## Bay of Bengal Programme Fishery Resources

REEF FISH RESOURCES SURVEY IN THE MALDIVES

- Phase II

BOBP/WP/80



## BAY OF BENGAL PROGRAMME Reef Fish Research and Resources Survey

BOBP/W P/80 MDV/88/007

Reef Fish Resources Survey in the Maldives

\_ Phase II

R C Anderson Z Waheed M Rasheed and A Arif

BAY OF BENGAL PROGRAMME Madras, India 1992 This paper describes the second phase of a reef fish resources survey carried out in the Maldives and presents preliminary estimates of reef fish densities and maximum potential yields. This follows an earlier phase carried out during 1987-88 in North Male Atoll from the research vessel *Faruinas* (Van der Knaap *et all* 991) of the Ministry of Fisheries and Agriculture. That first survey phase established that handli.nes and longlines are the best gear for catching Maldivian reef fish, it collected a considerable quantity of information of value for long-terni stock assessment and for potential developers, and it made a first estimate of potential yields from N. Male Atoll.

The second phase was conducted in Shaviyani, Alifu and Iaaniu Atolls during 1989-91. Species compositions and catch rates for the major gear and fishing areas were established, regional and seasonal differences were noted and a considerable quantity of information on the biological characteristics of commercial species was collected.

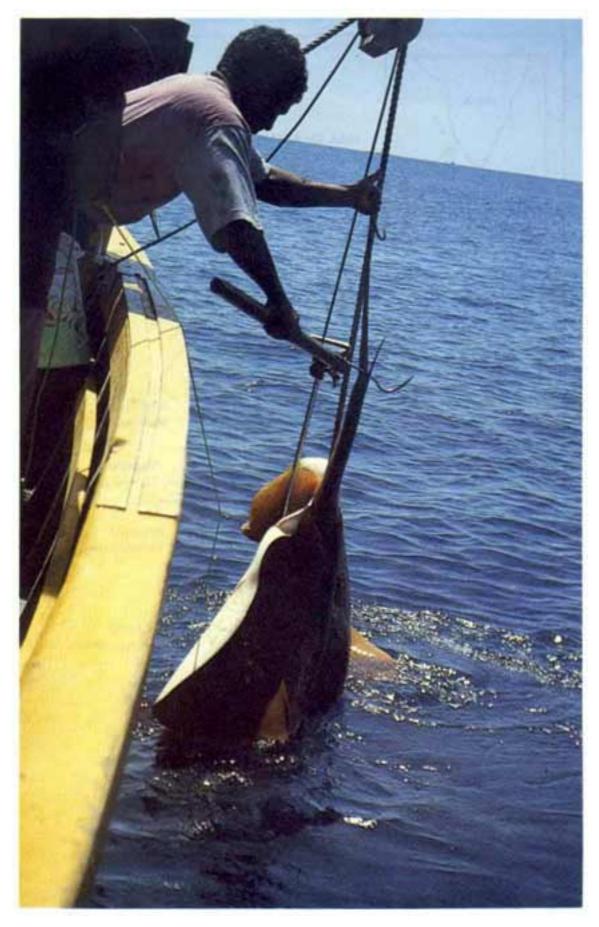
Preliminary estimates indicate a maximum potential yield of commercial reef fish (i.e. medium to large snapper, grouper, emperor and reefassociated jack) of the order of  $30,000 \pm 13,000$  t/year. The atoll basins (which constitute by far the largest part of the Maldivian atolls) are identified as having relatively large reef fish resources. The deep reef slopes outside the atolls support some high value species, hut their total potential yield is relatively small. It must, however, be noted that the stock assessment presented here is only of a preliminary nature and if the reef fishery is to be expanded, possibilities for which appear to be good, detailed monitoring wifl he required to make a more precise stock assessment.

The effort of several persons who worked on this survey need to be acknowledged. The staff of the Marine Research Section, particularly Hussein Shareef, Au Waheed, Ahmed Shareef, Ibrahim Naeem, Hussein Zahir, gave assistance with fieldwork and data compilation. Ali Naeem of MOFA assisted with the installation and the maintenance of electronic equipment on *Farumas*. The skippers (Yoosuf Idrees, Ibrahim Naseem, Adam Fulhu, Abdul Ghanee) and crew of *Farumas* cheerfully carried out the fieldwork, often in conditions that were far from ideal. Maizan Hassan Maniku, Lars Engvall, K. Sivasubramaniam, Martin Van der Knaap, Janne Fogeigren and Michel Kulbicki contributed by making useful comments on an early draft of this report. Constructive comments were also received from Drs. Daniel Pauly and Jeffrey Polovina.

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, Thailand. The Programme plays a catalytic and consultative role — it develops, demonstrates and promotes new techniques, technologies or ideas to help improve the conditions of small-scale fisherfolk communities in member-countries. The BOBP is sponsored by the governments of Denmark, Sweden and the United Kingdom, by member-governments in the Bay of Bengal region, and also by AGFUND (Arab Gulf Fund for United Nations Development Organizations) and UNDP (United Nations Development Programme). The main executing agency is the FAO (Food and Agriculture Organization of the United Nations).

| CONTENTS |                       |                                                                      | Page |
|----------|-----------------------|----------------------------------------------------------------------|------|
| In       | trod                  | uction                                                               |      |
|          | 1.1                   | Project background                                                   | 1    |
|          | 1.2                   | Existing reef fisheries                                              | 1    |
| 2.       | Materials and methods |                                                                      | 4    |
|          | 2.1                   | Fishing vessel                                                       | 4    |
|          | 2.2                   | Fishing gear                                                         | 5    |
|          | 2.3                   | Fishing survey                                                       | 7    |
|          | 2.4                   | Catch sampling                                                       | 10   |
|          | 2.5                   | Analytical methods                                                   | 10   |
| 3.       | Fisl                  | ning survey results                                                  | 13   |
|          | 3.1                   | Longline fishing inside the atolls                                   | 13   |
|          | 3.2                   | Comparison of normal v. circle hooks                                 | 16   |
|          | 3.3                   | Longline fishing outside the atolls                                  | 17   |
|          | 3.4                   | Handlining                                                           | 19   |
|          |                       | 3.4.1 Day handlining                                                 | 19   |
|          |                       | 3.4.2 Night handlining                                               | 20   |
|          |                       | 3.4.3 Commercial handlining catch rates                              | 21   |
|          | 3.5                   | Trolling                                                             | 21   |
|          | 3.6                   | Other fishing methods                                                | 22   |
| 4.       | Sto                   | ck assessments                                                       | 22   |
|          | 4.1                   | Models available                                                     | 22   |
|          | 4.2                   | Atoll basins                                                         | 28   |
|          | 4.3                   | Shallow reef areas                                                   | 30   |
|          | 4.4                   | Deep reef slopes                                                     | 30   |
|          | 4.5                   | Total stock assessment                                               | 32   |
| 5.       | Biological findings   |                                                                      | 33   |
|          | 5.1                   | Species composition                                                  | 33   |
|          | 5.2                   | Regional variation                                                   | 34   |
|          | 5.3                   | Seasonal variation                                                   | 35   |
|          | 5.4                   | Size composition                                                     | 36   |
| Ta       | bles                  |                                                                      |      |
|          | I.                    | Summary of fishing effort during the reef fish survey                | 8    |
|          | 2.                    | Summary of catch and effort by major fishing gear in Shaviyani Atoll | 9    |
|          | 3.                    | Summary of catch and effort by major fishing gear in Alifu Atoll     | 9    |
|          | 4.                    | Summary of catch and effort by major fishing gear in Laamu Atoll     | 9    |

| 5. <b>A</b> p                     | proximate sizes of Maldivian atolls                                                                                                             | 12              |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
|                                   | umber of standard 150-hook longlines deployed in the atoll basins of<br>three target atolls during different periods                            | 13              |
|                                   | tch rates by longline of reef fish species and species groups inside three target atolls                                                        | 14              |
| 8. Co<br>of                       | mposition of longline catches (percentage by weight) in the atoll basins four Maldivian atolls                                                  | 15              |
| 9. Co                             | mparison of catches by normal hooks and circle hooks                                                                                            | 16              |
|                                   | mmary of longline fishing effort at different depths on outer atoll<br>of the Reef Fish Survey                                                  | 17              |
|                                   | tch rates by longline on the outer reef at different depths ata both Phase I & 11)                                                              | 18              |
| 12. Ca                            | tch rates of major species and species groups by day handlining                                                                                 | 20              |
| 13. Ca                            | tch rates of major species and species groups by night handlining                                                                               | 20              |
| 14. Su                            | mmary of trolling catch rates                                                                                                                   | 21              |
| 15. Co                            | intributions of major reef fish species to the catches of four major                                                                            |                 |
| fis                               | hing gear (¾)                                                                                                                                   | 33              |
| Maps, Char                        | ts and Figures                                                                                                                                  |                 |
| 1.                                | Map of the Maldives                                                                                                                             | vi              |
| 2.                                | General arrangement of exploratory research vessel, R.V. Faruo'nas                                                                              | 4               |
| 3.                                | Multifilament bottom set longline                                                                                                               | 5               |
| 4.                                | Vertical stick longline/trolling                                                                                                                | 6               |
| 5.                                | Traditional handline                                                                                                                            | 7               |
| 6-12                              | Length Frequency Data                                                                                                                           |                 |
|                                   | 6. Apr10,, Virescens                                                                                                                            | 37              |
|                                   | 7Aprlon Virescens (Shaviyani Atoll)                                                                                                             | 38              |
|                                   | 8. Lwjanus DeMur                                                                                                                                | 39              |
|                                   | 9. Snapper 10. Loxodon Macrorhinus                                                                                                              | <b>40</b><br>41 |
|                                   | 11. Emperor                                                                                                                                     | 42              |
|                                   | 12. Grouper                                                                                                                                     | 43              |
| References                        |                                                                                                                                                 |                 |
| Appendices                        |                                                                                                                                                 |                 |
|                                   | otal numbers and weight (kg) of fish (by species) caught by longline side the three target atolls *                                             | 48              |
|                                   | otal numbers and weight (kg) of fish (by species and depth) caught by ngline on outer atoll reef slopes during Phase II of the Reef Fish Survey | 49              |
|                                   | otal numbers and weight (kg) of fish (by species and atoll) caught by<br>ay handlining                                                          | 50              |
|                                   | umbers of fish and weight (kg) of fish (by species and atoll) caught by ght handlining                                                          | 51              |
| Publications of the Bay of Bengal |                                                                                                                                                 |                 |



Hauling aboard the R. V. Farumas a sting ray caught on the long/me.

Fig 1: Map of the Maldives

