Western Europe have increased rapidly since the last decade. Japan and the USA are the most important markets for tropical shrimps. There is a growing market for the shrimps also in Hongkong, Singapore, Australia and Canada. Therefore, the longer term outlook for world trade in shrimp is for continued growth during the next two decades. According to the projections

Table 4.
Targets for exports in fisheries sector (value in Rs.million)

	1994	1995	1996
Shrimps	1942	2094	2366
Lobsters	144	151	158
Crabs	27	27	27
Ornamental fish	172	213	264
Others	124	124	124
Total	2409	2609	2939

Source : Export Development Plan -MOFARD, 1992.

of the MOFARD, it is expected to earn Rs. 2,094 million and Rs. 2,366 million in foreign exchange in 1995 and 1996 respectively from the export of shrimp. This is more than 80% of the projected export earnings from the fisheries sector (Table 4).

5. REGULATION AND MANAGEMENT

The development of the shrimp farm industry in Sri Lanka is managed by the Ministry of Fisheries and Aquatic Resources Development, which is the Project Approving Agency under the National Environmental Act No. 47 of 1980, as amended by Act no. 56 of 1988. This Act is the basic national charter for protection and management of the environment.

Under the provision of the Act, regulations have been framed to follow an Environment Impact Assessment (EIA) procedure before approving new projects for shrimp culture over 4 ha in extent. The EIA practices and procedures should ensure that high quality environmental information is available to public officials and citizens before decisions are made and before the government makes any significant commitment of environmental resources. It is better to anticipate problems than to cope with them after they occur. Therefore it is now common practice to require that before any major development, an environmental impact assessment should be prepared that will clearly set out what the effects could be and how it is proposed to compensate them. This kind of requirement may demand extensive investigations which may still leave much in doubt. MOFARD, as the project approving agency, calls for an Initial Environmental Examination (TEE) for projects over 4 ha and below 20 ha.

In the case of projects over 20 ha an Environmental Impact Assessment (EIA) is necessary. MOFARD is assisted by a scoping committee made up of 10–12 representatives from various concerned Agencies. Scoping committee approval is granted only after a thorough examination of the IEE or EIA reports which may include a public hearing process. Though there is no legal requirement to adopt the same procedure for projects below 4 ha in extent, MOFARD has requested the Provincial Councils to process and approve project proposals below 4 ha in order to avoid any environmental degradation and unplanned development of the industry. Northwestern Provincial Council has set up a similar Scoping Committee for this purpose.

6. CONSTRAINTS ON THE EXISTING FARMS

A number of technological, social and environmental constraints encountered by the shrimp farmers have been identified.

- i. The inadequate supply of wild spawners remains a major problem for the industry, particularly that of Tiger prawns (*P. monodon*) as all hatcheries depend on wild spawners for the production of fry. The actual production of the hatcheries is insufficient to meet the demand. Techniques have to be developed for rearing brood stock in captivity.
- ii. The shrimp farming industry in Sri Lanka is almost entirely dependent on imported feeds that are expensive and sometimes in short supply. Feed represents about 40 —60 per cent of the total operational cost. Local feed production is still in its infancy.
- iii. Diseases such as black/brown gill syndrome, bacterial infection (*Vibrio*), viral MBV infection and ectoparasitic infections are common in hatcheries and grow out ponds. These diseases are occurring in most semi-intensive and intensive culture systems. Insufficient numbers of personnel are trained in disease control and other techniques and this has prevented successful technology transfer to small scale shrimp farmers.
- iv. Lack of proper water management systems, inadequate infrastructure facilities such as supply of electricity, road networks etc., have caused concern among the shrimp farmers.
- v. Start of unauthorised and unplanned shrimp culture projects by various farmers both on private and government lands, causing serious threats to the existing farms authorised or approved by the scoping committee.
- vi. There are complaints of organised poaching at some farms.

7. MANAGEMENT ISSUES

- i. The majority of existing shrimp culture projects are along the northwestern coastal belt and depend on the Dutch Canal as the common water source. Any further expansion of the shrimp farm industry in this area has to depend on the availability of water from the same canal. This will be detrimental to the entire industry since there is already concern that pollution in the canal system is beyond optimal levels. Lack of a proper monitoring system to assess the impact of effluent discharge and the sedimentation in the water source has aggravated this situation. It is essential to rehabilitate the Dutch Canal early to avoid any water quality deterioration which may damage the existing shrimp farms and to explore the possibility of increasing the carrying capacity of the canal in order to develop the industry.
- ii. Destruction of large expanses of mangroves to construct new shrimp ponds is going on along the Northwestern coast especially close to Puttalam Lagoon and Mundal lake. Most developers do not consider the importance of mangrove forests because it is not immediately apparent. Mangrove forests provide essential nursery grounds for a large number of fish and shellfish species upon which the lagoon fishermen are totally dependent. If the mangrove ecosystem is damaged or reduced, there will be a reduction of fish catches of the lagoon

fishermen. In addition, this will destroy the nesting grounds for a number of migratory bird species who are coming from distance parts of Asia. For these reasons, mangrove forests need to be managed very carefully. Selection of alternative potential sites in the Southern and Eastern part of Sri Lanka will be a good solution to this issue. The experience gained and the lessons learned from the Northwestern coast can be used for a sustainable development of the shrimp industry in these areas.

- iii. Due to the capital intensive nature of brackishwater shrimp culture, participation of the villagers in the industry has been restricted to a large extent. At the same time the livelihood of most of the villagers who are engaged in paddy cultivation and fisheries are affected by the development of shrimp farms which cause salt water intrusion and loss of aquatic life and mooring facilities for fishing craft. Local communities are concerned that expansion of shrimp farming will lead to salination of drinking water supplies and a threat of flood during rainy seasons. This situation has created a series of public protests and conflicts between developers and villagers.
- iv. Growing unemployment among the local communities has created a number of socio-economic problems. Large farms almost always employ labour from outside the community for reasons of security. Employment opportunities for the members of the local community in shrimp farms are therefore negligible or non-existent. Provision of employment for the local communities in the projects would provide them with the opportunity to train themselves in prawn culture and in the long run they would be able to have community shrimp ponds or a cluster of farms in the area to obtain income as a compensation for the loss of agriculture lands, grazing lands and fishing.
- v. The concentration of shrimp culture projects in the Northwestern Province has almost reached saturation point. With the improvement in the conditions of the North and East, large areas of land suitable for shrimp farming would be made available in addition to those in the Southern part of Sri Lanka. Identification of these lands and provision of relevant information on water quality and soil conditions etc., may help to ease the stress on the land in Northwestern Province and thereby ensure the sustainable development of the shrimp industry in Sri Lanka.

8. CONCLUSION

Brackishwater aquaculture is dominated by shrimp farming which is presently concentrated along the Northwest coast. Though most of the farms have the approval of the Inter-ministerial Scoping Committee, the development has been unplanned. Management measures which are laid down as conditions for approval are not adhered to, due to the non-availability of follow up actions and monitoring activities by the authorities concerned. Unauthorised farms have aggravated the problem bringing into focus several technological, social and environmental issues and constraints. The experience and lessons learned from the Northwestern coast can be put into use when the potential lands for shrimp culture in the South, North and East are developed. Management measures for a sustainable development should be implemented vigorously by introducing an effective monitoring mechanism.

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MARINE SANCTUARIES AND CONSERVATION OF FISHERY RESOURCES

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ABSTRACT

The dwindling of coastal resources is of great concern to many developing countries. Critical habitats such as coral reefs, mangroves and seagrass beds make up the coastal ecosystems. These ecosystems are important for the wellbeing of people, coastal communities in particular. Coastal fisheries sustain many economies, coral reef associated fisheries supply 10 to 12% of the world's total fish landings. About 90% of fish landings in tropical developing countries comes from coastal waters and supplies 40% to 95% of animal protein consumption. Human activities have begun to degrade these ecosystems. Destructive fishing methods, over harvesting, pollution and sedimentation due to unplanned land use practices are the major causes. Several countries have attempted to arrest this trend by introducing various regulations to manage resource exploitation and by declaring marine protected areas. However, measures taken to protect and manage the resources have not produced the desired results, mainly due to the lack of involvement of the communities concerned.

1. INTRODUCTION

Natural resource management is not a new concept. In the past fishing communities had elaborate forms of resource management techniques, where they considered the resources as their own property and protected them from outside communities. This system functioned well in the past when population levels were low. However, the sense of ownership of resources has been lost in recent times due to the pressures of an increasing population. This has led to intensive harvesting of all living and non-living resources within reach. Natural resource management in the modern context attempts to rebuild this sense of ownership through a community participatory process.

The coastal zones are home for over 60% of the human population and are the sites for two thirds of the world's large cities. About 90% of fish landings in tropical developing countries comes from the coastal waters and supplies 40% to 95% of animal protein consumption (Holdgate, 1993). The high productivity of tropical coastal waters is due to seagrass beds, mangroves and coral reefs. These ecosystems are the breeding and nursery grounds of many economically important species. The health of these ecosystems has been degrading rapidly during the past two to three decades. About 60% of the coral reefs in Southeast Asia and almost 80% of reefs in the Philippines and Indonesia have been damaged (Lundin and Linden, 1993). Destructive fishing practices, pollution and sedimentation have been identified as the main causes of habitat destruction (Wells, 1993; Holdgate, 1993).

Juveniles of economically important reef fishes, shrimps and crabs grow within the mangroves and seagrass beds. It has been estimated that 10–12% of the world's total annual fisheries catch comes from reef related fisheries. Some of the highly productive reef fisheries in the Philippines support an annual fish harvest of 30 t km⁻². Fish catches from the surroundings of such productive reefs may reach 5000 kg per fisherman per year (White *et al*, 1994).

Although the status of critical habitats in the Southeast Asian countries is well documented, there is a dearth of information from the South Asian region. Sri Lanka, with a coastline of about 1700 kilometres supports highly productive ecosystems such as mangrove forests, coastal lagoons, estuaries, seagrass beds and coral reefs. These are important for national development and are rich in genetic resources.

Fish is the most important source of protein in Sri Lanka. This amounts to approximately 65 percent of the animal protein consumption and 13 percent of the total protein intake of Sri Lankans (Baldwin, 1991). Over ninety percent of the total fishing population in the country live along the coast. Fishing is concentrated in the coastal waters, classified as within 40 km of the shore (Baldwin, 1991). The harvests from coastal waters are several times more than the catches from the deep sea and offshore areas. There is evidence to indicate that many resources in the coastal waters are already over exploited (Ohman, et al, 1993; Lundin and Linden, 1993). The number of fishermen is expected to increase by 50 to 60 thousand by the year 2000 and a significant drop is expected in their per capita income (Joseph, 1993), due to the scarcity of resources in near shore areas.

The continental shelf of Sri Lanka is narrow, averaging only 25 kilometres in width and has a total area of 28,000 km². Sri Lanka has a tradition of fishing dating back several centuries. In the past fishing was carried out mainly by using non-motorised catamarans, dugout canoes and log crafts. Fishing methods used were mostly non-destructive. Angling, gillnetting and beach seines were the most common methods employed. With state assistance the fisheries industry was developed beginning from about the 1950s. This support was mainly in the form of fishing gear including nylon nets, glassfiber boats and outboard engines.

The greatest development of the fisheries sector was during 1977—1983, when fish production increased 8.4 percent, and even exceeded the overall growth rate and the growth of the agricultural sector during the same period (Joseph, 1993). According to the National Fisheries Development Plan (MFAR, 1990), the peak fish production occurred in 1983 when 220,806 tons were harvested. Exports of fish and other aquatic products reached a maximum in 1988 when the country earned 825 million Rupees (Baldwin, 1991).

In addition to the traditional fishing activities, collection of coral reef fish and invertebrates for the export market is of considerable importance. In fisheries export products, ornamental fish are rated as the third highest in volume and value after prawns and lobsters (Ohman *et al*, 1993; Joseph, 1993). Other fisheries and aquatic products from coastal waters are crabs, sea cucumber and various species of molluscs which are important for the local market as well as for export. More recently, with the development of the tourist industry, underwater recreational activities such as snorkeling and scuba diving and viewing coral through glass-bottomed boats have become popular.

The increase in production and development has brought several problems in its wake. Environmental stress is now a cause for serious concern. Destructive and uncontrolled fishing, over harvesting, coral mining, pollution, unplanned coastal development, indiscriminate cutting

of mangroves to create shrimp hatcheries and sedimentation due to destructive land use practices, are the major causes of environmental degradation. Reefs that are threatened are mostly located close to human population centres (De Silva, 1985; De Silva and Rajasuriya, 1988; Rajasuriya, 1991, 1993; Ohman et al, 1993). This is of particular concern in Sri Lanka as almost all critical habitats are located near the shore and are easily accessible.

The pattern of destruction of critical habitats is seen in many other countries as well, particularly in South Asia and Southeast Asia (Wells, 1993). This situation has arisen primarily due to unplanned development resulting from a lack of understanding of the environment. It is comparatively recently that many countries have come to realise that the sea is not an unlimited source of fish and other products. Impacts vary according to the resource uses at a location or a country. Unlike natural impacts such as storms and hurricanes, the impact of human activities tends to be chronic and rarely allows a habitat to recover. The main causes of reef damage in a regional context are sedimentation, pollution that causes nutrient enrichment and over exploitation (Wells, 1993).

Many coastal nations have been alarmed at the rapid decline of their resources, especially coral reefs, mangroves and seagrass beds (Wells and Hanna, 1992; Wells, 1993; Bohnsack, 1993). A number of countries have attempted to arrest this situation by developing fishery sector management plans and by declaring protected areas. However, labelling a site as a protected area has not produced the desired results. Therefore a simultaneous development in the ASEAN region was to involve the community in the protection and management of critical habitats.

2. **ROLE OF SANCTUARIES IN RESOURCE CONSERVATION**

Marine Protected Areas (MPAs) play an important role in conserving fishery resources in coastal waters. Their main function is to provide a refuge where healthy breeding stocks of fish and other organisms can be maintained. The value of protected areas has been proved especially in some of the functional MPAs in the Southeast Asian countries where MPAs have been in existence of a number of years (Wells, 1993; White, 1986, 1988). The importance of a marine sanctuary in increasing fish catches was clearly demonstrated in the case of Sumilon Island Marine Sanctuary in the Philippines. Fish catches in this sanctuary increased considerably after 10 years of effective management, but declined rapidly when the island management broke down in 1984 (White, 1988). Most MPAs constitute coral reefs, mangroves and seagrass beds.

In Sri Lanka the need for protected areas has been recognised only recently. In 1982, a committee on marine parks and sanctuaries established under NARA recommended the creation of the Hikkaduwa Marine Sanctuary in the southwest and the Bar Reef Marine Sanctuary in the northwest. They have been declared through the Fauna and Flora Protection Ordinance of the Department of Wild Life Conservation in 1979 and 1992 respectively. Both sanctuaries were created primarily to safeguard the coral reefs from destructive human activities.

3. **FISHERIES MANAGEMENT IN RESOURCES CONSERVATION**

Direct impacts on selective organisms have been fairly well documented but information on a few organisms is inadequate in formulating coastal management plans. Unlike gathering

information on most pelagic fisheries, where the study is concerned only with one or two species, often the inshore fisheries are not limited to a few species as most gear used are non selective and catches are multispecies.

Today intensive fishing has changed species composition and abundance, it also reduces the average fish size and age structure (Bohnsack, 1992). Population decline of species have been recorded from many areas. In the Caribbean fishing has affected the population of the Nassau Grouper (*Epinephelus striatus*) and the Jew Fish (*Epinephelus itajara*), this has led to the protection of these species in some locations. Giant clam populations in the Indo-Pacific region have been severely affected and in some parts they are listed as threatened. Barker and Shakeel (1991) expressed concern regarding the Giant Clam population in the Maldives. The Beche Der Mer fishery in the Maldives is also in need of management although only a few years old (Joseph and Shakeel, 1991). In Sri Lanka, destructive fishing methods and over harvesting and habitat destruction are major problems (Ormand, 1985; Sadacharan 1991; Olsen *et al*, 1992; Rajasuriya, 1993; Ohman *et al*, 1993).

In many developing countries habitat destruction and wastage due to fishing is of great concern. In Sri Lanka, fish caught in bottom-set nets used to trap lobsters are discarded, eggs of lobsters are removed and thrown away. Blast fishing is rampant in the southern coastal areas as well as coral mining. Ornamental fish collection using destructive methods are also damaging the habitats. In the Philippines blast fishing, Muro-Ami fishing and the use of poisons is killing reefs (Wells and Hanna, 1992). In the Maldives the meat and the shells of the Giant Clams are discarded after removing the adductor muscle (Barker and Shakeel, 1991). Often trawlers haul in large amounts of unwanted species that are discarded.

Many Governments have now accepted that unmanaged resource utilisation has led to the degradation of the critical habitats that are so important for the well being of the community. Most countries have attempted to control harvesting by introducing regulations and the declaration of protected areas. However, these attempts have not produced the desired results mainly due to the lack of key components to effectively manage their resources. De Silva (1985), identifies the lack of sufficient funds, expertise, proper understanding of policy makers, awareness among users as well as politicians, as some of the main causes of the inability to implement regulations.

4. COMMUNITY INVOLVEMENT IN MANAGEMENT

Several governments have now realised that although it is relatively easy to declare a protected zone and to introduce legislation to control harvesting, it is extremely difficult to implement these regulations. In fact most areas in developing countries, designated as marine protected areas are in practice 'paper parks' with no effective management (Wells, 1993). A major reason for the inability to implement legislation is the lack of communication between the users of the area and the enforcement bodies. Often laws are introduced without consulting the local fishermen. Similarly, marine protected areas are declared by governments without the involvement of the community that will be affected. This creates suspicion among the locals and they view the enforcement authorities as insensitive to their needs. Therefore the community should be involved at the very beginning, at the planning stages. The involvement of the community at the very

beginning may mean the difference between success and failure. Many developing countries are now beginning to adopt community participation in resource management. Government agencies in countries such as Australia and the United States are effectively managing their resources in protected areas. It is noteworthy that in both countries incorporation of the community and stakeholders into management and conservation has been central to efficient management (White *et al*, 1994).

4.1 Protected areas and community participation

In the Indian Ocean and Indo-Pacific regions Southeast Asian countries have been leading in establishing marine protected areas with a community based management approach. This has been achieved through the ASEAN-US Coastal Resources Management Project (CRMP). This approach has been identified as the only way of ensuring proper management within a protected area. Local participation has been identified as a key component in the ultimate success of a properly functioning marine sanctuary (White, 1988). Traditionally protected areas were meant to keep out people who utilise the resources within its boundaries. On land this could be achieved to some extent by controlling access, but is extremely difficult to control in the sea due to lack of physical boundaries and the inability to patrol the area.

In Sri Lanka, selection of sites and the declaration of marine protected areas have been carried out by the government without consulting or involving local communities. As a result the local communities have become antagonistic towards the government departments or agencies attempting to impose regulations on fishing and other activities within a protected area (Wickremaratne and White, 1992), especially where such activities are harmful to the environment and have to be controlled or stopped. Further, due to the lack of understanding the community does not perceive the benefits of sustainable resource use practices. An intensive educational programme at the very beginning helps to orient the community towards understanding the value of the resources and the need to manage them for sustainability. An example from the Philippines is the Sumilon Island Marine Sanctuary where an extensive educational programme at the inception has been the main reason for its success (White 1991). However, educating the community is not a simple task. This process should involve the government at the local level as well as the community and the stakeholders.

5. COASTAL RESOURCE MANAGEMENT IN SRI LANKA

Coastal resource management in Sri Lanka is a recent development. Several government departments and ministries, particularly the Departments of Wild Life Conservation and Coast Conservation are responsible for the protection of natural resources in the coastal areas. The primary responsibility for coastal resources management lies with:

- The Ministry of Fisheries and Aquatic Resources
- The Department of Coast Conservation
- The Department of Wild Life Conservation
- The National Aquatic Resources Agency
- The Central Environmental Authority

The Coastal Zone Management Plan of the Coast Conservation Department (CCD, 1990) addresses the key issues within the coastal zone and provides a framework for management. However, desired results have not been achieved although the initiatives have been based on rational and well thought out policies (Wickremaratne and White, 1992). They have identified the inability to mobilise the support and commitment of the local communities as the main reason for the failure.

5.1 Community-based management of a marine sanctuary in Sri Lanka

The Hikkaduwa Marine Sanctuary in the southwest of Sri Lanka was declared in 1979, through the Fauna and Flora Protection Ordinance of the Department of Wild Life Conservation. It is the first of only two marine sanctuaries in Sri Lanka. This area was declared a sanctuary primarily to save its coral reefs from human impacts. Attempts to protect this reef in the past have ended up in failure due to lack of local cooperation. Meanwhile activities that are harmful to the coral reef within the sanctuary continued to increase. These were illegal ornamental fish collection, discharge of effluent from hotels, illegal construction, damage due to fishing boats anchoring within the coral reef and other tourist related activities.

A community participatory process called the Special Area Management Project (SAMP) has been initiated at Hikkaduwa with support from the United States Agency for International Development (USAID). This process hopes to achieve resource management within the sanctuary area with the assistance of the community. Education and participation of the community is central to this process. It is implemented by the Coastal Resources Management Project supported by the Coast Conservation Department. However it is a long way to successful management. SAMP is a time consuming and stressful process. The sensitivity and the ability to adapt to emerging concerns of affected individuals will determine the success of this project (Wickremaratne and White, 1992). The government agencies in Sri Lanka are now beginning to accept that involving the community or the ultimate beneficiaries in protecting and managing natural resources is the best way of ensuring sustainability.

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DISPLACED FISHERMEN, THEIR MIGRATION AND ITS INFLUENCE ON FISHERIES MANAGEMENT

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ABSTRACT

Many thousands of Sri Lankan families have been displaced from their home districts by civil disturbance and ethnic conflicts during the last ten years. There are still large numbers of people receiving food assistance, living with friends and relatives, or awaiting repatriation from South India. Fishermen were particularly badly affected by these disturbances and even when not actually displaced the security regulations forbade night fishing and, sometimes, access to the beaches and frequently their equipment, craft and engines were destroyed. In spite of several programmes aimed specifically at assistance to displaced fishermen, there are still many who are unable to return to their original homes and to resume their normal occupation.

1. INTRODUCTION

Ethnic violence, terrorist activity, security operations and consequent civil unrest have displaced a large number of fishermen since 1983. Some were killed and some injured. Dwellings were destroyed and those affected were forced to seek temporary accommodation in state managed welfare centres or with friends and relatives. Some migrated to other districts. Traditional migrant fishermen were forced to keep away. A large number of fishermen are among those who sought refuge in South India.

Many fishermen who were not physically displaced could not engage in fishing because their craft and gear were destroyed. On the other hand, even if the craft and gear were available, the ground situation did not permit normal fishing. Security requirements restricted fishing in a variety of ways. Therefore, even these fishermen had to depend on food rations given by the state.

Community based fishing including fishery co-operatives at village level and traditional beach seine fishing were seriously affected. Many displaced fishermen are still unable to resume their activities and some of them have permanently left their fishing areas and have settled down elsewhere. Some of the fishermen have given up fishing completely and taken to other trades.

Thus, displacements of fishermen have influenced fisheries management in a variety of ways. In order to get a clear picture of the situation it is necessary to first see the magnitude of the general displacements all over the country since 1983.

1. DISPLACEMENTS IN GENERAL

Displacements commenced in July 1983 with the ethnic conflict in Colombo and the suburbs. Over 100,000 people left their residences and were temporarily accommodated in welfare centres or with friends and relatives. Most of them ran away from their homes in fear. After a short period many of them returned home. The number of displaced persons was reduced to 13,000 within about a month and by the end of the year many of them had been resettled. But fresh disturbances

Table I.
No. of families on food assistance

Year	Month	Number of families
1983	July	25,000
1984	December	3,350
1985	December	32,450
1986	December	20,020
1987	December	95,900
1988	August	29,500
1989	August	7,200
1990	July	170,000
1991	August	152,300
1992	December	163,000
1993	March	173,600
1994	June	140,000

started and additional numbers were displaced all over the island (Table 1). The disaster expanded to various militant activities which required security operations by the government. The ultimate result was numerous subversive activities leading to general civil strife. By its indefinite continuation the disaster multiplied the displacements.

Many people were displaced from their homes and had either to go into welfare centres or stay with friends and relatives until the ground situation was sufficiently improved for them to go back to their original places of residence. Some had to leave the country and seek refuge abroad, mainly in South India. Meanwhile, a large number of people were economically affected. They could not engage in their normal economic activities. The worst affected were farmers and fishermen.

Further, those of the originally displaced who were resettled have since been displaced repeatedly due to fresh incidents. Many families were deprived of their breadwinners and other family members due to deaths. A large number was injured and were either partially or totally incapacitated. The whereabouts of a large number are still unknown and they continue to be categorised as missing.

A cross section of the number of families displaced from their residences and who stayed in welfare centres and with friends and relatives since 1983 would show the general trend of displacements. They depended on food rations given by the state. Out of the displaced families, a large number (Table 2) are still in welfare centres and with friends and relatives, unable to get back to their original places of residence. The present 140,000 families on food welfare have not yet been registered for rehabilitation assistance. The total number of affected and displaced

Table 2.
The number of welfare centres and of families using them or taking refuge with friends and relatives in different districts in 1994.

District	No. of welfare centres	No. in welfare centres	No. with friends or relatives
Ampara	9	1171	883
Trincomalee	24	3489	3901
Batticaloa	8	1020	8710
Vavuniya	8	987	1634
Mannar	7	5429	7554
JaiTha	199	8968	47,482
Kilinochchi	11	5343	6978
Mullaitivu	18	4615	2424
Other Districts*	153	8954	9614
Total	437	39,796	89,185

* Includes those who migrated from North and East.

families categorised by district (Table 3) gives an overall picture of the situation. In addition there are 20,000 families in South India awaiting repatriation. A large number out of these are fishermen specially from Mannar District.

Table 3.
The number of families affected and displaced in different districts since 1983.

District	No. of families affected	Total number of families displaced
Ampara	51,000	31,700
Trincomalee	75,000	69,725
Batticaloa	106,075	98,000
Vavuniya	24,000	21,000
Mannar	33,000	22,000
Jaffna	250,000	200,000
Kilinochchi	27,500	22,000
Mullaitivu	25,250	20,000
Other Districts*	14,600	5,500
Total	606,425	489,995

* Includes those who migrated from North East.

3. DISPLACED FISHERMEN

Fishermen have been affected in many ways. Like others, many fisher families have been displaced physically and they fall into the categories of those who went to welfare centres, friends and relatives and those who sought refuge in India. Similarly many fishermen fall into the category of the economically affected. Many restrictions which affected normal fishing were imposed on coastal areas during the last decade. Restrictions were placed on areas of fishing, distance from the coast, period of fishing etc. Many fishermen got caught to direct subversive activities. Some were killed and others injured. Some are in the missing category. Many have lost their craft, engines, and fishing gear. Their houses have been destroyed. An analysis of the fishing population from information available mainly in the affected areas which shows the affected families, the damage caused to their craft, engines, fishing gear and houses would show the extent of displacement caused to fishermen due to the present crisis.

It is interesting to note comments made by District Administrations in their Situation Reports for the last month on fisheries. We may take the comments in respect of Jaffna and Mannar, as examples, as they are two badly affected districts.

3.1 Jaffna

“Around 24,000 families who were solely dependent on fishing in the district, had been badly affected by the total ban on fishing imposed by the Government. During normal times Jaffna district produced 30% of the whole Island’s requirement of fish. A major portion of the catch was sent to Colombo and also for export. The ban on fishing has deprived the entire fishing community of their livelihood. Most of them from the main Island of Kayts and coastal areas of the peninsula Karainagar, Ponnalai, Mathagal, Keerimalai, Kankesanthurai, Kyliddy, Palaly, Thondamannaru, Vettalaikerny and Kaddaikardu have all been displaced and are languishing as refugees in welfare centres and other places. Fishermen who were affected by the ban on fishing and were issued free dry rations under the relief scheme for a short period, were later disallowed to draw this relief. In desperation a few of them ventured out to sea defying the ban and very often lost their lives and fishing gear at the hands of the security forces. Their plight is very pathetic as they had been denied their livelihood and have also been refused any relief”.

3.2 Mannar

“The ban on fishing in the cleared area has been lifted but the fishermen in the uncleared area are not allowed to go fishing and they request dry rations. The approval of the Secretary, Ministry of Reconstruction, Rehabilitation and Social Welfare has been sought for the issue of dry rations. The request for night fishing by fishermen should be favourably considered in the interest of fishing industry.

The repairs effected to the ice plant at CFC Complex, Pesalai were not satisfactory and this has been brought to the notice of the Ministry of Fisheries and Aquatic Resources, Ministry of Reconstruction, Rehabilitation and Social Welfare and Ceylon Fisheries Corporation to rectify the defects. It is regretted to note that not a single Ministry has made any positive move.

This leaves room for misunderstanding to local people in regard to the interest they show in

to the improvement of fishing population.

The poaching by India Trawlers is a very serious problem. This has been brought to the notice of the Ministry of Defence, Ministry of Foreign Affairs, Ministry of Fisheries and Aquatic Resources and the Ministry of Reconstruction, Rehabilitation and Social Welfare. Immediate action is necessary. A suggestion to prevent this is to allow the local fishermen to do trawling during the night has been made to the Ministry Defence.”

If we examine the details in respect of Mannar, we are in a position to get a clearer view of the effects of displacements on fishery management in general. Mannar has over 5000 fishing families and about 7000 active fishermen. Mannar mainland is uncleared and only the Island has been given security clearance. A large number of fishermen went to India in 1986 and again in 1990. Many fishermen are at the Open Relief Centre at Madhu.

The main types of fishing were shallow water fishing, drift nets, beach seine and trawling. Beach seining was operated mainly by migrants.

Restrictions have been imposed in respect of night fishing and area (even on land there are no go areas). As a result, fishing has been at a minimum level for a long time. With the displacement of the beach seining migrant fishermen, it is noticed that the beach seines are gradually going out of use. Instead ‘Disco Nets’ and ‘Laila Nets’ are in operation. The beach seine set up has been seriously affected. Indian trawlers continue fishing on a large scale in the waters close to Mannar. Even the multi-day boats introduced recently have not become established in Mannar.

Under the Emergency Reconstruction and Rehabilitation Programme Progress Reports, the following comments have been made under fisheries;

“4.40 Under the ADB funded Agriculture Rehabilitation Project (ADB II) credit was made available for replacement of fisheries boats and equipment and rehabilitation/reconstruction of infrastructure. Under the infrastructure component, a work plan has been prepared for Rs. 59.7 m for the reconstruction of fisheries infrastructure such as buildings, supply of vehicles, furniture and equipment. Major projects include restoration of Cod Bay fisheries harbour complex, Batticaloa cold room complex, selected ice plants and fisheries training centre complex at Batticaloa (completed). The expenditure so far is Rs. 17.28 million.

4.41. Australia has gifted 2,500 fishing net packs worth a \$362,000 for distribution among lagoon fishermen in Ampara and Batticaloa districts. Distribution has been completed. In addition, it has also financed purchase of 120 outboard motors by NEPC. Distribution has been completed.

4.42. NORAD is supporting a programme on the production of fibreglass canoes and their distribution to conflict affected fishermen under the BIRRP. Some 250 families have benefited Expenditure: Rs. 2.37 million.”

In spite of the Rehabilitation and Reconstruction assistance displacements still continue. Those who cannot get back to their original places of residence or migrate and find places of their choice are likely to be relocated by the state in the near future. The state does not expect to continue with welfare centres for the displaced. This is applicable to the displaced fishermen as well. The effects of displacements among fishermen on future fisheries management will have to be looked at from this point of view as well.

CHANGES IN STRATEGY FROM DEVELOPMENT TO MANAGEMENT IN SOUTHERN SRI LANKA: A CASE STUDY OF NORAD DEVELOPMENT APPROACHES

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ABSTRACT

In Hambantota District, Galle Province, Norway has been funding an integrated rural development programme (HIRDEP) since 1979. It includes a Fisheries Project Management Unit which has been operating since 1981. After a number of surveys to establish the state and requirements of the fishing community, four fisheries service centres were constructed at main fish landings and their management and maintenance was entrusted to Fisheries Cooperative Societies. Through these and other cooperative societies funds have been made available for loans to local people for such things as purchase of bicycles or motor cycles (enabling them to market fish in inland areas), fish processing, repairs to or purchase of boats and engines, purchase of fishing gear, and a wide variety of other purposes. A district ice plant has been constructed, piped water supply installed to a number of fishing villages, underwater obstacles removed from fish landings and a field training programme set up at which more than a thousand fishermen have so far been trained in such things as engine maintenance, fisheries regulations and fish handling.

As a result of this aid, fish production in the district has increased, the quality of fish landed and marketed has improved and local incomes have increased. The credit programme, implemented through the cooperative societies, has released many from the bondage of middlemen charging extortionate rates of interest and thus allowed them to improve their general standard of living, through the purchase of better housing and facilities.

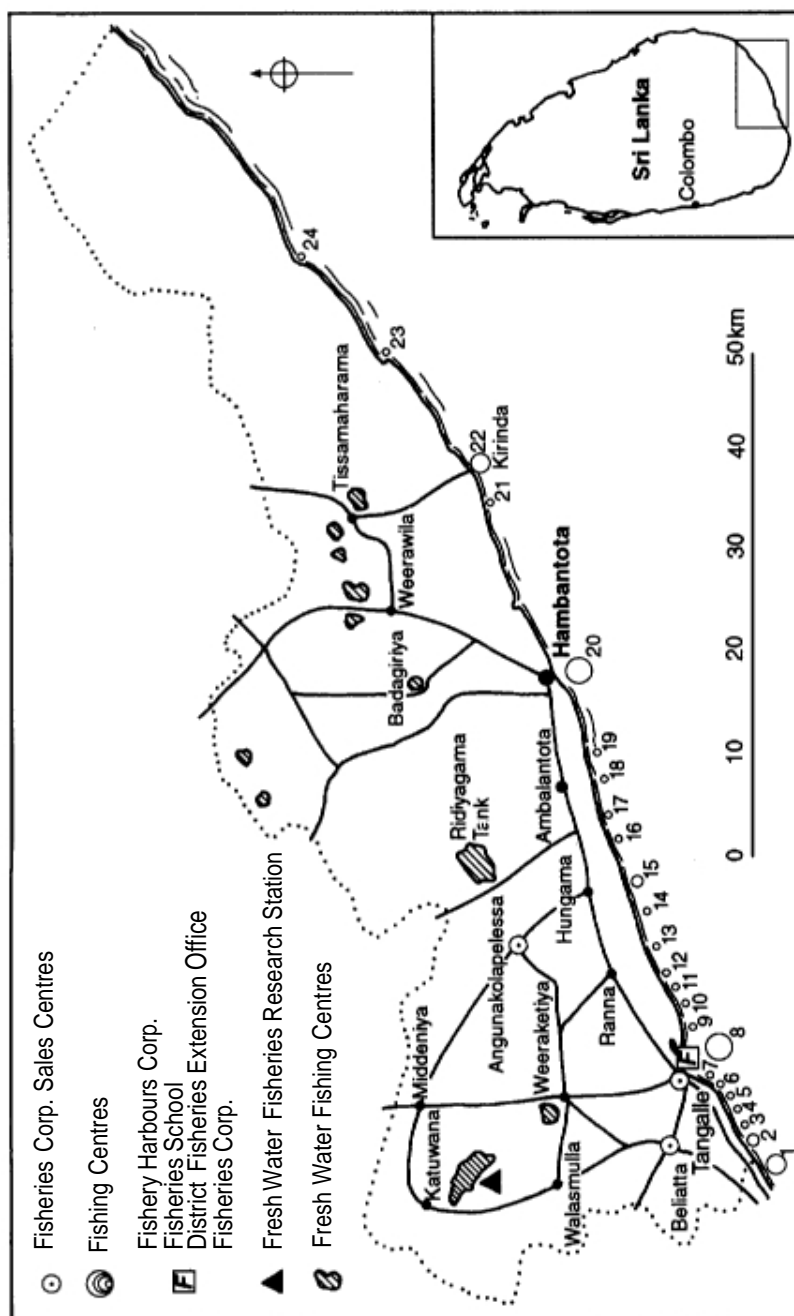
The whole programme has been carefully monitored and evaluated at every stage and, although HIRDEP is coming to the end of its assured funding by NORAD, the Fisheries Management Unit will continue its activities and the Fisheries Training Institute at Tangalle is to be improved. There are many ways in which this whole programme could be sustained and extended.

1. BACKGROUND

1.1 Hambantota District – basic information

Hambantota is one of the 25 administrative districts of Sri Lanka (Fig. 1). It is located in the extreme South of the country and is bounded by Matara in the West, Ampara in the East, Rathnapura and Monaragala districts in the North and the Indian Ocean in the South. It lies between 6° and 6.5° N and between 80.6 and 81.7° E. The distance from Colombo to Hambantota town is 237 km. The district has a land area of 2,590 square kilometres and a coastal belt 137 km long from South to South-East. Climatic conditions within the district vary enormously. The annual rainfall ranges from 1,900 mm to 1,000 mm from West to East. The average annual temperature is between 26.5 to 28° C and, at Hambantota town, mean relative humidity is about 82% throughout the year. Approximately one third of the area of the district is in agriculture use, another third is covered by the Yala National Park, other sanctuaries and the forest reserves.

According to the 1981 census the population in the district was 424,344 with a growth rate of nearly 2.2%. The population density varies between 300 and 450 persons per square kilometre.



The Fishing industry in Hambantota District. The numbered circles along the coast indicate the locations of fishing centres and their relative sizes: 1. Kudawella 2. Mawella 3. Seerimodera 4. Unakuruwa 5. Goyambokka 6. Rotagewatte 7. Pallikudawa 8. Tangalle 9. Medaketiya 10. Rekawa 11. Serimankudawa 12. Kammuthuge Waraya 13. Kahandamodera 14. Kalametiya 15. Kivula-Kalametiya 16. Ussangoda 17. Welipatanwila 18. Pattiya Waraya 19. Godawaya 20. Hambantota 21. Uraniya 22. Kinnda 23. Amaduwa 24. Patanangala.

in the western part and 50—200 persons per square kilometre in the central and eastern parts of the district. The potential labour force (age 10—59) of the district totals nearly 290,000 or 68% of the population.

1.2 The fisheries sector

Hambantota is one of 13 coastal districts in Sri Lanka and its coastal belt extends from Kudawella fishing village to the edge of the Yala National Park. There are 31 fish landing centres along the coastal belt two of which are the fishery harbours of Tangalle and Kirinda. The major contribution to fish production comes from the coastal fisheries. Fish is the main and preferred source of animal protein in the cereal based diet.

The total number of fishing families in the district is around 4,000 and the number of fishermen engaged in fishing activities is about 6,000. They are scattered in 113 Grama Niladhari divisions. In addition to these, it is estimated that around 1,000 other people are indirectly employed in fisheries related activities including fish vendors or traders, transporters, boat builders, boat and engine repairs and the suppliers of other services to the fishing industry. The total fishing fleet is around 2000 of which 44% has been mechanised. The total fish production in the district has gone up from 5750 tin 1980 to 15,000 tin 1993.

Fishing in the district is influenced by the weather, particularly the monsoons. The South-west monsoon period which is roughly from May to October is the main fishing season for the mechanised boats which fish for larger pelagics. The traditional craft are generally inactive during this period; they carry out limited fishing operations only when the weather is relatively calm. During November to April, beach seine fishing is also carried out along the coast.

There is a Regional Fisheries Training Institute at Tangalle which conducts regular residential training courses in marine fisheries for selected youths. In addition to that, the centre provides practically oriented training for active fishermen in their own fishing villages.

For fisheries administration and regulation in the district there is a District Fisheries Extension Office in Tangalle, under the Department of Fisheries and Aquatic Resources. This unit is headed by a District Fisheries Extension Officer and there are 11 Fisheries Inspectors working under him.

The district has 54 village level Fisheries Cooperative Societies and one umbrella organisation called the District Fisheries Union. Their total membership is around 7,000 (both males and females) and the share capital was Rs. 999,360 at the end of July 1994. Total savings of the members at this date were a little over Rs. 4 million. These societies are engaged in production, marketing, provision of welfare and credit facilities and other related activities.

There are around 16 sizeable lagoons scattered along the coastline, ranging in size from 31 to 570 ha, with a total surface area of approximately 2800 ha. Some lagoons are connected to the sea throughout the year, whilst others are completely isolated. In addition there are currently 21 tanks which may be classed as perennial, covering, at full storage capacity, a total surface area estimated to be 7836 ha.

1.3 Fish resources

The only systematic and scientific investigation of the fishery resources of the area is the The Survey of the Coastal Fish Resources of Sri Lanka conducted jointly by the Institute of Marine Research, Bergen and the Fisheries Research Section of the Ministry of Fisheries and Aquatic Resources using the research vessel Dr.Fridjof Nansen. Three resources surveys conducted in 1978, 1979 and 1980 which investigated the continental shelf around the island. These surveys identified the Hambantota Bank, which is a well-defined area with a relatively broad shelf limited by the Little Basses Reef to the East and the narrow shelf off Dondra Head to the West. During the second survey (April to June 1979), the total biomass was estimated to be 35,000 tons; 30,000 tons of demersal fish and 5000 tons of pelagic fish. The third cruise (January and February 1980) revealed that the total biomass of the continental shelf of Hambantota Banks was 110,000 tons comprising 55,000 tons of demersal and semi-demersal fish, 40,000 tons of small pelagic and 15,000 tons of large pelagic fish.

1.4 HIRDEP funded by NORAD

The programme of integrated rural development commenced in Sri Lanka in the late 1970s in order to channel resources into the less developed districts in the country. Hambantota District Integrated Rural Development Programme (HIRDEP) was started in 1979 and is one of the six originally targeted districts. The agreement between the Government of the Kingdom of Norway and the Government of the Democratic Socialist Republic of Sri Lanka was signed on the 30th October, 1979.

In addition to the general objectives of the I.R.D.Programme in Sri Lanka, the specific **objectives of HIRDEP** are as follows:

“The programme aims at achieving an increase in income, employment and production as **well as improvements of** social conditions and living standards of the men, women and children of the Hambantota District with special emphasis on the poorest groups.

The objectives are to be realised by means of;

- an integrated approach, whereby efforts within various fields are sought related to each other,
- a method of recurrent planning whereby information from ongoing activities are continuously fed into a revolving planning procedure,
- a method of concerned participation of the population of both sexes in a decentralised planning and implementation process.”

From the inception of the HIRDEP one of its main strategies for the achievement of its specific objectives has been maximum utilisation of the existing administrative and organisational structure in the district.

1.5 Fisheries Project Management Unit

The Fisheries Project Management Unit was set up under HIRDEP in 1981 in order to coordinate, plan, implement, monitor and evaluate the development activities which come under the fisheries sector in the district. This special unit consists of one Fisheries Project Manager and an Assistant Fisheries Project Manager. They are provided with transport and office facilities in the HIRDEP office. This unit has to date successfully completed a number of development projects which benefited the coastal and inland fisherfolk of the district.

2. PAST DEVELOPMENT GOALS

The basic thrust of the strategies pursued by HIRDEP to achieve its broad development goals has had the following characteristics:

- the development of key productive sectors, such as agriculture, fisheries and livestock;
- the development of basic infrastructure to support productive sectors;
- emphasis on strategies to integrate production, marketing and access to services;
- strategies to expand the social infrastructure base;
- strategies to reach target groups, through the promotion of local level and participatory planning;
- strategies to upgrade the human resource base of the district, and building the capacity of institutions charged with the responsibility of resource management.

Based on these strategies, a joint NORAD and Ministry of Fisheries team produced a report in 1979 which was to be the basis of the fisheries component in the programme for several years. The agreement of the first fisheries sector projects was signed on the 21st July 1981. As a result of this, a number of studies were conducted to assess the prevailing situation in the district with the expert assistance of the Norwegian Government.

A benefit-cost survey of fishing vessels and fishing methods was conducted for a period of one year to determine the most suitable craft for the district. The data were collected daily from 115 selected fishing craft of five different types scattered at eight main fish landing centres along the coastal belt. The data were processed and analysed with the help of computers in Norway. This report was published in October 1984.

In the meantime, another survey called Demersal Fish Exploitation Project off Hambantota was conducted to determine the fishing grounds and the catch effort of the same. This survey was also conducted for a period of nearly one year deploying three fishing vessels which belonged to the Fisheries Training Institute at Tangalle. This report was published in November 1984.

Four fisheries service centres were constructed in 1982 at four main fish landing centres in order to provide more facilities to the fishing communities and also to make available the required

input for the fishing industry close to hand. The *office* of the Fisheries Inspector was also located in the fisheries service centre so that he would be able to provide a better extension service and gather first hand and reliable information especially about the fish landings. The management and maintenance of these centres has been entrusted to the Fisheries Cooperative Societies.

A five-ton capacity block-ice plant was constructed in the heart of Hambantota town in 1982 in order to increase the quality of fish transported into the interior parts of the district. This also helped to increase the income level of the fishermen. The management and the maintenance of this plant has been entrusted to the Ceylon Fisheries Corporation.

The agreement for the provision of piped water to the fishing villages was signed on the 12th January 1983. Six water supply schemes were implemented in the fishing villages to provide quality drinking water to fishing communities therefore reducing the work load of the housewife. This helped to improve the health of the community. A total household survey conducted by the Fisheries Project Management Unit in November 1993, revealed that 69.7% of the fishing families in the district now have access to quality drinking water within 400 m.

Removal of underwater obstacles at the fish landing centres is another component implemented under HIRDEP. Underwater rocks which were hindering the movement of fishing craft and the operations of beach seines were removed at six fish landing centres. It was very difficult to implement this programme because there were difficulties in finding people capable of underwater rock blasting, difficulties in obtaining explosives for this purpose due to the security situation, difficulties in sorting out the disagreements between the contractor and the fishermen and in carrying out such work throughout the year. It had to be done within a period of less than five months in the year when the sea is relatively calm.

Another programme was implemented to provide funds as a grant to the seven Fisheries Cooperative Societies in the district, so that they could commence sales of fuel, fishing gear and engine spare parts to members as well as non-members. This component has been named as Provision of Seed Money to the Cooperative Societies.

A Field Training Programme for Fishermen is being implemented under HIRDEP with the assistance of the technical staff of the Fisheries Training Institute at Tangalle. The duration of the course is 15 days. Training programmes are conducted at their own fishing villages and so far, 1,180 fishermen have been trained. The course contents are

- seamanship,
- navigation,
- fishing methods,
- repair and maintenance of inboard and outboard engines,
- rigging, mending and care of fishing gear,

- fibreglassing techniques,
- fish handling,
- Fisheries Ordinance and Regulations,
- savings.

In addition twenty two selected members of Fisheries Cooperative Societies in the district were trained for a period of four months in two batches as mechanics to repair marine engines. They were issued with tool kits as a loan after completing the training.

At two fishing centres very old wooden orus (traditional crafts) were fibreglass coated to prolong their lifetime. At four fish landing centres where electricity was not available, solar beacons were installed on an experimental basis. The ten-ton capacity block-ice plant at Tangalle which belongs to the Ceylon Fisheries Harbours Corporation and had not been working for a long time, was renovated for a total cost of Rs.2.1 million.

The fish breeding and rearing station at Muruthawela was provided with the following facilities: one double-cab pick-up vehicle for the staff to distribute fingerlings and for the extension work, four motor cycles for the Fisheries Inspectors to collect statistics and for the extension services, one hand tractor with a trailer to transport fuel and manure to the station and two filter units to provide quality water for the ponds and for drinking.

At two fishing villages settlement schemes were implemented in which 110 families were settled. Loan facilities were provided through the National Housing Development Authority for the construction of houses. Five residential quarters were also constructed in the district for the benefit of the District Fisheries Extension Officer, three Fisheries Inspectors and the Principal of the Fisheries Training Institute at Tangalle.

Transport facilities were provided to the field officers of the District Fisheries Extension Office at Tangalle. They were provided with one double-cab pick-up vehicle and five motor cycles for extension services.

Generally, the fishermen are bonded to the middleman and as a result they are very poor and unable to escape from this vicious circle. To eliminate this situation, credit was provided to the village level Fisheries Cooperative Societies. Forty three such societies in the district were granted Rs. 30,000 each so that their members could obtain loans and this would function as a revolving fund in the society and to provide more credit to the members. At the very beginning the loans were issued only to 430 members of the 43 societies but by the end of July 1994 the total number of members who had obtained loans from this revolving fund had gone up to 1378. the loan recovery rate is 79.6%. This scheme is being monitored regularly and the purpose for which the loans were obtained has been analysed (Table 1).

Fifty bicycles were also granted to 11 Fisheries Co-operative Societies so that the members may commence fish marketing. The cost of a bicycle is Rs. 3000 and it was a loan to the member

from the society. Ninety five reconditioned motor cycles were also issued, for fish marketing through the Fisheries Cooperative Societies in order to provide quality fish to the inland parts of the district and to increase the ex-beach price of fish to the producer.

Forty-five outboard motors have been issued to the members of nine societies for the mechanisation of traditional crafts and 128 6 m FRP boats with outboard motors and fishing gear have been issued through the Societies to increase the fish production and the income level of the fishing families.

Hence the total expenditure incurred up to the end of August 1994 has Rs. 78 million out of which Rs. 30 million has been granted to the Fisheries Co-operative Societies.

Table 1.
Loans **under** NORAD assistance to members of Fisheries Co-operative Societies
from April 1990 to **December 1993**.

No.	Purpose	Male	Female	Total
01	Manufacture Of Maldive fish	0	20	20
02	Manufacture of dried fish	4	27	31
03	Marketing of fish	112	0	112
04	Fishing gear	381	32	413
05	Repairs-boats	32	8	40
06	Repairs - outboard motors	9	2	11
07	Tool kits	22	0	22
08	Migration for fishing	4	0	4
09	Purchasing of boats	13	1	14
10	Repairs - beach seine nets	1	0	1
11	Purchasing outboard motors	2	1	3
12	Construction of fish kraals	3	0	3
13	Poultry farming	10	23	33
14	Goat farming	1	4	5
15	Cattle farming	1	0	1
16	Manufacture of poultry food	2	7	9
17	Coconut fibre industry	9	60	69
18	Marketing coconut yarn	0	9	9
19	Marketing of hoppers	0	1	
20	Boutique	15	21	36
21	Tea boutique	2	10	12
22	Marketing coconut wood rafters	1	0	
23	Marketing of vegetables	5	3	8
24	Marketing of coconut	0	2	2
25	Mobile grocery	3	12	15
26	Marketing of betel	1	0	
27	Marketing of king coconut	0	2	2
28	Marketing of salt	1	1	2
29	Brick making	13	15	28
30	Bakeries	1	0	
31	Marketing of yoghurt	0	1	

No.	Purpose	Male	Female	Total
32	Farming	11	19	30
33	Marketing of garments	3	8	11
34	Manufacture of sweets	0	4	4
35	Manufacture of mosquito nets	0	1	1
36	Metal breaking	0	3	3
37	Handicrafts	1	0	1
38	Building houses	36	44	80
39	Building lavatories	3	0	3
40	Electricity	1	4	5
41	Purchasing sewing machine	0	7	7
42	Motor cycle for fish marketing	33	0	33
43	Purchasing household goods	1	0	1
44	Bicycle for fish marketing	53	0	53
45	Repairing vehicles	1	0	1
46	Get rid of high interest loans	56	36	92
47	Redeeming pawned goods	1	6	7
48	consumer needs	2	1	3
49	Medical assistance	1	2	3
50	Father's aim giving	1	0	1
51	Wife's foreign trip	1	0	1
52	Purchasing bicycles	3	1	4
53	Others	2	4	6
TOTAL		858	402	1260

3. BENEFITS AND BENEFICIARIES

The fishing communities in the district have benefited immensely as a result of the development programmes implemented under HIRDEP with NORAD assistance. Two reviews were conducted to assess the progress of the fisheries sector in 1988 and 1993 jointly by NORAD and the Department of Fisheries and Aquatic Resources.

Fish production in the district has increased from 5750 t per annum in 1981 to 15,000 t in 1993. This is a direct result of the provision of services and inputs required for the fishing industry and also due to the proper management of the fisheries sector activities in the district through the village level Fisheries Cooperative Societies.

The quality of fish landed has also been improved by the provision of sufficient ice. The distribution of quality fish to the interior parts of the district was also increased by the provision of bicycles and motor cycles to the members of the societies for fish marketing. This helps to improve the health of the consumers and the producer is getting a higher price since the competition for fish at the fish landing centres is increased.

Most of the credit programmes implemented through the village level Fisheries Cooperative Societies upgraded the management of the societies and also helped to get members released from the bonds of middlemen. Ninety two (7.3%) members out of 1260 have obtained loans from the societies at an interest rate of 12% per annum, to settle the loans they have taken from the

middlemen at very high interest rates such as 240% per annum. One hundred and ninety eight (15.7%) have obtained loans from the societies for fish marketing and the other purposes for which loans were obtained are shown in Table 1.

The field training programmes helped to upgrade the capabilities of the fishermen to maintain and service their marine engines and to attend to minor repairs of the fibreglass boats. They were trained to handle the fishing gear very effectively and efficiently and as a result of that the catch effort has been increased. In addition, their knowledge of the Fisheries Ordinance and Regulations and the Co-operative Law was improved leading to better management of the fisheries sector in the district. Proper handling of fish to reduce post-harvest losses, resource management of the demersal fish on the continental shelf, including lobster fishing, and to save part of their daily income for future use were some of the main topics discussed in detail in these field training programmes.

Removal of obstacles at fish landing centres and the provision of seed money to commence sales of fishing gear, engine spare parts and fuel also helped to increase fish production in the district mainly because these two programmes increased the number of fishing days.

Provision of transport facilities, residential quarters and foreign training to the fisheries extension officers improved their job satisfaction and work efficiency, rendering a better service to the fishing communities of the district.

The benefits of the settlement schemes are as follows, as mentioned in the first review report of the fisheries sector under HIRDEP:

- a proper housing area has been developed with infrastructure facilities,
- they no longer have problems with stray animals or serpents and were safer,
- with the new roads they had better access to the sea,
- no longer afraid of fires, whereas previously the shed was liable to catch fire,
- health conditions had already improved because of better housing facilities and water nearby
- they were able to keep their fishing gear more safely stored,
- processing of fish is easier and can be done safely (women do Maldivian fish processing),
- the overall quality of life is better.

The target group of all these fisheries sector programmes was the very poor fishing families, the food stamp holders. Thus, the income level of the fishing family was increased and thereby the quality of life improved.

4. FUTURE CHALLENGES TO BE ADDRESSED BY HIRDEP

HIRDEP is entering into its final phase of receiving NORAD funds; the period 1995 to 2000 will be treated as a period of consolidation. The sustainability of the programmes already conducted will be scrutinised. However, the Fisheries Project Management Unit will continue the issue of beach landing craft, outboard motors, motorcycles for fish marketing and the field training programmes until the allocated funds have finished. In the meantime all the programmes implemented will be closely monitored and evaluated.

Nevertheless, if priority is given and funds are available the following activities may be implemented under HIRDEP to further improve the fishing industry in this district.

A proper resource survey has not been carried out since 1980 and it is not possible to predict the maximum sustainable yield or the total biomass available in the continental shelf area of the Hambantota Bank. Therefore, action should be taken to harvest the available deep sea pelagic resources by introducing more multi-day boats with modern electronic equipment through the district union. Conversion of existing single day boats to multi-day boats will also be useful to reduce the operational cost and to improve the deep sea catches and thereby reduce the use-conflict in coastal waters.

Fish marketing should be further improved to give a better price to the producer and to provide more quality fish to the interior remote villages in the district. The cost of insulated vans are very high and the village level cooperative societies are not in a position to purchase and mobilise them. If funds are made available to the district union it has the capacity to commence a fish marketing programme utilising 3–5 insulated vans.

The Fisheries Training Institute at Tangalle is to be improved. A training vessel with modern electronic equipment and new buildings for the centre should be provided.

To improve the freshwater fish production, educated youths living around the perennial tanks in the district should be trained in fish breeding and rearing of fingerlings. They should be provided with mini-laboratories for this purpose.

Most of the lagoons in the district have various problems. It is not possible to develop these lagoons since the cost would be very high and the appropriate technology unavailable. Therefore, proper studies should be conducted to understand the problems and how to find solutions to them.

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ENVIRONMENTAL POLLUTION AND ITS IMPACT ON FISHERY MANAGEMENT IN LUNAWA LAGOON

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ABSTRACT

Lunawa Lagoon is one of the major lagoons close to Colombo which provided a livelihood for the fishing community in that area until the 1970s. This waterbody and its aquatic resources have been degraded over the last two and a half decades, coinciding with the increase in the number of industrial establishments in the area, developed with little regard to environmental planning. The wastes generated by these industries and released untreated into the water have resulted in detrimental effects not only to the lagoon but also to the ground water resources.

A survey was carried out to ascertain the present status of the aquatic resources and to study the damage resulting from this unplanned industrial development. Results indicated that more than one hundred Jakotu fishery activities (which harvested prawns) were destroyed by the industrial releases into the drainage system. Fish catches of 50 kg/boat/day have been lost since 1979 and there has been a severe reduction of biodiversity in the lagoon. In addition, some areas of the lagoon have become breeding grounds for disease vectors, threatening the health of the surrounding population. Furthermore, deterioration of water quality and contamination of water with heavy metals were also observed. Dissolved oxygen availability in the water of the lagoon varied from sampling station to station with values ranging from zero to 14.6 mg/l indicating eutrophic conditions in some parts of the lagoon. Although pH values indicated slightly acidic conditions at some stations and slightly alkaline in others, no threatening levels of pH were observed at any station during this study.

For the rehabilitation of the area, an acceptable programme is needed for treating the liquid wastes generated by the industries and safely disposing of the treated effluent into the environment and should be introduced without further delay.

1. INTRODUCTION

Lunawa Lagoon is located south of Colombo in an area developed as an industrial and residential suburb. A large number of industries were established in the 1960s in the Moratuwa-Ratmalana area inter-mixed with residential and commercial establishments. A residential population of approximately 350,000 people is concentrated in this area which covers about 40 km². There are squatter settlements and low income families living along the canal banks and the periphery of the lagoon and their domestic waste water is directed to either septic tanks, soakaway pits or to drainage ditches. The high water table in this area and faecal contamination of ground water is also evident.

Recent studies recorded 225 industrial establishments in the study area with the predominant industries including garments & textiles, chemicals, metal finishing, food and asbestos products (Associated Engineering, 1994). The industries located in the Moratuwa Ratmalana area did not have waste water treatment plants and liquid wastes were discharged untreated into nearby storm-water canals. These releases aggravated the problems of water pollution and resulted in degradation of aquatic resources in the area.

The Lunawa lagoon, which is the major water body in the area receiving drainage water from the Moratuwa Ratmalana basin has been severely damaged as a result of this environmental degradation. The aquatic life of the lagoon has been greatly degraded due to contamination of its tributaries and the significant fishing industry supported by the lagoon two decades ago is now seriously threatened. Prior to 1979 there was a considerable amount of fishery activity with about seventy five fishermen in the lagoon and it was said that more than hundred Jakotu fisheries were also based in the lagoon. There was considerable biodiversity i.e. at least 22 fish species and six species of crustaceans were recorded from the lagoon.

A survey was conducted to obtain information regarding water quality, pollution and fishery aspects of the lagoon as a consequence of the industrial boom in the area during the 1950s and more intensively in the 1960s. This paper deals with the effect of such development on the aquatic resources and discusses possible management considerations to mitigate further deterioration.

2. MATERIALS AND METHODS

The physico-chemical characteristics of water have a dominant limiting effect on the aquatic environment. The chemical nature of the water determines the species that can survive and the population distribution of species. The following physico-chemical parameters were selected for this study to ascertain the quality of water.

A. Physical parameters

- i. Turbidity
- ii. pH
- iii. Dissolved Oxygen
- iv. Salinity

B. Nutrient parameters

- i. Nitrates
- ii. Nitrites
- iii. Phosphates
- iv. Ammoniacal nitrogen

C. Pollution parameters

- i. Bio-chemical Oxygen Demand
- ii. Organic matter concentration
- iii. Oil and grease

D. Heavy metals

- i. Manganese
- ii. Zinc
- iii. Copper
- iv. Lead

E. Microbiological Parameters

- i. Faecal Coliform count

2.1 Collection of samples

Water samples were collected from seven stations in the lagoon and sediment samples were also collected from the same locations. Table I gives a brief description of selected sampling sites and Fig. I indicates their locations.

Temperature, salinity, pH and dissolved oxygen were measured *in situ*; the rest of the parameters were analysed in the laboratory according to the techniques given by Department of the Environment (1980), APHA/AWWA/WPCF (1985) & Hanson (1973). In the case of saline

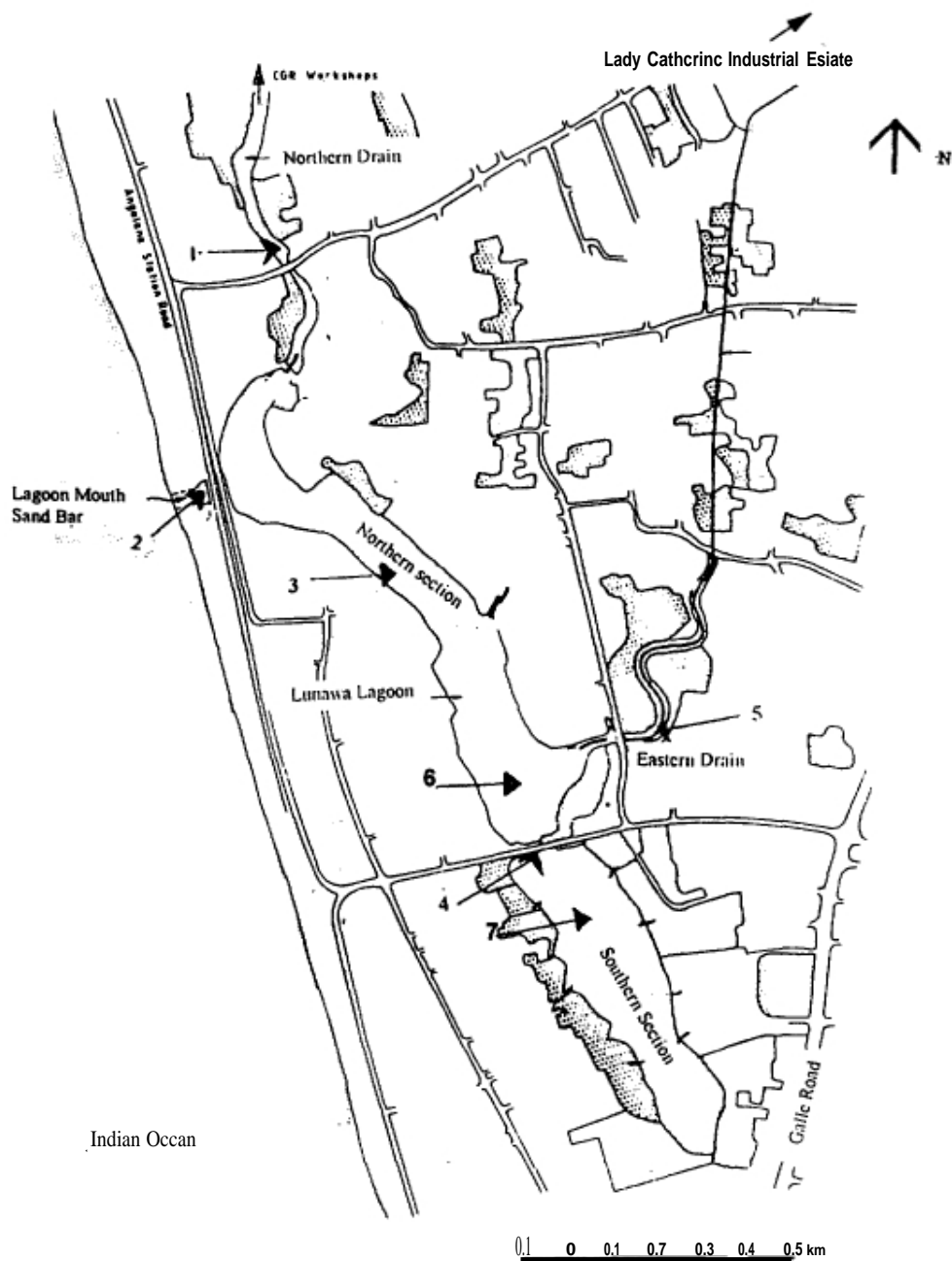


Fig. 1. Lunawa Lagoon, indicating location of sampling sites.

conditions, analyses were conducted according to Parson et al (1984). Discussions were also held with the fishermen who had experienced the ill effects resulting from industrial pollution.

Table 1
Description of Sampling Stations

Station No.	Specific Features
1.	Northern Drain, at the bridge on Angulana Station Road. This drain carries waste water from the CGR workshop.
2.	The point where the lagoon opens into the sea. Most of the time the outlet is closed due to formation of the Sand Bar.
3.	This point is located in the western bend of the lagoon. Densely populated area.
4.	The bridge at Lunawa Station Road. This is the narrow connection point between the Northern & Southern sections of the lagoon.
5.	Eastern Drain which carries polluted water from Lady Catherine Industrial Estate.
6.	This point is located in the lagoon proper at the Northern section in close proximity to the eastern drain outlet.
7.	This point is located in the lagoon proper-southern section which receives surface runoff & domestic waste.

3. RESULTS

Analytical results are presented in Tables 2, 3 and 4.

3.1 Basic physico-chemical parameters

The variation in the temperature determined did not show any drastic changes during the short period of study. However, salinity varied from freshwater to saline conditions i.e. zero to 15 ppt. Turbidity varied from 5.8 to 29 NTU, whereas pH values varied from 6.63 to 8.31 indicating slightly acidic and alkaline conditions at different locations (Table 2.)

Total lack of dissolved oxygen was reported from Station 5 whereas Station No. 1 too had a value less than 2 mg/l during the period of the study. Stations 2, 3, 6 & 7 indicated super saturation of dissolved oxygen varying between 7.2 and 18.6 mg/l indicating eutrophic conditions during daytime (Table 2)

Nitrate concentrations in the water varied from 0.11 mg/l to 5.74 mg/l whereas nitrite concentrations varied from 0.02 to 0.35 mg/l. Available phosphates in the water samples also varied between 0.08 and 1.31 mg/l all of which can contribute to the eutrophic conditions. Furthermore, sediments collected from the same locations contained large amounts of total phosphates (Table 2). In addition, ammoniacal nitrogen in the lagoon varied from 7.8 mg/l to 18.2 mg/l under drought conditions whereas concentrations varied between 0.38 mg/l and 33.9 mg/l after rains. A high value was observed from station No. 1 which receives a storm water drain from the nearby area (Table 2)

Table 2.
Mean values of physico-chemical water quality parameters in Lunawa Lagoon.

Station	1	2	3	4	5	6	7
Water temperature oC	28	28	27	26	28	28	26
Salinity ppt	0	7.5	2.5	2.5	0	0	0
Conductivity mS/cm	1.48	17.42	10.4	5.9	0.9	3.28	4.25
Turbidity NTU	17.8	7.9	7.9	11	19.5	17	8
pH	6.7	7.6	8.3	7.6	7.1	6.9	6.9
Dissolved oxygen mg/l	1.0	9.5	14.6	8.8	0.5	18.6	7.2
Oil & grease mg/l	1672	1972			2804	988	696
Ammoniacal nitrogen mg/l	26.05	8.12	7.8	13.8	15.4	0.48	0.38
Nitrate nitrogen mg/l	1.23	1.67	4.28	5.7	0.85	0.11	2.39
Nitrite nitrogen mg/l	0.21	0.015	0.07	0.02	0.02	0.04	0.34
Phosphate mg/l	0.78	0.13	0.11	0.12	0.36	0.17	0.15
BOD mg/l	20	55	12.6	82.2	81	1.26	27.8
Organic matter mg/l	14	36	16	14	62	14	
Copper mg/l	0.01	0.013	0.013	0.061	0.014	0.007	0.011
Lead mg/l	0.002	0.005	0.005	0.004	0.003	0.003	0.004
Zinc mg/l	0.023	0.064	0.1	0.13	0.09	0.016	0.045
Manganese mg/l	0.1	0.067	0.036	0.05	0.34	0.086	0.019

3.2 Pollution parameters

BOD varied from 12.6 mg/l to 145.4 mg/l in the samples collected from the lagoon. The highest level of pollution was recorded at station 5. Organic matter concentrations varied from 6 to 62 mg/l. Stations 2 and 6 contained high levels of organic matter. Drains originating from populated areas release their organic loads into the lagoon in close proximity to station 2 (Table 2). Extremely high concentration of oil and grease, ranging from 0.9 g/l to 2.8 g/l, indicate heavy contamination of the water (Table 2).

Determination of concentrations of some heavy metals in the lagoon waters and sediment samples indicated that Manganese, Zinc, Copper and Lead were available in the sediment and in the water. Concentrations of manganese in the water varied from 0.02 to 0.37 mg/l; copper concentrations varied from 0.006 to 0.061 mg/l; zinc concentrations were found to be between 0.016 and 0.135 mg/l whereas lead levels were between 0.001 and 0.008 mg/l. As could be expected, the levels found in the sediments were higher than those in the water (Table 3).

3.3 Species diversity

A considerable biodiversity i.e. at least 22 fish species and six species of crustaceans had previously been recorded (Table 4). With respect to the fishery in the lagoon, the fishermen claimed

Table 3.
Lead, copper and total phosphorus in the sediments of Lunawa Lagoon.

Station	1	2	3	4	5	6	7
Coppermg/kg	0.013	0.009	0.291	2.114	0.855	nd.	nd.
Leadmg/kg	0.023	0.028	0.139	0.145	0.036	nd.	nd.
Totalphosphorusmg/kg	85.6	55.53	372.4	169.4	99.7	nd.	nd.

that the species diversity changed and there was a high abundance of *Lepidocephalus thermalis* (Ahirawa) during 1979. Later Tilapia became dominant in the lagoon. A limited number of fish species are found in the lagoon at present but the fishermen claim their flesh is not edible due to the unacceptable oily taste. Similarly, phyto- and zooplankton diversity has been reduced and replaced by blue-green algae (*Spirulina* sp. and *Anabaena* sp. – filamentous blue greens) and a few tolerant zooplankton species (*Daphnia* sp. & *Brachionus* sp.).

4. DISCUSSION

The study revealed that the water in the lagoon is not only eutrophicated but also contaminated with heavy metals. A considerable area is covered by aquatic weeds mainly consisting of water hyacinth. Water stagnates in some areas and provides breeding grounds for insect vectors such as mosquitoes. The formation of the sand bar prevents fluctuations of sea water and aggravates the water quality problems. These observations on sand bar formation and water movements are in line with those of Jayakody (1988). The pH values recorded in his report are slightly acidic (4.2–6.2) whereas such low pH values were not recorded during the period of the present study. The recorded levels of dissolved oxygen in 1988 were found within the range of 3 and 4.2 mg/l whereas complete absence of dissolved oxygen was also recorded in some areas during this study.

Some areas of the lagoon are inaccessible due to siltation and the dense growth of water plants. Dissolved oxygen and biochemical oxygen demand were negatively correlated. All nutrients i.e. nitrates, nitrites, phosphates and ammoniacal nitrogen were found to be well in excess of levels which would indicate eutrophic conditions (Yoshikawa, 1985). Observations supported these results since aquatic weeds were thriving and covered a considerable area of the lagoon (BKH Consulting Engineers, 1987). Species diversity was observed to be very limited also indicating high levels of pollution. Nutrient loading would have resulted in the present eutrophic conditions under which excess oxygen is released during the day allowing the water to become supersaturated in the areas where there were high densities of algae. This was also evident from the green colour of the water in some places. Blue green algal blooms in some places were dominated by *Spirulina* and *Anabaena* sp. Dominant zooplankton populations varied from station to station and some areas which had less oxygen were dominated by species of *Daphnia*.

The levels of hydrogen sulphide observed in the lagoon exceeded the maximum allowable concentrations for a healthy aquatic environment. Where hydrogen sulphide levels exceeded the limits, little or no dissolved oxygen was determined. The toxicity of hydrogen sulphide itself can severely damage the fish population and is in line with the reported decline in fish catches. According to the fishermen in the area catches of fish and prawn catches to be 200 and 10

Table 4.
Fish and crustaceans found in Lunawa Lagoon prior to the pollution problem.

Common name (Sinhala)	Common name (English)	Zoological name
Thambaiaya	Red snapper	<i>Lutianus argentimaculatus</i>
Moda	Barramundi	<i>Lates calcarifer</i>
Gan koralaya	Pearl spot	<i>Etroplus suratensis</i>
Ilathaya	Scat	<i>Scatophagus argus</i>
Kapuhanda	Mono	<i>Monodactylus argenteus</i>
Kawaiya	Climbing perch	<i>Anabas testudineus</i>
Madakariya	Green snake head	<i>Ophiocephalus punciatus</i>
Lula	Striped snake head	<i>Ophiocephalus striatus</i>
Godaya	Mullet	<i>Mug/isp.</i>
Waligowwa	Ban eyed goby	<i>Glossogobius giuris</i>
Ahirawa	Malabarsprat	<i>Ehirawafluviatilis</i>
Wekkaya	Milk fish	<i>Chanos chanos</i>
Petiya	Olive barb	<i>Puntius sarana</i>
Paratiya	Yellow tailed scad	<i>Acute mate</i>
Katilia	Common glass fish	<i>Ambassis commersoni</i>
Hal messa	Anchovy	<i>Engraulis sp.</i>
Kalanda	Silver whiting	<i>Sillago sihama</i>
Kossa	Reefcod	<i>Epinephelus tauvina</i>
Anguluwa	Long whiskered catfish	<i>Mystus gulio</i>
Tilapia	Tilapia	<i>Oreochromis mossambicus</i>
Kalissa		<i>Penaeus monodon</i>
Malissa		<i>Penaeus dobsoni</i>
Kin issa		<i>Penaeus indicus</i>
Kakuluwa	Mud crab	<i>Scylla serrata</i>

kg/fisherman/day respectively but there is little or no fishery activity at present. Sand bar formation prevents the recruitment of fish and other resources as reported by Jayakody (1988) and the present quality of the water and sediment is a not suitable environment for many edible fish.

The heavy metal concentrations determined in the sediments and in the water column are fairly high and the lagoon at present receives untreated industrial effluent. According to Freedman (1989) background concentrations of heavy metals such as manganese, zinc, copper and lead in fresh water are 0.008, 0.0015, 0.003, and 0.003 mg/l respectively. The values determined for the same metals in Lunawa lagoon waters exceeded those background concentrations indicating contamination of water due to the release of industrial effluents. There is no doubt that higher concentrations of these metals would be found in fish due to bioaccumulation. The presence of other toxic metals such as cadmium, mercury and chromium cannot be ruled out. Attempts were not made to determine the bioaccumulation of heavy metals in aquatic organisms.

The guidelines set for the marine coastal waters liable to pollution (Bureau of Ceylon Standards, 1987) specified that oil and grease in the surface layer should not exceed 0.1 mg/l.

Extremely high concentrations of oil and grease, ranging from 0.9 g/l to 2.8 g/l indicated heavy contamination of the water and no doubt fish in the lagoon may also be contaminated. The major source of oil and grease could be the industrial estates/ industries in the area which are estimated to produce 66 kg/day, with 61 kg/day of this being from the textile manufacturing sector (Associated Engineering, 1994.). These contaminants have severely detrimental effects on aquatic resources such as the clogging of gills of fish as well as causing anoxia due to poor oxygen exchange between the atmosphere and the surface water.

Supporting evidence comes from the report of Associated Engineering (1994) to confirm that the catchment of the lagoon receives a heavy load of pollutants. The loading of waste water generated from industrial establishments per day is estimated to be 3272 m³. This waste water flow has a BOD₅ of 1681 kg /d, COD, 3846 kg/d and Total Suspended Solids 368 kg/d whereas the total nitrogen released is 399 kg/d and total phosphorus 11 kg/d, all of which ultimately find their way to the lagoon contaminating water, soil, and to some extent the air as well. In addition domestic waste water loading contributes a further BOD₅ of 4413 kg/d, almost three times greater than the level of industrial releases to the environment.

It should therefore be noted that while the untreated wastes from the industrial establishments in the area are largely responsible for the degradation of aquatic resources, the residents living on the Lagoon reservation also contribute to the pollution of water and the pollution of Lunawa lagoon cannot therefore be reversed naturally. All parameters determined exceeded the environmental quality standards set for fishery activities and nature conservation drafted by the Central Environmental Authority (1991).

5. RECOMMENDATIONS AND MANAGEMENT ISSUES.

This study leads to the following recommendations for remedial measures to rectify the situation although it may take a long time for the lagoon to become a diverse, healthy aquatic system again.

- i. Prevention of indiscriminate release of untreated liquid wastes generated from industrial establishments.
- ii. Prohibition of disposal of solid wastes into feeder streams and marshy areas of the lagoon.
- iii. Prevention of unsatisfactory disposal of sewage from housing complexes and low income squatter families.
- iv. Designate and enforce a buffer zone surrounding the lagoon.
- v. Construction and proper maintenance of silt traps wherever necessary.
- vi. Dredging of the lagoon and removal of bottom sediment which is contaminated with heavy metals.

- vii. Make necessary arrangements to provide industrial waste treatment facilities to the industrial establishments. (Attention be given to the provision of a common sewerage treatment plant.)
- viii. Prohibit release of treated effluent into storm water canal system and the lagoon.
- ix. Removal of sand bar from time to time for the purpose of flushing the lagoon and recruitment of fish and prawn species.
- x. Educational programmes for factories, households and schools in the area on the causes for degradation of the lagoon and the methods for restoration.

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INTEGRATION OF FISHERY MANAGEMENT INTO COASTAL AREA MANAGEMENT PLANS IN SRI LANKA.

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ABSTRACT

The coastal zone of Sri Lanka has three main components: a relatively narrow continental shelf from 2–20 km wide, a number of shallow coastal lagoons and estuaries, and some coral reefs. These habitats are rich in species and in 1993 70% of the total marine harvest came from the coastal zone. The coastal zone is also important for aquaculture.

The interaction between the fishing community and other components of the coastal zone is two way. Fishing has an impact on fish stocks and increasing numbers of fishermen living along the coast have a direct impact on the coastal vegetation, including mangroves, and this contributes to instability of the coastal zone. Although the erosion and deposition of sand from the coast is primarily linked to natural cycles such as the monsoons, these processes are altered by human activities such as agriculture, forest clearance and construction activities. Landfill in estuaries, sand and coral mining and industrial pollution are all particularly detrimental to fisheries and the livelihoods of fishing communities. It is therefore important that fisheries management is integrated into the general Coastal Zone Management Plan and that the latter must be well defined legally, must be supported by the public, and must be flexible enough to accommodate long-standing rights and privileges exercised by those living along the coast and exploiting the coastal zone resources.

1. INTRODUCTION

In the 1920s the government of Sri Lanka realised the importance of the coast and the problems associated with it. During that period erosion of the coast was a major problem and their efforts were all directed towards its arrest. The agencies responsible were the Departments of Railways, Highways, Irrigation and Public Works. Due to lack of understanding of the fragile and vulnerable nature of the coastal zone and its users, especially the fishermen, no action was taken to arrest the deterioration other than erosion. As a result the problems associated with the coast became acute and complex.

In 1984 an advisory council comprising representatives from a number of Ministries responsible for the resources and the constructions in the coastal areas laid down a set of principles to arrest further destruction of the coastal zone. The Department of Coast Conservation, which was then an arm of the Ministry of Fisheries and Aquatic Resources, played the role of coordinator. At the discussion the Ministry also played a major role as the representative of the fishermen who live in the area and use this resource for their living.

The principles laid down at the discussions were based on the following:

1. The nature of the coast,
2. Its common heritage,
3. The state's responsibility and its limits,

4. The necessity of a plan to manage the coastal resource and its powers,
5. Inter-agency coordination and cooperation,
6. Community understanding and support in management of the coastal resources.

The principles laid down were later used in formulating the coastal management plan. To manage the fisheries activities in the coastal zone, the Department of Fisheries and Aquatic Resources with the help of UNDP is preparing a management plan for the Fisheries Sector. This paper will discuss integration of fishery management into the Coastal Zone Management Plan.

2. FISHERIES RESOURCE IN THE COASTAL ZONE

2.1 Fish Resources in Coastal waters

Coastal waters are defined as the strip of sea over the continental shelf. The continental shelf around Sri Lanka is a narrow platform, having a mean width of 20 km. But at a few points off the east coast it narrows to 1–3 km. To the north and northwest the shelf widens into an extensive shallow bank and forms the floor of the Gulf of Mannar, Palk Bay and the Pedro Bank before merging with the continental shelf of the Indian mainland. Sri Lanka, being a tropical country, has waters which are very rich in species which are very varied in quantity. There are over 500 species of edible fish found in coastal waters. Their sizes range from 4 cm long Sprats (*Anchoviella* spp) to 1–2 meter long Marlins (*Histiophoridae* spp). Closer to the inshore areas the resource is large compared to the resource beyond, the majority being small pelagic species.

In 1993 170,000 t, amounting to more than 70% of the total marine catch, was harvested from the coastal zone. Ninety percent of this catch was pelagic species which move in large shoals and form the dominant group in beach seine landings. Species of fish such as pony fishes (Leiognathidae), Sprats, Sardines (*Amblygasrer* spp) and herring-like fishes (Clupeiformes) contribute greatly to the inshore gillnet and beach seine fisheries. Other pelagic fish found in large numbers in Sri Lankan waters are the Mackerel (*Rastrelliger* spp) Horse mackerel (Carangidae), Flying fish (*Exocoetus* spp), pomfrets (Sphyratnidae), Garfish (Belonidae), Barracuda (Sphyraenidae), Mackerel tuna (*Euthynus affinis*), frigate Mackerel (*Auxis thazard*) and Skipjack (*Katsuwonus pelamis*). Among the valuable bottom living species the brightly coloured fish such as Parrot fish (Scaridae), young groupers (Serranidae), Coral fish (Chaetodontidae), Angel fish (Pomacanthidae) and Wrasses (Labridae) are found mostly in coral reefs. Among the submerged rocky bottoms, common species found are Snappers (Lutianidae) and Bream (Lethrinidae).

2.2 Lagoons and estuaries

The lagoons and estuaries are an interface between marine, freshwater and land. They are important coastal environments which are highly productive and the effects of which extend out into coastal seas. The fauna and flora that live in these areas are able to live over or in muddy substrates and are able to withstand fluctuating salinity. The principal species of fish which feed in estuaries are representatives of a number of families including Sprats, Herrings and Grey Mullet.

2.3 Coral reefs and rock

Coral reefs are regions of high benthic primary producers. They have maximum growth at depths less than 25 meters and at temperatures between 25°C—29°C. They form 2 to 3 percent of the nation's total shore line (Coastal Zone Management Plan, 1990) and provide diverse living opportunities for a multitude of plants and animals. Young stages of many valuable bottom living species of fish are found here. In Sri Lanka nearly 75 species of fish belong to the Wrasses, Demoiselles, Angle fish and Coral fish are found in large numbers in the reefs. The coral reefs are also places of shelter for lobsters. Another aquatic animal of commercial value found in large numbers is the Pearl oyster which grows on large patches of hard sea bed at many points round the coast specially in the Gulf of Mannar.

3. IMPORTANCE OF THE COASTAL ZONE TO THE FISHERY INDUSTRY

Sri Lanka has a population of 17.7 million. To satisfy its fish protein requirements it needs 270,000 t of fish per year, 220,000 t of which is taken from its own waters, the rest is imported. The marine sector contributes 202,000 t to the total fish catch, the balance comes from inland waters. Coastal waters contribute 80% of the marine catch, the balance comes from the deep sea and offshore areas. The deep and offshore catches are mostly tuna, tuna-like fish, bill fishes and sharks the majority of which spend their young days in coastal waters before they move out to the deep sea. The fish stocks in coastal waters rely on the primary production of those waters which may be affected by pollutants that may enter the coastal waters or be destroyed by the destruction of lagoons, estuaries and coral reefs.

3.1 Importance of coastal zone to coastal aquaculture

In 1993 nearly 1500 t of shrimps were exported from Sri Lanka most of them cultured. In the western coastal zone, where most of these prawn farms are located, land suitable for prawn culture is hard to obtain. Further, the egg bearing female prawns and prawn larvae needed for culture have to be obtained from the coastal waters. Degradation of the coastal water reduces the number of larvae and berried prawn resulting in collapse of the industry.

3.2 Coastal areas are important for fishery activities.

The coastal zone is the area where most fishery activities take place. The fishermen not only build houses in the coastal area but also land, dry and process their catch there. In Sri Lanka there are nearly 1000 landing places most of which are scattered along the coast. With the introduction of large motorised boats the number of landing places has reduced. A number of landing places, anchorages and harbours have developed (locations of fishery harbours include Kirinda, Tangalle, Puranawella, Mirissa, Galle, Beruwala, Mutwal, Mannar, Myladdy, Trincomalee and Valachchihi). The coastal zone is also where fishing boats are built and repaired, the main boat building areas are in Negombo, Jaffna and Beruwala. Repair facilities are available at most of the harbours and anchorages. Vital statistics from the fisheries sector are shown in Table 1.

Table 1.
Statistics of the fisheries sector in Sri Lanka.

1.	Fishing population	marine	412,200
		inland	55,909
	Total fishing population		468,109
	Projected population of Sri Lanka		17,433,200
	Fishing population as percentage of total population		2.78%
2.	Active fishermen (1989)	marine	98,444
		inland	12,891
	Total active fishermen		111,335
3.	Fishing households (1989)	marine	87,808
		inland	11,451
	Total number of fishing households		99,259
4.	Fleet strength (1989)	marine inboard craft	2357
		outboard craft	9028
		non-mechanised	15,136
		inland non-mechanised	4058
	Total fleet		30,579
5.	Number of fishing villages	marine	1050
		inland	1289
	Total number of fishing villages		2339
6.	Contribution of fishery to Gross Domestic Product		2.2%

(Source: Fisheries Survey 1989)

4. THE IMPACT OF THE COASTAL ZONE ON FISHERIES

4.1 Coastal erosion and its effect on fishing villages

The interface between water and land is dynamic. Apart from man made causes storms, waves and currents carry sand from place to place, eroding at one place and depositing it in another, changing the shoreline constantly. During calm weather waves deposit sediment and build up the beach. In rough weather the wind energy dissipates on the shore causing erosion of the beach. Coast erosion takes place when removal of sand exceeds deposition and it has been estimated that approximately 175,000—285,000 m² of coastal land is lost each year in the coastal belt extending from Kalpitiya to Yala National Park.

Erosion in the south and west of the Island is high during the beginning of the southwest monsoon and on the North and East coasts at the end of the Northeast monsoon. Unless the eroded sand returns shoreward from offshore areas during the calm season the beach shrinks, resulting in decrease in size of the fishing villages (e.g. Dehiwala, Moratuwa, Ulhithiyawa, Kandakuli) and the areas for fishing operations (e.g. beach seine operations in Colombo District).

Rising sea level is also causing decrease of the shoreline. Recent estimates have shown that over the last century all over the globe there has been 0.5 to 2.0 m rise in sea level causing coastal dwellers, the fishermen, to move landwards.

4.2 Coastal deposition and its effect on the fishing industry

Accretion of sand obstructs rivers and other water outlets, prevents escape of flood water resulting in lowering of salinity (e.g. Koggala lake) and flooding of dwellings, and prevents the escape of industrial effluent resulting in destruction to aquatic life (e.g. Lunawa Lagoon). It also impedes entry of aquatic fauna and oxygenated water from the sea resulting in lowering of fish production (e.g. Mundal lagoon). Deposition of sand on the seabed also causes destruction of fish habitat. In areas north of Talawila sand deposits have destroyed the aquatic environment causing destruction of fishing grounds (e.g. the beach seine fishery in Kandakuli South).

Land fill in estuaries and lagoons is most often carried out for housing construction or for urban expansion (e.g. Negombo, Crow Island, Mattakkuliya). In Negombo the areas adjoining the lagoon were filled in for housing, reducing the area of mangroves. In Trincomalee sections of the bay have been filled for construction of industrial projects. In most coastal areas individuals residing on the banks of lagoons and estuaries encroach on to the estuary or to the lagoon in order to increase their land area, reducing the effective water area of the estuary or the lagoon and leaving little room for fish to breed and grow.

4.3 Sand and coral mining causes destruction to fishing villages and to aquatic life

Sand and sea shells are used for the construction industry. In 1984 approximately one and a half million cubic meters of sand were mined from the coastal region for construction purposes. Removal of sand from river outfalls along the coast leads to coastal erosion and beach retreat causing destruction of large numbers of fishermen's houses. (e.g. Moratuwa, Lunawa)

Corals have been used in Sri Lanka from time immemorial in the building industry. In the southern and western coastal areas corals were used instead of bricks in construction work (e.g. the forts of Kalpitiya and Galle, and houses on the south western coast). Coral in the form of lime is used as binding, plastering and as painting material in the building industry. It is also used to remove acidity in agricultural lands and as a chemical in the ceramic, sugar, steel and fertiliser industries. Corals are extracted by breaking coral reefs, by collecting coral debris and by mining dead corals from inland areas (e.g. Kahawa, Thelwatta, Akurala, Ambalangoda). All these actions cause destruction of the fragile coastal zone where fishermen live.

Coral reefs are places where primary production is said to be as high as $5000 \text{ g C m}^{-2} \text{ y}^{-1}$. They support highly productive filamentous green algae, blue green algae and symbiotic Zooxanthallae, on or in coral skeletons. Juveniles of many economically important demersal fish (e.g. Grouper (Serranidae), Parrot fish (Scaridae) Wrasses, Damoiseselles, Angel fish and Coral fish.) live among corals and feed on algae on the coral and on the coral polyps.

Destruction of corals is caused not only by coral miners but also by persons employed in other trades such as tourism and ornamental fish exporters. Tourists and persons employed by the tourist trade walk over the coral to get a close view of coral beds while others collect pieces of coral as souvenirs. Those who want to see the corals anchor over the reefs damaging the live corals, still others catch multicoloured coral fish for export. All these destroy the fish and fish habitats.

4.4 Discharge of pollutants to the coastal waters reduces marine production

Most of the coastal tourist developments have problems disposing of waste water and sewage due to lack of adequate space for the necessary structures. Most developers use the space for room expansion leaving no room for waste disposal. Most hotels in Hikkaduwa, Negombo and Beruwala allow sewage and waste water to empty on to the beach. In certain instances the waste water pits are located very close to the high water mark. Pollution through these sources affects the coral reefs (e.g. Hikkaduwa) and other biological environments reducing marine production.

5. THE IMPACT OF FISHERIES ON THE COASTAL ZONE

Sri Lanka has a population of 17.5 million of which 0.45 million depend on fisheries for their living (Table 1). They live in 1050 villages distributed along the coastal zone. Almost all live within 2 km of the beach. Unlike in agriculture, the houses of fishermen are built close together, a style that has evolved in order to muster combined effort for bringing the catch to the shore, dragging the craft and gear to the beach and also for security. The majority of fishing villages are sited close to the fishing grounds. Since most of the fishing grounds are situated close to the river or lagoon mouths the fishermen prefer to live closer to the shore where the rivers or the lagoons opens to the sea (Negombo, Chilaw, Kalpitiya, Mutwal, Panadura, Kokilai, Nayaru, Batticaloa, Valachchiennai). These coastal dwellers use not only the land and living resources but also the non-living resource of the coastal zone.

5.1 Fishing settlements exerts pressure on coastal vegetation

The last few centuries have seen a gradual increase in population in the maritime area causing a heavy demand for land and the plants that grow on it, thus causing changes to the coastal zone. In the south west maritime zone the Palmyra tree which was growing profusely has totally disappeared leaving only its name at places where it grew (e.g. Tal Aramba is Palmyra forest, Tal pitiya is Palmyra garden). These trees would have been used by the early settler fishermen to construct their houses and boats (e.g. palm trunks are used for boat building in the Maldives even today). Being a hardy tree it would have resisted the heavy southwest monsoon winds (during May – October) by absorbing its energy. Its bushy roots trap fine sand and soil particles making the top sandy layer erosion resistant. Removal of such vegetation would have been the preliminary step towards coastal erosion.

Rhizophora sp is the dominant mangrove plant in the wet zone. Mangroves were used in building houses making boats, fish traps, brush piles and for staining nets and sails in addition to its use as firewood. The expanding fishing villages which were close to the lagoons or river mouths have used the mangrove vegetation for all these purposes.

5.2 Impact of fishing on the coastal fish resource

The survey carried out by the Norwegian Research Vessel “*Dr. Fridtjof Nansen*” estimated that the total biomass of Sri Lanka’s continental shelf and the area immediately adjacent to it was 750,000 t. The annual sustainable yield (ASY) of this resource is said to be 250,000 t of which 175,000 t is pelagic and 75,000 t is demersal and semi-demersal. The present coastal production from the above resource is 170,000 t of which 159,700 t is pelagic and the balance 11,300 t is

demersal (Fisheries statistics, 1993, Ministry of Fisheries and Aquatic Resources). The coastal pelagic resource is nearing the annual sustainable yield (ASY) but the district based catch analyses show heavy pressure on the resource and at certain times over exploitation.

5.3 Use of wood for craft building exerts pressure on depleting coastal forest cover

Sri Lanka has a fleet of 27800 fishing craft nearly 16500 of which are non-traditional Oru, Vallam, Teppam etc. (Ministry of Fisheries and Aquatic Resources, 1990). Although some are motorised all have wooden or fibre reinforced plastic (FRP) hulls. The hardwood needed for the manufacture of craft was mostly taken from the coastal zone. Due to lack of suitable wood for craft building fishermen are now using the only alternative available the fibre reinforced plastic (FRP) and most of the new craft used in the beach seine fishery today are made out of FRP.

5.4 Built structures cause coastal erosion

Every year during the monsoon period numbers of fishing villages face the danger of getting washed into the sea as a result of the heavy sea erosion. To arrest erosion boulders are piled along the coast as a protective measure. These measures sometimes cause more damage to the village or to the adjoining village. Whenever boulders are laid instead of the beach absorbing the energy of the wave it reflects some of the wave energy back to the next wave, which causes more damage to the coast. Further, heavy swash passes through the spaces between the boulders and removes the material when it recedes causing erosion behind the boulders.

Fishery harbours and anchorages with breakwaters built to supplement the shelter often have negative results. A dramatic example of such failure can be found in Kirinda where the harbour became silted up in a short period of time. Further, such breakwaters have created not only coastal erosion problems but have induced the entry of sand bearing currents in to the harbours causing siltation (e.g. Beruwala Harbour)

5.5 Removal of reefs and boulders for fishery activities result in coast erosion

Reefs that lie close to the surface of the sea acts as breakwaters and create calmer areas between the reef and the beach. These natural breakwaters are blasted with permission from the state agencies to create passages for fishing boats or to help beach seine operations. The waves enter through these breaches and erode the coast causing heavy damage to the shore.

6. INTEGRATION OF FISHERIES MANAGEMENT IN TO THE COASTAL ZONE MANAGEMENT PLAN.

Fisheries management is fundamentally a method of allocating the fisheries resource. In allocating the fisheries resource, a system has to be designed to divide the resource among the different type of fishing activities (e.g.- beach seiners, purse seiners, gillnetters, cast netters etc.). Long before any scientific understanding of fish stocks fishermen were aware of the reduction in abundance caused by over fishing. They knew that over fishing has to be dealt by collective action which later became the written fisheries law. They also knew the value of protecting the females and young animals by means of non-fishing seasons such as the breeding seasons or prohibition of fishing for young fish, and these were added to their laws. When the abundance of the stocks

further declined fishermen prevented outsiders coming to fish in to their area. When it further declined fishing was confined to a privileged few in the village. This situation is common to both rich and poor, developed and underdeveloped countries.

6.1 The common regulations widely used in fisheries management

- i. Closed areas: fishing prohibited in nursery, spawning or rapidly depleting areas.
- ii. Prohibited methods: use of explosives, poison or poison giving material in fishing is banned in any water body of Sri Lanka (e.g. Fisheries Ordinance section 14).
- iii. Protected female fish: female lobsters that carry eggs are protected (e.g. Spiny Lobster and Prawn (Shrimp) Regulation 1973).
- iv. Protected young fish: young lobsters are protected by lobster regulations, In inland water bodies young fish are protected by prohibition of gillnets having a mesh less than three inches.
- v. Protection for species: endangered species are protected by banning or controlling exports. (Fisheries Ordinance Sec. 12).

The above measures have been applied for centuries all over the world and in Sri Lanka during the last few decades. But these laws cannot ensure conservation. To control and protect the fish stock knowledge of the size of the fish stock is required. In Sri Lanka an attempt was made in 1978 —1980 to assess the fish stock in the coastal waters. The report published has been used even today to prevent over fishing in coastal waters. The department of Fisheries and Aquatic Resources, which is responsible for the management of fisheries in Sri Lanka, frames regulations to achieve maximum sustainable yield and for orderly fishing. It collects basic statistics on catch, fishermen, households, boats, methods, areas etc. It also enforces regulations to identify and licence boats (Registration of fishing boats regulation, 1980), levy tax on size and/ or weight of boats (Foreign fishing boat regulation, 1981), issue permits to regulate the catch (e.g. Purse seine regulation). The information gathered is used in the introduction or reduction of boats to achieve the maximum sustainable yield.

6.2 Features that should go into an integrated coastal zone management plan

- The coastal zone management plan must be broad based and well defined.

To integrate a fisheries management plan within the coastal area management plan, the latter must be broad enough to accommodate fisheries. It must also have an institutional and legal framework for such integration. Further, each sector in the coastal area management plan must have a well defined area of action with responsibilities and arrangements for coordination with other sectors of the plan.

In the fisheries sector fish stocks in the coastal waters rely on primary production of that area. The primary production will be affected if the water in the coastal area is polluted. The pollutants discharged from industries and agricultural land (e.g. pesticides and fertiliser run off) reach coastal waters through water ways, estuaries

and lagoons. If the area of action is not well defined and the institutional structure is not strong, prevention of pollutant discharge may be difficult, resulting in resource reduction.

- The coastal zone management plan must have legal power.

The resources of the coastal zone are daily getting scarcer and, as a result, different sectors of the coastal zone may compete for the same resource and this will lead to conflicts. To deal with such conflicts there must be provisions and mechanisms with legal powers in the coastal zone management plan.

- It must be supported by the public.

In integration of fisheries into the coastal zone management plan policies made must be supported by the public. Decisions taken without public support may fail during implementation. Further, awareness has to be created among the public regarding the decisions made. This awareness can be created by having discussions, workshops and seminars for persons who are affected or benefited by the decisions.

- It must be flexible and long-standing rights and the privileges must be honoured.

In Sri Lanka, coastal waters and beaches have been used by the fishermen for centuries without any hindrance although there have been some problems with a few developers from the tourist industry. In preparing policies for integration of fisheries, due care and respect has to be given to ancient rights and privileges (e.g. beaches are common property, every person has the right to approach them and use them). When regulations are framed to control the use of a resource through prohibitions or restrictions it should be made sufficiently flexible to deal with different types of situations.

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CURRENT ISSUES OF FISHERIES PROJECT DESIGN

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ABSTRACT

Despite the importance of fish as a source of protein, and frequently as a source of export income in developing countries, fisheries development projects have a very poor record of success. Lending to the fisheries sector by international banks and aid agencies has therefore declined in recent years and fisheries development is in crisis. This paper examines the lessons to be learned from previous projects and discusses the principle areas of project design and implementation which need improvement. These include, project preparation and formulation, management and supervision of the project, design and selection of fishing vessels, the need for hard information on the fisheries resources, conditions for fisheries credit and loan repayments and the two-way environmental aspects of fisheries projects – those of the fishery on the environment as well as those of such factors as pollution on the fishery. The paper concludes with some comments on the current thinking of major banks with regard to their support for the fishery sector.

1. INTRODUCTION

1.1 Importance of the sector

Fish is the largest single source of animal protein and one of the fastest growing food commodities entering international trade. The harvesting and processing of these resources is a source of income for over 150 million people, the majority of whom are in the low income groups. Fish represents the primary source of animal protein for over a billion people and is also one of the animal food items least influenced by religious principles. Recent research also shows that its regular inclusion in the diet helps to prevent cardiovascular diseases and other health disorders. World fish production peaked to 100 million tonnes in 1989. This dropped to some 97 million tonnes in 1990 because of the decline in pelagic catches by Japan, Chile and the Soviet Union. Preliminary indications are that there was a slight growth in 1991. Over 50% of this production came from developing countries. World fish production has exceeded that of beef, pork, sheep, poultry and eggs. In many developing countries, such as in Asia and the Pacific region, fisheries is also a major source of foreign exchange and is an important contributor to Gross Domestic Product. The importance of fisheries commodities, traded fisheries and technical staff, has greatly increased but has been hampered by the inflexibility in implementation of plans for future development. These factors are further discussed in the following paragraphs for fishery administrators to be fully aware of the major problems, and to safeguard against them in the future design and implementation of fisheries projects.

1.2 Important general issues in the fisheries sector

Harvesting of some commercial stocks has reached or will soon reach the top level of rational exploitation at a time when developing coastal states are stepping up their efforts to increase domestic food supplies, generate foreign exchange, improve the fishery sector's added value and diversify their economies. This level has been reached as a result of free and open access to the sea, lack of good resource management practices and sustained increase in demand and prices. At the same time technological improvements have led to over capacity, particularly in the industrial

nations' distant water fleet, which despite their own extended jurisdiction, still operate under licences and other agreements or illegally, off the coasts of many developing nations because the developing nations lack the means to develop their own capabilities. Indiscriminate sale of licences to foreign vessels leads to overfishing of the coastal state resources, and many of these coastal states do not receive a fair share of the catch value because catches are often landed in foreign bases, or transhipped mid-stream to other destinations without a correct declaration of the catch weight to the coastal state authorities.

Developing countries lack the skills and means to manage the resources within their EEZ. Poor or non-existent surveillance and enforcement facilities put many Third World nations in a weak position to manage the operations of the foreign fleet in accordance with established agreements. This also applies to the local fleets which normally violate regulations. Coastal nations rely on the good will of the foreign interest which more often give very little or no importance even to the preservation of resources. At the same time the high costs of resource management programmes, makes it difficult to persuade Governments to implement such programmes and enforce established regulations.

Moreover, the international market is still growing. More than one third of the world's fish production enters international trade, the highest proportion of any basic commodity. In 1991, world fish trade amounted to around US\$35 billion, of which an estimated US\$18–19 billion in net foreign exchange earnings went to developing countries. Despite its importance on world markets and to the economies of the industrial and developing countries, Government's support, and allocation of adequate resources to the sector have been unsatisfactory. Fish production, other than from aquaculture, is still basically a hunting and gathering activity. The ability to increase national fish harvests depends on the national productivity of fish stock which is in urgent need of rational management and not just the level of effort applied to it.

1.3 Trends in investment

It is widely recognised that the record of success in fisheries development projects has been very low. Over the last decade, international financing of fisheries projects throughout the world, with the exception of those in a few countries, appears to be going through a crisis. There is widespread dissatisfaction with lending to the sector, in particular to capture fisheries, and commitments are falling. Lending to the fisheries sector by multinational banks and bilateral donors peaked worldwide in 1983 at around US\$500 million. This dropped to nearly US\$150 million in 1985. Since then there has been a declining trend in the number of projects financed annually. There are of course fisheries investments taking place other than through international financing, and these investments, which are not normally subject to detailed feasibility studies of a certain standard, are by public and private sector financing from entirely local sources. Statistics on such financing are scanty, but there is reason to believe that it exceeds the amount of official development assistance. The main problems encountered in these projects could be attributed to technical inadequacies, with weak project concept and design, administrative and managerial weaknesses of the implementing agencies. Poor supervision by financing institutions, due to lack of in-house resource management programmes, makes it difficult to persuade Governments to implement such programmes and enforce established regulations.

1.4 Changes in opportunities and requirements

Highly significant changes in global fisheries have occurred since the end of the Second World War. Two major changes are, first a shift from a period of rapid growth in total catch to a period of slow growth and, second, the general extension of national jurisdiction over fisheries.

Several other developments have also occurred. Notable among these were:

- i. the oil crisis of the seventies which had a paralysing effect on the fishing fleets, leading to an enormous drive to improve efficiency of fuel utilisation;
- ii. the mounting external debt and the chronic shortage of hard currency, which brought some of the fishing activities in developing countries to a virtual halt, since importation of spare parts and other essential imports were particularly difficult;
- iii. the law of the sea with its 200 miles extended jurisdiction and the responsibility of the coastal states for its management;
- iv. increase in catches from 40 to 100 million tons/year and doubling of the gross registered tonnage of the world's fishing fleet (5—10 million);
- v. the large number of licensing arrangements and joint ventures between foreign fleets and developing countries;
- vi. the virtual overfishing of most commercial species as a result of unsatisfactory property rights, free and open access, sustained increase in demand and prices and poor resource management;
- vii. the substantial growth in aquaculture, particularly of high value species through private initiatives such as in China, Thailand, Indonesia and elsewhere;
- viii. Pollution of coastal and inland waters and general environmental degradation. As a result, fisheries are facing new challenges and opportunities.

One other issue is the frequent conflicts between artisanal, semi-industrial and industrial fishing interests both local and foreign. To resolve these conflicts in open access fisheries is a problem and since goodwill between the interested parties is often lacking it is a challenging task.

Population growth, coupled with economic and social development are placing a heavy burden on coastal resources, often resulting in depletion of natural resources and their environment. Therefore, appropriate planning and integrated management of resource use and allocation becomes an essential task.

Post-harvest technologies and marketing systems have not kept pace with the increased catches. The loss resulting from discarding by-catch, and incidental catch from single species fisheries and spoilage as a result of bad handling and poor preservation represent millions of tonnes yearly. Of primary importance, therefore, is how to devise and implement cost effective programmes to reduce this waste, and improve the uses of the incidental and by-catches.

Poor and fragmented technological research has prevented the development of fish products from species that for economic and market reasons are not used for food production. At present they represent one third of total world catches. Better use of these resources should be of primary concern, bearing in mind the social and cost implications of such a measure.

Aquaculture, other than seaweed culture, still represents around 10% of the total world fish production, which reached 100 million tonnes in 1989. Development of aquaculture in third world nations faces severe technical and management problems, and it is still a long term process to bring these nations to the required level of management. Therefore, resources from the wild will continue to dominate world fish supplies for several decades. If aquaculture is expected to become a significant source of food fish products in the near future, strong support to research into culture techniques, feed formulation and fingerling production, training and extension should be provided.

1.5 Lessons from experience in project design and implementation

Sometime ago the FAO/Investment Centre reviewed the performance of some 70 projects in agriculture and related sectors that were implemented during 1980—1990. This study unfortunately dealt with only a few fisheries projects which were all financed by the World Bank. The objective of this study was to identify the extent to which projects ran into performance difficulties, which could be attributed to faulty design, and on the basis of this analysis to suggest improved approaches to project preparation. In this assessment some 22 types of general problem were identified, and grouped into several major categories as shown in Table 1.

In the limited number of fisheries projects, it was found that the most common problems were of an institutional nature followed by conceptual shortcomings. The institutional problems were mainly caused by assignment of insufficiently qualified staff to managerial positions, a problem compounded by frequent staff changes, and considerable delays in fielding, or poor quality of, technical assistance that was deemed necessary at the preparation or approval stage. It is possible for instance that the design of the project placed an unrealistically high demand on managerial and technical skills contributing to the non-sustainability of the project. Among the conceptual problems, unduly tight scheduling set at the appraisal stage, was one of the main problems in over 80% of the projects reviewed. The time over-run problems normally stem from consistently excessive optimism during project preparation. Because of this, loans have been cancelled due to excessive delays in disbursement.

Technical problems included production shortfalls, in some cases as much as 75% of the projected vessel catch, and the introduction of a fishing vessel type and design which was unacceptable to fishermen, and hence the credit component and the shore based processing facilities did not achieve their objectives. Often technologies on which a project is based have not been tested on a significant scale in the project environment.

Among financial problems the main one was the investment cost over-runs, again due to inadequate time available to collect realistic unit costs of equipment, material and labour. Overestimates of output prices and returns were mainly confined to export marketing where the availability of exportable quality fish, ease of access to markets and producers and price levels

had been too optimistically assessed at preparation and appraisal. In local marketing it was observed that real prices were sometimes above appraisal projections, possibly reflecting a relatively increasing scarcity of fishery products or import restrictions.

Often projects are not integrated into the sectoral and general economic environment. Projects tend to be prepared and financed in an *ad hoc* fashion, to enhance the visibility of special donors' assistance, and may not be consistent with national development plans and priorities. The result is a number of individualistic approaches, often sharing the same resources within the sector. This lack of coordination and sharing of experience between donors themselves and within Government, though recognised and often discussed, has not been remedied so far. Improved donor coordination has not yet been successful, because of the intense competition between donors for projects. It leads therefore to the importance of coordination at Government level, which would require strong institutions able to hold their own professionally, against the power of international donors, and supported by realistic and well prepared sectoral development plans. Another initiative to deal with the problem of *ad hoc* projects is the use of fisheries sector studies as a basis for potential sectoral involvement by various agencies.

Table 1.
Problems faced by fishery development projects.

Problem category	Problem type
Conceptual	Too many or unbalanced components
	Too big
	Schedule too tight
	Non-sustainable
	Inflexible*
Technical	Production technology deficiency
	Poor engineering
Financial/Economic	Under-estimated costs
	Counterpart and recurrent budget shortage
	Low output prices or market problems
Social	Inequitable benefit distribution
	Slow adoption
Institutional	Bad management or staffing
	Unsuitable organisational structure
	Ineffective technical assistance
	Procurement difficulties
	Land acquisition difficulties
Environmental	Poor monitoring and evaluation
	Natural disaster
Political	Resource degradation
	Turmoil or war
	Insufficient Government commitment

* Or, expressed differently, an absence of mechanisms intended to enable the project to respond to changing circumstances.

2. SOME COMMON ISSUES RELATED TO FISHERIES PROJECTS

2.1 Project Formulation

There have been gross inadequacies in the process of project identification, preparation and appraisal, due primarily to two reasons: inadequate time and funds available for this work, particularly when large construction work such as fishing ports and shore facilities are involved and where pre-investment studies are to be made; secondly, the limited range of technical experts deployed, and the lack of relevant technical experts in the various financing institutions. Areas which require major emphasis during project preparation and appraisal relate to:

- the fish resources and their level of exploitation,
- the market and its capacity to absorb increased catches at realistic prices,
- the fleet, fishing gear and fishermen's level of competence,
- the infrastructure needs,
- Government policy and institutional capability,
- catch and resource monitoring for sustainable development.

Unless all the relevant technical, institutional, financial and economic issues pertaining to a project proposal are fully covered during preparation and appraisal, the project is unlikely to perform satisfactorily or to attain its targets. Though good preparation still cannot guarantee success it can minimise the risk of failure. In most countries the fisheries administrations are weak in technical capability, and therefore their contributions are limited, although it is better if locally available knowledge and experience can be used for project preparation.

2.2 Project management and supervision

Project management which is the country's responsibility has not always been effective. As said earlier, these organisations are often weak in technical management skills and as government departments they are subjected to various rules and regulations and are vulnerable to shifts in political direction. Institution building under certain projects has been very effective, especially in relation to national development banks. Project management has also suffered from conflicts between various implementing agencies such as banks, port authorities, irrigation departments etc. and the local fisheries department. This to some extent has been overcome by allowing all agencies to participate in the project through coordinating committees.

Supervision on the part of financing institutions has not been as effective as it should have been, particularly as regards technical coverage. Given that the responsibility for implementation of projects must be shouldered by Governments, financial institutions must respond rapidly to changes in special circumstances of the situation. Often there is a lack of continuity of supervision mission members, and certainly a deficiency in technical supervision. Lack of continuity of supervisory personnel has caused serious problems in projects where views and ideas of different people have had to be implemented, causing severe cost overruns, and operational problems.

It is, therefore, necessary that when projects are complex adequate technical and managerial guidance should be provided on a more regular basis. As an example all fisheries harbour design and works require substantial civil engineering and fisheries operational expertise to avoid costly errors and to minimise problems such as siltation, wave erosion, faulty breakwater designs etc. and to take full account of the needs and practices of fishermen, fishing vessel captains, fish traders and others who are to use the new port facilities.

2.3 Fishing vessel design and selection

Most fisheries lending to date has been directed at the design, construction and sale of fishing vessels to fishermen, often with the aim of replacing obsolete craft and modernising the fleet. The aim in most cases was the production of standard types of vessel to be built under competitive bidding, with better standards of construction. Choice of vessel design and engine specification are of paramount importance and experienced fishermen have their own ideas about vessel specifications, and therefore a standard design should be based on a thorough analysis of fishermen's needs, likes and dislikes, fishing methods, local sea conditions, kinds of boats fishermen are accustomed to using etc. If such an analysis is not made at the outset, the slightest mishap will destroy the confidence of the fishermen. In cases where there is a major departure from existing vessel design, such changes should be carried out before the project, and fishermen's acceptance of the new design features should be studied after a long period of trial fishing.

2.4 Fisheries resources and statistics

The state of knowledge about fish resources has been one of the major problems in project design, and has been raised as an issue very frequently during project preparation. The response of Governments, banks and other donors to this consideration has been quite inadequate. Catch forecasting is difficult, as there are a number of variables which can influence catch rates. However, economic performance depends largely on the ability to forecast catches. This in turn depends on the country's organisations, physical resources and scientific capacity for study of the resources, calculating biomass and sustainable yields and thereafter monitoring the impact of a progressive increase in fishing effort. Very few developing countries have the people or the means to perform this job properly and continuously. Bilateral and other donor assistance to develop this capacity in the developing countries has not been very successful. The process of fisheries resources evaluation and monitoring also depends on the existence of a reliable system for the collection and analysis of fisheries statistics covering catches and fishing effort. Often statistical coverage is inadequate and its reliability suspect. Therefore increased support should be given to innovative research programmes, resources assessment and management and for developing reliable statistics.

2.5 Fisheries credit and loan repayments

Providing loans in cash or in kind to fishermen, particularly to artisanal fishermen, has given rise to more difficulties than there have been for any other area of development. Most countries which have established fisheries credit schemes of one sort or another have experienced difficulties with repayments and high rates of arrears or default. A majority of lending to fishermen still continues to be handled by the informal market. There are advantages and disadvantages in this system, but overall it appears to provide more benefits to the lender than to the fishermen. Where

local banks were the instruments of lending, eventual losses were covered by cross-subsidization from the bank's more profitable operations or direct contract from the treasury.

The essential drawbacks of most fisheries credit programmes are that they impose rigidities both on the lenders and borrowers, and the lenders lack of understanding of the fishermen's way of life. The lenders problems are the interest and maturities that are not in line with market conditions and of margins which do not cover transaction costs and risks. On the borrowers side, there have been difficulties because compliance was required with cumbersome formalities to obtain a loan, with restrictions imposed on fishermen to accept, for example, a newly designed boat which they did not like.

Often the fishermen's way of life is not appreciated and taken into account. The main points to consider are that fishermen have to move to wherever the fishing is good. Their earnings derive from daily sales of a highly perishable catch and sometimes amount to a very small proportion of the value of their boats and gear. Their earnings fluctuate widely from one season of the year to another depending on seasonal changes in the abundance of fish. Their earnings depend on going to sea each day, and a day ashore, for whatever reasons, costs a day's income. Therefore, lending agencies should be more flexible in the frequency and amount of repayment instalments, and avoid insisting on regular semi-annual payments at the office, monitoring the accounts, requiring fishermen to make long journeys, sometimes at the loss of one or two days earnings. Another important factor is the banks' familiarity with the sector which is the key to making fisheries credit competitive, with credit to other activities. The better the sector is known the lower are the banks' transaction costs and risks, and the means to achieve this acquaintance with the sector include special training of staff, continuity of bank personnel dealing with the fishery sub-sector and clients in fishing communities, collective group lending, and the improvement of bio-economic and socio-economic data.

2.6 Environmental aspects

Environmental considerations enter fisheries projects in two ways: the influence that a changing environment has on fisheries and the manner in which fisheries projects in turn affect the environment. Regarding the former, fisheries like other natural resource exploitation are threatened by destruction of the natural habitat through industrialisation, urbanisation, oil pollution, destruction of coral reefs and agricultural intensification. On the other hand, fisheries projects can damage the environment by cutting mangroves for shrimp farms, changing currents and siltation patterns by breakwater construction, depleting resources by excess fishing effort, and indiscriminate use of fishing gear such as trawling. A changing environment increases project risks and in the past this aspect was not been given much consideration during feasibility studies. There are cases where, due to severe environmental changes, facilities have been abandoned, or had to be redesigned and constructed at very high costs. In the future, risks attributed to environmental factors will no doubt gain in relative importance. Virtually all preparation and appraisal of fisheries projects contains a detailed evaluation of this aspect, to indicate side effects of a project on other sectors and to make a judgement on the sustainability of the project itself. Some areas of environmental concerns are given below.

In capture fisheries the major direct negative environmental impact is over exploitation. Over

fishing not only degrades the target fish population, but affects other fish species linked to its food chain. Trawling is of special concern because dragging nets along the bottom can damage benthic communities. Damage to coral reefs by anchors and divers can be significant. Use of explosives and poison would kill fish indiscriminately and destroy habitats.

Clearing of forests and increased agricultural activity will affect the quantity and quality of water entering rivers and streams, which in turn will have an impact on aquatic populations. The construction of flood control measures and irrigation schemes interrupt seasonal flooding and alter water quality, which in turn has a direct impact on fish breeding and growth. In culture fisheries the most obvious effect is the clearing of land for the establishment of ponds. This can be destructive in coastal areas such as mangrove swamps and wetlands which are particularly sensitive to disruption. Water management in areas affected by fish ponds is crucial as ponds can reduce the water supplies available for competing demands such as irrigation, domestic or industrial uses. Other problems relate to depletion of wild fish populations when fingerlings from the wild have been indiscriminately fished, and the spread of disease. The discharge of effluent from processing into waters that cannot adequately dilute and disperse the waste can result in severe pollution.

Coastal areas are extremely important in the socio-economic development of the third world countries. The highly productive and complex ecosystems that characterise these areas provide support to a large number of economic activities and it is imperative that they are conserved.

2.7 Inadequate management framework

Most countries which have a substantial fishery possess a poor, if not totally inadequate, management framework with which to manage their fisheries resources. The ability to carry out this task, depends on the Country's organisation, physical and financial resources, and scientific capacity for studying the resources, calculating realistic biomass and productivity estimates and thereafter monitoring the impact of a progressive increase in the fishing effort to avoid any over exploitation. On regulations and enforcement, while most countries have an appropriate and legal framework, they lack institutional manpower and financial resources to enforce it.

3. CURRENT THINKING OF MAJOR BANKS ON THEIR SUPPORT TO THE SECTOR

The banks' support will be guided by the need to achieve a sustainable management regime, with respect to the fisheries resources. In this respect Banks will support the development of a policy and institutional framework including community based management, which will support the sustainable management of the fisheries resources. It would also support in-depth environmental impact assessment and mitigation measures for effective resource utilisation and management. Banks will promote active community involvement with the assistance of fishery associations, in projects which target small scale fisheries and encourage the delegation of the management of localised waters to relevant local governments and communities. Banks will support strengthening of local and central government administrative capacities to monitor resource status, landings etc. as well as activities which contribute to amelioration of environmental pollution and resource degradation. They will promote rationalising fishing

activity, domestic or foreign, in offshore areas and establish resource management and information systems. Aquaculture, infrastructure development and reduction of post harvest losses would also be given high priority.

RESOLUTION OF CONFLICTS IN SMALL SCALE FISHERIES IN SRI LANKA

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ABSTRACT

The legislation governing fisheries in Sri Lanka is summarised and the current provisions for solving disputes are outlined. A number of case studies are then described of disputes which have been settled using these mechanisms. The new Fisheries and Aquatic Resources Act makes provision for areas of water, plus adjacent land, to be designated as local management areas and for any existing fishermen's society to be designated as the Local Fisheries Management Authority. The latter will then be able to make recommendations to the Minister on how their fishery should be conducted and regulated, thus involving the local community and, hopefully, reducing if not eliminating the occurrence of disputes which need to be settled by centrally organised and protracted inquiries.

1. INTRODUCTION

The history of the fisheries industry in Sri Lanka dates back to the mid-nineteenth century. Very little fishing activity was carried out before then, basically only for local consumption. The fishing was mainly done in fresh water or in large reservoirs in the Island. The State had no direct dealings with this fishery. With the development of fisheries and when it was thought necessary to have some controls in this field, the local government authorities introduced some regulations covering this subject. Some of the enactments introduced between 1889 and 1940 are:

- i. Village Communities Ordinance – 1889
- ii. Local Boards Ordinance – 1989
- iii. Game Protection Ordinance – 1909
- iv. Local Governments Ordinance – 1920
- v. Fisheries Ordinance – 1940

These ordinances mainly deal with the inland fisheries. As regards marine fisheries, the concern was mainly with the Madel or the beach seine fishery. The regulations cover some controls on use of certain types of fishing gear in specified sea areas and migrant fishermen. Up to about 1910, the State had little interest in the fisheries sector except for the pearl fishery and the whale fishery. During this era the consumption rate of fish went up considerably and there arose a good demand for fish. As a result, people living close to the coastal area gradually turned to fishing activities along the coast and these later became their sole profession.

2. LEGISLATION OF FISHERIES IN SRI LANKA

The Fisheries Ordinance Law No. 24 which was enacted in 1940, covered most of the fisheries activities in the Island. There was provision to appoint a Director, Deputy Director and several

other officers for administration purposes, and this became the basic law in regard to fisheries sector activities. Local fishing operations during this time were primarily artisanal and they did not have any scientific knowledge of fishing. With general industrial development in the world, the fisheries industry too gained fairly good recognition and this influenced the local fishermen to follow the technique. Synthetic netting material and marine engines were introduced in the 1950s.

With industrialisation, the fisheries sector in Sri Lanka was directly influenced and many of the artisanal fishermen were affected and sometimes deprived of their traditional activities. The madel (beach seine) operators were also affected, leading to various conflicts among the different gear users. The conflicts became more frequent and the State was compelled to use the provisions of the Fisheries Ordinance to settle them.

2.1 Provisions for solving disputes

Fisheries Ordinance 1940 contains detailed provisions to deal with disputes. Sections 20 and 20A, the main points of which are reproduced below, provide regulations to appoint a Committee of Inquiry or a Commissioner to deal with fishing disputes.

- i. Section 20 provides power to the Minister to appoint a Commissioner or a Committee to hold a public inquiry into any dispute if he thinks it necessary and expedient to do so. Such a Committee shall consist of not more than three members.
- ii. The Commissioner or the Committee of Inquiry shall hold a public inquiry into all subject matter referred to him following the undermentioned procedures:
 - a. to call for written representations from desiring persons before the specified date.
 - b. fixing a time and date for the public inquiry.
 - c. to give wide publicity in the disputed area.
- iii. All persons involved in the dispute are entitled to be present at the inquiry and make representations orally or in writing.
- iv. The commissioner/Committee of Inquiry have the lawful right to order any person or persons to give evidence or to take any documents into their custody.
- v. The Commissioner or the Committee has the discretion to order the witness to take an oath before giving his or her evidence orally.
- vi. The Commissioner or the Committee has the power to determine the procedure to be followed at the inquiry.
- vii. The Commissioner or the Committee shall prepare a report on the findings of the inquiry and the recommendations, including the rights, restrictions or prohibitions imposed in regard to fishing activities in the waters relating to the dispute. This

report shall be read at the conclusion of the inquiry and thereafter published by a gazette notification.

- viii. The persons who are affected by any matters of the report shall submit written representations to the Minister within a period of one month from the date of the publication of the report in the Gazette.
- ix. After reviewing the report and the representations, the Minister shall prepare regulations for the purposes of:
 - a. prohibiting, restricting or regulating the take of fish in any specified part of water related to the fishing dispute,
 - b. fixing different days or time to take fish from disputed areas of waters for different groups or sections of persons.

In addition to Sections 20 and 20A, the Minister has power to make regulations to regulate and control the fishing industry under Section 33 of the Fisheries Ordinance. The Minister also has the right to frame regulations to protect the fish resources in the waters of Sri Lanka and to restore the rights of the small scale fishery. The relevant ordinances are:

- i. Inland Water Fishing Regulations – 1978
- ii. Beach Seine (Madel) Regulations – 1984
- iii. Purse Seine Net Fishing Regulations – 1986

2.2 Case studies

Some of the main disputes that have taken place in the past and the resolutions arrived at in settling them through various new regulations framed since then, are now described:

Karainagar fishing regulations – 1979

These regulations were framed to solve the disputes between the mechanised boat owner fishermen and the small scale artisanal fishermen in 1979. This dispute was settled by fixing different days for mechanised craft fishing. They were allowed to fish on Mondays, Wednesdays, Fridays and Sundays in the week. The remaining days were allocated for the fishing of non-mechanised crafts. The disputed area was from Thoombilipiddy to Kovalan Light House Point to the village of Weerappidy.

Kokkilai fishing regulation – 1981

This conflict was between local and migrant fishermen who belonged to two communities of different races. The migrant fishermen were mainly from Negombo and Chilaw areas. A Commissioner was appointed to investigate the dispute. After the inquiry, recommendations were presented to the Minister. New regulations were framed to regulate the fishing methods, the main points of which are:

- a. Fishing in Kokkilai lagoon was restricted to local fishermen only of Kokkilai,

Kokkuthuduwawa, Kuranandukemi, Pulmoddai and Thennammaruwadi and the settled migrant fishermen of Mohothuwaram.

- b. The demarcated area of one square mile at the mouth of the lagoon was allowed only for cast-net operations and the mesh size of these cast-nets should be not less than one half of an inch (1.27 cm).
- c. Both cast nets and drift nets were allowed outside this demarcated area subject to a drift net mesh size of not less than two inches (5.08 cm).
- d. The number of fishermen was limited to a maximum of two thousand out of which six hundred should be drift net fishermen.
- e. All these fishermen who are entitled to engage in fishing should obtain a valid fishing licence.

Weligama Bay fishing regulation – 1981

Weligama Bay area was divided into four main harbour areas by the regulation made under the Game Protection Ordinance in 1939. These Waraya (area of harbours) were named as Weligama Waraya, Pelena Waraya, Kaluwella Waraya, and Mirissa Waraya. Fishing at the time was done by the artisanal fishermen.

After the introduction of synthetic nets, most of the fishermen started to use them within the bay area. The artisanal fishermen objected to this new type of net and this resulted in a dispute between parties for and against them. In the mid 1970s the fibreglass oru (crafts coupled with an outrigger) were introduced with nylon nets. The outrigger oru fishermen cast their nets within the bay area and the artisanal fishermen were severely affected.

The Minister of Fisheries appointed a Commissioner in the latter part of the 1970's to investigate the dispute and to safeguard the rights of the small scale fishermen. The Weligama Bay Fishing Regulations were framed on the recommendations of the Commissioner. These regulations completely prohibited use of gillnets or drift nets within Weligama Bay and one mile distant towards the sea from the mouth of the Bay.

Matara Polhena Thotamuna fishing regulations – 1982

The main factor that led to this conflict was the caste of the two communities in the Polhena, Thotamune fishing villages. Both parties claimed that they had the right to fish in the disputed area which covers one and a half miles west of Nilwala Ganga, which runs through Thotamune, and about half a mile into the sea surrounded by the rocks.

As it was felt that this dispute would lead to serious a problem in time to come, the Minister appointed a Commissioner to inquire into the dispute. The Terms of Reference were:

- i. The space available for the fishermen of Thotamuna to engage in their occupation in the part of the sea extending to about 0.25 acre in Polhena situated about 1.5 miles from Thotamuna Matara.

- ii. To determine the rights of the fishermen of Polhena.
- iii. To determine whether there is a possibility of permitting the fishermen from areas other than Thotamuna and Poihena to engage in fishing in that part of the sea extending to about 0.25 acre in Polhena.

After considering the recommendations made by the Commissioner, and the written representations submitted by the people of Matara, Thotamune and Polhena, the Regulations laid down in 1982 covered the following areas:

- a. Fishing in the disputed area was allowed only to the permanent residents of the villages of Polhena and Thotamune.
- b. The number of fishermen entitled to fish in the area was limited to a maximum of seventy five.
- c. The period of fishing is limited to the months commencing from April to October each year on alternate days of the week decided by the Advisory Committee.
- d. Fishing is allowed only on the licences issued by the Assistant Government Agent, Matara on the Recommendation of the District Fisheries Extension Officer.
- e. Only rod and line fishing and catching of ornamental fish are allowed in the area.

Rekawa Lagoon fishing regulation – 1982

The Rekawa Lagoon fishing dispute arose in the late 1970s. This lagoon is situated about seven miles away from Tangalle town towards Hambantota and surrounded by Godigama, Marakolliya, Rekawa and Kapuhenawala villages. The dispute arose between the cast-net fishermen, drift net fishermen and stake trap, normally called Jakotu, fishermen. Several discussions with the parties involved in the dispute were held at district and departmental level but failed as they did not agree to the decisions taken. As a result of this situation, the Minister was compelled to appoint a Commissioner to inquire into the conflict and to report on the situation. The Rekawa Lagoon Fishery Regulation, gazetted on the basis of the recommendations of the Commissioner, covers the following matters:

- a. Fishing in the lagoon is allowed only to the fishermen residing around the lagoon.
- b. Use of any fishing gear other than cast nets and drift nets were prohibited.
- c. Erecting of any structure other than stake traps (Jakotu) are prohibited in the Lagoon.
- d. Only twenty five fishermen were allowed to erect stake traps, one for each person.
- e. Only fifty drift net fishermen are allowed to engage in fishing.
- f. The minimum mesh size of the drift nets is limited to four inches and only four pieces of net are allowed to be used.

- g. The dimensions of each stake trap are 60 feet long by 15 feet wide.
- h. Stake traps are allowed in the shallow area in the lagoon starting from the Nattolpitiya Riverup to the mouth of the lagoon but should not be across the lagoon.
- i. Drift nets are allowed to operate in the centre or the deeper portion of the lagoon which is called "Maha Eliya". Permission should be obtained for fishing from the District Fisheries Extension Officer, Tangalle.

Regulation of fishing activities in the sea adjacent to the Coast of administrative districts of Colombo and Gampaha – 1986

The conflicts in these areas grew up in the mid 1980s and their backgrounds were quite different from those of the other disputes. The main factor that led to this conflict was the prawn trawling carried out in the disputed area by the fishermen of Mutwal and Lunupokuna. These fishermen had obtained the assistance of Chilaw fishermen in the form of boats and trawl nets. The trawl net had to be dragged mechanically along the water bed or in mid-water to obtain high catches. The local fishermen who are engaged in small scale fishery, were severely affected by this trawl fishing and their income diminished. This led to increased clashes between the parties concerned and the Police even had to be summoned to maintain law and order in the area. Several rounds of discussions were held at district and departmental levels. As these failed, the Minister was compelled to appoint a Commissioner to inquire into the dispute and report. These regulations were drawn up on the basis of the findings and recommendations of the Commissioner and the main points covered by these regulations for the control and management of the fishing activities are as follows:

- a. Fishermen who are not permanent residents of Wattala, the parish of St. James' Church (Mutuwala), the parish of St. John's Church (Modera Weediya), the parish of St. Andrew's Church (Lunupokuna) Moratuwa, Lunawa and Angulana are prohibited to engage in trawl fishing and obtaining assistance of trawl fishermen outside this area.
- b. The permanent residents of the disputed area are prohibited to obtain the assistance of trawl fishermen outside the area.

Purse seine net fishing regulations – 1986

The conflict between the purse seine fishermen and the small scale fishermen on the Southern Coast which took place recently was part of an ongoing problem. Purse seine gear was introduced into the Sri Lanka fishery in the early 1950s but did not operate with much success at the start. This method of fishing became popular after it was used in a survey conducted on the live bait and small pelagic resources under the UNDP Project. The fishermen in the southwest and northwest coastal areas started purse seine operations only in the 1980s. This gear has proved extremely effective and had some adverse effects on the artisanal fishermen creating deep opposition. In view of this, the necessity arose to frame regulations limiting the operation of this gear to more than 7–10 miles from the shore and a permit system was introduced to have a proper control and management of this fishery.

The main matters covered by this regulation are:

- a. A fee of Rs.20,000/- was fixed for obtaining a permit for a period of 12 months.
- b. The mesh size of the purse seine net should be 3/8" or more and the length should be 225 meters or less.
- c. Maximum wattage of surface lamps should not be above 1500 watts.
- d. The nets should be used beyond 7 miles from the shore in the districts of Colombo, Kalutara, Galle, Matara, Hambantota, Ampara, Batticaloa and Trincomalee, and beyond 10 miles from shore in the districts of Gampaha, Puttalam, Mannar, Mullaitivu and Jaftha.

The Department of Fisheries and Aquatic Resources issued only a few permits before 1989, four to Galle district, two to Kalutara district, and one to Negombo in the Gampaha district. A maximum number of permits was been issued during 1991, 48 to Galle, and 10 to Kalutara district. The issue of permits to each district is restricted to 50 for Galle and 10 to Kalutara district. Most of the permit holders often ignored the conditions laid down by fishing within the 7 mile prohibited zone and a large number of small scale fishermen came out in protest and opposed the behaviour of the purse seine operators.

At this stage the Ministry stepped in and necessary legal measures were taken to stop these illegal fishing operations. As a result of this, eighty (80) cases were referred to the Courts and 700 fishermen had been fined by the end of 1993. In addition to this, permits were not issued to purse seiners for the year 1994. The fishing activities however, are taking place as usual without the permits even within the prohibited area.

The small scale fishermen continue to make representations to the Ministry and it is reported that two purse seine boats have been set on fire and destroyed and two fishermen have been killed in protest. As a measure of remedy, the Ministry banned the purse seine fishery operations under the Emergency Regulations in April, 1994. However, as the emergency regulations are not in force at present, action will be taken to resolve the conflict by amending the Purse Seine Fishing Regulations.

Chilaw trawl fishing conflict

Sri Lanka had an off-shore commercial trawl fishery on the Wedge Bank between 1920 – 1975. Since 1976, after the historic demarcation of the water and Indo-Sri Lanka border, the whole of Wedge Bank and one-third of the Pedro Bank lie within the Indian Exclusive Economic zone and no commercial trawling has taken place. Since then, trawling is confined to the north and northwestern coasts where almost all the trawling grounds suitable for prawn fishing occur.

As a result of the recent terrorist activities, most of the valuable and important grounds in Mannar have been abandoned. Therefore, trawling for prawn is limited to the Chilaw area. The trawling was carried out by 3.5 t mechanised boats and close to 140 boats of this type are in operation. The trawl fishing was carried on throughout the season. Due to this, all other small

scale fishermen were affected and conflict rose to a peak in 1991. The small scale fishermen came out in protest and were making havoc by burning houses and property. A number of people were hospitalised and complaints of injury and conflict became so high that a police curfew had to be declared in the area. His Excellency the President was informed of the position and he advised the Prime Minister to take steps immediately to remedy the situation. Many rounds of discussions were held at the highest level and it was finally decided to ban prawn trawling by 3.5 t boats in the Chilaw area. All the trawler owners were paid compensation for their 3.5 t boats and a monthly subsistence allowance of Rs.4500/- per family per month was paid by the Department of Fisheries and Aquatic Resources until such time as they were given alternative boats and gear for deep sea fishing. A special Rehabilitation Project was planned for this purpose with the approval of the State and the funds were allocated from the Treasury in 1992*

Two separate regulations drafted for resolving the conflicts in the administrative district of Puttalam have been submitted for approval by Parliament and the Cabinet of Ministers. They are:

- i. Chilaw Lagoon Fisheries Regulations – 1993
- ii. The Old Dutch Canal and Mundel Lagoon Fishing Regulations – 1994

The Chilaw Lagoon regulation has been drafted to settle the conflicts between the Harasdel, Kattudel and cast net fishermen. The artisanal fishermen who were operating cast nets in Chilaw lagoon have been deprived by the Harasdel and Kottudel fishermen of operating their nets every where in the lagoon. As their nets are of very small mesh size, tiny fishes and other small species also get caught. The cast net is a falling gear and can only be operated in waters without obstacles. The catch of this device is limited to a few kilograms. A number of attempts were made to bring about an amicable settlement with no signs of response from any party. The Minister then, referred the dispute to a Commissioner for holding an inquiry and report.

The Commissioner issued his report and the draft regulations presented below are based on his recommendations. The approval of the Cabinet Ministers has been obtained and it is submitted to Parliament for sanction. The draft legislation includes the following main points:

- a. Harasdel are allowed to operate one mile south from the Chilaw bridge.
- b. Without obstructing the flow of the canal, the harasdel could be laid on both sides in the canal (Elamaga).
- c. A gap of 100 meters should be allowed between two units of Harasdel.
- d. The number of Harasdel may be determined after allocating 100 meter blocks one mile away from the Chilaw bridge.
- e. Mesh size of the Harasdel should be not less than 4cm or 1.5 inches.

* NOTE: Details of this scheme are given in the final paper of this volume (page 242).

- f. Kattudel should be erected between 6.00 p.m. and 6.00 a.m.
- g. Cast-nets may be cast at any time during the day.

The Old Dutch Canal and Mundel Lagoon fishing regulation – 1994

Trap net and drag net operators of Udappuwa are monopolising the control of the lagoon and thereby severely depriving drift net operators. There are a few types of drift nets used in Puttalam district. 'Godadela' is a popular net used by the poor fishermen because of its low cost and effectiveness. Recently, the drag net and trap net fishermen were operating in the Dutch Canal and the Mundel Lagoon.

The dispute was between the Mundel and the Udappuwa fishermen which started as a result of the Mundal fishermen objecting to the use of the dragnet by the Udappuwa fishermen. The following are the terms of reference for the inquiry:

- a. The operation of drag nets between the Puttalam Lagoon and the Mundal Lagoon across the Old Dutch Canal, causing obstruction to the movement of other fishermen, and also causing migration of fish,
- b. The rights of the fishermen who are engaged in fishing trap nets in this area,
- c. The rights of the fishermen who are engaged in fishing by drag nets in the area,
- d. The manner in which the fishermen, whose rights have been recognised, should engage in fishing in the area.

On the basis of the recommendation made by the Commissioner, the following regulations were drafted for the approval of Parliament.

There are two demarcated areas:

- i. the part of the Old Dutch Canal starting from the Palavi bridge running through the Mundal Lagoon up to the Southern end of the Mundal Lagoon;
- ii. the Mundal Lagoon.
 - a. No fishermen shall use trap nets or drag nets in the above mentioned area,
 - b. Drift nets of a mesh size below 1.5 cm (2 inches) are not allowed in this area.

3. THE NEW FISHERIES AND AQUATIC RESOURCES ACT

There is provision made under this Act to designate areas of Sri Lanka waters or lands adjacent to these areas or both, as local management areas in order to have a proper community-based fisheries management. Any existing fishermen's society, association or any other body that represents the fishermen of the particular fisheries management area could be designated as the Local Fisheries Management Authority. If there is no existing institution as such the Minister can establish such fisheries management authority by order published in the Gazette. This is a new outcome of the new Fisheries Act to give more room for community based management of

fisheries. Until this there was no legal body recognised for this purpose.

These Local Fisheries Management Authorities have the power to make their recommendations to the Minister on the following.

- a. the conduct of fishing operations and the use of different types of fishing gear in a particular local fishing management.
- b. to establish the closed seasons for fishing or closed seasons for catching of specified species of fish in the area.
- c. the times during which fish may be taken.

This Local Fisheries Management Authority will give the opportunity to all fishermen to organise their own work on a better footing, without fear of competitors who take an advantage at their expense. It will also create a good sense of responsibility for them to freely organise their fishing activities towards gaining social and economical development, which is the sole object of the fisherfolk. This self-management system will give better results than the enforcement of regulations by the State Authorities. These community-based Fisheries Management Authorities will have full rights and freedom to intervene in any type of conflict directly.

THE TERMINATION OF PRAWN TRAWLING IN CHILAW AND ITS IMPLICATIONS FOR FISHERIES MANAGEMENT

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ABSTRACT

As the market for prawns increased during the 1960s local, traditional prawn fishing could not meet the demand. Prices rose and businessmen invested in 3.5 t mechanised prawn trawlers. In the Chilaw area the advent of these boats was greatly resented by the local, small-scale fishermen because they disturbed the fishing grounds, damaged fishing gear and were largely owned and manned by people from outside the district. The complaints were met in 1976, and several years thereafter, by sets of regulations which restricted the days on which prawns could be harvested by various methods, in different areas of the fishing grounds. However, these regulations were disobeyed and the Ministry of Fisheries lacked the resources to enforce them. The 3.5 t boat owners formed an association to regulate their own activities but prices continued to rise and by 1980 the incentives for a free for all were overwhelming and the system broke down. Disputes between trawlers and beach seine and other small-scale fishermen increased throughout the 1980s and came to a head in February 1992 with a major conflict which resulted in over a million Rupees worth of damage to property and a police curfew.

Discussions between the Ministry of Fisheries and both parties were underway but were pre-empted by a strong government politician who, seeking votes among the more numerous small-scale fishermen and their supporters, went directly to the Prime Minister who immediately ordered the termination of prawn trawling by police order as a breach of law and order. The Ministry of Fisheries was left with the bill for compensating the owners of the 3.5 t trawlers (which were destroyed) and for providing subsistence allowances to the owners, their crews and their families. This compensation programme still continues.

The implications of this quite arbitrary form of fisheries management, which did at least completely end the long running dispute, are discussed.

1. ECONOMIC BACKGROUND OF THE PRAWN TRAWLING INDUSTRY IN SRI LANKA

Until about the latter part of the 1960s, fish and prawns had only a local market in the Island except for the traditional exportable fishery products of Sri Lanka such as c.hanks and pearls. In the local fish market, prawns were in relatively low demand compared to other varieties of fish and accordingly the local prawn market was very small and prawns fetched a lower price than fish. Prawns were a substitute for fish for those who had insufficient money to buy fish at a higher price. It was often seen that low income group consumers bought prawns for their meals.

However, during the period from the latter part of the 1960s to the early part of the 1970s this situation showed a gradual change and at this stage the Asian Prawns Export Market was born. The populations of Singapore, Hongkong and Taiwan, most of whom were of Chinese origin, were economically strong at this period and as a result they had tended to consume rich meals with prawns which they most preferred. Thus the demand for prawns rose due to enhanced sales of this traditional product. This resulted in the creation of a new prawn export market in Asia. The number of prawn exporting businessmen in the Island increased more than ever in the past.

Because prawn production could not meet the demand the price of prawns escalated rapidly. Since then the necessity to increase prawn production in Sri Lanka has been the concern of all those who are engaged in the trade. It was realised that the age old prawn fishing methods could not cope with the anticipated production requirements and it was necessary to introduce more efficient and modern gear. With this economic background the prawn trawling industry, using 3.5 ton mechanised boats, began.

2. THE HISTORY OF THE PRAWN TRAWLING FISHERY AND ITS EXPANSION

It is said that prawn trawling by the traditional canoes from Negombo, which continues to the present day, originated some 100 years ago. It is also known that the prawn trawling gear used with two Catamaran crafts has been in operation on the southwestern coast of the Island from the 1920s. Prawn trawling by 3.5 t (28 feet) mechanised fishing crafts started in the 1950s on an experimental basis and these fishing boats commenced production on a commercial basis in the 1960s. This method then extended into areas such as Mannar, Negombo, Chilaw, Nutwal and Hendala (Fernando and Shantha, 1994).

By the latter part of the 1960s, the prawn trawling by 3.5 t mechanised fishing craft had started in the Chilaw area and by the time this method was abandoned in 1992, there were 137 boats of this type in operation.

3. PROTESTS IN REGARD TO PRAWN TRAWLING AND MANAGEMENT STEPS TAKEN IN THIS CONTEXT

The Chilaw 3.5 t mechanised prawn trawling vessels were not only operating in those areas but these boats were in operation in areas such as Mampuri to the north, and Hendala on the south, of Chilaw. In the early part of the 1970s many protests were pouring in from beach seine fishermen as well as other small scale fishermen in Chilaw and several places to the north and south of Chilaw. Their grievance was that these 3.5 t trawling boats were causing damage to their fishing gear and they had come into the Chilaw area from a long way away, as well as from close to the coastal areas near their villages, and were exploiting their fish and prawn population. Moreover, the fish were frightened by the trawling gear and large boats as a result of which the fish and prawns migrated towards the deep sea area leaving the coastal belt, thus causing loss to the fish resources of the area as well as reducing the catches of the small scale fishermen. These protests later developed into severe conflicts at provincial level which finally became fishing disputes between the parties concerned.

The Department of Fisheries intervened in this dispute and was compelled to set up Commissioner level investigations and finally frame some regulations to control them. The first was the "Chilaw Fisheries Regulations" gazetted on 21/10/1976 (Ariyadasa, 1994). Mechanised prawn trawling was prohibited up to one mile from the coastal belt in areas of the southern bank of Deduruoya and Ambakandawila cemetery grounds, on Tuesdays, Thursdays and Saturdays. Prawn catching by other craft was prohibited in these areas on Mondays, Wednesdays and Fridays. Prawn catching by any other types of boat on Sundays was prohibited. It is stated in the regulations, that prawn trawling should not cause any obstruction to beach seine fishery activities.

Thereafter, the Iranawila Fishing Regulations were published on 25/09/1978 by the Ministry of Fisheries (Ariyadasa, 1994). This regulation covered the sea areas from north of Iranawila Village limits to the southern limits of Lansigama and prawn trawling by mechanised boats, using of drag nets, was prohibited on days other than Fridays and Saturdays. Finally, the Ministry of Fisheries gazetted the Udappuwa Fisheries Regulations on 01/10/1979 (Ariyadasa, 1994). By this regulation an exclusive beach seine fishing area was allocated covering a 2.5 mile wide stretch of sea adjacent to the coast from Sinnekarakkupota to Udappuwa and no other fishing method or craft is allowed to fish in this area. Another area has been allocated for Theppam fishing only and any other forms of fishing craft are not permitted here.

Through these fishing regulations and by exclusively allocating separate fishing areas for various types of fishing method, especially limiting the days in the week for trawl fishing and Theppam fishing, an attempt has been made to establish a fishing industry management system in this area, at the same time minimising any damage caused to the beach seine fishery and the small scale fishery in Chilaw and adjoining areas to the north and south. However, these regulations could not be implemented. The 3.5 t prawn trawlers continued to operate on days and in areas which were prohibited by these regulations. The Ministry of Fisheries was able to do some inspection work in the sea area only when it had the opportunity to have its own craft or to obtain a boat from the Navy to arrest anyone fishing unlawfully in the prohibited areas or to chase them off. The Ministry was at a disadvantage mainly because it did not have the required resources such as patrol boats and lacked skilled personnel with legal training.

4. BACKGROUND TO THE TERMINATION OF THE PRAWN TRAWLING IN CHILAW

For about two and a half decades, there was no management system in relation to the Chilaw 3.5 t prawn trawling fishery. In the 1970s there was a community-based fisheries management system operated by a society comprising the 3.5 t boat owners, the basic objective of which was the continue operations with the existing number of boats and to operate that number of boats for a limited number of days in the week. Under this management system, each family who owned boats undertook not to allow any increase in the fleet in the Chilaw area. However, this management system failed in the 1980s because the export demand for prawns went up and the price of prawns in the local market increased correspondingly.

To meet this situation each fishing family in Chilaw who owned boats increased their fishing fleet. In addition to this, fishermen who did not engage in this type of fishing earlier also used their boats for this purpose. As the number of fishing craft engaged in this type of fishing in the Chilaw area increased, an acute competition between these boats owners was created and for this reason they started operating the boats even on days that were prohibited for fishing under the management system in question. Fishing was even carried out in the areas prohibited North and south of Chilaw. This situation resulted in major conflicts and an atmosphere of dispute between the parties in Chilaw in the 1980s. During this period, the prawn trawling boatmen frequently had rows with the beach seine and small scale fishing operators in Chilaw and adjoining areas and even in places further afield. The 3.5 t trawler owners won the battles on most occasions because

they had the backing of a politician of the State in Chilaw area and also because they were economically strong.

The beach seine and small scale fishermen in Chilaw and adjoining areas did not give up the fight and went on fighting for their rights often complaining to the political authorities in the area and the State departments regarding their opponents behaviour, but failed because they were weak and did not have political help. However, at the final stage, the small scale fishermen who were in the majority, were fortunate enough to receive some response from a sponsor. He is a person from outside Chilaw but a politician of the governing party who was canvassing hard to obtain a large preferential vote in the Puttalam District which was considered essential. The common cause of both parties came together beautifully at the same time. A strong patron who was essential to the small scale fishermen in Chilaw and a large group of clients with the asset of a large number of preferential votes needed by the so called patron, met each other for a common goal.

5. TERMINATION OF THE PRAWN TRAWLING BY 3.5 T BOATS IN CHILAW

A grand opportunity to terminate this fishery arose at dawn on the 4th of February, 1992. On this day there occurred a gigantic dispute between the small scale fishermen and the 3.5 t trawler operators. During this dispute, in addition to the physical injuries caused to the people, over one million Rupees worth of property was lost by destruction and fire. The dispute led to a situation where a provincial police curfew had to be declared in Chilaw beach area. At this stage the Ministry of Fisheries, was having discussions with both the parties searching for an amicable settlement.

However, the strong politician of the government party representing Puttalam District, who sided with the small scale fishermen, showed greater efficiency and was faster than the Minister in charge of Fisheries. He met the Prime Minister immediately and made arrangements for total termination of the operation of the 3.5 t prawn trawling fishery with effect from 10th March 1992, by Police order under conditions of breach of law and order in the area. The Minister of Fisheries and his officials were not aware of this arrangement until the decision came into effect.

The Minister of Fisheries and his officials were left only with paying compensation to the boat owners who had lost employment in the fishery and to implementing the scheme to give them relief. Hence, the 137 prawn trawling vessels ceased their fishing activities and there were 132 owners of these boats. The Department of Fisheries and Aquatic Resources destroyed the boats, and paid compensation to their owners and to the 663 crew members. In place of their destroyed boats, the Department of Fisheries and Aquatic Resources provided them with 25% subsidy against the cost of purchasing alternative boats of 34, 32 and 17.5 foot plus marine engines and fishing gear. The balance of 75% was arranged with loans from the Peoples Bank, the Bank of Ceylon, the Hatton National Bank and the Provincial Rural Development Bank on submission of applications for same. Until such time as the alternative boats are supplied, the Department of Fisheries and Aquatic Resources pay subsistence allowances of Rs. 150/- per day per affected family unit amounting to Rs. 4500/- per month. Total provision for this payment was released from the Treasury to the Department of Fisheries and the Banks.

This compensation payment programme was introduced as the "Chilaw Fisheries

Rehabilitation Project” and was implemented by the Fisheries Industry unit of the Department of Fisheries and Aquatic Resources.

Following are the details of expenditure incurred by this project;

i.	25% subsidy for fishing boats etc. from the Department	Rs. 37,062,200
ii.	75% Bank Loan component	Rs. 111,186,600
iii.	Compensation for the destroyed boats	Rs. 8,23 1,500
iv.	Monthly subsistence allowance to the Trawler owners and the Boat crew families	Rs. 62,258,882
	Total	Rs. 218,739,182

6. ASSESSING THE IMPLICATIONS FOR FISHERIES MANAGEMENT

Firstly, it would be useful to assess the method used to terminate this trawl fishing for prawns. The proper way to act in this type of dispute is to appoint a Commission of Inquiry to investigate the dispute in terms of the Fisheries Ordinance and to frame regulations on its recommendations for implementation. Instead, what happened here was that the prawn trawling was stopped by Police order. Further, there was no inquiry made to investigate the charges made by the small scale fishermen against the prawn trawlers. No opportunity was given to the 3.5 t trawler fishermen to represent any of their case in regard to the charges made against them.

The charges were totally accepted, arbitrarily without any inquiry. Further, no attention was paid to all the types of fishing industry in the Chilaw area. There was only concern over the small scale fishing industry in the area. No one had the least care for the previous management system which prevailed in Chilaw. In other words, they did not consider the community-based management system of the trawler owners or the provisions of the Fisheries Regulations for dealing with the dispute. Also, before termination of the prawn trawling fishery, no attempt was made to investigate whether the prawn resources could be exploited to the maximum level by the gill nets of the small scale operators in the Chilaw region without damaging the prawn population. All these management deficiencies are seen in the programme adopted for terminating the 3.5 t prawn trawl fishery in Chilaw.

It would also be useful to assess the scheme to pay compensation and subsidy to those who suffered losses i.e. the boat owners and the crew. It has to be stated that this programme was a very expensive, long-lasting and highly complicated issue. The programme started at the end of March 1992 and after two and a half years has not finished yet. What has really taken place is that the Department of Fisheries and Aquatic Resources has been brought into close combat with the trawler owners and the crew who have, from time to time, been submitting various proposals to the Department of Fisheries and Aquatic Resources. This situation has led this project to drag on to the present day adding more and more problems, wasting time and energy and increasing the expenditure. As a result, this project has up to now consumed nearly 22 million rupees. The multiplication payment of compensation and the assistance represent a major component of this

colossal expenditure. Had the Department of Fisheries and Aquatic Resources paid a lump sum of compensation against the losses suffered at the beginning such a gigantic expenditure would not have been incurred and much time and energy could have been saved.

However, finally the problem has now been solved. Wasting so much valuable time and a colossal sum of money in the fisheries management process of this dispute cannot be considered as a characteristic of good management.

7. CONCLUSION

Although, several management deficiencies were embodied in the programme for terminating the 3.5 t prawn trawling fishery in Chilaw, it has to be said that as a whole and historically, a permanent and specific solution to an age old problem in the fisheries management field in the region has been achieved. This can be considered as the only experience of this type that has ever occurred in the Island in the field of Fisheries Management.

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