

*Handbook N° 19 (1980)*

**A HANDBOOK FOR  
LOBSTER FISHERMEN  
OF THE TROPICAL  
PACIFIC ISLANDS**

by

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# PREFACE

This handbook is based on work carried out by the author while he was SPC Lobster Officer in the Russell Islands, Solomon Islands.<sup>1</sup>

The South Pacific Commission gratefully acknowledges the assistance of the Fisheries Division of Solomon Islands Ministry of Natural Resources. Thanks are also due to many people in the Russell Islands, particularly Loun Island, for their assistance during fieldwork.

The handbook consists of a brief introduction, followed by practical advice on capture, live storage and live transport of lobsters. The Appendices deal with the anatomy of *Panulirus penicillatus*, the various species of *Panulirus* found in the tropical Pacific, and mortality and changes in value of lobsters during live transport.

The sections on capture, storage and transport have deliberately been phrased in simple English so that they will be of maximum benefit to village lobster fishermen who do not speak English as their first language. The assistance of the SPC Language Teaching Specialist, Althea Purdy, with these sections is gratefully acknowledged.

1. Prescott, J. (1979), *Report on the South Pacific Commission lobster project in Solomon Islands*, Noumea, South Pacific Commission.

# INTRODUCTION

The names lobster, rock lobster, spiny lobster and crayfish are all commonly used to describe crustaceans of the family Panuliridae. For convenience, the term *lobster* is used in this handbook. There are five species of the genus *Panulirus* which are common in the tropical central and western Pacific Ocean. The five species are found in varying degrees of abundance from one area to another. However, the double-spined rock lobster, *Panulirus penicillatus*, is generally the most abundant in the region (see Appendices 1 and 2). This handbook deals specifically with the double-spined rock lobster, but many of the capture, storage and transport techniques described here are applicable to other *Panulirus* species and to butterfly lobsters (Scyllaridae).

Worldwide, lobsters are an important, high-value fisheries product. Large multimillion dollar fisheries are based on them in many countries. In 1974 total world production of lobsters was in the region of 75,000 metric tonnes. Demand, however, is greater than supply. This situation is likely to continue as most of the major fisheries are already fished to their limit.

In the tropical Pacific, lobsters are an important resource for several reasons. Their market value is usually much higher than that of fish or other traditional produce. Fresh, locally caught lobsters are in especially high demand for the tourist industry. Also, lobsters are an export commodity. Of particular importance is the fact that lobsters can be caught, stored and transported alive to market, without sophisticated equipment or technology.

The aim of this handbook is to provide lobster fishermen with the information necessary for the successful capture, live storage and live transportation of lobsters.

# CATCHING LOBSTERS

In some places in the Pacific people catch lobsters with traps or with baited lures, but in most places in the Pacific you must catch lobsters, particularly the double-spined rock lobster, by hand. This handbook only talks about the catching of lobsters by hand. However, if you know other good ways to catch lobsters, you should continue to use those ways. You should check your local fishing regulations. In some places there are rules which control the methods of fishing or the size of lobsters which you are allowed to catch. Also, you should not catch female lobsters carrying eggs.

You only need a few things to catch lobsters by hand. You can see these things in Figure 1. You can catch lobsters best at night. Dive along the edge of the reef near the place where the waves break, or walk along the reef in shallow water with a light or a torch. It is best when the water is just deep enough to cover the lobsters. If the tide is too high, the waves will come across the reef and it will be difficult to see the lobsters (see Figure 2).

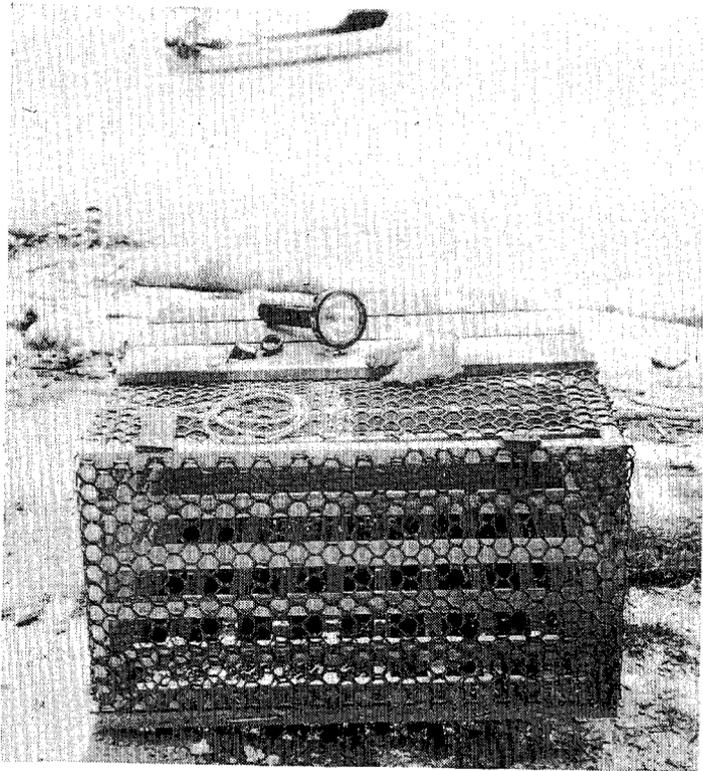


Figure 1: The basic equipment for catching and storing lobsters: diving goggles, a waterproof electric torch, a strong nylon glove, and a cage. Rigid nylon netting covers the cage. The door, which is in the top of the cage, is tied with pieces of inner tube.

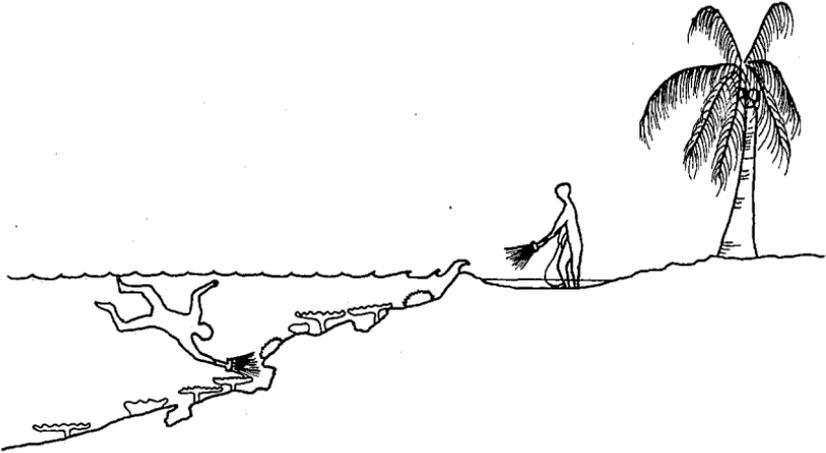


Figure 2: Double-spined rock lobsters live in shallow water outside the reef and on the reef flats of exposed coasts and windward sides of atolls. They usually live in less than 5 metres (15 feet) of water. The other lobster species sometimes live in the same area, but a little bit deeper.

You can sometimes find lobsters under coral heads and in caves during the day, but most of them stay hidden until night. Soon after sunset the lobsters begin to move around on the top of the reef. Then it is easy to catch the lobsters by hand. Lobsters are usually most active on nights when there is no moon, or when there are several hours of darkness before the moon rises.

If you fish for lobsters in the daytime, the sun can make the lobsters too hot and it can kill them.

When several men go fishing together for lobsters on a reef, each man should choose a different part of the reef. You should not fish in the part where another man is fishing. If there is only a small lobster fishing area, it is usually best for only two or three fishermen to fish together.

The best time for fishing is when the weather is fine and the sea is calm. It is difficult to catch lobsters in rough weather.

Lobsters live in salt water. They die quickly in fresh water, so it is better not to go fishing for lobsters when it is raining. If it begins to rain after you have begun fishing, keep the lobsters that you have already caught out of the rain.

Lobsters don't usually leave a reef, so wait for the best time to catch them. They will still be there.

You must catch a lobster carefully if you want to keep (store) it alive. Perhaps the lobster will be processed, or will be sold frozen. It will look nicer and will be worth more money if it has not lost its legs or antennae. The best way to catch a lobster is to hold it by the back (not the tail). If you hold the lobster's legs or antennae, they may fall off. Then the lobster may die while you are storing it. If you grab the lobster's tail, you

may hurt it inside. If you find a lobster in a hole, it may be difficult to catch the lobster without hurting it. Leave it for another time.

When you have caught some lobsters, put them quickly into a bag and carry them, or put them into a canoe or a boat. If you put the lobsters into a canoe or a boat, cover them with wet bags. This will keep them damp. Do not put lobsters in pools of water. They will quickly breathe all the air in the water and die. If you are fishing with other people, each fisherman should put the lobsters he has caught into a separate basket in the canoe or boat. Then he can cover them and keep them separate from the others.

Put the lobsters into a live storage enclosure (see section on "Live storage" on page 6) as soon as you can. Handle them carefully so that you do not hurt them. When lobsters are together in a bag or a basket, they usually hold each other strongly. If you try to separate them, you may hurt them. Empty the lobsters from the bag or the basket straight into the live storage enclosure. The lobsters will stop holding each other as soon as they touch the sea water.

If you cannot put the lobsters straight into the enclosure, tip them slowly from the bag or basket into the bottom of your canoe or your boat. The lobsters will stop holding each other. You can then pick them up one at a time.

If a lobster has just changed its shell, it has a soft shell. It will die if you try to store it alive. It is better to eat it quickly. If a lobster is going to change its shell soon, it will probably die during live storage. You should eat these lobsters quickly too. How can you tell if a lobster is ready to change its shell? Do this. Hold its back firmly. Squeeze it. If it makes a cracking sound, the lobster is nearly ready to change its shell.

# LIVE STORAGE

You can keep lobsters alive for a long time. It is not difficult to make an enclosure (pen or cage). In Solomon Islands we kept lobsters alive for six weeks. Only about 20 per cent (20 in every hundred) died.

If lobsters are healthy, if they are not hurt or sick when you put them into the enclosure, they will live for a long time.

## Materials for a good enclosure

You can use many different kinds of materials. You can make the enclosures with local materials like bamboo and cane. The best kind of enclosure is made from sawn timber. You can see two types of enclosures in Figures 3A and 3B.

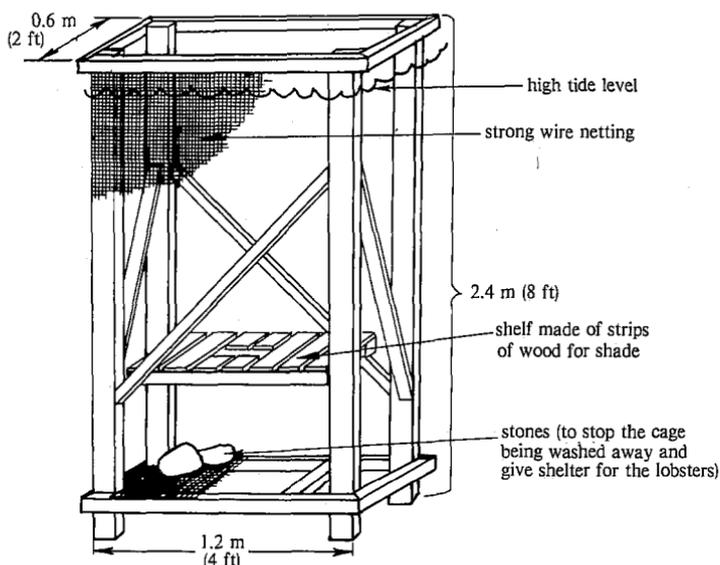


Figure 3A: Live storage pen

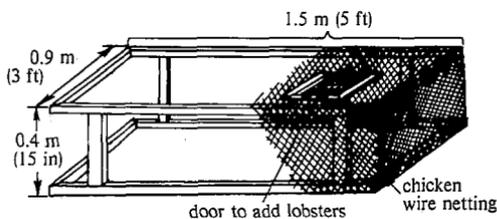


Figure 3B: Live storage cage

For the frame, choose timber that will not rot easily and that marine borers will not eat. The frame should last at least as long as the net which covers it. It is difficult to remove netting from an old frame and to put new netting on the frame.

The net covering must be strong so that lobsters will not chew through it. If you use chicken wire (wire 1.25 millimetres thick) for an enclosure on the bottom of the sea, the lobsters will break the wire. They do not break this kind of wire on cages which are hung from a raft.

Galvanised wire netting with wire 1.75 millimetres thick is strong enough, even if the cage is on the bottom of the sea. But this thicker wire costs more and is heavy.

The best netting material is stiff nylon netting, 3 millimetres thick with a mesh size of about 2.5 centimetres. Unfortunately, this kind of netting is not available in all Pacific islands. In 1977 it cost about the same price as heavy wire netting.

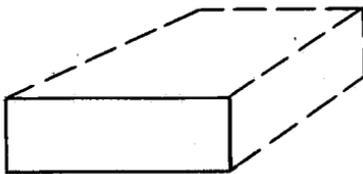
### Building an enclosure

Different kinds of enclosures are good for different kinds of places. For example, pens like the one shown in Figure 3A are good in shallow, calm water where the tide does not rise or fall more than half a metre (one and a half feet). Make a strong top for the pen which you can open easily and close tightly. A top which overlaps the sides by several inches is good.

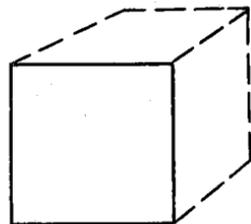
In pens, lobsters usually hang from the underside of the shelves. Add extra shelves to give the lobsters more area to cling to. Tie the shelves to the corner posts of the pens with strong rope. Nylon rope is best.

Cages on the sea bottom, like the one shown in Figure 3B, are best in areas where the sea is rough. Make the top of the cage so that you can open the whole top to take lobsters out. But if you also make a small opening in the top, you can put the lobsters into the cage one by one. Make the top of the cage of thin wood. If you use too much wood in the cage, the cage will become heavy when it has been in the water a long time.

In cages, lobsters usually spend most of their time hanging from the top of the cage. Do not make the cage too deep. The lobsters need plenty of space across the top of the cage.



good shape



poor shape

In deep water where the sea is calm, you can tie the cages to rafts. Make the rafts of bamboo, or of wood that floats well. Hang the cages from the rafts with strong rope. Nylon rope is best.

The lobsters need shade. Put sheets of black or other dark-coloured plastic over the top of the pen or cage. Attach the plastic firmly or the waves will remove it. One way of attaching the plastic is to tie lightweight chicken wire over the plastic. You can also use bags or coconut leaves to shade the pens and cages, but you will need to change them more often than plastic. Remember, the sun can kill your lobsters.

Sometimes you will have to move the enclosures (pens or cages), so the enclosures should be small enough to put into the canoe or boat which you will use to move them. However, the enclosure should be big enough for the number of lobsters you want to store.

### **Rules for storing live lobsters**

Rule 1—Only store lobsters which you have handled carefully and which are healthy. The lobsters should have some legs left on each side, or they will die very quickly. Eat or process lobsters which are in bad condition.

Rule 2—Don't put too many lobsters into an enclosure. If there are too many lobsters, a lot of them will die. Don't put more than about five lobsters for each square metre of the total area of the pen or cage. For example, in a cage which is 100 centimetres wide, 150 centimetres long and 40 centimetres high, there should not be more than about 18 to 20 lobsters.

Rule 3—Do not put your enclosures near fresh water. Do not put them near places where rivers flow into the sea. Sometimes fresh water from the land mixes with the salt water. Sometimes you can see the fresh water, or you can feel it because it is usually colder than sea water.

Rule 4—Put the enclosures in a place where the sea water moves. Then the lobsters will have plenty of air to breathe. Also, if the water is moving, it won't get too hot during the day. Remember that lobsters like cool water. Calm, shallow water sometimes gets too hot for them during the daytime.

Rule 5—Remove dead lobsters from the enclosures before they rot. Check the enclosures regularly. This will help you to find any damage to the enclosures and to repair them before any lobsters escape.

You can store lobsters for at least six weeks without feeding them. But try to store them for only a short time. If you only store them for a short time, they are less likely to die or escape or be damaged by storms. Lobsters do not lose very much weight while they are being stored, but they may not be of such good quality if you store them for a long time.

# LIVE TRANSPORT

You can send live lobsters from the village to market in several ways. You can send them by plane, by private boat or canoe, or by government ship. Live transport will be more successful if the lobsters are healthy. If you look after the lobsters well during storage and remove them quickly but gently from the enclosures, they will stay in good condition. If possible, handle and transport lobsters at night. Keep them out of the sun and high temperatures.

Keep the lobsters cool during transport by shading them. Check the lobsters regularly (but not too often) during transport. Remove any dead lobsters.

For each means of transport there is a special way of packing lobsters. You must pack them in a way that will prevent them getting too dry or too hot. You must also pack them in a way that will stop them moving about and getting damaged.

## TRANSPORT BY SHIP

If you send lobsters to market by ship, they will be travelling for a long time. Different ways of packing are best for different lengths of time.

### *Wet bags*

For a journey that will last eight to ten hours, pack the lobsters between wet bags (Figure 4A). Only ten (or less) in every hundred will die during the journey. Clean copra bags make good packing material. Wash the bags in clean salt water before you use them.

Pack the lobsters on timber shelves to protect the lower layers of lobsters from the weight of the ones on top. The shelves will keep the lobsters above any pools of water which may collect around them. If the lobsters are in pools of water, they will quickly finish the air in the water and then they will die. Cover the lobsters completely with bags. Wet the bags with salt water while they are on the ship. Keep the lobsters in the shade.

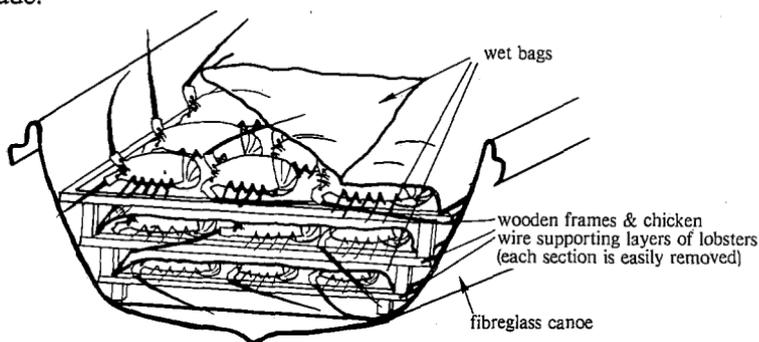


Figure 4A: Cross-section of canoe showing the packing method for live transport

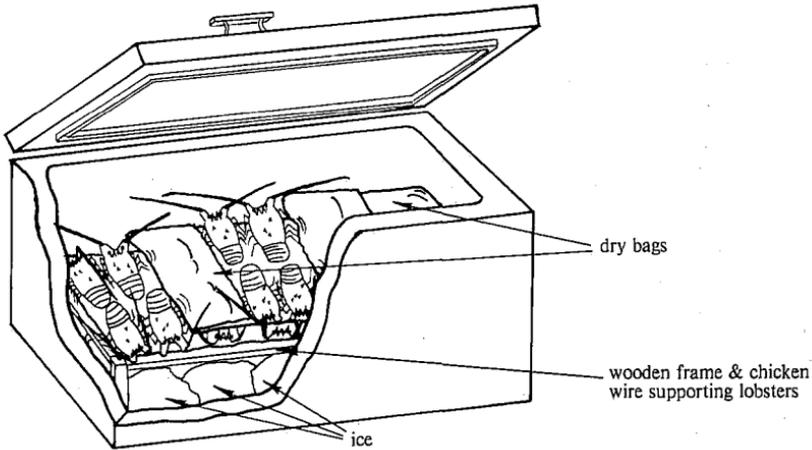


Figure 4B: Cut away of refrigerator body to show packing method for live transport

### *Sawdust*

For journeys lasting up to 20 hours, pack the lobsters in dry sawdust. The sawdust reduces air movement around the lobsters. It stops them getting too dry. Dry sawdust also helps to keep the lobsters cool. Keep them in the shade if possible. If you pack lobsters in sawdust, only about ten in every hundred will die on a journey twenty hours long.

The sawdust must come from timber which will not change the colour or taste of the lobsters. Sawdust from a light-coloured softwood is probably best. Place the first layer of lobsters on a thin layer of sawdust. Cover them lightly with another layer of sawdust. Put a second layer of lobsters on top of the first layer and cover them with sawdust in the same way.

Do not pack lobsters more than two layers deep. If there are more than two layers the lobsters will not be able to breathe and they will die.

You can put the lobsters in lightweight trays or cartons. Keep the lobsters cool. Keep them out of the rain.

### *Refrigeration or ice*

For long journeys you must keep the lobsters really cold. If the ship has refrigeration equipment you can store the lobsters between dry bags at temperatures between 12 and 15 degrees Celsius. Only about ten out of a hundred will die during a journey lasting up to 30 hours. If you use an insulated container and ice (see Figure 4B), the temperature in the container should be between 12 and 15 degrees Celsius. Using ice you can only transport a small number of lobsters in a quite big container. Remember, on long journeys you must keep the lobsters cold. If you get a good price for your lobsters, it is worth using refrigeration or ice. If the price is not good enough, refrigeration and ice will be too expensive, and you will not make any profits.

## AIR FREIGHT

Air freight is a quick way of sending lobsters to market. Not so many lobsters will die. But it may be more expensive to send lobsters by plane than by ship.

Pack the lobsters in a cardboard carton or large empty biscuit tin just before you put them on the plane. Use wood shavings, sawdust or newspapers to pack them. Do not put the carton or tin in the sun or it will get too hot.

## TRANSPORT OF LOBSTER TAILS

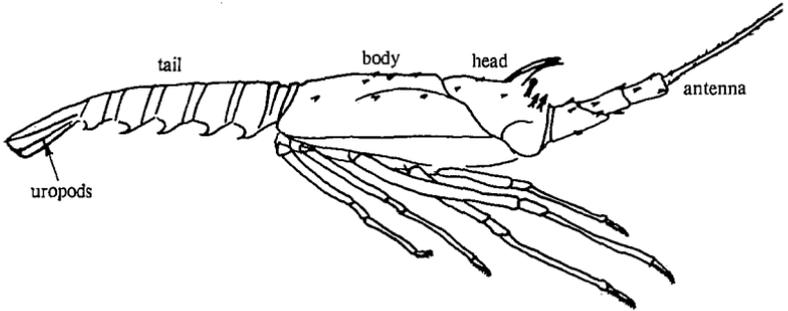
If you cannot send live lobsters to market, send lobster tails. While the lobsters are still alive, remove their tails. Wash the tails in clean, cool, fresh water. Pack the tails in ice made from clean drinking water. Break the ice into small pieces so that it can touch every part of the tails. This will make the tails get cool quickly. Pack the tails in layers. The package should not be more than one metre deep. Lobsters packed like this are very heavy because of the weight of the ice. You will probably have to send them to market by sea.

*Do not* pack whole lobsters in the same way as lobster tails.

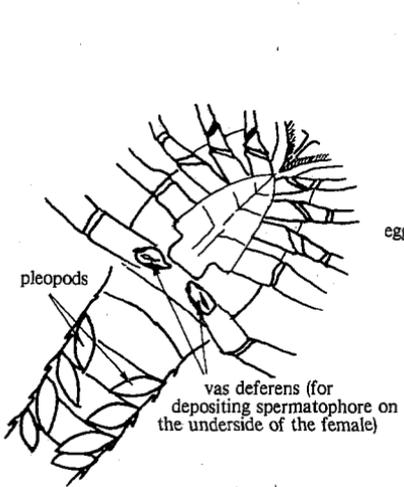
**You must be careful** with lobsters when you are packing, storing and transporting them. Lobsters are not strong. If you are not careful with them, they will die. You can earn lots of money from lobster fishing if you are a careful fisherman.



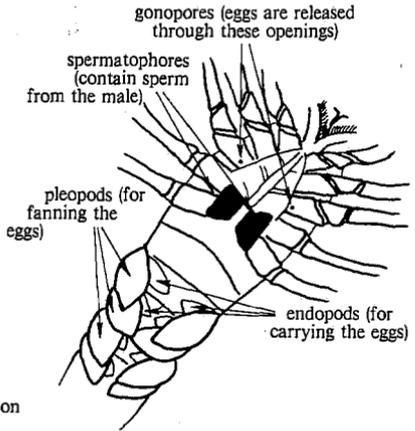
# Appendix 1: Anatomy of *Panulirus penicillatus*



Schematic drawing of *Panulirus penicillatus*



Ventral view, male lobster



Ventral view, female lobster

## Appendix 2: Guide to the species of *Panulirus*

### DOUBLE-SPINED ROCK LOBSTER

#### *(Panulirus penicillatus)*

Left: female, 89 mm C.L.' Right: male, 99 mm C.L.  
Both caught in the Russell Islands, Solomon Islands.

**Description** Robust carapace and legs with relatively short antennae. Antennules unbanded. There is a characteristic double set of spines between the bases of the antennae. The females are usually greenish above and the males are reddish brown. In the north tropical Pacific males more closely resemble females in coloration. The carapace of the male becomes extremely large in relation to the tail in old individuals.

**Distribution** This species, found from the Red Sea to the Galapagos Islands, has the widest distribution of any panulirid lobster.

**Habitat** Found in areas with continuous strong surf action typical of barrier reefs or fringed reefs on the windward sides of islands. Depth range usually between 0-5 m in the surf zone, but occasionally taken from deep water.

**Notes** This species is the most numerous and has the most potential for supporting small fisheries in most parts of the tropical Pacific.



1. Carapace length

## PAINTED ROCK LOBSTER (*Panulirus versicolor*)

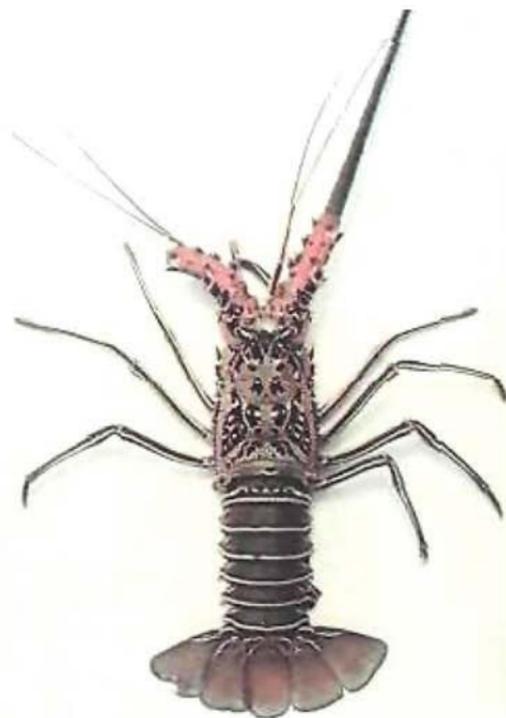
Female, 92 mm C.L.  
Caught in the Russell Islands, Solomon Islands.

**Description** Body usually olive-green with black markings on the carapace and black and white bands on the posterior margins of the abdominal segments; the antennae are dark above and white below, with a rich pink base. The legs are delicate.

**Distribution** Indo-Pacific, as far east as Tonga.

**Habitat** Usually found living amongst live coral and under large coral heads in clear lagoons with good water circulation, or on exposed reefs in deeper water.

**Notes** This species is commonly seen during the daytime, when it can easily be speared.



## BLUESPOT OR WHITE WHISKERED ROCK LOBSTER

(*Panulirus longipes* or *Panulirus femoristriga*<sup>1</sup>)

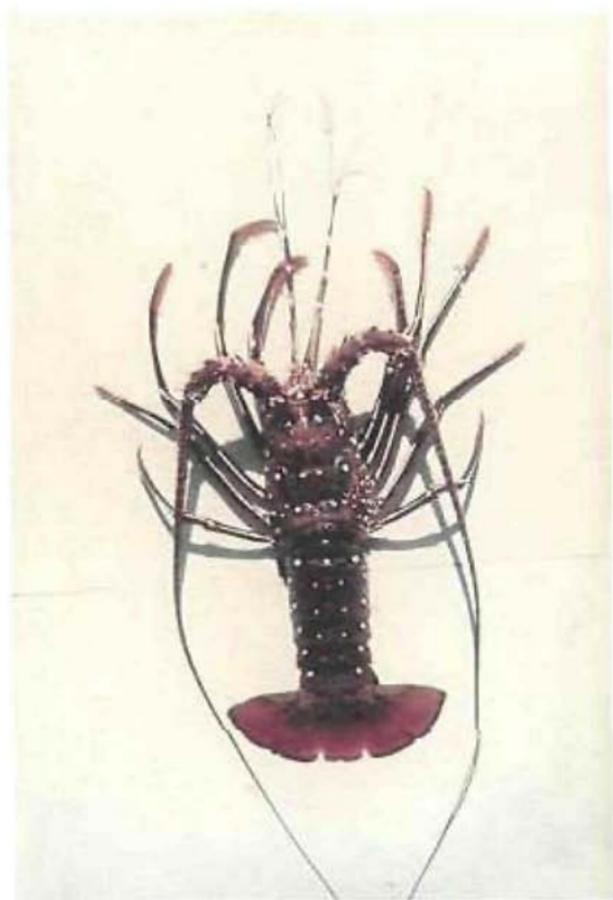
Male, 71 mm C.L.

Caught at Bourail, New Caledonia, 1 m deep.

**Description** Body prominently red-brown with many small white spots. Specimens from some localities have unbanded antennules and the bases of the antennae are a rich pink; from other localities they are very distinctly banded and the antennae bases are vivid blue.

**Distribution** Coral Sea area.

**Habitat** Exposed reefs with generally oceanic conditions in 1-20 m depths. This species is often found on the same reefs as *P. penicillatus* but at a slightly greater depth.



1. The taxonomy of this species is under review.

## ORNATE ROCK LOBSTER (*Panulirus ornatus*)

Male, 175 mm C.L.

Caught at depth of 5 m near Amédée Pass, New Caledonia.

**Description** Generally bluish blue-green above. Antennules dark with white bands. Antennae pinkish brown. The legs are characteristically cream-coloured with distinct dark markings. Oblique sub-median mark on each abdominal segment.

**Distribution** Indo-Pacific, as far east as Fiji.

**Habitat** Usually found in areas of generally quiet waters which are influenced a great deal by terrestrial silt, typical of gulfs or lagoon areas. Depth to 30 m.

**Notes** This is the largest *Panulirus* species; specimens as big as 21 kg are reported from New Caledonia. In Papua New Guinea it supports a small reef and trawl fishery. There are annual spawning migrations in the Gulf of Papua.



## SCALLOPED ROCK LOBSTER (*Panulirus homarus*)

Female, 70 mm C.L.  
Caught in 4 m depth at Bourail, New Caledonia.

**Description** This species is most distinctive when viewed from the side. The best identifying features are the mottled olive colouring on the legs and the light cream coloured areas on the sides of the carapace and antenna base. This species is probably the least common one in the tropical Pacific.

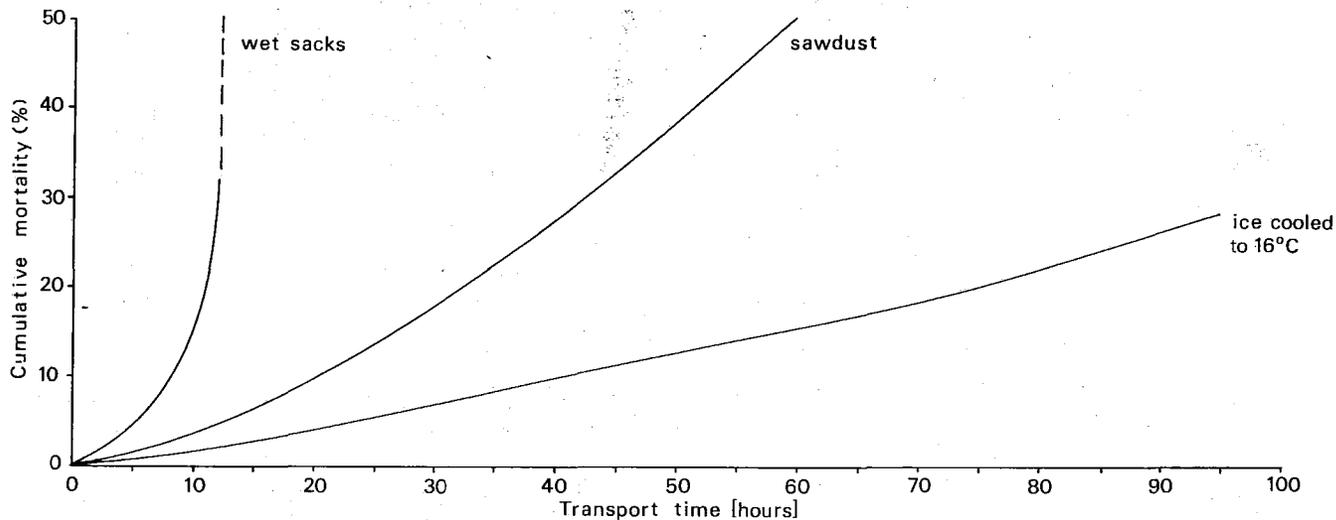
**Distribution** Indo-Pacific, as far east as the Marquesas Islands.

**Habitat** Found in a variety of habitats from muddy inshore waters to exposed areas.

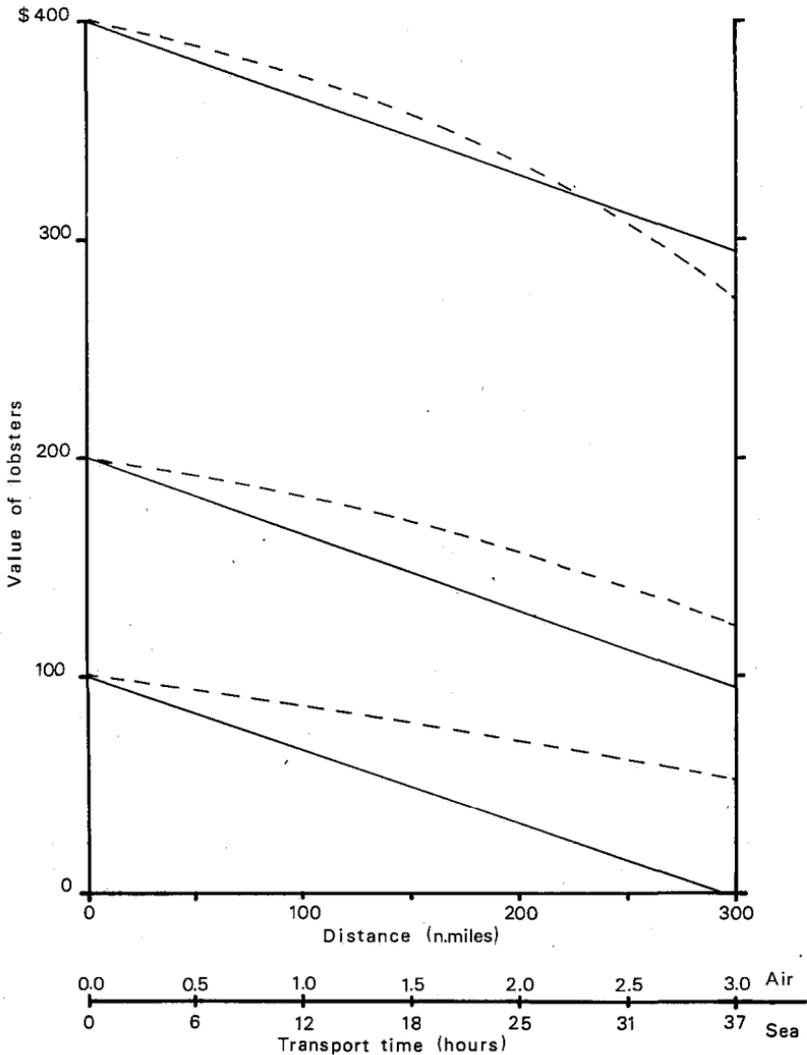


### Appendix 3

Expected cumulative mortality during live transport. The mortality curves approximate those found experimentally during trials in Solomon Islands. Lobsters used had been stored for six weeks before transport. Trials with wet sacks were not carried on for periods longer than 12 hours.



## Appendix 4: Comparative economics of live transport by sea and air



Change in value of 100 kg of lobsters during live transport by air (solid line) and sea (broken line) calculated for initial values per kg of: \$1 (bottom), \$2 (centre), and \$4 (top).

The accompanying figure shows the change in value of lobsters for varying distances of transport. Calculations are based on the mortality rates shown in Appendix 3 and freight rates obtained in 1977. The sea freight rate was that charged on Solomon Islands vessels; the air freight rate was an average of the rates in Solomon Islands and New Caledonia.

The figure shows that if the value of lobsters is low (\$1 or \$2 per kg) sea transport is more economical. If the value is high (\$4 per kg) the costs of transport by sea and air are about the same, but if the distance to be transported is more than 250 nautical miles, air transport is more economical.

This appendix is intended only as an example. Fishermen or fishing companies proposing to transport lobsters should make their own calculations.

