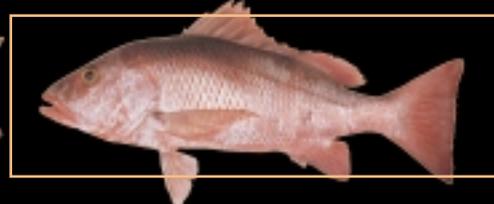




# Deep-bottom fishing techniques for the *Pacific Islands*



**A MANUAL FOR FISHERMEN**



Secretariat of the Pacific Community

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**A MANUAL FOR FISHERMEN**

*Garry L. Preston, Paul D. Mead, Lindsay B. Chapman & Pale Taumaia*

*Illustrated by Steven J. Belew*



*Australian Agency for  
International Development*



*Coastal Fisheries Programme  
Capture Section, SPC*

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## UNITS, CONVERSIONS AND ABBREVIATIONS

Metric units are used throughout this document. Conversions between metric and imperial units are as follows:

|                     |   |               |          |   |          |
|---------------------|---|---------------|----------|---|----------|
| 1 millimetre (1 mm) | = | 0.039 inch    | 1 inch   | = | 25.38 mm |
| 1 centimetre (1 cm) | = | 0.393 inch    | 1 inch   | = | 2.54 cm  |
| 1 metre (1 m)       | = | 3.281 feet    | 1 foot   | = | 0.305 m  |
| 1 metre (1 m)       | = | 0.546 fathoms | 1 fathom | = | 1.83 m   |

Some manufacturers use nominal equivalents in converting between metric and standard US measures. The nominal equivalents of the metric measures given in this document are as follows:

|             |   |           |              |   |          |
|-------------|---|-----------|--------------|---|----------|
| 5 mm -----  | = | 3/16 inch | 16 mm -----  | = | 5/8 inch |
| 6 mm -----  | = | 1/4 inch  | 19 mm -----  | = | 3/4 inch |
| 8 mm -----  | = | 5/16 inch | 22 mm -----  | = | 7/8 inch |
| 10 mm ----- | = | 3/8 inch  | 25 mm -----  | = | 1 inch   |
| 12 mm ----- | = | 1/2 inch  | 50 mm -----  | = | 2 inch   |
| 14 mm ----- | = | 9/16 inch | 100 mm ----- | = | 4 inch   |

Apart from the units of measure noted above, other abbreviations used regularly in this document include the following:

|      |                                      |
|------|--------------------------------------|
| dia. | Diameter                             |
| SPC  | Secretariat of the Pacific Community |

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## TABLE OF CONTENTS

|  |           |
|--|-----------|
| <b>INTRODUCTION</b>                                  | <b>1</b>  |
| <b>CHAPTER 1: BOTTOM FISHING BASICS</b>              | <b>3</b>  |
| A. Bottom fishing in the Pacific .....               | 4         |
| B. Commonly caught fish .....                        | 6         |
| C. Safe navigation .....                             | 8         |
| D. Avoiding accidents and injuries .....             | 10        |
| <b>CHAPTER 2: FISHING GEAR AND EQUIPMENT</b>         | <b>13</b> |
| A. The standard bottom-fishing rig .....             | 14        |
| B. Line materials .....                              | 15        |
| C. Hooks, swivels and sinkers .....                  | 16        |
| D. Tools and utensils .....                          | 18        |
| E. Knots for hooks and tackle .....                  | 20        |
| F. Knots for joining lines .....                     | 22        |
| G. Using loops to join lines and attach tackle ..... | 23        |
| H. End loops in cable .....                          | 24        |
| I. Trace attachment points .....                     | 26        |
| J. The assembled line .....                          | 27        |
| K. Reels for bottom fishing .....                    | 28        |
| L. Bait .....  | 30        |
| M. Chum .....  | 32        |
| <b>CHAPTER 3: THE FISHING VESSEL</b>                 | <b>35</b> |
| A. General vessel considerations .....               | 36        |
| B. Handreel mounting .....                           | 38        |
| C. Containers for fish and ice .....                 | 40        |
| D. Anchor rope .....                                 | 42        |
| E. Anchors .....                                     | 44        |
| F. Echo-sounders .....                               | 46        |
| G. Fish landing tools .....                          | 48        |
| <b>CHAPTER 4: FISHING OPERATIONS</b>                 | <b>51</b> |
| A. Choosing the fishing ground .....                 | 52        |
| B. Fishing inside the reef .....                     | 53        |
| C. Fishing outside the reef .....                    | 54        |
| D. Checking the depth .....                          | 56        |
| E. Anchoring up .....                                | 58        |
| F. Positioning the boat at anchor .....              | 60        |
| G. Hooking and hauling fish .....                    | 62        |
| H. Boating the fish .....                            | 64        |
| I. Hauling the anchor .....                          | 66        |
| J. Drifting with wind and current .....              | 68        |
| <b>CHAPTER 5: AFTER FISHING</b>                      | <b>71</b> |
| A. Taking care of the catch .....                    | 72        |
| B. Handling fish for export .....                    | 73        |
| C. Care of the boat .....                            | 74        |
| D. Care of the fishing gear .....                    | 76        |
| E. Keeping records .....                             | 77        |
| <b>APPENDIX: OTHER DEEP-BOTTOM FISHING METHODS</b>   | <b>79</b> |



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## 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.



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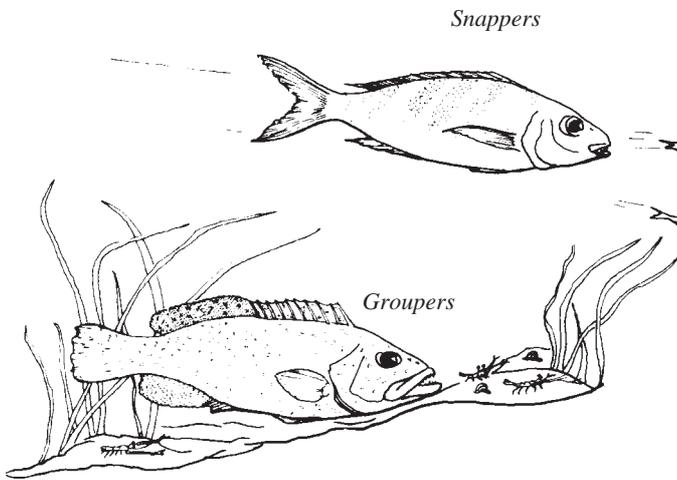
CHAPTER 1

***BOTTOM FISHING BASICS***

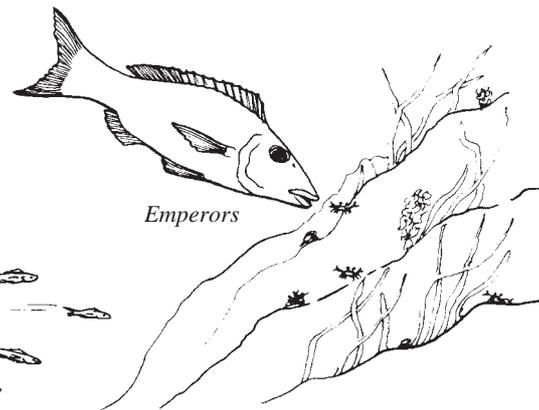
|    |                                 |    |
|----|---------------------------------|----|
| A. | BOTTOM FISHING IN THE PACIFIC   | 4  |
| B. | COMMONLY CAUGHT FISH            | 6  |
| C. | SAFE NAVIGATION                 | 8  |
| D. | AVOIDING ACCIDENTS AND INJURIES | 10 |

## SECTION 1A : BOTTOM FISHING IN THE PACIFIC

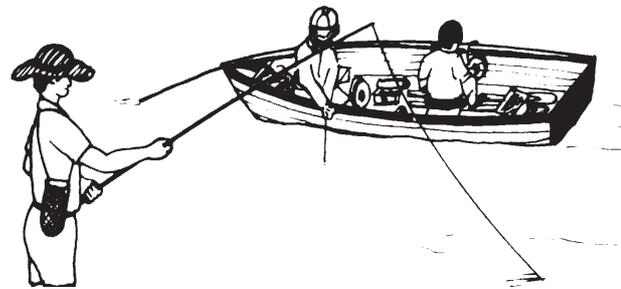
Bottom fishing is the name given to line-fishing with baited hooks on or very close to the sea bottom. This is a fishing method which catches predatory fish that feed on bottom-living crustaceans, fish, etc. One or more hooks may be used.



Bottom fishing catches predatory fish...

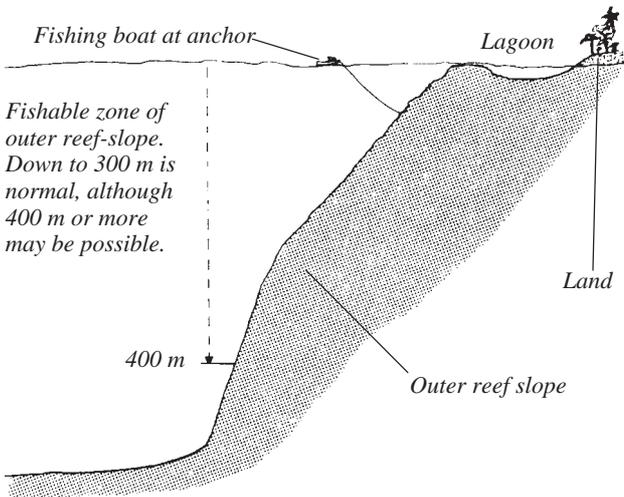


...and can be carried out by various methods, from the shore or from a boat



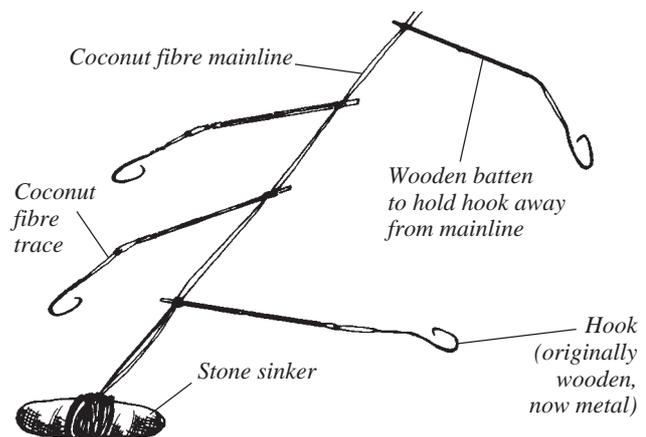
Bottom fishing is practised worldwide by anglers, sportsmen and commercial fishermen. There are many styles of bottom fishing, from boats or from the shore, using handlines, fishing rods, bottom longlines, etc. Some techniques are specialised to catch particular species. Most bottom fishing is carried 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.

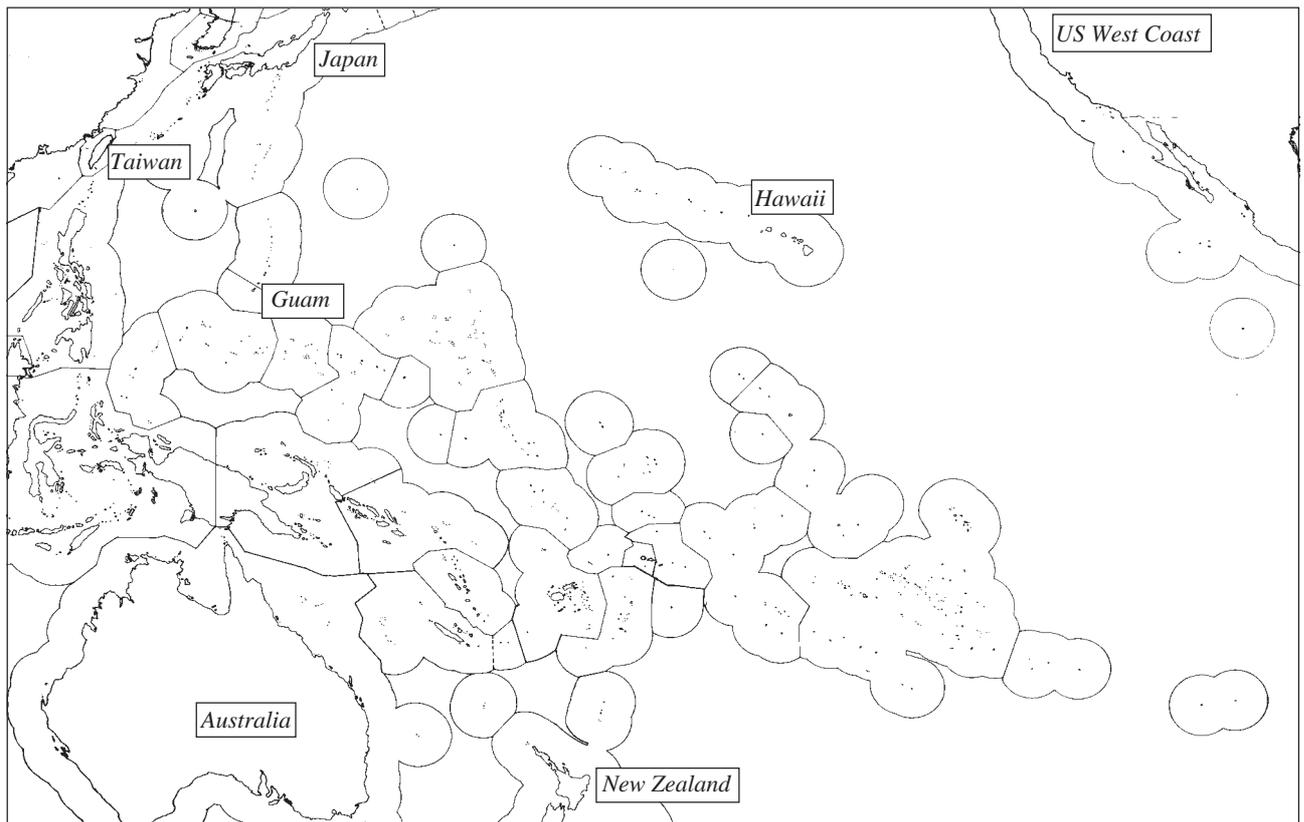
Traditional Polynesian deep-bottom fishing rig



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*



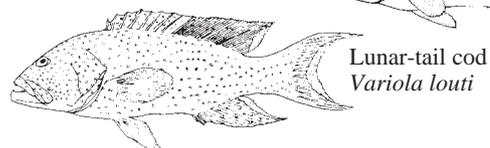
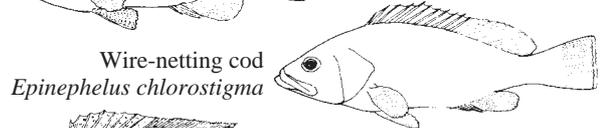
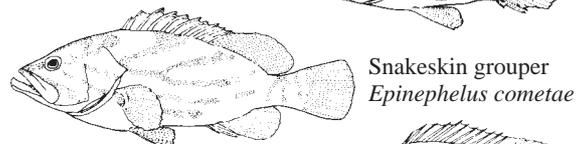
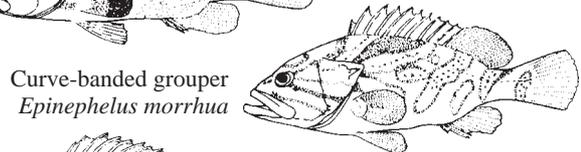
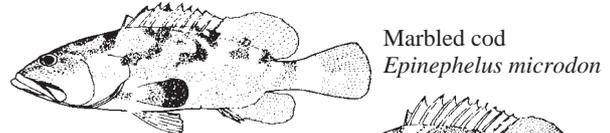
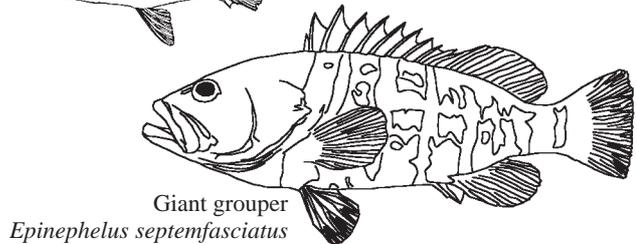
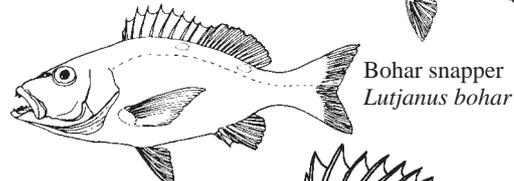
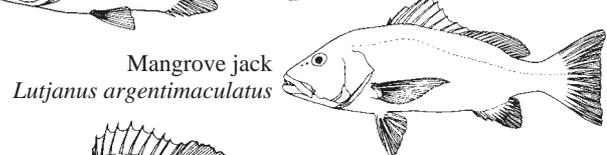
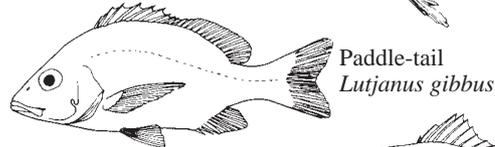
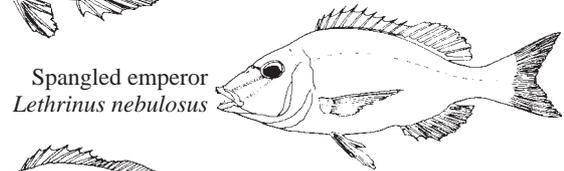
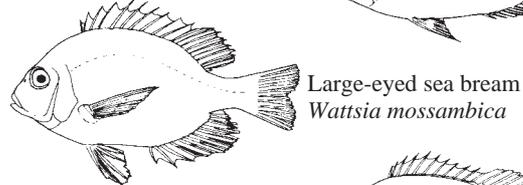
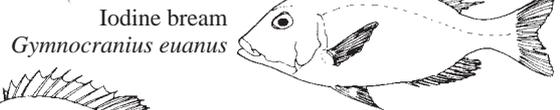
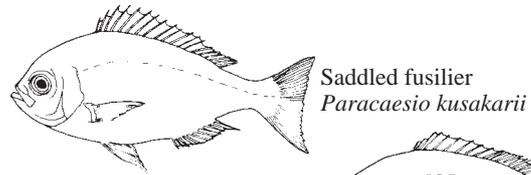
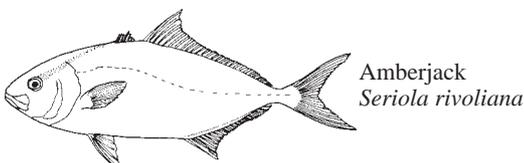
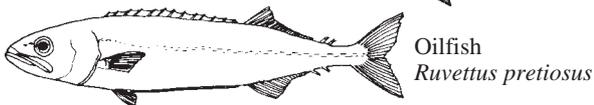
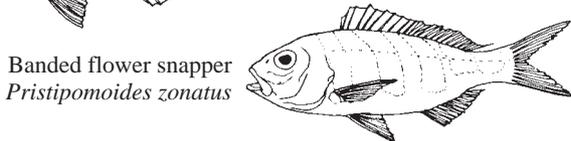
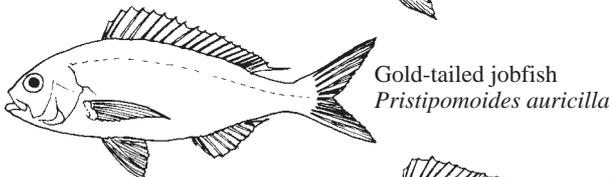
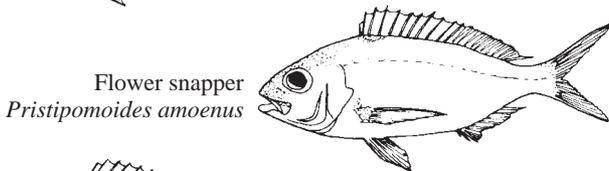
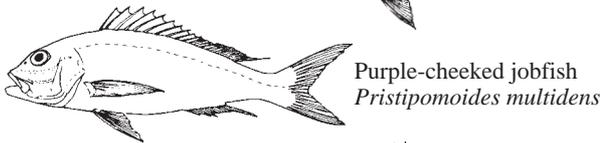
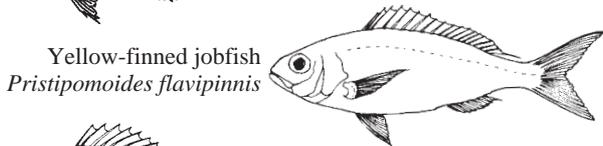
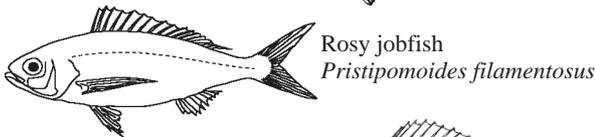
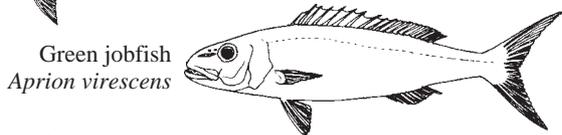
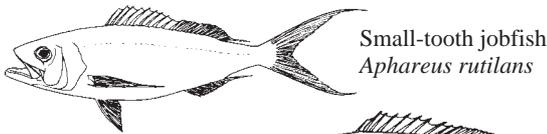
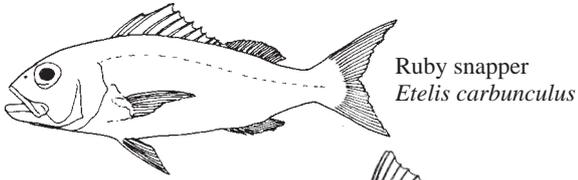
More recently, however, the development of local fish markets is giving renewed opportunities for the development of this resource in many locations. Urban fish markets in the Pacific Islands are becoming increasingly quality-conscious, and deep-bottom fish can command premium prices if properly handled 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.

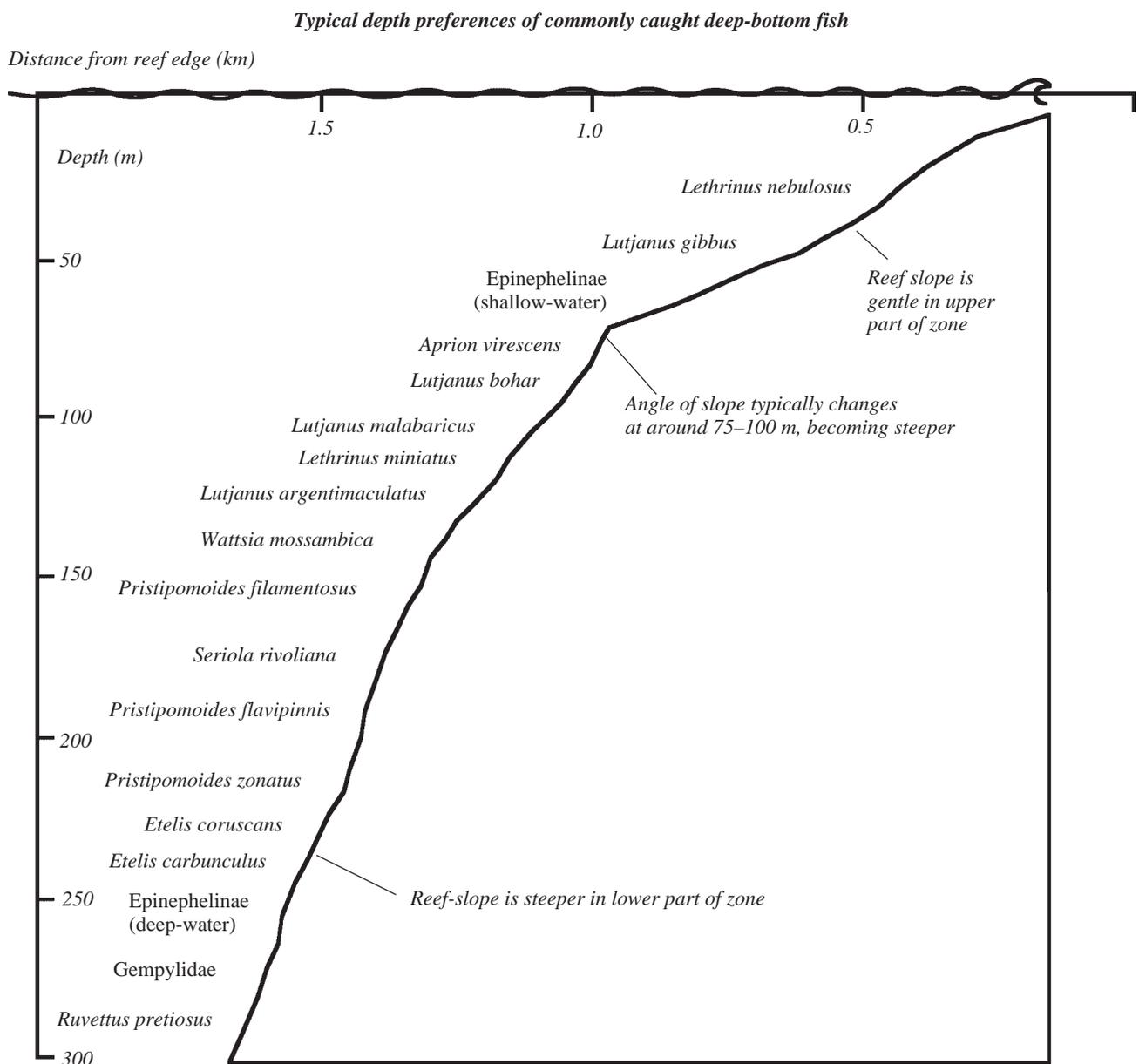


## Fish habitats

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.

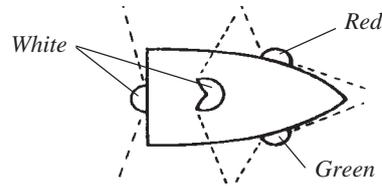
## SECTION 1C: SAFE NAVIGATION

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.

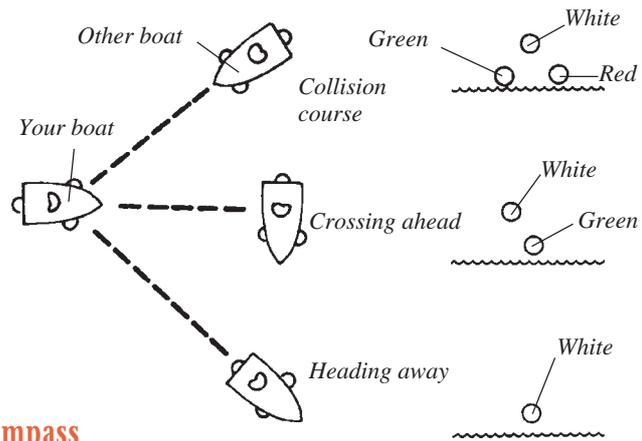
### Rules of the road

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.

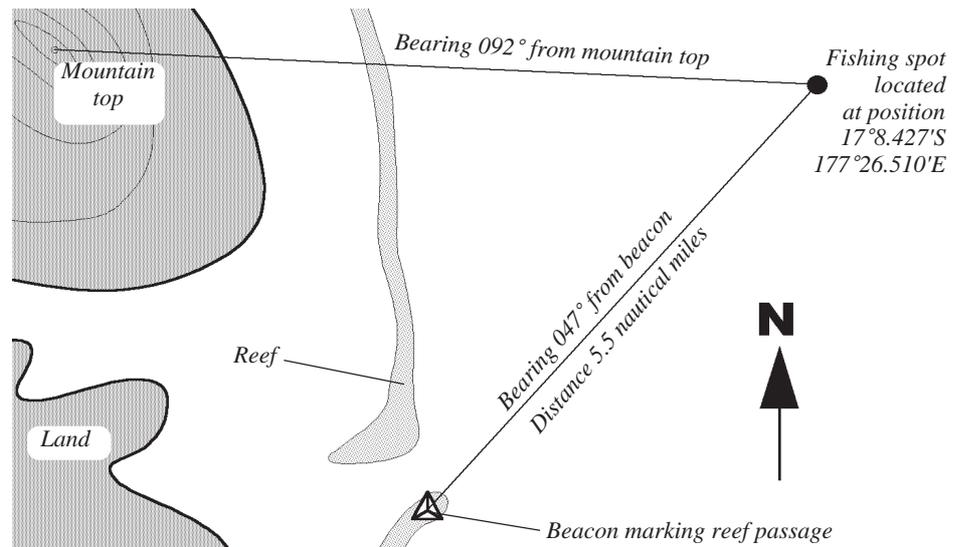
Despite its usefulness, a GPS unit is a supplement for a compass, not a substitute. All electronic devices can develop flat batteries, break down or malfunction, especially if dropped in sea water. In addition, the accuracy of a GPS can be greatly reduced at times when there are few satellites within 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

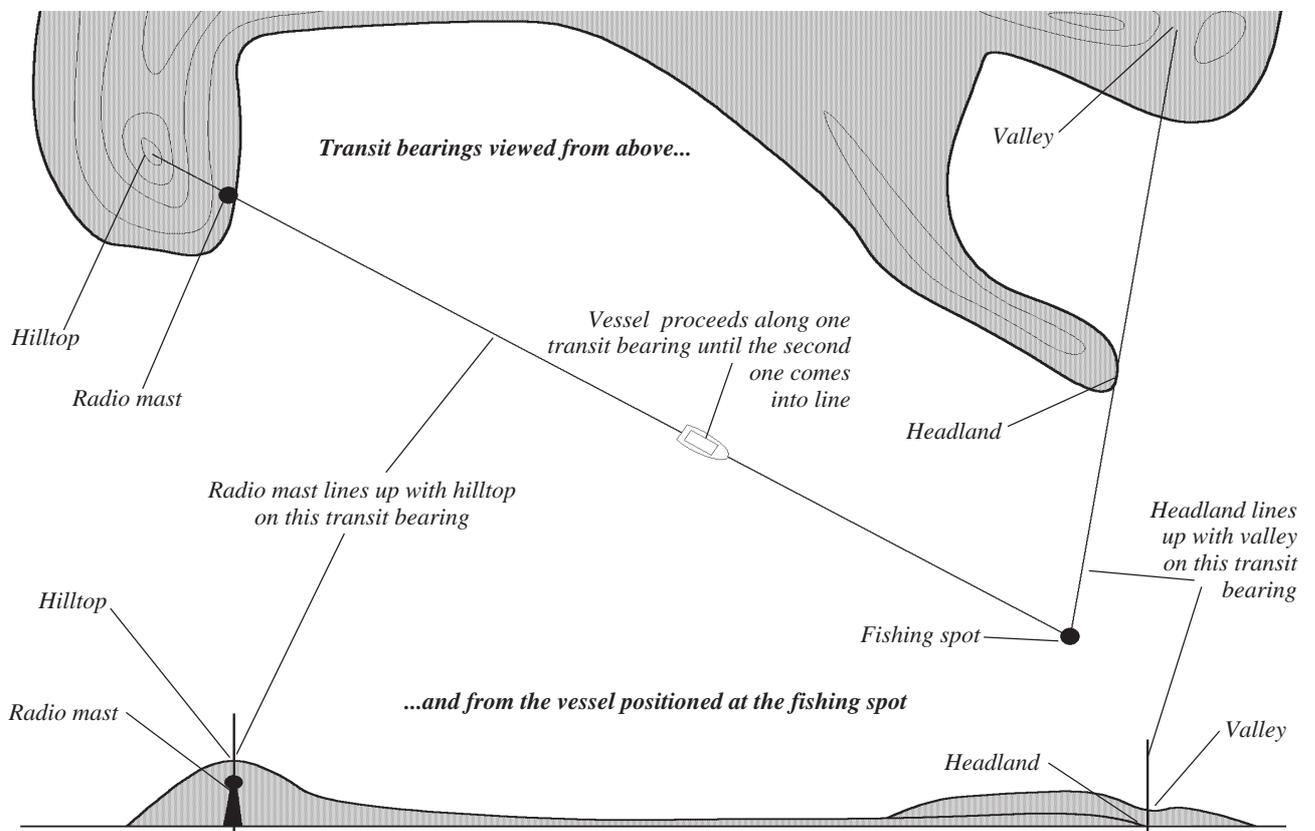
If the coordinates of a good fishing spot are known — for instance if the fisherman has recorded them previously, or been told by a friend — then a compass and marine chart can be used to calculate the bearing and distance of the spot from the fisherman's fishing base. This information can then be used 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.

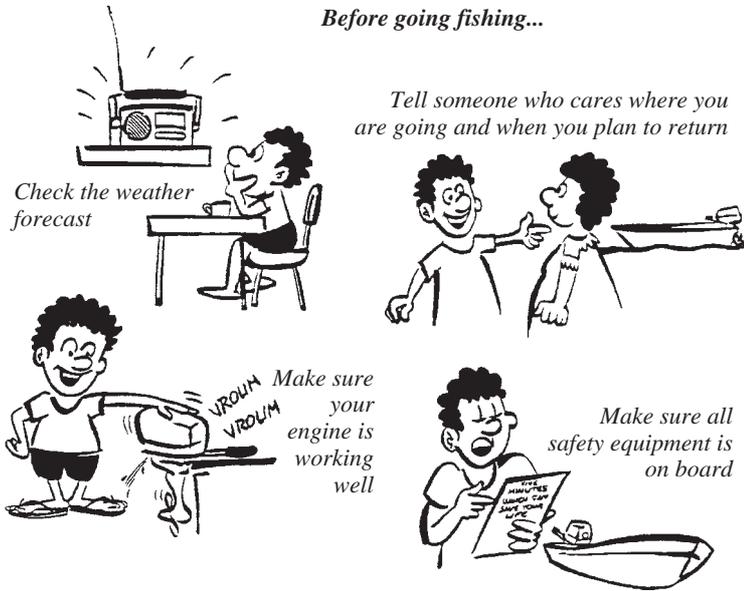


The fisherman should always be able to approach the fishing spot by first lining up one of the transits, and then following the transit line until the landmarks of the second transit are also in alignment.

## 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.

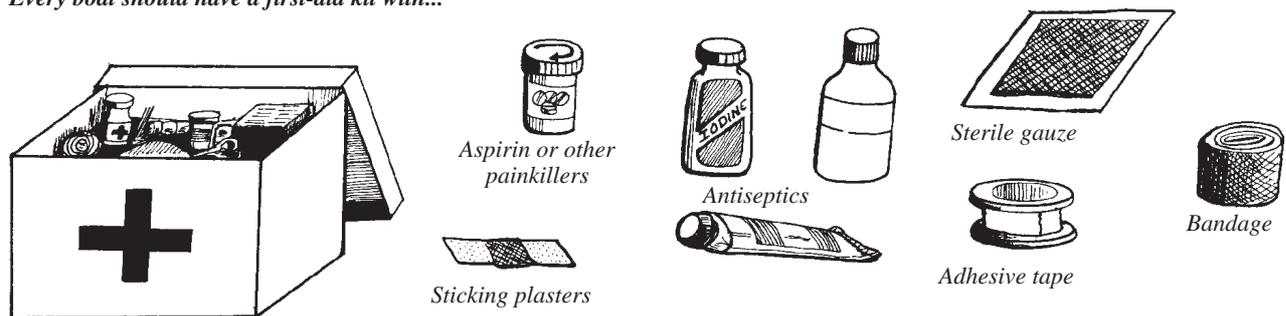
## INJURIES

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.

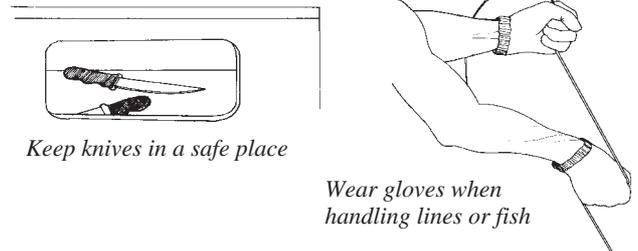
*Every boat should have a first-aid kit with...*



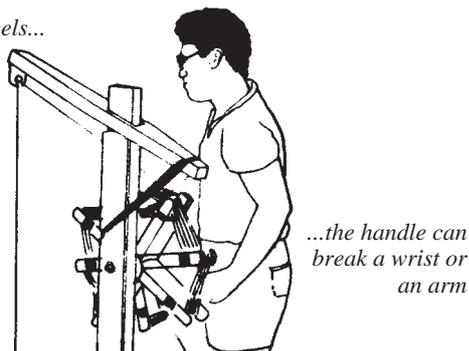
### Avoid accidents

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...*

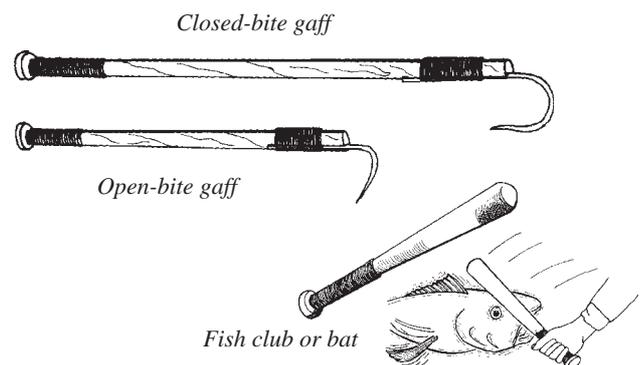


*Watch out for spinning handreels...*



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.





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CHAPTER 2

***FISHING GEAR AND EQUIPMENT***

|    |   |    |
|----|---|----|
| A. | THE STANDARD BOTTOM-FISHING RIG             | 14 |
| B. | LINE MATERIALS                              | 15 |
| C. | HOOKS, SWIVELS AND SINKERS                  | 16 |
| D. | TOOLS AND UTENSILS                          | 18 |
| E. | KNOTS FOR HOOKS AND TACKLE                  | 20 |
| F. | KNOTS FOR JOINING LINES                     | 22 |
| G. | USING LOOPS TO JOIN LINES AND ATTACH TACKLE | 23 |
| H. | END LOOPS IN CABLE                          | 24 |
| I. | TRACE ATTACHMENT POINTS                     | 26 |
| J. | THE ASSEMBLED LINE                          | 27 |
| K. | REELS FOR BOTTOM FISHING                    | 28 |
| L. | BAIT  | 30 |
| M. | CHUM  | 32 |

## SECTION 2A: THE STANDARD BOTTOM-FISHING RIG

Deep-bottom fishing gear can be made from a range of materials, but the basic structure is generally the same:

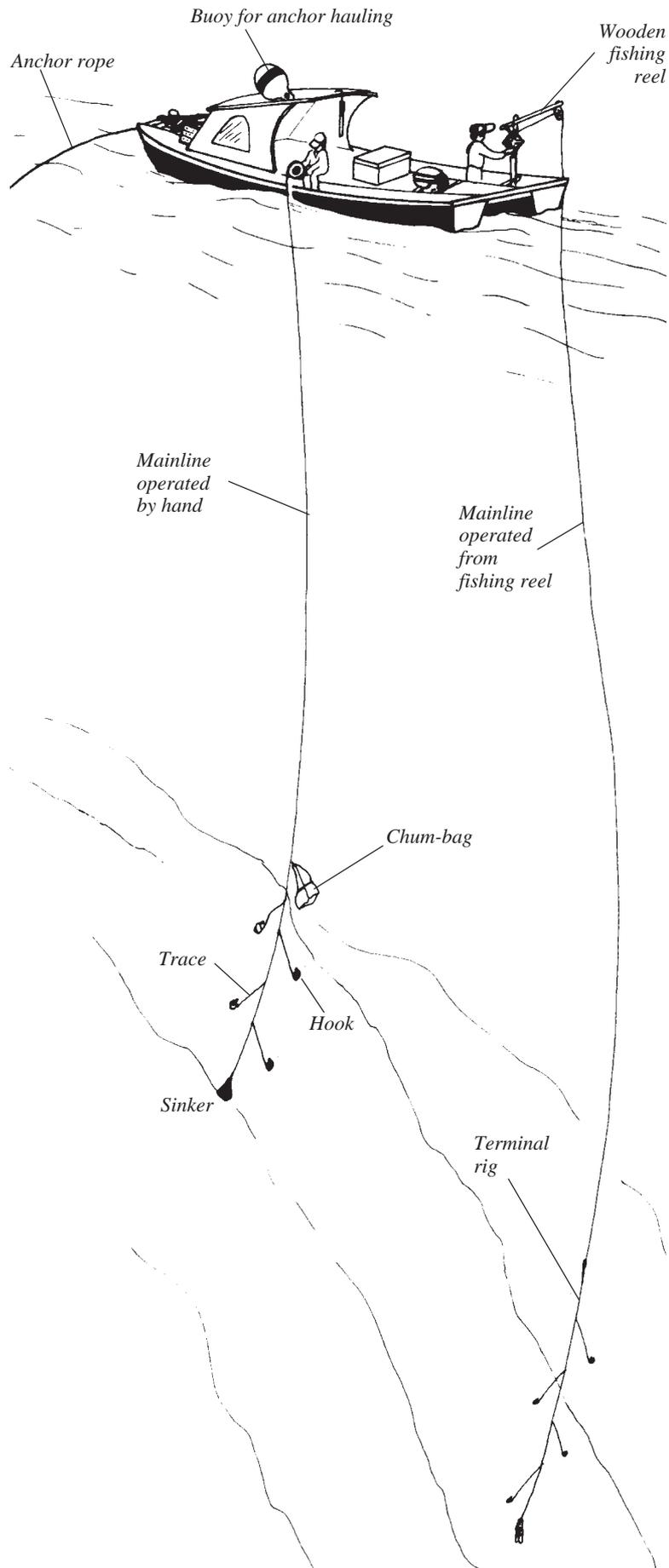
- a **mainline**, several hundred metres long, to lower the hooks to the bottom. For reasons of cost most fishermen use nylon for the mainline, but some prefer a braided line (such as 'Super-Toto'), which stretches less and allows the fisherman to feel the bite more easily.
- a **terminal rig**, usually 2–5 m in length, with attachment points for the mainline, several hooks, and a sinker. The terminal rig may be made of nylon, or steel cable to resist cutting by the sharp teeth of fish or rough rocks and corals on the sea floor. The attachment points may be loops made on the ends of the terminal rig and at intervals along its length, or may be swivels knotted or crimped into the rig.
- several **hooks**, each fixed to a short **trace** which can be connected to or disconnected from the attachment points along the terminal rig. This allows the traces to be changed quickly and easily when damaged or when the size of the fish being caught calls for smaller or larger hooks.
- a heavy **sinker**, 0.5–2 kg in weight depending on the strength of the current, to get the rig down to the bottom quickly.

In some cases, the terminal rig may also carry a **chum-bag** (see section 2M). This is attached to a short trace so that it can be connected to the upper hook attachment point, or to the swivel that connects the terminal rig to the mainline.

Because the fishing grounds are outside the reef, deep-bottom fishing is always carried out from a boat. This may be anything from a small canoe to a large commercial fishing vessel, but in most cases artisanal fishing boats of 6–12 m in length are used. The gear may be fished by hand or using one of the fishing reels described in section 2K.

Chapter 3 provides more information on preparing deep-bottom fishing vessels, while the rest of this chapter focusses on the fishing gear itself.

Bottom fishing from a small (8m) fishing vessel

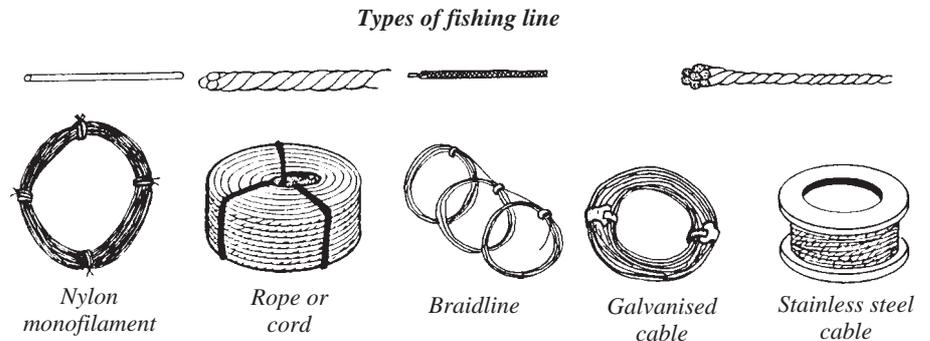


## SECTION 2B: LINE MATERIALS

Various monofilament and multifilament fishing lines are available in a variety of materials, including natural fibres, plastics and other synthetic fibres, and metals. The main types of line are:

- **monofilament**; single filament plastic lines, usually nylon
- **multifilament**; lines made of several or many threads
- **twine, cord** and **rope**: line of increasing weight in which two or three bundles of fibres are twisted together
- **braidline**: line of several filaments woven together; often as a sleeve around a central core of fibres
- **cable** (also called multi-strand wire): metal lines made of several filaments (wires) twisted together

The main types of line used in bottom fishing are nylon monofilament or braided lines such as super-toto, which are used for the mainline. Typical line strengths would be 20–50 kg breaking strain in shallow waters, and 50–100 kg in waters deeper than 100 m. Terminal rigs and traces are generally made of monofilament nylon or steel cable. Single-strand wire is not generally used in deep-bottom fishing, due to the tendency of the fish to spin on the line when hauled in, causing the wire to snap.



### Handling lines

A line is in its natural state when it is laid out straight and under slight tension. At other times, such as when coiled, or faked on deck, careful handling is required to avoid tangles, kinks and knots which will diminish its performance. In particular:

**Don't** allow cable to get twisted, curled or kinked by bad storage and handling. This can easily result in line breakage.

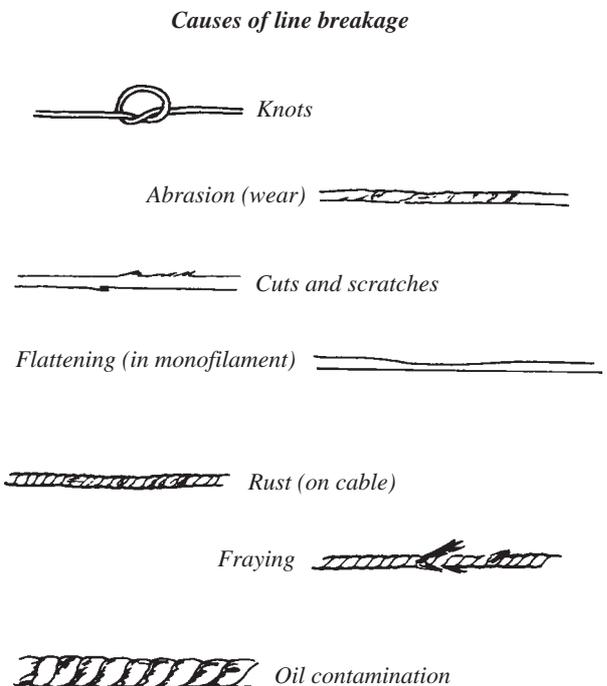
**Don't** allow unnecessary knots to develop in lines. Knots can weaken a line to 50 per cent or less of its original strength. If a line gets knotted, discard it or cut out the knot and rejoin the line. Never pull tangled lines tight if you can avoid it.

**Don't** expose lines unnecessarily to the weather. Sunlight causes deterioration in synthetic lines; water and bacterial growth rot natural fibres; salt water rusts wires and cables. Leave new lines on shore until they are needed.

**Do** check lines regularly for condition. Look for surface abrasions, cuts, flattening of the line, wear, fraying, rusting, knots, and oil contamination. Decide whether the wear point has been significantly weakened. If so, repair or replace it.

**Remember:** a weakened line will break at the time when it is under the greatest strain—with a big fish on the end of it.

Sections 2E–2I provide information on working with various types of ropes, lines and cables and describe the knots and fastenings needed to rig bottom fishing gear.



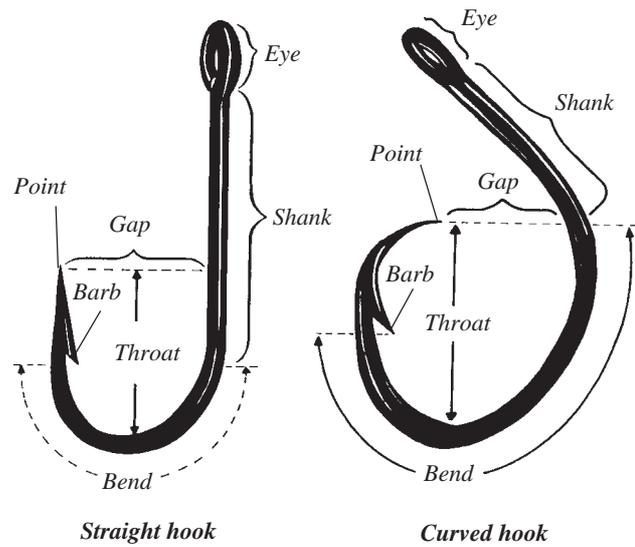
## SECTION 2C: HOOKS, SWIVELS AND SINKERS

### Functions of a hook

The hook has two functions — to catch the fish, and then to retain it until it is safely on board the boat. To catch the fish, the hook has to be of the right shape so that the point will catch in the fish’s mouth, gills or stomach. The point has to be hard enough and sharp enough to penetrate through hard skin and bone. The shank and the bend of the hook have to be solid and strong enough to take the impact of the striking fish, and its struggles to break free, without snapping or straightening.

As well as being strong and sharp, a good hook should be rust-resistant for long life, and smooth, so as not to act as a saw and cut its way out of the fish. Hooks are sold in a wide variety of shapes and sizes. Single, double and even treble hooks are used in various forms of fishing but for deep-bottom fishing the preferred type is a curved single hook.

Parts of a hook

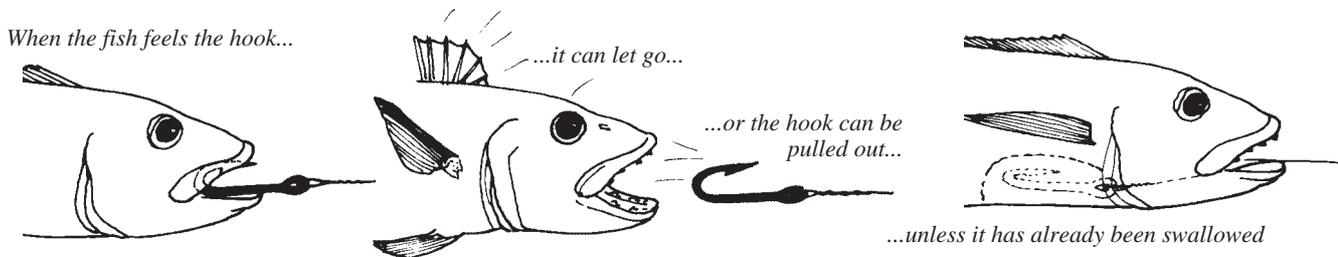


### Hook action

The actions of straight and curved hooks differ as follows:

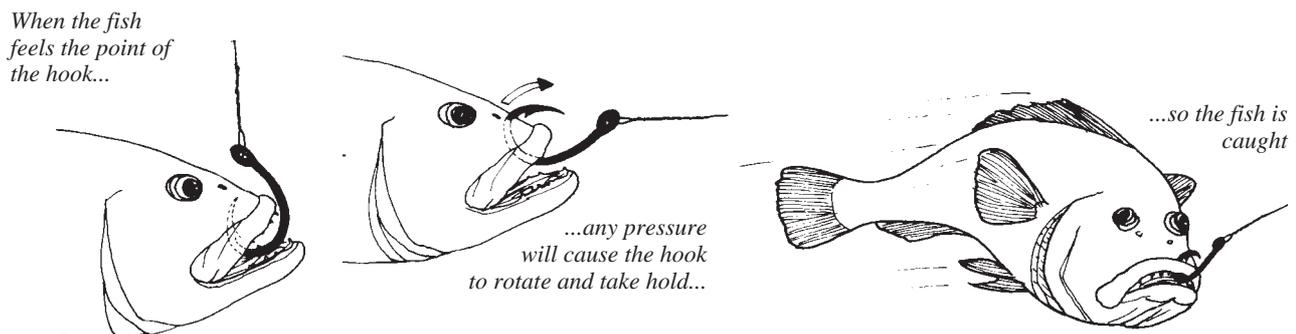
- with a straight hook, if the fish feels the point and pulls back, the hook will often pull out. Straight hooks are good for the types of fishing in which the bait is moving, such as trolling, or styles of fishing in which the fisherman can strike and deliberately hook the fish, such as rod-fishing or shallow-water handlining. In deep-bottom fishing, however, it is hard to strike effectively, so unless the fish actually swallows the bait, it may not be caught on a straight hook.

Action of a straight hook



- with a curved hook, if the fish feels the point and pulls back, the hook will rotate and catch around the corner of the mouth. The hook is essentially ‘self-hooking’, which is advantageous for fishing in deep water, where it is hard to feel the bite, and where the length and elasticity of the line make it difficult to strike quickly.

Action of a curved hook



## Hook types

There are various kinds of curved or circle-type hooks, as shown below. The type most commonly used is the Mustad Tuna Circle Hook, in sizes ranging from 9 (small) to 4 (large). Other kinds include Gamakatsu, Eagle Claw, O'Shaughnessy, BKN, Tankichi and Wide-gap hooks.

### Curved hooks

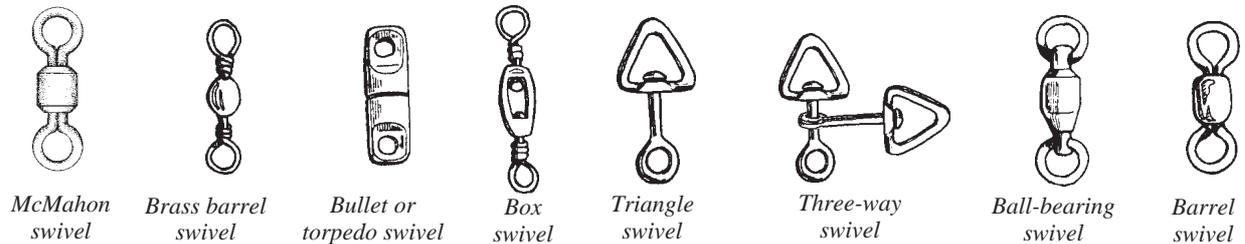


The main disadvantages of curved hooks are the relatively high cost, and the fact that they are more difficult to bait than straight hooks. However their advantages in terms of number of hook-ups make curved hooks highly preferable for this kind of fishing.

## Swivels

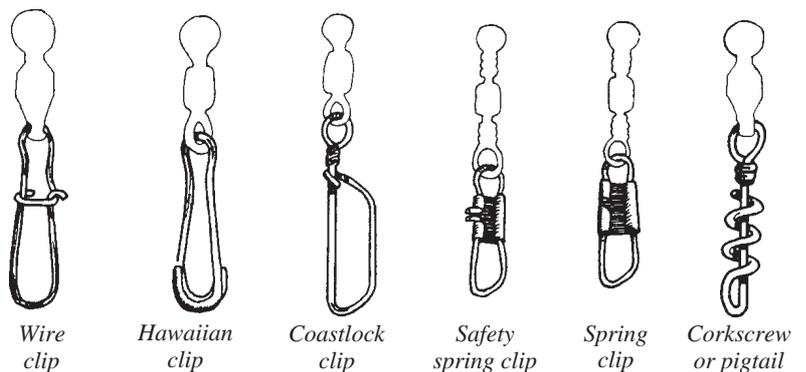
A swivel is normally incorporated into the deep-bottom fishing gear between the mainline and the terminal rig. The swivel helps stop the mainline becoming twisted during use. This is a particular problem when hauling a line on which one or more fish has been caught. The movement or angle of the fish can cause the line to twist considerably, especially if the fish is a grouper coming up with its mouth wide open. If fishing with a chum-bag, the line may twist on the way down, too. A swivel is thus an essential part of the deep-bottom fishing line. The most widely available are barrel swivels, and bullet or torpedo swivels.

### Types of swivel

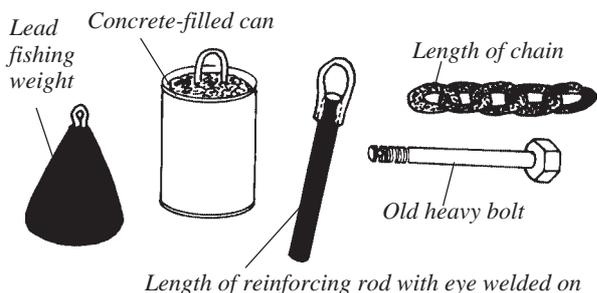


### Types of snap clip

Some swivels come with snaps, clips or other 'easy-fix' devices which allow rapid changing of terminal rigs. The strongest types of snap clip are the pig-tail and the coastlock clip. Many snap clips are lightweight and often much weaker than the rest of the swivel, which causes them to break or open under the weight of a struggling fish.



### Sinkers



## Sinkers

Any dense, heavy item weighing 0.5–2 kg and with an attachment point can be used as a deep-bottom fishing sinker. Sinkers often break off during fishing, so cheap throwaway items are the best. These include welded lengths of heavy steel reinforcing rod, lengths of heavy chain, and concrete-filled cans.

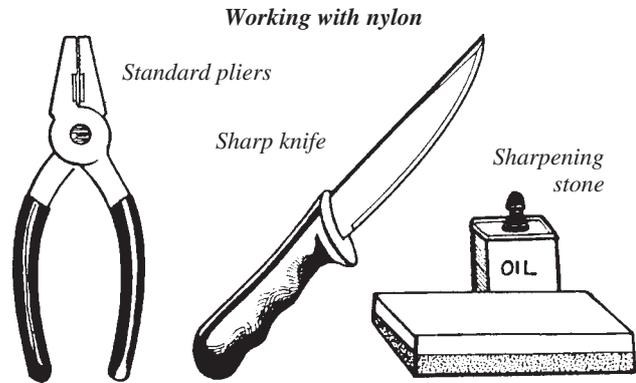
## SECTION 2D: TOOLS AND UTENSILS

Most of the preparation for deep-bottom fishing is normally done on shore before the fishing trip starts. This makes gear rigging easier and more comfortable, prevents new materials being contaminated with salt water before they are used, and avoids wasting time at sea. Gear rigging is time consuming, and mastering some of the techniques, particularly when working with wires, requires plenty of patience. However, gear rigging principles are easily learned, and will develop with practice.

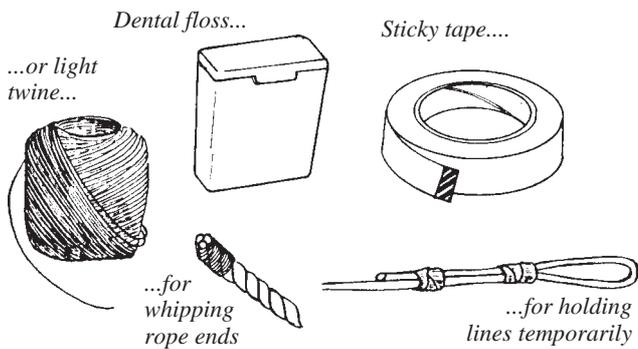
The most important thing about gear rigging is to have on hand the right tools and materials for the job. The tools needed will vary depending on the materials being used, but are mostly general-purpose items available through hardware or other retail stores.

### Working with nylon

When working with nylon monofilament, only basic tools are needed. These include a pair of standard pliers, a good knife and a sharpening stone (oilstone or whetstone). Knives should be sharpened regularly.



### General rope work

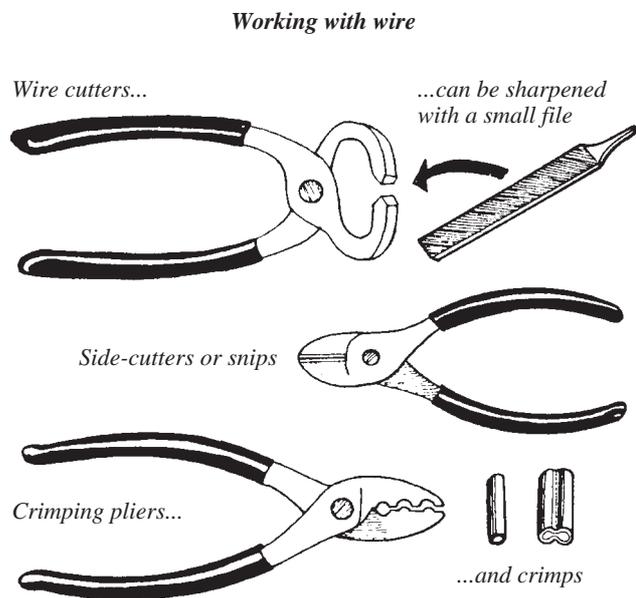


### General rope work

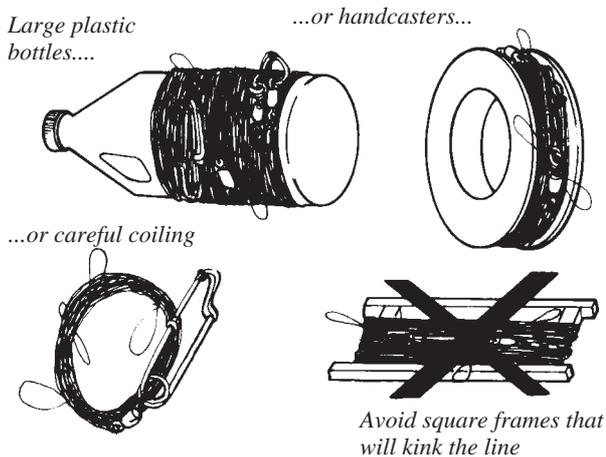
For general work with ropes and lines, it is useful to have on hand adhesive tape, light string or twine, and, if available, waxed dental floss. These are used for whipping rope ends, temporarily attaching or holding line, and more.

### Working with wire

If using wire, a pair of wire cutters or snips will also be needed. Cutters are preferred as these can be sharpened using a small file. For some types of cable, crimping pliers and crimps or sleeves of the correct size may also be needed.



### Storage of lines and terminal rigs



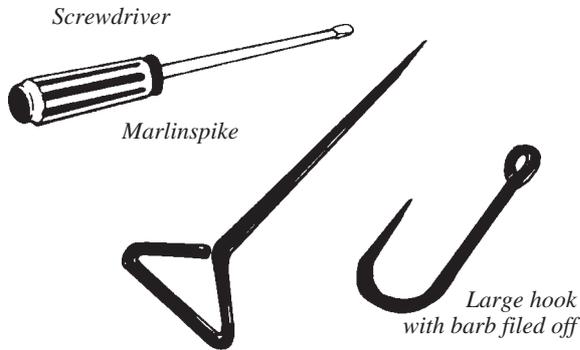
### Storage of lines and terminal rigs

For the storage of completed lines and terminal rigs, plastic or wooden handcasters are useful and can be improvised if not readily available. The diameter should be at least 20 cm — large enough to ensure that lines do not kink or bend. Rectangular wooden-framed line holders should not be used, as these tend to kink the lines, especially when used with wire.

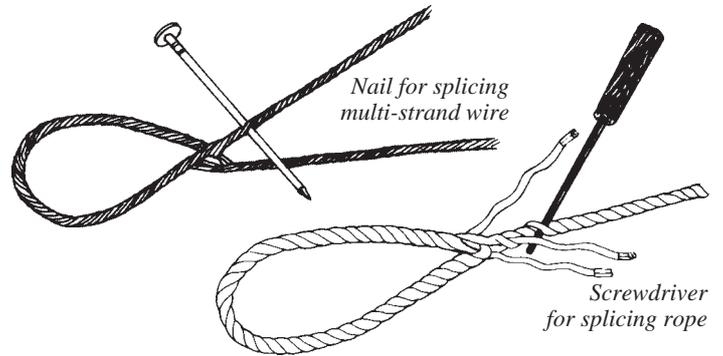
## Splicing

In some cases it may be necessary to splice ropes or cables. For this, a tool is needed to spread the lay of the standing part so that the end of the free strand can be passed between. This can be done using a fid or marlinspike made for the purpose. Alternatively, the job can be done using a screwdriver, a nail, or even a fish-hook with the barb filed off.

Various tools can be used...



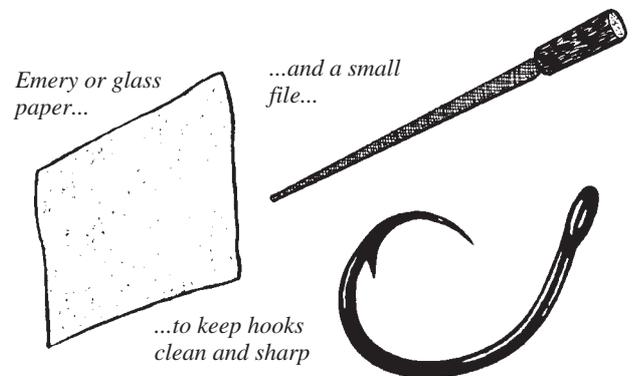
...for splicing multi-strand wire and rope



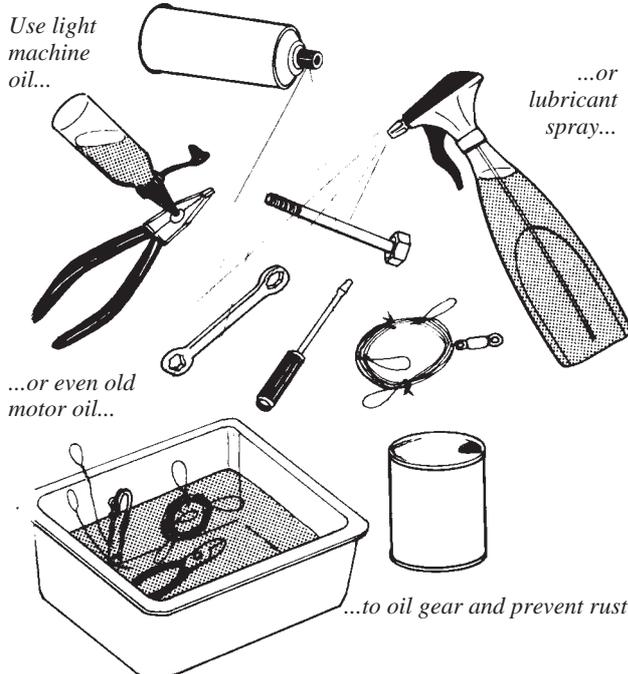
## Hook sharpening

For cleaning and sharpening hooks, emery or glass paper and a small flat or three-cornered file are required (see section 5D).

Hook sharpening



Rust prevention

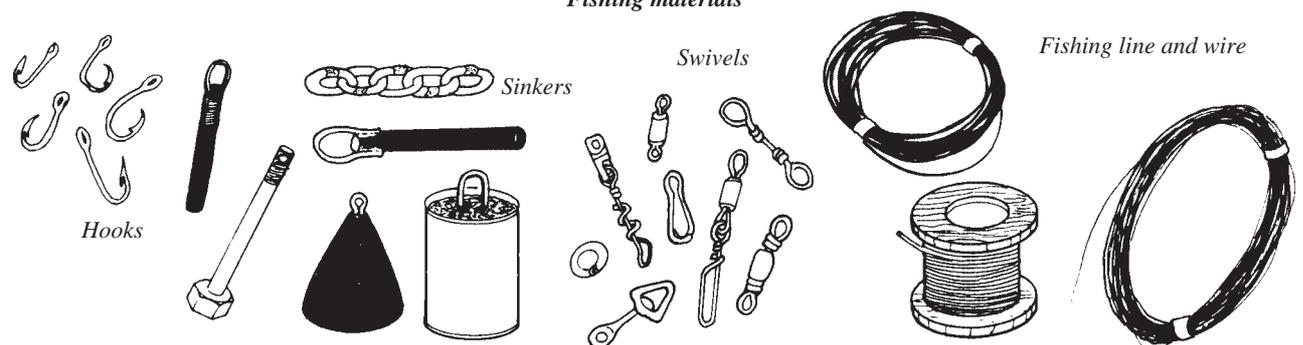


## Rust prevention

To keep all metallic gear — e.g. hooks, wire, cable — and tools in good condition, wipe or wash off any salt water after use and oil well. Use ordinary motor oil or spray-on water repellent lubricant (e.g. CRC, WD-40). Reject oil drained from motor engines is perfectly okay.

In addition to tools, fishing tackle and materials will also be needed, as already shown in sections 2B and 2C. Methods for making up the fishing gear are described in the next few sections of this chapter

Fishing materials



## SECTION 2E: KNOTS FOR HOOKS AND TACKLE

Nylon monofilament fishing line is slippery and does not grip well when tied. Many knots will come undone under tension, even if they appear secure when tied. Some knots which will hold, and which can be used for attaching tackle to monofilament lines, are shown below.

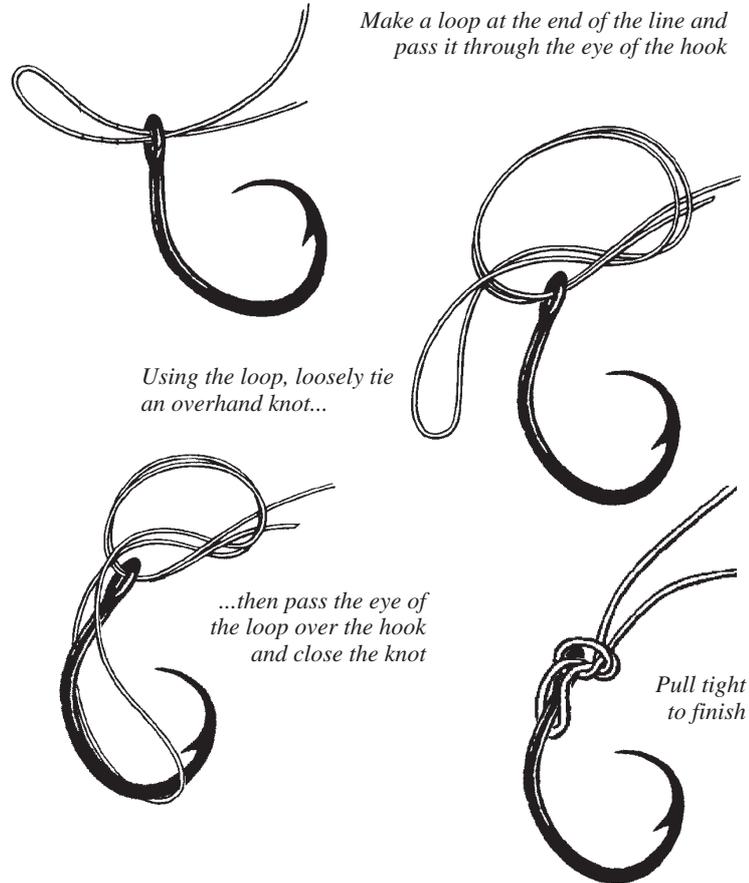
### Palomar knot

The palomar knot is popular among Hawaiian fishermen, who claim it is easier to tie and less likely to slip than other knots.

To tie the palomar knot:

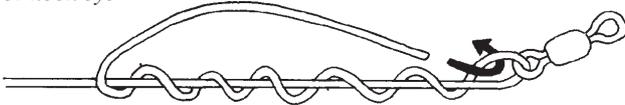
- double the end of the line over in a loop;
- pass the loop through the eye of the hook or swivel and tie it loosely in an ordinary overhand knot;
- pass the eye of the loop over the body of the hook or swivel;
- pull gently on the standing part of the line and the tag end together to close the knot;
- tighten it up by pulling hard on the mainline;
- cut off the tag end close to the knot.

### Palomar knot

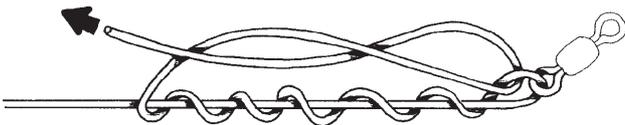


### Clinch knot

Thread the end of the line through the swivel or hook eye



Put 4 or 5 twists in the line, then pass the tag end through the loop created...



...then bring the tag end back through the second loop



### Clinch knot

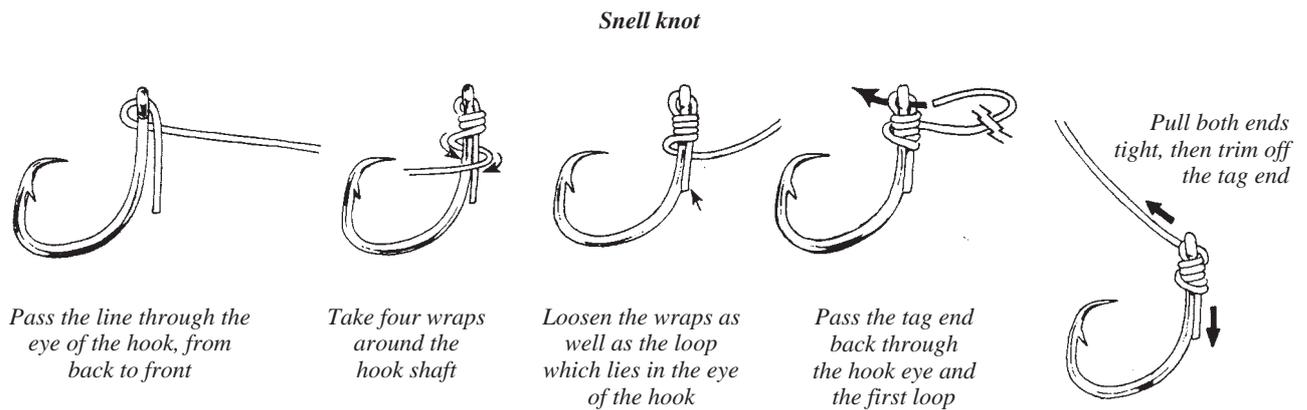
This is a good knot for light monofilament. To make it:

- pass the end of the line through the eye of the hook or swivel and double it back;
- rotate the hook or swivel four or five times, twisting the tag end around the standing part. (Lubricate the lines with saliva to make it slip more easily);
- pass the tag end back through the loop at the end of the twist and pull gently so that the knot starts to close up;
- pass the tag end back under itself;
- hold the hook or swivel with pliers and pull hard on the mainline so that the knot pulls tight.

Pull the tag end tight and cut off close to the knot, then flatten it with pliers or your teeth so that it cannot slip or be pushed back through.

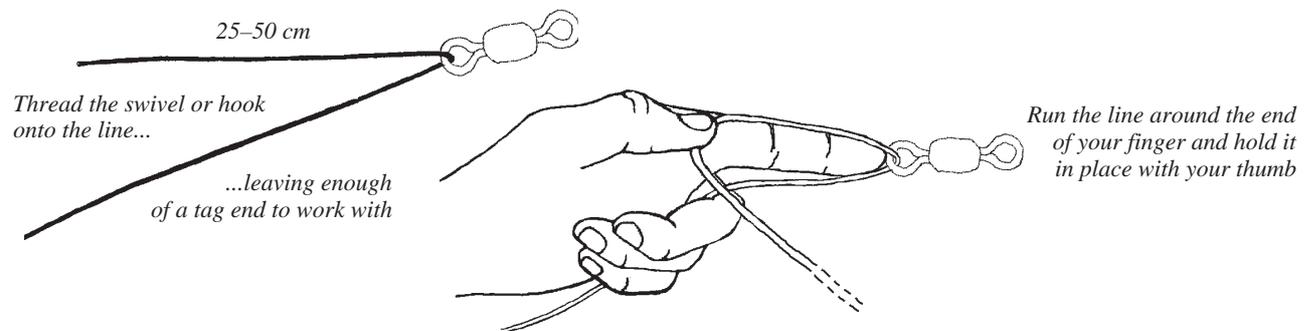
## Snell knot

This is a quick and reliable way to attach hooks using monofilament. The knot is made as shown in the diagram.



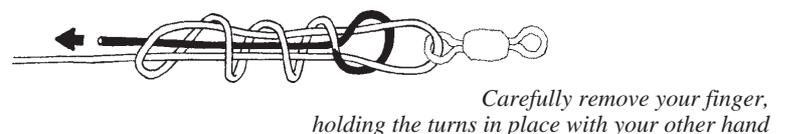
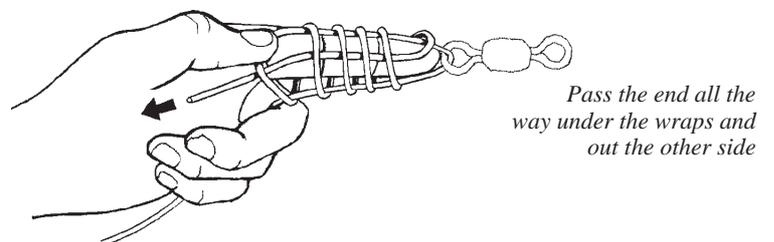
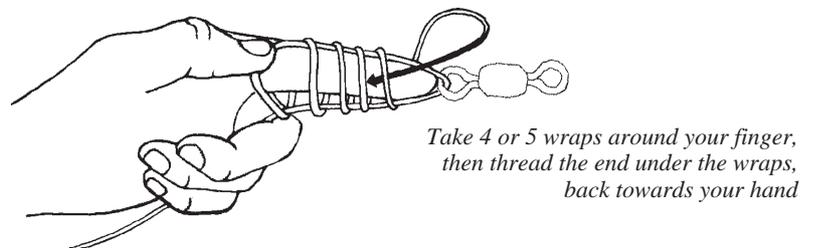
## Slip knot

As well as being good for heavy monofilament, this knot can also be used for braided lines like super-toto, dacron, etc., whose rough surface prevents slipping and makes the clinch knot (above) hard to pull tight.



To make the slip knot:

- thread the line through the eye of the hook or swivel, leaving about 25–30 cm of line to work with;
- run the line down the inside of your forefinger, around your fingertip, and up the back of the finger, leaving the hook eye pulled against the fingertip;
- take four or five loose turns with the tag end around the finger, working back towards the fingertip;
- pass the tag end back along the finger inside the loose turns;
- remove the finger, holding the turns in place with the other hand, and pull gently on the tag end.



This will tighten the knot around the main line, leaving a long loop which can be pulled tight by holding the hook with pliers and pulling hard on the mainline.



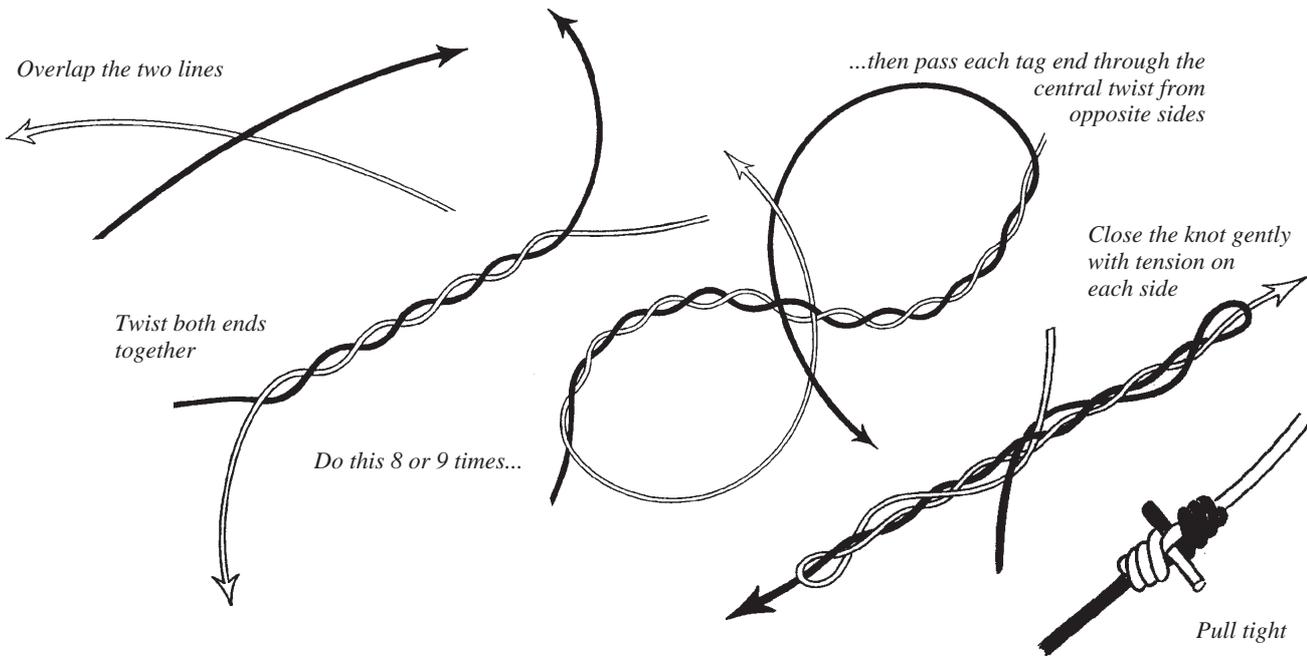
Pull tight

## SECTION 2F: KNOTS FOR JOINING LINES

Fishing is often carried out using monofilament or other light lines which cannot be spliced and which may slip unless special knots are used. All knots will weaken a line, sometimes reducing its breaking strain by more than half. The two knots shown below are recommended as being the strongest methods for joining monofilament and other fishing lines, and least likely to slip.

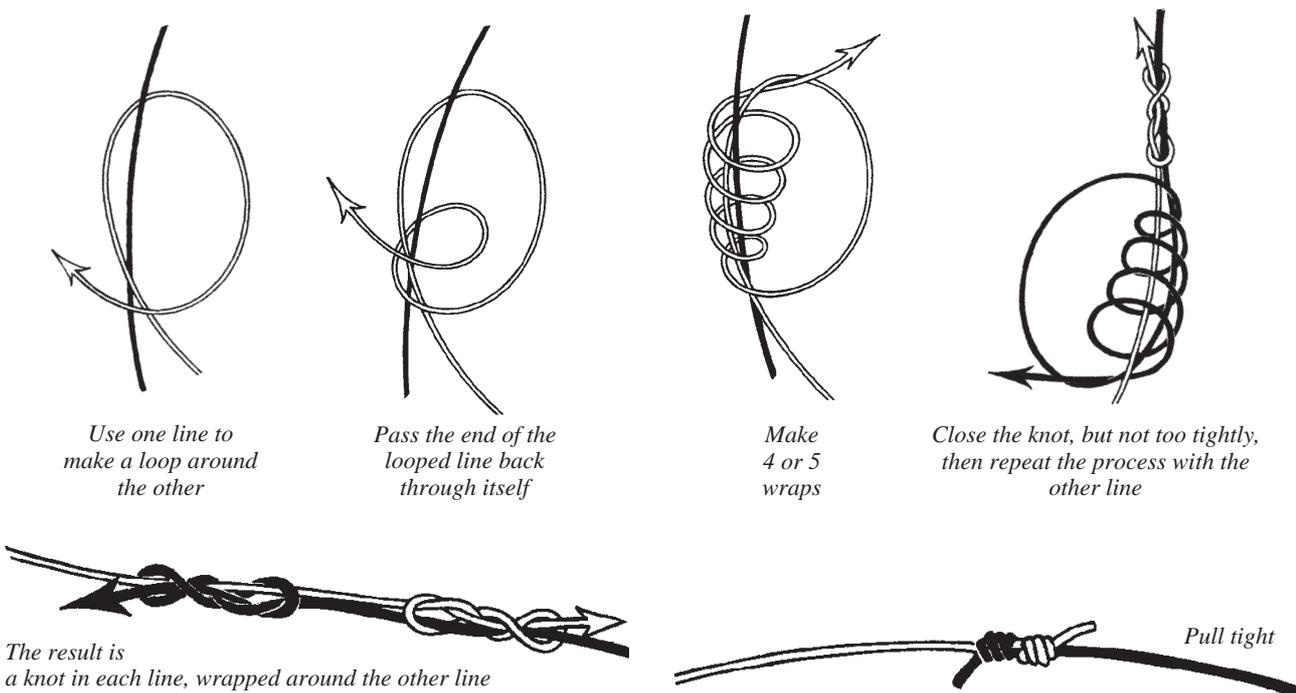
### Blood knot

This is suitable for joining monofilament and similar lines.



### Double slip knot

Suitable for heavier lines or those which have a rough surface and do not slip easily.



## SECTION 2G: USING LOOPS TO JOIN LINES AND ATTACH TACKLE

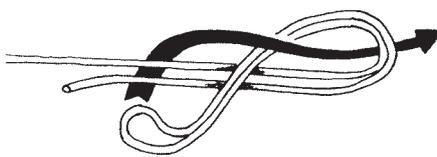
Loops made at the end of a piece of line or at intervals along its length can serve as attachment points for other lines or for items of fishing tackle. The terminal rigs illustrated in section 2J are connected to the mainline via an end loop, while the traces that carry the hooks are attached to loops along the length of the rig. Knowing how to make strong loops in a variety of line materials is thus essential for making up deep-bottom fishing gear, and is illustrated in the next few sections of the present chapter. This section shows how to make and use end loops in nylon and other light lines. Sections 2H and 2I show how to make end loops in cable, as well as the harness knot used to make trace attachment points in both nylon and cable.

### Double figure-eight knot

This knot is the most useful for making end loops in all types of line and will hold well even in nylon monofilament.

*Double figure-8 knot*

*Double end of line over...*



*...pass doubled end around standing part of line...*

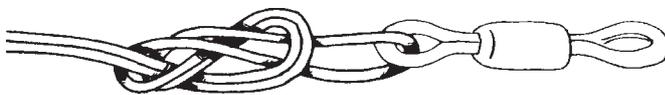


*...and back through loop*

### Using end loops

Hooks and swivels can be simply attached to monofilament line by threading onto the line before making the loop. Alternatively, they can be attached by passing the completed loop through the hook or swivel eye, and then around the body. This enables tackle to be disconnected and changed easily.

*Attaching tackle using end loops*



*Thread the line through the eye of the hook or swivel before making the loop*

*Alternatively, thread the loop through the eye of the hook or swivel...*



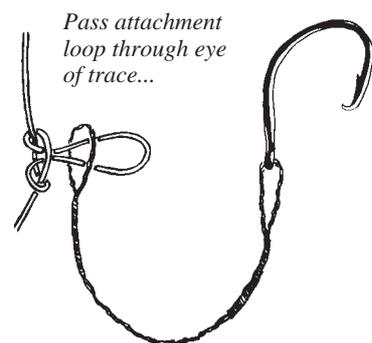
*...and pull tight, making sure the line falls into the right position.*

*No good. The line may interfere with the action of the swivel*

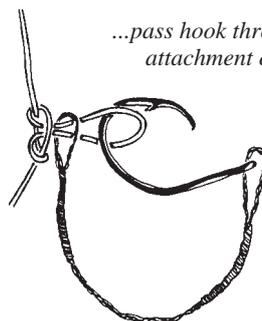


Lines can also be joined together using loops. End loops are made on the ends of each of the lines to be joined, and one loop is passed through the other in the manner shown below. This method is mostly useful for joining lines when one of them is fairly short, and is used in deep-bottom fishing to attach traces to the terminal rig.

*Joining lines with loops*



*Pass attachment loop through eye of trace...*



*...pass hook through attachment eye...*



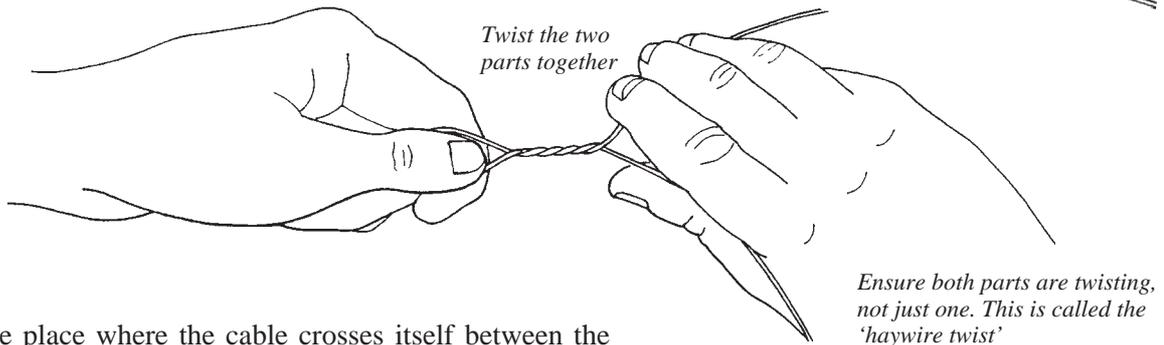
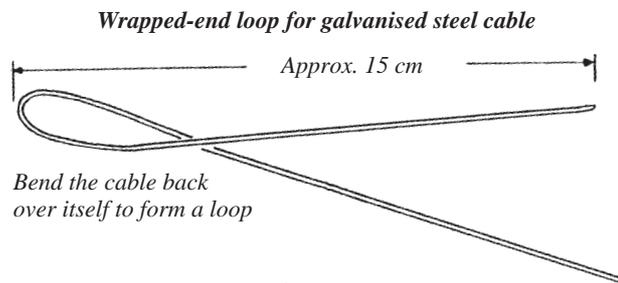
*...and pull tight*

## SECTION 2H: END LOOPS IN CABLE

Some types of cable, such as 9-strand Turimoto galvanised longline wire, can be wrapped to form end loops. Turimoto cable is made up of three major strands, each of which consists of three minor strands, so there are nine individual wires in the body of the cable. Making end loops involves separating the major strands so that they can be wrapped around the standing part of the cable.

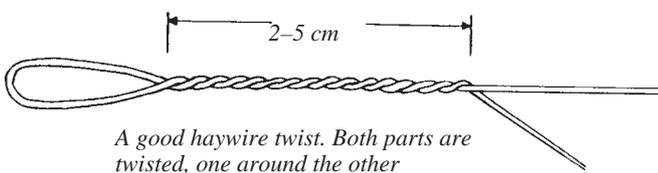
The best way to make an end loop in galvanised cable is to begin with a haywire twist, followed by individual wrapping of each major strand, as shown below.

- 1 Make a bend in the cable to form an eye or loop. Make sure you leave enough of a tag end to work with (15 cm or so).



- 2 Hold the place where the cable crosses itself between the fingers and thumb of one hand, with one strand on each side of the hand to keep them separate. Grip the eye with the forefinger and thumbs of the other hand, or with pliers if necessary. Using both hands, twist the cable strands together.

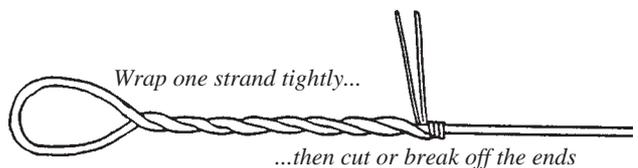
Ensure that the two strands are truly twisting, rather than one staying straight and the other wrapping around it. Continue until the twist is 2–5 cm long. This is called a haywire twist.



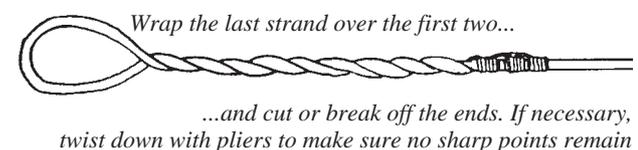
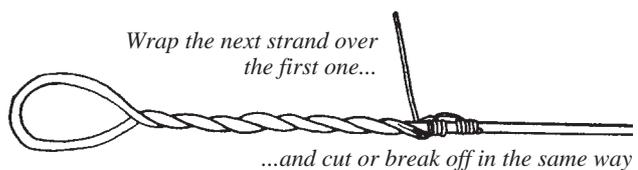
- 3 Separate the cable so that the three major strands can be handled individually. Wrap one major strand tightly three or four times around the main strand, and cut or break off its minor strands flush with the standing part of the wire.



- 4 Take the second major strand and repeat the process, wrapping it tightly around the standing part of the wire and covering up the ends of the first wrap. Cut or break off the excess.



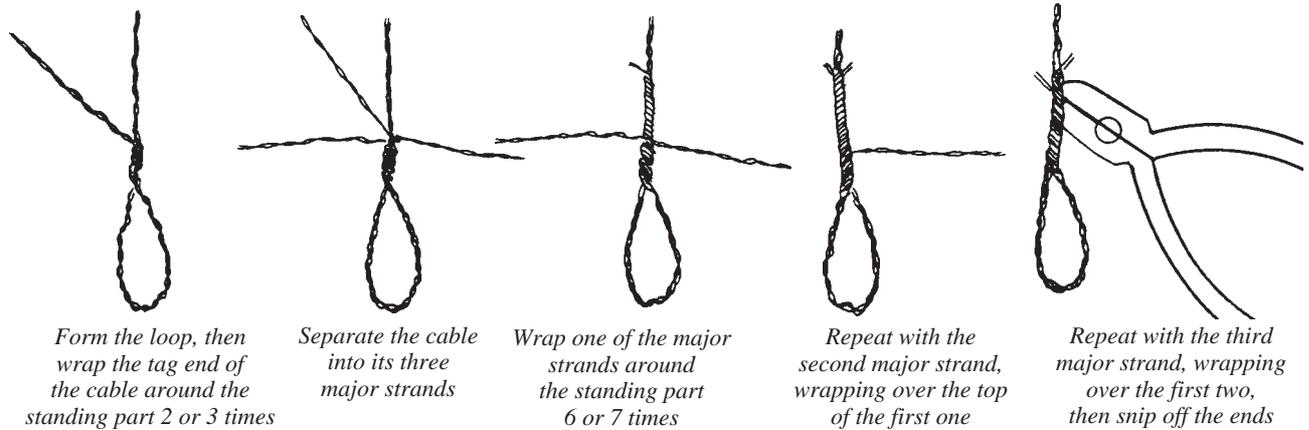
- 5 Finally repeat the procedure with the last major strand, covering up the ends of the second. The finished product should have a regular shape and no sharp ends sticking out. If sharp ends protrude at any point during the wrapping procedure, twist them down with a pair of pliers.



## Simplified wrapped-end loop

An alternative way to make end loops in galvanised cable, which is quicker but less strong, is shown below.

### Wrapping a simple end loop in galvanised steel cable



## Flemish Eye

To strengthen an end loop in cable, and reduce the likelihood of it untwisting, you can make a 'Flemish eye'. To do this, tie an ordinary overhand knot in the cable, pulling the knot tight until the eye is about the size you want it. Pass the tag end back through the knot once more and start wrapping as above. The finished product is a stronger and more rigid end loop.

To make the Flemish eye...

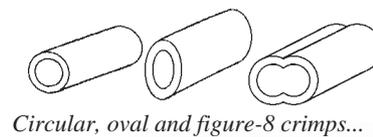


...tie a double overhand knot in the cable before completing the loop

## Crimps

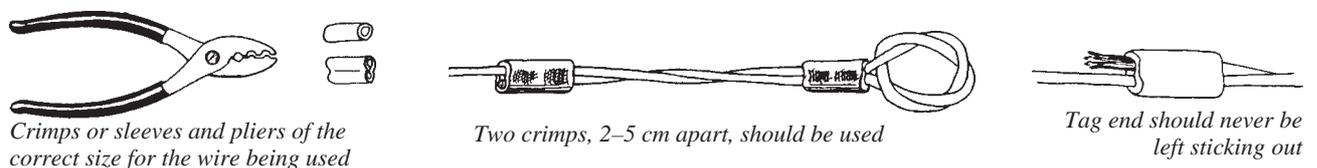
Seven-strand and 49-strand stainless steel cable and similar products cannot be reliably wrapped or knotted and must be crimped using metal sleeves and crimping pliers. Crimps (also called sleeves or swages) can also be used to join monofilament lines together, or to attach hooks and swivels to monofilament and other fishing lines. Crimps are tubular lengths of brass, aluminium, or other suitable metal which are slid over the line and then pressed onto it using a special crimping tool. The crimp may be circular, oval or figure-8 shaped in cross-section, and when squeezed shut, grips hard on the line to prevent it from slipping.

### Using crimps



When using crimps to make end loops in cable, it is best to use two sleeves and ensure that they are the right size for the cable. Slide the sleeves onto the cable and then tie a Flemish eye as shown above. Pass the tag end through the first sleeve, push the sleeve hard against the Flemish eye, and crimp it tightly shut using the pliers. Wrap the tag end slightly around the main strand and crimp the other sleeve over the end, making sure the two strands are tight together and the end does not stick out.

### Crimping end loops

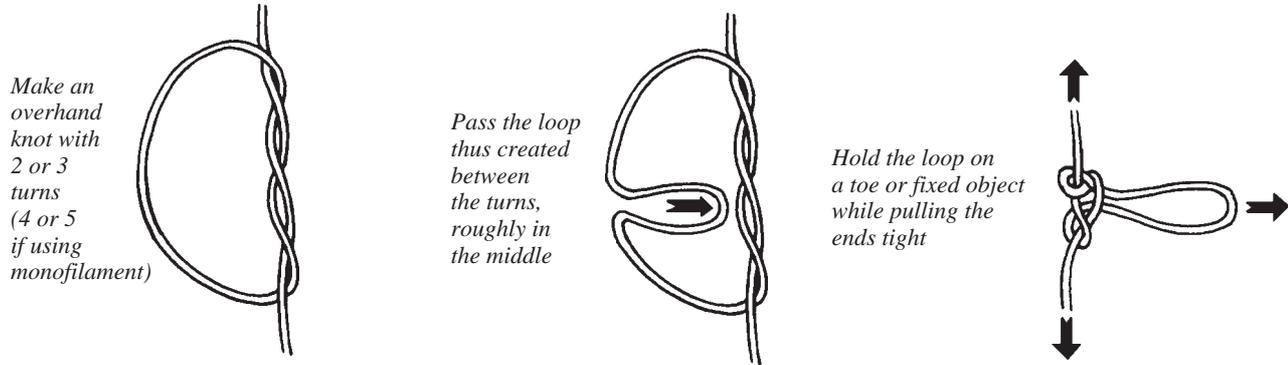


## SECTION 2I: TRACE ATTACHMENT POINTS

There are several ways of making loops along the length of a terminal rig. These are used as attachment points for the short traces that carry the hooks.

### Artillery loop knot

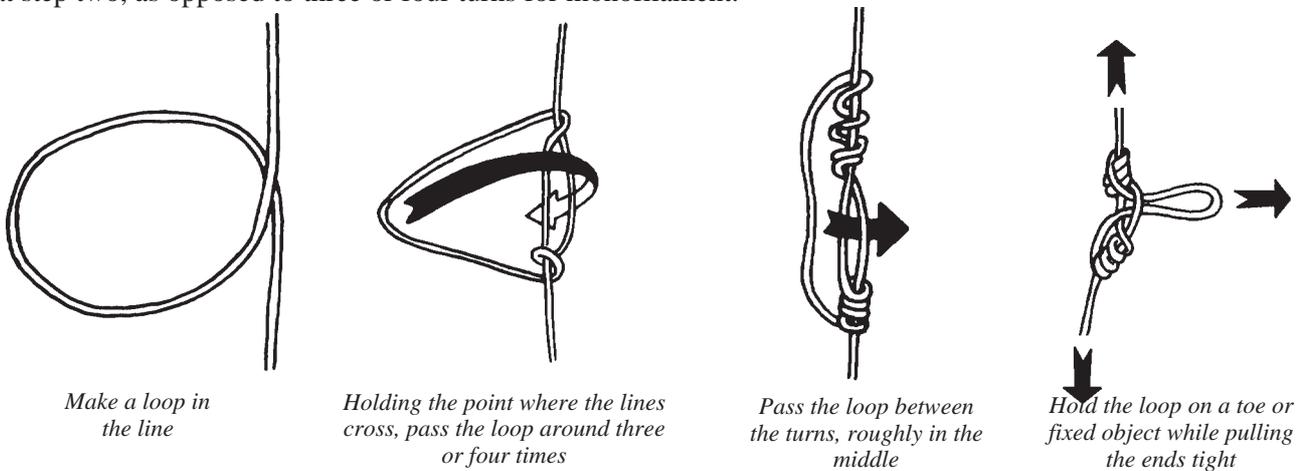
This is used to make attachment loops along a length of Turimoto multi-strand galvanised steel longline wire, or other types of cable. It can only be done in a fairly short length of line (say, 3–4 m maximum) because it requires an overhand knot to be made in the line, and this is impractical with very long lines.



The artillery loop knot can also be used to make loops in a length of nylon monofilament. If using monofilament, however, a few extra turns should be taken in the initial overhand knot to prevent the loop from slipping under a heavy load.

### Harness knot

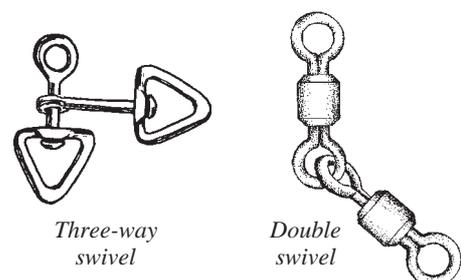
This knot can be used for both cable or, more often, monofilament. If using cable, only a single turn is needed at step two, as opposed to three or four turns for monofilament.



The harness knot is useful for making loops in long pieces of line, where it may not be practical to make overhand knots as required when using the artillery loop knot.

### Three-way swivels

As an alternative to loop, three way swivels (or double swivels) can be fixed into the terminal rig at appropriate point along its length. Three-way swivels allow the trace to rotate, which is helpful in deep-bottom fishing, as many deep-bottom fish will spin on the line as they are hauled. If there is no swivel, this can cause the trace and terminal rig to become twisted or, occasionally, to break. Nevertheless, three-way swivels are not widely available, and where they are they may be expensive. They are thus not widely used in deep-bottom fishing.

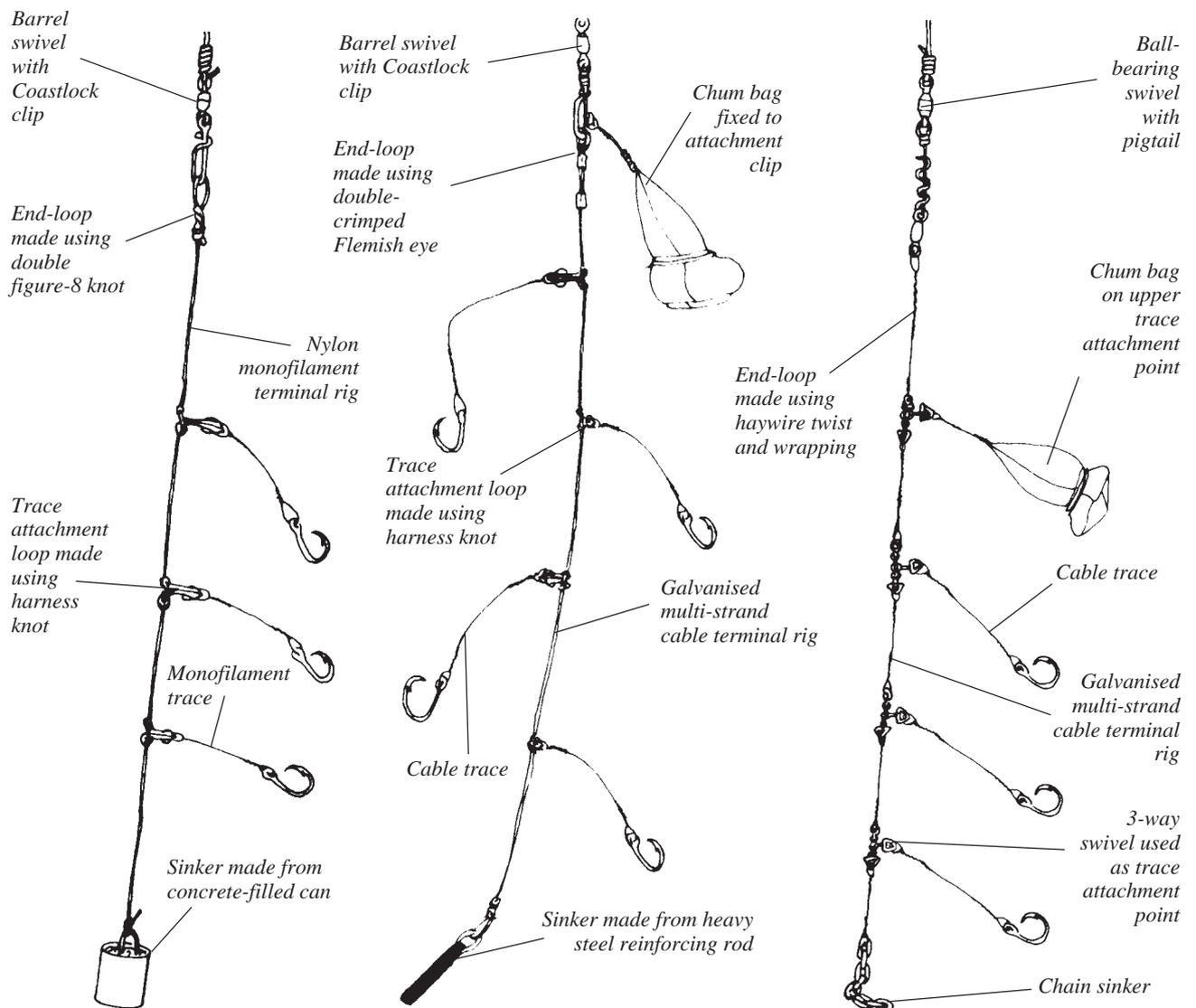


## SECTION 2J: THE ASSEMBLED LINE

The completed deep-bottom fishing line is made up of two main parts:

- the **mainline** makes up most of the length of the line and is used to get the hooks to the bottom. Nylon monofilament of 100 kg to 300 kg breaking strain is the usual material, but braidline or other types of line can also be used. Stainless steel cable has also been experimented with but the weight of the cable in the water makes it hard for the fisherman to tell when the sinker hits bottom. Line length depends on the fishing depth, but normally should be at least 500 m.
- the **terminal rig** carries the baited hooks and sinker and, in some cases, a chum-bag. It may be made of nylon, in which case it is usually of lower breaking strain than the mainline. Alternatively, steel cable may be used, the most popular material being Turimoto 9-strand galvanised steel longline cable. An end-loop is made at the top for connection to the mainline, and at the bottom for the sinker. Several attachment points for traces are spaced along the rig's length, made using one of the knots shown in section 2I, or using three-way swivels.

*Different terminal rig arrangements*

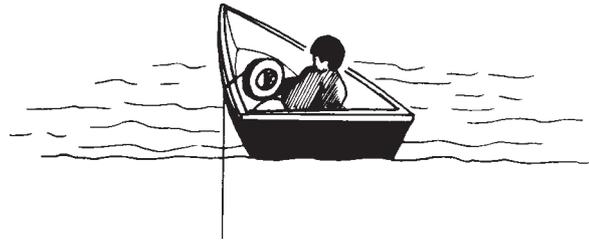


In assembling the terminal rig, many fishermen prefer to put larger hooks at the top of the rig, and progressively smaller ones lower down. In many fishing situations more smaller fish are taken close to the bottom, with fewer but larger fish higher up. For this reason, most fishermen also prefer to place the chum-bag (see section 2M) on the upper attachment point.

When fishing on smooth or sandy bottoms, sinkers can be attached directly to the terminal rig. On rough or rocky bottoms, however, it is better to attach them using a short length of light line which can break off if the sinker gets stuck, so that the terminal rig (and any fish caught) can be retrieved more easily.

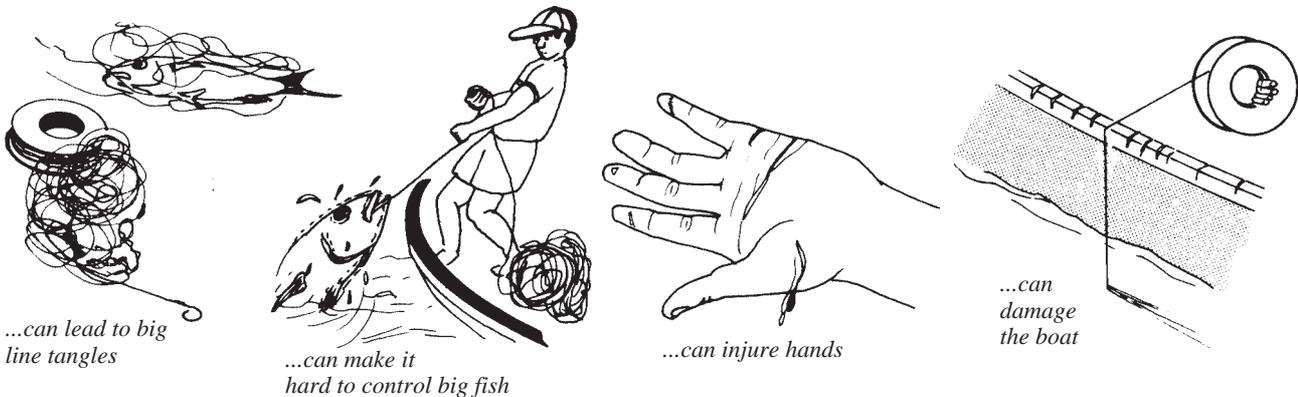
## SECTION 2K: REELS FOR BOTTOM FISHING

Bottom-fishing is often carried out using a simple handline. In shallow waters the line need not be too long, and can be coiled onto a handcaster or bottle for storage. In deeper waters, however, the length and relative thickness of the mainline make this impractical, so the line is usually allowed to fall freely into the bottom of the boat or into a box or bucket.



Some fishermen still prefer to use this method because they say it allows them to strike more rapidly when the fish bite. However there are a number of problems with using such long handlines. One is the length of time that it takes to hand-haul such a length of line in deep waters. Once the line is in the boat, there is a potential for messy line tangles that can take hours to undo. When a large fish such as a shark takes the hook, it can be difficult to control and may injure the fisherman's hands. In fact just normal handling of the line will inevitably cause cuts, burns and blisters. In addition, rubbing of the line on the edge of the boat can wear the line and leave deep cuts in the gunwale, especially if braidline is being used.

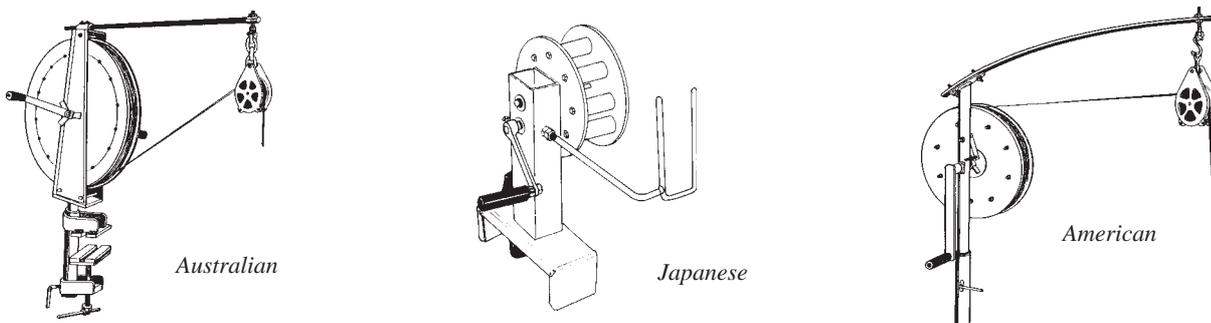
*Using handlines for deep bottom fishing...*



Fishing reels allow the line to be properly controlled. Reels increase the speed at which line can be recovered, allow the fisherman to play large fish more easily, avoid hand injuries, keep the line away from the boat most of the time, and avoid tangles by keeping the line stored compactly. The main disadvantage of fishing reels is that they are an extra cost to the fisherman. In addition, badly made or positioned reels can be difficult to use and can cause muscle strain. However these problems can be solved — the cost of reels will be recovered over time by increased efficiency and productivity, while backaches can be avoided by proper reel construction and positioning. Most fishermen who get used to fishing with a reel will not go back to using a handline.

Many varieties of fishing reel are available commercially, and several are suitable for deep-bottom fishing. These are usually fitted with friction brakes and an easily adjusted mounting system, and most are robust and constructed from materials which will last for a long time even in the marine environment.

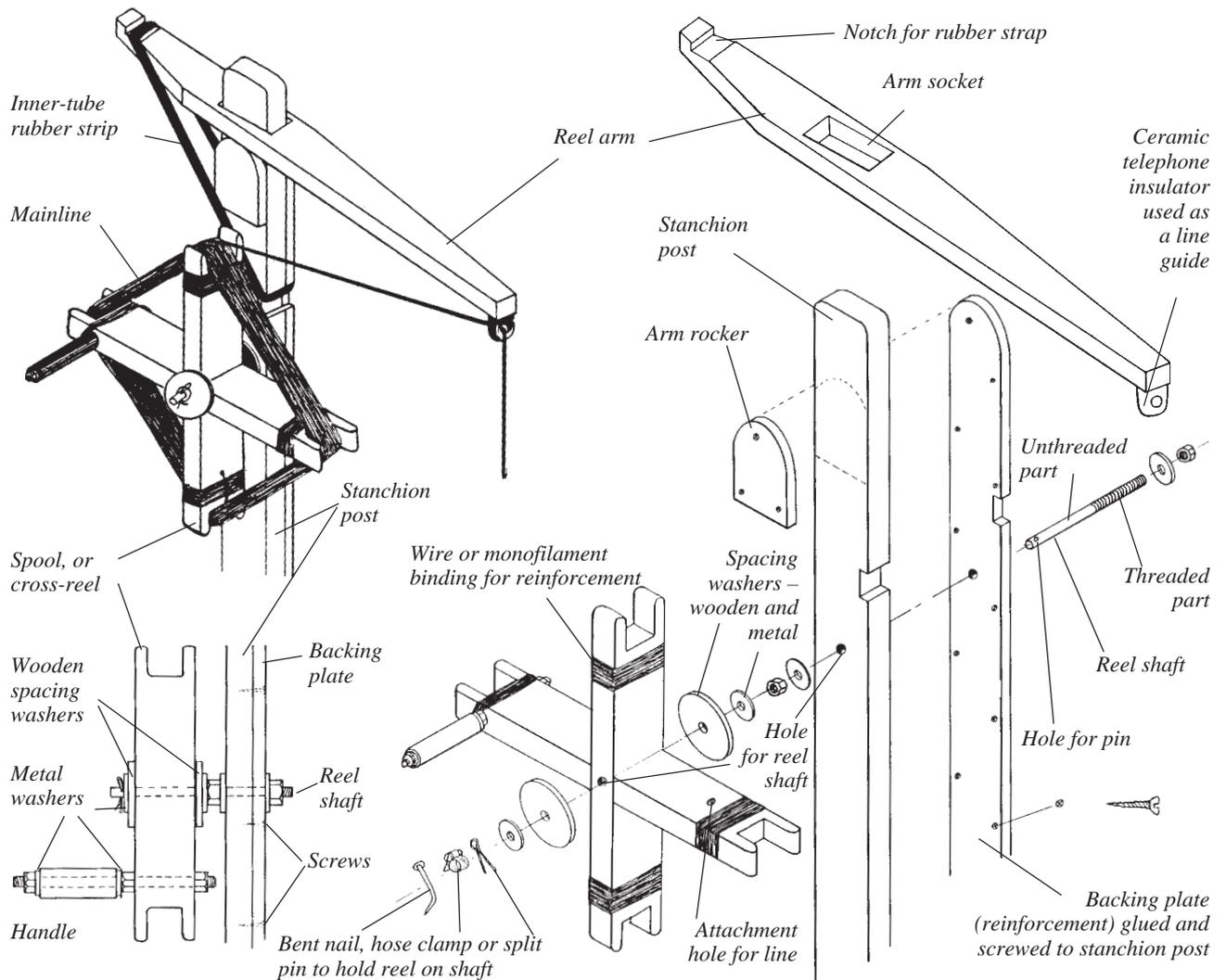
*Some commercial deep-water fishing reels*



Unfortunately reels like this are usually expensive (typically US\$ 500–1,000) and of limited availability in the Pacific region. In addition, spare parts may be unavailable and damage may be difficult to get fixed locally.

A better solution for small fishermen in the Pacific Islands region is the wooden handreel shown below. The reel was first introduced into Western Samoa in 1975 by FAO, and has since been promoted by SPC as well as by many Pacific Island Fisheries Departments. These reels are commercially produced in many places, and can also be made by the fisherman himself using simple tools and locally available materials.

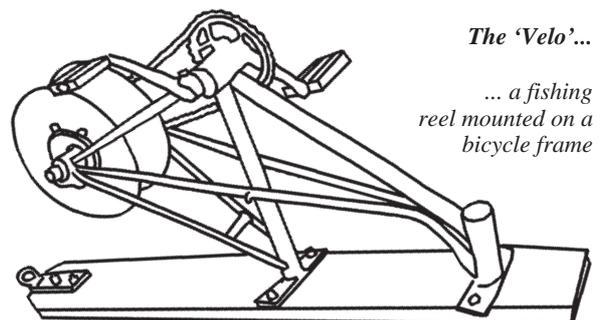
*The wooden handreel and its parts*



Although quite simple in appearance, a lot of care must be taken when constructing this reel if it is to work properly. A badly made reel will cause much frustration, reduce the effectiveness of fishing operations, and may break at the most important moment—that is, with a large fish on the line. For these reasons, the SPC has produced a separate handbook which gives detailed instructions and plans to enable proper construction of the FAO Samoan reel (*SPC Handbook No 25: Notes on the construction of the FAO wooden handreel*), available from SPC.

The most common fault in making these handreels is poor alignment of the line, which causes it to ‘miss’ the reel when being wound in. To ensure good alignment it is very important that the holes for the reel shaft and the lever arm are cut straight and accurately. Only limited adjustment is possible by adjusting the insulator position or adding more spacing washers to the reel shaft.

In addition to wooden handreels, other, more elaborate reels can be improvised by the enterprising fisherman, especially those with metalworking skills or facilities. An example shown here is the ‘Velo’, a reel made from an old bicycle frame, first developed in Vanuatu. This reel has the advantage that it can be wound using both hands, or, on some models, with both feet (by re-fitting the bicycle seat), and that it uses the bicycle’s gearing system to increase hauling speed.



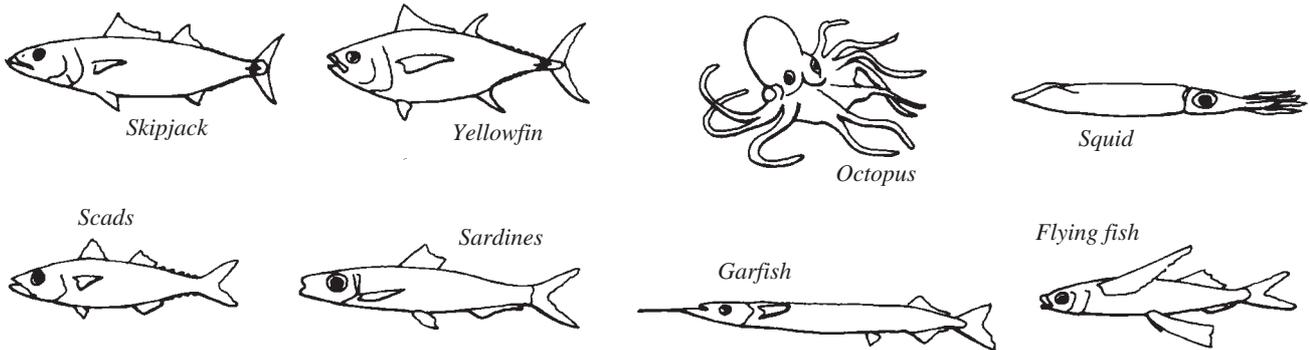
## SECTION 2L: BAIT

Bait is of prime importance when deep-bottom fishing. Pulling lines up and down for several hundred metres is hard work, so it is important to make sure the bait is working properly, staying on the hook and attracting fish.

For almost all types of fishing, the fresher the bait, the better it works. When the fish are biting well, almost any kind of bait will work: but when the fish are 'fussy' and hard to catch, fresh bait will out-fish frozen or salted bait, and old, smelly bait will be almost useless.

A good bait is fresh, has plenty of oil content (so as to give a good odour and draw fish in from a distance), and is strong enough to stay on the hook. Unfortunately, it is not always easy to find bait with all these features.

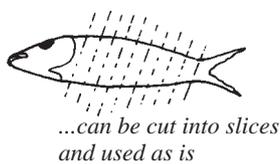
### Commonly used bottom-fishing baits



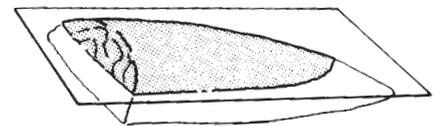
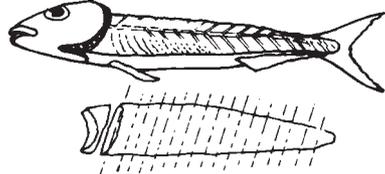
### Cutting bait

Bait should be cut to a size which fits the hooks being used. Small fish can be cut into sections along the length. Larger fish should be filleted and the fillets cut into the right-sized pieces. Very thick fillets should be thinned down if necessary. Always leave the skin on the bait to help keep it on the hook.

Small fish...



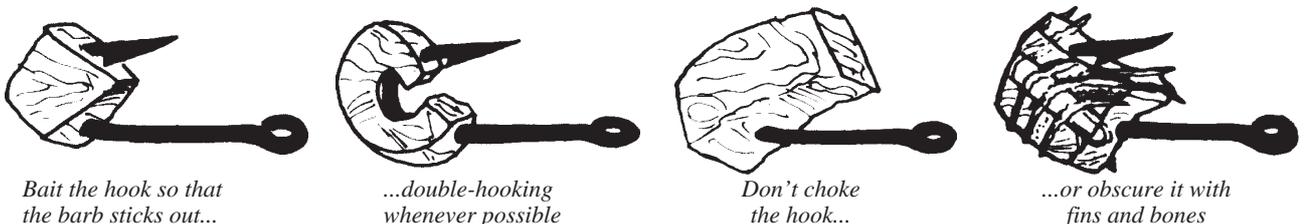
Larger fish...



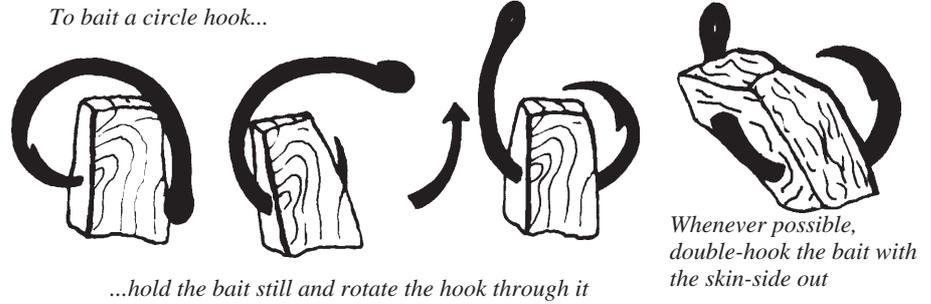
### Baiting the hook

When baiting the hook, remember that the idea is for the point and barb to catch in the fish's mouth. Make sure the bait is not too thick, so the point and barb stick out a little. If there is too much bait, the fish can get a grip on the hook without being caught. Also, make sure there are no bones or fins in the bait which will interfere with the hooks action.

Whenever possible, bait should be double-hooked to reduce its chances of falling off the hook. Most bait pieces are tapered, with a thick end and a thin end. The point of the hook should be inserted into the skin side of the thin end and out through the flesh side. The hook is then passed through the bait a second time, by inserting into the flesh side of the thick end and out through the skin side. The result is a double-hooked bait with the skin on the outside.

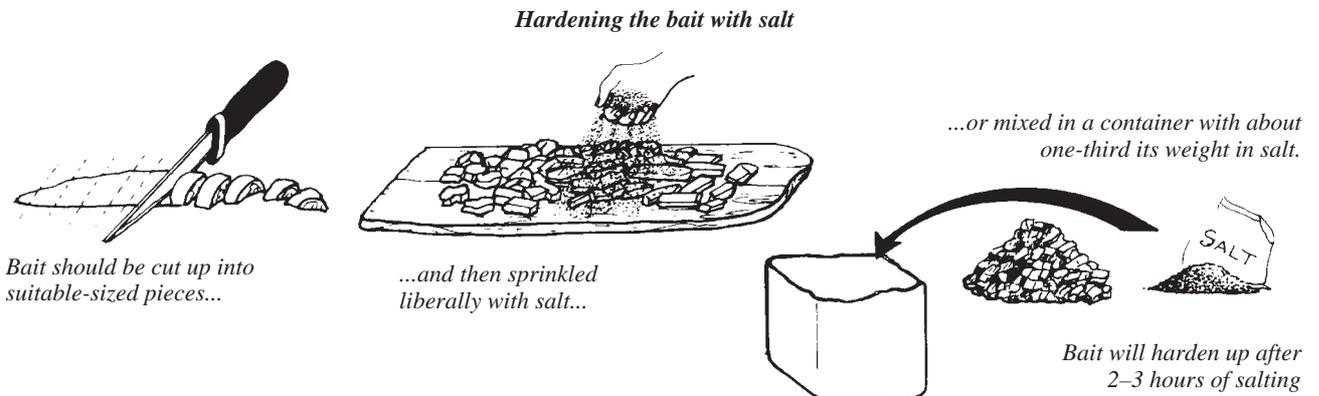


The best way to bait any hook, especially a tuna circle, is to hold the bait still and rotate the hook into and through it. If the bait is a little soft, it can be held on the flat of the fingers and the hook rotated through it and between the fingers, so that it is supported at all times.



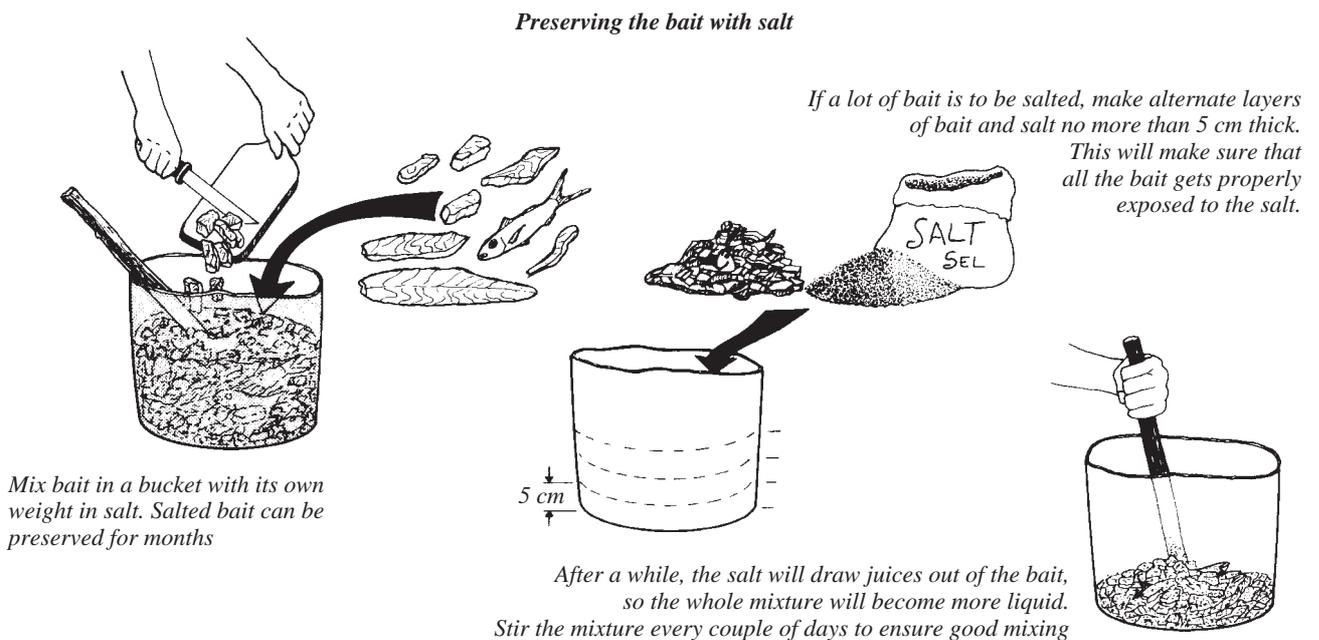
### Hardening bait

Oily bait such as tuna easily becomes soft and mushy, especially after it has been frozen. This makes it difficult to bait the hook without squashing the bait, and causes it to fall quickly off the hook. To prevent this, the bait can be hardened by salting for a short period before fishing. To harden bait, cut it into the right-sized pieces, then sprinkle with plenty of salt, or mix in a bucket with about a third as much salt as there is bait. Do not add any water, 2–3 hours in the salt will toughen up the outside of the bait chunks and make them hold on to the hook better.



### Preserving bait

Salting more heavily is a good way of preserving bait in places where there is no refrigeration, or where bait is hard to come by. Cut pieces or whole fish can be salted, but whole fish larger than 1 kg should be filleted or cut into pieces smaller than 1 kg each. Simply mix the bait pieces with their own weight in salt, stir them up, and then store them away for later use.



For larger volumes, place a layer of bait no more than 5 cm thick in a bucket, add an equal weight of salt, then add more layers of fish and salt. Do not add any liquid - plenty of juice will be drawn out from the fish. Mix the fish and salt well, and stir up from time to time. Bait salted in this way can be kept for months.

## SECTION 2M: CHUM

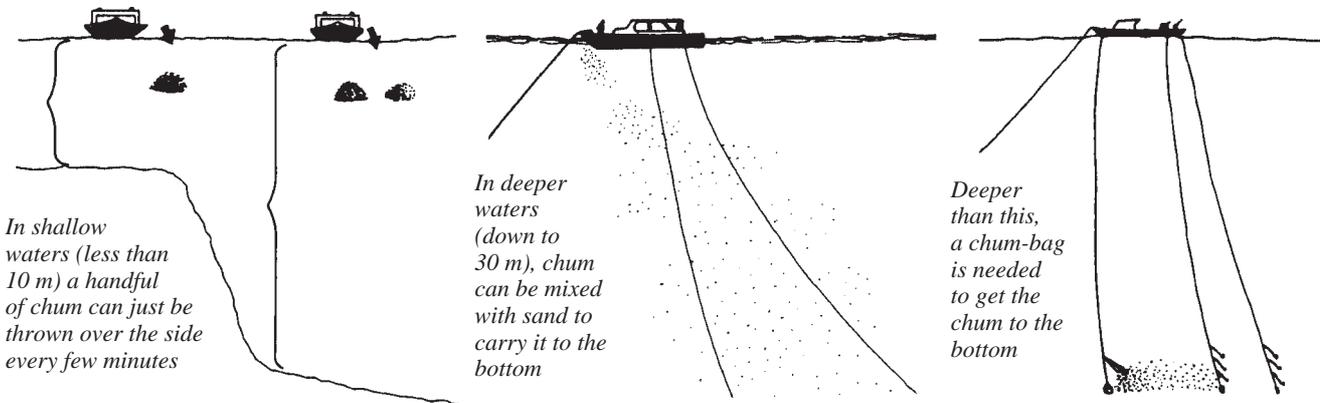
Chum is very finely ground or chopped bait which is released into the water at intervals while fishing, to attract the fish to the fishing spot. The chum is meant to excite the fish by its smell, but the particles should be too small to allow them to feed properly. The fish search for the source of the smell, and eventually find the baited hooks, which they bite in their excitement. Chumming is normally done at anchor, but can be effective when drift-fishing as long as there is little wind and the current moves the boat along with the chum.



Chum

The ideal place to release the chum is close to your bait, preferably just up-current. The chum sinks down, drifting with the current, so that a cloud of odour and particles moves downstream from your bait. When a group of fish meet the odour they will tend to swim against the current, looking for its source. Repeated chumming provides the fish with a trail of odour that leads to the bait.

Chumming in shallow water is easy: handfuls of chum can simply be thrown over the side from time to time. In deeper water, the chum will take longer to sink, so some fishermen mix sand with it to help carry it down faster. In very deep water neither of these methods will get the chum to the seabed before it disperses far and wide, so a chum-bag, as shown on the opposite page, is used.



### Making chum

The important thing in making chum is to ensure that the bait is chopped or ground into very small pieces, so that the fish cannot feed properly on it. Chum can be made by chopping up bait or waste fish with a heavy knife or a meat cleaver. The bait has to be chopped for a long time to get the particles small enough and they tend to fly around in all directions.

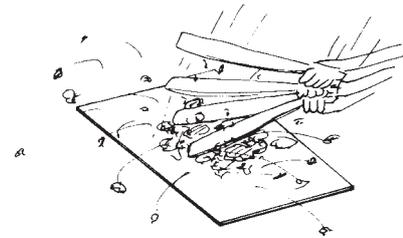
A better way is to boil waste fish heads, skeletons, and even guts. Boiling should continue until the fish and bones are properly broken up.

A third way is to buy a mincer (meat grinder) and use it to mince up fillets of bait or trash fish. Most mincers will not handle bones and are easily clogged by scales or skin, so this method is not so good for making use of waste parts of fish.

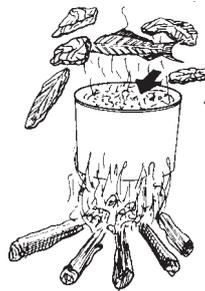
Another good (but expensive) type of chum is tinned fish, which is easy to mash into small pieces and has no hard bones.

### Making chum

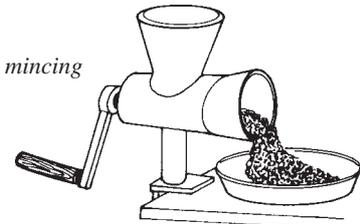
*Chum can be made by chopping...*



*...boiling...*



*...or mincing*



*Mashed-up tinned fish is also an effective, if costly, kind of chum*



## 'Stretching' chum

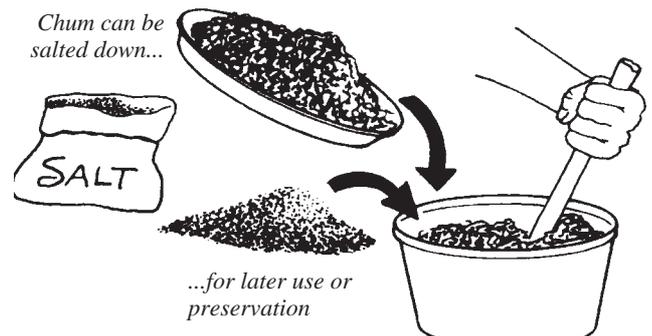
All types of chum can be 'stretched' by mixing in flour, or cooked, mashed starchy foods such as rice, yam, sweet potato, taro, cassava, etc. As well as making the chum go further, the starch thickens the mixture so it is easier to use. The chum should have a thick texture, like mashed potatoes, or a thick stew. Another good additive is grated coconut flesh, which adds oil to the chum mixture and helps disperse the odour.



Starchy foods such as rice, breadfruit or taro, which may be locally cheap, can be used to stretch the chum

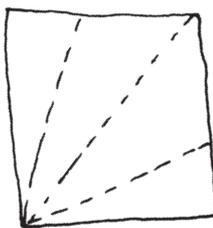
## Preserving chum

Once made, chum can be frozen until ready to use. Alternatively, it can be preserved for weeks by salting. To do this, mix in salt to half the weight of the chum and stir every few hours for the first 3–4 days. After this, the chum can be stored away until ready for use.



### Making a chum-bag

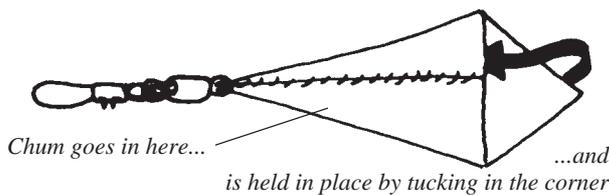
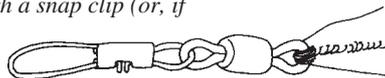
Take a 25 cm-square piece of denim...



...and stitch two adjacent sides together to form a cone



Then attach a swivel with a snap clip (or, if unavailable, a loop of line) to the point



## Chum-bag

A chum-bag is attached to the terminal rig and is used to carry the chum to the bottom, where it opens so that the chum can disperse.

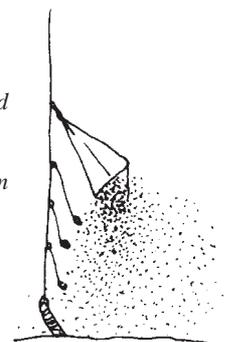
The bag is made from a 25 cm x 25 cm square of denim, canvas or other heavy cloth. Fold over two adjacent edges so that they meet in the middle as shown, and stitch them together. This gives a long cone-shaped bag with a flap at the end which can be tucked in after the bag has been filled with chum. Sew or tie on a snap swivel (or an eye made of strong cord) which can be used to connect the bag to one of the attachment loops on the terminal rig. Many fishermen prefer to use the uppermost attachment point, both so that the chum will shower down on the other hooks, and because the top hook is usually the one that catches fewest fish.

The chum-bag is clipped or tied onto the terminal rig immediately before fishing, filled with chum, and the corner flap tucked in firmly to close it. The line is allowed to sink to the bottom, being careful not to tug or jerk on it, so as not to accidentally release the chum. Once the sinker touches bottom, the line is tugged sharply a few times. This opens the bag and the chum is released, raining down over the other hooks before being dispersed by the bottom current.

Chum bag is allowed to free-fall to the sea floor...



...then the line is tugged to release the chum



Some fishermen operate the chum bag from a separate line so that it will not interfere with their fishing, and so that they can make sure the chum is released up-current of the other lines.



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CHAPTER 3

***THE FISHING VESSEL***

|    |                               |    |
|----|-------------------------------|----|
| A. | GENERAL VESSEL CONSIDERATIONS | 36 |
| B. | HANDREEL MOUNTING             | 38 |
| C. | CONTAINERS FOR FISH AND ICE   | 40 |
| D. | ANCHOR ROPE                   | 42 |
| E. | ANCHORS                       | 44 |
| F. | ECHO-SOUNDERS                 | 46 |
| G. | FISH LANDING TOOLS            | 48 |

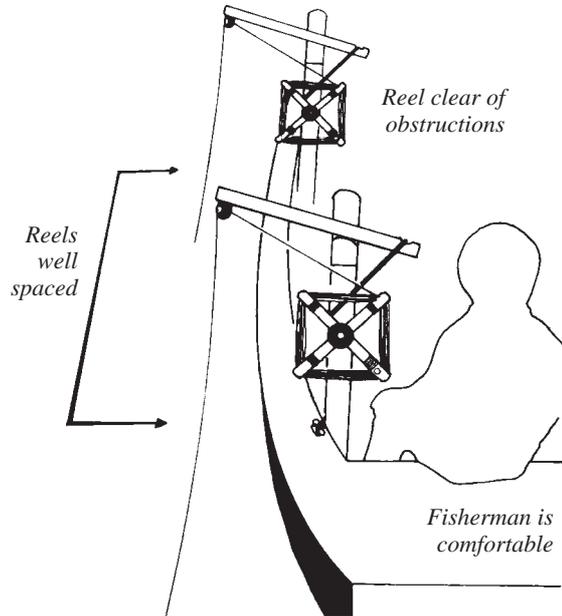
## SECTION 3A: GENERAL VESSEL CONSIDERATIONS

Deep-bottom fishing is an active occupation, and can present the risk of injuries, especially in rough weather. When hauled aboard, one or more fish connected to a terminal rig carrying several hooks can be difficult and hazardous to handle. On a badly organised vessel, fish may be lost because equipment is inaccessible or in the wrong place. Some careful thought about the arrangement of the boat can pay dividends in more efficient, more comfortable fishing, and higher catches.

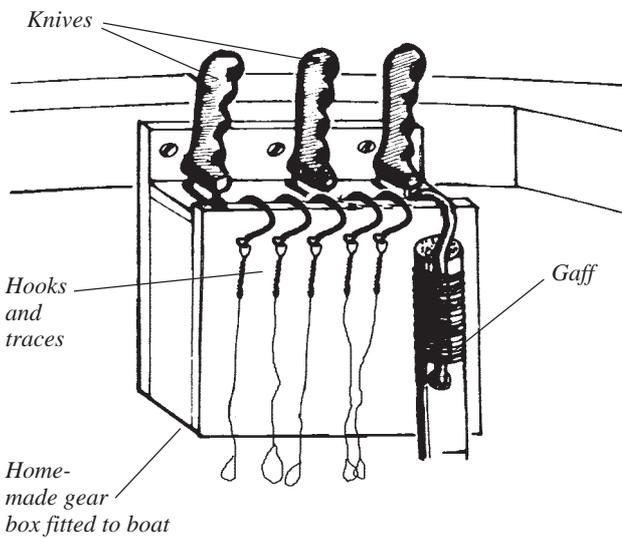
### Fishing Positions

If handreels (see section 2K) are to be mounted on the boat, ensure that they are far enough apart not to interfere with each other, and that the crew using them are not obstructed by deck equipment. Badly positioned or mounted reels can cause severe muscular pain, as well as tangled lines and lost fish.

Each fisherman should know his spot on the boat, and this is the point from where he should handle his lines, bring aboard fish, etc. Normally there should be one crewman for each fishing line—it is not usually feasible for a fisherman to operate more than one line unless they are hydraulically-powered (see appendix). For 6–10 m boats, no more than three or four lines can be fished without tangling.



*Hazardous gear stored to be accessible but safe*



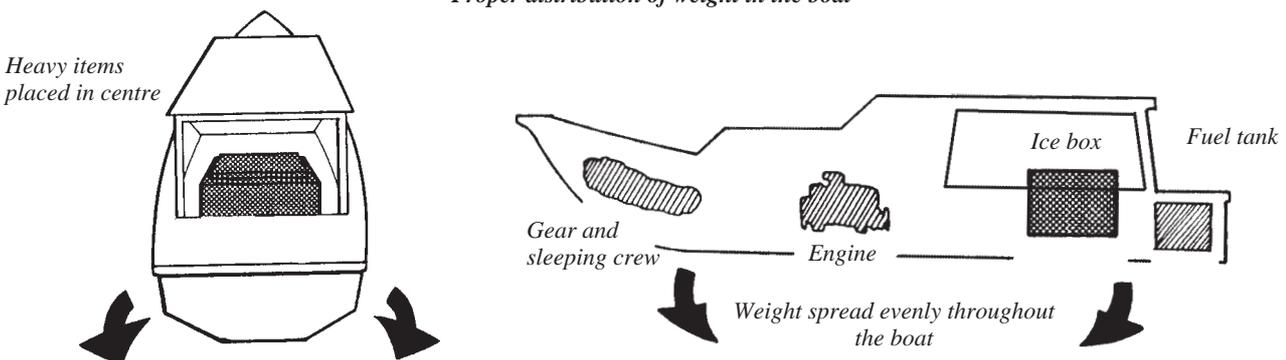
### Gear storage

Keep potentially dangerous pieces of often-used deck equipment, such as gaffs, knives, and spare terminal rigs, in an accessible but safe place. Store them in a box or choose a particular spot where they should be hung. Never leave them lying around on deck, where they are sure to cause injury.

### Balance and trim

Locate heavy items low down and centrally so that the boat is not unbalanced in any direction. The icebox may be the heaviest item on board when full. If possible, locate it so that it does not block off access from one part of the boat to another. Second will probably be the engine(s), and third will be the combined weight of the crew. Try to plan for an even distribution of weight, especially when the boat is underway.

*Proper distribution of weight in the boat*

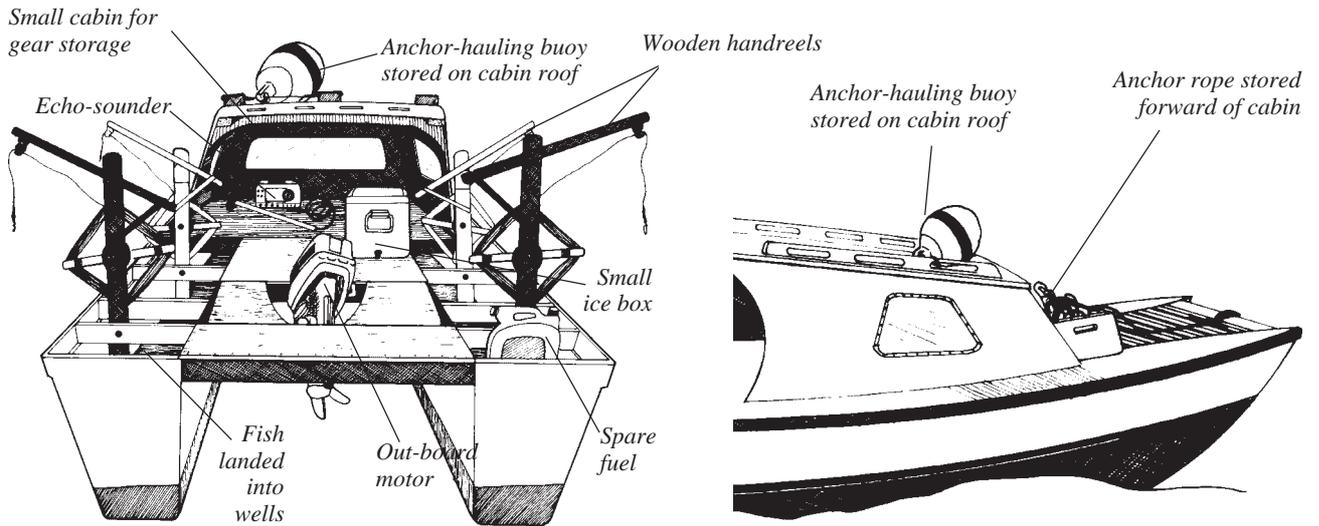


## Commercial fishing arrangements

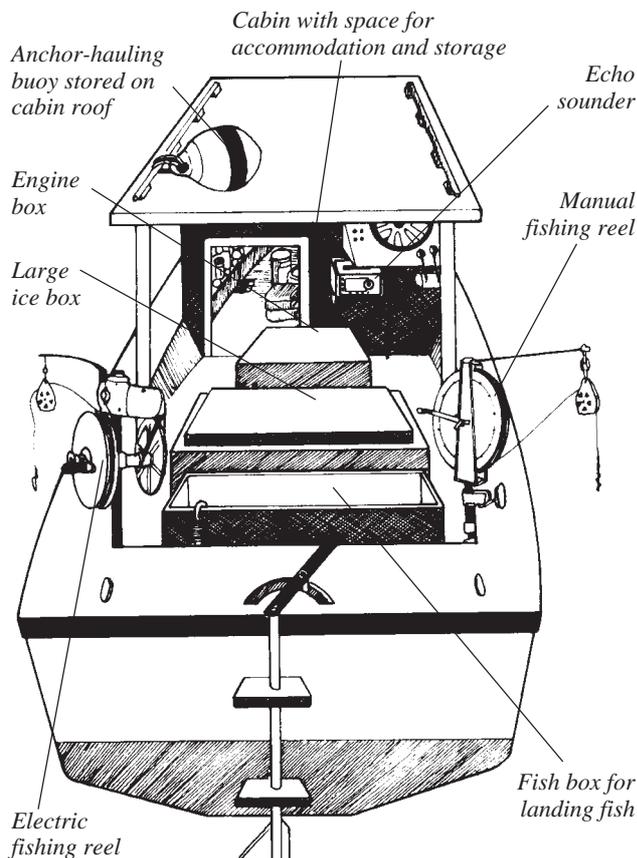
Two of the more popular types of fishing vessel used in the Pacific Islands region are the outboard-powered ‘alia’ catamaran, which is now made in a range of sizes from 7.5 m to 11 m, and a variety of inboard diesel-powered V-bottom monohulls ranging from 8–12 m in length. The diagrams below show ways in which these vessels might be set up for commercial deep-bottom fishing.

The ‘alia’ has no crew accommodation, limited carrying capacity, and a short operating range because it is outboard powered, so is essentially a day-trip vessel. It is shown here fitted with wooden handreels and a small portable ice box. Because of use of handreels, a crew of at least two, preferably four, is required on a boat rigged up like this.

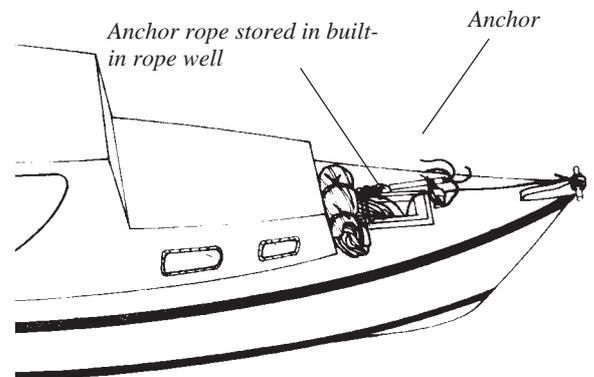
*‘Alia’ catamaran rigged for deep-bottom fishing*



*Diesel-powered V-bottom monohull rigged for deep-bottom fishing*



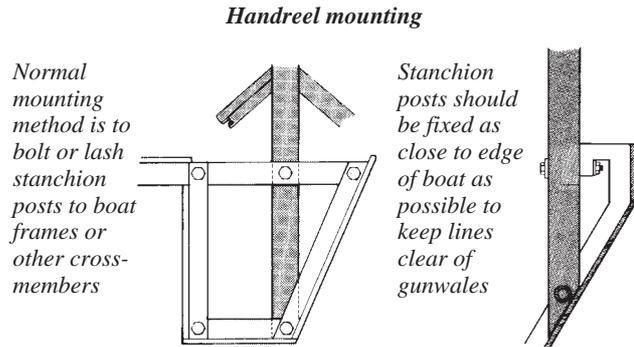
The monohull vessels typically have sleeping quarters for two or three crew, a carrying capacity of a tonne or two, and are diesel-powered, giving them extended operating ranges, so these vessels can undertake fishing trips of a week or more. The vessel is shown fitted with a fish box, a large deck ice box, and commercial fishing reels, one of which is electrically powered, and run off the vessel’s battery. Since there are only two fishing reels, the vessel could be operated by two crew, but a third crewman means that the crew could work in shifts, so that the reels are kept fishing day and night.



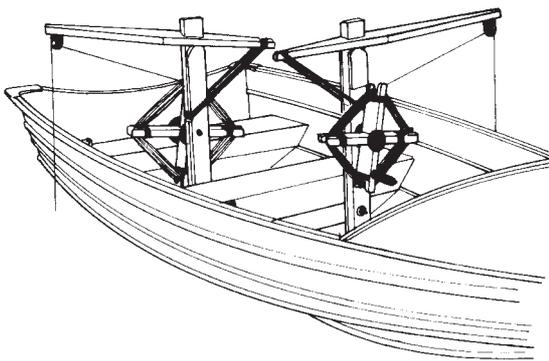
The rest of this chapter provides more detail on the various items of equipment and on aspects of vessel layout relevant to deep-bottom fishing.

## SECTION 3B: HANDREEL MOUNTING

Wooden handreels can be mounted on most fishing vessels in the 8 m length class by drilling through the stanchion posts and bolting them to the frames of the vessel, or to other suitable points. The posts should be bolted in at least two places, to ensure they are secure and will not move under load. Alternatively the posts can be lashed down, although this is less suitable. In all cases they should be mounted as close to the edge of the boat as possible to keep the line well clear of the boat during fishing.



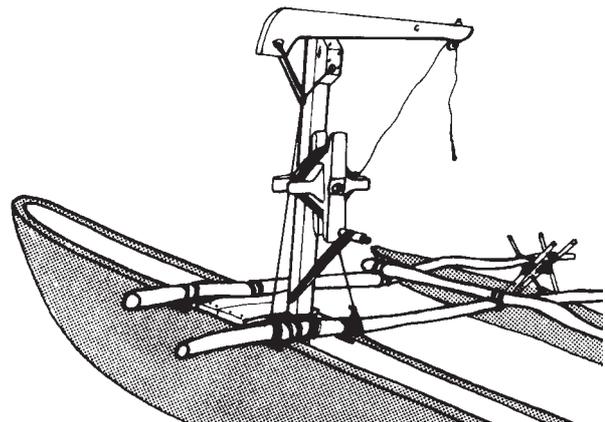
*Standard reel mounted on an aluminium dinghy*



### Mounting reels on small boats

Wooden handreels can also be mounted on much smaller vessels. In many locations aluminium dinghies have been fitted with reels by bolting or lashing the reels to the seats or any cross-members. In those models without seats, a plank can be lashed across the gunwales to provide an attachment point for the reel posts.

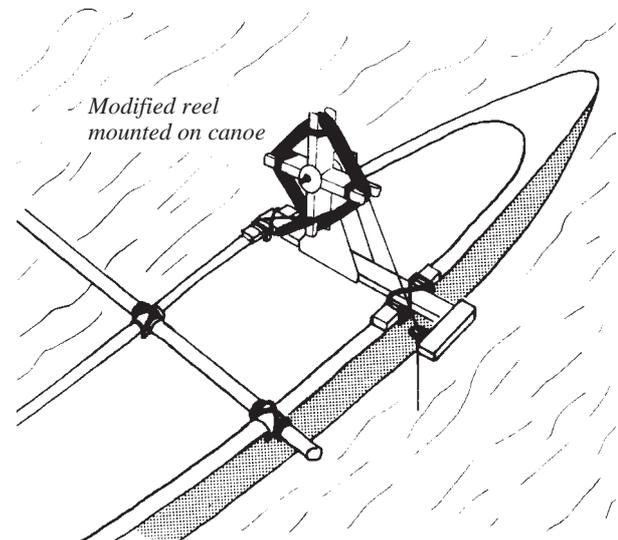
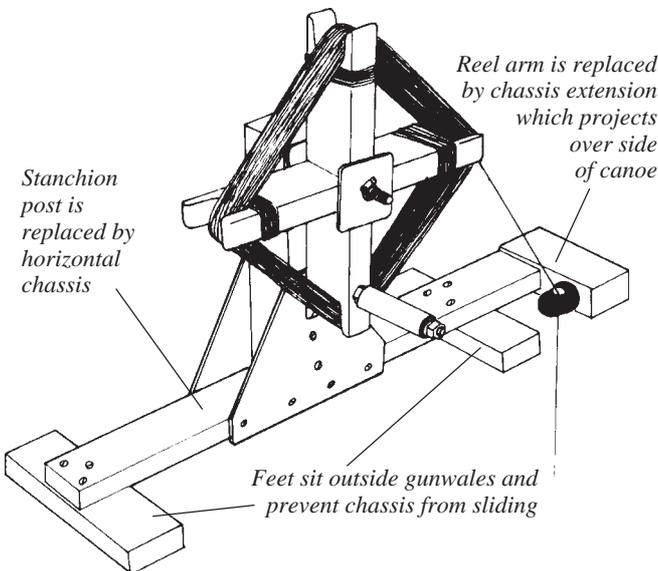
*Standard reel adapted to an outrigger canoe*



### Mounting reels on canoes

Handreels can also be modified to fit onto canoes. Standard handreels can be adapted to fit into the well of an outrigger canoe, with the stanchion post being lashed to the cross-members that connect the hull and the outrigger. Alternatively, the support arrangement for the reel can be altered to better fit the boat. The diagram below shows a modified version of the reel designed by FAO to be mounted across the sides of a canoe.

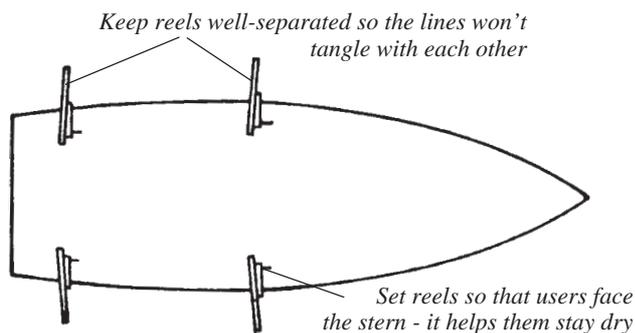
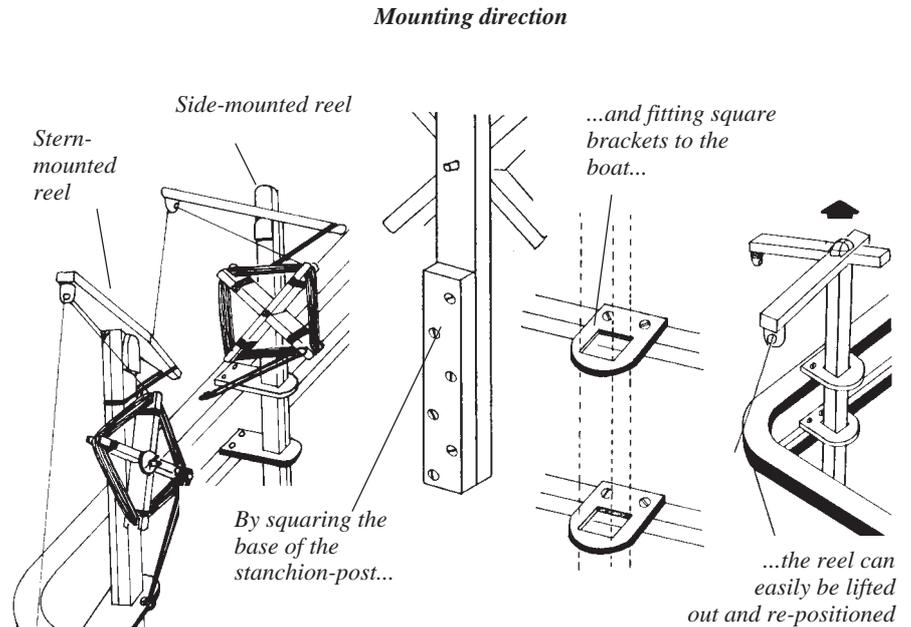
*Wooden handreel modified to fit across the gunwales of a canoe*



## Mounting direction

Depending on the boat and the deck arrangement, wooden handreels can be ‘side-mounted’, that is with the reel-arm sticking out over the side of the boat, or ‘stern-mounted’, in which case the reel-arm points toward the stern or transom.

For fishermen who need to regularly change the mounting position of a reel, or dismount it completely from the boat, reels can be mounted using square wooden or steel brackets screwed to appropriate points on the frames or other parts of the boat. To do this, it is also necessary to increase the thickness of the stanchion post at the point where it fits in the bracket, by screwing on pieces of timber to make the post square in cross-section. The post can then easily be inserted into the brackets, where it will stay firm in either the side- or stern-mounted position.

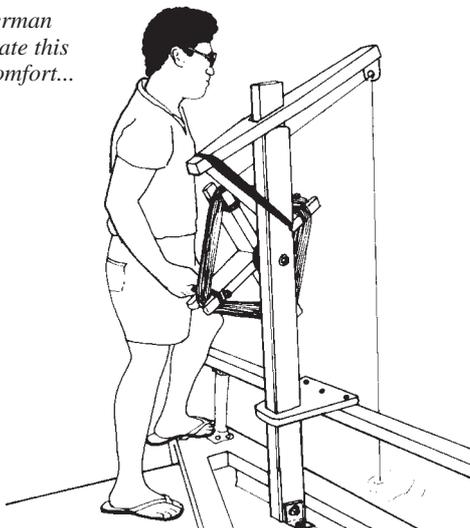


In all cases the reels should be well separated to reduce the chances of the lines tangling with each other. They should be mounted in places where they are accessible and free from obstruction, and where they themselves will not obstruct other aspects of the fishing operation. If possible position the reels so that the users face the stern of the boat. This will avoid them being drenched with drops of water from the line every time they reel it in. Bottom fishing is usually carried out at anchor so the wind will always blow the spray away from a reel-user facing the stern.

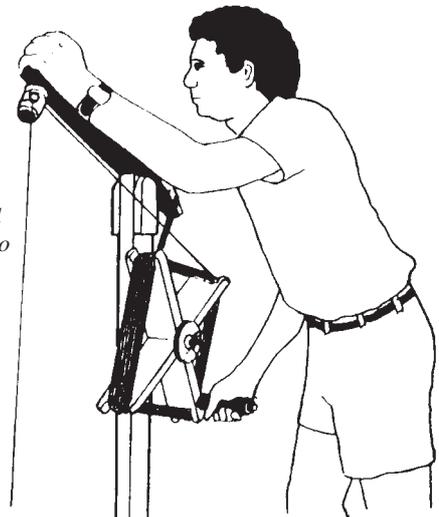
## Comfort

When mounting the reels, it is important to remember the fisherman's comfort. Badly placed reels can cause severe muscular strain to the user. Mount the reel so that the shaft is about level with the user's stomach, and the post follows the midline of the body when the user is standing comfortably in front of the reel.

*The fisherman can operate this reel in comfort...*



*...but this reel is mounted too low, and will give the fisherman a backache*



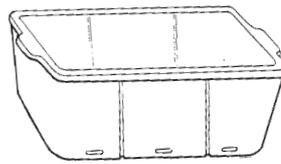
## SECTION 3C: CONTAINERS FOR FISH AND ICE

### Fish containers

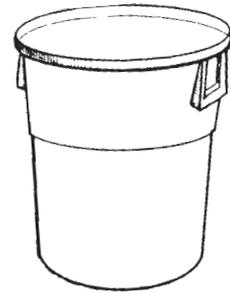
In a small vessel, fish are often landed directly into the bottom of the boat, but this presents a number of possible dangers and problems. The tail and teeth of a thrashing fish can cause injury, and so can any hooks or wire terminal rigs to which the fish is still attached. Slime and blood will make the deck slippery and dangerous. The fish may beat against frames or items of deck equipment, cutting or bruising itself and lowering the quality of the flesh.

Most of these problems can be avoided by landing the fish into a box or bin. For small boats, the simplest way is to carry a plastic or wooden container big enough to accommodate the size of fish being caught without bending them.

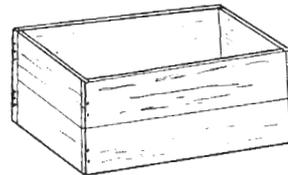
#### Fish containers for small boats



Plastic fish box – the best option



Plastic garbage bin – OK for small fish



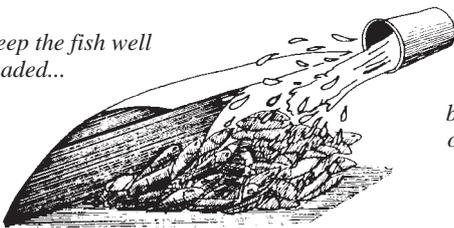
Wooden box – suitable but less hygienic

### Keeping fish cool

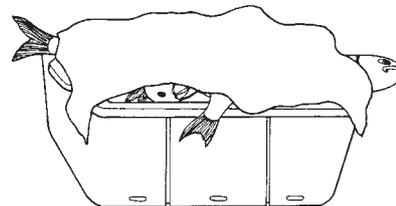
Wherever possible, ice should be used to keep the catch in good condition. In places where ice is not available, or where the boat cannot carry sufficient quantities, fish should be washed and then kept shaded and as cool as possible to prevent spoilage. One way to do this is to cover the fish with wet sacking or other cloth. This keeps the fish moist and prevents them drying out, and has a cooling effect as water evaporates from the surface of the sacking. Throwing a bucket of water over them now and again also helps them stay cool.

#### Keeping the catch cool without ice

Keep the fish well shaded...



...and throw a bucket of water over them from time to time



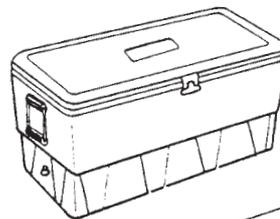
Cover the fish with wet sacking. Evaporation from the sacking will have a cooling effect

A much better way to keep fish cool is to use ice, which keeps fish in good condition for longer. This means that fishermen can stay out at sea fishing for longer periods, and can often get a better price for their catch because it has stayed fresher.

### Ice containers

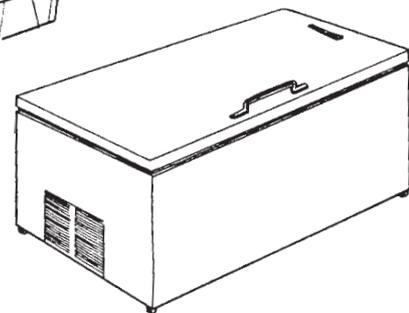
To get the best value out of ice, an insulated container is needed to stop it melting away too quickly. For small vessels, domestic chill bins or 'esbies' may be suitable, although usually quite expensive. On larger boats, old domestic chest freezers may be used. These are usually cheap or free, but tend to be poorly insulated and rust rapidly, leaving dangerous ragged corners. Insulated 'ice bags' are becoming available in some countries. These are quite expensive, lightly insulated and hard to handle when filled with small fish and ice. However they are useful for the odd very big fish which will not fit into the ice box, and for canoes or other narrow types of boat, due to their shape. (They also make good sleeping mattresses when empty).

#### Ice containers for small boats



Domestic ice boxes or 'esbies' are convenient, but costly and quick to break

An old chest freezer is OK for a larger boat, but may rust quickly



Insulated ice bags are good for large fish, and can be folded up (or slept on) when not in use

## Built-in vs on-deck ice boxes

In some boats, limited deck space or the shape of the hull or working area encourages the builder to construct the ice box as an integral part of the boat's hull. In some boats this works well and results in real savings in space, or in extra convenience for the crew. Built-in ice boxes can double as comfortable seats or bunks, and can convert unused corners or sections of the hull into valuable ice or fish storage space.

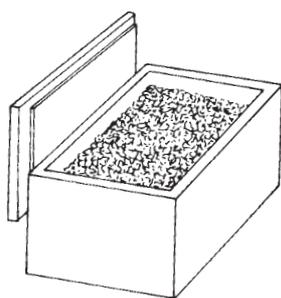
In other cases, however, built-in ice boxes lead to real problems, especially in plywood or wooden boats. The boxes cannot be moved if they turn out to have been badly positioned. Damage to the ice box or water penetration into the insulation may be impossible to repair. If the insulation becomes wet it may cause waterlogging and rot in the hull timbers, or delamination of fibreglass. If the hull is holed close to the ice box, repair is made more difficult. Proper drainage and cleaning of the ice box may be difficult or impossible.

If a boat owner wants to use spare hull space, he should consider fitting 'drop-in' ice boxes which can be removed when necessary, or the use of insulated ice bags (see above) as alternatives. Removing a built-in ice box is usually a lot more difficult and time-consuming than building it in the first place. Where space permits, however, on-deck ice boxes are a better choice, provided they are the proper size and shape, are properly secured and do not interfere with fishing or the boat's operation.

## Using slurry

If fishing for export (see section 5B) or for quality-conscious local markets, the fisherman may choose to use slurry, or iced brine, while fishing. Slurry is a mixture of ice and seawater which allows the fish to be chilled faster, and to lower temperatures, than is possible by just using ice. Because it is salty, a properly mixed slurry will have a temperature of about  $-4^{\circ}\text{C}$ , and its semi-liquid nature gives good contact with the fish and leads to very rapid cooling.

### Using slurry



*To keep fish in prime condition, fill an ice chest with slurry, or iced brine by mixing two parts of ice with one part seawater*



*Brine small fish (under 3 kg) for 2–4 hours...*



*...and larger fish for 6–10 hours...*

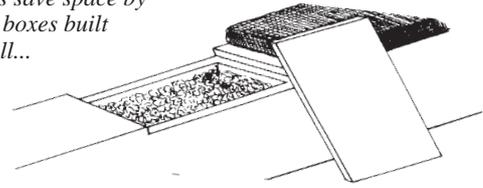


*...before transferring to ice storage*

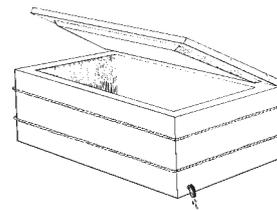
If fishing for demanding export markets, it is important to make sure the fish do not move around in the slurry too much as this will knock the scales off them and reduce their value. If the boat is rolling a lot, excess seawater should be bailed or drained from the slurry to reduce the amount of movement. If this does not solve the problem, it may be necessary to put each fish into a plastic bag for protection before it goes into the slurry.

### Built-in vs on-deck ice boxes

*Some boats save space by having ice boxes built into the hull...*



*...but these often cause trouble through leaks. A better solution is a separate box that can be lifted in and out...*



*...or a stand-alone ice box on deck*

A small ice box or fish bag makes a good slurry container, provided that it is properly watertight. To make the slurry, mix two volumes of crushed ice with one volume of seawater. The mixed slurry should have a thick consistency, like wet cement, and when put into it the fish should remain suspended, rather than sinking to the bottom. As the ice melts, drain or bucket off the meltwater and add extra ice to maintain the consistency.

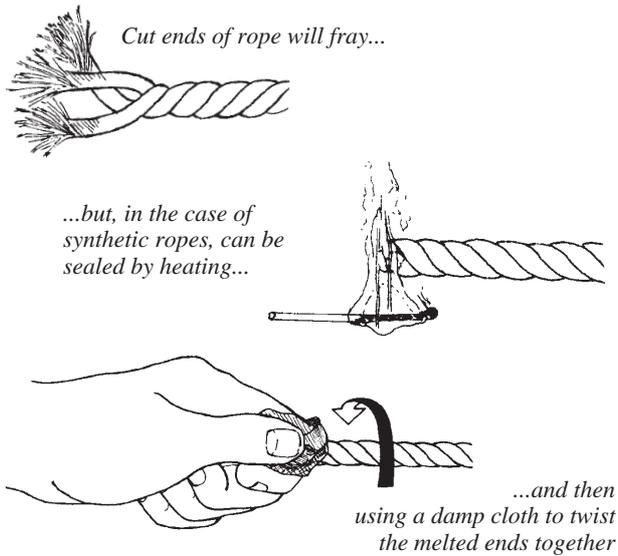
Small fish (under 3 kg) should be left in the slurry for 2–4 hours, larger fish for 6–10 hours, to ensure complete chilling. Fish should not be left in the slurry for too long, however, as the low temperature may cause them to start freezing. The eyes become cloudy once the fish is getting too cold. At this time, they should be transferred to normal ice storage.

## SECTION 3D: ANCHOR ROPE

Deep-bottom fishing is mostly carried out at anchor, and since the waters are deep, a lot of anchor rope is needed. Most boats carry at least 500 m of anchor rope, which should be made of a floating material, such as polypropylene, so that it will not become snagged on the bottom. The size of the rope should be suited to the weight of the boat—12 mm rope will normally be suitable for an 8.5 m boat, and 9 or 10 mm rope for a smaller vessel.

This section describes some of the knots and splices needed when preparing and using anchor ropes. Suitable anchor gear is described in the next section, while the specialised methods for setting and hauling the anchor during deep-bottom fishing are covered in chapter 4.

### Sealing a synthetic rope end by melting



### Sealing rope ends

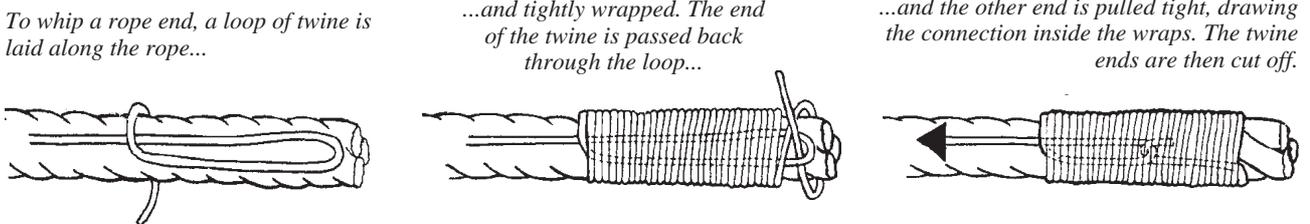
The ends of most types of rope will quickly begin to fray or unravel once they are cut, making handling difficult, so it is necessary to seal them before making knots or splices. There are various ways of doing this, depending on the material the rope is made from.

### Melting

The ends of many synthetic ropes can be quickly melted into a solid plug by using a match or cigarette lighter to heat them for a few moments. Some ropes will begin to burn during the process, and give off noxious fumes, so this job should be done outside, or in a well-ventilated place. Once the rope is hot and visibly melting, a damp cloth is used to twist the rope ends together and extinguish any burning parts. The result is a fused rope-end which will not fray.

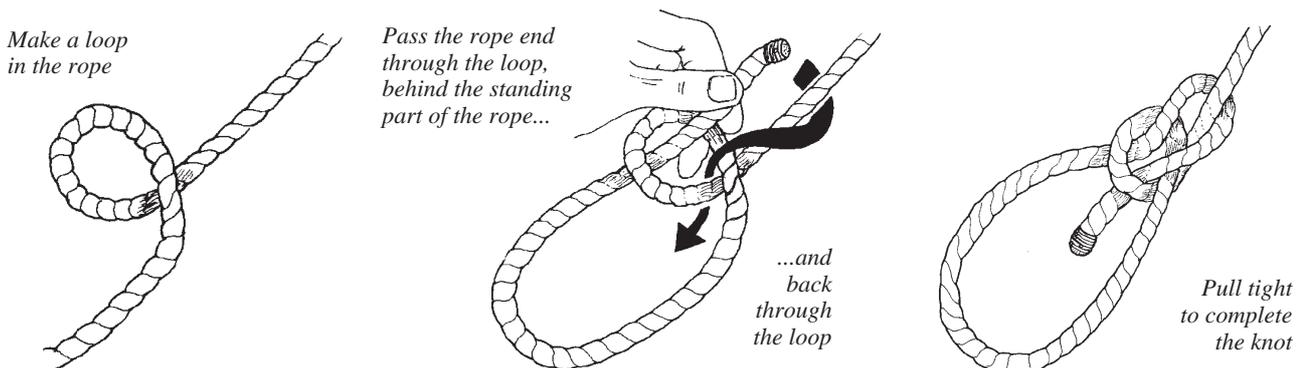
### Whipping

Another method, suitable for natural fibre ropes which do not melt, is to whip the rope ends. This is done using light twine or dental floss as shown in the diagram below.



### Bowline knot

The bowline is good for making a temporary attachment loop in ropes. It is strong, will not slip, and is fairly easy to undo. However it is not good for slippery lines and will not hold in nylon monofilament.



## Eye splice

To make an eye splice, if necessary first tape or seal the end of each strand of the rope. (This is not needed when using tarred kuralon, the type of rope most commonly used in vertical longlining). It may be helpful to number the ends, or to mark them with different colours. Unlay the ends until you have enough length to work with—about 20–25 cm is enough for 10–12 mm diameter rope. With some ropes, it may be necessary to tie or tape the strands together to prevent them unlaying too far.

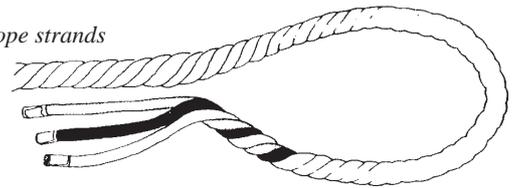
Double the rope back so that the finished eye will be the size that you want. Form the eye and spread the strands fan-wise, placing them against the rope where it is to be entered. Untwist the body of the rope a little and pass the centre end under the centre strand. Then, pass the left end under the next rope strand to the left and the right end under the next strand to the right. If the rope is hard-laid, you may need a spike or fid to separate the strands widely enough.

If this has been done correctly all three ends should be sticking out at the same level, evenly spaced around the main body of the rope. If they are not like this, pull them out and start again.

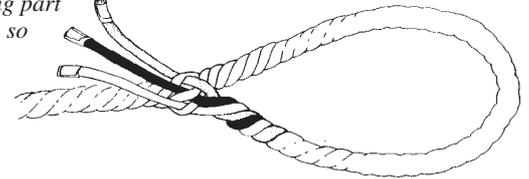
Continuing the splice is easier than starting it. Pull the first tucks tight, then take any end and pass it over the next strand and under the one after. Repeat for the other two ends, so that each shows two tucks in the main body of the rope. The ends should still be even and regular.

Repeat this procedure until each strand has three or four tucks, then cut off the ends close to the body of the rope. To make a tapered splice, make additional tucks with two of the ends so that all three finish at different places, then cut off. With slippery ropes, or those which fray badly, it is worth whipping the splice to ensure that the ends never slip back through the strands.

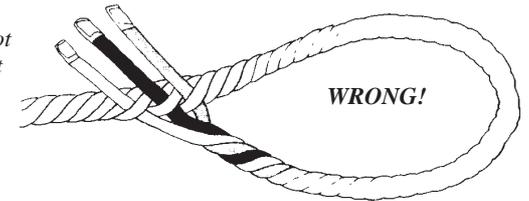
Unlay the rope strands and, if necessary, tape or seal the ends



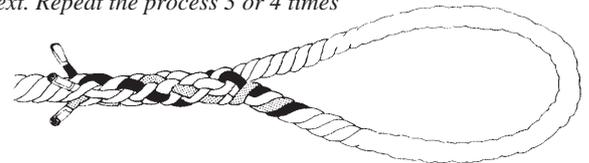
Pass the ends through the standing part of the rope so they are at the same level



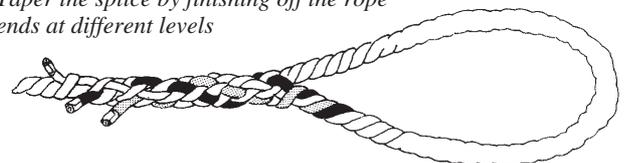
Make sure they are not at different levels, like this



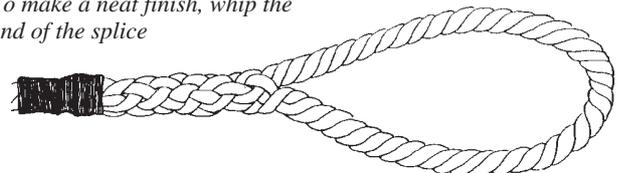
Pass each end over one strand and under the next. Repeat the process 3 or 4 times



Taper the splice by finishing off the rope ends at different levels



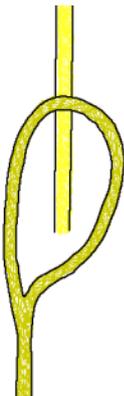
To make a neat finish, whip the end of the splice



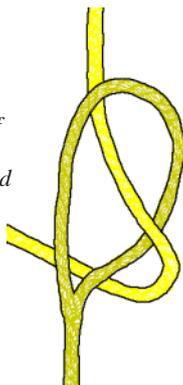
## Sheet bend

This is a quick and simple knot, easy to undo, for attaching one rope to a loop (an eye splice or bowline) in another. It is useful for attaching an anchor line to a rope strop or similar attachment point on the boat.

Pass the free end of one line through the loop in the end of the other, from back to front



Bring the line out through the front of the loop, then around behind the standing part



Pass the line under itself, and across the face of the loop



Pull tight to complete the knot



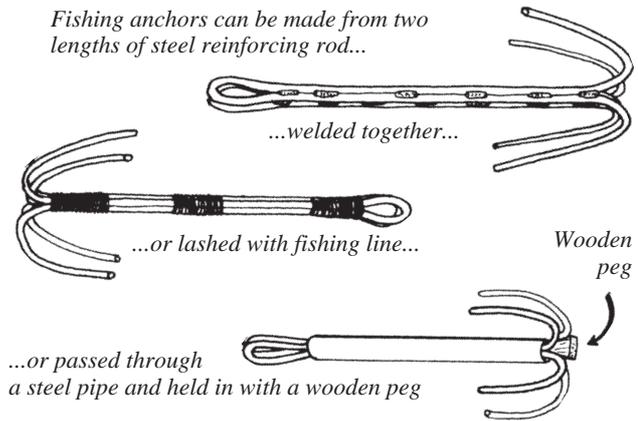
## SECTION 3E: ANCHORS

Deep-bottom fishing normally takes place from an anchored boat. However the great water depths involved mean that some specialised anchoring gear and techniques are required.

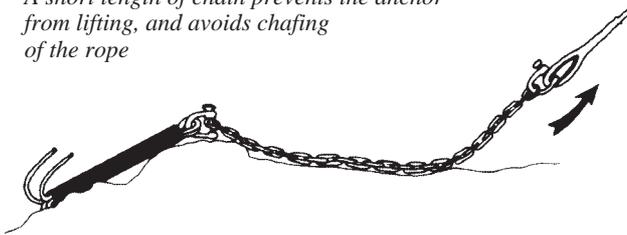
### Bottom fishing anchor

Deep-bottom fishing grounds are often rough and anchors have a tendency to get stuck. Since there is no chance of diving down to free an anchor stuck at 300 m depth, deep-bottom fishermen use a specially made fishing anchor which will hold the boat under normal conditions, but whose prongs will bend when forced, freeing the anchor.

Bottom-fishing anchors are made from 10 mm dia. steel reinforcing rods, and are easy to fabricate. A typical anchor would be made from two 4-metre rods bent double and welded together as shown in the diagram, with the free ends being bent back to form the prongs. If welding gear is not available, the rods can be lashed together using monofilament nylon. Alternatively, they can be inserted through a length of galvanised pipe and a piece of wood knocked into the end to hold them in place. This latter system needs no welding or lashing, and adds weight to the anchor, which helps it hold.



A short length of chain prevents the anchor from lifting, and avoids chafing of the rope

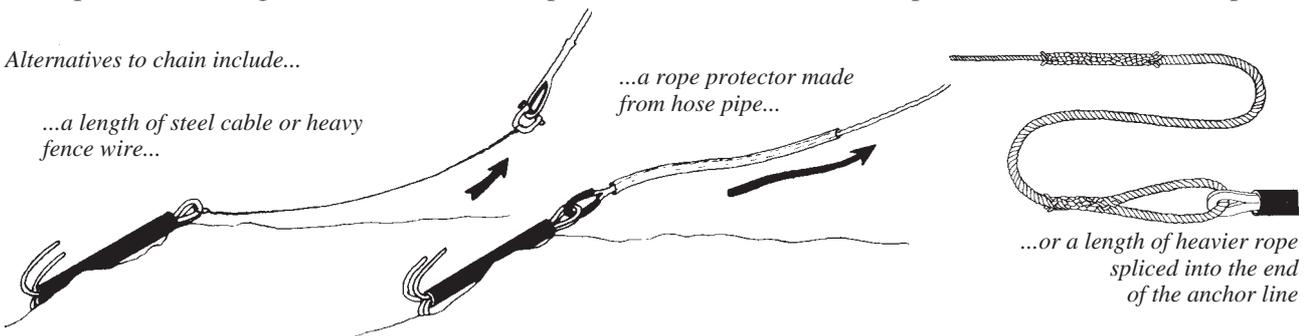


### Chain and rope

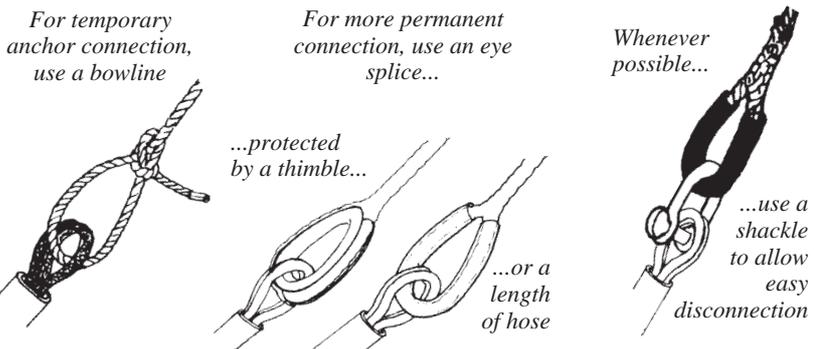
Fishing anchors should be connected to the anchor rope with 3–5 m of chain. The chain adds weight to the end of the anchor, preventing it from lifting when the boat pulls. It also stops the anchor rope from making contact with the sea floor and being cut on rocks or coral.

If chain is not available, a length of heavy cable or fence wire will help protect the rope, but will not add much weight. If neither is available, protect the rope by covering it with a length of rubber hose or plastic pipe. Failing that, splice a short length (2–4 m) of heavier rope onto the end of the anchor rope as an anchor attachment point.

Alternatives to chain include...



The rope should be connected to the anchor or chain using a bowline knot or, for a permanent connection, an eye splice, as shown in section 4D. If using an eye splice, protect the rope by putting a plastic thimble or a short length of hose into the splice. Where possible, place a shackle between the anchor and the rope or chain to allow easy disconnection when needed.

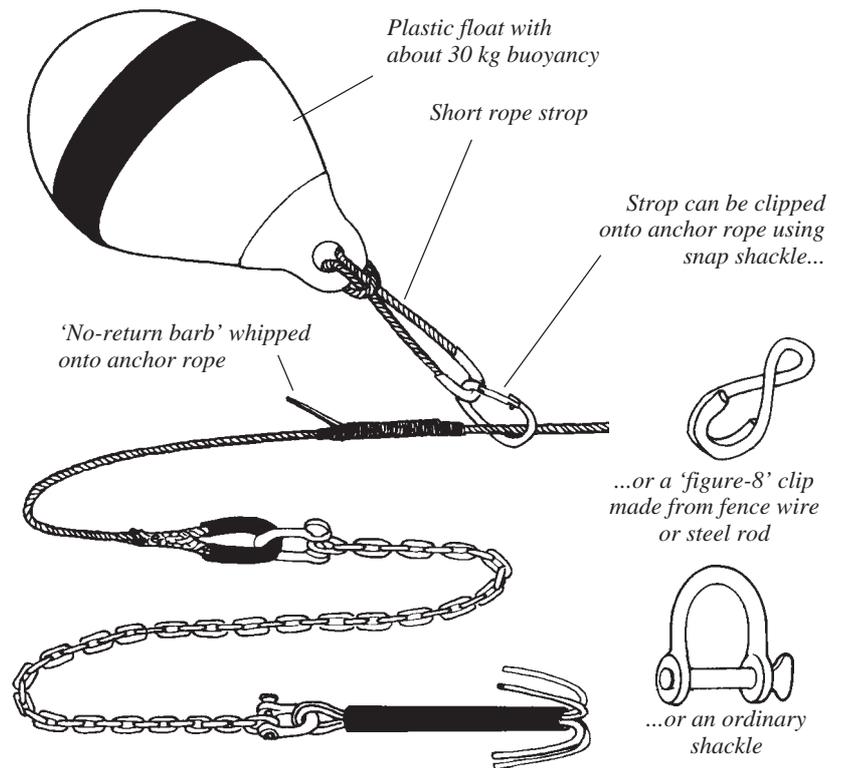


## Anchor hauling gear

Manually hauling a fishing anchor from great depths is back-breaking work. Fortunately there is a simple method of hauling using the boat's motor, provided that the anchor rope is correctly rigged in advance.

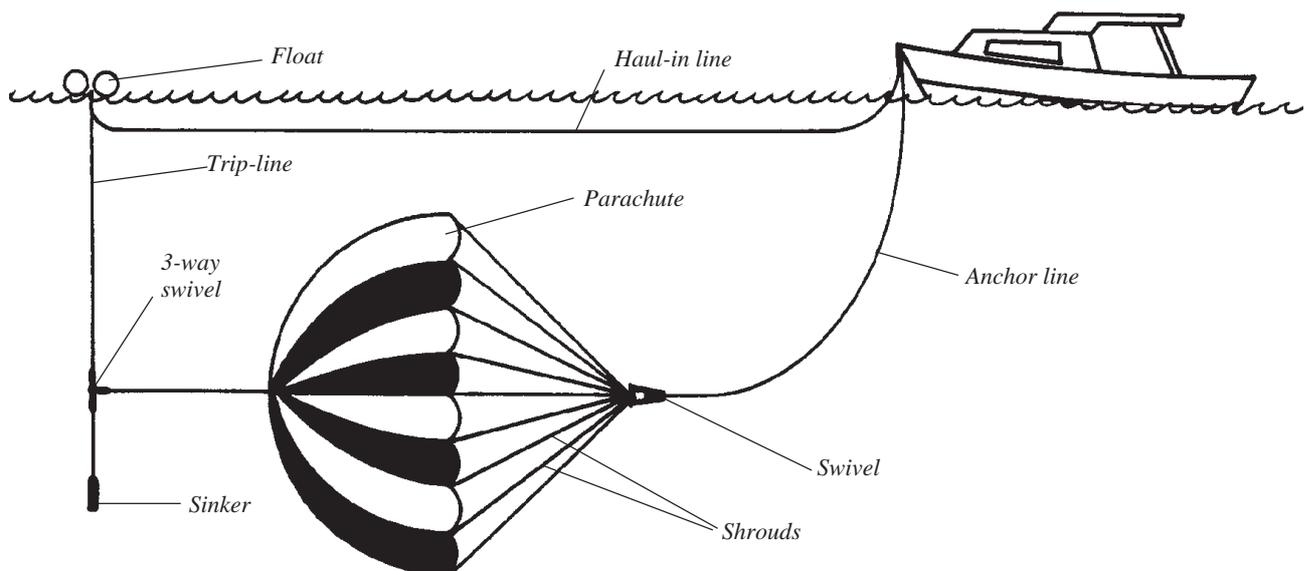
The details of the hauling method are given in section 4I. For it to work, the anchor rope has to have a 'no-return barb' whipped onto it using the method described in section 3D. The barb can be made from a 15–20 cm length of 3 mm dia. fence wire or similar material, and is attached close to the end of the anchor rope, as shown in the diagram.

Also needed are a float of 30 kg or more buoyancy (about 50 cm or more in dia.) on a short rope strop, and a shackle which is used to attach the strop to the anchor rope so that the buoy slides freely. An ordinary shackle can be used, but a snap shackle allows for faster connection and disconnection of the buoy. Alternatively, a simple 'figure-8' clip can be made from heavy fence wire or a light steel rod.



## Sea anchor

Sea anchors, or parachute anchors, are occasionally useful for deep-bottom fishing under the right combination of wind and current. They are also a very good safety feature, as they can be used to prevent a broken-down boat from drifting too far while waiting for help.



Sea anchors can be of various kinds. Purpose-built models are available commercially, and these consist of a cone made from strong synthetic cloth, and fitted with shrouds made from webbing similar to that used in car seat belts. In locations where there are military surplus stores, second-hand cargo parachutes can be purchased. Alternatively, an enterprising fisherman can improvise a sea anchor from a sheet of canvas or tarpaulin and some rope. The use of a sea anchor is discussed in more detail in section 4J.

## SECTION 3F: ECHO-SOUNDERS

An echo-sounder is an electronic device which uses sound to measure the depth of the water below the boat. Echo sounders comprise two main components: the **display unit** and the **transducer**

The **display unit** is usually mounted in the vessel's wheelhouse or other convenient location, and shows a continuous depth readout once the sounder is switched on. Older units generally displayed the depth by making a trace on a slowly scrolling roll of paper, which was convenient because the paper rolls could be kept for reference. Newer units often have a liquid-crystal display (LCD) which replaces the paper roll, or a cathode-ray tube (CRT, similar to a TV screen) with a multi-coloured display that indicates not only depth but also bottom type, water temperature and other features. Although these units have a certain amount of internal memory, which allows recent soundings to be reviewed, this is normally limited and they must generally be linked up to a videotape recorder or computer if a permanent record of the soundings is to be made.

The **transducer** emits and receives the echo-sounder's signal. It is fixed to the boat below the water line, and is connected to the display unit by a length of shielded cable which transmits data back and forth between the two components. The cable itself is calibrated to the sounder's data transmission needs and should never be shortened or extended. If this is done the sounder will give false readings (or none at all).

*A modern LCD echo-sounder*

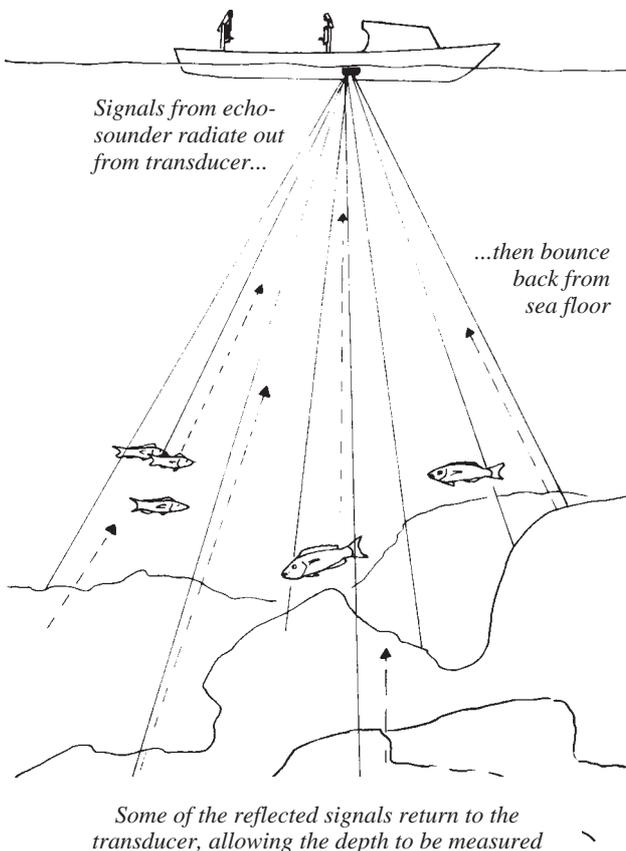
*Digital depth readout*

*LCD display*

*Magnified bottom image*



*Echo-sounder operation*



Transducers operate by emitting bursts of low-frequency sound, which is usually hardly audible to the human ear but which is conducted strongly over long distances in water. The sound is reflected from any surfaces it encounters, including the sea bottom, fish, plankton, suspended particles in the water, and even temperature discontinuities where the density of different layers of water changes. The reflected signals bounce back to the transducer which detects their strength and transmits this information to the display unit. By computing the time between transmission and bounce-back, the echo-sounder measures the distance to the source of the reflection and posts this information on the display.

A sounder's depth rating depends on both the power of the signal emitted by the transducer, and the frequency of the sound used. The more powerful the signal and the lower the frequency, the greater the depth rating. For deep-bottom fishing, a 50 kHz transducer will allow the greatest depth penetration, while a 200 kHz transducer will be suitable if fishing is mainly in shallower waters.

Most sounders run on 12 or 24-volt direct current which can be delivered from the vessel's electrical power system. On a small boat without an electrical system, power can be provided by carrying one or two well-charged car batteries.

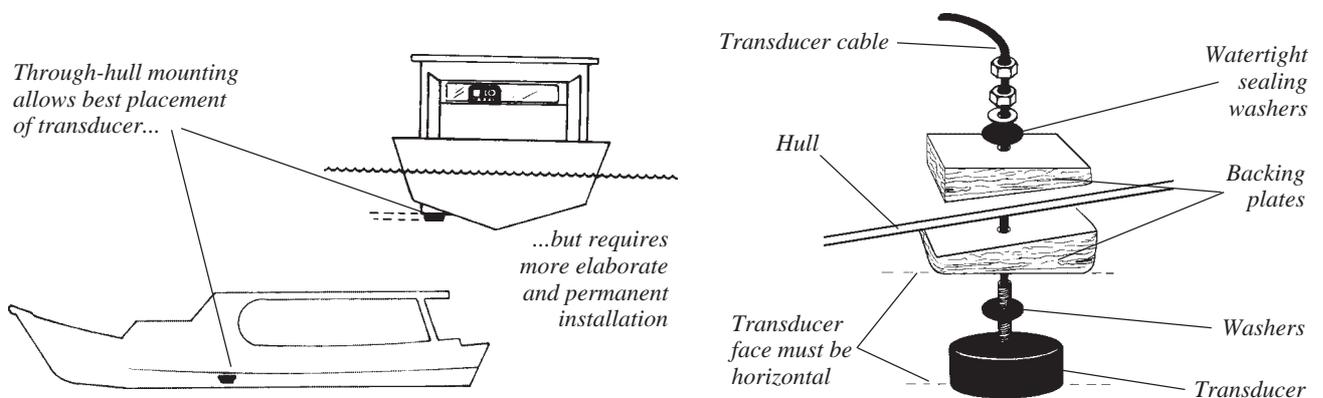
## Transducer mounting

The recommended location for the transducer is one-third of the vessel's length back from the bow. When the echo-sounder is mounted it is very important that the surface of the transducer should be horizontal. If the transducer is mounted at an angle the sensitivity to signals bouncing back from the sea floor will be reduced, while sensitivity to scattered signal reflections will be increased, affecting the clarity of the display. The normal rolling of the vessel will also change the transducer angle and contribute to reduced sensitivity so wherever possible the transducer should be positioned to minimise the effects of vessel roll.

## Permanent mounting

Through-hull mounting requires the vessel to be pulled out of the water so that a hole can be drilled through the hull and the transducer permanently set in the desired position. This is normally the best way to mount a transducer because it allows positioning away from sources of interference (other shipboard electronics, engine and propeller noise, bubbles, etc.). However once the transducer is mounted in this way, removing it or relocating to another part of the vessel, or to another vessel, becomes a major headache.

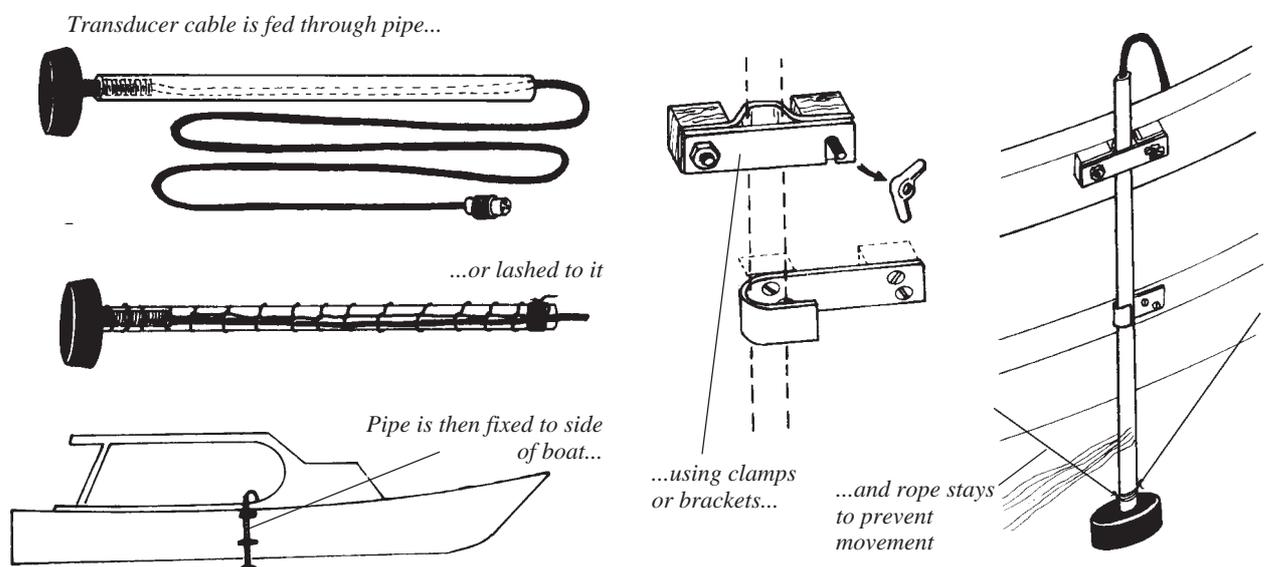
### Permanent echo-sounder mounting



## Temporary mounting

This is an option which allows the echo-sounder to be moved from boat to boat if necessary, and which avoids complicated installations, vessel haul-outs and the drilling of holes through the hull. A suitable temporary mounting involves fitting the transducer to the end of a length of aluminium or, as a second choice, steel pipe which can then be lashed to the vessel's gunwale or fixed in pipe clamps attached to the vessel's sides. Various options may be possible depending on the vessel's size and shape. The main requirement is to get the transducer well below the water surface where it will not be affected by bubbles, and to ensure it is mounted so that the transducer face is horizontal.

### Temporary echo-sounder mounting



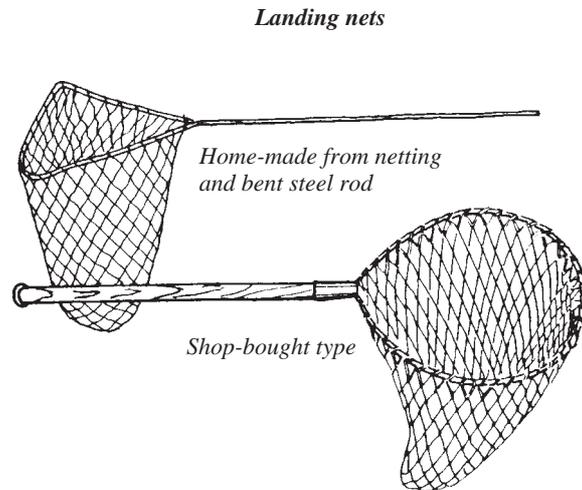
## SECTION 3G: FISH LANDING TOOLS

The time when a hooked fish is most likely to break loose or become unhooked is the moment when it is being hauled from the water into the boat. Fish landing tools are used to reduce this risk.

### Landing nets

Landing nets are most suited to small fish (5 kg and under). Netting small fish is much more appropriate than gaffing them, and causes less physical damage. This is especially important when the catch is to be exported (see section 5B).

A landing net can be bought, or made by tying a piece of netting onto a stiff frame of wire, metal rod or piping. The netting should be knotless if possible and of small mesh size to avoid tangling the fish. A triangular frame is the easiest to construct and use. The frame should be lashed onto a strong handle. Handle length is normally between 50 and 200 cm, depending on the height of the boat above the water.

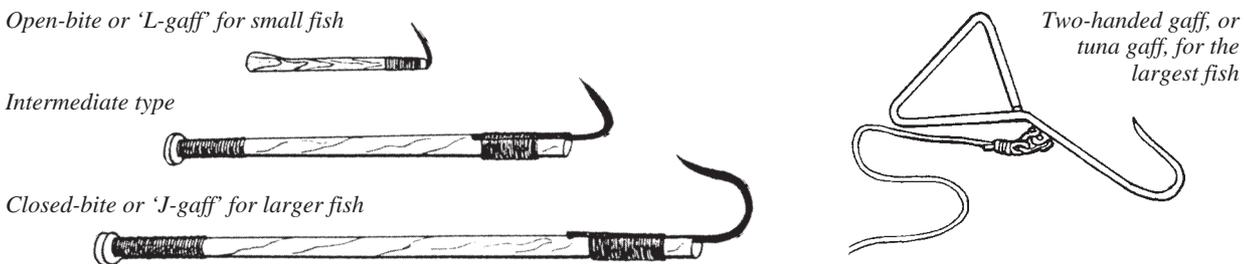


### Gaffs

Gaffs are used for bigger fish. They require more skill on the part of the user, and result in damage to the fish, particularly if badly handled. They can also be dangerous.

The two main types are the 'L-gaff' and the 'J-gaff', which have different shapes. Their actions are shown in section 4H. A small gaff with a wide-angled bite is good for smaller-sized fish. A larger gaff with a narrower-angled bite is more common and is better for larger, heavy fish.

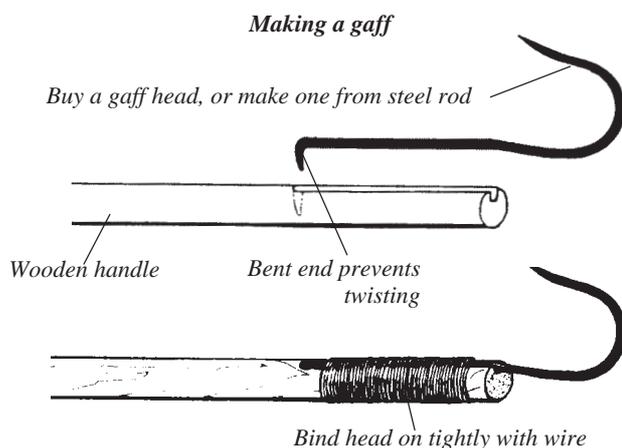
*Types of gaff*



For very heavy fish which have been played to exhaustion, a double-handed gaff enables the fisherman to put all his energy into heaving it aboard. These are specialised gaffs not found on most general fishing boats.

### Making a good gaff

The gaff head is usually bought ready made but can be home-made if necessary by bending and filing a stainless steel or other metal bar. On many commercially made heads, the bite is too small, and needs to be bent further open for normal commercial use. Make sure the base of the head shaft is turned over at right angles to prevent twisting. The handle is usually wooden, and should be grooved to accommodate the head shaft. Attachment is by tight binding, preferably using wire, which will not be cut by the sharp teeth of fish. The other end of the handle should be wrapped or wound with cord to ensure a good grip.

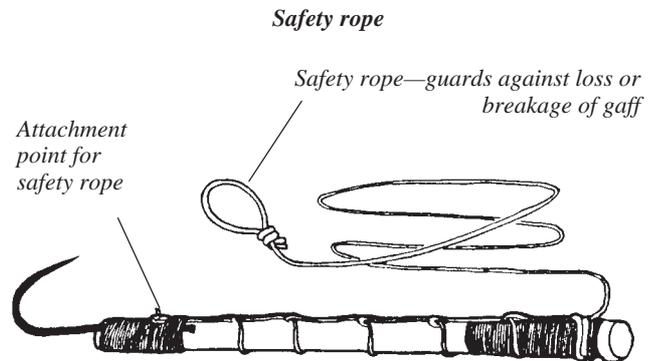


## Gaff handles

The length of a gaff handle depends on the normal distance between fish and fisherman at the time of gaffing. A long handle can be very dangerous if the fisherman loses his grip on it when gaffing a thrashing fish. In general, handles should be kept as short as is reasonably possible. Many boats carry both a long-handled and a short-handled gaff.

## Safety rope

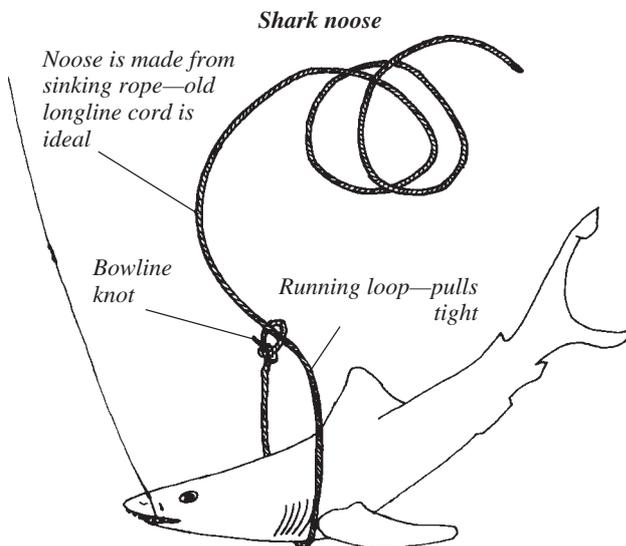
When gaffing large or violently fighting fish, it is useful to attach a safety rope which will prevent the fish escaping if the fisherman loses his grip on the gaff handles. The rope should be attached to the head end of the gaff, half-hitched along the handle, and tied off at the end. This will enable the fisherman to regain control of the gaff handle if he loses his grip on it while gaffing a thrashing fish, and will prevent the loss of the fish and the gaff head if the handle breaks. The other end of the rope should be tied to the boat.



## Gaff points

Most gaffs are barbless in order to prevent excessive damage to the fish. The main exceptions are certain two-handed tuna gaffs (see opposite page), which often have a barb to reduce the chance of the fish leaping off the gaff. However barbed gaffs will cause extensive damage to the flesh of the fish, and should be avoided by commercial fishermen wishing to produce a good-quality product. In any case, most of the fish caught when deep-bottom fishing are relatively subdued by the time they have been hauled up from a depth of 300 m or so, and are rarely energetic enough to leap off the gaff.

The point of the gaff should be sharpened regularly, following the instructions for sharpening hooks given in section 5D.

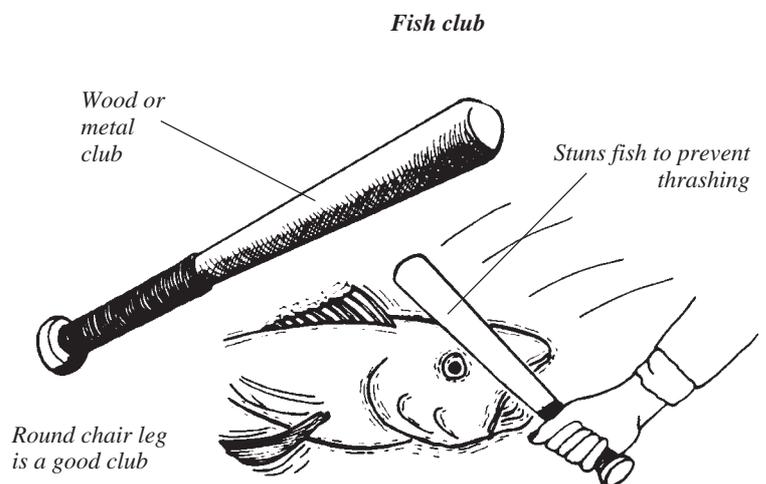


## Shark noose

This is a simple length of strong rope which should preferably sink, and be hard-laid. Ordinary 6 mm Kuralon longline cord is ideal. The rope is usually passed around the fishing line on which the shark is hooked, made into a noose by use of a bowline or similar knot (see section 3D), then manoeuvred around the shark's body and pulled tight.

## Fish club

This is used to subdue violently active sharks or other fish once they are in the boat. A good club is about 40 cm long and 5 cm in diameter at the business end, made of heavy wood and having a handle lashed with cord to ensure a good grip. An old chair leg will often be found suitable.





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CHAPTER 4

***FISHING OPERATIONS***

|    |                                |    |
|----|--------------------------------|----|
| A. | CHOOSING THE FISHING GROUND    | 52 |
| B. | FISHING INSIDE THE REEF        | 53 |
| C. | FISHING OUTSIDE THE REEF       | 54 |
| D. | CHECKING THE DEPTH             | 56 |
| E. | ANCHORING UP                   | 58 |
| F. | POSITIONING THE BOAT AT ANCHOR | 60 |
| G. | HOOKING AND HAULING FISH       | 62 |
| H. | BOATING THE FISH               | 64 |
| I. | HAULING THE ANCHOR             | 66 |
| J. | DRIFTING WITH WIND AND CURRENT | 68 |

## SECTION 4A: CHOOSING THE FISHING GROUND

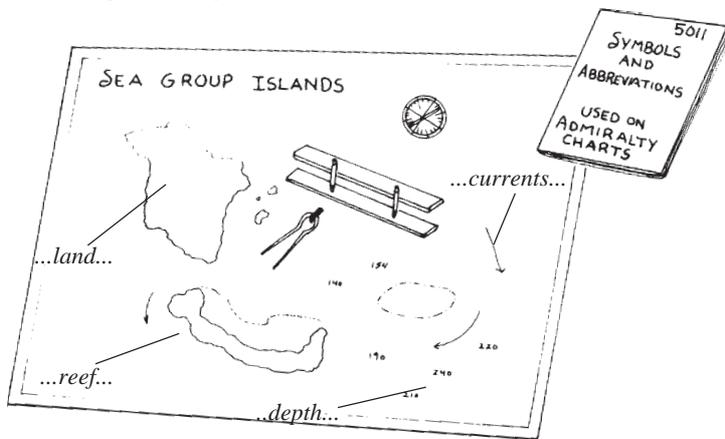
The fishing trip should always be planned ahead, so that the fishing area chosen allows the fisherman to take advantage of the weather, sea condition, tide and seasons.

### Using charts

Many fishermen already have their favourite fishing spots and can navigate to them using some of the techniques described in section 1C. For those wanting to scout out new grounds or explore unknown areas, marine charts exist for most locations in the Pacific. Some areas are covered in a lot more detail than others, but in all cases charts give information on the locations of reefs and islands, depths, and sometimes currents. This information can be used by the fishermen to pick promising spots. Always consult charts before setting off, and take them with you on the boat in case the weather or other fishing conditions change. Your nearest Fisheries office, marine department, navy base or coastguard station can help you obtain charts of your area.

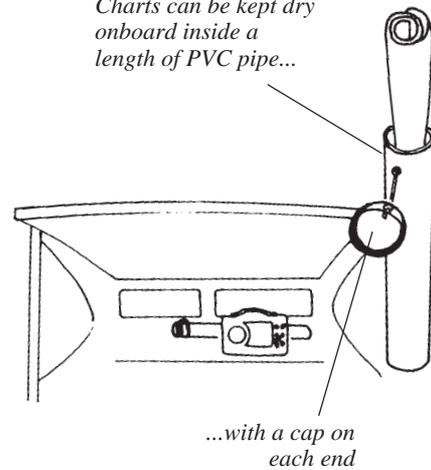
*Use marine charts on shore and on the boat*

*A marine chart provides information on...*



*...and many other things useful to a deep-bottom fisherman*

*Charts can be kept dry onboard inside a length of PVC pipe...*



The soundings on a marine chart give information on the water depth, the steepness of the slope of the sea floor, and whether the bottom is rough and craggy or smooth and even. This information allows the fisherman to guess at possible good fishing sites, which he can then check out more thoroughly using an echo-sounder, or by actual fishing. More information on understanding echo-sounder readings is given in section 4D.

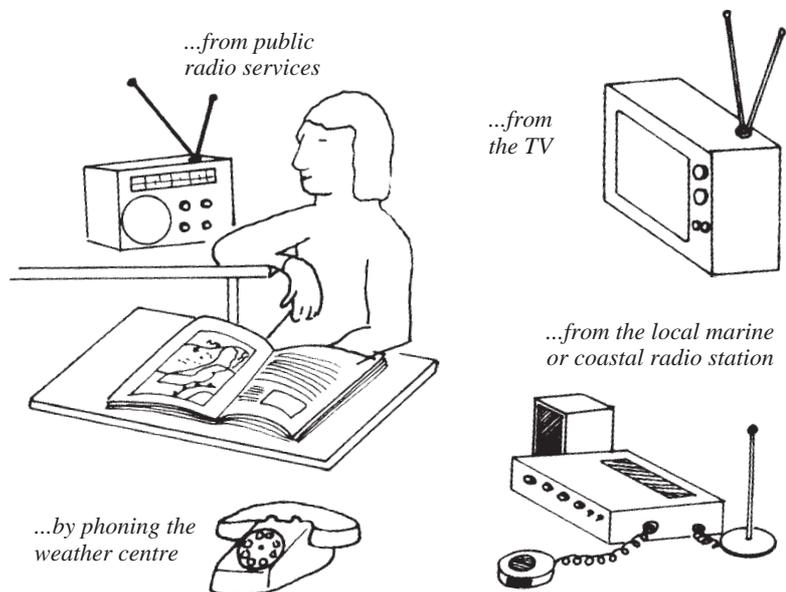
### Allowing for the weather

Always check the weather before going fishing. Try to get the latest weather forecast from the radio or newspaper. Plan to fish in a location which will give you shelter from the prevailing wind, and which allows you to run to safety if the weather worsens.

### Wind

If the wind is blowing more than about five knots it will be the main factor controlling the position of the boat while fishing at anchor. Plan your fishing trip so that you can take advantage of the prevailing wind and use it to fish the depth or area you want. More detail on using wind and current to position the boat is given in section 4F.

*Before setting off, get the weather forecast...*



## SECTION 4B: FISHING INSIDE THE REEF

Bottom fishing inside barrier reefs is not really 'deep-bottom' fishing, since the water depth very seldom exceeds 100 m, and true deep-bottom species are not caught. Nevertheless, the same techniques can be used and will often give good catches.

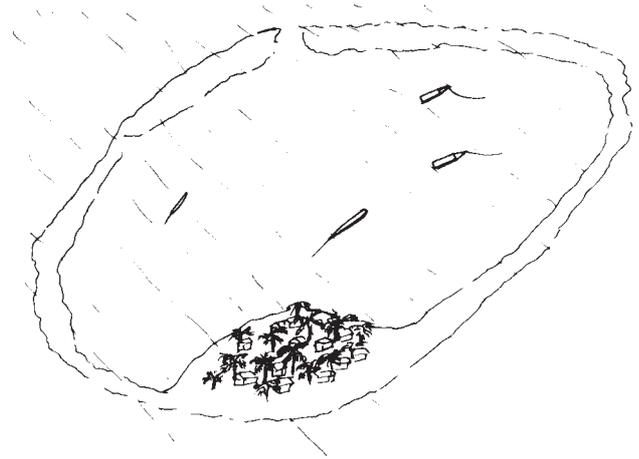
### Lagoon waters

Fishing in the waters of the lagoon has a number of attractions. It usually involves less travelling time, and allows a quicker run for home if the weather looks uncertain. Anchoring and fishing tend to be easier because of the shallower depths, and the fish caught are normally well known and acceptable among the local population. An experienced fisherman who knows the area can take advantage of spawning runs and other seasonal events to improve his catches.

However, there are disadvantages to lagoon fishing. In many areas, fishing pressure is heavy because most local fishermen fish in the lagoon. Fish tend to be smaller on average than those taken outside the reef. In some areas, certain species may be dangerous to eat or sell due to the possibility of ciguatera poisoning, particularly the larger fish, which may make up a big part of the catch weight.

Most of the catch when lagoon fishing will consist of small snappers, emperors and groupers, mainly less than 3 kg in weight. Although the odd bigger fish will also be caught from time to time, it is sensible to use fairly light gear when lagoon fishing so as to be able to catch the smaller size fish. Handlines of 50–70 kg test nylon monofilament, or a braided line of the same strength, are often more practical for shallow water fishing than handreels. A 25–50 kg test monofilament terminal rig with small-sized hooks, such as size 9 or 7 tuna circles, is good tackle for this situation. If small barracuda or other fish with sharp teeth start to bite off the hooks, then change to a similar strength terminal rig made from light cable. This will prevent gear loss, but the cable trace will probably catch fewer fish than the nylon.

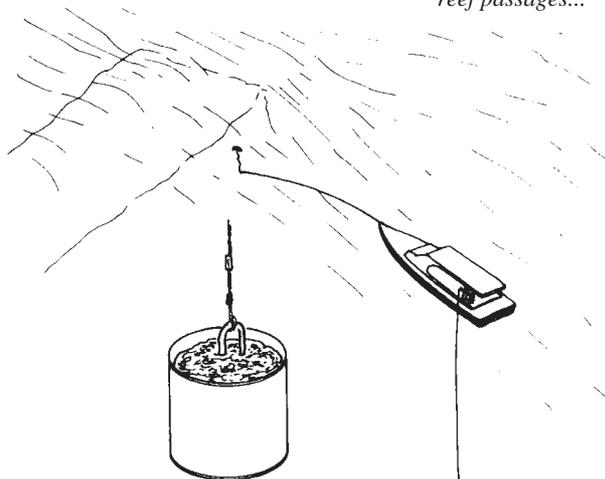
*Lagoon waters may be overcrowded with too many fishermen*



### Passes

Bottom fishing close to breaks or passes in the reef is a compromise between 'true' deep-bottom fishing, and lagoon fishing. The safety factor is higher inside the reef than outside, but larger fish, and species more normally found outside the reef, can often be caught. Ciguatera poisoning can still be a problem, particularly among the larger fish.

*Fishing in strong tidal currents close to reef passages...*



*...may need extra heavy weights to get the gear to the bottom*

When fishing in or close to passes, the catch will consist of some of the larger snapper, emperor and grouper species, the exact types depending on fishing depth and the distance from the true outer reef zone. Green jobfish are often caught in numbers in this zone, and so are some pelagic species, such as yellowfin tuna and Spanish mackerel, especially at night. Because of the presence of these larger fish, heavier gear is required for fishing close to passes. Cable terminal gear is normally used, 50–100 kg test and rigged with size 7, 6 or 5 tuna circle hooks or equivalent.

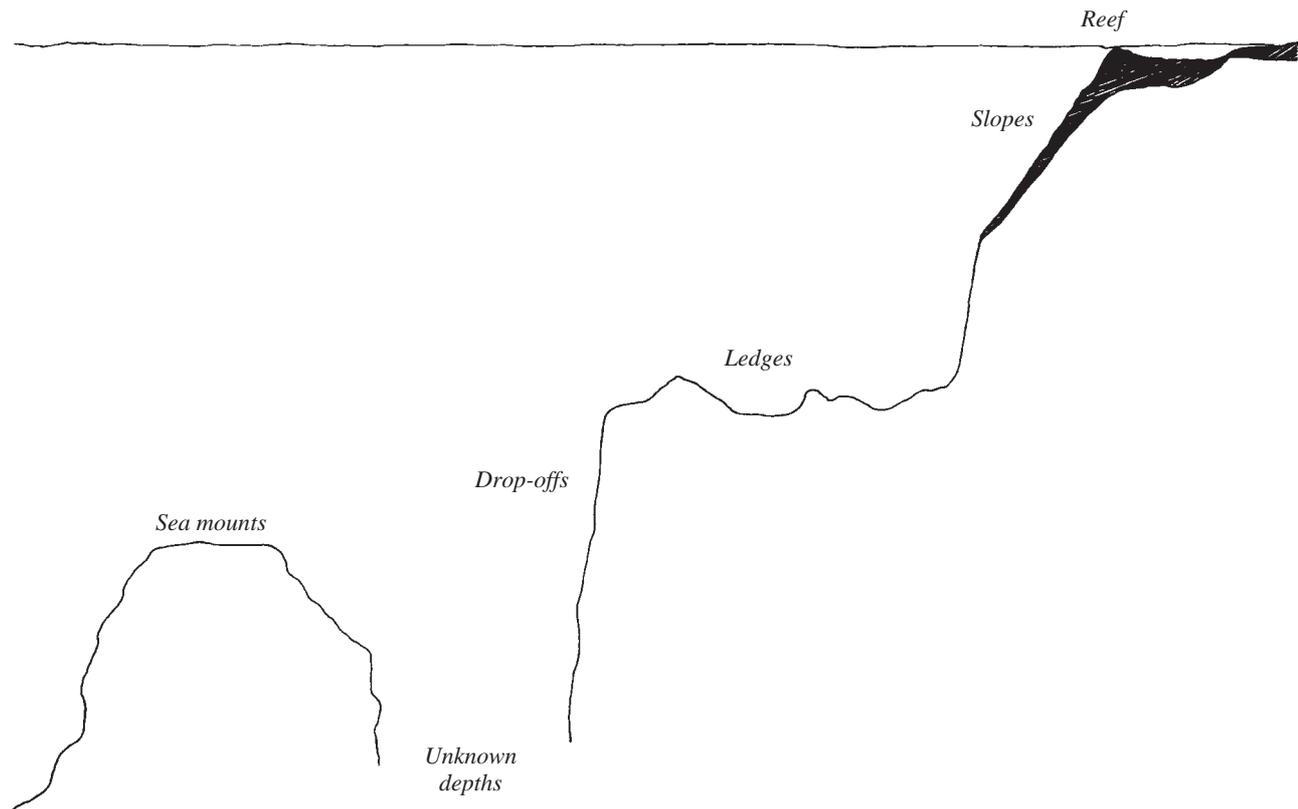
One problem with fishing close to reef passes is that tidal currents can be very strong and can make fishing difficult. It may be necessary to use extra heavy weights on the terminal rigs just to get the gear to the bottom in the face of the strong tidal flow.

## SECTION 4C: FISHING OUTSIDE THE REEF

'True' deep-bottom fishing takes place outside the barrier reef. Depths of 400 m or more can be fished and many of the species caught are found only below 150 or 200 m.

### The reef slope

Beyond the area where ocean swells break on the reef, the sea bed slopes down rapidly to the ocean floor, which may be many hundreds or perhaps thousands of metres deep. The slope is generally not so steep closer to the surface, but changes to a steeper gradient at a depth often around 80–100 m. Below this depth the slope may be almost vertical or it may be relatively gradual, with ledges or areas of even depth. The sea floor may be smooth and sandy or muddy, or it may be rocky, or very rough, with underwater hills and valleys.

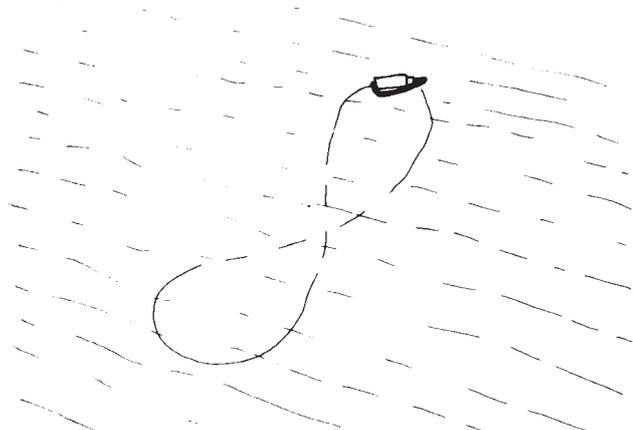


Deep-bottom fishing covers the whole range of the slope, from the upper levels of 40 m or less, to the maximum fishable depth, which under the right conditions may be up to 600 m (although more usually 400 m).

Usually the fisherman aims to fish a particular depth or depth range which he knows (or hopes) will be productive. To do this, he tries to anchor or drift so that the action of wind or current will keep his boat in waters of the desired depth (see sections 4F). Once there, fishing goes ahead but it is almost sure that the lines fish in a range of depths, as the boat swings on its anchor or drifts over bottom irregularities.

Fishing the reef slope, there is always the possibility of hooking very large powerful fish or those with sharp teeth. It is therefore usual to use terminal gear made from heavy cable, and medium to large hooks, at least when exploring new areas. In places where large or toothy fish are rare, smaller hooks and nylon traces can be used and these will generally be more effective than the heavier gear.

*When deep-bottom fishing, the boat almost always swings around....*

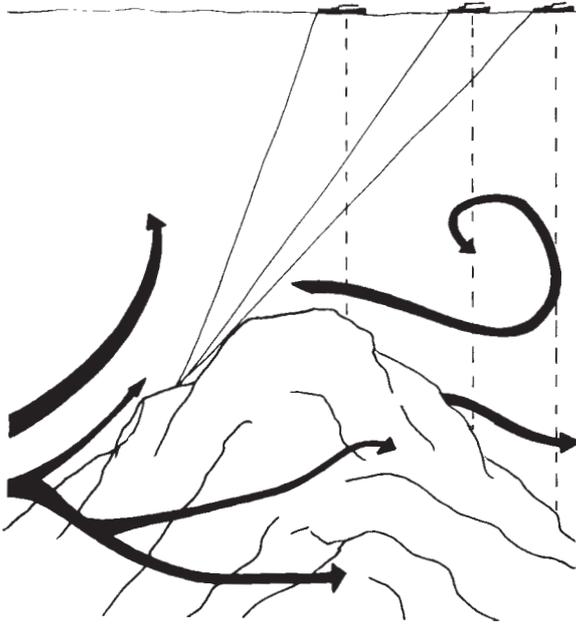


*...so the lines end up by fishing in a variety of depths*

## Sea-mounts

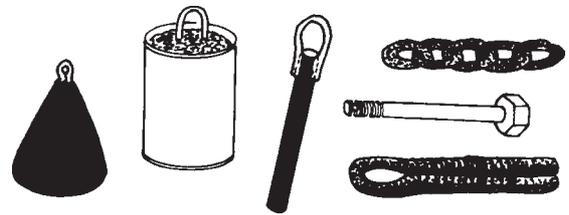
Sea-mounts are underwater banks or mountains, sometimes very large. Fishing these areas is the same, in principle, as fishing the reef slope. The main difference is that, since there is no emerging reef or land, it is easier to take advantage of wind and current to anchor in a place that will allow the boat to drop back onto the desired fishing depth.

*Currents over and around seamounts can be strong and complicated.....*



The species of fish caught will depend very much on the fishing depth, the sea bed type, the slope of the sea floor, and other factors. The species composition of the catch from two apparently similar seamounts can be quite different, even when they are close to each other. Fishing itself sometimes has a rapid effect on the fish population on seamounts, with changes in the species composition being noticed once the seamount is found and becomes more heavily fished.

Currents over and around sea-mounts can be very strong and complex. Extra heavy anchoring gear and heavy fishing weights may be needed to overcome their effects.

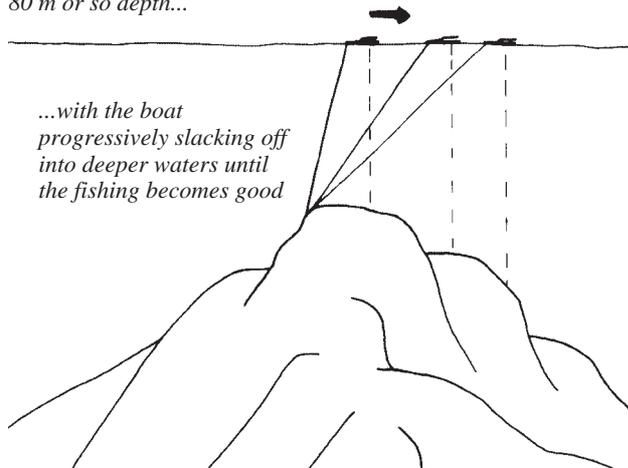


*...and may dictate the use of extra-heavy fishing weights*

## Fishing depth

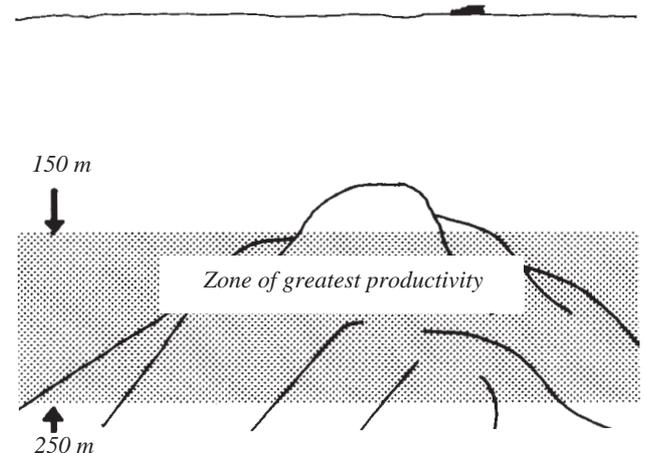
In general, when exploring a new fishing area, it pays to anchor in relatively shallow water and start fishing somewhere around the 80 m mark. Fishing is easier in shallower water, and if you can catch enough fish there, then there is no need to take on the extra work of fishing deeper. If this zone does not seem to be productive, the anchor rope can be slacked off, allowing the boat to move to a deeper area. In this way the fisherman can work deeper bit by bit until the fishing is good.

*Normally fishing starts in 80 m or so depth...*



*...with the boat progressively slacking off into deeper waters until the fishing becomes good*

*The most productive zone is normally from 150–250 m*



The most productive fishing depth in many locations lies somewhere between 150 and 250 metres, although good catch rates may be taken outside this range. Generally speaking, there are greater numbers of smaller fish in the upper parts of the fishable depth range, with smaller numbers of larger fish in the deeper parts. For this reason, it is usual to use larger hooks when fishing deeper. The best fishing depth depends on the location and the type of fish you want to catch. Section 4F gives more information on how to get yourself into the right fishing depth.

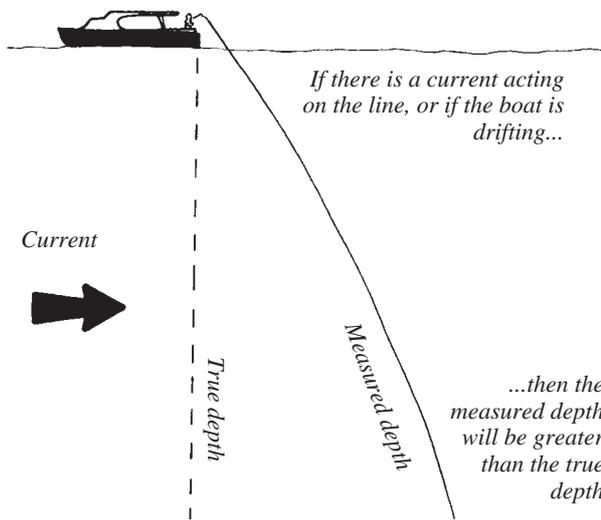
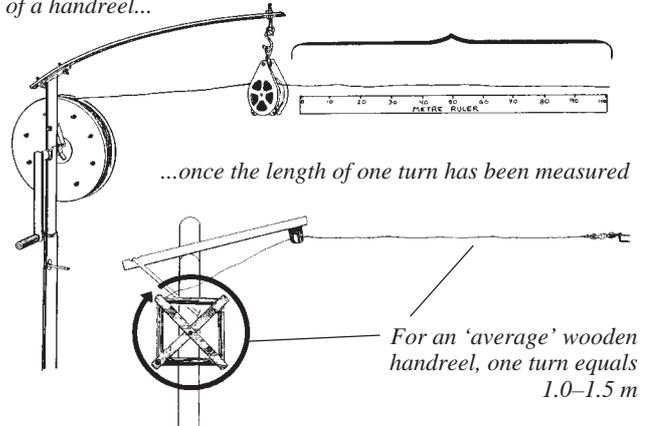
## SECTION 4D: CHECKING THE DEPTH

It is important to have a good idea of the depth when anchoring up to start fishing, and to keep a close watch while the fishing continues. In this way the fisherman quickly discovers which are the most productive fishing depths, and can return if the boat drifts into the wrong depths.

### Using handreels

If the boat is equipped with fishing reels of any kind, the fishing depth can be measured by counting the number of times the reel turns before the sinker hits bottom. You need to know how much line the reel takes up or pays out each turn. This can be easily measured by just unwrapping one turn and measuring it with a tape measure one day while on shore. Most wooden handreels take up between 1 and 1.5 metres per turn. To estimate the depth just multiply the number of turns needed to touch bottom by the length of one turn.

Depth can be estimated by counting the turns of a handreel...



### Allowing for current

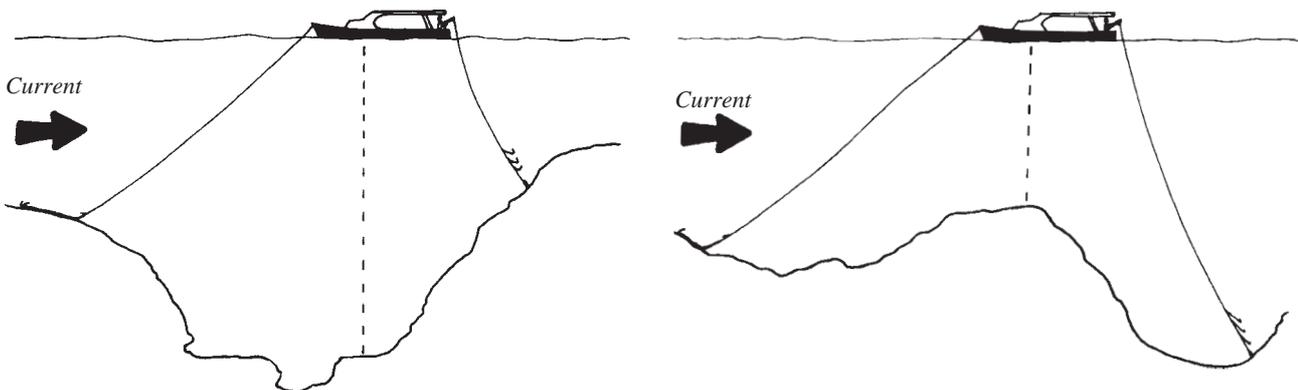
When using any type of line to measure the depth, the current will act on the line to pull it away from the vertical. This means you have to pay out extra line to allow for the current. If the boat is swinging or drifting, this may add further to the amount of extra line you have to pay out. Especially when drift fishing, or in a strong current, the line may hang in a curve, making it hard to judge the angle of the line, or the water depth.

When estimating depth using a fishing line, therefore, remember that the true depth cannot be any greater than the measured depth, but may be less, possibly by a great deal. If the fishing line is at a 45° angle to the vertical, then the true depth will be only 70% of the measured depth. The nearer the line is to the vertical, the less will be the error.

### Rugged bottom

Using fishing lines to measure depth can also give a false reading if you are fishing over a sea floor that has a lot of vertical relief. Depending on the seabed shape, the boat could be anchored in one depth, lying in another, and fishing in a third. The effect of current and vessel swing on the fishing line makes it very difficult to estimate the true fishing depth under these circumstances.

The shape of the seafloor can affect the depth estimate...



...in these diagrams anchoring depth, depth under boat, true fishing depth, and measured fishing depth are all different

## Echo-sounder

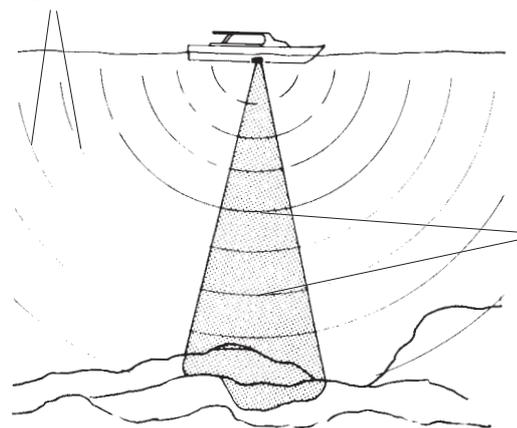
The best way of all to measure depth quickly and accurately is to purchase an echo-sounder. Unfortunately, the cost of echo-sounders suitable for small boats in Pacific locations is quite high (up to 1,000 US dollars or more, depending on model, exchange rates, local import duties, etc.). This puts them out of the reach of many fishermen. However, for the commercial operator, an echo-sounder is a valuable asset which soon repays the owner's investment in fishing time gained.

Section 3F provides basic information on echo-sounders. Knowing a little about how the echo sounder signal 'reads' its target helps the fisherman get the maximum information from the depth display or paper trace.

### The signal

The sound signal travels out from the transducer in all directions. In order to avoid receiving unwanted echoes coming back from all these directions, the transducer is focussed so as to receive mainly those echoes coming more or less vertically upwards from the sea floor. The transducer's sensitive zone takes the shape of a cone whose angle is usually around  $20^\circ$ , although this varies between echo sounder models. The sounder therefore picks up mainly those echoes which are bounced back from within its cone of sensitivity.

*Signals go out in all directions, and return as echoes...*

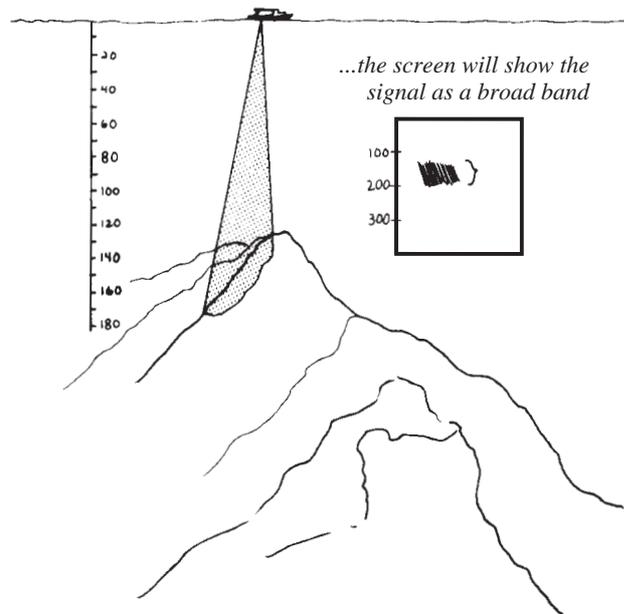


*...but only those within the sounder's cone of sensitivity will be registered*

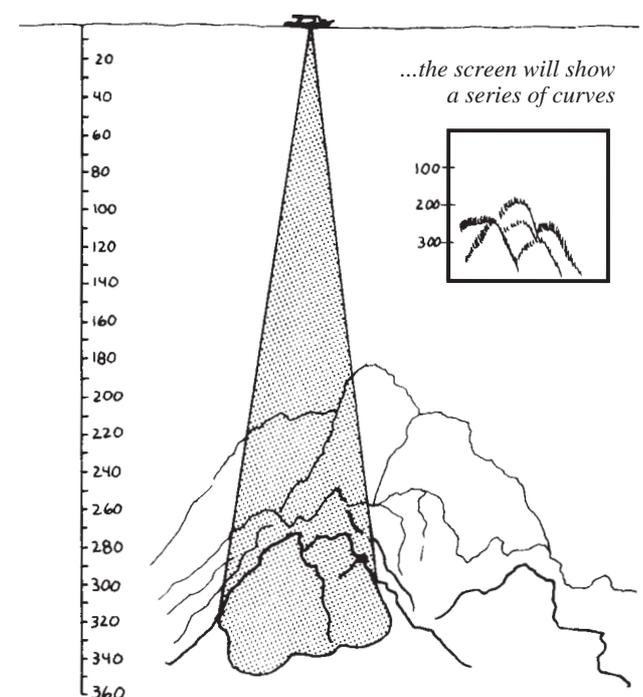
### Steep or irregular bottoms

If the seabed is very steeply sloping there may be depth variations inside the area of the cone. In this case, the echo from the shallowest depth will be received first, and those from the deepest part last. The result on the display screen is a closely grouped series of signals, which may merge into a single thick band, which indicates the depth range within the cone.

*On a sloping seafloor...*



*On a very irregular seafloor...*



If the bottom is very irregular, there may be great depth variations inside the cone area. This is particularly true in deep water, where the area covered by the cone is greater than in shallower water. In this case, individual peaks and troughs inside the cone may be detected separately by the sounder. On the display screen this results in a series of curves at widely spaced intervals.

## SECTION 4E: ANCHORING UP

The chosen fishing grounds are located using charts, depth soundings, landmarks and bearings, or your own experience. Once there, the first job is to anchor up ready for fishing.

### Allowing for wind and current

By anchoring upwind or up-current of the chosen fishing spot, the wind or current can be used to carry you back over it. You therefore have to decide which of these two forces is going to have the greatest effect on your boat.

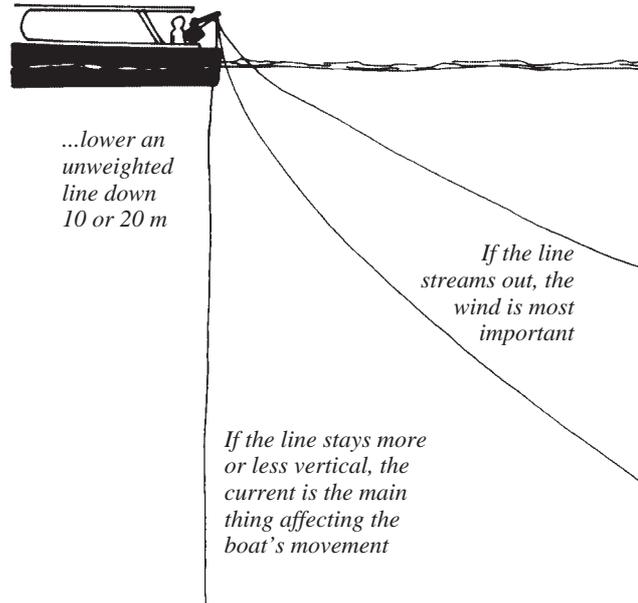
If the wind is blowing more than about 10 knots, it will almost certainly affect you more than the current. If the wind is less than this, then either one could be more important, depending on the current strength.

To estimate the effect of the current, lower one of your fishing lines 10–20 m (10 turns of the handreel) down over the side, with just the swivel or clip normally used to attach the terminal rig, but no additional weight, while drifting.

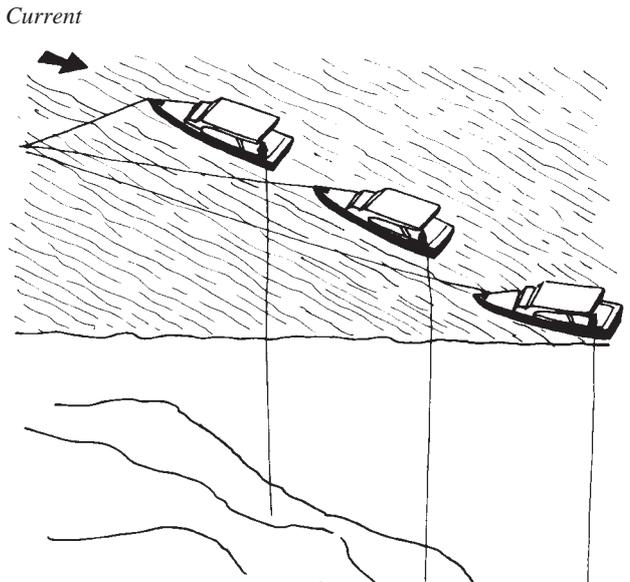
If the line goes more or less straight up and down, you are drifting with the current. This means the current is the main thing controlling your movement, so you should plan to anchor up-current of the fishing spot. The current direction can normally be seen from the direction of the boat's drift, as well as the fact that the line will never be quite vertical but will hang at a slight angle, in the down current direction.

If the fishing line hangs out from the boat at a fairly steep angle, this means that the wind is the main thing controlling your movement, so you should plan to anchor upwind of the fishing spot. However, the current may still affect your position, and it is wise to allow for this by heading slightly up-current too.

To test the influence of wind and current on the boat's movement...



When the current is the main factor controlling drift...



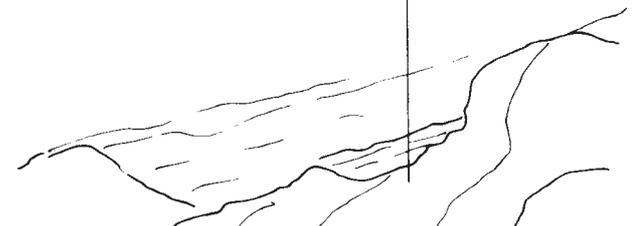
...head into the current, anchor, and then allow the boat to drift back as required

When the wind is the main factor controlling drift...



...head into the wind before dropping anchor...

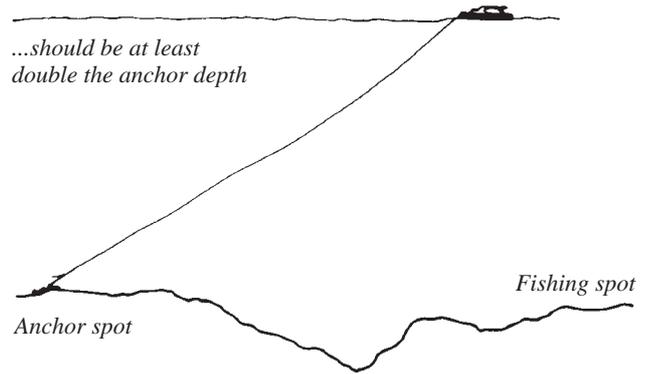
...but remember also to allow for the direction of the current



## Picking the anchoring spot

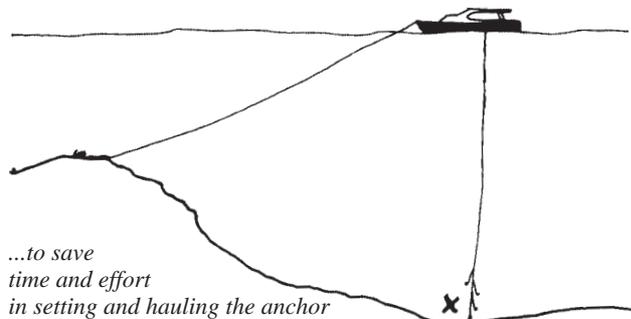
Once you have decided in which direction to go in order to anchor, head in that direction until you are a suitable distance away from where you want to fish. If you have an echo-sounder, run it as you move, to get an idea of the bottom shape and depth. The right distance depends on the anchoring depth. Plan to be at least twice as far from the fishing spot as the depth of the water you are anchored in, more in strong wind or current conditions. This allows you plenty of space to drop back on the anchor rope without overshooting the fishing spot. It also puts the anchor rope at a shallow angle and makes it less likely to pull out.

The distance from the anchor spot to the fishing spot...

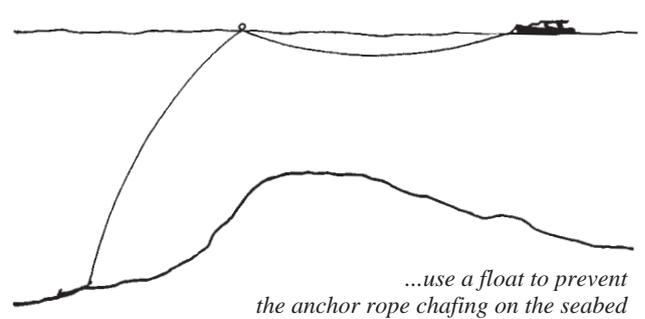


Whenever possible, anchor in water shallower than the fishing depth, so that less time and effort is required to set and, especially, to haul the anchor. If the bottom shape does not permit this, you may have to anchor in the same depth of water as the fishing spot, or even deeper. Whenever possible attach a float to the anchor rope once the anchor has settled, to make the job of hauling the rope easier. This is especially important when fishing in deeper water, to keep the rope off the bottom.

Always try to anchor in water shallower than the fishing spot...

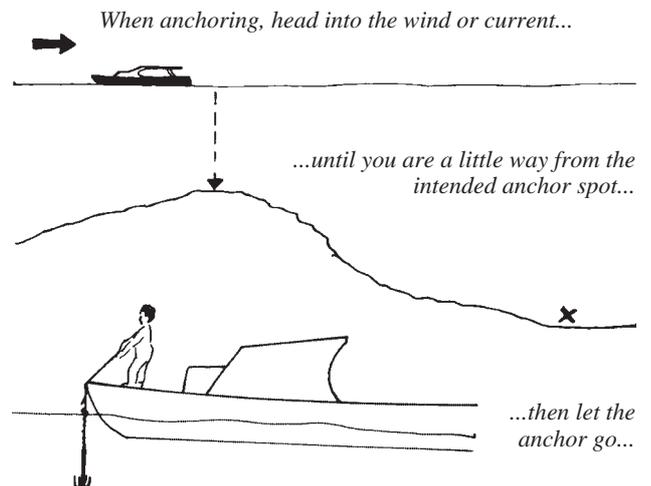


If anchoring deeper than the fishing spot...



## Anchoring procedure

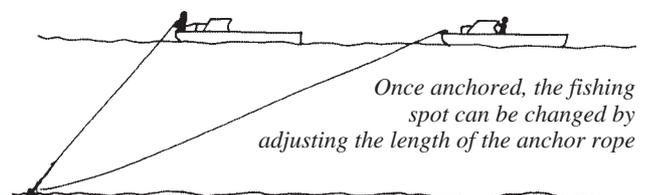
Normal anchoring procedure is to head slightly past the place where you will drop the anchor, into the wind or current. The anchor is then dropped, and by the time it hits bottom the boat will have been pushed back over the anchor spot.



The anchor and chain is lowered over the bow of the boat and then let go. One crew man should control the anchor rope as it runs out, preventing any tangles or knots from going over the side. If this does happen he should pull the tangle back in and free it, otherwise it will not be possible to haul the anchor by the labour-saving method shown in section 4I.



The rope will stop running out fast once the anchor hits the bottom. The anchor man should then hold on to the rope until it pulls fairly tight, then slowly pay out extra rope until the right fishing depth is reached.

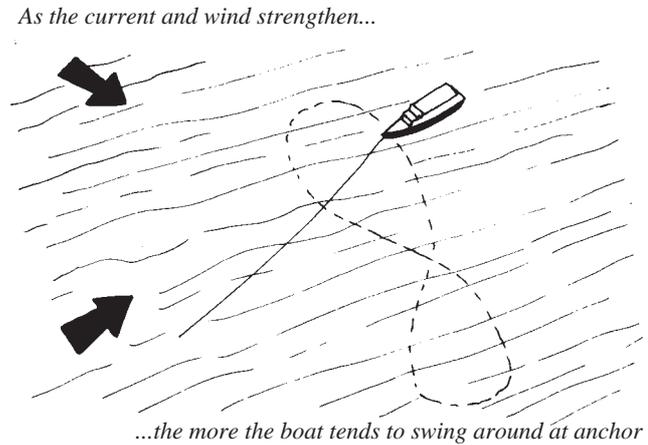
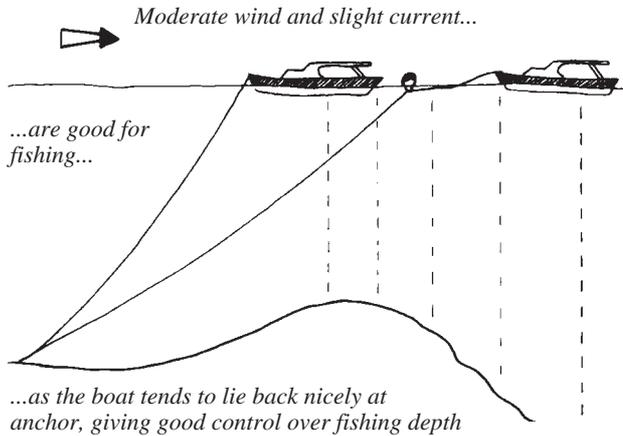


Once this happens, the rope is tied off at the bow of the boat, and fishing can start in earnest. If the fishing turns out to be no good, either pull in or let out anchor rope to change fishing spots, or haul the anchor and move.

## SECTION 4F: POSITIONING THE BOAT AT ANCHOR

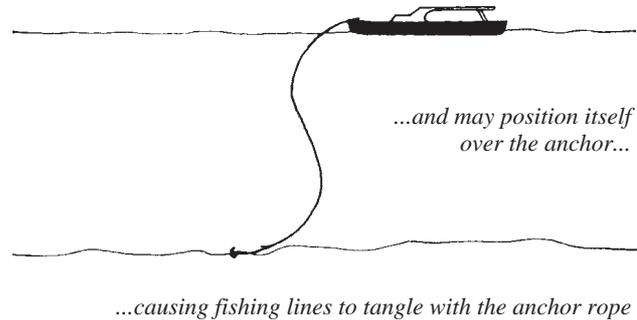
Both wind and current affect the way the boat will lie at anchor. The way in which a particular boat is affected will depend on its area above and below the waterline. It is important to allow for these forces so that the boat ends up resting over the area the fisherman wants to fish.

In general, if the wind is less than about 10 knots, and the current is weak, the boat will lie back at anchor in the wind. These are the best fishing conditions, because the wind can be used to control the fishing depth. The stronger the wind or current, the more the boat will swing around, in a figure-of-eight motion, through a range of fishing depths.



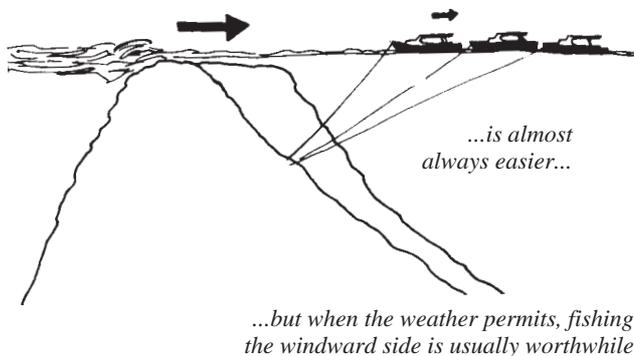
Weak winds and currents make anchoring easy but it may not be possible to use wind or current to push the boat back at anchor into the right fishing depth. Under these circumstances the boat may rest above the anchor spot, so that the fishing lines keep catching the anchor rope.

In weak winds and currents, the boat may not want to lie back over the fishing spot...



If the current is running along the reef, with flat calm weather or the wind blowing in the opposite direction then this is the ideal time to try drift fishing, preferably using a sea-anchor (see section 4J).

Fishing the leeward side of a reef or seamount...



### Fishing leeward and windward slopes

Except in flat calm weather, fishing in the lee of a reef is a lot easier than trying to fish on the windward side. By anchoring in the shallower water close to the reef, the wind can be used to carry the boat back towards deeper water. Slacking off more anchor rope allows the boat to fall further back, and increases the fishing depth. Fishing a leeward slope therefore gives the fisherman good control over his fishing depth, as well as making anchor hauling easier (see section 4I).

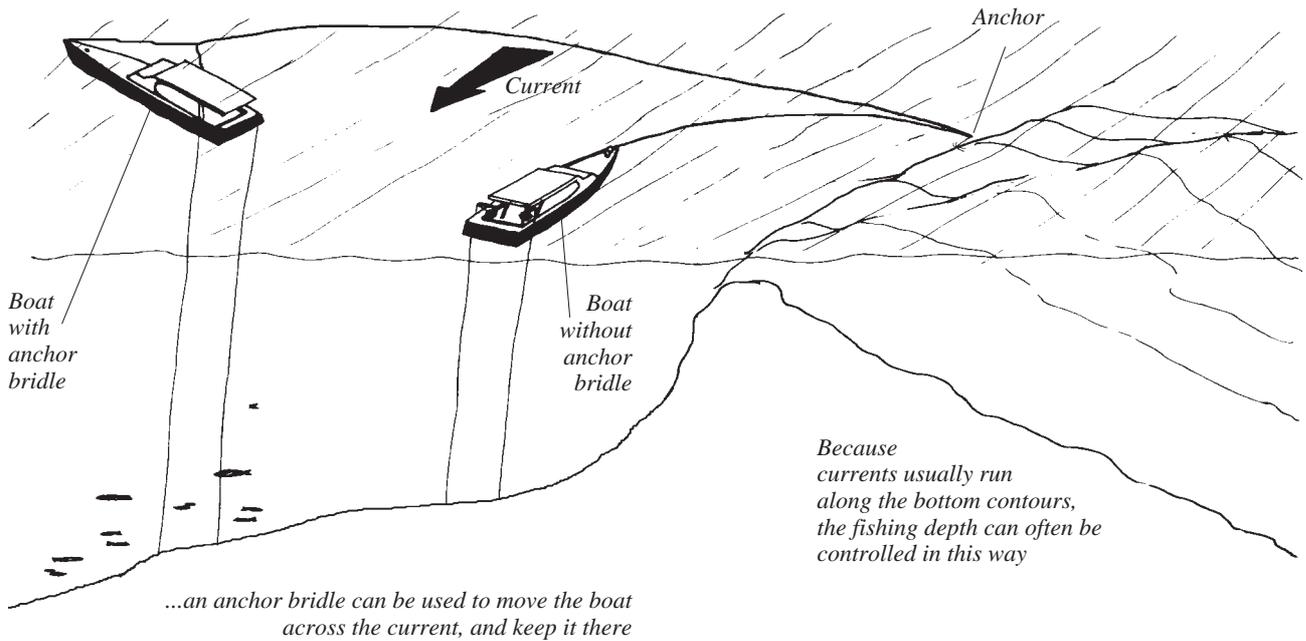
If there is little or no wind, or if the wind is not blowing in its usual direction, it may be possible to fish areas that are normally to windward. These areas often have steep slopes that make anchoring difficult, but fishing there is almost always worthwhile. Windward slopes are often more productive than leeward ones, and get fished less because the wind usually prevents fishing. So, on the odd occasion that fishing is possible, catches can be very good. Since fishing on these slopes is generally done when there is little or no wind, this is again a good time to try drift-fishing with a sea-anchor.

## Using an anchor bridle

If the current is stronger than about 1 knot, and the wind is less than about 10 knots, then the current will probably be the main thing controlling the boat's position. The boat will tend to hang back at anchor, but the combined effects of wind and current may cause the boat to rest at an angle to the anchor rope, making fishing awkward or uncomfortable.

Under these conditions, an anchor bridle can be used to help position the boat in the right spot. To use a bridle, the boat is first anchored as normal. A short section of rope is then tied between the anchor line and a strong point on the side of the boat, and tightened up. This has the effect of turning the boat side-on relative to the anchor, and the current. The current then acts on the side of the boat something like the wind on a kite, causing the boat to swing off to one side.

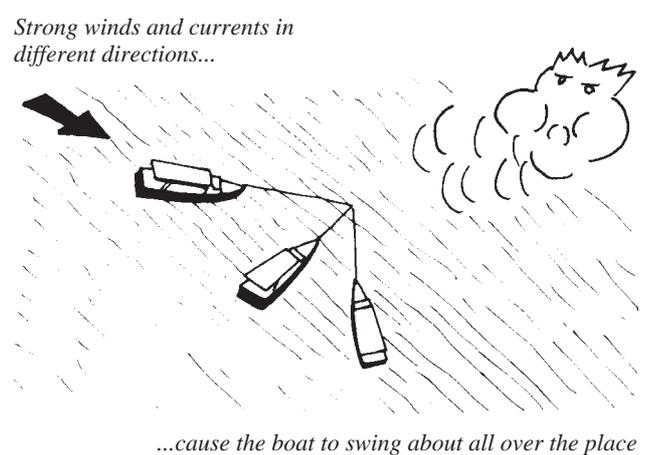
*When the current is the dominant factor affecting the boat...*



By adjusting the length of the bridle, and thus the angle of the boat to the current, the force of the current can often be used to manoeuvre the boat into the correct fishing depth. This can be especially useful when fishing on long, fairly straight stretches of reef-slope. In such situations the current usually runs along the reef, so fishing depth can be adjusted quite easily using this method.

## Strong winds and currents

When both the wind and the current are too strong, fishing can be difficult or impossible. If the current and wind are in the same direction, the anchor may drag or be repeatedly pulled out. If they are in different directions, the boat will swing a great deal, and it may be impossible to stay in the right fishing depth for any length of time. Strong currents can also prevent the fishing line from reaching the bottom.



## SECTION 4G: HOOKING AND HAULING FISH

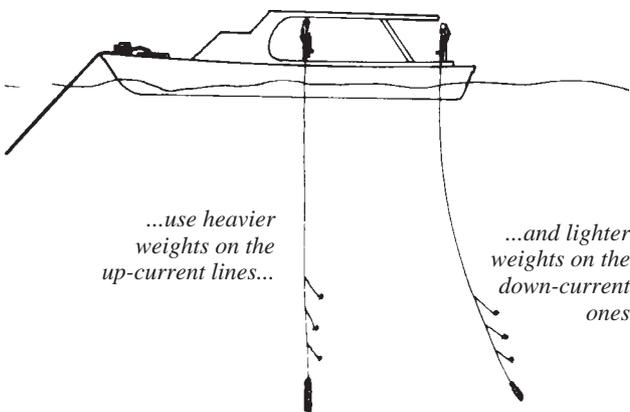
### Being prepared

Once the boat is at anchor, all the crew should be ready to start fishing straight away. In particular, all the gear should have been prepared, the bait cut, etc., on the trip out. Arriving at the fishing spot and then spending time preparing gear is a waste of precious fishing time. The only thing you should have to do before fishing is attach the terminal rig and sinker to the line and bait the hooks.

### Checking depth

At least one crewman should be given the job of depth checking each time he hauls up and resets his line. This is done by counting the turns on the handreel, as described in section 4D. This enables the crew to know what depths the boat is swinging about in, or whether the boat is dragging anchor into deeper water. Checking in this way should still be done even if you have an echo-sounder. The sounder only tells you the water depth under the boat. The lines may be fishing in a different depth altogether because of boat movement and current.

To prevent tangling...

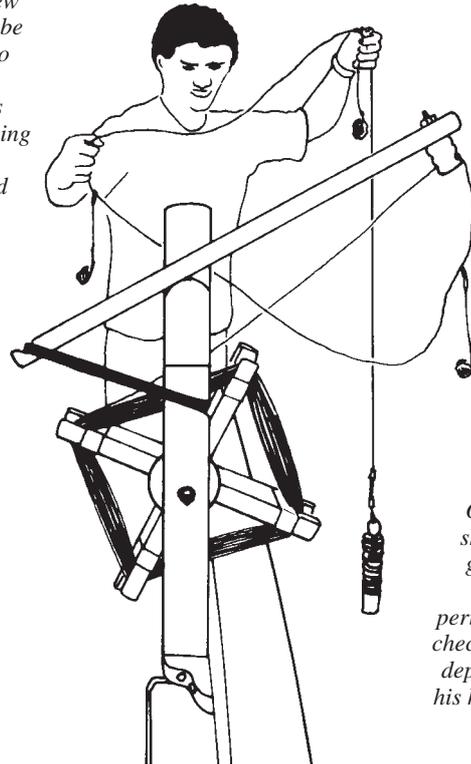


### Holding bottom

Once the sinker has reached the seabed, most of the weight will go off the line. If the fisherman continues to pay out more line, the terminal rig and slack line will sink to the bottom and may hook up on rocks and coral. Too much slack line will also prevent the fishermen from feeling when the fish are biting.

It is therefore very important to keep the line tight. In a big swell, this may mean repeatedly paying out and hauling in line as the boat rises and falls. This can be tiring and frustrating but is the only way to fish efficiently and prevent bottom hook-ups.

The crew should be ready to fish as soon as the fishing spot is reached

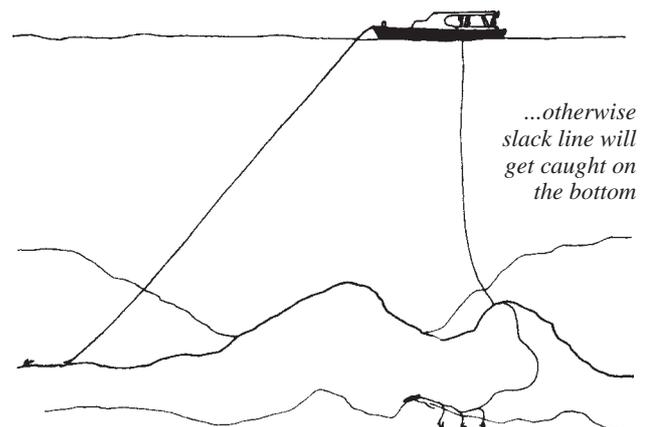


One man should be given the job of periodically checking the depth using his handreel

### Getting the lines down

The best way to commence fishing is to have one person get his line in the water first, using a medium sinker (0.5–1 kg). From the way the line lies, the rest of the crew can then see how strong the current is and in which direction it is running. All the lines should be weighted heavily enough so that the current does not drag them too far from the boat and out of the desired fishing depth. When there is little or no current, all the lines can use the same-size weights. When the current is strong, however, those fishermen furthest up-current should use the heaviest weights, so that their lines will not be carried back and tangle with other lines further down current.

Always keep the fishing lines tight...

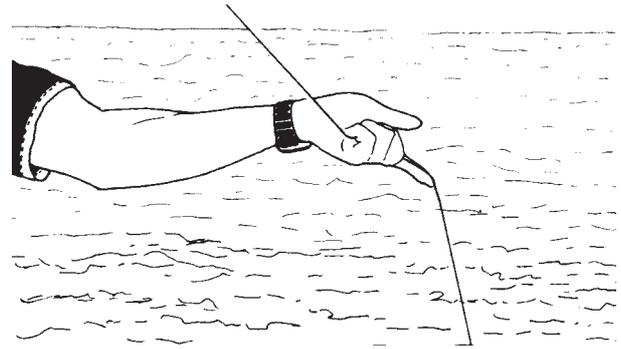


## Feeling the bites

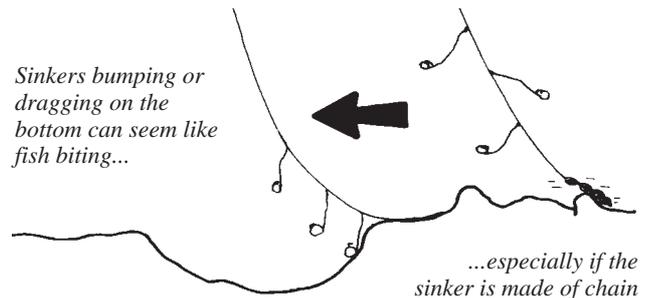
There is no mistaking the bite of a large fish, which can be powerful enough to almost pull you out of the boat. But feeling smaller bites when fishing in deep water can be difficult, and is something which comes only with practice. When fishing with braided lines bites can be felt quite easily, but nylon is stretchy and does not transmit the feel of the bites to your fingers very clearly. The heavy fishing sinker tends to damp down the jerk of the line as the fish tugs at the bait. If the sinker is dragging or bumping across the bottom as the boat moves, the bumps can be mistaken for bites. A strong current will make bites even harder to feel.

The main thing in feeling bites is to keep the line tight, so that the weight is just resting on the bottom, but the terminal rig is kept off the seabed. Make sure the line is not against the gunwale or side of the boat, as this will prevent you feeling the bites. Use a re-bar or lead sinker which is heavy enough not to bounce around too much. If using a length of chain as a sinker, the movement of the chain links may mask the jerks of the fish. Otherwise, feeling the bites of the smaller fish is a question of concentration, practice, and experience.

*Get used to feeling the line...*



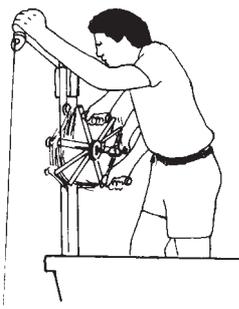
*...and learning to distinguish bites from other 'noise'*



## Checking the line

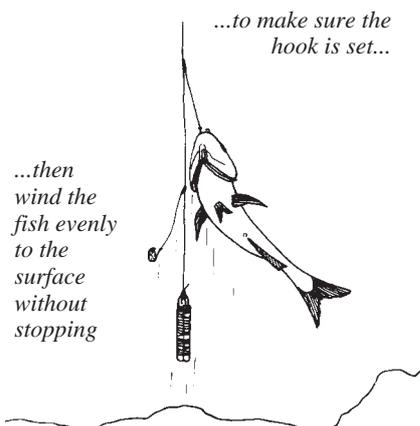
Although bites can be difficult to feel, it is usually a lot easier to tell if one or more fish are actually hooked on the line. Nevertheless, small fish may go undetected so you should always check your hook regularly—at least every 15 minutes—to see if you have a fish or whether you may have lost all your bait. Hauling in should be done smoothly, at a comfortable speed which you can keep up without stopping until the terminal rig is on board. Handlines should be hauled in with a hand-over-hand motion, dropping the line on the deck in front of your feet. Handreels should always be wound evenly.

*When a fish bites, give the handreel three or four rapid turns...*



*...to make sure the hook is set...*

*...then wind the fish evenly to the surface without stopping*



## Striking

Striking when a fish bites means pulling on the line, the instant the bite is felt, to set the hook in the fish's mouth.

Striking in deep water is very difficult, partly because the bites are hard to feel, and partly because the usual type of fishing line, nylon monofilament, is very stretchy. This means that when you pull on the line, it stretches before the other end responds to the pull—by which time the fish may be gone.

Nevertheless, when you do feel a good bite, it is worth striking by rapidly hauling in 4 or 5 metres of line. There is always a good chance that the fish has the bait in its mouth or throat, but is not yet hooked. Striking can set the hook before the fish has a chance to change its mind and spit out the bait and hook.

Avoid jerking the line as this can pull the hook from the fish's mouth. Stopping takes the pressure off the fish and may allow it to escape. Fish caught in deep water usually inflate with air on the way up, due to the expansion of their swim bladder. If you stop hauling, the fish keeps on floating up and this can cause bad tangles in the line, or allow the fish to float off the line. Once you have started hauling, make sure tension is kept on the line at all times, and do not stop until the fish is at the surface.

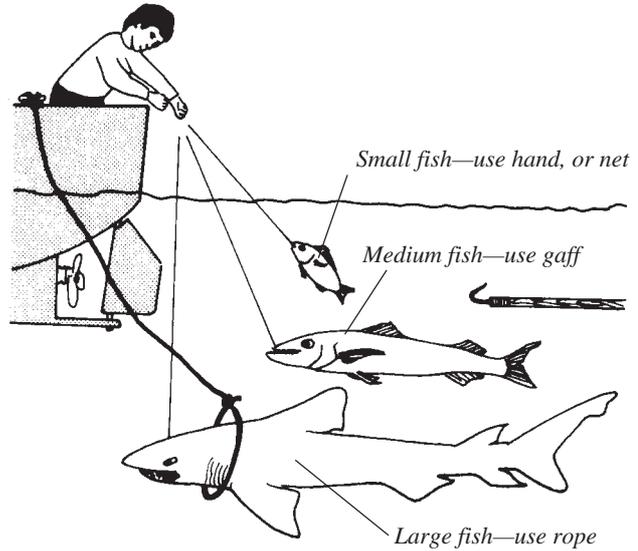
## SECTION 4H: BOATING THE FISH

The time when a fish is being lifted from the water into the boat is the time when it is most likely to be lost. Extra weight may come on to the hooks, and tear them from the fish's mouth, or the fish may unhook itself as it thrashes in panic. It is therefore important to boat the fish in a smooth, efficient manner, where necessary using a net, gaff or other landing tool (see section 3G).

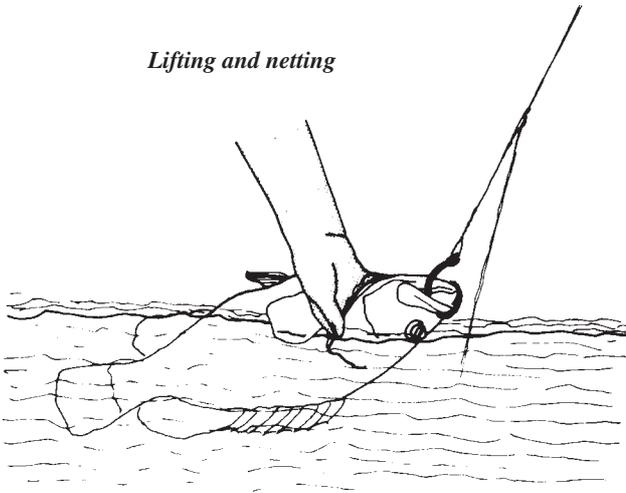
### Fish size

The size of the fish can usually be estimated while it is being hauled in. When it first comes into view as it is brought towards the boat, the size can be confirmed and a decision made as to whether a net or gaff will be needed. In fact most deep-bottom fish are subdued when they reach the surface because of the inflation of their swim bladder that occurs when they are hauled up from the deep. This also causes them to float belly-up, making them a lot easier to grasp through the gills and lift aboard.

As a general rule, fish under about 10 kg can be lifted straight into the boat or netted, while fish over 10 kg should be gaffed. Very large fish may need two or more of the crew, with a gaff each, to boat them. The largest fish and many sharks may be too strong or dangerous to gaff, but can be noosed by two or three crew working together.



*Lifting and netting*



### Lifting and netting

Lifting fish aboard by hand is a simple operation, but is dangerous with sharp-toothed fish. If the fish can be seen to be properly hooked, the terminal rig should be grasped a foot or two in front of the hook and the fish lifted smoothly out of the water and into the killing box or other receptacle. If it looks as if the fish could fall off the hook, then it should be grasped in the gills and lifted aboard.

When netting, the terminal rig is grasped in the same place, and the net brought up over the tail and body of the fish from behind.

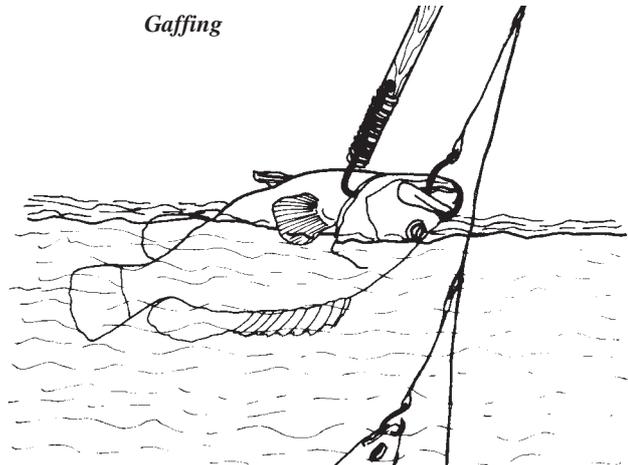
### Gaffing

Gaffing is by far the most popular method of boating fish. Some different types of gaff are described in section 3G.

Whenever possible, the fish should be gaffed in the head. This avoids damage to the flesh, and may help stun or kill the fish.

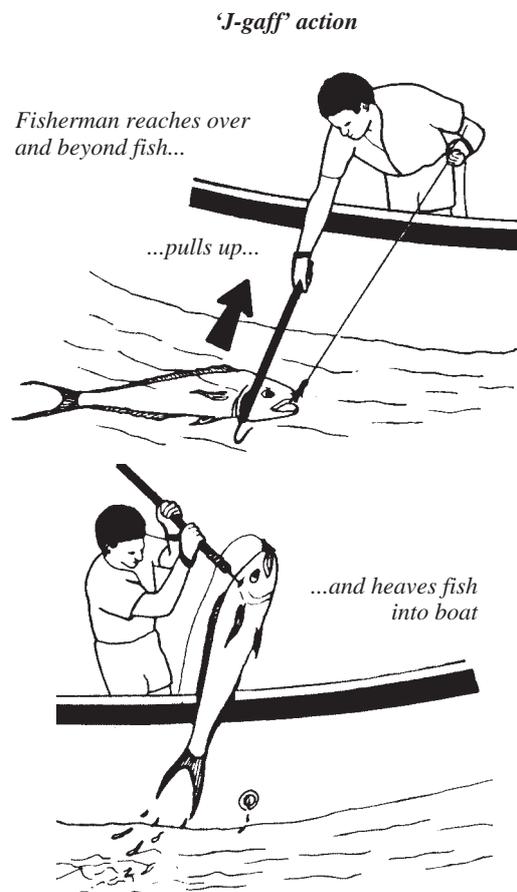
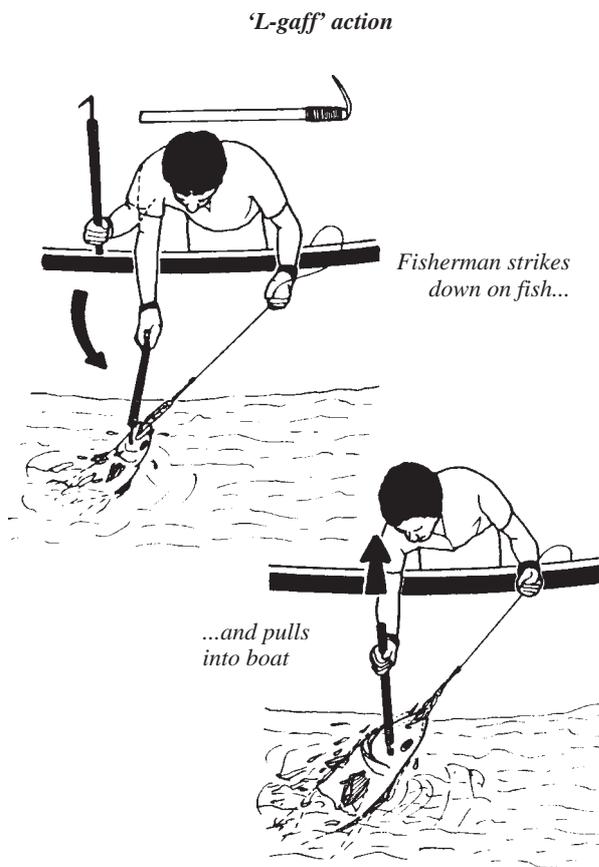
A fish gaffed through the body has more leverage to use when thrashing about, and may succeed in leaping off the gaff and back into the water. Even if it does not escape it will almost certainly bruise or cut itself, lowering its flesh quality and market value in the process.

*Gaffing*



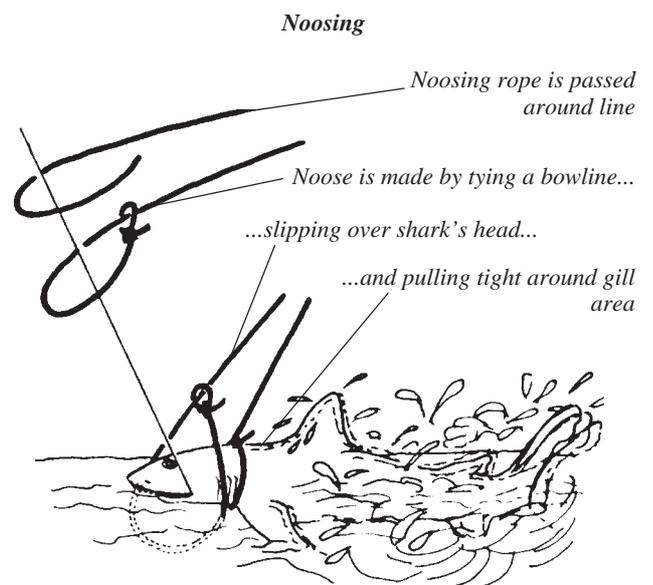
## Gaff actions

The actions of the two main types of gaff, the 'L-gaff' and the 'J-gaff', are shown below. The L-gaff is used mainly on smaller-sized fish, and the action is to strike down on the fish from above. The J-gaff is more common and is better for larger, heavy fish. The gaffer reaches over and beyond the fish with the gaff, and then pulls back towards the boat, sinking the point home. The fish can then be hauled aboard with both hands on the gaff handle.



## Noosing

Noosing is mainly used as a way of manhandling sharks or other fish which are too large to be brought aboard by one or two men using gaffs. A length of stiff sinking rope should be used—longline cord is ideal. The rope is passed around the line on which the shark is hooked, and the end is then tied in a bowline knot around the standing part of the rope. This forms a noose which is then opened up wide and allowed to slide down the line and into the water. The shark is held close to the water surface using the fishing line, and the noose is manoeuvred over its head, with the help of gaffs if necessary, until it is around the gill area. It is not necessary to get the rope back over the shark's fins—this is just about impossible with some long-finned types. Once the noose is around the gill area, it is pulled tight, and the shark can then be hauled aboard, or just tied off until it dies.



## Unhooking

Once the fish is on board, it should be lifted straight into the box or a part of the boat where it can be controlled for unhooking. The hooks can be removed by hand, or with the aid of pliers and a knife, depending on the type of fish and the way it is hooked. A circle hook should be removed by rotating it out of the fish's mouth, in a motion which is the reverse of that used when baiting the hooks (see section 2L).

## SECTION 4I: HAULING THE ANCHOR

After fishing, or when changing fishing spots, it is necessary to haul up the anchor, sometimes from water several hundred metres deep. This section shows a simple way to take the back-breaking labour out of doing this job by hand.

### Anchor gear

The anchor must be a grapnel-type fishing anchor made from reinforcing rod, as shown in section 3E. Other types of anchor may be too strong and solid to break out if stuck on the bottom. Normally the anchor should have a short length (3–4 m) of chain connected to it.

Other gear required for the job is also shown in section 3E. The anchor rope is attached to the end of the chain. A no-return barb, made of stiff wire, is lashed to the anchor rope, 1–2 metres from where it joins the chain, so that it points back toward the anchor. A large float of 30 kg or greater buoyancy, and shackle with which to clip it onto the anchor rope, complete the gear list.

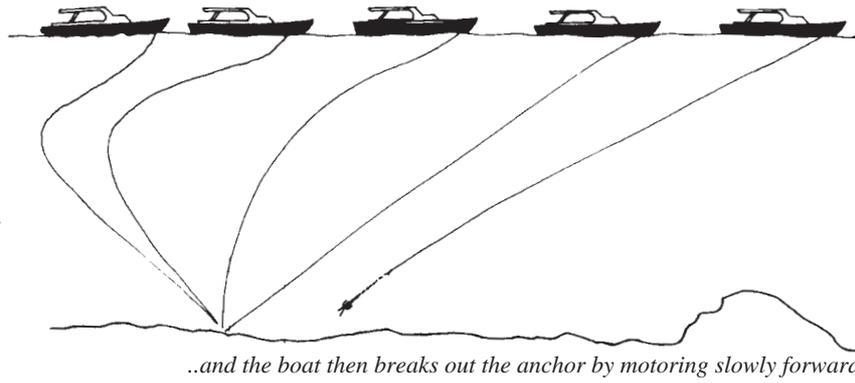
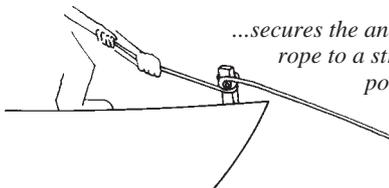
### Breaking out

To break out the anchor, first take any slack out of the rope by hand hauling while gently motoring the boat forward. Once the rope cannot be easily pulled in any further, tie it off to a strong point on the boat. Then slowly motor forward, into the wind or current, until you have passed over the anchor and the rope pulls tight behind the boat. Keep going for 30 seconds or a minute. If there is no apparent resistance holding the boat back, this means the anchor is free of the bottom.

*The anchor man takes up the slack...*

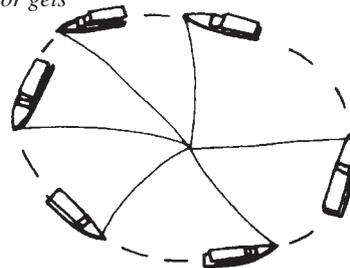


*...secures the anchor rope to a strong point...*



Because the prongs of this type of fishing anchor bend easily, it very seldom gets stuck. However, on rare occasions the chain, or the chain end of the anchor, may get stuck on rocks and refuse to break out. If this happens, try pulling in a different direction, or circling to free the anchor. Have a crewman pull up and down on the rope to shake the chain free. One of these methods will usually free a stuck anchor.

*If the anchor gets stuck...*



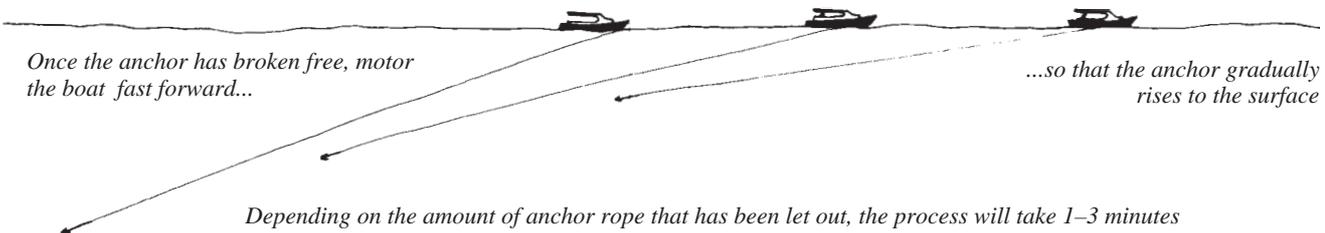
*...change direction, or motor in a circle to break it out*

### Raising up

When the anchor is free, turn the boat in the direction of deep water and speed up to 5 or 6 knots. Keep travelling at this speed for 1 or 2 minutes, longer if you have a lot of rope out. Travelling at this speed causes the rope, chain and anchor to rise in the water, until they are being towed along behind the boat just a few metres below the surface.

*Once the anchor has broken free, motor the boat fast forward...*

*...so that the anchor gradually rises to the surface*



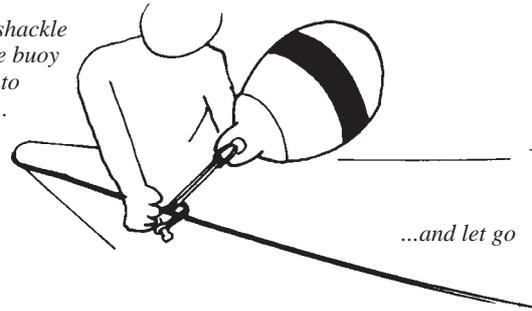
## Attaching the anchor buoy

After a minute or two of towing, clip the buoy onto the anchor rope using the shackle. The buoy should be able to slide freely along the anchor rope.

Throw the buoy over the side, where it will be dragged back along the anchor rope by the resistance of the water. This will gradually raise the rope the last few metres to the surface as the buoy slides along the anchor rope towards the anchor.

Once the anchor rope is more or less horizontal...

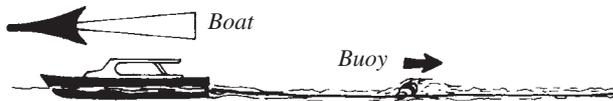
...shackle the buoy onto it...



...and let go

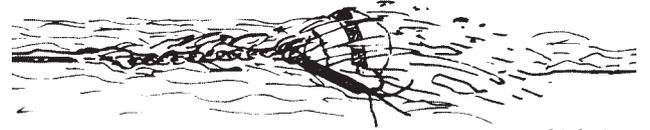
## Towing the anchor

After 2–3 more minutes of towing, the buoy will come up against the anchor chain, from where it can go no further. At this point, the buoy will plough through the water, throwing up a lot of spray. The boat can now stop, turn around, and start hauling in the rope.



Water resistance will cause the buoy to slide along the anchor rope as the boat continues to move forward

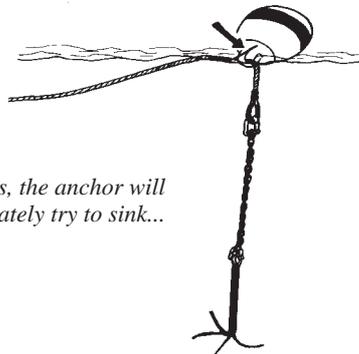
The buoy will eventually come up against the anchor...



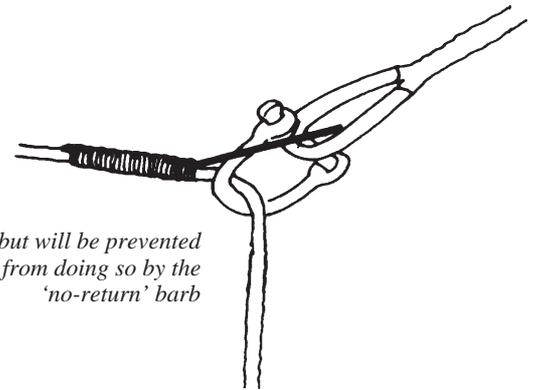
...at which time it gets dragged through the water, throwing up spray

The anchor will try to sink as soon as the boat stops, but this causes the no-return barb on the rope to trap on the buoy shackle. The anchor therefore finishes up hanging from the buoy just a couple of metres below the sea surface

When the boat stops, the anchor will immediately try to sink...

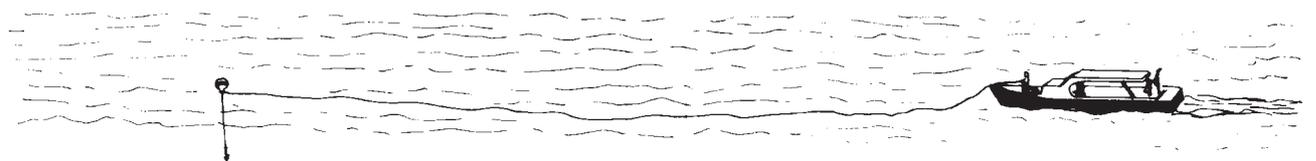


...but will be prevented from doing so by the 'no-return' barb



## Hauling in

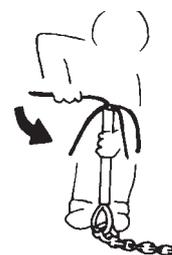
To recover the anchor, a crewman stands in the bow of the boat, hauling in the floating anchor rope as the boat motors towards the anchor, until the buoy is reached. The buoy, chain and anchor are then brought aboard, and the buoy is unshackled from the rope.



## Straightening the anchor

The final job is to check the anchor and bend back into the correct shape any prongs that may have been straightened out if the anchor got stuck on the bottom. The anchor is then ready to be reset at the next location.

Any prongs that have been straightened out by becoming hooked on the bottom...



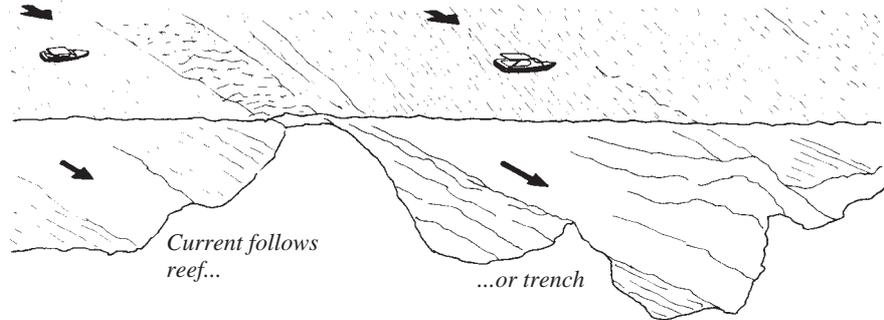
...can easily be bent back into shape by hand

## SECTION 4J: DRIFTING WITH WIND AND CURRENT

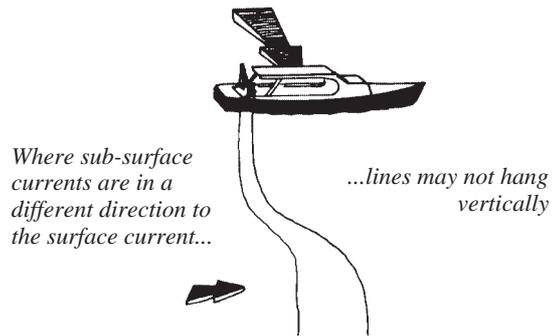
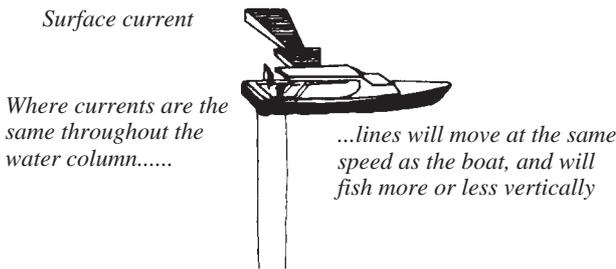
Fishing from an anchored position is the most usual method of deep-bottom fishing. However, under the right conditions fishing can be carried out by drifting, and this may allow you to fish areas not normally possible from an anchored boat.

The best conditions for drift fishing are when there is little or no wind (less than 5 knots for most boats) and when the surface current is either running parallel to the reef and the bottom contours, or is so weak as to have no effect on the boat. It is possible to drift-fish in stronger breezes, but only when the wind is blowing in the same direction as the current.

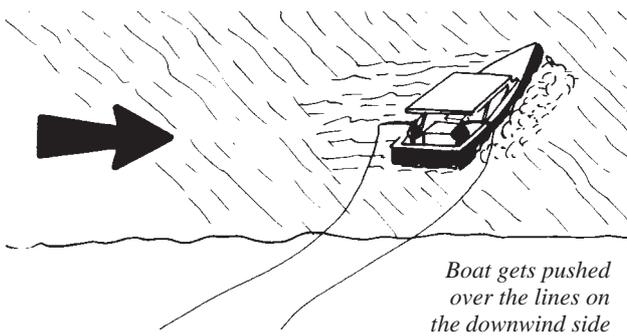
Under these conditions, the boat tends to drift along the depth contours. Once the boat is moved to the desired depth and allowed to drift, it will stay in the same depth for a good length of time. If the wind or current are in the wrong direction, it will quickly drift out of the desired depth range.



If the wind is very light, and the drift is controlled by the current, fishing is reasonably easy. The surface current has much the same effect on the lines as it does on the boat, forcing them along in the same direction, and keeping them more or less vertical. If there are strong sub-surface or bottom currents, it may be necessary to pay out plenty of extra line to account for this.

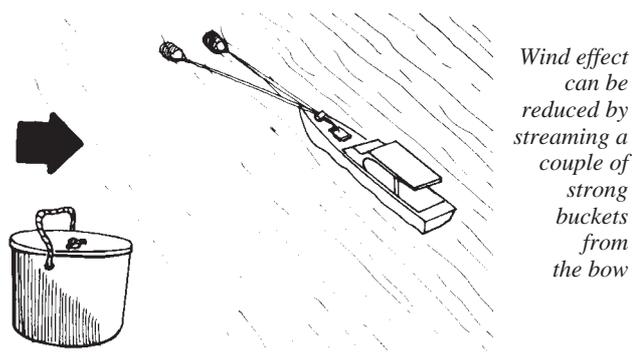


Strong wind makes drift fishing difficult

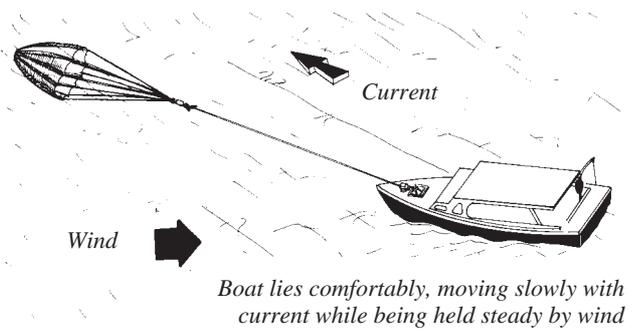


If it is the wind which is controlling the drift, fishing can be much harder, because the boat may be moving in a different direction to the surface current. This tends to pull the lines away from the vertical, and forces the fishermen to pay out a lot of extra line to reach the bottom. Those fishermen on the downwind side will have their lines pulled under and against the hull of the boat, making it hard to feel the bottom or any bites on the line. Under such circumstances, therefore, fishing should only be done from the up-wind side of the boat.

The harder the wind is blowing, the faster will be the drift, and the greater the problem. One way to counter the problem is to slow down the speed of the drift. A simple way of doing this is tie one or more strong buckets (not cheap plastic ones, whose handles will quickly pull out) on to short lengths of rope and trail them in the water from the boats bow. This not only slows down the rate of movement, but swings the boat's bow into the wind, reducing rolling and making fishing more comfortable.

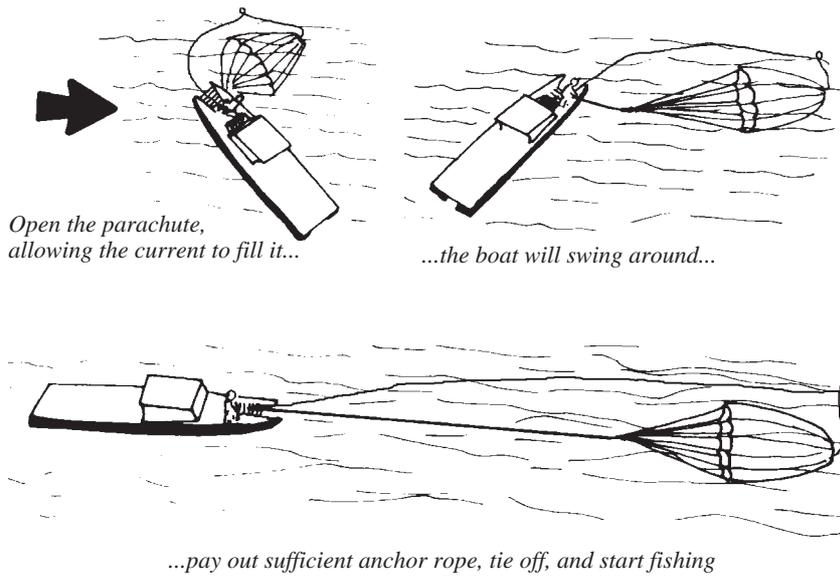


A better solution, but a more expensive one, is a sea-anchor. This consists of a cone of canvas or other strong material (see section 3E) which acts like a parachute in the water. (In fact old cargo parachutes are sometimes used as sea anchors). The sea-anchor greatly increases the boat's underwater surface area, putting the boat under the control of the surface current, rather than the wind. If the current and the wind are moving in opposite directions, a sea-anchor can often be used to keep the boat more or less stationary or moving only slowly.



*Boat lies comfortably, moving slowly with current while being held steady by wind*

As well as being a generally useful fishing tools, sea-anchors add to the safety of small-boat fishing operations.



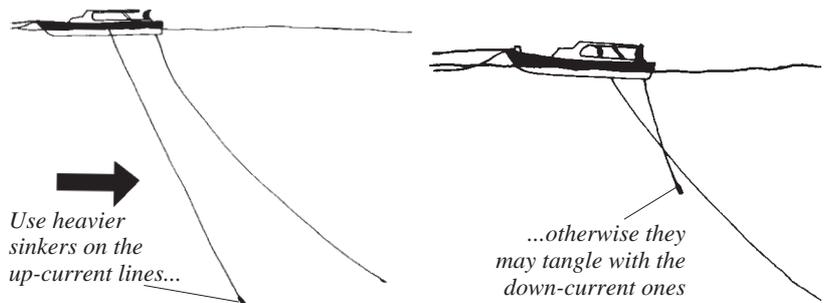
*Open the parachute, allowing the current to fill it...*

*...the boat will swing around...*

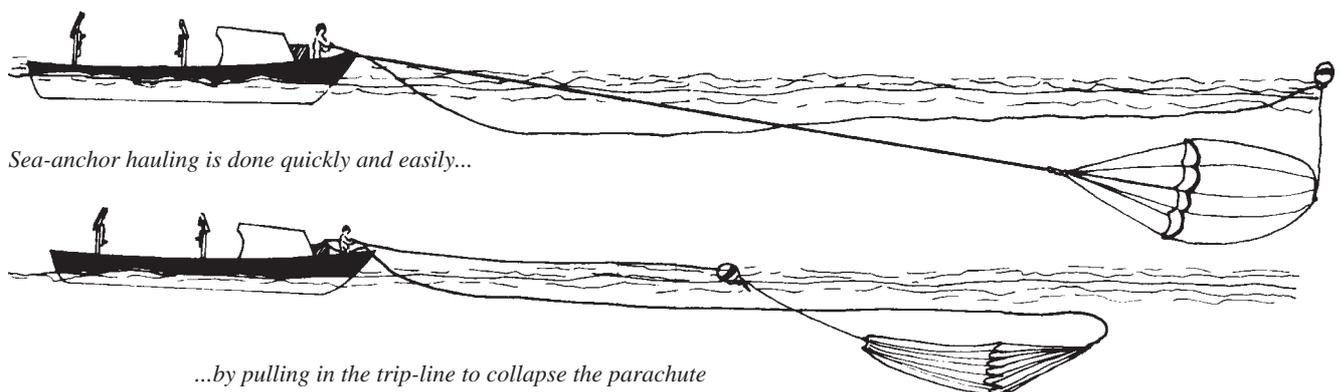
*...pay out sufficient anchor rope, tie off, and start fishing*

Setting the sea anchor is straight forward enough. It is simply lowered over the bow of the boat, with the anchor man keeping the opening of the parachute turned into the current to help it fill quickly. The trip-line and float attached to the apex of the sea-anchor are also paid out as the sea-anchor fills, and allowed to float free with no tension on them. Once some resistance is felt, the anchor rope is paid out until the anchor is 10–15 metres away, and the rope tied off. The whole procedure can be made faster if the boat is put into reverse gear for a few seconds. An experienced crew can set a sea anchor in less than a minute and be ready to fish.

Depending on the strength and direction of the surface and sub-surface currents, the fishing lines may be carried forward or aft of the boat as they are lowered to the bottom. To avoid tangles it is important that the up-current lines should have heavier sinkers than the down-current ones.



Hauling a sea anchor is almost as quick and easy as setting it. Hauling in the trip rope turns the parachute around, folding it shut as it is hauled in.



*Sea-anchor hauling is done quickly and easily...*

*...by pulling in the trip-line to collapse the parachute*



---

CHAPTER 5

***AFTER FISHING***

|    |                          |    |
|----|--------------------------|----|
| A. | TAKING CARE OF THE CATCH | 72 |
| B. | HANDLING FISH FOR EXPORT | 73 |
| C. | CARE OF THE BOAT         | 74 |
| D. | CARE OF THE FISHING GEAR | 76 |
| E. | KEEPING RECORDS          | 77 |

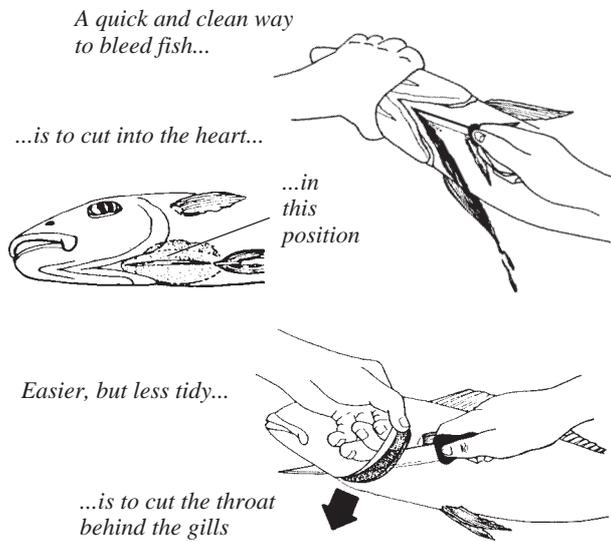
## SECTION 5A: TAKING CARE OF THE CATCH

Commercial fishermen can usually expect to get more money for their fish if it is well handled and presented. Taking care of the catch starts from the minute the fish is boated, and may involve only a little effort on the fisherman's part.

### Bleeding

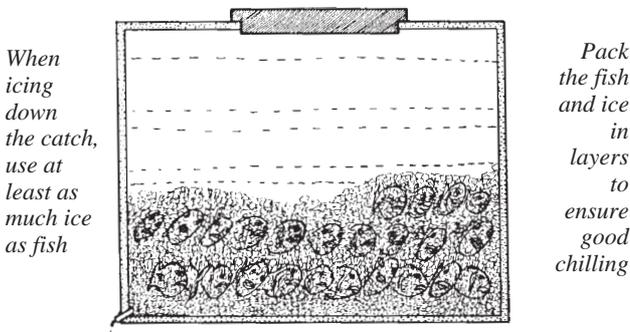
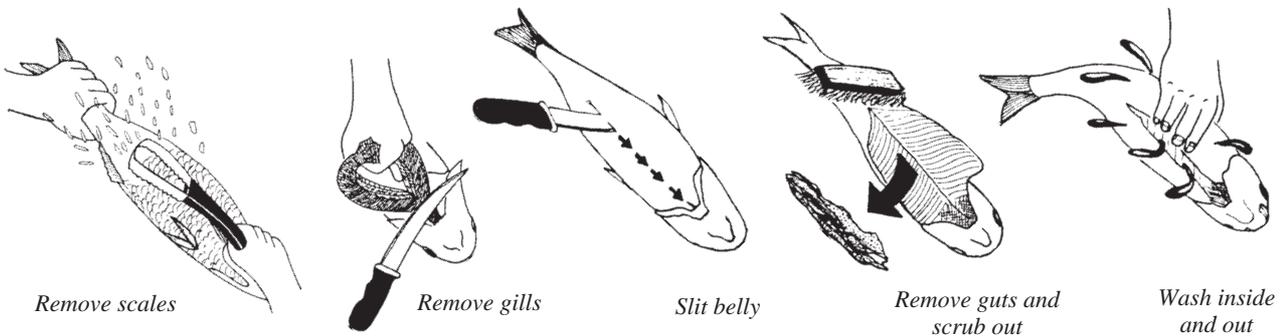
If the fish will ultimately be sold as fillets, it is usually worth bleeding them while still alive. This ensures that the flesh of white fish will be truly white—not pink or grey—when filleted. Bleeding also helps remove the lactic acid which builds up in the fish's body when it is struggling on the line, and which can cause the flesh to become soft and jelly-like.

Bleeding is done by slitting the 'throat' of the fish while it is still on the hook or gaff. The most inconspicuous way is to make the incision into the heart region of the fish, between the ventral fins. When the appearance of the whole fish is less important, a knife can simply be pushed behind the gills, cutting through the throat from the inside.



### Cleaning fish

In some locations, the market requires fish to be landed whole; in others consumers prefer their fish to be cleaned—that is either gutted, gilled, scaled, or some combination of these. If the fish do have to be cleaned, this should be done reasonably soon after the fish has died in the killing box, perhaps during a lull in the fishing. If time does not permit this, the fish can be iced down whole and cleaned later, after the fishing is finished.



If the fishing trip is longer than a few hours, then ice should be carried and the fish iced down as soon as possible after capture. The best way is to allow fish to accumulate until a reasonable quantity has been caught (but in any case for no more than an hour), and then transfer them to the ice box. Working to this type of pattern avoids too much interruption to the fishing, and unnecessary opening of the ice box. When put into the ice box, the fish should be properly layered or mixed with their own weight of ice to ensure rapid and complete cooling.

When the fish have been in the ice box for some hours or days, check to make sure that the ice and fish are still well-mixed together. Repack the ice box if necessary. When the fishing trip is over, dispose of the catch as soon as possible. When unloading the fish from the boat, handle them carefully to avoid bruising and damage. Carry fish in bags or boxes, preferably mixed with some ice. Do not leave the fish in storage in the boat's ice box any longer than is needed. If it is necessary to do this, check the fish daily to ensure there is still enough ice. Re-pack or add more ice when required.

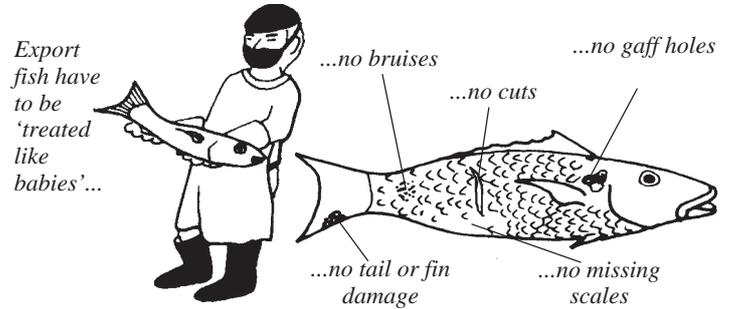
## SECTION 5B: HANDLING FISH FOR EXPORT

In some countries, good airline connections make it possible for fishermen to export fresh deep bottom fish to the high-priced fresh fish markets in Japan, Hawaii, the United States West Coast, and Guam. To be acceptable on these markets, the fish must be handled in a special way, as shown below.

### Careful handling

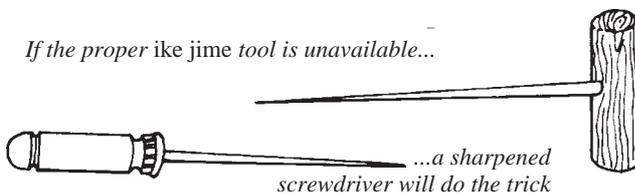
Fish destined for export must be handled carefully at all stages, from the time they are caught to the moment they are put on the plane. In particular, they must never be dropped, thrown about or otherwise mistreated. Bruises, cuts, missing scales, gaff holes or other marks on the fish will render them unsaleable. The golden rule is to 'treat them like babies'.

*Treat export fish like babies*



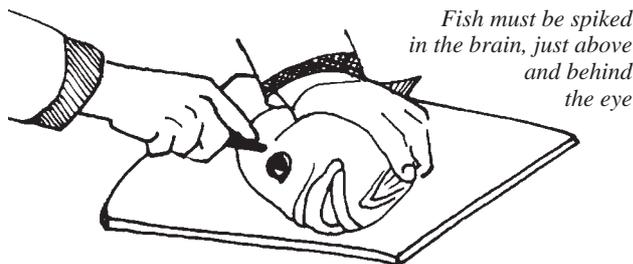
### Spiking the fish

*If the proper ike jime tool is unavailable...*

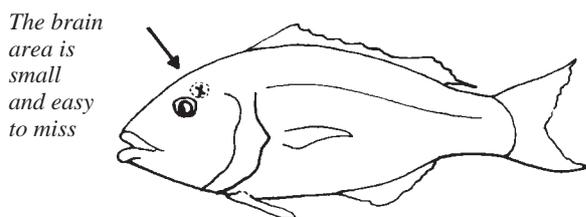


### Spiking

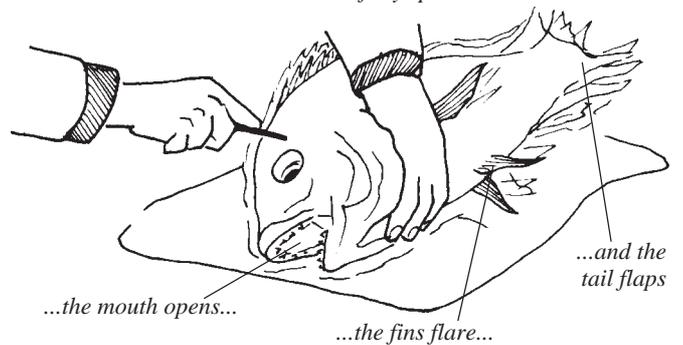
Fish being exported to Japan and certain other markets should not be allowed to die naturally, but should be killed immediately after being brought on board by inserting a steel spike into the brain. This is known as the 'ike jime' method of preparing the fish. If the proper *ike jime* tool is not available, a screwdriver sharpened to a point makes a good spike.



To kill the fish, the spike is placed just above and behind the eye and pushed into the brain. The fish will flap very briefly and then die immediately. If it does not do this, you have missed the brain.



*When the brain has been successfully spiked...*



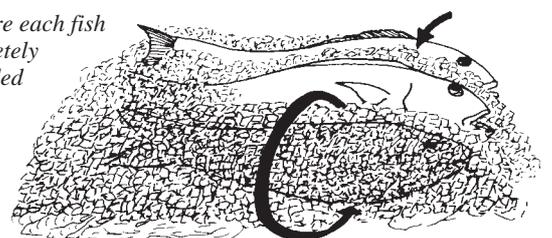
### Chilling

Once dead, export fish must be rapidly chilled to zero degrees centigrade, and kept that way until they reach the market. The best way to chill them is to put them straight away into a container of saltwater ice slurry, as explained in section 3C.

When the fish have been chilled in slurry, they should then be transferred to ice storage, as shown in section 3C. Extra care should be taken to make sure each fish is surrounded by plenty of ice, so that they retain their low temperature. Fish should not be allowed to touch each other as this can cause discolouration of the skin, lowering the fishes' value or making them unacceptable. The fish should be left on ice until shortly before they are to be packed for export.

### Chilling export fish

*Make sure each fish is completely surrounded by ice...*



*...and that no fish touches another one*

## SECTION 5C: CARE OF THE BOAT

Commercial fishing places heavy demands on a small boat and its equipment. Thrashing fish can damage paintwork, fittings, and deck equipment. Fish slime and blood will stick to surfaces, making them slippery and dangerous. Scales and scraps of fish waste will collect in bilges and corners, blocking pipes and drains and making the boat smell. Salt spray will accumulate everywhere, causing electrolysis or corrosion of metal fittings and making moving parts such as hinges and joints seize up. A general deterioration of the boat will occur unless it is properly cleaned at the end of every day's fishing, and receives some basic maintenance each time it returns to port at the end of a fishing trip.

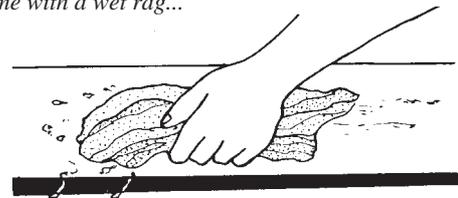
### General cleaning

At the end of the day, or during a lull in the fishing, throw a bucket of sea water over the decks and interior surfaces of the boat, and clean off any patches of blood or slime with a stiff brush or a rag. Bail or pump out the bilges and pick out any pieces of waste fish which may be in there.

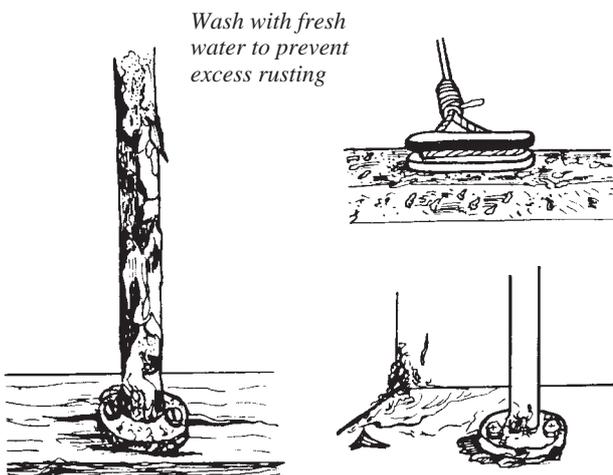
#### General cleaning



Wipe off fish slime with a wet rag...



#### Metal fittings



...or a stiff brush for dried-on blood

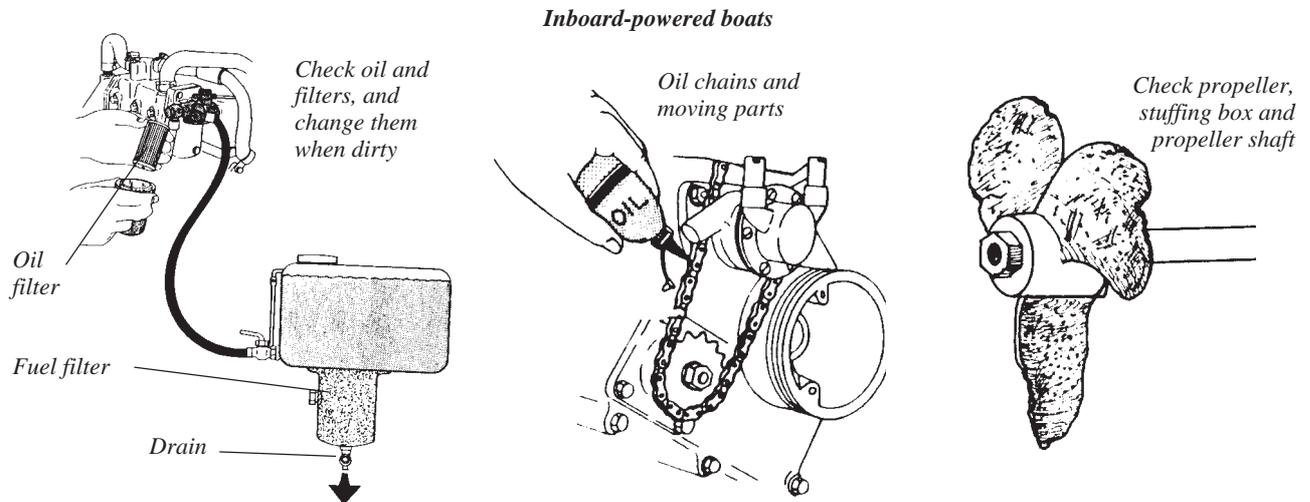


### Cleaning metal fittings

When the fishing trip is over, wash or wipe down any metal fittings or moving parts using fresh water. This will remove salt and fish scales and help prevent the fittings from rusting up, jamming, or developing dangerous rough or jagged edges.

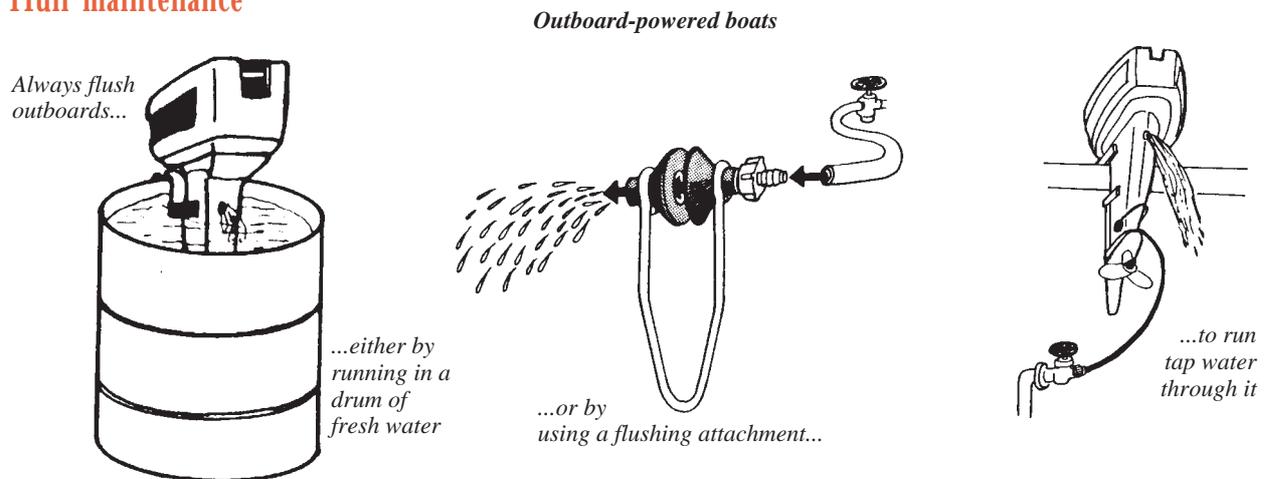
## Engine maintenance

When the fishing trip is over and the engine has cooled off, wipe or wash the exterior surfaces of the engine with a rag dipped in fresh water. When it dries, wipe it with an oily rag or spray with light lubricant oil for protection. Treat any moving or corrosion-prone metal fittings in the same way. Use a grease gun to grease up the grease nipples or cups on the motor after every trip. Check the engine and gearbox oil, and change when necessary.



If the engine is an outboard, flush the engine cooling system with fresh water if possible. This can be done by removing the engine from the boat and running it in a drum of fresh water. If the outboard is permanently mounted on the boat, use a commercially available (or improvised) flushing device, fitted on to a water hose, to supply fresh water to the engine cooling intake.

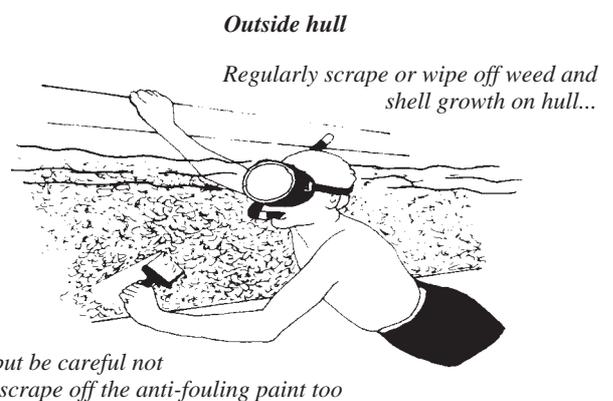
## Hull maintenance



The build up of weeds, barnacles and worms on the hull below the waterline will increase your fuel consumption greatly and in wooden boats may lead to serious damage by borers or rot. Repaint the hull with anti-fouling paint every 9–12 months or as often as necessary. In between times, keep the hull clean by brushing or wiping with a cloth, being careful not to damage the paint surface.

## Repairs

When the fishing trip is over, make a note of any damage which may have occurred - broken booms, lost deck equipment, etc. Carry out repairs or replacement as soon as possible, before the damage is forgotten about, or becomes serious or dangerous.



## SECTION 5D: CARE OF THE FISHING GEAR

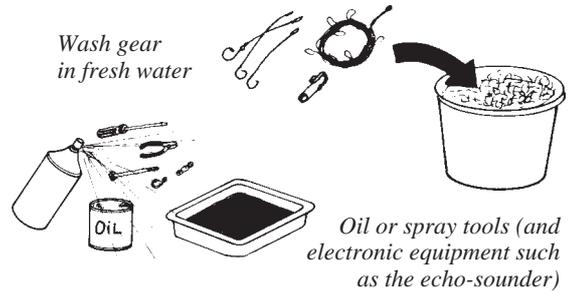
Like the boat, the fishing gear suffers damage and deterioration during use, and after the fishing trip needs to be cleaned, maintained, and where necessary repaired.

### Cleaning and rust prevention

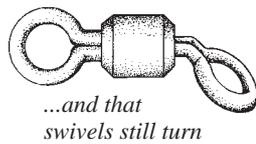
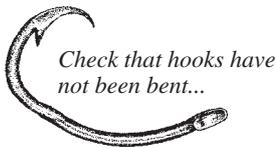
Wash all fishing gear in fresh water to remove encrusted salt. Scrape off any adhering blood and slime, and ensure the gear is properly dried before storage.

Use a light oil (such as CRC or WD-40) to spray tools, the echo-sounder, and any electronic gear that may have been touched with wet hands.

#### Cleaning and rust prevention



#### Hooks and swivels

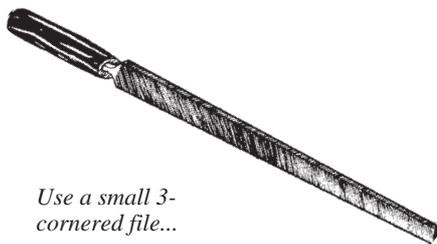


### Hooks and swivels

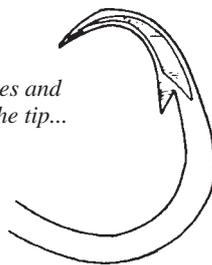
Check all hooks to make sure they are sharp and have not been bent. Likewise, check swivels to see that they have not corroded or bent and that they are still turning properly.

Hooks can be sharpened with a small three-cornered file and abrasive paper, but this then removes the galvanised coating from the hook and increases the rate of rusting. A properly sharpened hook should leave a clear, fine scratch when drawn across the thumbnail.

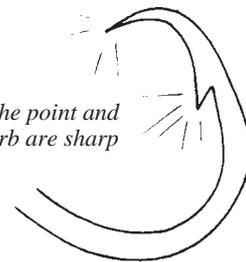
#### Sharpening hooks



...to file the sides and outer edge of the tip...



...until the point and barb are sharp



Although used hooks can be sharpened when necessary, they should be replaced when they become too rusty. Continued use of rusty hooks to save money is a false economy as they will result in fewer hook-ups and a lower catch. The same goes for hooks which have been bent by a large fish. These should be discarded, not bent back into shape, as this will weaken them and they may break or straighten when taken by the next big fish.

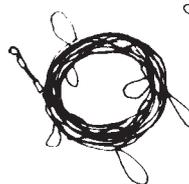
### Terminal rigs

Check for cables that are fraying or untwisting, worn monofilament, trace attachment loops that have pulled tight, etc. Repair or replace anything that looks suspect, before it has a chance to break with a large fish on the end. Make up new rigs and traces to replace those that have been lost or damaged.

Store terminal gear in a dry place, neatly coiled or wrapped on handcasters, old plastic bottles, or other circular objects 15–30 cm in diameter.

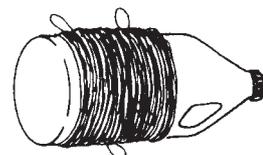
#### Terminal rigs

After cleaning terminal rigs...



...store them on handcasters...

...or large-diameter plastic bottles

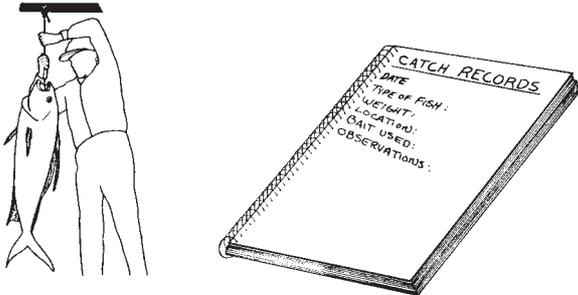
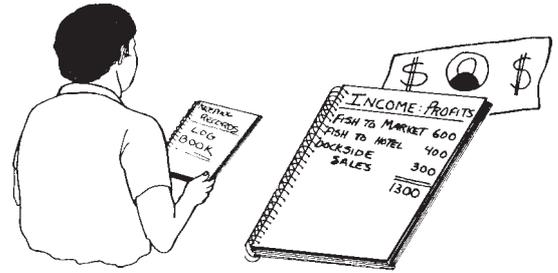


### Anchor

Check the anchor to make sure that the prongs have not become weakened by too much bending (see section 4I).

## SECTION 5E: KEEPING RECORDS

By keeping records of his fishing and business activities, a commercial or semi-commercial fisherman will be aware of his own performance, and can continue to try to improve on it. Notes should be kept during each fishing trip, and then written up properly once the trip is over. Many Fisheries Departments or fishery research agencies will provide log-books and technical assistance to help fishermen keep good records.

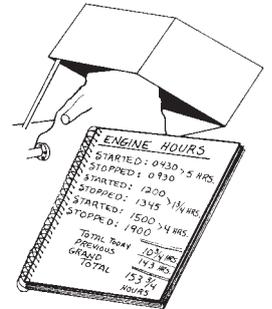


### Fishing records

By recording the number, weight and type of fish caught and the area where they were taken, the fisherman can build up a valuable log of his successes and failures over a period of years. This can be a useful reference for the future, reminding the fisherman of where his best catches came from during a given season, or the best depth, time of day, tide or moon to fish in a particular area.

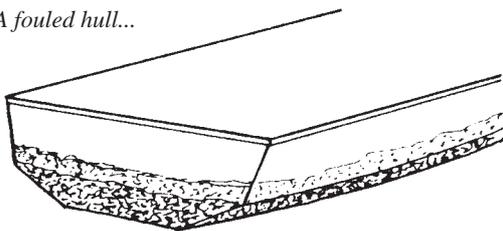
### Operating records

As well as information on fish catches, records concerning the operation of the boat should also be kept. In particular, details of the number of hours the engine has been run should be written down. This enables the fisherman to know when he should carry out basic maintenance procedures, such as oil changes, in accordance with the manufacturer's recommended procedures. Doing this will avoid dangerous and costly breakdowns and engine down-time.

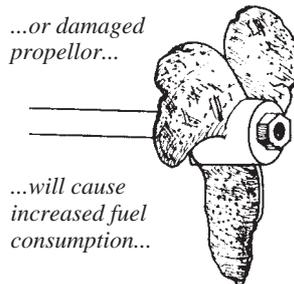


By recording how much fuel was used on each trip, and knowing the number of hours the engine has run, the fisherman can calculate the average fuel consumption per engine running hour. This allows proper estimation of fuel consumption for long trips. It also allows him to keep a check on whether his boat is continuing to perform efficiently. If fuel consumption per engine hour starts to rise over a period of several trips, it could be an indication of engine malfunction. Alternatively, the boat may be getting badly fouled by growth on the hull, or may have suffered damage to the propeller.

A fouled hull...

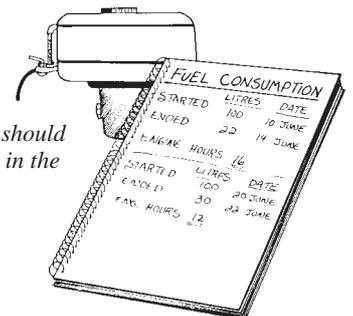


...or damaged propellor...



...will cause increased fuel consumption...

...which should show up in the records



### Financial records

Any commercial or semi-commercial fisherman should keep a running record of the money he spends on his fishing, and on his earnings. This should include the cost of fuel, bait, crew wages, ice, rations, vessel and engine maintenance and repairs, gear, bank loan and interest repayments, etc. By balancing this against the income he receives for the sale of fish, and from any other activities (occasional charters, transport jobs, etc.), the fisherman can see the true profitability of his business, and areas where he could economise on costs.



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APPENDIX

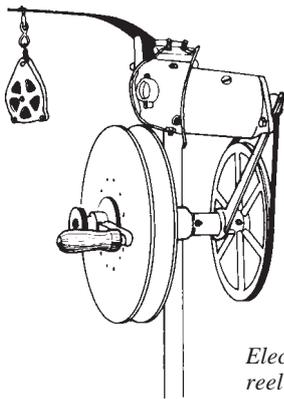
***OTHER DEEP-BOTTOM  
FISHING METHODS***

Apart from the standard line-fishing technique described in this manual, there are a number of other ways of capturing deep-bottom fish. Some are well-established and successful, while others are not very widespread. Many experiments have been carried out to develop new deep-bottom fishing methods, some of which have been successful, others less so.

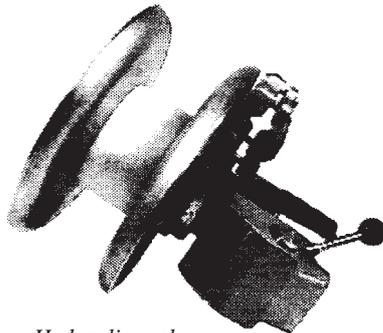
## Electric and hydraulic reels

One obvious way to increase the vessel's fishing power is to mechanise the fishing operation. This can be done using electrically- or hydraulically-powered reels to haul the lines, rather than relying on muscle power. A range of styles and models are available, including true reels (which store the line, as well as hauling it) and line pullers (which haul the line, but do not store it).

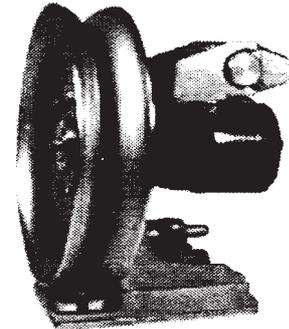
*Mechanised deep-bottom fishing reels*



*Electric reel*



*Hydraulic reel*

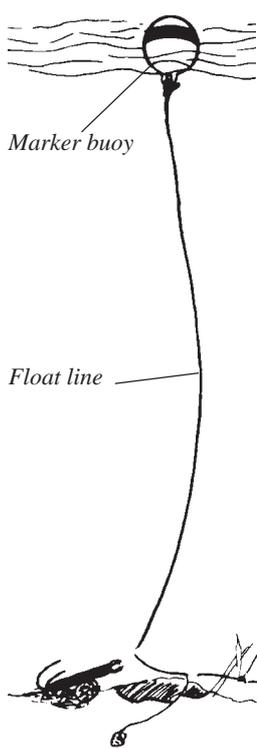


*Hydraulic line puller*

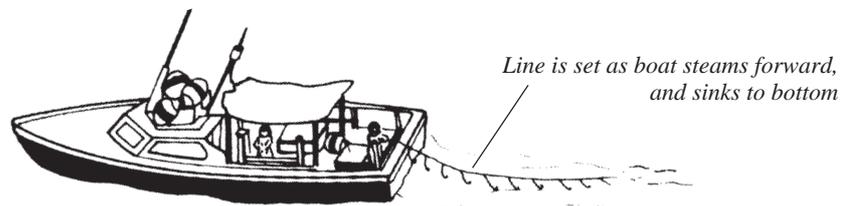
The use of mechanised hauling systems obviously requires that the vessel be suitably equipped with an electric or hydraulic power system. The reels are relatively costly – between US\$ 500 and 1,000 depending on the model – but they greatly increase fishing efficiency, and in some cases allow a single fisherman to operate more than one fishing line.

## Bottom longlines

An alternative way to increase fishing power is to have more baited hooks in the water at any one time so that more fish can be caught. Bottom longlines work on this principle.



A basic bottom longline consists of a mainline which may be tens or hundreds of metres long, and which has baited hooks attached to short traces at regular intervals along its length. The ends of the longline are normally weighted or anchored, and at least one end has a retrieval line running to the surface.



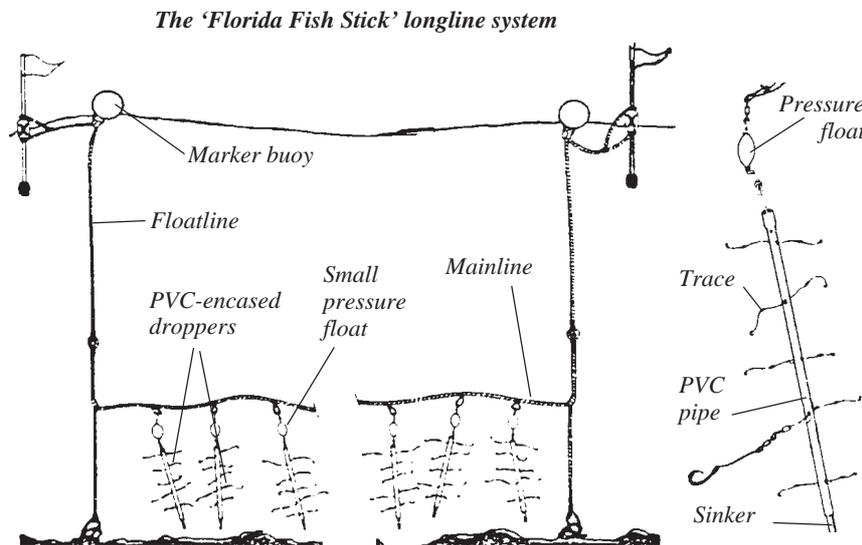
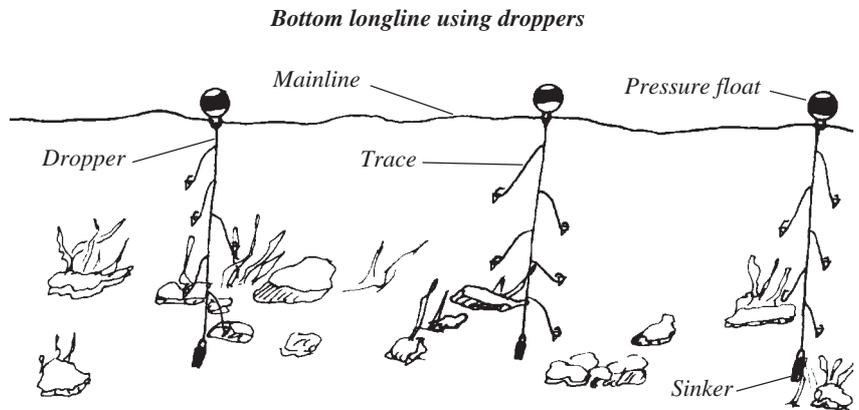
The line is usually set from a moving boat and then buoyed off until the time comes to haul it in. The float is set first, followed by the floatline, the anchor, the mainline, another anchor, and then another floatline and float. The line can be hauled from either end depending on weather and other fishing conditions.



In the most simple type of longline, the hooks simply lie along the sea floor. In deep-bottom fishing, this can lead to hooks becoming caught on rough or rocky ground, resulting in heavy gear losses. In addition, many deep-bottom fish actually feed just above the sea floor and are reluctant to take bait that is lying on the bottom. As a result, various methods are used to raise the baited hooks a little way above the sea floor.

One way to do this is to attach floats at various points along the mainline so that the entire mainline is lifted off the bottom. The disadvantage with this is that the mainline, or parts of it, may be lifted **too** high, so that it is several metres above the seafloor.

A better way is to replace the traces along the mainline with 'droppers' instead of simple traces. A dropper is very much like a deep-bottom fishing terminal rig. It consists of a length of monofilament or cable with several attachment points for traces, a sinker at one end and a small pressure-resistant float at the other. When the longline is set, each dropper stands vertically on the sea floor as in standard deep-bottom fishing.



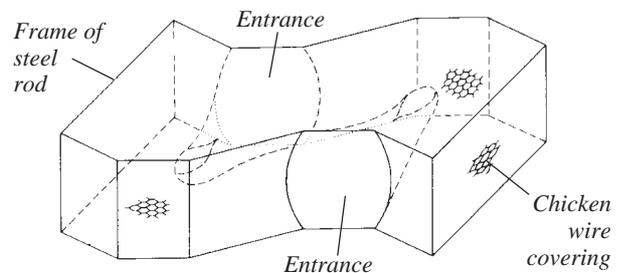
A further development on this system was the 'Florida Fish Stick' longline system. In this method the dropper was encased inside a rigid PVC tube with holes cut at intervals along the side so that the traces could protrude through. The purpose of the system was to avoid the extensive tangling of the droppers which occurs from the movements of the hooked fish while the longline is still on the bottom. However the system caused as many problems as it solved as the PVC-encased droppers were costly, easily broken, and very difficult to handle on the boat.

The Florida Fish Stick system has now been essentially abandoned as a deep-bottom fishing method, although curious fishermen still experiment with it occasionally.

## Traps

Numerous experiments have been carried out throughout the Pacific to capture deep-water snappers by trapping. This is based on reports of a successful trap fishery for these species in the Caribbean. Most trials have used Caribbean-style 'Z-traps' made of a frame of steel reinforcing rod covered with galvanised chicken wire or similar mesh. The traps are usually about 1.8 m long by 1.2 m wide by 50 cm high.

*Caribbean-style 'Z-trap'*



Predictably, the difficulties of stowing, manoeuvring and especially hauling these heavy, bulky traps aboard small fishing vessels, combined with generally low catch rates and a high incidence of trap loss or damage, has meant that they have never been successfully adopted as a commercial fishing method in the Pacific. Although still the subject of occasional trials or experiments, Z-traps are now generally regarded as unsuitable for deep-bottom fishing in the Pacific

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