
INTRODUCTION

The Secretariat of the Pacific Community (formerly the South Pacific Commission) has been active in promoting fisheries development in Pacific Island countries for over 30 years. SPC's work has included the assessment of inshore and offshore marine resources, the introduction and testing of new or exotic fishing gear and techniques, and the provision of training programmes in the technical and vocational skills required to support developing fisheries.

A particular area of strength has been SPC's programme of training in fishing and boat-handling techniques for small-scale fishermen. This programme, initiated in 1978, has been carried out by SPC's team of Masterfishermen, who, at the request of Pacific Island governments, conduct training courses and visit fishing communities to carry out practical fishery demonstration activities. These officers have a combined experience of over 60 years in fishing and in training fishermen in Pacific Island countries. The information contained in this manual has been compiled from the discussions and written records of the SPC Masterfishermen and other fisheries development staff. In fact, part of the reason for compiling the manual was in order to capture, at least partially, the largely unwritten specialist knowledge and practical experience accumulated by SPC's fishing staff during field activities.

The main purpose of the manual, however, is to help Pacific Island fishermen improve their deep-bottom fishing success, particularly in commercial or semi-commercial situations. The manual is intended to act as a guide to the principles and techniques of good deep-bottom fishing, for use by fishermen who want to refine or broaden their skills. We have tried to give as much detail as possible on the rigging and use of the main fishing gear, as well as providing brief descriptions of other, less common fishing methods. We have also included information on fish handling practices which will lead to top prices for fish sold on both local and export markets. We hope that the information in this manual will enable both new and established deep bottom fishermen to improve their fishing success, their profits, or both.

A further aim of the manual is to serve as a resource for the formal training activities carried out by the SPC Fisheries Programme as well as by national fisheries development agencies and extension officers. The manual is intended for use as a training aid to help introduce and explain fishing topics to rural fishermen and others. To support this aim, we have tried to present as much information as possible in a visual form, for the benefit of the many Pacific Islanders whose first language is not English. For the same reason, the text has been kept as simple and non-technical as possible.

In compiling this manual, we have split the many interwoven aspects of deep-bottom fishing into a series of individual topics. Each of these is covered in one double-page spread intended to convey as much information as possible relevant to that particular topic. We have tried to be comprehensive in the coverage of each subject. Since fishermen tend to be at odds as often as they are in agreement over the details of fishing, we have tried to present the range of options or opinions on subjects where no consensus was clear. Most contentious issues have been avoided unless their mention is considered essential.

The topics are organised into five main chapters which deal with bottom-fishing basics, preparation of the fishing vessel, gear and equipment, fishing procedures, and activities after the fishing trip. This is followed by a short appendix which provides information on new or not-so-common bottom-fishing methods. Predictably, it has proven impossible to avoid overlap altogether. However, we hope that the cross-references in the text, together with the detailed topic headings and sub-headings presented in the contents list, will enable readers to follow a given theme through the text, or to find the specific information they seek.

As well as the present document, SPC has produced a number of other manuals, handbooks and training materials on fishing and related topics. *Trolling Techniques for the Pacific Islands: A Manual for Fishermen* provides complete information on trolling methods and gear. Similarly, *Vertical Longlining and Other Methods of Fishing Around Fish Aggregation Devices* explains the techniques involved in this type of fishing. The three volumes of the *SPC FAD Handbook* are aimed at helping Fisheries Departments to establish FAD programmes which will provide maximum benefits for the local fishing industry. Various other SPC training and public information materials (including lecture notes, videos, overheads and posters) on fishing, FADs and safety at sea are also available, as are construction diagrams and specifications for the wooden fishing handreels described in this manual. Further publications are planned dealing with other aspects of fishing not so far covered by the above materials. For more information write to SPC at the address on the last page of this document.

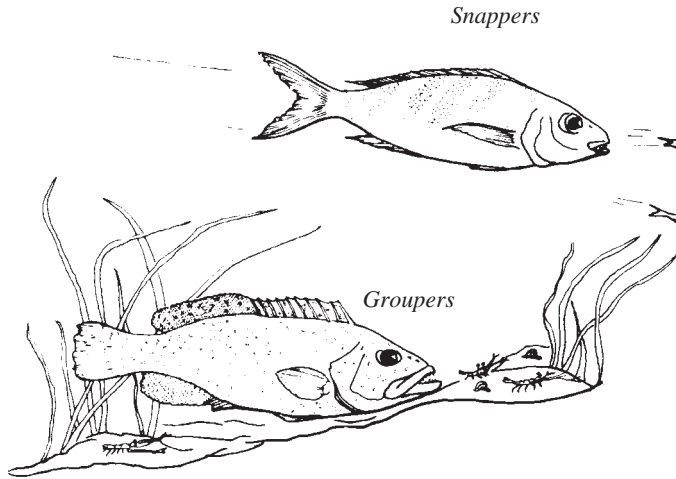
CHAPTER 1

BOTTOM FISHING BASICS

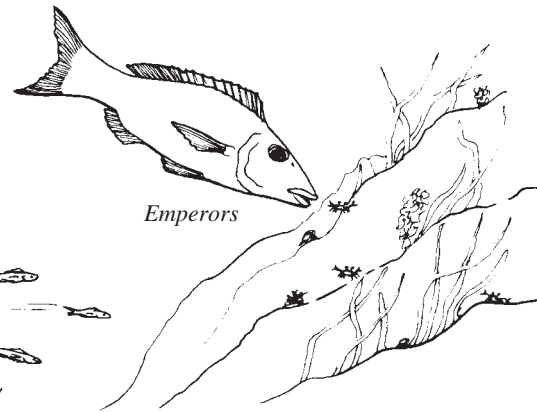
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SECTION 1A : BOTTOM FISHING IN THE PACIFIC

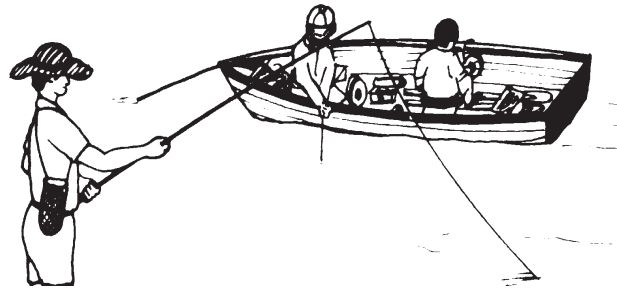
Bottom fishing is the name given to line-fishing with baited hooks on or very close to the sea bottom. This is a fishing method which catches predatory fish that feed on bottom-living crustaceans, fish, etc. One or more hooks may be used.



Bottom fishing catches predatory fish...

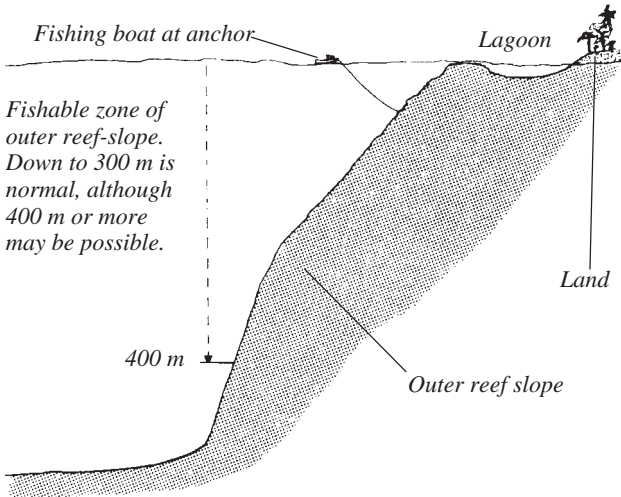


...and can be carried out by various methods, from the shore or from a boat



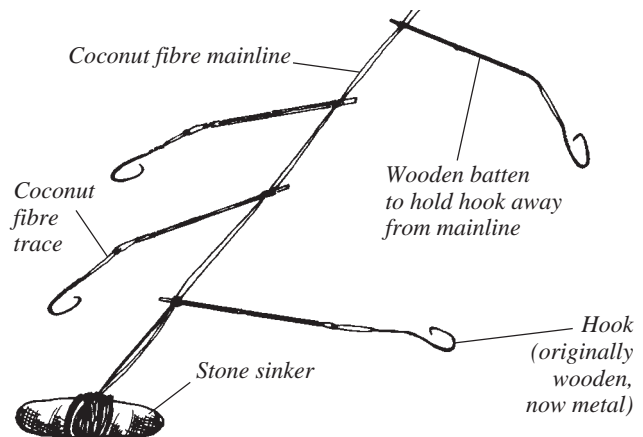
Bottom fishing is practised worldwide by anglers, sportsmen and commercial fishermen. There are many styles of bottom fishing, from boats or from the shore, using handlines, fishing rods, bottom longlines, etc. Some techniques are specialised to catch particular species. Most bottom fishing is carried out in relatively shallow water (less than 100m).

The fishable zone



Deep-bottom fishing is the name given to line fishing for bottom species using a multi-hook rig in waters over about 100 m deep. In the Pacific, this depth zone includes reef slopes and seamount areas, usually outside barrier reefs. In such areas the sea floor may descend to a depth of several thousand metres. The fishable zone is usually down to about 300 m, although 400 m or more may sometimes be possible. Deep-bottom fishing is a laborious and difficult fishing method but is made easier by a variety of tricks and techniques for fishing in such deep waters.

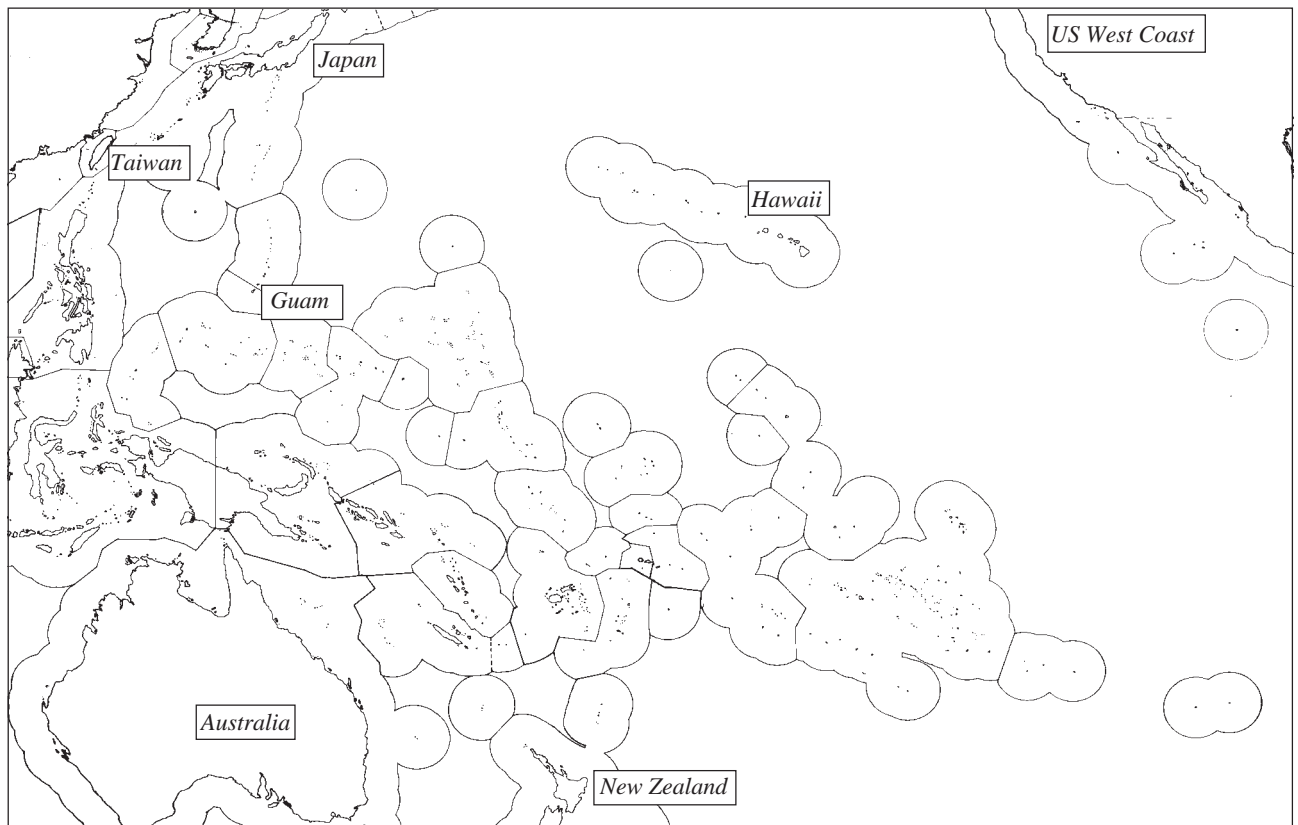
Traditional Polynesian deep-bottom fishing rig



Deep-bottom fishing has been known for many years in the Pacific region, and has been practised for generations in some of the remote island communities of the Pacific, particularly Polynesia. In the old days fishing was carried out from paddling canoes using gear made from locally-available materials, and was a challenge to even the most experienced fisherman. Nowadays, many modern types of fishing gear and equipment are helping to make deep-bottom fishing easier and the technique is spreading more widely in the Pacific. Nevertheless, considerable skill and determination is needed to fish effectively using this method.

Deep-bottom fishing has been trialled in most Pacific Island countries, successfully in some places, less so in others. In the past the main development target in many countries was to access high-priced fresh fish markets in Japan, Guam, Hawaii and the United States West Coast. Countries with direct airline routes to these markets were the most successful in exporting fresh fish at high prices. Even though fisheries have tended to be export-based, the fishing operation is usually artisanal in nature, involving small vessels, manual (non-mechanised) fishing methods, and simple technology.

Export markets for Pacific deep-bottom fish



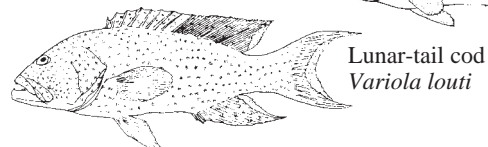
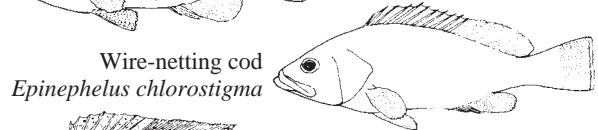
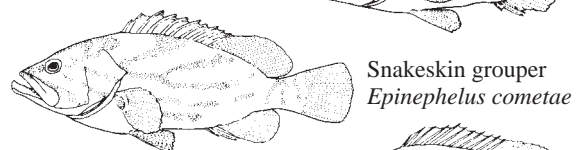
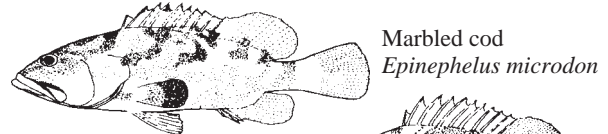
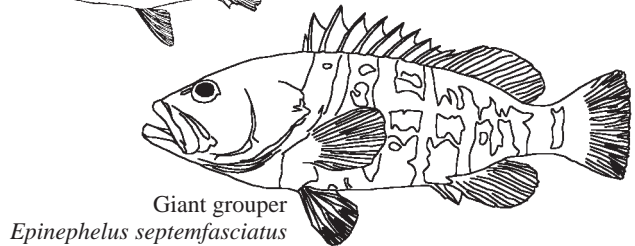
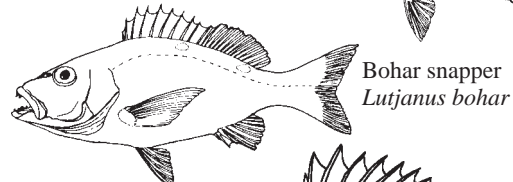
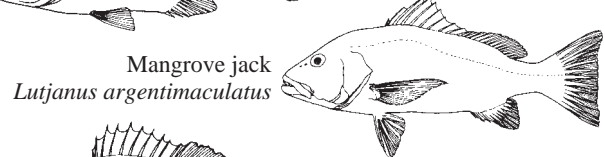
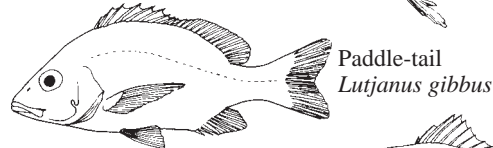
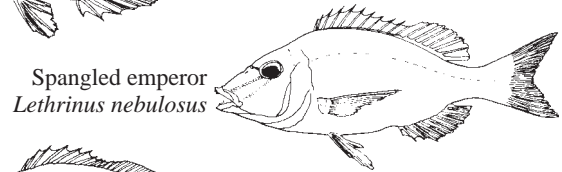
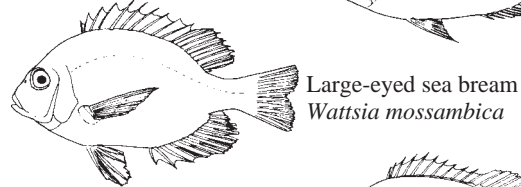
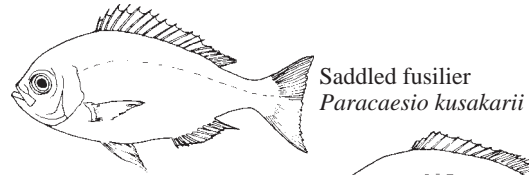
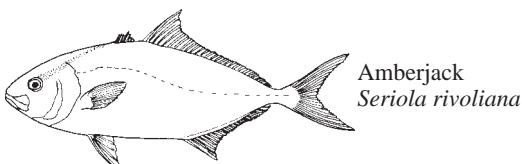
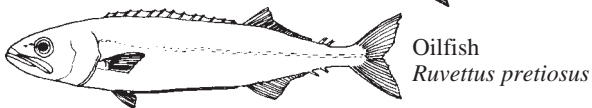
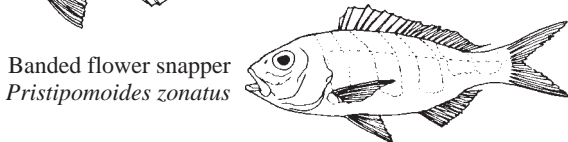
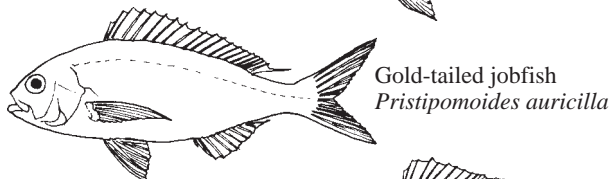
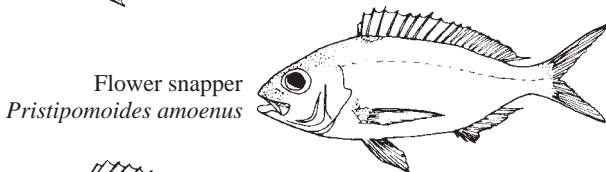
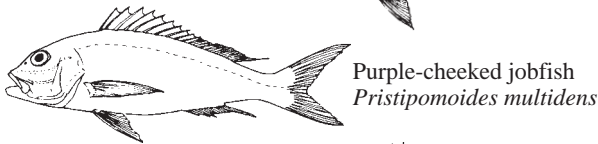
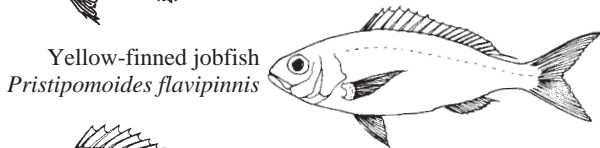
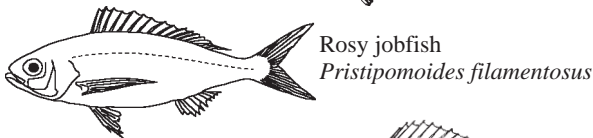
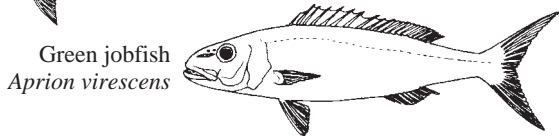
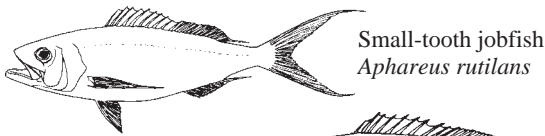
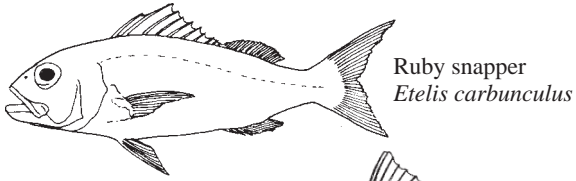
More recently, however, the development of local fish markets is giving renewed opportunities for the development of this resource in many locations. Urban fish markets in the Pacific Islands are becoming increasingly quality-conscious, and deep-bottom fish can command premium prices if properly handled and marketed. A major advantage of deep-bottom fish for both local and export markets is that the species caught never carry ciguatera fish poisoning. This is a type of natural toxicity which originates from reef and lagoon fish that feed on toxic reef algae.

Ciguatera fish poisoning causes illness and makes the affected person unable to eat seafood for a long time. The possible presence of ciguatera is a major cause of concern for many consumers of reef and lagoon fish. The fact that it never occurs in deep-water fish, due to their diet, makes these fish all the more valuable.

The growth of local tourist and catering industries is also adding to the demand for high-quality deep-bottom fish. In addition, new export markets are developing in Australia, New Zealand and elsewhere; these are more accessible to many island countries than the 'traditional' Japanese and US markets. And finally, air-freight links to many Pacific Island countries are improving because of the growth of fresh tuna exports from the region. In many cases this provides the opportunity to 'piggy-back' the export of deep-bottom fish onto an existing export operation. All these factors are providing renewed opportunities for the development – or re-development – of deep-bottom fisheries in the Pacific Islands region.

SECTION 1B: COMMONLY CAUGHT FISH

The main target species of deep-bottom fishing are deep-water red snappers, sometimes called ruby snappers, and the pink snappers, or ‘jobfish’, both of which fetch high prices in most locations. However these normally make up only a portion of the catch: many other fish types are also taken, including groupers, emperors, breams, snake mackerels (especially when night-fishing) and sharks. Some of the common types taken deep-bottom fishing are shown below. Many additional species may also be taken, especially if the boat swings into shallower waters while fishing.

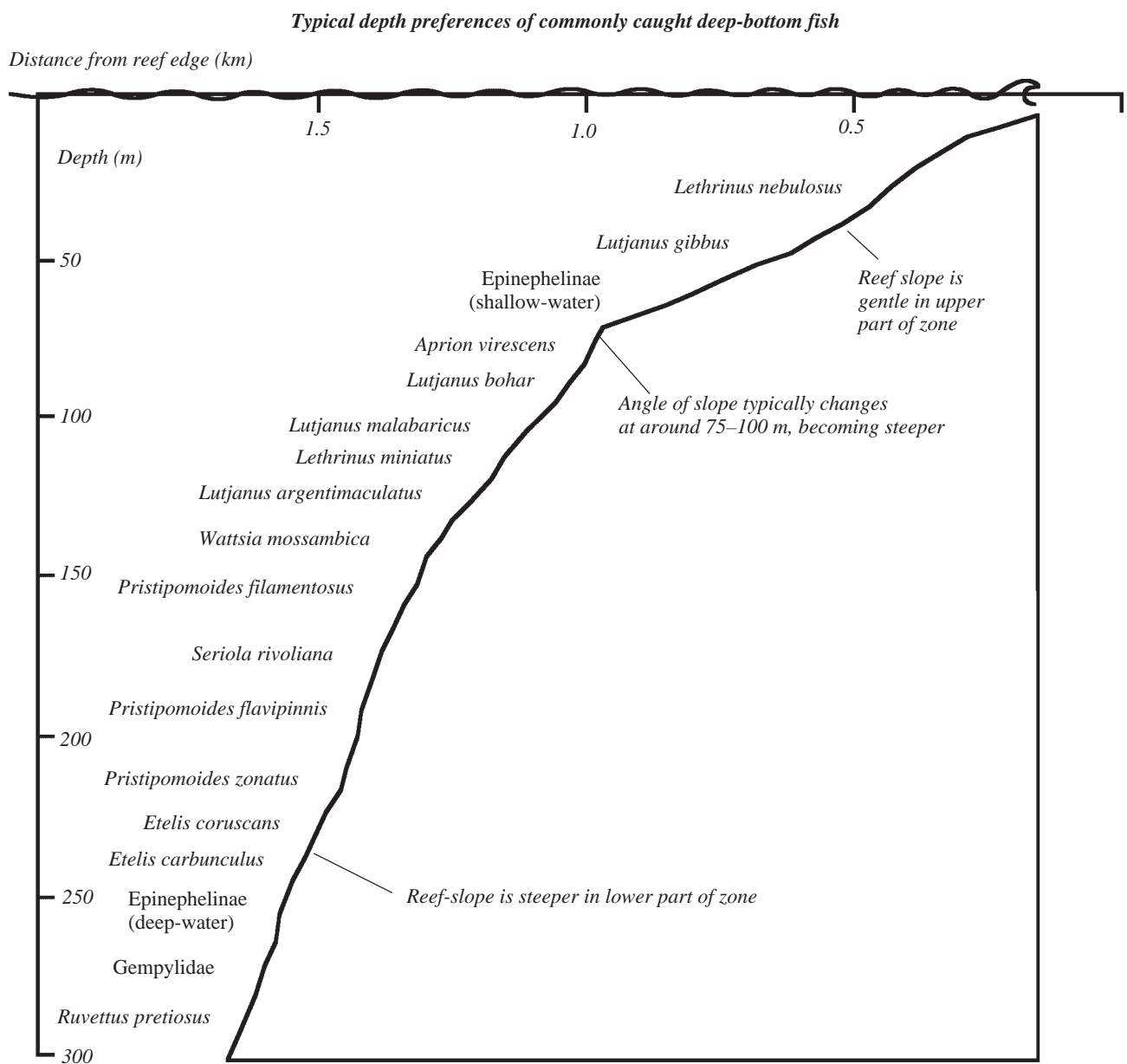


Fish habitats

Many factors influence both the species composition of the catch, and the size of the species caught. The number of species in the catch declines as one moves from west to east across the region, and more species are taken around high islands than around atolls and low islands. The species composition on seamounts is often different than on island reef slopes, and individual seamounts can differ markedly even when close to each other. There are also a number of unexplained local features that have been observed by SPC's masterfishermen: for instance, only very small specimens of the ruby snapper, *Etelis carbunculus*, have ever been caught around Rarotonga in the Cook Islands, while in New Caledonia the rosy jobfish, *Pristipomoides filamentosus*, grows much larger than anywhere else. In many parts of Micronesia, the long-tailed red snapper, *Etelis coruscans*, grows much larger than is usual in south Pacific waters.

Depth

As far as the fisherman is concerned, the main factor likely to affect his catch composition is fishing depth. The chart below gives an idea of the depth ranges inhabited by some of the more common species which can be caught deep-bottom fishing. As noted earlier, this can vary considerably from one location to another.



In general, greater numbers of smaller fish are found in the upper part of a species' depth range, and a smaller number of fish, but larger individuals, in the deeper parts, with the best fishing depth somewhere in between. The ruby snappers are generally quite deep-living, being found at 200–300 m, while the jobfish are found a little shallower, at 150–250 m. Deep-bottom fishing thus typically targets the 100–300 m depth range.

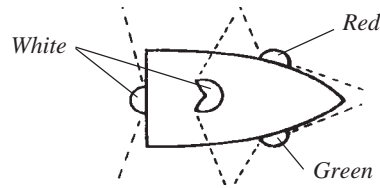
SECTION 1C: SAFE NAVIGATION

A basic knowledge of coastal navigation—the use of a compass and marine charts—is important to any fisherman travelling outside his own locality. As well as helping him locate good fishing grounds, the ability to navigate and read charts will assist him to avoid groundings, find shelter in rough weather, and locate places to put ashore in an emergency.

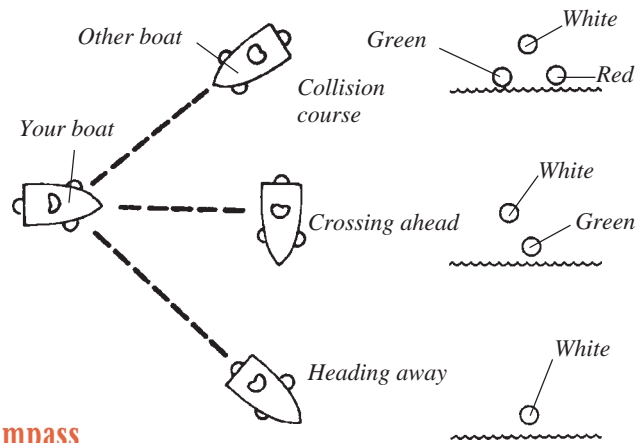
Rules of the road

In areas where marine traffic is heavy, it is also important to know the ‘rules of the road’, that is, which boats have right of way in a given situation. Most seagoing collisions occur at night, because people are not aware of the meaning of ships’ lights and navigation markers. Each fisherman should take the trouble to learn the system of navigation beacons in his locality, as well as the meaning of ships’ running lights. A boat’s port (left) side should have a red light, its starboard side a green light, and its stern a white light. One or more white masthead lights may also be carried on larger boats. These lights allow a seaman to work out the direction in which other boats are travelling, and thus enable him to avoid collisions. All fishermen should know the meaning of the lights—and have lights themselves if travelling at night.

Small-boat system of lights...



...and what they show



Three different types of hand-bearing compass



Compass

The most essential piece of navigation equipment for deep-bottom fishing is a compass. Normally a hand-bearing compass, designed to allow bearings to be taken from prominent objects, is the most useful for a small vessel. The fisherman must know how to use the compass properly—that is, he must be able to take a bearing, follow a course, and work out the reciprocal (opposite direction) of a heading. Ideally he should also be able to plot bearings on a chart and perform elementary coastal navigation. Correct use of a compass will help the fisherman to find his way to the fishing ground and, more importantly, to find his way home again afterwards.

Global positioning system (GPS) receivers

GPS receivers are electronic positioning devices which assist navigation by reference to satellites, and which allow known fishing spots to be located quickly and easily. The position is entered into the unit which then guides the fisherman to the correct spot by providing information on the course to be followed and distance to be covered. In the past GPS units have been expensive and limited in their availability in the Pacific Islands, but are now gradually getting cheaper and more widespread. In recent times the first hand-held GPS units costing less than US\$ 100—cheaper than the cost of a good hand-bearing compass—became available. As GPS units continue to fall in price and become more widely available they will be increasingly used by deep-bottom fishermen.

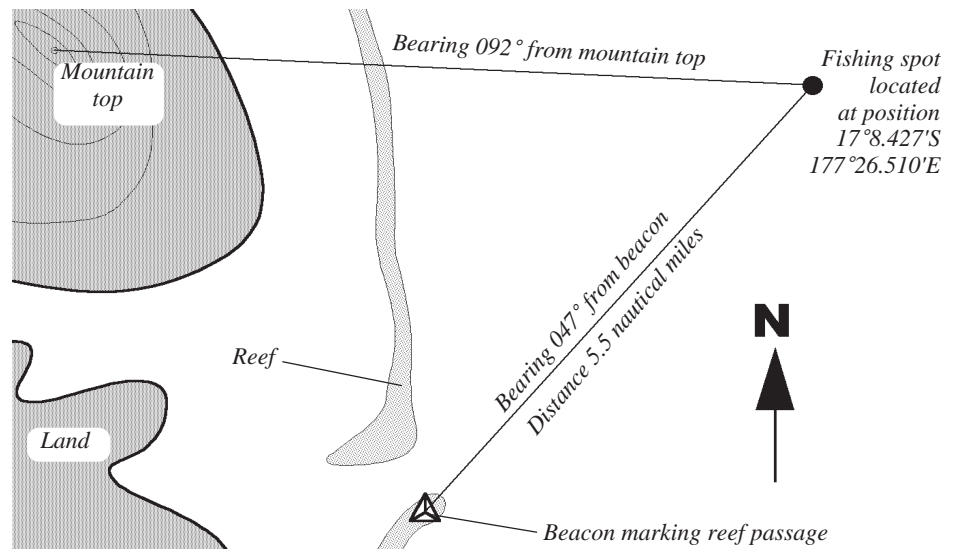
Despite its usefulness, a GPS unit is a supplement for a compass, not a substitute. All electronic devices can develop flat batteries, break down or malfunction, especially if dropped in sea water. In addition, the accuracy of a GPS can be greatly reduced at times when there are few satellites within range, or when heavy cloud cover or rain interferes with reception. **Therefore, a compass should always be carried even if a GPS is used.**



A low-cost hand-held GPS unit

Using bearings

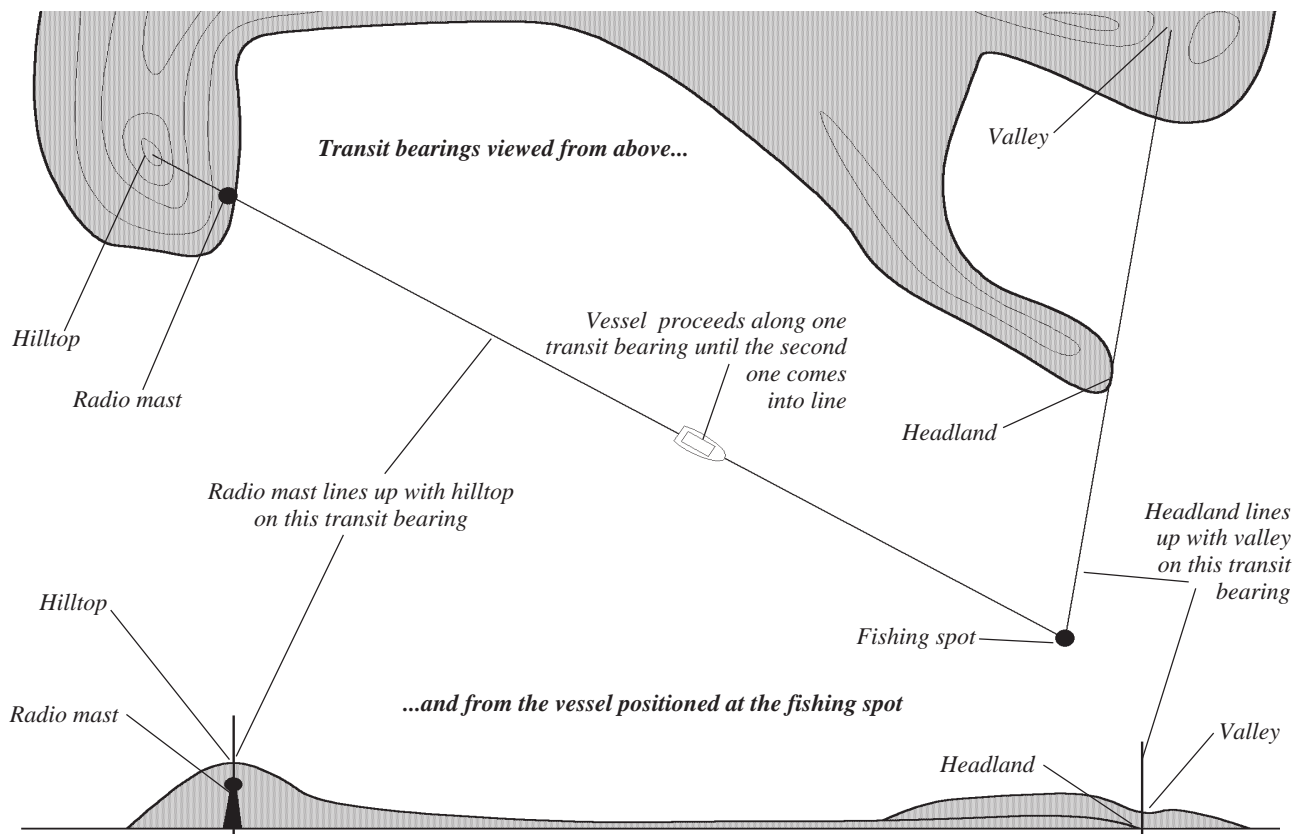
If the coordinates of a good fishing spot are known — for instance if the fisherman has recorded them previously, or been told by a friend — then a compass and marine chart can be used to calculate the bearing and distance of the spot from the fisherman's fishing base. This information can then be used to navigate directly to and from the fishing spot without having to waste time searching around.



Using transit bearings

A transit bearing is an imaginary line created when two prominent landmarks or other features are in alignment. Examples might include lining up two mountain peaks, one in front of the other, or a navigation beacon on the reef with a church steeple on the shore. The best transit bearings are taken on objects which are clearly visible and far apart; objects that are close together will not give an accurate transit bearing.

It may not be possible to use transit bearings when far offshore from low islands or atolls, because the land is not high enough to allow landmarks to be seen. In this case the fisherman will be much more reliant on the use of his compass. However, when fishing around high islands it is usually possible to find a couple of transit bearings which intersect at the location of the fishing spot. These can be noted down when a good fishing ground is found.



The fisherman should always be able to approach the fishing spot by first lining up one of the transits, and then following the transit line until the landmarks of the second transit are also in alignment.

SECTION 1D: AVOIDING ACCIDENTS AND INJURIES

PLANNING

Many accidents at sea are caused by carelessness or lack of preparation. Vessels go adrift for simple and easily avoidable reasons, such as running out of fuel, or minor engine breakdowns. In many cases these incidents could easily have been avoided, but instead they cause great suffering, enormous search and rescue costs, and even loss of life. All boat owners have a responsibility to themselves and their crew to ensure that they have done their best to avoid accidents, and are in a position to cope with them if they do happen. Because it usually takes place outside the reef, deep-bottom fishing can be a dangerous activity for careless or ill-prepared fishermen.



Pre-departure checklist

Before setting off to sea, every fisherman should do the following:

- check the weather forecast. If in doubt be prepared to cancel the trip or cut it short;
- tell someone who cares (family or friends) where he is going and when he plans to return, so that the alarm can quickly be given if he does not come back on time;
- check that the engine is in good condition and running well;
- check that all safety equipment and supplies are on board.

Safety equipment

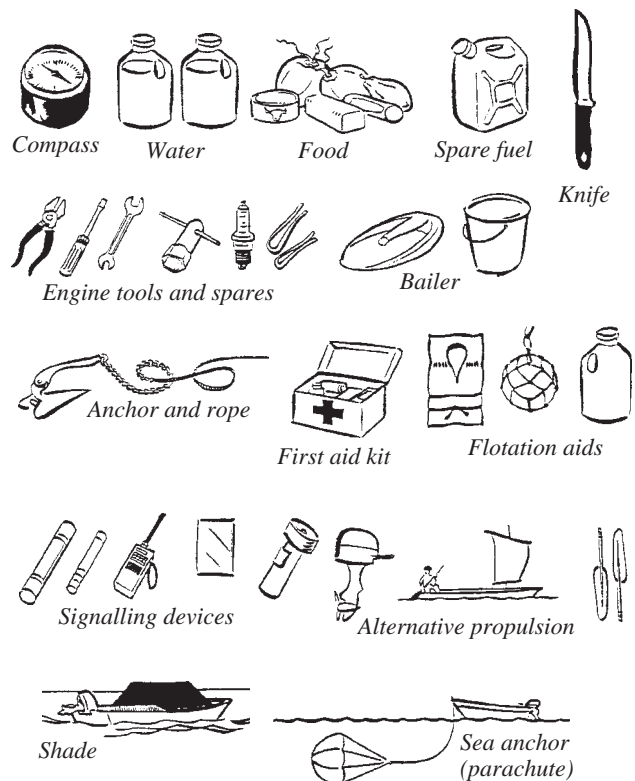
The type of safety equipment and supplies carried will depend on the type of vessel, the duration and distance of the fishing trip, and local regulations. Even small boats should have a minimum of equipment and supplies, including:

- a compass;
- tools and spare parts for engine repair;
- an anchor and anchor rope;
- a bailer which will float if dropped over the side;
- food, and plenty of drinking water or coconuts;
- spare fuel;
- knives.

Other equipment should include some or all of the following:

- alternative means of propulsion: oars, emergency sail rig, or spare outboard motor;
- a sea anchor (parachute);
- flotation devices: life-jackets, life-raft, longline floats, plastic containers
- signalling devices: a heliograph (signalling mirror), waterproof torch, flares, air horn, VHF radio, EPIRB (emergency position-indicating radio beacon).

Safety and life-saving equipment



For a fisherman whose boat sinks, clinging to a fishing float or a 20-litre plastic container may mean the difference between life and death.

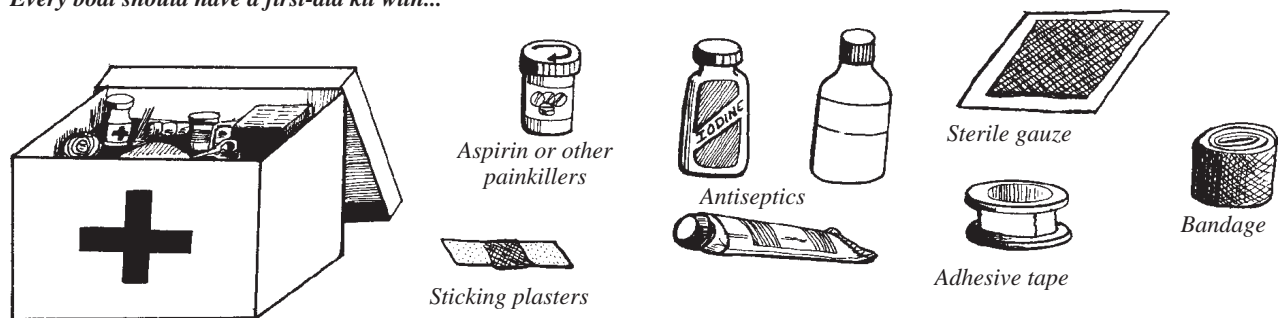
INJURIES

Deep-bottom fishing boats are places where sharp hooks, gaffs and knives are being used to catch and subdue sometimes lively and powerful fish, often in choppy weather. In addition, the fish themselves often have sharp teeth, spines and gill rakers. Minor injuries such as cuts, bruises and line burns are thus almost a certainty, especially on hands, and there is the potential for more serious accidents to happen. The sensible fisherman will take all reasonable precautions to reduce the chances of accidents to a minimum and be ready to cope with them if they do occur.

First-aid kit

In many countries, the law requires boat owners to carry a basic first-aid kit. Even where this is not mandatory, fishing boats should have some first-aid supplies on board. These should include aspirin or panadol (for pain), sticking plasters, a couple of small bandages and some antiseptic liquid and ointment.

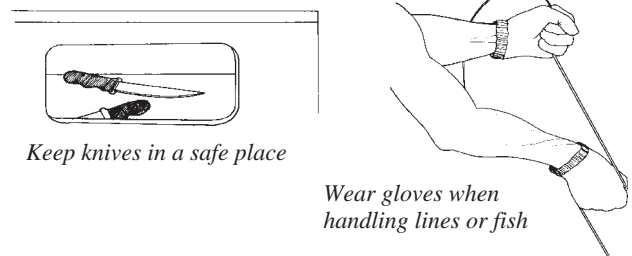
Every boat should have a first-aid kit with...



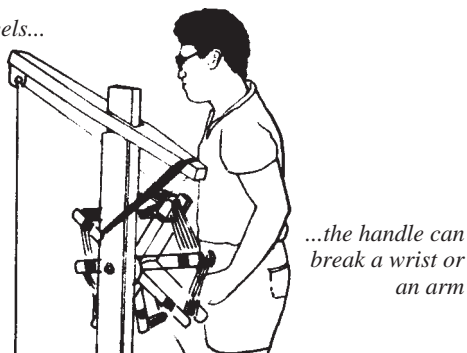
Avoid accidents

The boat's skipper should ensure that all his crew adopt safe working practices and avoid injury to themselves and other crewmen. When handling fish, gloves should be worn to protect the hands from lines, hooks, fish spines and teeth, and knives. When not in use, fishing gear and knives should be stowed safely where they will not slide around or be stepped on.

Avoid accidents...



Watch out for spinning handreels...



When deep-bottom fishing using a wooden handreel (see section 2K), a common cause of injury is from the reel's spinning handle. Certain kinds of fish such as sharks and tunas will sometimes take off on a powerful run, even after they have been reeled in close to the boat. Fish may need to be played by unwinding the reel so that they can take some line, but the reel handle should never be let go so the fish can run free, or it will spin out of control. If this does happen, keep well out of the way of the spinning handle until the fish slows or the reel can be brought under control.

A couple of gaffs and a fish club or bat (see section 3G) are useful equipment when deep-bottom fishing. Although most deep-bottom fish have little fight left in them when boated, it is not uncommon to catch tunas or other lively fish which will thrash and cause damage. These fish should be gaffed through the head and then stunned with a fish club as soon as they have been brought on board. This not only stops the fish from causing injuries, but also prevents damage to the fish flesh which could reduce its value.

