

# MALDIVES MARINE RESEARCH

**Bulletin** 

A biannual publication of the Marine Research Section Ministry of fisheries and agriculture, Male' Republic of Maldives



# MALDIVES MARINE RESEARCH BULLETIN

The Maldives Marine Research Bulletin will be published twice a year by the Marine Research Section of the Ministry of Fisheries and Agriculture. The Bulletin aims to improve understanding of the Maldivian marine environment and to promote the sustainable utilization of marine resources by providing a means of dissemination of relevant information. Each issue will be dedicated to a single theme, on any marine topic, but with particular emphasis on fisheries and marine life. Bulletins will include original research results, reviews, and manuals. The Maldives Marine Research Bulletin will be published in English with a Dhivehi summary. Information published in any Bulletin may be freely used, but the source should be acknowledged. All enquiries should be addressed to:

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# THE MARINE RESEARCH SECTION: A SUMMARY OF THE FIRST 10 YEARS WORK, 1984 - 1994

MARINE RESEARCH SECTION MINISTRY OF FISHERIES AND AGRICULTURE MALÉ, MALDIVES

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#### **MINISTER'S PREFACE**

It is a great pleasure to introduce this first "Marine Research Bulletin". Its publication is symbolic of the growing importance of marine research to our country. The Maldives is after all, more sea than land, and we depend almost entirely on the sea's resources for our livelihoods.

Within this volume are summaries of all the major research activities undertaken by the Marine Research Section during its first ten years. It makes impressive reading, for much has been achieved. This achievement is a tribute to Maizan Hassan Maniku, whose vision was the key factor in the formation and development of MRS. It is also a tribute to those, both Maldivian and foreign, who have worked at MRS over the past decade.

We are most grateful to those foreign donors who have supported many of our research activities since 1984. Special thanks are due to the British Government and the United Nations System, which between them have provided roughly three quarters of all foreign aid to MRS.

I congratulate everyone at MRS for their efforts over the last ten years, and encourage them to greater achievements in the years ahead.

Hassan Sobir Minister of Fisheries and Agriculture

# **DIRECTOR'S INTRODUCTION**

I am delighted to be launching this first of what I hope will be many Marine Research Bulletins. The Maldives Marine Research Bulletin is a completely new Journal aimed at promoting wider understanding of the interactions between ecology and management of fisheries and the marine environment of the Republic of Maldives. This bulletin is intended to keep all interested parties well informed in what is considered to be a dynamic field.

The Ministry of Fisheries and Agriculture is legally responsible for the rational and sustainable management of all living marine resources in the EEZ of the Maldives. The Marine Research Section is responsible for providing the information to the Ministry that it needs to carry out this mandate; as well as providing technical information to the private sector in utilizing the living marine resources in a sustainable manner. MRS is also responsible for disseminating as widely as possible information relevant to the rational and sustainable utilization of living marine resources. This Bulletin should provide one further means of meeting that responsibility.

The aim of this particular Bulletin is to provide an accessible summary of all the work under-taken by MRS from its inception up to mid-1994. It should be particularly useful to newcomers to the Maldivian fisheries sector, whether they are overseas consultants or local trainees, by providing a ready introduction to relevant literature. It should also be of use to fisheries science teachers and students, and anyone with an interest in the coral reefs of the Maldives. In addition this volume is intended as a small token of appreciation to all those who have generously supported our efforts over the years, by summarising the achievements that they have supported financially or in their intellectual capacity.

It is unfortunate that various constraints prevented the publication of this Bulletin in time for MRS's tenth anniversary. Within the last twelve months major developments have included the explosive growth of the live grouper export fishery; the initiation and subsequent banning of a Napoleon Wrasse fishery; the review of turtle harvesting activities leading to the introduction of a ban on trade and a ten year moratorium on catching of turtles; and the selection and designation of 15 top sites as marine protected areas. MRS has played a key role in all of these developments.

It is becoming increasingly clear at both global and national levels that marine resources can no longer be thought of as inexhaustible. The importance of research to the sustainable management of all resources can only increase. The first ten years of MRS have been fascinating and challenging. The next ten years are likely to prove even more demanding.

Finally, I owe a debt of gratitude to a number of colleagues for their assistance in compiling the information that appear in this issue. I acknowledge the immense contribution made in the writing of this bulletin by the technical staff, especially the untiring efforts of Dr. Charles Anderson, who has been with us in various capacities right from the inception of the marine research program initiated in 1984. I could have had no more professional or dedicated a team of researchers and assistants than those who have been associated with the activities of MRS. and who had an input in this issue.

Maizan Hassan Maniku Director General

## THE MARINE RESEARCH SECTION:

# A SUMMARY OF THE FIRST TEN YEARS WORK, 1984 - 1994

Marine Research Section Ministry of Fisheries and Agriculture Malé, Republic of Maldives

The Marine Research Section of the Ministry of Fisheries and Agriculture (MOFA) marked its tenth anniversary on 24th July 1994. On that day in 1984 a handful of Ministry of Fisheries staff moved into a rented house at H. Sanoraamaa to start the first concerted fisheries research work in the Maldives. Two years later MRS moved to a government building at H. Whitewaves, where it is still based.

The main aim of MRS from the beginning has been to carry out research on the fisheries resources within the Maldivian EEZ in order to promote their rational and sustainable utilization. MRS's mandate was later expanded to include all living marine resources, and so coral reef research was started. The major constraint to carrying out this work has been and continues to be the lack of qualified manpower. Nevertheless, considerable improvements in our understanding of Maldivian fish and coral reef resources have been made, as the outlines of major projects below will testify.

Fisheries research has ranged from the basic (cataloguing the fishes of Maldives) to the applied (exploratory fishing both offshore and inshore). In view of the importance of the tuna fishery to the Maldives, tuna research has received much attention, but reef fish resources have great potential for development so have also been subject to much research. There have been major projects on;

- tuna biology, with two major tagging projects and ongoing monitoring and analysis;
- tuna baitfish resources;
- exploratory offshore fishing;
- reef fish resources;
- shark fisheries;
- fish taxonomy;
- traditional fishing gears of the Maldives.

Coral reef research has concentrated on the effects of environmental degradation, both natural and human induced. There have been major projects on:

- the effects of coral mining on reef fisheries;
- the rehabilitation of degraded reefs using artificial reef blocks;
- Crown of Thorns Starfish;
- development of a coral reef monitoring capability.

The Government of Maldives fully recognizes the importance of its fisheries and its coral reefs, and the key role research must play if these resources are to be sustained. It therefore gives considerable financial support to MRS. Nevertheless, much of the research work carried out by MRS has been generously funded by foreign donors. Foremost among these has been the British Government through its Overseas Development Administration (ODA). In addition to funding two Technical Cooperation Officers, ODA provided funds for the two major research projects on coral reef degradation, and for several major scholarships.

The United Nations Development Programme (UNDP) and the Food and Agriculture Organization of the United Nations (FAO) funded both phases of the reef fish resources survey, the offshore fishing survey, and the shark fishery review. MRS has particularly benefited from its association with two FAO regional bodies: the Bay of Bengal Programme for Fisheries Development (BOBP) based in Madras, and the Indo-Pacific Tuna Programme (IPTP) based in Colombo.

The Government of Canada, through its International Development Research Council (IDRC) and its International Center for Ocean Development (ICOD) funded part of the crown of thorns programme, part of fish taxonomy programme, the coral reef monitoring project, and the participation of several MRS staff in training workshops.

The Australian Government supported the baitfish research project through its Australian Centre for International Agricultural Research (ACIAR) and Commonwealth Scientific and Industrial Research Organization (CSIRO) Division of Fisheries.

Other assistance has been received from the New Zealand Government, the United Nations Educational Scientific and Cultural Organization (UNESCO), the Commonwealth Fund for Technical Cooperation (CFTC), the Arizona State University Cancer Research Institute, the British Voluntary Service Overseas (VSO), Australian Volunteers Abroad (AVA), the Japanese International Cooperation Agency (JICA), the Government of Thailand and the Malaysian

Technical Cooperation Programme. The support of all of these organisations is gratefully acknowledged.

Brief summaries of the major research projects undertaken by MRS during the period 1984 -1994 are given below, as is a full bibliography.

## TUNA RESEARCH ACTIVITIES (1984 - ONGOING)

The Maldives is a tuna fishing nation. Historically the tuna fishery was the country's most important activity. With the development of tourism over the past two decades the relative importance of the fishery has declined. Nevertheless, tuna fishing remains a major contributor to the national economy, providing the bulk of visible export earnings, the major source of employment on many islands, and a major source of food for the entire population.

Tunas account for an average of about 90% of the total recorded fish catch. With mechanization and other improvements in the fishery, tuna catches have been increasing steadily over the last decade and are now in excess of 70,000t per year. About 80% of this is skipjack tuna, which is caught mainly by pole and line. Other species caught mainly by pole and line are yellowfin tuna, bigeye tuna (juveniles of which are mixed in with the yellowfin catch and not normally separated from it) and frigate tuna. Species caught mainly by trolling are little tuna (kawakawa), dogtooth tuna and the related wahoo and sailfish.

Apart from the Exploratory Offshore Fishing Survey (see below) the main tuna research activities undertaken by MRS have been tuna tagging and analysis of fishery statistics. In addition, support was given to a project assessing the impact of fish aggregating devices (FADs) on the tuna fishery, carried out by MOFA.

English name	Dhivehi name	Scientific name
makipindowee mowing	an also her a solution a	7.8% However, a higher no
Skipjack tuna	Kalhubilamas	Katsuwonus pelamis
Yellowfin tuna	Kanneli	Thunnus albacares
Bigeye tuna	Loabodu kanneli	Thunnus obesus
Frigate tuna	Raagondi	Auxis thazard
Little tuna/kawakawa	Latti	Euthynnus affinis
Dogtooth tuna	Woshimas	Gymnosardo unicolor
Wahoo	Kurumas	Acanthocybium solandri
Sailfish	Fangadu hibaru	Istiophorus platypterus

Table 1. Major tuna and tuna-like species caught in the Maldives.

#### Methods

Two tuna tagging programs have been undertaken by MRS. The first was carried out during 1990, with the assistance of IPTP. Nearly 10,000 tunas were tagged, of which 81% were skipjack and 19% were yellowfin. A second Maldivian tuna tagging programme is being carried out during 1993-94, with financial assistance from UNDP through the World Bank (IDA Third Fisheries Project). The target of over 7000 tag releases has been met, and tag returns are still being received.

The Ministry of Fisheries and Agriculture collects detailed statistics of tuna catches and fishing effort from every island. These data have been compiled by species, month and atoll since 1970 and form an extremely valuable source of information. Less information is available on length frequencies of tuna catches. MRS has collected length frequency data from Malé market since 1984, and on tagging and other fishing trips when possible. Some data have also been collected from the atolls by MOFA field officers, but these are generally of poor quality. Therefore starting in 1993, fishing skippers have been recruited in the atolls by MRS to measure their own catches on a regular basis. MRS staff also carried out the biological monitoring of an FAD assessment program.

#### Results

From the first tagging program a considerable amount of information on tuna migrations was obtained. 96.7% of skipjack returns were from within the Maldives, and only 3.3% were from outside. The foreign returns were from Sri Lanka, Lakshadweep and the western Indian Ocean. Most of the returns from Sri Lanka and Lakshadweep were from fish tagged in the north of the Maldives. Most of the returns from the western Indian Ocean were of fish released in the south of the Maldives. Skipjack tagged "offshore" appeared to be more migratory than those tagged "inshore".

Overall recovery rates for yellowfin were much lower than for skipjack (7.0% v. 17.8%). However, a higher proportion of yellowfin than skipjack were recovered outside the Maldives (17.9% v. 3.3%). Both skipjack and yellowfin recoveries from outside the Maldives show evidence of the fish having moved with the prevailing currents.

Growth rate estimates for both skipjack and yellowfin were made from tag return data. For skipjack, growth rates of 2.4cm/month at 40cm and 1.4cm/month at 70cm were estimated. For yellowfin, growth rates of 2.8cm/month at 40cm and

2.4cm/month at 70cm were estimated. However, because of poor length-atrecapture data these estimates might not be too reliable. Analysis of the skipjack tagging data using tag attrition models suggests that skipjack stocks are lightly exploited in the Maldives. The second tagging programme was planned to provide further information, particularly on the movements of "offshore" v. "inshore" fish, and on the growth of skipjack.

Analysis of tuna catch and effort data is still at an early stage, but has already revealed many insights into the fishery and it's target species. For example, in the case of yellowfin tuna the seasonal pattern of the fishery has been worked out: juveniles occur off the west coast of Maldives during the southwest monsoon, and off the east coast during the northeast monsoon. Integration of data from Maldives with information from Sri Lanka and India has allowed the migratory pattern of these fish in the central Indian Ocean to be elucidated. Furthermore, growth rates have been estimated, at 2.9cm/month, which is consistent with the tagging results. Analysis of catch and effort data has also revealed longer term changes in tuna abundance in Maldivian waters. For example, skipjack catches decrease significantly during El Niño years, while those for yellowfin, frigate tuna and little tuna all increase.

#### Discussion

The tuna fishery is the most important fishery in the Maldives. Its continued vitality is essential for the well-being of the country. With the continuing development of tuna fishing fleets elsewhere in the Indian Ocean there is growing concern about the status of the tuna stocks fished by the Maldives. Research on tunas is therefore accorded a high priority by MRS. Findings to date have, fortunately, suggested that tuna stocks are not in immediate danger of overexploitation in the Maldives. However, there is clearly a real need to continue monitoring stock status as tuna fisheries throughout the Indian Ocean continue to expand. In particular there is a need to carry out tagging of tunas in fishing areas outside the Maldives, to see to what extent these fisheries are targeting tunas that would otherwise migrate to the Maldives. There is also a need for further analysis of variations in tuna abundance in relation to oceanographic perturbations so that in future these fluctuations in tuna abundance might be predicted. Such studies will require increasing international cooperation, so MRS is playing an active role in IPTP, and in the development of its successor, the Indian Ocean Tuna Commission (IOTC).

#### References

Nearly one third of all MRS reports are concerned with the tuna fishery (see Bibliography). Key references include Anderson (1984, 1988a, 1993), Anderson

and Hafiz (1991), Hafiz (1986b), Rochepeau and Hafiz (1990), and Sivasubramaniam (1988). Key tagging reports include Bertignac (1994) and Yesaki and Waheed (1992b). Reports on the FAD monitoring programme include Anderson (1991) and Naeem and Latheefa (1994).

#### **TUNA BAITFISH RESEARCH (1984 - ONGOING)**

Most of the tuna catch in the Maldives is made using the traditional pole and line method. This technique cannot operate without a regular and adequate supply of suitable livebait. As the pole and line fishery expands, its future viability will depend upon a better understanding of the major baitfish resources. For this reason the Marine Research Section has been carrying out research on baitfish since 1984, with local funding. However, much of the work to date was done during the course of a specific Baitfish Research Project. This research project was carried out from 1988 for a period of three years. The project involved collaboration between scientists from CSIRO Australia and MRS; it was funded by the Australian Centre for International Agricultural Research (ACIAR).

#### Methods

Initial studies concentrated on identifying species involved in the fishery; identifying major seasonal trends in baitfish utilization; and documenting baitfishing methods. This was carried out by taking part in baitfishing activities, sampling catches, and interviewing experienced chummers in islands throughout the country.

Under the CSIRO / ACIAR / MRS project more detailed studies were undertaken of bait growth, reproduction and feeding. This was done by regularly sampling bait catches at a few locations throughout the Maldives and studying their length frequencies, otoliths, gonad maturities, and stomach contents. In addition, the role of reef fish predation on baitfish populations was investigated by studying the gut contents of potential predators.

#### Results

Over 20 species of fish that are regularly used as livebait have been identified. There are, however, only three main types:

- MUGURAAN (several species of Fusiliers, family Caesionidae);
- BOADHI (several species of Cardinalfishes, family Apogonidae);
- REHI (the Silver Sprat, Spratelloides gracilis).

In addition to these varieties, MIYAREN (the shorthead Anchovy, *Encrasicholina heteroloba*) is common in the southern atolls where it tends to replace *rehi*. In the northern and central atolls *rehi* is most abundant on the western side of the Maldives during the southwest monsoon, and on the eastern side during the northeast monsoon. Detailed studies on the growth and reproduction of *miyaren*, *rehi* and *hondeli* (the Blue Sprat, *Spratelloides delicatulus*) showed that these species grow fast, have short lives and have high fecundity. Stomach content analysis of predatory reef fish suggested that *muguraan* were an important dietary component, while *boadhi* and *rehi* appeared to be less important.

#### Discussion.

There is still much work to be done in order to obtain a full understanding of Maldivian baitfish population dynamics. Nevertheless, studies to date suggest that *miyaren, rehi* and *hondeli* (in common with many other small pelagics) can sustain high levels of fishing without great risk. The situation for the longer-lived *muguraan* and *boadhi* is more complicated and needs further study.

#### References

Information on the Maldivian baitfishery is given by Anderson and Hafiz (1984 and 1988), Blaber et al. (1990), Hafiz (1985 and 1988), Maniku et al. (1990), and Milton et al. (1990a and 1990b).

#### **EXPLORATORY OFFSHORE FISHING SURVEY (1987 - 1988)**

In 1986 the Republic of Maldives declared a 200 mile Exclusive Economic Zone (EEZ). Traditional pole and line tuna fishermen rarely venture beyond 30 miles offshore. Therefore the zone 30-200 miles offshore is barely exploited. The Marine Research Section carried out an exploratory fishing survey in this offshore zone for one year, between December 1987 and November 1988. The survey was carried out with the support of the Bay of Bengal Programme (BOBP) and was largely funded by FAO under its Technical Cooperation Programme. Support was also given by the British Overseas Development Administration (ODA). The main aim of the survey was to test the feasibility of commercial multiday fishing in the zone 30-100 miles offshore using drifting gillnets and pelagic longlines.

#### Methods

Fishing operations were carried out from a chartered 15.6m wooden fishing vessel, "Matha Hari". The vessel was usually operated with six crew and two MRS staff on

board. Fishing was carried out at night. "Matha Hari" operated both longline and gillnet gear. A full set of longlines consisted of 100 tuna hooks and 100 shark hooks. A full set of gillnets compromised equal quantities of three different mesh sizes (125mm, 150mm and 180mm stretched mesh) which covered a total length of about 2.5km. Fishing was confined to the eastern side of the Maldives and was carried out in three latitudinal areas: north (based at Felivaru), central (off Malé) and south (off Laamu Atoll).

#### Results

A total of 49 nights fishing were carried out during the course of 24 fishing trips over the one year survey period. The total catch from 49 fishing nights was 22.6t. This comprised 68% shark, 21% skipjack, 7% billfish, 3% yellowfin and 1% others. The highest catch of shark was made by shark longline (average 4.9 sharks, 223 kg, per hundred hooks). Higher catches of sharks were made in the north of Maldives than in the south. Skipjack was caught mainly by gillnet (average 24.5 skipjack, 108.5kg, per set). Yellowfin catches by tuna longline were low (average 0.32 yellowfin, 10.8kg, per hundred hooks).

#### Discussion

The exploratory offshore fishing survey was handicapped by the lack of the infrastructure necessary to support multiday offshore fishing. Repairs, maintenance, catch disposal, and obtaining supplies all took an inordinate amount of time. As a result, only 49 nights fishing were carried out. Despite this the survey aims were largely achieved.

The drifting gillnet was recognized as being an unsuitable gear for catching tunas in Maldivian waters. On average it caught only 20% of the tuna landed by pole and line masdhonis operating inshore of "Matha Hari" at the same time. While catches by gillnet could be increased in a number of ways, the gillnet was shown to be unviable as an alternative to pole and line for catching tunas.

The tuna longline also proved to be not very successful (although crew inexperience and lack of good bait did not help). Overall catch rates, and particularly those for yellowfin tuna, were low. Given the low prices then (and now) available for yellowfin in Maldives, tuna longlining is unlikely to be commercially viable. However, if a market were developed for high value sashimi yellowfin this situation would change.

In contrast to the gillnet and tuna longline, the shark longline did yield catches in commercial quantities. A small boat equipped with a hydraulic line hauler and a

400 hook longline might be able to catch up to one tonne of sharks per night on average. With current prices for shark fins this is a viable proposition.

Since the completion of the survey at the end of 1988 there has been no commercial interest in offshore gillnetting. However, there has been considerable interest in shark longlining, with several parties initiating operations.

#### References

A full report of the exploratory offshore fishing survey is given by Anderson and Waheed (1990a). An executive summary is provided by Anon (1990). Other information is provided by Anderson (1990a and 1990b), Anderson and Waheed (1989) and Waheed and Anderson (1989).

#### REEF FISH RESEARCH AND RESOURCES SURVEY (1986 - 1991)

The Maldives is a country of coral reefs. It is also a country of fishermen. It is therefore somewhat surprising that less than 10% of the recorded fish catch is of reef fish; the great majority of the fish caught are oceanic tunas. Considering the vast extent of coral reefs within the country, the Government of Maldives was aware that reef fishes represented an underutilised natural resource. In order to assess the potential for a larger fishery, and to plan its development, the Government initiated a "Reef Fish Research and Resources Survey" with assistance from UNDP and FAO in 1986. The Survey was carried out in two phases. The first phase was carried out between September 1986 and December 1988; the second phase ran from January 1989 to September 1991.

The objectives of the first phase were:

- to determine the most appropriate types of reef fishing gear for use in the Maldives;
- to estimate the relative abundance of commercial reef species;
- to undertake a preliminary assessment of economic feasibility and marketing;
- to train MRS staff.

The objectives of the second phase were:

- to make an assessment of the size of the reef fish resources and of their potential sustainable yields;
- to conduct trial fishing for potentially valuable deep-water snappers;
- to assess the status of the beche-de-mer (sea cucumber) fishery;
- to assess the status of the giant clam fishery;

- to conduct marketing surveys;
  - to continue the training of MRS staff.

#### Methods

The reef fishing survey was conducted from a 12.8m second generation dhoni R.V."Farumas", modified with a small wheelhouse and a line hauler. During the first phase the vessel was equipped with a 23HP engine. This was upgraded to a 33HP engine for the second phase. During the first phase fishing was limited to North Malé Atoll. Fishing was carried out using traps, bottom-set longlines and handlines. During the second phase fishing was carried out in Shaviyani, Alifu and Laamu Atolls, using longlines and handlines. Assessments of the beche-de-mer fishery, the giant clam resource, and reef fish market potential were made by short-term consultants working with MRS staff.

#### Results

During the first phase the relative efficiencies of traps, bottom longlines and handlines were tested. Traps were found to be relatively inefficient, and also to be subject to high losses. Bottom longlines and handlines were both found to be effective for catching reef fishes in the Maldives. Preliminary estimates of the size of the reef fish resources in North Malé Atoll and their potential sustainable yields were made. However, it was recognized that extrapolating these results to the whole of Maldives could be misleading because of differences in conditions between atolls.

Accordingly, during phase two fishing was carried out in three atolls thought to be representative of different regions in the Maldives: Shaviyani (north), Alifu (centre) and Laamu (south). The south was found to have much lower catch rates and a different species composition from the north and centre.

From the longline catch data, it was possible to make rough estimates of reef fish stock size in each of the three major habitat types (namely atoll basins, reef areas, and deep reef slopes outside the atolls) for each of the four atolls surveyed. From this the total potential yield of commercially valuable reef fish from Maldives was roughly estimated at  $30,000 \pm 13,0001$  per year.

In addition to these first estimates of maximum sustainable yields, a considerable quantity of biological information was collected from the reef fish survey catches, and from sampling commercial landings. This included length frequency data for numerous species; length-weight relationships for 50 species; and data on reproductive and feeding activities. These are some of the data needed for a better

understanding of fish populations and for estimating their sustainable yields. Also, a large collection of reef fish otoliths was amassed; many new records of fishes for Maldives were made; and over 80 species of crabs were obtained from fish stomachs.

Table 2.	Estimates of maximum	sustainable yields of	Maldivian reef fish by major
habitat.			

	Estimate of maximum sustainable yield (t per year)			
Habitat	Mean	Lower	Upper	
Atoll basins	24,000	13,500	36,000	
Reef areas	5,250	3,000	7,000	
Deep reef slopes	500	400	600	
Total (rounded)	30,000	17,000	43,000	

A giant clam fishery started in Maldives in June 1990. A survey of the fishery and its resource base was carried out in early 1991 under this project. It was recognized that continued fishing at the rate then in force would result in the giant clam resource being rapidly fished out. Various management options were proposed.

A beche-de-mer fishery started in Maldives in 1985. A survey of the fishery and its resource base was carried out in mid-1991. Export value of beche-de-mer had dropped since 1988. It was found that a major cause of the drop in export earnings was the overexploitation of the most valuable species and consequent fishing of less valuable varieties. In addition, smaller individuals of all species were being exploited, and processing techniques were inadequate. Various management and quality improvement options were proposed.

Three short consultancies on reef fish marketing were carried out, one during the first phase of the reef fish survey, and two during the second phase. Export markets for high value chilled reef fish (including groupers and deepwater snappers) were identified in Europe and the Far East. However, the entry of Maldives into these markets was hindered by logistical constraints (lack of infrastructure, difficulties in consolidating consignments, high airfreight costs etc.), and by competition from other tropical countries with cheaper production costs. Domestic markets were also reviewed and potential for expansion was again found to be limited in the immediate future.

#### Discussion

The Reef Fish Research and Resources Survey successfully completed all of its stated objectives. An assessment of the reef fish resources showed that there is considerable scope for expanding the reef fishery. That this had not happened was largely due to marketing constraints, which were identified during the project. The considerable quantity of biological data collected during the fishing surveys form a sound basis for more detailed stock assessment as the fishery expands. These data have , for example, recently been used to produce a first estimate of sustainable yields for grouper, following the start of the live grouper export fishery. Similarly, training (both on-the-job and overseas) received by MRS staff involved in the project has proved to be invaluable since then.

As a result of the giant clam survey, it was recognized that the fishery was not sustainable. Therefore, the Ministry of Trade and Industries stopped issuing licenses for the export of giant clams, effectively halting the fishery. MRS has now initiated giant clam culturing trials. As a result of the beche-de-mer survey a ban was introduced on sea cucumber collection using scuba gear, in order to protect deepwater spawning stocks.

#### References

Major findings of the Reef Fish Research and Resources Surveys are given by Van der Knaap et al. (1991) and Anderson et al. (1992). Executive summaries of the two phases of the project are given by Anon (1991 and 1992). Information on the beche-de-mer fishery is given by Joseph (1992) and on the giant clam fishery by Barker (1991). Marketing survey reports are by Willmann (1988), Elsy (1989) and Naseer (1991). Other reports include Anderson (1992a and 1992b), Barker and Shakeel (1991), Gallene (1987 and 1988), Hussain (1988), Johnson (1988), Joseph and Shakeel (1991), Mendoza (1986), Shakeel (1991a, 1991b, 1993 and 1994), Van der Knaap (1989a and 1989c), Van der Knaap et al. (1989) and Z. Waheed (1988).

#### **SHARK FISHERIES REVIEW (1992)**

Although Maldives is justly renowned as a tuna fishing nation, it has also had significant shark fisheries since historic times. At the beginning of the 1990's a number of serious problems affecting the Maldivian shark fisheries came to light.

These included suggestions of overfishing of the valuable deepwater Gulper Shark (or Spiny Dogfish, *Centrophorus* spp.) resource; conflicts between fishermen catching sharks and those targeting other resources; and complaints from the tourism industry about the reduction of shark numbers at particular 'shark diving' sites. Overfishing and unresolved conflicts between resource users could potentially result in considerable loss of income to fishermen. The removal of sharks from popular diving sites could potentially result in enormous loss of income to the tourism sector. MOFA recognized the urgent need to assess and resolve these problems. Therefore with assistance from FAO it carried out a review of the Maldivian shark fisheries during July to November 1992.

#### Methods

Information on Maldivian sharks and shark fisheries was obtained in three ways. First, a review was made of all available information at MRS, in particular data from the exploratory offshore fishing survey, and from the reef fish resources surveys (see project profiles above). Export data (for shark fins and oil) collected by Customs and compiled by MOFA were also reviewed. Secondly, numerous interviews were conducted with people connected in some way with the utilization of shark resources. These included government officials, businessmen, tourism industry representatives, diving instructors, and fishermen. Thirdly, questionnaires were distributed to all fishing islands by MRS in May 1992; replies were received from 170 islands by mid-November 1992.

#### Results

Eleven different shark fishing methods were identified and documented. The most important methods are longlining for oceanic sharks; netting for reef sharks; and deep handlining for Gulper Sharks. A total of 34 different species of sharks were recognized from Maldivian waters, including several new records for Maldives, and one species new to science. Yields of major shark products were estimated as follows:

- 1.44kg dried shark fins per 100kg fresh shark;
- 27kg salt dried shark meat per 100kg fresh shark;
- 26.7litres (23kg) high grade liver oil per 100kg deepwater Gulper Shark.

From these conversion factors, and export data, it was possible to estimate roughly the size of the major fisheries. For shallow water sharks (oceanic and reef combined) the annual average catch prior to 1977 was about 460t/yr. There appears to have been a major expansion of fishing effort in 1977, which boosted catches tremendously. Since 1977 the annual shallow-water shark catch has averaged about

1340t/yr. The deepwater shark fishery started in 1980, and rapidly peaked at about 330t/yr in 1981, since when catches have declined. The total value of shark product exports was estimated at MRF 12.1 million (USD 1.17 million) in 1991.

The status of Maldivian shark stocks was reviewed. With the limited information available it was not possible to make rigorous stock assessments, but the following preliminary conclusions were made:

- Deepwater sharks overfished; control of fishing effort required.
- Reef sharks fished at about optimum level; expansion of fishery to be avoided.
- Oceanic sharks underfished; expansion of fishing effort could be encouraged.
- Whale Sharks possibly endangered; should be protected.

The importance of reef sharks as attractions for the diving tourist market was reviewed. It was roughly estimated that foreign divers spend USD 2.3 million per year on shark-watching dives in the Maldives. There is therefore a strong case for protection of reef sharks within the tourism zone.

#### Discussion

A number of recommendations were made for the better management of shark resources. The main recommendations concerned restriction of fishing effort in the Gulper Shark fishery; the expansion of the offshore longline fishery for oceanic sharks; the restriction of reef shark fishing, especially by gillnetting, within the tourism zone; the banning of fishing for Whale Sharks. Fishing for Whale Sharks was banned in 1993, and fishing for reef sharks at certain diving sites within the tourism zone was banned in June 1995.

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The shark fisheries of the Maldives were reviewed by Anderson and Ahmed (1993). An executive summary of this review was provided by Anon (1993). Information on Maldivian shark fisheries is also given by Anderson (1991 and 1992c) and by Anderson and Ahmed (1992a and 1992b).

#### COLLECTION AND IDENTIFICATION OF ECONOMICALLY IMPORTANT FISH SPECIES (1986 - ONGOING)

The project "Collection and Identification of Economically Important Fish Species" was initiated by MRS in 1986. It has been ongoing since then. It has been

mainly locally funded, although the Canadian aid agency ICOD has made substantial contributions. The aim of the project is to obtain a sound taxonomic understanding of economically important reef fishes and also other non-traditional marine species. Acquiring this knowledge is an essential first step in the development of rational management plans for the sustainable exploitation of the country's fishery resources.

#### Methods

MRS staff have collected fish specimens during the course of exploratory fishing surveys; while taking part in commercial fishing operations; at Malé market and other landing sites, from aquarium fish collectors; and during diving operations. All fishes have been identified, preserved (or photographed if too large to keep) and catalogued at MRS. Dr. John E. Randall, of the Bishop Museum, Hawaii (the World's foremost authority on coral reef fish taxonomy) visited Maldives twice in 1988 to work with MRS staff under this project. During these visits extensive collections of small reef species not normally taken by fishermen were made.

#### Results

A total of over 900 species have so far been catalogued from the Maldives. Over 300 of these were recorded from the Maldives for the first time as a result of this project. Seven species have been described as new to science; several more await description. Many publications have been produced detailing these findings. Over 400 identified and catalogued lots of fishes are now held in the MRS reference collection.

#### Discussion

This project has been successful in cataloguing the fish fauna of the Maldives. Studies to date have concentrated on shallow water fishes (i.e. those found in less than 200m depth). Attention is now being turned to the deepwater fishes. At the same time, records of new shallow water species are being maintained. It is likely that the known fish fauna of the Maldives will rapidly be increased from 900 to over 1000 species.

#### References

Four volumes of an illustrated "Catalogue of Fishes of the Maldives", giving details of nearly 300 species have been produced (MRS, 1986,1987,1988 and 1992), entirely by MRS staff. A checklist of all shallow water fishes known from Maldives has been published (Randall and Anderson, 1993). Reports on new or

rare fishes from the Maldives include those of Ishihara et al. (1993), Randall (1988 and 1992), Randall and Goren (1993) and Randall and Pyle (1989). A colour guide to some of the more common edible reef species has been published (McAllister, Anderson and Alfonso, 1992).

#### FISHING GEAR SURVEY (1989 - ONGOING)

Since the islands of the Maldives were first settled, perhaps as long as 3000 years ago, the people of the Maldives have undoubtedly had a taste for fish and have developed numerous devices for catching them. The country has rich fishery resources and fishing is the principal means of livelihood for the majority of the people. With few resources other than those provided by the sea this could hardly be otherwise. The main type of fishing is livebait pole and line fishing for surface swimming skipjack and yellowfin tunas. This traditional fishing method has dominated the fishery for centuries. There are, however, many other types of fishing undertaken in the Maldives, although several of these are now dying out. The objectives of this project were, first, to catalogue the existing gears of the Maldives, including gears that have recently become obsolete. The second objective is to develop these fishing gears and to introduce new ones in order to improve the fisheries. This gear survey is funded entirely from local sources.

#### Methods

The Ministry of Fisheries compiled a list of the fishing methods used on every island in the Maldives during the early 1980's. This list was used as a basis for selecting islands throughout the country to visit in order to obtain detailed information on a complete range of fishing gears. Details of the fisheries, processing techniques and vessels were obtained at the same time. Discussions were held with fishermen to identify areas where improvements could be made. One such area is in water spraying for pole and line tuna fishing. Mechanical water sprayers were introduced in the north of Maldives during the early 1990's.

#### Results

Details of all the types of fishing gear used in the Maldives were obtained and documented in a "Catalogue of Fishing Gear of the Maldives". The use of mechanical water sprayers was documented by MRS, and information on their construction and use disseminated throughout the Maldives.

#### Discussion

The cataloguing of all the known fishing gears of the Maldives has provided a sound foundation from which further developments can be made. The use of mechanical water sprayers rapidly spread to the south of Maldives, partly through the efforts of this program. Plans have been made to study ways of further improving productivity in the pole and line fishery, including trials with mechanical poles, and to introduce new gears for deepwater fishing.

#### References

A comprehensive "Catalogue of Fishing Gear of the Maldives" was prepared by Waheed and Zahir (1991). Information on mechanical water sprayers is given by Anderson and Waheed (1990b) and Waheed (1992a). Other relevant reports include Anderson and Ahmed (1993), Anderson and Waheed (1990a), Hussain (1988) and Van der Knaap et al. (1991).

# EFFECTS OF DEGRADATION OF THE ENVIRONMENT ON LOCAL REEF FISHERIES (1987-1990)

Many reefs in Maldives, but particularly those in the immediate area of Malé, are subject to severe stress from a number of causes especially coral mining. The Government of Maldives was concerned that these stresses may reduce the numbers of fish that can be caught from the coral reefs in North Malé Atoll. In order to study the effects of coral reef degradation on reef fisheries, a three year research project was started in 1987. It was funded by ODA and carried out in cooperation with the University of Newcastle upon Tyne, U.K. The main objectives of the project were:

- to describe the reef associated fishery together with the biology and behaviour of the major commercial species and their trophic base;
- to carry out a socio-economic survey of the artisanal reef fishery in the Maldives;
- to document the variations in degradation of the environment and associated variations in the reef fish population and the artisanal fish catch.

#### Methods

Information on the reef fishery and reef fish catches were obtained from three main sources. First, from existing fishery statistics. Secondly, by sampling reef fish catches landed at Male fish market. Thirdly, by sampling reef fish catches in Alifu, Meemu, Dhaalu and Vaavu Atolls by selected local fishermen. In addition some sampling of resort catches was carried out. The basic assumption being tested was that it would take longer to catch a specified amount of fish in a degraded environment than in a non-degraded one. The socio-economic survey was conducted by means of a set of questionnaires. Altogether 202 interviews were conducted in 7 atolls, out of which 114 were with reef fishing crewmen and 88 with boat owners. The description of variations in degradation of the environment, and of fish species abundance and compositions were achieved by means of visual assessments. A total of 152 species of reef fish were selected for visual assessment at 100 sites.

#### Results

It was established that coral mining is the major cause of reef degradation in the Maldives. Coral mining reduces the topographical complexity of the reefs. As a result reef fish diversity and abundance on mined reef flats is reduced. However, mining reef flats appears to have little deleterious impact on the numbers of commercial reef fish species on adjacent unmined reef slopes. In socio-economic terms, reef fishing is mainly a part-time activity, with a relatively small proportion of the income of households who are involved in reef fishing being derived from this source. However, there was potential for development of the reef fishery given favorable markets and incentives.

#### Discussion

Since this project was completed in 1990, the reef fishery has expanded as predicted, especially with the opening of new export markets for live grouper. As a result of the development of these new markets, the socio-economic status of reef fish fishermen has improved dramatically, especially in the central atolls. However, it seems unlikely that this improvement will be sustainable because the grouper stocks are being overexploited.

Although coral mining on reef flats appears to have little effect on edible reef fish stocks, it does affect aquarium fish stocks and, more importantly, it destroys sea defences. This results in an increased risk of island erosion and flooding. It was therefore recommended that traditional coral mining be phased out, with the supply of building material being replaced with locally manufactured concrete blocks or imported aggregate. Reclamation of land was also found to be environmentally unsound, as well as being particularly uneconomic. It was recommended that land reclamation should not be undertaken unless absolutely necessary. The full environmental implications and sea defence costs should be carefully assessed for any such development.

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# Marine Research Section Staff List, 24 July 1984 - 31 July 1995

Name	Current or Last Position	Date Joined MRS	Date Left MRS
Maizan Hassan Maniku,BSc, Dip.Ed.	Director of Fisheries Research and Development	24 Jul 1984	in the second
Ahmed Hafiz	Deputy Director	24 Jul 1984	1. 2-1 6-2
Fathimath Seema	English Secretary	24 Jul 1984	6 Sep 1993
Hassan Shakeel, MSc	Senior Resources Officer	24 Jul 1984	11 2-2 2 2
Abdullah Naseer, BSc, MSc	Reef Ecologist	24 Jul 1984	11 2-1 2 2
Mohamed Shiham Adam, BSc, MSc	Fishery Biologist	24 Jul 1984	5-169
R. Charles Anderson, BSc, PhD	Fishery Biologist	24 Jul 1984	8-8 F 8
Aishath Aniya	Librarian	24 Jul 1984	Feb 1985
Mohamed Rasheed	Peon	24 Jul 1984	8 Dèc 1985
Fazna Ahmed	Trainee	4 Mar 1985	27 Jun 1985
Aishath Rasheeda	Data Acquisition Officer	10 Mar 1985	17 Nov 1990
Mohamed Rasheed Hussein	Fisheries Research Assistant	10 Mar 1985	30 Jan 1991
Ahmed Solih	Research Manager	28 May 1985	14 Oct 1986
Ahamed Fayaz	Field Officer	16 Jul 1985	26 Mar 1986
Mohamed Faiz, Dip.Fish.Mang	Resources Officer	5, Aug 1985	10-236
Ali Rasheed	Project Officer	6 Jan 1986	21 Jun 1986
Sana Mohamed, BSc	Reef Biologist	12 Feb 1986	1. 5-6 5 2
Hussein Zahir	On Scholarship	24 Feb 1986	5 E - 2 - 3
Fazeela Ali Didi	Trainee	5 Mar 1986	4 May 1991

Ali Manik Muzunee	Peon	17 Mar 1986	21 Jan 1987
Mohamed Habeeb	Field Officer	7 Jul 1986	8 Nov 1989
Zaha Waheed	On Scholarship	8 Aug 1986	-
Alec R. Dawson Shepherd, BSc, PhD	Reef Ecologist	8 Dec 1986	15 Sep 1991
Abdul Hannan Yoosuf	Peon	22 Jan 1987	3 Mar 1988
Martin Van der Knaap, BSc	Fishery Biologist	15 Apr 1987	15 Jan 1990
Ahmed Jaleel	Under Secretary	17 May 1987	12 Dec 1990
Sameena Qasim	Masakath	27 May 1987	14 May 1990
Mariyam Hussein Didi	Senior Secretary	9 Jul 1987	
Hussein Shareef	Trainee	6 Sep 1987	3 Dec 1990
Ahmed Shathir	Field Officer Gr II	13 Apr 1988	10 308 1000
Moosa Mohamed Fulhu	Field Officer	13 Apr 1988	23 Oct 1989
Mohamed Ibrahim	Peon	16 May 1988	22 Nov 1988
Hassan Shafeeq	Trainee	24 May 1988	22 Mar 1990
Mohamed Hazmath	Trainee	13 Jun 1988	29 Aug 1988
Ali Waheed, Dip.Fish.Tech.	Fishing Technologist	20 Apr 1989	17 Joh Lasa
Hassan Labeeb	Peon	24 May 1989	12 Mar 1990
Abdul Waiz	Computer Operator Trainee	28 Jan 1990	1 Oct 1991
William R. Allison, BSc	Biologist	30 Jun 1990	28 Jun 1992
Zubaida Mohamed	Cleaner	9 Jul 1990	19 May 1994
Susan Clark, BSc, PhD	Coral Reef Biologist	28 Jul 1990	31 Jan 1995
Simon Hall, BSc	Data Analyst	14 Oct 1990	3 Oct 1991
Ahmed Arif	Trainee	3 Dec 1990	15 May 1993
Ahmed Shareef	Fisheries Research Assistant	26 Mar 1991	6 Oct 1993

Aminath Ameena
Ibrahim Nadheeh
Ibrahim Naeem
Ismail Haleem
Basheera Mohamed
Aishath Hudha Ahmed, BSc
Ahmed Shiham
Frank Siciliano, BSc
Fathimath Nahida
Hussein Faiz
Akhthar Mohamed Ali
Hassan Hameez
Mariyam Rozlyn Saleem
Ahmed Simon Shareef
Sherin Nahida
Waheeda Abdul Hakeem
Ahmed Rifaaee
Fathimath Shabeen
Zeeniya Riyaz
Hamid Shafeeu
Abdulla Shaan

Trainee	19 Jun 1991	20 Mar 1993
Fisheries Research Assistant	19 Jul 1991	1-06(1001
Fisheries Research Assistant	19 Jul 1991	31 Jul 1993
Fisheries Research Assistant	19 Jul 1991	TO YON LOOK
Cleaner	14 Feb 1992	
On Scholarship	11 Apr 1992	1001
Trainee	19 Jun 1992	13 Sep 1993
Data Analyst	26 Oct 1992	26 Oct 1994
Trainee	2 Mar 1993	24 Jan 1994
Trainee	15 Mar 1993	18 Jan 1994
Computer Operator Trainee	9 May 1993	18 Jun 1994
Trainee	13 May 1993	16 Aug 1994
Fisheries Research Assistant	23 Aug 1993	1000000000
Trainee	8 Nov 1993	13 Feb 1995
Senior Secretary	30 Mar 1994	25 Jul 1994
Cleaner	5 Jul 1994	TT TROPALAS
Trainee	8 Aug 1994	The second second
Secretary	22 Aug 1994	
Computer Operator Trainee	27 Aug 1994	20 Jul 1995
Trainee	10 Dec 1994	-
Trainee	20 Jun 1995	Contra 1202

تَحْرِسُو مَوْرُدُوْ مُوْسَعُ مَرْمُوْ مَعْمَدَ مَدْمُو مَدْمُوْ مُوْمُوُ مُوْرُدُوْ مُوْمُو مُوْمُ مُومُ مُومُومُ مُومُ مُومُ مُومُومُ مُومُ مُومُ مُومُ مُومُومُ مُومُ م

4. ئۇتىرىمە خەرجە تە ئىكى ئى بىر خە شەر كەر قە تەترى بەترى بە تەب سەھە تەكىرى خىد خىر قى بەر ئەر ئەترى ئەترى قەر قى مەكە توپترىش ئەك تەر ئەك ئەك ئەك ئەك ئەك ئە تەتر قەترى ئەك تەر ئەترىك ئەترىش ئە بويتر قەرىپى تەتر قەترى ئەتر ئەترىك ئەترىش ئە بويتر قەرىپى

 رَحْدُوْهُ کَمْ مَدْمَرْ بَعْرَ مَدْمَرْ بَعْرَ مَدْمَرْ بَعْرَ مَدْمَرْ بَعْرَ مَدْمَرْ بَعْرَ مَدْمَرْ مُحْدَمُ مُعْدَمُ مُعْدً مُودَرَمُ مُعْدَمُ مُ مُعْدَمُ مُوضَعْ مُعْدَمُ مُ مُعْدَمُ مُعْدَمُ مُعْدَمُ مُعْدَمُ مُعْدَمُ مُعْدَمُ مُعْدَمُ مُعْدَمُ مُعْدَمُ مُ مُ مُعْدَمُ مُعْدَمُ مُعْدَمُ مُعْدَمُ مُوهُ مُعْدَمُ مُوهُ مُعْدَمُ مُعْدَمُ مُعْدَمُ مُعْدُمُ مُعْدُمُ مُعْدُمُ مُعْدُمُ مُعْدُمُ مُعْدُمُ مُعْدَمُ مُعْدُمُ مُعْدُمُ مُعْدَمُ مُ مُعْدُمُ مُ مُعْدُمُ مُ مُعْدُمُ مُ مُعْدُمُ مُ مُعْدُمُ مُعْدُمُ مُ مُعْدُمُ مُعْدُمُ مُ مُعْمُ مُولًا مُولَعُ مُ مُعْمُ مُ مُعْدُمُ مُ مُعْدُمُ مُ مُعْدُمُ مُ مُعْمُ مُ مُ مُعْدُمُ مُ مُعْدُمُ مُ مُعْدُمُ مُ مُعْدُمُ مُ مُ مُعْ مُعْدُمُ مُعْمُ مُعْمُ مُعْمُ مُعْمُ مُعْمُ مُعْدُمُ مُ مُعْمُ مُ مُ مُ مُعْمُ مُ مُعْمُ مُ مُعْمُ مُ مُ مُعْمُ مُ مُعْمُ

ר איני ארייאלי שיעישית הה רצית הה ואוים ואים

درسرد دستوم مدرمورد، مسرد ومردد تحمد مرم مرم مرم هنام ردرمرمرو کس مرمور و مرجوع مرم مرم مرم مرم مرم مرم منابع درمرمرو کس مرمور و مرجوع مرم مرحم مرم مرم مرم مرم مرمور مرم مرم مرم ماسر و دری دستوم مرم مرجوع مرم مرم مرمور مرم مرم مرم ماسر و دری دستور مرم مرجوع مرم مرم مرم مرمور مرم مرم مرم مرم ماسر و دری مرمور مرم مرم مرم مرم مرم مرمور مرم مرم مرم مرم ماسر و درم مرمور مرم مرم مرم مرم مرم مرم مرم

- ال سام دورد محموق فرسر دهرو هر قرم و مرد المرد المرد
- 5. אל השור שינים בשל היי הא ניי לא לי שי ארי שי ארי בא ארי בא איי בא א

ליל גיל היא היא היא אין אין אין אין אין אין אין גער בת ברבבת התב של בהלעיר בבתפית בבבערי העיציאר בהקצ קסנתל שליני אשי באביני עור ביציני עי ביי ביי על ג פינכלים י כיים אעורב התפים עות אוקת לעת עצו בל אינה גילים גמצות אינים ביני ברעי ברע על גע געור ברא ביני גער האינים כי האצעי בלגלי כי האעים יעתרע בית ביו אולי ואילי אורטיט בישר אינצ על בארי שתייל הצי בת ביי באי באני אישיאל שינישית גיל אישילאל באבל בנצורי הי בנייבי בש את בציע צייי צני שבי בגו או איי בני באת עיצבי שינייני שארית שצע באיל בי אר היי ביש איניע בקבי ווום וווארט גענעיעי עצואר.

وَسَحْمَرِ مَرْدَى مَرْمِرِهِ عَدَ وَمَرْ وَبَرَ وَمَرْ وَبَرَ وَمَعْرَمُ وَبَرَ وَمَرْ وَمُرْ وَمَرْ ومُرْ و وَمَرْ وَمَرْ وَمَا وَالْمَا وَمَا وَمَرْ وَمَرْ وَمَرْ وَمَرْ وَمَرْ وَمَرْ وَمَرْ وَمَرْ وَمَرْ وَمُرْ وَمَرْ وَمَرْ وَمَرْ وَمَرْ وَمَرْ وَمَرْ وَمُرْ وَمُرْ وَمُرْ وَمُرْ وَمُرْ وَالْ وَمْ مُرَمْ وَمُرْ وَمَرْ وَمَرْ وَمَرْ وا

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ין לי בינים לאת אנים אלי ביל יי אי ביעור באריי

געצי קראליט ג'יי גע בקפע ארשט עית גע געורים אין ג'י געצי קרשאלצ לא לא לגע בקפעארש עית גע לייר אין גע געצי געצע איז גערי גערע גע געייע גער געייע גער לא לא שייני

مَحْدَرُوْ دَبْعُوْدُوْ دَمْ مُحْدَدُ بَعْرَمُ دَمْعَوْمُ دَعَمَدُ وَمُوْدُوْ. جَدَرُوْ وَمُحْدُوْ دَوْعُ وَتُوْعُ وَبْعَرْهُ بَعْرَمُ يَعْرَمُ وَعَرَبُوْ مَدْدُوْ مَدْعُ عَرْدُوْ مُرْبُوْ وَمُوْ مَدْ عَدَمُوْ وَحَدْمُوْ دَوْعُ مَدْعَالُهُ بَعْرَمُ وَعَرَبُوْ مَدْعَ مَدْدُوْ مُرْبُوْ وَمُوْ مَدْ عَدَمُوْ وَحَدْمُوْ وَحَدْمُ بَعْرَمُوهُ وَمَعْرَمُ مَدْعَ مَدْمُ وَمَرْمُوْ وَمُوْ وَحَدْمُوْ وَحَدْمُوْ وَحَدْمُ مَدْعَدُهُ مَدْعَمُوهُ وَمَعْرَمُ مَدْعَ مَدْمُ مَدْمَ مَدْمُ وَمَرْمُ مُعْ وَمُوْ وَحَدْمُوْ وَمَدْمُ مَدْمَا وَمَدْمُ مَدْمَا مَدْمَ مَدْمَ مَدْمَ وَمَدْمَوْ مَدْمَ مُوْ مَدْمَ مُوْ مَرْمُ مُوْ وَمُوْ وَحَدْمُوْ وَمَدْمُ مَدْمَوْ وَمَعْرَبُهُ مَدْمَوْ مَدْمَوْ مَدْمُونُو مَدْمَوْ مَدْمَوْ مَعْدَمُونُ مَدْمُونُ مُوْمُونُ مُوْمُونُ مُوْمَوْ مُعْدُمُونُ مُوْمُونُ مُونُ مُوْمُونُ مُونُ مُونُونُ مُوْمُونُ مُوْمُونُ مُوْمُونُ مُوْمُونُ مُونُونُ مُوْمُونُ مُونُ مُونُونُ مُونُونُ مُومُونُ مُونُونُ مُوْمُونُ مُوْمُونُ مُونُ مُونُونُ مُونُ مُونُونُ مُونُونُ مُونُونُ مُونُونُ مُونُونُ مُونُونُ مُونُونُ مُونُ مُونُونُ مُونُ مُونُونُ مُونُ مُونُونُ مُونُ مُونُ وَمُونُونُ مُونُونُ مُونُونُ مُونُ مُونُونُ مُونُونُ مُونُونُ مُونُونُ مُونُونُ مُونُونُ مُونُ مُونُونُ مُونُ مُونُ مُونُونُ مُ مُونُونُ مُ مُونُونُ مُو 
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