

## APPENDIX I

### Chronology

#### 1988

- JAN. The Advisory Committee of BOBP endorses a subproject to establish a Fisheries Extension Service.
- APR. An outline of an extension subproject is prepared with the help of an FAO Consultant.
- SEP. BOBP prepares a concept note on how the planned extension service could address the needs of fisherfolk
- DEC. BOBP and MOFA reach agreement on the aims and objectives of the subproject.

#### 1989

- APR. An extension unit with four staff is established in MOFA.
- Three types of boat-hauling devices are demonstrated. Programmes on the demonstration are broadcast and enquiries are received from fisherfolk.
- An NRI consultant identifies methods to improve the quality of cured fish. Two MOFA staff participate in a training course in fish-drying at CIFT, Cochin.
- JUN. A newly designed rapid appraisal method is tested in Faafu Atoll. On the basis of this experience, the strategy is refined.
- A simple pulley block-hauling device is demonstrated in Faafu Atoll.
- SEP. MOFA with BOBP assistance undertakes rapid appraisals in all the target islands. The first of the contact fisherfolk are identified.
- OCT. The steel capstan is the preferred boat-hauling device. The Ministry orders eleven more units.

#### 1990

- JAN. The extension staff start analyzing the field data.
- APR. A draft of the Status and Needs Study is completed.
- AUG. The Status and Needs Study is discussed at an interministerial meeting.
- SEP. 12 fisherfolk undergo training in improved salt-drying of fish.
- Two MOFA officers go on a study tour to Sri Lanka, to learn about fisheries extension.
- OCT. Eleven capstans are shipped from Madras to Male. Ten are to be distributed on credit and one is for demonstration purposes.
- DEC. Eleven fisherfolk are trained in maintenance of engines.
- Eight fisherfolk receive training in making hooks and lures.

#### 1991

- JAN. : Field visit cancelled due to austerity measures enforced by Government.
- FEB. : The Status and Needs Study is cleared by the Ministry of Planning and Environment
- APR. : The Status and Needs Study is cleared by the GOM.
- The availability of ten boat-hauling devices, for purchase on credit, is announced on the radio. MOFA receives 41 requests.

- MAY : The President's Office recommends the subproject to operate through the Island Development Committees.  
An eight-day field trip is undertaken by MOFA and BOBP staff to islands in Meemu and Vaavu.
- JUL. : A nine-day field trip is undertaken by MOFA and BOBP staff, representatives from the Ministries of Atolls Administration, Public Works and Labour and Health, to all islands in Meemu Atoll.
- SEP. : A seven-day field trip is undertaken by MOFA and BOBP staff to all the islands in Vaavu and Faafu Atolls.
- NOV. : An eight-day field trip is undertaken by MOFA, BOBP and Atolls Administration staff to all islands in Meemu.
- DEC. : A workshop brings together thirty representatives from the Island and Atoll Development Committees in the three target atolls.  
  
The annual 'Fishermen's Day' is celebrated at the end of the workshop.

## 1992

- MAR. : A group of MOFA staff is selected to take responsibility for the implementation of activities in 1992. They are trained, in-service, on extension methodology and issues relating to fisheries management.
- APR. : MOFA, in cooperation with the Voice of Maldives, produces and broadcasts five programmes focusing on reef management.
- MAY : A field visit of nine days is carried out to Meemu and Vaavu Atolls. The team consists of BOBP, MOFA and Voice of Maldives staff.
- JUL. : During a seven-day field trip to islands in Meemu and Vaavu, MOFA and BOBP staff undertake training exercises, on coral reef management, for the Island Development Committees and schoolteachers.
- SEP. : An effort to write a handbook for Atoll and Island Development Committees, on reef management, is initiated.  
Preparation of a colouring book on coral reefs, for schoolchildren, gets underway.
- DEC. : The first draft of the colouring book is given for scientific editing.

## 1993

- FEB. : A consultant, together with MOFA staff, prepares a chapter/content outline of the handbook.  
  
A six-day field trip is made to Meemu and Vaavu, by a team consisting of the Consultant, MOFA, BOBP, Atolls Administration and Voice of Maldives staff.  
  
The first draft of the handbook is circulated for comment.
- MAR. : A study tour for GOM officials and BOBP staff, to learn from the experience of community-based resource management efforts in the Philippines, is undertaken.
- MAY : MOFA staff receive training in participatory radio programming by an international Consultant.
- JUN. : Work on the translation into Dhivehi and the illustrations for the colouring book are undertaken by two national consultants.  
  
Draft of the handbook shown to the Coastal Resource Management Project in Sri Lanka.
- JUL. : Translation of the handbook draft completed by a Consultant in the Maldives.
- AUG. : The contents of the handbook are discussed at an interministerial meeting in Male.
- OCT. : The committees review the handbook at an island-based workshop.
- DEC. : The colouring-cum-work book is officially released at the Fishermen's Day celebrations in the Maldives.  
  
The subproject is terminated and handed over to MOFA.

## APPENDIX II

### Documentation relating to the subproject

#### Consultancy reports

- TIETZE, U. (1988). *A BOBP Project Idea, Fisheries Extension Services, Maldives*. BOBP-FAO. Madras, 1988.
- PICKSTOCK, M. (1993). *Fisheries Radio – Republic of Maldives*. World Radio for Environment and Natural Resources (WREN), U.K.

#### Working documents

- BAY OF BENGAL PROGRAMME (1988). *Fisheries Extension Services, Maldives subproject*. BOBP, Madras.

#### Published material (Working papers, reports, etc.)

- THE EXTENSION AND PROJECT SECTION, MOFA. (1991). *A View from the Beach : Understanding the status and needs of the fisherfolk in Voovu, Meemu and Foofu Atolls, Maldives*. BOBP/WP/76. BOBP-FAO, Madras.
- BAY OF BENGAL PROGRAMME (1992). *Manual boat hauling devices in the Maldives*. BOBP/WP/71. BOBP-FAO, Madras.
- MOFA (1993). *Life on Our Reefs*. A colouring book. BOBP/MAG/20. BOBP-FAO, Madras.

#### Bay of Bengal News

- ROY, R.N. (1991). Maldives — Needs and concerns of Maldives fisherfolk — A view from the beach. *Bay of Bengal News*, Issue No. 41. BOBP-FAO, Madras.
- HAGLUND HEELAS, A.M. (1992). Extending the message of resource management in the Maldives. *Bay of Bengal News*, Issue No. 46. BOBP-FAO, Madras.
- HAGLUND HEELAS, A.M. (1992). Voice of Maldives : Using airwaves to reach scattered fisherfolk communities. *Bay of Bengal News*, Issue No. 47. BOBP-FAO, Madras.
- ROY, R.N. (1993). Radio training pays dividends in Maldives. *Bay of Bengal News*, Issue No. 51. BOBP-FAO, Madras, 1993.
- HAGLUND HEELAS, A.M. (1993). Protecting the riches of the reefs. *Bay of Bengal News*. Issue No. 52, BOBP-FAO, Madras.

#### Radio programmes

- VOICE OF MALDIVES and EXTENSION AND PROJECT SECTION, MOFA. Five radio programmes on reef resource management Male 1992 (In Dhivehi).
- VOICE OF MALDIVES: Programme Director Badru Naseer, for SAVE (SAARC'S Audio Visual Exchange): *Facing a Challenge*. Based on the experience and learnings from the subproject, broadcast in the SAARC region, September 15, 1993 (in English).

## APPENDIX III

### Training inputs

The staff of the Extension Unit received several short training inputs, some on-line, some abroad. The programme included :

- A tour to study fisheries extension activities in Sri Lanka and India, organized by the National Institute of Fisheries Training, Sri Lanka, and BOBP, Madras.
- Training in fish drying, organized by the Central Institute of Fisheries Technology (CIFT), India.
- Training in extension methodology, participatory rapid rural appraisal methods and needs analysis techniques, by BOBP staff.
- A tour to study community-based resource management projects in the Philippines, organized by the Bureau of Fisheries and Aquatic Resources, Philippines.
- Training in participatory radio programming for fisherfolk, by World Radio for Environment and Natural Resources (WREN), U.K.

Selected fisherfolk, from the target atolls, received training in the following :

- Improved salt-drying of fish, at the SIO Fish Processing Centre, Meemu Atoll.
- Maintenance of inboard engines, conducted by MOFA staff.
- Hook-making and Japanese lure-manufacturing, by a private sector ironsmith.
- Population education, by the Ministry of Health
- Reef resource management with special reference to :
  - The giant clam fishery.
  - The beche-de-mer fishery.
  - The bait fishery.
  - The reef shark fishery.
  - Coral and sand mining.

Provided by the Marine Research Section (MRS), Male.

## **APPENDIX IV**

### **Official mandate of MOFA**

The basic mandate of the Ministry of Fisheries and Agriculture, Republic of Maldives, is to :

- Formulate and administer regulations on matters relating to fisheries;
- Carry out the research needed for such development;
- Develop and promote fisheries;
- Collect and analyze statistical information on fisheries necessary for the management and development of the sector;
- Maintain and administer work related to uninhabited islands; and
- Promote agriculture in the Maldives.

The Fisheries Law of the Maldives (Law No. 5187 of 24.8.1987) provides MOFA with much of its mandate.

## APPENDIX V

### The Giant Clam - A resource at risk: The threats and issues

#### Introduction

In many Southeast Asian countries, the giant clam's adductor muscle tissue (which hinges the two halves of the shell and is responsible for opening and closing the valves) is a highly priced delicacy. In the Maldives, the giant clam fishery began as recently as in June 1990 and continued only until January 1991. It then was recognized that, to protect dwindling stocks, a ban on export had to be introduced.

An early warning signal had been the increasing distances some fishermen had to travel to target the giant clams. In the beginning, they collected clams in the lagoon areas of their islands. But as the numbers decreased, they were forced to move to deeper waters. Once a reef was exhausted, they would move on to the next: As they progressed further from the base island, they had less time for fishing and, so, less would be collected in the day. The number of giant clams in some atolls had fallen to such low levels that the fishery was not profitable to pursue.

Already, at an early stage, the giant clam fishery provoked great concern among fishery and non-fishery people. This led to a survey, by a Consultant hired from the 'International Giant Clam Programme' in Australia and the Marine Research Section (MRS) of the Ministry of Fisheries and Agriculture (MOFA), to assess the current status of the giant clams in the Maldives. The survey was limited to four northern atolls -Shaviyani, Raa, Lhaviyani and Kaafu.

The initial centre for the giant clam fishery in the Maldives had been R Ugoofaavu. The general opinion of the fishermen was that Raa Atoll originally had the highest density of clams.

#### THE GIANT CLAM

Giant clams are slow-growing and long-living organisms. *T. squamosa*, the faster growing of the two species found in the Maldives, shows a slowing in growth after an age of approximately ten years. Their expected life span is more than 25 years.

The most outstanding attribute of giant clams is their symbiosis with a specific algae, which lives in their bodies. The algae makes food by photosynthesis and shares it with the host clam. Thus, the giant clam rarely uses any other reef organisms for food. Hence, as far as nourishment is concerned, these animals are quite independent and have a very loose connection with the reef food-web.

Giant clams are predominantly found in coral reef areas. *squamosa* is mainly found in sheltered areas, from the reef flat in shallow waters, down the reef slope and right to the bottom. *T. maxima* is found in all areas of the reefs, down to approximately 15 m, although it is more abundant on the reef flat and crest.

#### Species composition

Only two species of clams, *Tridacna squamosa* (averaging 45 cms shell length) and *Tridacna maxima* (reaching a maximum of 35 cms shell length) have been identified in the Maldives. The Dhivehi term for giant clam, *gankha*, refers to both species.

The major target of the clam fishery was *Tridacna squamosa*.

#### The giant clam fishery

Until 1990, giant clams were not harvested in the Maldives and many reefs probably still support pristine clam populations. However, once harvesting began, the stocks of *T. squamosa* seriously declined in less than one year.

As the clams usually inhabit shallow reef-flats and are unattached, they are easy to find and remove, making them especially vulnerable to over-exploitation.

The fishery was started by a private, local company, which commissioned fishermen to collect whole clams. The buyers were Taiwanese. Only the adductor muscle was exported; the clam meat and shell were discarded. Adductor muscles weighing less than 100 grams when frozen were not accepted. Therefore, only the larger species *T. squamosa* were preferred. Shortly afterwards, another local company started buying both dried adductor muscle and mantle tissue. Again, the buyer accepted only large clams.

From discussions with the fishermen and the local buyers, it appeared that they believed that all the small clams were juvenile *T. squamosa* that would grow and replenish the stocks. This was incorrect; most of the small clams were *T. maxima*. There was a serious risk of fishing *squamosa* to below a critical population density, whereby natural population growth would not occur. It is estimated that it will take eight or more years before the depleted areas can be fished again.

#### The stock position

##### FISHED REEFS

The survey covered a total of 38,700 m<sup>2</sup> of fished reef and found an average density of 3.4 clams per hectare\*. The highest density seen was 18.8 *T. squamosa* per hectare in one area of R. Maadhunifaru. All other sites on this reef had

\* 1 ha = 10,000 m<sup>2</sup>

no *T. squamosa* at all. The findings showed that there were very few, and frequently no, *T. squamosa* on fished reefs (mostly Raa and Shaviyani Atolls). They were found only on 33 per cent of the surveyed reefs. Overall, their average density had been reduced to about a third of an unfished population.

*T. maxima*, which has not been targeted by the fishermen, was reasonably abundant in all areas surveyed. An average of 29.9 clams per hectare was seen in fished areas.

#### UNFISHED REEFS

*T. squamosa* was seen in 93 per cent of the unfished reefs in the area surveyed. The average density for 46,050 m<sup>2</sup> of unfished reefs was assessed to be of 10.6 clams per hectare. Some of the resort islands in Kaafu Atoll also showed relatively high densities of this species.

An average of 39.6 of *T. maxima* per hectare was seen on unfished reefs.

It was noted that it took approximately six months to fish an atoll to the point where it became too expensive to collect any more clams. The natural population densities would only have sustained the fishing pressure for a few more years.

Subsequently, export of giant clams was prohibited

#### ISSUES

If and when the fishery is re-opened, how should it be managed? The following measures could be considered and discussed:

- Establishing a minimum size limit;
- Determining a permitted harvest level:
  - Number of clams in general, or
  - Number of clams per fisherman;
- Introducing giant clam culture;
- Increasing the population of clams, through stocking spat artificially;
- Periodical closures, to enable recovery;
- Limiting the number of fishermen allowed to harvest in one area; and
- Allowing fishing to develop without any controls

## APPENDIX VI

### Coral Reef Management Handbook for the Island Development Committees

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