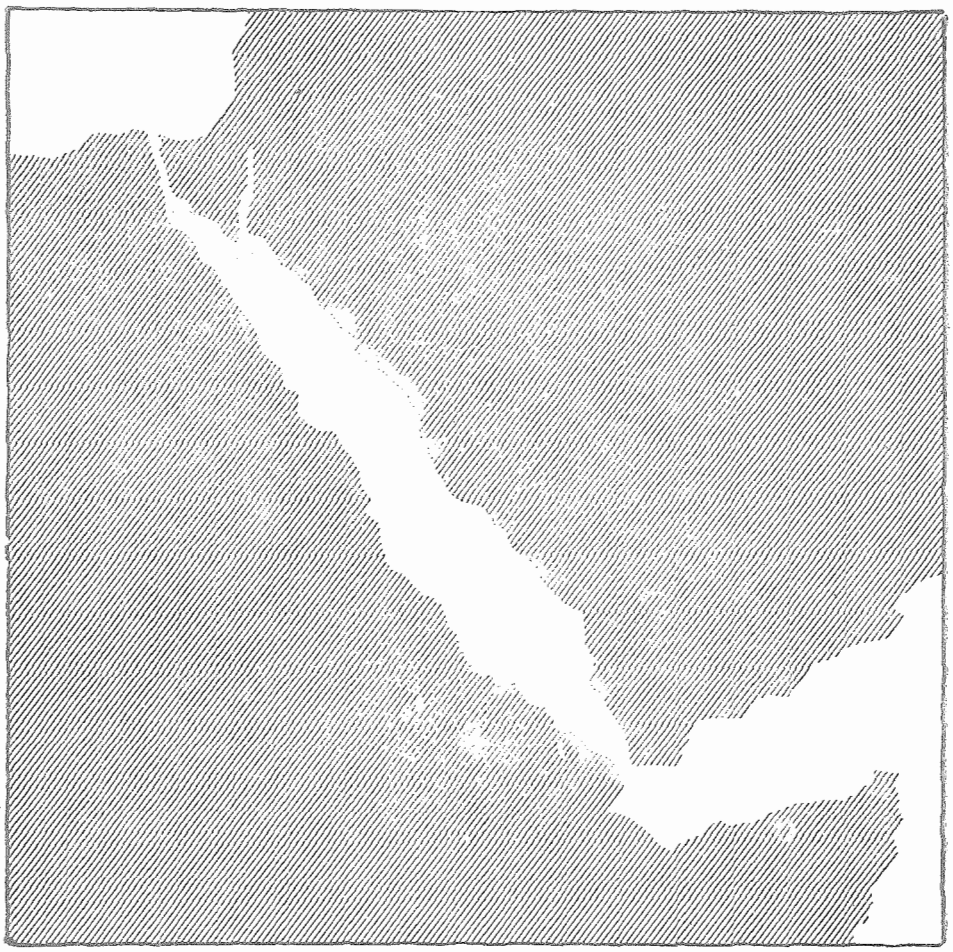
RAB 81/002/INT/5

# DEVELOPMENT OF FISHERIES IN AREAS OF THE RED SEA AND GULF OF ADEN

## THE SPINY LOBSTER FISHERY OF THE YEMEN ARAB REPUBLIC



UNITED NATIONS DEVELOPMENT PROGRAMME

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

# THE SPINY LOBSTER FISHERY OF THE YEMEN ARAB REPUBLIC

A.C. Atkins (Consultant)

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Project for Development of Fisheries in Areas of the Red Sea & Gulf of Aden

October 1982

## SUMMARY

This report is the outcome of a two-month mission to the Yemen Arab Republic in April-June 1982. It gives background information regarding previous spiny lobster surveys and describes exploratory fishing undertaken by diving and through the use of tangle nets. The marketing situation in the country is discussed and recommendations are given for handling and processing lobster. Some basic recommendations are suggested for regulating the fishery It is concluded that the two species of spiny lobster found in the coastal waters are not present in sufficient numbers to encourage large scale commercial exploitation. It is recommended that future exploitation should be encouraged as an artisanal fishery through free diving and that further exploratory fishing should be undertaken using tangle nets. The marketing system should be improved and further information should be collected on present catches, including those taken by foreign vessels.

CONTENTS

# 1. INTRODUCTION

## 1.1 Terms of Reference

To visit principal landing and marketing sites and become familiar with all aspects of lobster industry;

To identify characteristics of the industry, i.e., species identities, identity of landing sites, identity of fishing locations, monthly catches by landing site, number of participating fishing units, fishing methods gear, and vessels, trip durations, number of crew and basis of income and cost sharing, prices, marketing/distribution infrastructure and procedures;

To identify the future prospects for the fishery, the industry's existing problems (if any) and most appropriate actions considered for proper management and development of the fishery;

To produce two reports, an internal report describing consultant's activities, a summary of the findings and recommendations concerning future actions and a situation report providing a detailed account of the present characteristics of the industry and its future prospects.

## 1.2 Persons Met

Cairo

| | |
|---|---|
| H.Ben Alaya, Project Manager, | RAB/81/002 |
| I.Feidi, Economist/Investment Analyst | RAB/81/002 |
| C.Bean, Masterfisherman (Egypt) | RAB/81/002 |
| J.Byam-Shaw, Boatbuilder (Sudan) | RAB/81/002 |
| D.Lintern, Fisheries Administration, | RAB/81/002 |
| T.G. Pillai, Aquaculture Consultant | FAO Headquarters |

Sanaa

M.Jama, FAO Representative
Yusuf A.Abdullah, FAO Programme Officer
Fuad F. Shomali, UNDP Administration Officer

Hodeida

Hussein LouLou, Chairman, Fisheries Corporation
Ahmad Taleh, General Manager, Fisheries Corporation
M.Alawi Madari, Credit Officer, Fisheries Corporation
A.Yusuf Ali, Credit Officer, Fisheries Corporation
Sadir Al Mahmoud, Production and Marketing, Fisheries Corporation
Gayrd M. Saeed, Administrative Manager, Fisheries Corporation
Abdel Rachman H., Statistics and Studies, Fisheries Corporation
O.Christoffersen, Consulting Engineer, World Bank Proj.
Mahmoud Bouhlel, Marine Biologist, FAO
J.Lenz, Marine Biologist, UNESCO

Suez

| | |
|---|---|
| M.Sanders, Senior Marine Biologist, | RAB/81/002 |
| P.Main, Marine Engineer, | RAB/81/002 |
| S.M.Kedidi, Marine Biologist, | RAB/81/002 |

## 1.3 Comments on Work Programme

Few Spiny Lobster are at present landed in the YAR and it was agreed that my Terms of Reference should be amended and that exploratory fishing should be carried out on potential fishing grounds.

I was based at the Fisheries Corporation Offices in Hodeida. From there a number of day trips and two extended trips of four days each were undertaken. Exploratory fishing was limited by delays in providing a vehicle and security passes, and by mechanical failures on the Corporation fishing vessels. Fishing took place from a Corporation GRP MFV or houri hired locally.

Abdel Rachman Hayer was appointed as counterpart. He is an Oceanography/Geology graduate from Sana'a University who joined the Fisheries Corporation at the beginning of 1982. After being injured in a road accident he was unable to accompany me on subsequent field trips. The Corporation Masterfisherman, Mohamed Gazeem, was present during fishing trips on the Corporation MFV. Useful information and help was also provided by M. Alawi Madari and A. Yusuf Ali in the Credit Department of the Fisheries Corporation.

## 1.4 Itinerary

| | |
|---|---|
| 25 April | Fly to Rome |
| 26-30 April | Briefing at FAO, Rome, and visa and travel arrangements |
| 1 May | Fly to Cairo |
| 2 & 4 May | Briefing at FAO Regional Fisheries Project, Cairo |
| 3 May | Briefing at HQ Regional Fisheries Project, Suez |
| 6 May | Fly to Sana'a |
| 8 - 9 May | Meetings with FAO and UNDP personnel, Sana'a |
| 12 May | Fly to Hodeida |
| 13 May | Meetings and discussions with Chairman and Staff of Fisheries Development Corporation |
| 15-16 May | Meet counterpart staff, purchase fishing gear |
| 17-20 May | Rig tangle nets. Arrange for security passes and driving licence |
| 22 May | Exploratory diving and observation, Salif area |
| 23 May | Exploratory diving and observation, Ras Khatib |
| 26 May | Make arrangements for trip to Khanha |
| 27 May | Visit Hodeida Fish Market |
| 30 May | Load Fisheries Corporation MFV vessels departs from Khanha |
| 31 May | Drive to Khanha. Make camp at Zahari |
| 1 June | Exploratory diving and observation from shore Maustrij |
| 2 June | Exploratory diving and observation from a Houri, Zahari |
| 3 June | Exploratory diving and observation from shore, Qatabba |
| 4 June | Exploratory diving and observation from shore, Isa |
| 5 June | Visit Hodeida Market |
| 6 June | Visit Hodeida Market. Preparations for trip to Al Mulk |
| 7 June | Drive to Zahari |
| 8 June | Exploratory diving and observations from a Houri, Zahari to Qatabba |
| 9 June | Fisheries Corporation vessel arrives at Al Mulk. Set nets and survey reef flats |
| 10 June | Exploratory diving, Al Mulk. Drive to Qatabba. Exploratory diving Qatabba. Drive to Hodeida |
| 13 June | Prepare for fishing trip from Hodeida (subsequently cancelled) |
| 14 June | Prepare notes on lobster fishing for Fisheries Corporation |

15 June Visit to Hodeida Fish Market. Arrange for Exit Visa
16 June Prepare notes on lobster fishing for Fisheries Corporation
17 June Discuss findings and conclusions of Lobster Survey with Chairman and Staff of Fisheries Corporation
Fly to Sana'a
19 June Conclude administrative matters at FAO and UNDP Offices, Sana'a
22 June Fly to Cairo
23 June Evaluation in discussions with Project Manager FAO, Cairo
24 June Fly to Rome

## 2. BACKGROUND INFORMATION

### 2.1 Artisanal Fishery - Vessels and Fishing Methods

Three types of vessel are used - the Sambouk (12-15 m length and motorized), the Houri (a planked canoe 4-10 m in length) and the Ramos (a raft of logs approx. 2 m length). Normal fishing practice is to put to sea in the evening, set gillnets overnight, handline fish during the night, and land the catch between 7.00 hrs and 8.00 hrs the next morning. Other techniques observed were beach seines and barrier nets. In the areas visited almost all the larger Houris were motorized mainly by Yamaha outboard motors up to 30 hp. Houri landings observed were less than the 40 kg/day average estimated by Walczak (1977). The gillnets are constructed of PA multifilament with stretched mesh of 50-100 mm rigged to float and weighted by concrete sinkers. No monofilament nets were seen. Traps are reported to be used but again none were seen aboard vessels.

Several Sambouks are engaged in trawling for shrimp, landing their catch between 6.00 hrs and 8.00 hrs at Hodeida Fish Market.

### 2.2 Fisheries Development Corporation

The Fisheries Development Corporation was established by the YAR Government to promote and control fisheries development. The Corporation is directly involved in catching and processing. The Fisheries Corporation fleet at present comprises :

1 vessel - Yamaha GRP MFV
LOA 11.10 m
Beam 2.55 m
Draught 1.2 m
Gross Weight 4.03 t
Fish Hold 25.5 $m^3$
Fuel Tank 800 litres
Manual Trawl Winch
Yanmar Diesel

5 vessels - Yamaha GRP MFV
LOA 7.90 m
Beam 1.9 m
Draught 0.82 m
Hold 3.12 $m^3$
Yanmar Diesel 3 cylinder. Estimated BHP (max. cont.) 20-25 hp

1 vessel - Sambouk wooden construction
LOA 14 m
Diesel
Trawl Winch and Gallows
Echo-sounder

One further vessel in the 7.9 m class was delivered during May 1982, but it was badly damaged during transit, and is not in commission.

The vessels are beached at Ras Khatib and Salif. During my stay the two large vessels were shrimp trawling out of Salif. The catch was stored in a cool box and collected daily in an open truck. On arrival at the Corporation the shrimp and scalefish catch was packed in plastic bags, weighed to 1 kg, and stored in domestic freezers.

2.3 Previous Surveys

Walczak in 1977 "Study of the Marine Resources of the YAR" reported seeing P. versicolor and P. ornatus in the fish market. Efforts to catch Spiny Lobster by woven 'Sahawa' traps were unsuccessful.

Agger in 1973 "YAR Fishes and Fisheries" reported seeing only one spiny lobster in the market in a 1972 April to May Survey.

Spiny Lobster (Palinuridae) and Locust Lobster (Thenus orientalis) were taken by the Shrimp Trawler Tareg II at a rate of approximately 1 and 10 kg per 3½ h/haul respectively.

The Kuwait Gulf Shrimp Fisheries Company which operated a fleet of shrimp trawlers in the YAR from 1969-71 conducted a survey of Spiny Lobster by scuba diving but failed to find fish in commercial quantities.

3. SURVEY OF LOBSTER FISHERY

3.1 Interviews with Fishermen

These were carried out informally whenever the opportunity presented itself. In the latter half of the survey I was without an English speaker and communication was difficult. We did not meet any fishermen who fished specifically for lobster; the reason given on several occasions was the absence of a local market. The Yemeni fishermen we spoke to had little regard for the food value of lobster. Information given about the frequency of landings and fishing methods used was general and often contradictory. We were told that infrequent catches of lobster were taken incidentally in gill and seine nets.

Lobster were reported to be prolific around the offshore islands - Great Hanish and Little Hanish.

3.2 Visits to Fish Markets and Landing Sites

Fish Markets and landing sites at Hodeida, Salif, Khataba, Zahari, Khanha, and Maustrij were visited. Hodeida Fish Market is the most important outlet for fish in the YAR. During six visits to Hodeida Market only one Spiny Lobster was seen for sale - species P. versicolor. Details of fish sales at the market are collected by Fishery Officers from the Government and the Fisheries Corporation. They indicated that landings of lobster were infrequent - about once or twice a month. On this basis landings through the market are less than 100 kg annually

No landings of lobster were recorded at any of the other landing sites visited. The Fisheries Extension Officer at Khanha, responsible for catch data told us that no lobster were landed in that area.

## 4. EXPLORATORY FISHING

### 4.1 Selection of Fishing Area

The coast is separated from the mountainous interior by a flat coastal plain (the Tihama). The shore-line is low-lying and characterized by extensive sandy beaches and silt/mud banks inshore. North of Kamaran and between Khanha and Mokha there are shallow fringing reefs. The survey was concentrated in the rocky and coral reef coastal environment which offered the best prospects for lobster fishing.

### 4.2 Diving

#### 4.2.1 Fishing Technique

Free (skin) diving was carried out from the shore and when possible from a Fishery Corporation Vessel. The equipment used was a mask, snorkel, fins, gloves, and speargun. The gun featured a double rubber sling and a 6 mm barbed spear. These items were purchased in Rome - they are not at present available in the YAR.

Fishing and observation using this method was limited to a depth of 5 m. Water turbidity varied. Underwater visibility was usually less than 5 m and decreased markedly close to the shore. As the prevailing Westerly winds increased in strength during the late morning and afternoon, water turbulence further reduced visibility. Because I was diving up to 400 m distance from the boat or shore, only a few of the lobster seen were taken for further examination. The lobster were conspicuous underwater because of their white antennae. There was little difficulty in catching the lobster although the smaller specimens offered a small target for the speargun and were more easily taken by gloved hand. The lobster occurred singly, or in groups of two or three occupying the same den. They did not seem susceptible to any fishing technique which involved fish "tickling" them out of their dens.

#### 4.2.2 Observations and Results by Area

##### Salif Area

The sea bed inshore is gently shelving and shallow around this peninsula. To the west it drops sharply into deeper water (20 m). The sea bed inshore comprises of loose sand and silt with patches of seaweed and low, poorly developed coral growth. The area is sheltered by Kamaran Island and consequently underwater visibility was good. No lobster or suitable habitat for lobster was seen.

##### Ras Khatib

Lying 1-2 km offshore from the sandy spit of Ras Khatib are a number of outcrops of massive rock rising abruptly from a gently shelving sea bed of silt and sand at 3-4 m. Suitable caves and crevices in the rock were occupied by lobster (P. versicolor). Seven lobster were observed in one and a half hours diving; three were taken. The fish observed were all similar in size. The carapace length of those shot was 5 cm, 5.8cm., and 6 cm. This is a favourable habitat for lobster but it is very limited in extent. The most productive rocky outcrop occupied an area of only 200 $m^2$.

Scale fish were prolific close to the rocks, especially Grouper, Parrotfish and Jack.

Ras Isa

Diving took place on a section of the fringing reef which is sheltered from the westerly winds by the Ras Isa headland. The reef consists of a shallow platform of dead coral extending 200-400 m from the shore and fringed on the seaward side by an area of active coral growth. The band of coral growth is 30 m wide and is characterized by massive coral heads rising from a coral sand sea bed at 3-5 m depth. Lobster (P. versicolor) were fairly prolific in the band of live coral growth, occupying caves and overhangs. Ten lobster were observed in a period of one and a half hours diving. Two lobster were taken and measured. Carapace lengths were 5.0 cm and 6.9 cm. This represented the approximate size range of all fish seen (5.0 - 7.0 cm carapace length).

Scalefish were abundant on the reef.

This reef was unlike any other I saw during dives in YAR inshore waters with regard to the abundance and variety of coral marine life. The area is accessible by road and the reef is close to the shore-line. This reef may be better used for scientific research and recreational use than commercial exploitation. This would require legislation designating the area as a Marine Park from which it would be illegal to remove coral, shells or fish.

Ras Katenib

This is an area of shallow gently shelving sea floor with isolated coral growths. Infrequent sightings of lobster reported in coral heads.

Khataba

A limestone platform is exposed on the beach to the north of the village. It extends for 30 m offshore. The rocky area appeared to offer a suitable habitat for lobster but none were seen in two diving sessions. Most of the rock overhangs were occupied by Blue Spotted Ray (Dasyatis). The coast here is unprotected, this together with the shallow water (1-2 m) produces turbulence and poor underwater visibility.

Kushaf (Plectorhynchus schotaf) and (Plectorhynchus gaterinus) were prolific and a number were speared.

Khataba to Maushij

South of Khataba the coastline is characterized by a fringing coral reef 200-400 m offshore. In places it forms a continuous platform just below the surface at low tide. The coral formations offer little protection for lobster and none were seen on the fringing reef or the coral heads inshore.

Al Mulk

This was the only locality at which fishing for lobster were known to take place. Local fishermen reported that fishing vessels from Djibouti periodically visited the area and took lobster by free diving. They identified P. versicolor as the only species caught and two moult shells found on the beach confirm this is probably correct.

The foreshore comprises of a spit of coral debris extending seawards from a low headland. The sea bed is compact coral sand and rocky ledges. Observation

by diving was inconclusive. Although weather conditions were good and there was little turbulence, visibility underwater was less than 1 m. Some suitable habitat was observed, but no lobster were seen during 45 min diving.

Blue Swimming Crabs were numerous in shallow water.

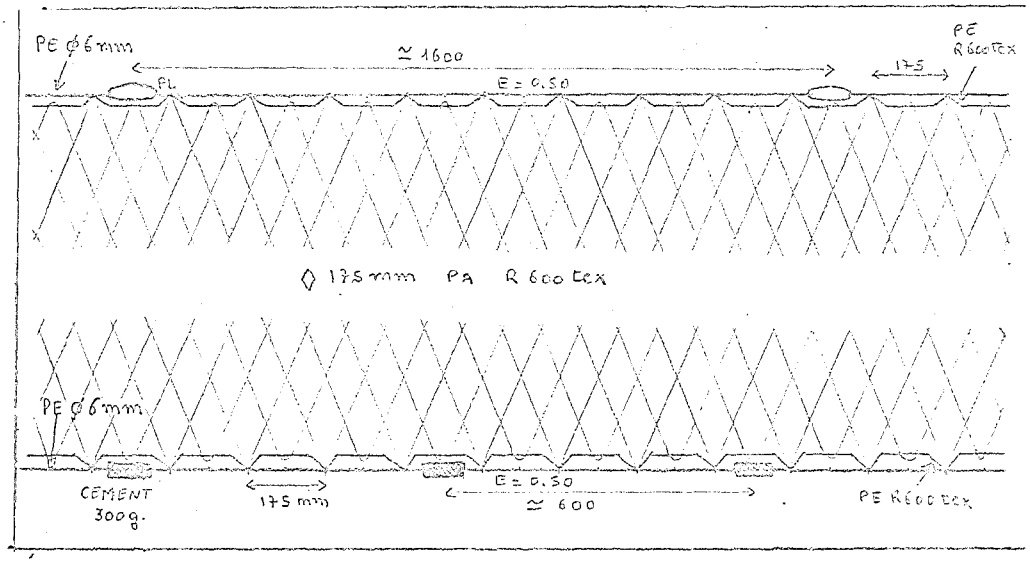
4.3 Tangle Nets

4.3.1 Construction

Three 40 m tangle nets were rigged using some materials from the Fisheries Corporation Gear Store and some purchased locally. The features of the net are shown below. The concrete sinkers which are used locally for gillnets are not ideally suited to a tangle net as they foul the meshes. However a reasonably effective tangle net could be rigged from locally available materials.

Tangle net
Bottom set

Spiny Lobster
& scalefish




4.3.2 Fishing Results

The only opportunity to try the nets was during the trip to Al Mulk. An overnight set close to the spit produced fish (mainly Guitar Fish, Rhinobatis annulatus) but no lobster. No conclusion could be drawn from this as conditions were unfavourable - a calm clear night with a full moon. An extended period of fishing and the use of an echo-sounder are necessary for an effective trial of tangle nets.

5. NOTES ON SPECIES OF SPINY LOBSTER

5.1 Panulirus versicolor (The Painted Rock Lobster)

The bright colour pattern of this species clearly distinguishes it from other Spiny Lobsters. Other distinguishing features are:

- striped legs
- pink base to antennae
- cream band across each tail segment
- green/blue colour with white lines and patches on carapace.

It occurs throughout the Western Central Pacific and in the tropical waters of the Indian Ocean. It is reported as being "not abundant" throughout its range and of little commercial importance. It has been recorded previously in the Red Sea and the Gulf of Aden but does not form the basis of a lobster fishery in any of the countries of the region.

This species was observed in conditions of varying turbidity in shallow waters from 0-5 m. The most important factor determining abundance and distribution within the region is probably habitat. P. versicolor prefers coral reef and only immature specimens were found on rock. This is a shallow water species which is uncommon below 10 m.

The lobster shelters in caves in the coral heads, emerging at night (especially during moonless conditions) to feed. It is thought to have a vegetarian diet and will not enter traps.

Information on P. versicolor is sparse - little research has been published and there are no catch statistics.

5.2 Panulirus ornatus (The Ornate Rock Lobster)

The distinguishing characteristics of this species are:

. blue/green carapace with yellow spines
. large cream spots on abdominal segments
. legs with black and white blotches

P. ornatus occurs in the Western Central Pacific (to the North Coast of Australia), the Indian Ocean, and East Africa. It is a commercial species which supports a lobster fishery in the Torres Straits and the Gulf of Papua.

This is a shallow water species found to a depth of 15 m in turbid coastal waters.

It is a migratory species and during seasonal migration it is taken by trawling. Infrequent catches of lobster taken by shrimp trawlers in YAR waters are probably this species although none were caught during my stay.

The most important fishing method in the Pacific Fishery is catching at night using lanterns and scoopnets. They are transported live.

5.3 Panulirus penicillatus (Double-spined Rock Lobster)

The distinguishing characteristics of this species are:

. brown/green, blue/green carapace with cream spots
. transverse groove on each abdominal segment

This is an oceanic species inhabiting clear waters not influenced by land runoff. Reported by Agger (see references) as abundant on offshore Ethiopian Red Sea Islands.

It is taken at night on coral reefs by spear or by hand.

6. PROCESSING AND MARKETING

6.1 Potential for Domestic and Export Sales

The main constraints on the development of YAR fishery resources are the lack of processing facilities and the inadequate distribution system serving inland areas. Many of the fishing villages are inaccessable by road.

A limited domestic market for lobster would be supplied by hotels in the urban centres of Sana'a, Taiz and Hodeida. Imported lobster is already on the menu at some of these. In Hodeida the merchants were aware that a good price could be obtained for lobster in the expatriate community and occasionally they were offered for sale by door-to-door salesmen. The fish are sold 'by the piece' for between Y.Rls. 20 and 50 (U.S.$ 4-10).

There is a ready world demand for frozen 'Rock Lobster Tails', particularly in North America, but export is not worth considering at present catch levels.

6.2 Supply of Ice and Processing Facilities

Ice supply at Hodeida, Khanha and Mokha is adequate for present demands. The larger sambouks are taking ice to sea. Most vessels avoid the rapid deterioration of their fish by fishing at night and landing the catch early the following morning. The fish is auctioned in a matter of minutes, soon after landing. Despite the insanitary conditions and inconvenience of Hodeida Market (and to a lesser extent other markets) the scalefish seen and eaten was of excellent quality. Lobster can be landed in satisfactory conditions (either chilled or alive) using existing procedures.

There is no plant in any of the fishing centres which is suitable for the processing of frozen tails for export. The Fisheries Corporation is at present freezing shrimp and fish in domestic freezers. This is not a satisfactory method for bulk catches. Freezing (particularly in the centre of the fish mass) takes up to 3 days and temperature is well above the minimum necessary ($-18^{o}C$).

6.3 Procedures for Handling and Processing Lobster

As it is expected that any future lobster fishermen and vessels be drawn from the existing fisheries, the following proposals exclude procedures which involve the construction of live wells or fitting freezing equipment on board vessels. Lobster deteriorate rapidly after death and they must be landed live or tailed and chilled in ice.

Healthy lobster will survive out of water for up to two days but some mortalities will occur after 24 hours. They should not be exposed to strong sunlight, wind or high ambient temperatures. Normal practice is to pack the lobster in hessian bags or cardboard boxes in order that movement is inhibited and breathing allowed. A simple method is to cover the fish with a damp canvas. Dead whole lobster should be rejected by the consumer; deterioration in this case will be indicated by discolouration of the flesh at the butt end of the tail.

The following procedure is recommended where it is impossible to land live fish - as for example when lobster are speared and where there are limited processing facilities.

(a) As soon as possible after capture the tail is separated from the head by a pulling and twisting action.

(b) The intestine (or gut) in the tail is removed by breaking off an antenna inserting it in the vent and withdrawing it with the gut attached.

(c) Dirt and sand should be removed by washing in sea water.

(d) The tails should be immediately chilled by being placed in crushed ice. On small vessels an ice chest is suitable for storage. Tails packed in layers of ice will keep for up to three days and need not be disturbed until they reach the processor.

The chilled tails should be packed in heavy duty freezer bags and frozen to a temperature of -18°C within 6 hours. Small quantities may be frozen and held like this in a domestic freezer.

6.4 World Bank Fishery Development Project

The main features of this project are the construction of harbours or jetties, and associated processing and marketing facilities at Hodeida, Khanha, Mokha and Khoba. Together with the completion of a tarmaced road linking Khoba to the Jizan-Hodeida road, this project is expected to boost YAR landings and lead to an increase in the relative importance of Khoba as a marketing centre.

7. REGULATIONS

The Spiny Lobster is vulnerable to overfishing and the development of a Lobster Industry would require regulation to prevent depletion of stocks. Further statistical data would be required before detailed draughting of legislation, but it is recommended that the following basic regulations are considered.

(a) A minimum legal size based on carapace or tail measurement.

(b) A prohibition on taking and marketing egg-bearing females.

(c) A closed season for fishing.

The carapace measurement is taken from the front of the horns which protect the eyes to the hindmost edge of the carapace.

The tail measurement is taken lengthways from the point of separation from the head to the rearmost extremity.

8. CONCLUSIONS

8.1 Spiny Lobster Stock

Two species of Spiny Lobster are found in YAR coastal waters - P. versicolor and P. ornatus. P. versicolor predominates inshore. Indications are, that neither species is abundant and that they are not present in sufficient numbers to encourage large-scale commercial exploitation.

The habitat favoured by Spiny Lobster is sandstone or limestone rock, or coral reef. Unlike adjoining countries such as the South Yemen and Ethiopia such ground is limited in extent.

The incidental catch of Lobster in gillnets and trawls is small, suggesting limited distribution and abundance.

Exploratory fishing established two areas where Lobster are present and could be exploited on a very limited scale.

This survey was not exhaustive. Two stretches of coast, those north of Khoba and south of Mokha, were not visited.

ii) The processing, marketing, and distribution system should be improved.

iii) The Fisheries Extension Officers at Mokha and Khanha should try to determine the nature and extent of fishing by foreign vessels in their areas.

APPENDIX 1

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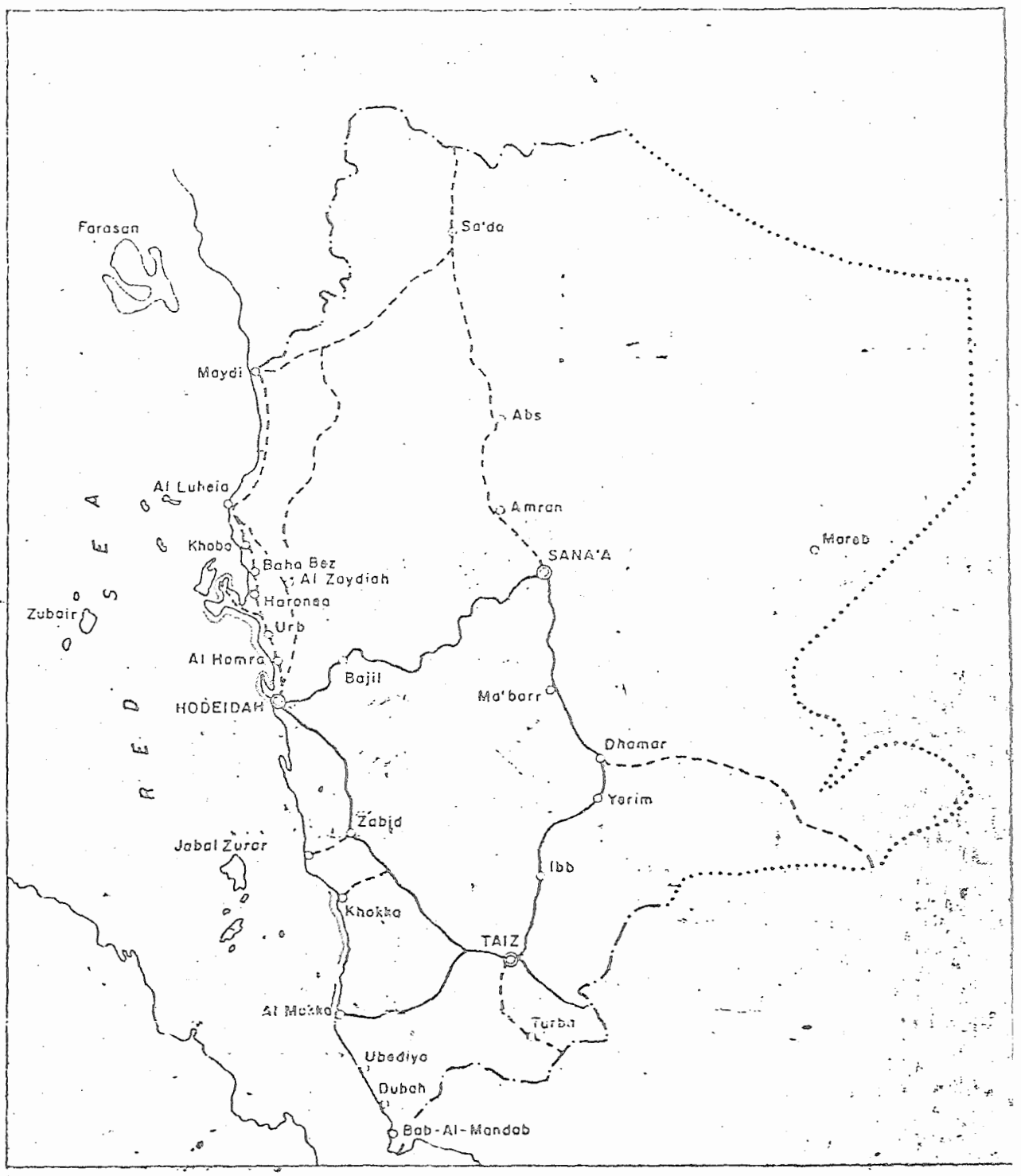
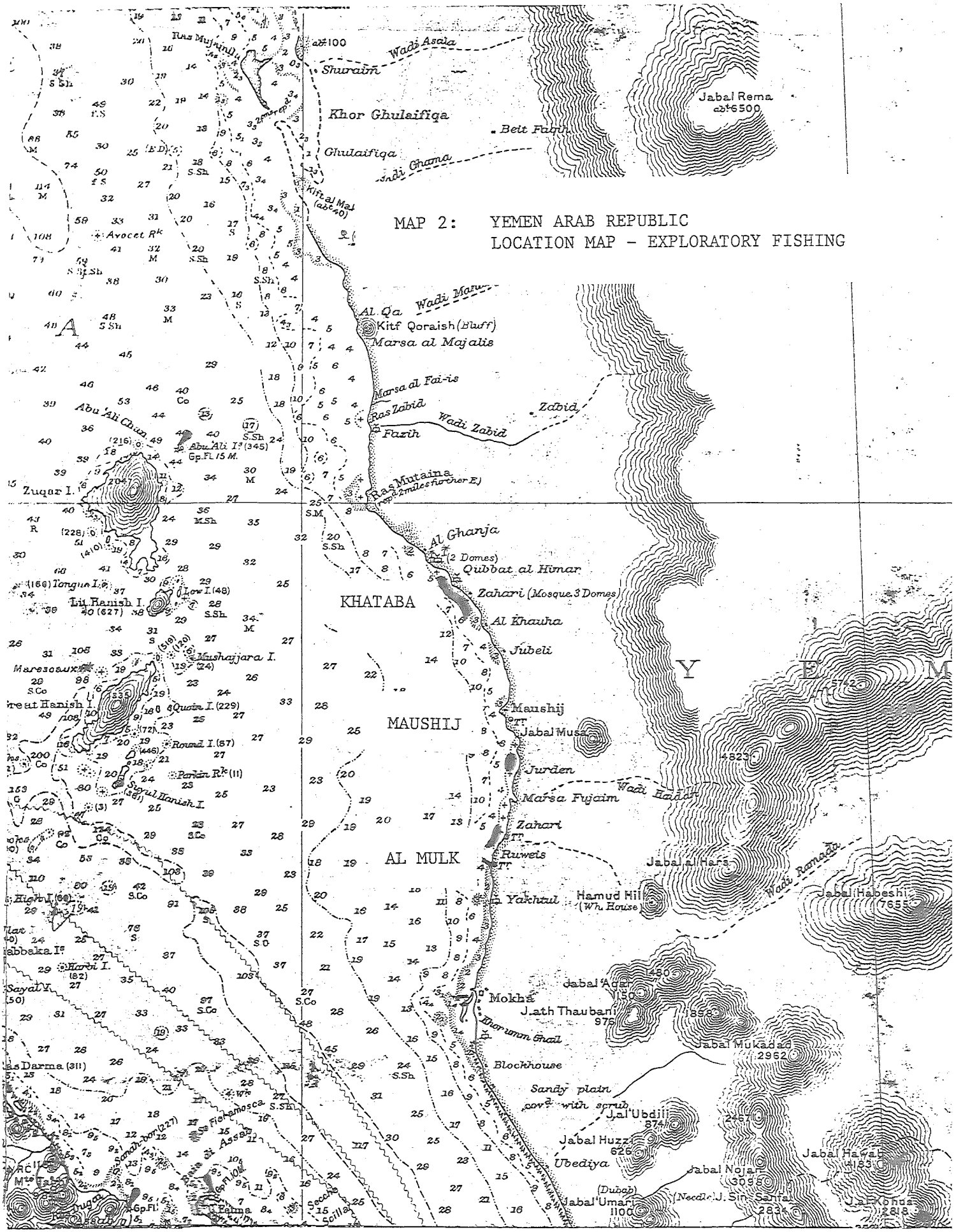
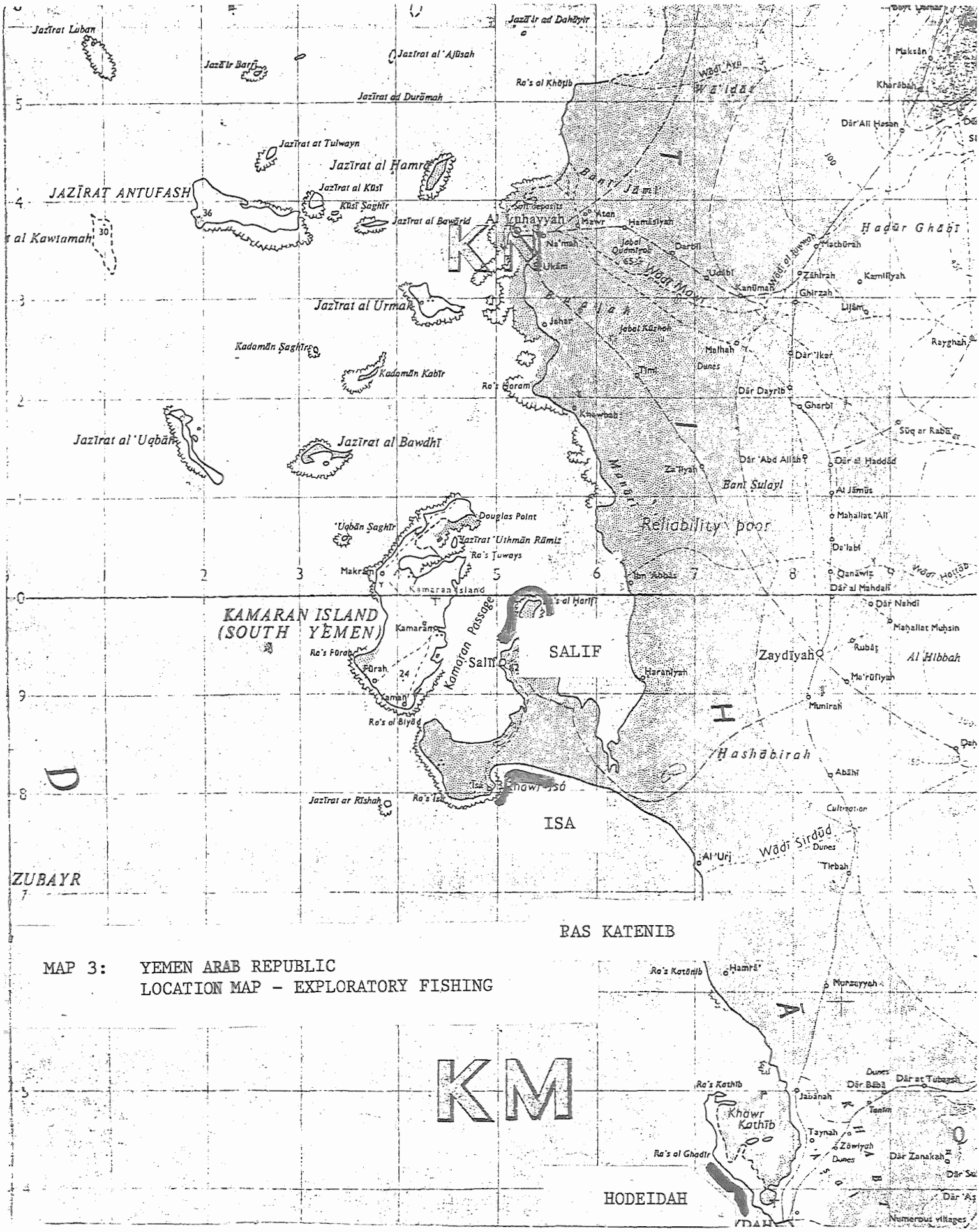
MAP 1: YEMEN ARAB REPUBLIC



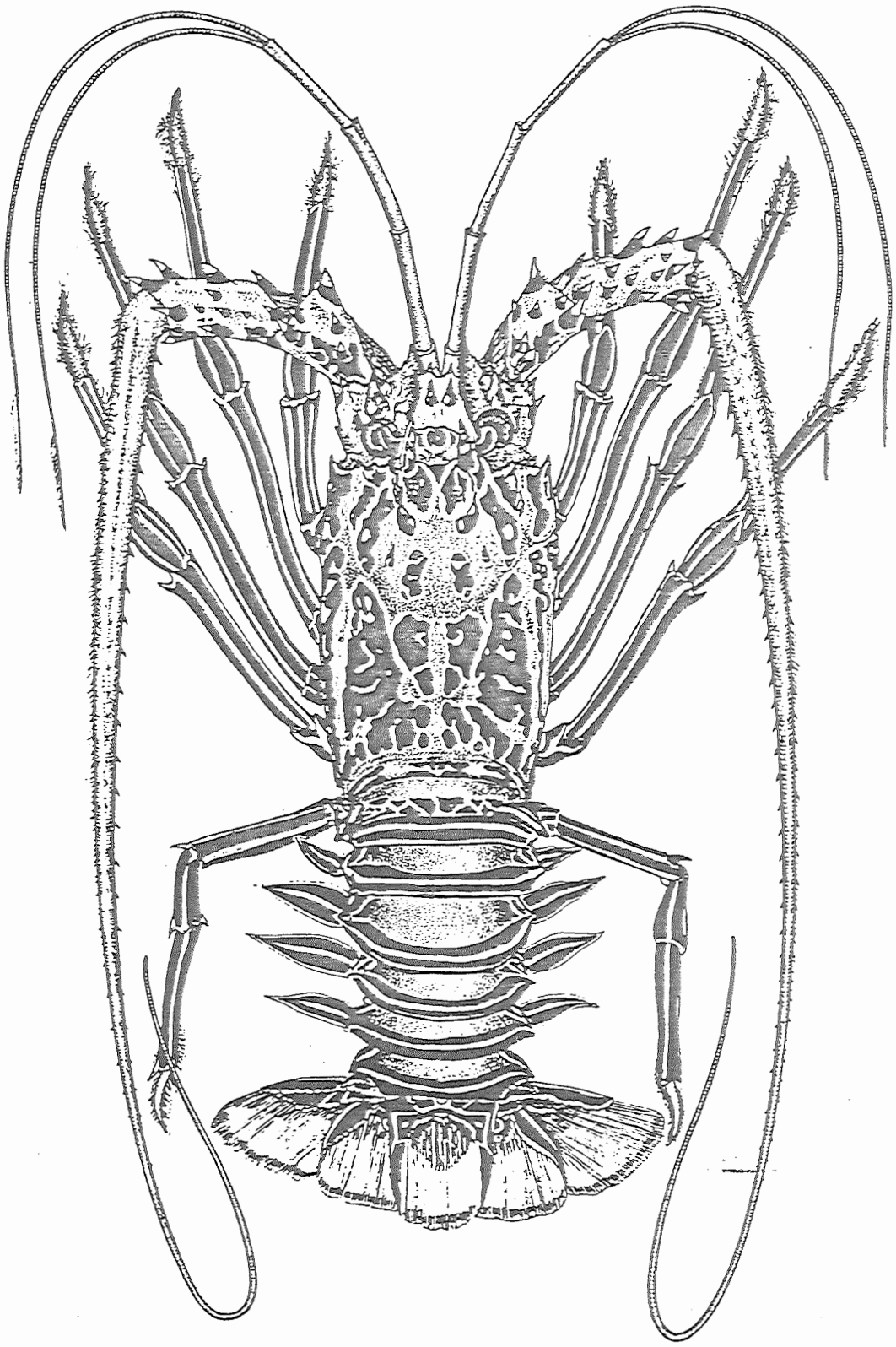



MAP 2: YEMEN ARAB REPUBLIC
LOCATION MAP - EXPLORATORY FISHING




MAP 3: YEMEN ARAB REPUBLIC
LOCATION MAP - EXPLORATORY FISHING

FIGURE 1 : ILLUSTRATION - PANULIRUS VERSICOLOR



*Panulirus versicolor*

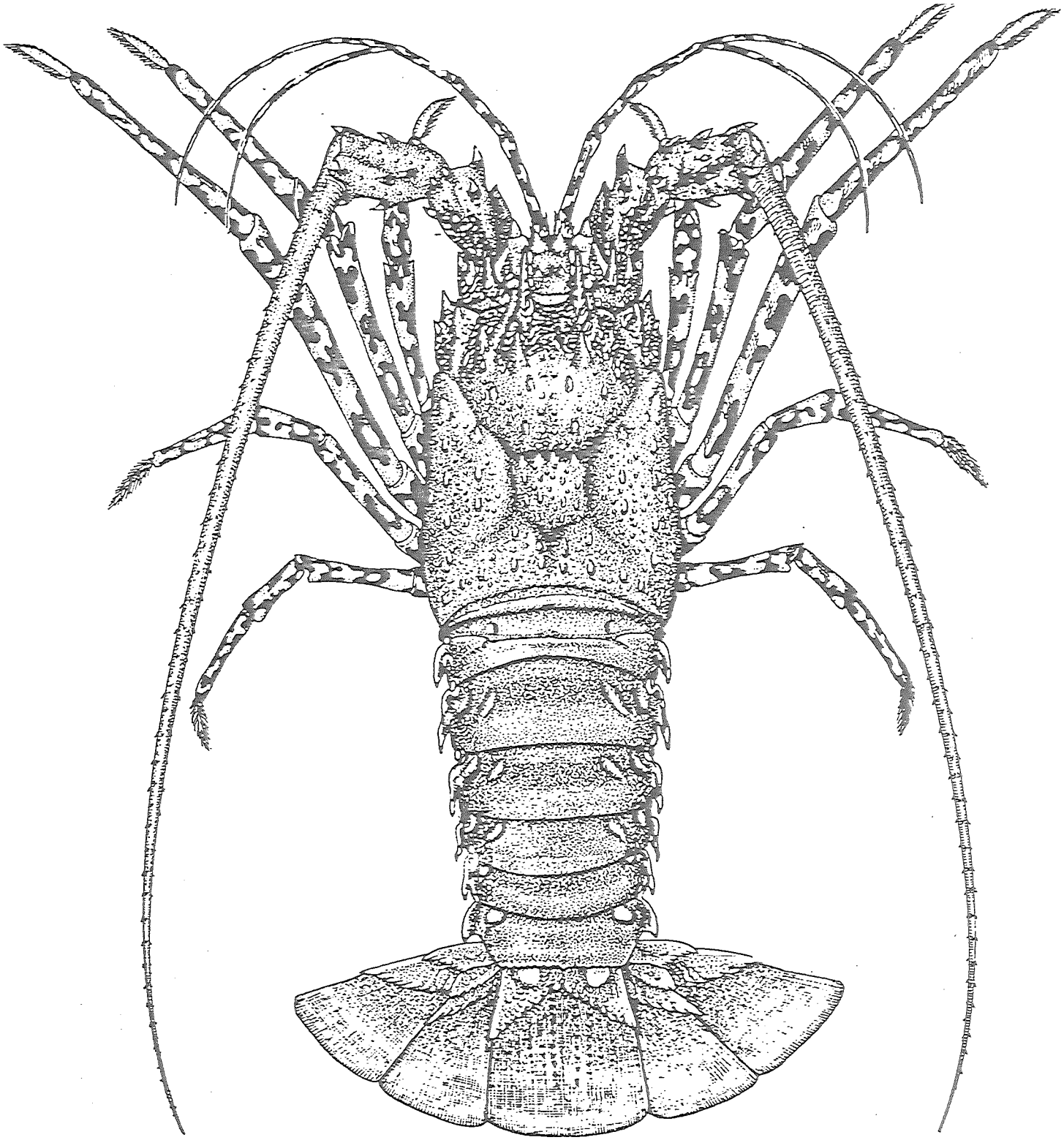


FIGURE 2: ILLUSTRATION - PANULIRUS ORNATUS