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## CHAPTER 2

# VERTICAL LONGLINING

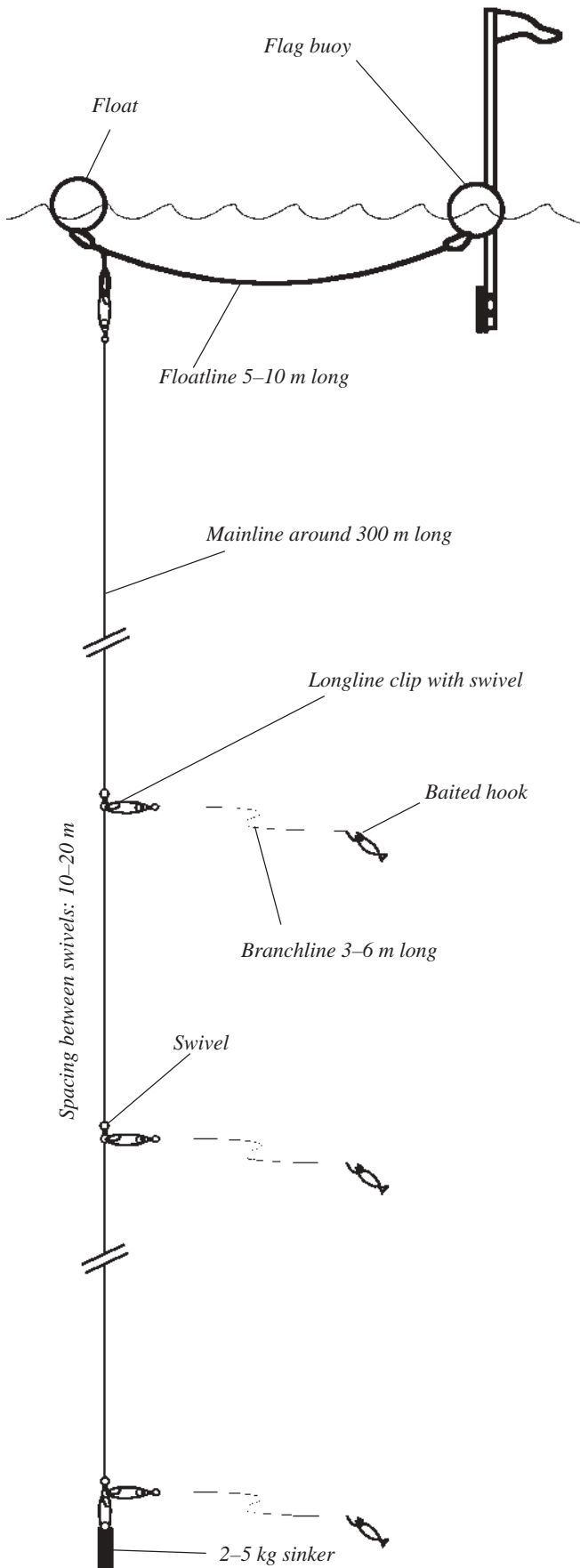
- A. BASIC GEAR CONFIGURATION
- B. THE MAINLINE
- C. BRANCHLINES
- D. OTHER GEAR AND EQUIPMENT
- E. SETTING THE LINE FROM A BASKET
- F. SETTING THE LINE FROM A SAMOAN HANDREEL
- G. SETTING MULTIPLE LINES
- H. HAULING THE LINE
- I. TARGETING FISH CONCENTRATIONS
- J. FISHING WITH A SEA ANCHOR
- K. GEAR CARE AND MAINTENANCE
- L. SCALING UP THE FISHING OPERATION

### INTRODUCTION

This chapter describes the gear and techniques used for vertical longline fishing. The first few sections describe the materials and construction methods needed for making the longline and its various components. The next part of the chapter concentrates on the basic fishing method—different ways of setting single and multiple lines and the techniques for hauling them after fishing. The last part of this chapter describes more advanced aspects of fishing, such as ways to get the fishing gear close to the concentrations of fish around FADs, the use of a sea anchor for vertical longline fishing, care and maintenance of the fishing gear, and the prospects for moving up to use larger-scale equipment.

SECTION 2A: BASIC GEAR CONFIGURATION

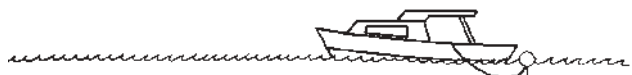
Schematic diagram of typical vertical longline fished from a surface float



Vertical longlining is a simple and relatively cheap way to fish in deep water for tunas and other oceanic fish. It is particularly suitable for fishing around FADs but can be used anywhere where tunas are found.

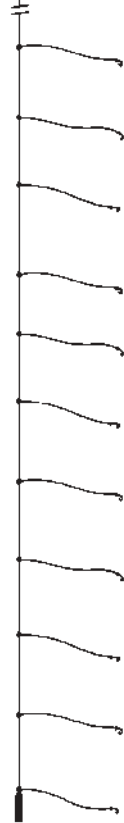
A basic vertical longline comprises a single long weighted mainline suspended from the surface and which reaches down to a depth of 300 m or more. Connected to the mainline are a series of branchlines (sometimes also called snoods or leaders), each of which carries a baited hook. The branchlines are attached using longline clips to swivels which are built into the mainline at intervals of 10-20 m.

There are numerous styles of fishing using vertical longlines. The lines may be fished from a basket or bin, or can be wound onto a fishing reel. The wooden Samoan handreel, widely used in the Pacific, can be used when the mainline is made from nylon monofilament.



Vertical longline being fished directly from the vessel

Alternatively, larger-scale drums can be fabricated to allow fishing of more lines, or the use of heavier line materials. The vertical longline can be fished from the boat or FAD, or can be buoyed off and allowed to drift free. The lines may be set float-first or sinker-first. Depending on the circumstances, it may even be possible to fish several vertical longlines in a string, connected to each other by long floatlines.



As well as the fishing style, the gear itself may also vary in its details, for instance in the length of the mainline and the number and spacing of the branchlines (and thus their fishing depth range). Specific local circumstances, such as the depth at which fish are found to be biting and the type of materials available, may prompt variations in the gear used and the detailed design of the line.

Personal preference is another major factor in gear selection and design. Some fishermen simply prefer handling kuralon over nylon monofilament, or find that fishing from a Samoan handreel gives them backache and so prefer to fish from a basket and hand-haul the lines. Others prefer to use two or three small floats at the head of the line, instead of a single large one, because it makes it easier to see when there is a fish on the line.

Despite the variations in detail, the principles that apply to making up the gear are standard. Once fishermen become familiar with the basic gear rig and fishing procedure, adjustments can easily be made in response to the fisherman's individual needs.

The table below provides specifications of the materials typically needed to make up a single vertical longline with a 300 m mainline and 15 hooks and branchlines spaced at 10–20 m intervals. The table below is intended as a guide, and not necessarily a specific recommendation. The materials listed in the table are suitable for the construction of a good-quality vertical longline, but equally good alternatives are available for many of them.

Component	Typical materials	No./Amount
Surface float	Plastic longline float 300 mm diameter	2
Marker buoy	Bamboo or fibreglass pole	1 x 3 m length
Floatline	Polypropylene rope 6–8 mm dia. or Kuralon longline rope	1 x 5–10 m length
Mainline	Monofilament nylon, 200–500 kg test or Kuralon longline rope	1 x 300 m length
Swivels	McMahon Heavy Duty, size 10/0–12/0 or leaded swivels	15
Branchlines (each 3–6 m long)	Nylon monofilament, 125–250 kg test (breaking strain should be at least 50 kg less than that of the mainline)	15 x 3–6 m lengths
Longline clips	Size 1–12 cm longline clip with swivel	15
Hooks	Mustad tuna circle size 14/0, 15/0 or 16/0 or BKN size 48 or Japan tuna hook size 3.6 mm	15
Sinker	Lengths of rebar 2.5 cm dia x 22–40 cm long, tied or welded together to make weights of 2–5 kg	6 pieces

The choice of which options a fisherman follows will depend on local availability of materials, fishing conditions, and his own personal preferences. The rest of this chapter provides more detailed information on many of these options, including making up the gear, basic fishing styles, and more advanced fishing strategies that may be followed by someone who finds vertical longlining to his liking and wishes to scale up the fishing operation.

## SECTION 2B: THE MAINLINE

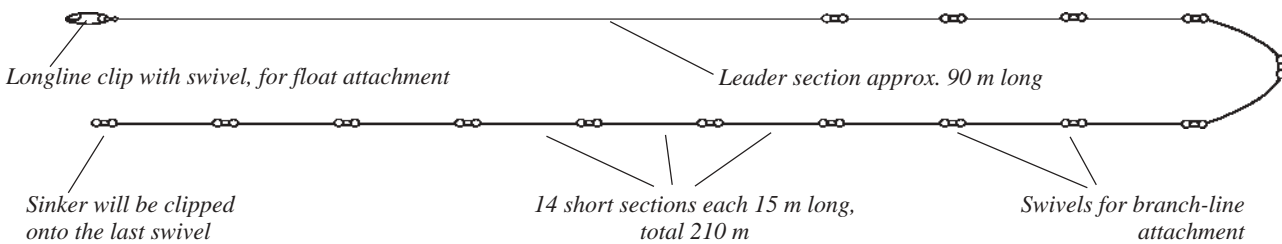
### LINE MATERIAL

There are two widely-available choices of material for the mainline: **nylon monofilament** and **longline rope**.

- if **nylon monofilament** is used it should be at least 200 kg test breaking strain, although up to 500 kg test can be used if local circumstances or availability dictate. 200-kg or similar monofilament is widely available, and fairly cheap. The slipperiness of nylon makes it difficult to hand-haul and it will easily tangle if fished from a bin or basket, but it is compact enough to be fished from some types of fishing reel, such as the Samoan handreel (see section 2F).
- **longline rope**, which is made of a nylon material called Kuralon, is heavier and bulkier than nylon monofilament and cannot be fished from a Samoan handreel, although larger reels can be made to accommodate it. However Kuralon is easier to grip when hand-hauling and is less liable to tangle when fished from a basket. Although new Kuralon is expensive, second-hand material can sometimes be obtained cheaply in places where industrial longliners operate.

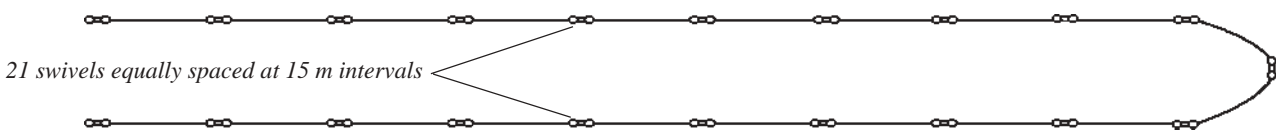
Irrespective of which material is used, the basic design of the mainline is the same. The line is divided into a number of parts: a long ‘leader’ section which runs from the surface to the first swivel, and then a number of shorter equal-length sections which separate the rest of the swivels. The swivels will serve as the attachment points for the branchlines (see section 2C). Once the line has been rigged up, the fishing depth can be changed by shortening or lengthening the first section of mainline, that is, the section from the surface to the first swivel.

*Design example for a 300 m mainline with 15 branchlines*



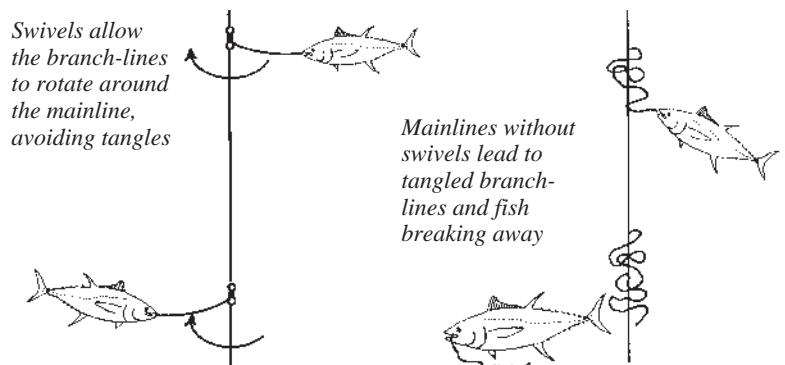
Some fishermen prefer a variation on this design: they incorporate swivels all the way along the line, so that, effectively, there is no leader section. This arrangement uses more swivels but has the advantage that the line can be used either way up, so that it does not matter which way the line is stored on a handreel or laid out in a bin. This variation is particularly useful if the lines will be set float-first from a wooden handreel, as described in section 2F. In addition, this system allows the fisherman to get more hooks in the water, and to target shallow-water species such as mahi mahi, sailfish and marlin if these are present in the fishing area.

*‘Reversible’ mainline design, total length 300 m*



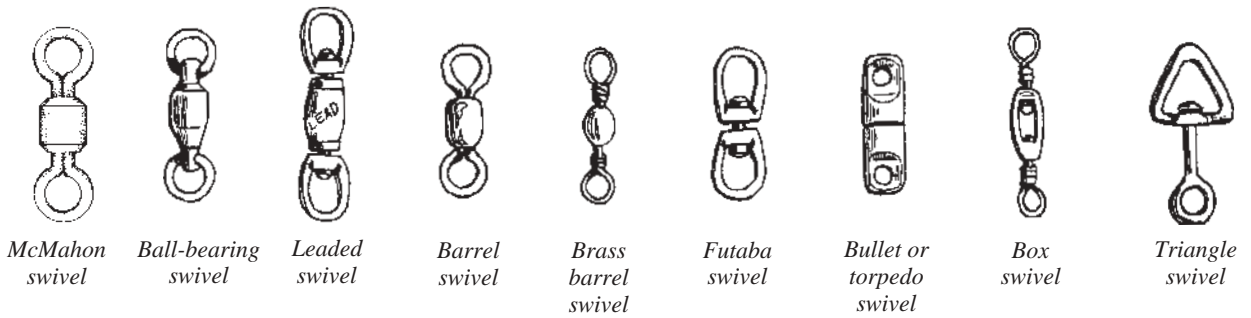
### SWIVELS

Swivels are built into the mainline at regular intervals, typically every 15 m. The swivels serve two purposes; they provide secure attachment points for the branchlines and they allow sections of the mainline to rotate independently, reducing the likelihood of the mainline and branchlines tangling with each other.



Heavy duty swivels made of brass or stainless steel should be used. Brass barrel swivels function almost as well as stainless steel ball-bearing swivels and are available at a fraction of the cost.

*Swivel types*



**ATTACHING THE SWIVELS**

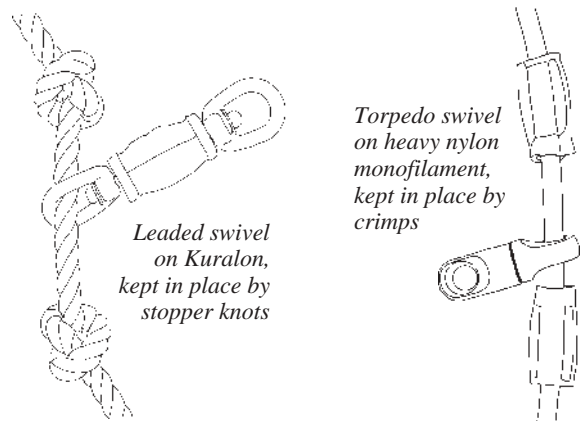
There are two basic methods for building swivels into the mainline using the knots, splices and other line-connection techniques described in sections 1E–1H:

*Free-running*

One eye of the swivel is threaded onto the line, allowing it to slide free. The swivel is kept in the right place by blocking its movement using stopper knots or crimps. This method creates a 3-dimensional swivel arrangement by allowing the swivel to rotate both horizontally and vertically.

Stopper knots are difficult to tie in monofilament, since the knots tend to be too small to prevent the swivels sliding over them. Crimps are therefore needed if nylon is being used for the mainline, and this will add extra cost to the line. If Kuralon is being used, a simple overhand or figure-of-eight knot will be large enough to stop most swivels.

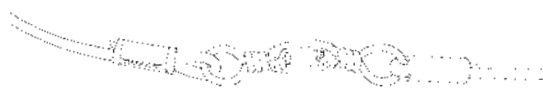
*Free-running swivel arrangements*



*In-line swivel arrangements*



*McMahon swivel spliced into Kuralon*



*Box swivel crimped into heavy nylon monofilament*



*McMahon swivel crimped into lighter nylon monofilament using Flemish eyes*

**Tied-in, or 'in-line'**

This is the most common method. The line is cut into sections of the appropriate length and the ends of each section are then fixed into the swivel eyes using knots, splices or crimps. This does not allow as much freedom of movement for the swivels as the free-running method unless 3-way swivels can be obtained. However this technique may be necessary if the mainline is made of monofilament and crimps are not available.

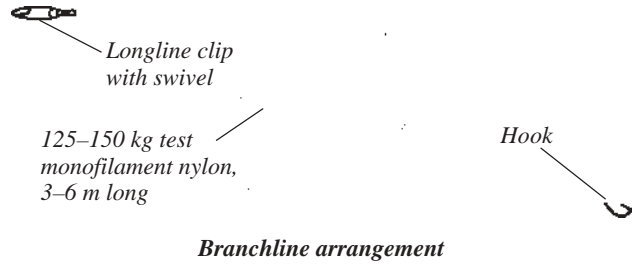
Clinch, slip or trilene knots, or crimps, are suitable for connecting the ends of monofilament sections, braided lines or other lighter lines into the swivel eyes. For Kuralon or other 3-strand materials an eye splice is the best option: tying a bowline knot is a lot faster but is weaker than a splice. In addition the knots will snag and tangle if the line is fished from a basket, and may also hook up on and tangle with the branchlines.

Which system is used will depend on the material from which the mainline is being made, the relative availability and cost of labour and materials, and the personal preference of the fisherman who owns the gear.

## SECTION 2C: BRANCHLINES

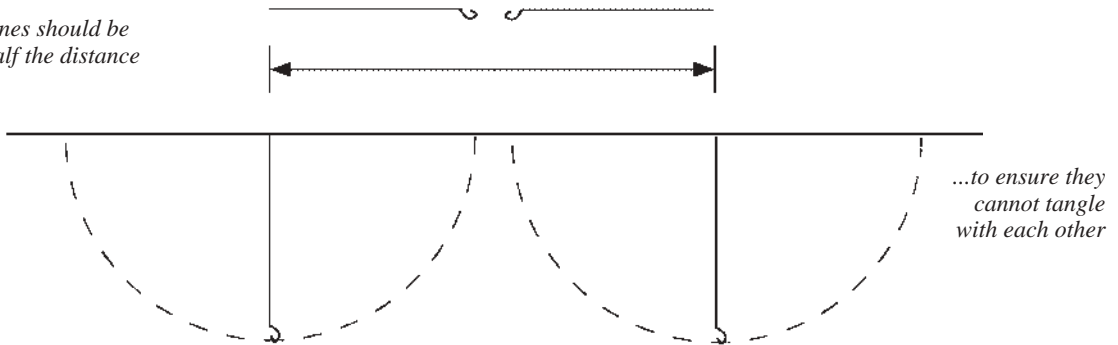
### LINE MATERIALS

Branchlines consist of a length of nylon monofilament with a hook at one end and at the other a longline clip (sometimes called a snap) fitted with a swivel. The monofilament used should be of a lesser breaking strength than the mainline. If 200 kg test monofilament is used for the mainline, then branchlines should be made from 125–150 kg monofilament.



The length of the branchlines should be a bit less than half the distance between swivels in the mainline. For instance if the swivels are spaced 15 m apart then the branchlines should be less than 7.5 m long. Restricting the length of the branchlines in this way helps prevent them from tangling with each other.

Length of branchlines should be kept to less than half the distance between them...



### CLIPS AND HOOKS

#### Longline clips

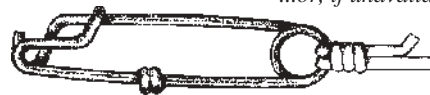
Standard longline clips or snaps are used for connecting branchlines into the swivels on the mainline. A range of sizes are available: the size should be selected so that the clip will fit the mainline swivel or other attachment system being used (see next page). Clips with a length of 10–12 cm are usually a good choice.

Some longline clips come fitted with a swivel in the base: these types are better than those with no swivel.

Choose 10–12 cm longline clips with swivels...

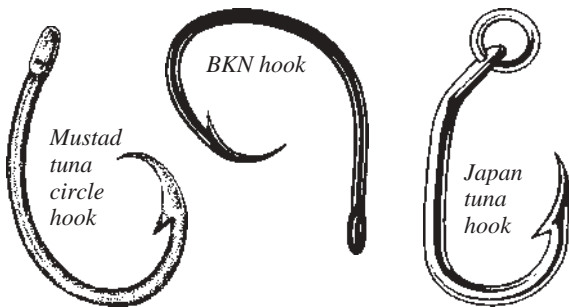


...or, if unavailable, without swivels



#### Hooks

The best types of hooks to use are size 14/0–16/0 Mustad tuna circles, size 48 Tankichi BKN tuna longline hooks, or 3.6 mm Japan tuna hooks. These hook styles have a circular hooking motion which is adapted to the way a tuna takes the bait. Tuna circle and Japan tuna hooks are available in stainless steel versions which are more costly than the standard galvanised types but last longer. If circle hooks are unavailable a range of other straight hook types can be substituted, but they will probably result in fewer hook-ups.



#### Attaching hooks and longline clips

Hooks and longline clips are attached to branchlines using crimps, or by knotting using one of the monofilament knots shown in section 1H.

## ATTACHING BRANCHLINES TO THE MAINLINE

### Direct attachment

If three-way swivels or sliding swivels are being used on the mainline, the longline clips on the branchlines can be attached directly into them (provided of course that the clip is the right size to pass through the swivel eye). This provides a secure attachment for the branchline while also allowing it to rotate in both horizontal and vertical dimensions. If the longline clip is also fitted with a swivel at its base then the branchline will be very well protected against tangling and cut-offs.

If standard 2-way swivels have been used in the mainline, the branchline can still be clipped into the swivel eye (normally the lower, for reasons that will be explained later). In this case the connection is secure but somewhat stiff, and limits the rotation of the branchline to the horizontal dimension only. Even this rotation will be impeded somewhat by the weight of the mainline on the swivels, so it is important to make sure that longline clips with built-in swivels are used in this arrangement.

### Attachment rings and double swivels

Any of these attachment methods requires that the size of the mainline swivels and the longline clips are matched to each other—sometimes an impossibility in places where gear in a range of sizes is hard to obtain. In addition, clipping and unclipping snoods from certain types of swivels can be awkward and difficult to do quickly.

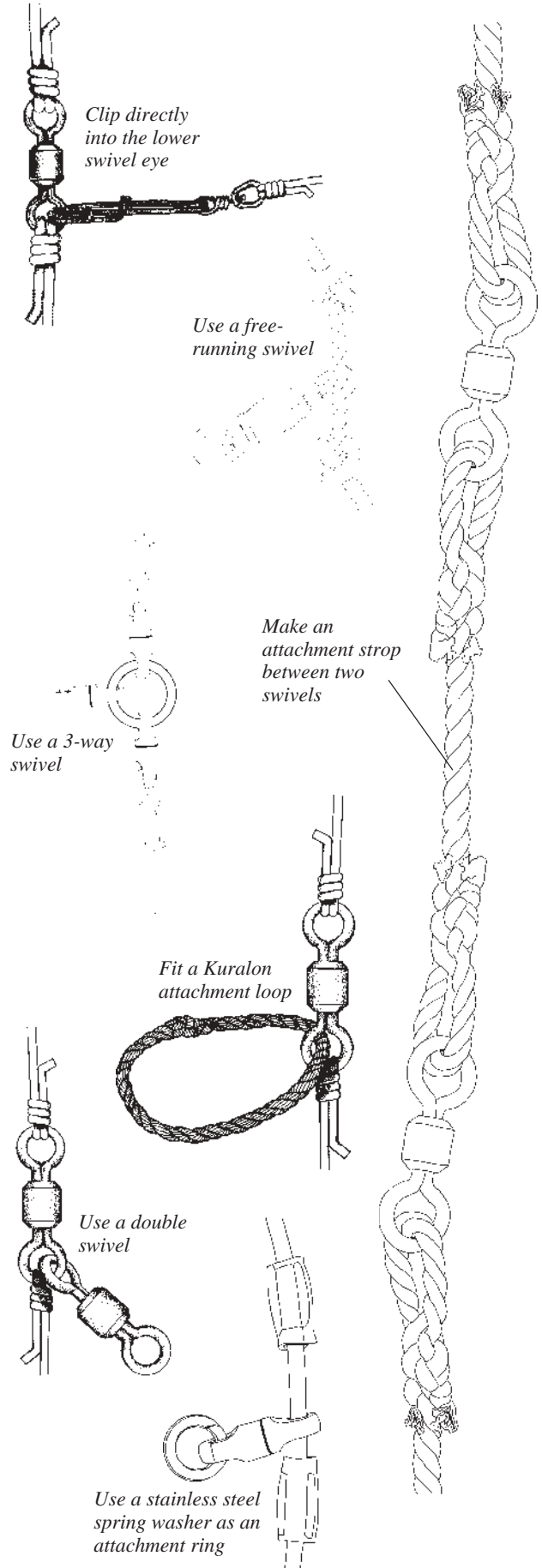
When this problem is encountered, an option is to fix attachment rings into the swivels, or to use a double swivel arrangement. A simple way of doing this is to splice small loops of Kuralon into the swivel eye. This allows for fast, easy attachment of the longline clips.

Alternatively a sturdy stainless steel spring washer can be fitted through the eye by opening and closing it using two adjustable wrenches.

If the eye of the swivel is too small to attach a longline clip or an attachment ring, it may be possible to use a double-swivel arrangement. Some types of swivels can be purchased with the eye of one swivel threaded through the eye of another.

Fitting the mainline swivels with an attachment ring makes it easier to clip the snoods on and remove them, and the connection is quick and flexible rather than awkward and stiff. The drawbacks are that the attachment rings add bulk to the line, and must be regularly checked and replaced as they become worn, especially in the case of Kuralon loops.

### Branchline attachment methods

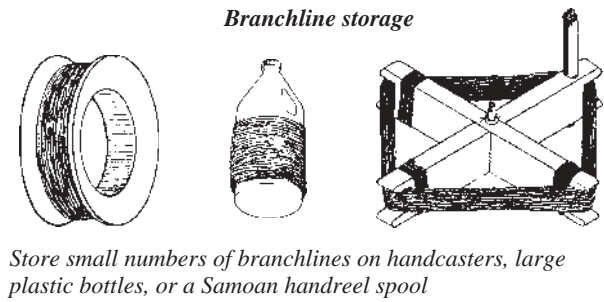


## SECTION 2D: OTHER GEAR AND EQUIPMENT

### BRANCHLINE STORAGE

During the fishing operation, a systematic approach to the storage and handling of branchlines is needed if they are not to finish up as a tangled mess.

For small numbers of branchlines, the best storage method is to wind them onto a handcaster spool or other cylindrical object, such as a large-diameter plastic bottle. Alternatively, if the boat is using Samoan handreels (see section 2F), one handreel can be used to store the branchlines while the mainline is fished from another.



*Store small numbers of branchlines on handcasters, large plastic bottles, or a Samoan handreel spool*

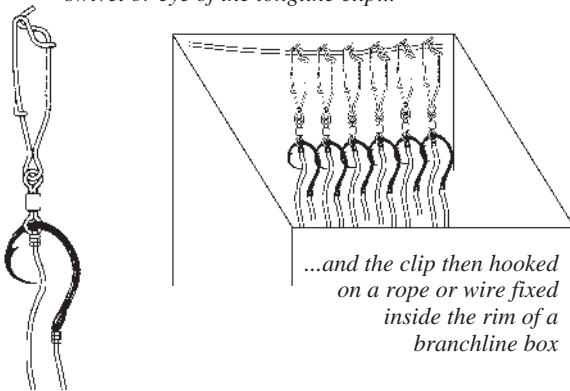


*Avoid small-diameter rectangular frames, which will kink the branchlines*

The hook of the first branchline is hooked into a hole or groove made in the spool for this purpose, and the branchline wound on. When the longline clip is reached the hook of the next branchline is hooked through the clip and winding continues so that the next branchline is wound on the spool. The process continues until the spool is full. Normally one or two large handcasters are enough to hold all the branchlines for a single mainline.

#### *Storing branchlines in a box*

*The hook of the branchline is passed through the swivel or eye of the longline clip...*



For larger numbers of branchlines, a box or bin is more practical. A length of nylon monofilament is attached inside the rim of the box using U-nails, staples or tie-wires. For storage the hook of each branchline is hooked through the swivel or eye of its own longline clip. The clip is then attached to the nylon line inside the rim of the box, and the body of the branchline placed in. To avoid tangling the clips are attached to the line in careful sequence, starting from one corner or specific place marked on the box and working around the edge. The last branchline clipped in place will have its line on top of the pile and so should be the first one to be taken out of the box when fishing commences. As long as the order of storage is kept systematic, and the 'last-in-first-out' rule is followed, the branchlines should not become tangled.

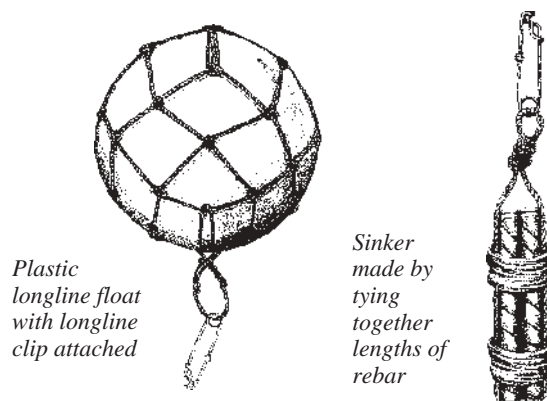
### FLOATS AND SINKERS

Standard 300 mm diameter hard plastic longline floats are suitable for vertical longlining. A short loop of Kuralon fitted with a longline clip should be tied or spliced to each float to allow quick attachment and removal. The floats are generally not clipped directly to the mainlines. Instead, both the float and the mainline are clipped onto loops, or swivel eyes, in a section of polypropylene floatline, as explained opposite.

Instead of a single larger float, two or three smaller floats connected in a short string can be used. This is more costly and cumbersome but when a fish is hooked it can be seen more easily due to the submersion of the first float in the string. It also acts as a shock absorber when a fish strikes or makes a run after being hooked.

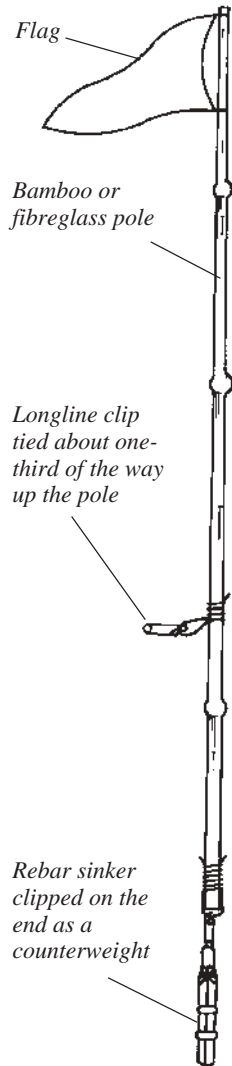
Scrap lengths of steel reinforcing rod (rebar) are commonly available and can be used to make sinkers. Use 4–6 pieces of 20–40 cm length rebar to make 2–5 kg sinkers by welding the pieces together or binding them with nylon monofilament offcuts or lengths of old inner tube rubber. To allow quick attachment and removal, a longline clip is fitted to each sinker using a simple Kuralon or monofilament bridle.

#### *Floats and sinkers*





## FLAG BUOYS

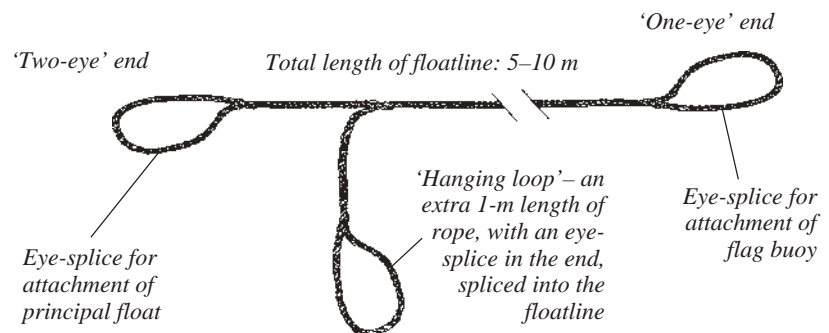


A 3 m length of bamboo or a fibreglass pole is ideal for attaching a flag to a float so it can be seen from a distance. A longline clip is tied to the pole about one-third of its length from the bottom so that it can be clipped to a float. At the bottom end a counterweight comprising the standard rebar sinker is attached to keep it upright in the water. Some fishermen prefer to fix the sinker or float permanently to the flagpole, while others prefer to use longline clips so the sinker and float can be removed for convenience in storage.

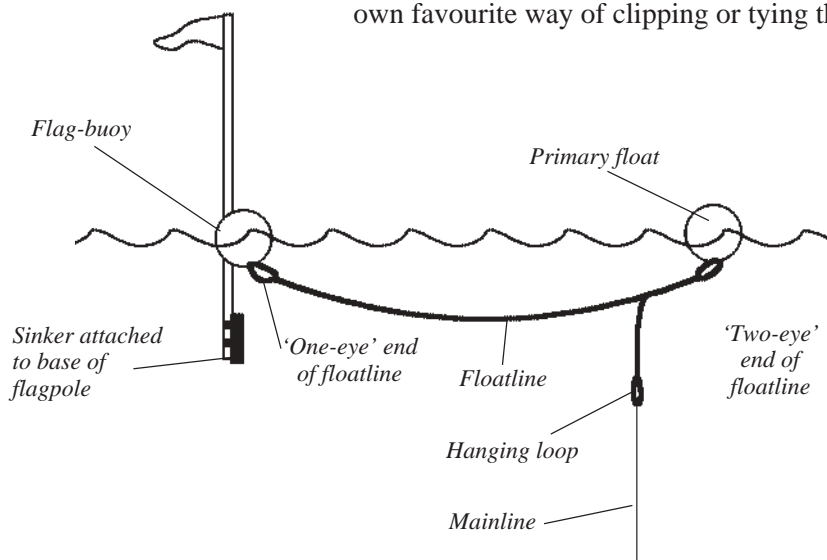
## FLOATLINE

Floatlines are used to join one or more floats at the surface. They should be made from sections of 6–8 mm diameter polypropylene rope or Kuralon longline rope. When fishing single vertical longlines, a short floatline of 5–10 m in length on each line is sufficient. The function in this case is to make retrieval of the mainline easier, as well as to allow backup flotation to the principal float. If multiple vertical longlines are being fished (see section 2G) then longer floatlines or extra rope sections, 60–100 m in length, can be used to keep the mainlines well separated and avoid tangling.

A basic floatline is just a length of rope with an eye splice (see section 1F) in each end. However a better system is to give each floatline a two-eye end and a one-eye end. To rig this, an eye is first spliced into each end of the floatline. Then, about 2 m from one end, an extra 1-m length of rope, with another eye-splice already made in the end, is spliced in. This extra 'hanging loop' is used as the attachment point for the mainline, while the two end-splices are used to attach the float and flag buoy respectively.



This is not the only floatline system that can be used, and most fishermen have their own favourite way of clipping or tying the mainline to its floats and floatline.



## Floatline arrangement

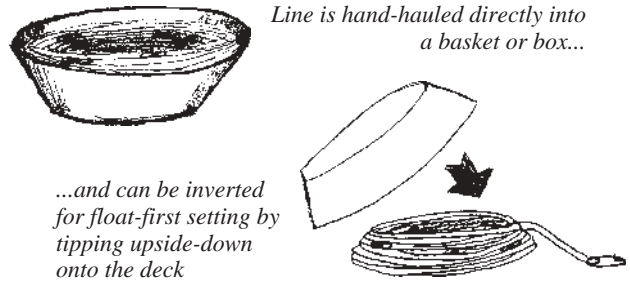
When fishing a single mainline, one floatline is used. The mainline is clipped to the eye-splice of the hanging line, at the 'two-eye' end of the floatline, while a float without flagpole is clipped to the other eye-splice at the 'two-eye' end. The flagpole buoy is clipped to the eye-splice in the 'one-eye' end of the line.

## SECTION 2E: SETTING THE LINE FROM A BASKET

This section describes the basic procedure for setting a vertical longline from a basket. Section 2F describes fishing with a wooden hand-reel, and section 2L briefly discusses the use of a larger longline drum. Setting multiple vertical longlines is described in section 2G, and hauling the lines in section 2H.

### GEAR

Fishing from a basket is the cheapest and simplest way to carry out vertical longlining. The line is stored in a basket or bin and is set and hauled by hand. Because of its slippery nature and its tendency to tangle, nylon monofilament is not very suitable for basket-style fishing. The best material is Kuralon longline rope, or alternatively a strong braided line made of a material such as dacron which is easy to grip and which sinks.



When the gear is hauled in after fishing, the mainline is coiled into the basket or bin for storage. Since hauling always starts from the float, this means that the top end of the line goes into the basket first, and the bottom (sinker) end of the line finishes up on top of the pile. If the line is to be set sinker-first (see opposite page) this is not a problem as the sinker end is the first to be deployed. If the line is to be set float-first then the line needs to be reversed before it can be set. This is done by turning the basket over and dumping the line onto the deck in an upside-down pile, so that the float end is now on top. Alternatively, a 'reversible' mainline with swivels along the entire length (see section 2B) can be used, in which case there is no need to turn the line upside down before setting float-first.

### BASIC PROCEDURE

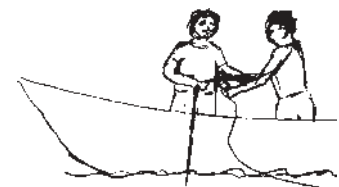
Irrespective of whether the line is set sinker-first or float-first the basic setting procedure is the same. The mainline is paid out over the side of the boat by one crewman—the 'line-man'—at a speed which allows a second crewman—the 'bait-man'—to clip on the branchlines as the mainline goes by. Normally a third crewman is responsible for driving the boat.

The line should always be set from the part of the boat which will avoid the line and the boat being pushed together by the action of current or wind. Which part of the boat this is will vary depending on the direction and strength of wind and current, and whether the boat is under way, drifting, or tied to a FAD.

While the line-man pays out the mainline at the correct speed, the bait-man takes a branchline and throws the baited hook over the side while holding onto the longline clip at the other end. Baiting may be done during the setting operation, or it may be preferred to save time by baiting all the hooks before setting begins. Once the hook is in the water, the branchline is clipped into the appropriate swivel eye or attachment ring on the mainline. The procedure is repeated, with baited branchlines being clipped onto the swivels as they appear, until all the hooks have been set.



The bait-man throws the bait well clear of the boat...



...before attaching the branchline to the mainline

For safety reasons **the baited branchline is never clipped onto the mainline until the hook is in the water.** This is to avoid injuries that might be caused if a large fish bites on a hook which is already in the water while the bait-man is still holding a connected-up branchline in his hand.

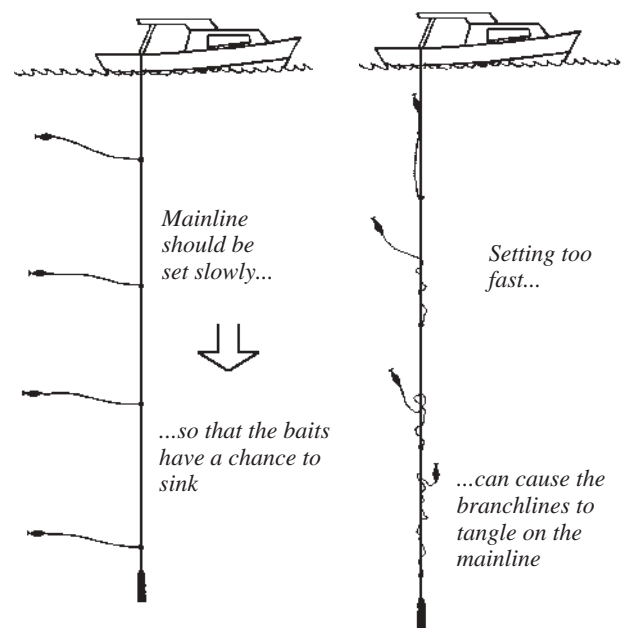
## SETTING SINKER-FIRST OR FLOAT-FIRST

As mentioned previously, vertical longlines can be set **sinker-first** or **float-first**. Sinker-first setting takes longer but can be done when the boat is drifting or tied to a FAD. Float-first setting is faster but is only really practical while the boat is under way.

### Setting sinker-first

The sinker is clipped onto the swivel or attachment point at the bottom of the mainline, and the line lowered slowly over the side by the line-man while the bait-man clips a branchline onto each swivel as it goes by. The line should be paid out slowly, otherwise the branchlines will stream upwards and may tangle with the mainline. If there is a strong current which keeps the branchlines clear of the mainline, then setting can be sped up a little, but if the current is weak then the line should only be lowered at the same rate that the baits sink naturally. Having to lower the line so slowly makes the sinker-first method rather time-consuming, with about 10–15 minutes needed to set each line.

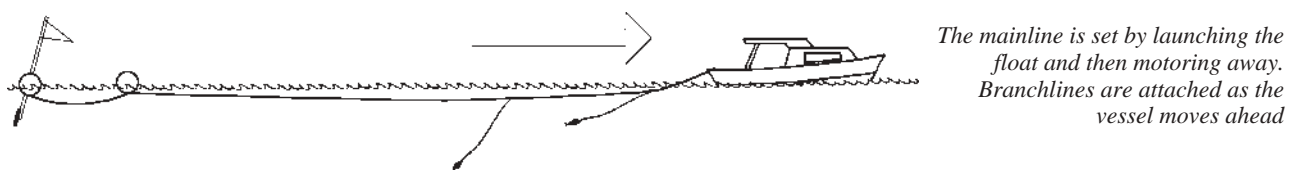
Alternatively the line can be buoyed off from the boat, or set free to drift, so that more lines can be set. Fishing with multiple lines is described in more detail in section 2G.



### Setting float-first

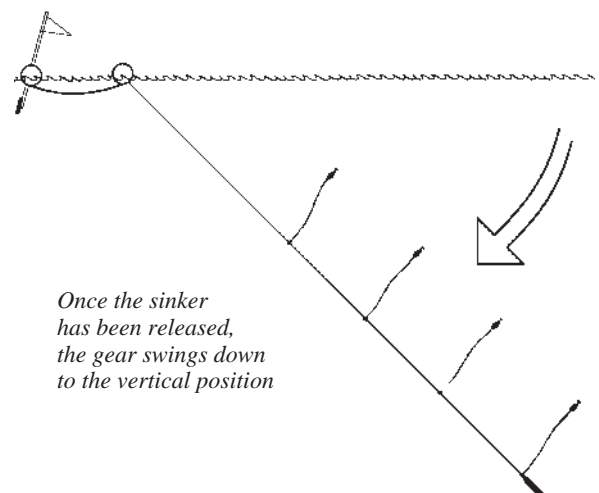
Float-first setting is the reverse of the above procedure. It allows faster deployment of the gear as the vessel's engine is used to accelerate the setting process. This method is most suited to setting single vertical longlines, and is impractical when setting strings of lines.

The floatline is prepared first by attaching a flag buoy to the one-eye end and a primary float to the two-eye end as shown in section 2D, and the end of the mainline into the hanging loop on the floatline. The flag buoy is then put over the side with the floatline, the primary float and the beginning of the mainline, as the vessel starts to motor away. The boat continues on course, with the upper section of the mainline now paying out.



When the first swivel is reached, the vessel slows down to an appropriate working speed so that the bait-man can attach the branchlines as the mainline swivels go by. The boat driver may need to slow down and speed up between swivels. Once the last branchline has been attached, the sinker is clipped on and let go over the side. The whole process should take less than 5 minutes.

Apart from speed, the other advantage of this method is that the entire system is deployed more or less horizontally at the surface and then swings slowly down to its vertical position through an arc with the branchlines streaming behind the mainline. This reduces the chances of the branchlines tangling with the mainline, which is always a risk when the sinker-first method is used.



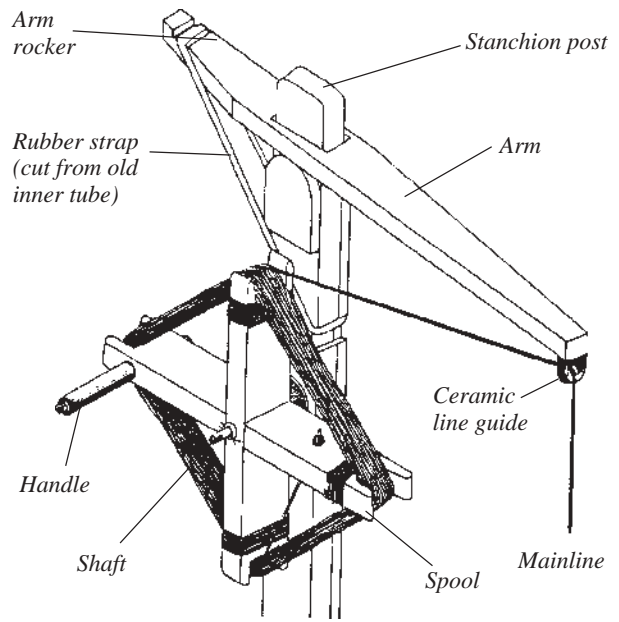
## SECTION 2F: SETTING THE LINE FROM A SAMOAN HANDREEL

### THE SAMOAN HANDREEL

Because it is easy to rig, inexpensive, and effective when fishing, monofilament nylon is a good material for vertical longlines. However, unlike Kuralon and other rope materials, it cannot be fished from a basket or bin as described in section 2E, because it is too prone to tangling, and too slippery for practical hand-hauling. A reel is therefore needed to operate vertical longlines with nylon monofilament mainlines.

Any type of large fishing reel can be used for this purpose, but the one discussed here is the wooden 'Samoan handreel'. This was introduced into Samoa in 1975 by the Food and Agriculture Organization of the United Nations and has now become widespread in the Pacific Islands region for deep-bottom fishing and trolling. The reel can easily be adapted for vertical longlining and is ideal when only a small number of mainlines are being used. Instructions for building the reel are given in *SPC Handbook No. 25 (1985), Notes on the Construction of the FAO Wooden Fishing Reel*.

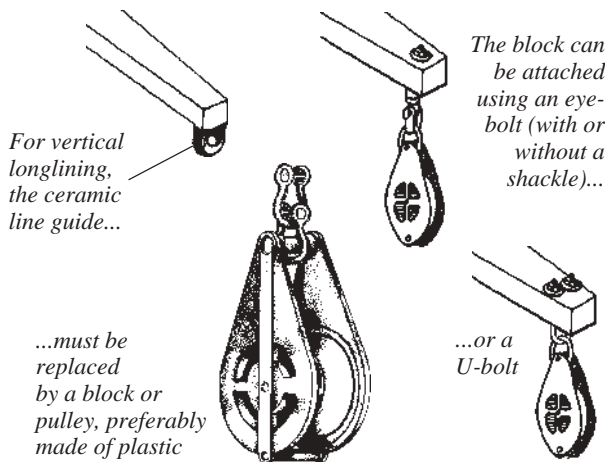
The FAO/ Samoan wooden handreel



### ADAPTING THE REEL

#### Replacing the line guide

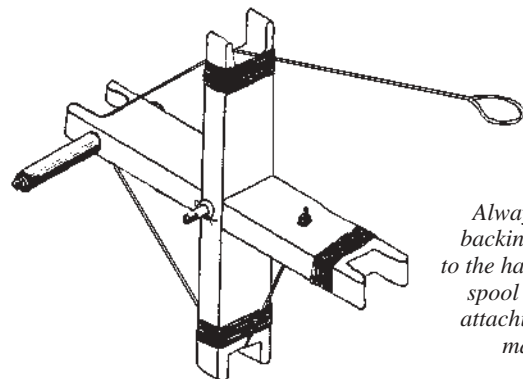
Most Samoan handreels use a ceramic electrical insulator (of a type used on telegraph poles) as a line guide. This is too small to allow passage of many of the larger types of swivel that may be used on a vertical longline. Even if the swivels could pass through, they would soon chip the insulator, which would then damage the mainline. The line guide must therefore be replaced by a large-diameter pulley or block, preferably plastic, that will allow the free passage of the swivels in the mainline. Take care to select one in which the sheave (wheel) is slightly recessed into the walls, so that if the line ever jumps off it will not jam down the side.



To fit the pulley, dismantle it and fit an eye-bolt over the pin at the top, and then fix this to the correct place on the reel arm. This gives a solid attachment which will not swing from side to side too much, thus keeping the line properly aligned with the handreel during setting and hauling. If the pulley cannot be dismantled, a U-bolt and/or a small shackle can be used instead.

#### Adding a backing line

In vertical longlining the handreel spool is used for storage, setting and hauling of the mainline. Before winding the mainline onto the spool, however, a backing line made from light rope or heavy monofilament should first be attached. This can be done by tying the backing around the reel, or knotting it through a small hole drilled in one of the reel arms for this purpose. A loop is made in the free end of the backing, or a longline clip attached, and this serves as a connection point for the mainline.



The mainline should always be properly attached to the backing before being wound onto the reel. This way, when the mainline is unwound during fishing there is no chance that the whole lot will disappear over the side when the end is reached. If it is made fairly long, the backing can also be used to let the line away from the vessel, with a buoy attached, so there is never a need to disconnect the mainline and it can easily be retrieved.

The reel should also be fitted with a braking system to ensure that a large fish making a run will not pull too much line off the reel or cause an injury. A simple loop of inner tube rubber, attached to the side of the boat and looped over the reel handle, makes a simple but effective brake. More elaborate systems have also been devised by some fishermen.

Once the reel is ready for use the mainline can be wound onto it. The type of mainline used (with a leader or reversible, as shown in section 2B) will depend on whether the line is to be set sinker-first or float-first. Depending on the length and diameter of the nylon being used, it may be possible to fit two mainlines on a single handreel spool. In any case the spools can be easily changed over during fishing, so additional mainlines can be stored on spare spools, allowing the fisherman to carry as many lines as he can operate.

## SETTING THE LINE

The basic principles of setting the line using the wooden handreel are similar to those outlined in section 2E. As with basket gear, the options exist for setting the line either sinker-first or float-first.

### Setting sinker-first

The mainline is threaded through the block or pulley on the reel arm, and then a sinker clipped onto the first swivel at the bottom end of the line, along with the first baited branchline. The line-man lowers the mainline by controlled unwinding of the reel while the bait-man connects the branchlines one at a time as the swivels go past. For safety reasons the baited hook is always thrown into the water before attaching the longline clip to the swivel, as described in section 2E. The line-man lowers the mainline slowly over the side, watching the bait as it sinks to ensure the rate of unwinding is not so fast as to cause tangles. Under no circumstances should the reel be let go and allowed to free-spool—this is a guaranteed recipe for large tangles.

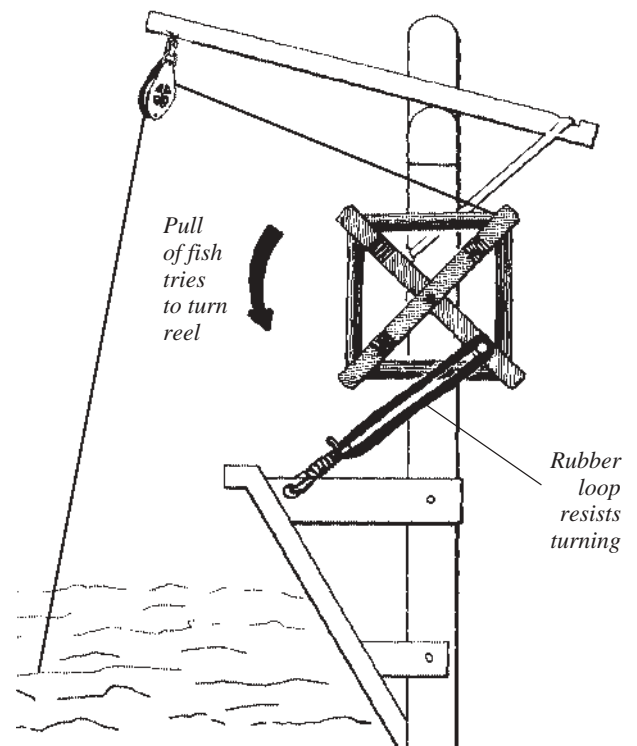
### Setting float-first

Setting the line float-first can be done roughly as described in section 2E, using a reversible mainline as shown in section 2B. Normally branchlines would not be clipped onto the first 4–5 swivels, since these will be the ones that end up lying in shallower depths where large tunas would not usually be expected. However if surface-feeding fish such as mahi mahi or small tunas are in the area, it may be worth attaching branchlines to even the shallowest swivels.

Setting is much as described in section 2E. The flag buoy is set first and the vessel motored ahead until the floatline runs out, at which point the primary float is set. Once the mainline begins to run off the reel the vessel needs to be kept at a reasonably slow speed so that the line-man can keep the reel under control. The bait-man attaches branchlines as the swivels go by, taking care to put the hooks overboard before connecting the longline clips.

Once the end of the mainline is reached, the sinker and last baited branchline are attached and dropped overboard, causing the mainline to sink in an arc to its vertical fishing position as shown in section 2E.

*A simple handreel braking system*



## SECTION 2G: SETTING MULTIPLE LINES

### STARTING SMALL

The best way to start vertical longlining is to set a single mainline and fish it from the boat so as to become familiar with the gear and the fishing method. When they have been through this stage and become familiar with vertical longline fishing, most fishermen will want to scale up their fishing operation by setting greater numbers of lines. In this case the next step is to start setting free-drifting vertical longlines. If several fishermen are operating in an area, they will need to mark their flags or floats so that each person's gear can be identified.

### SETTING LINES TO DRIFT

The float-first setting method, described in sections 2E and 2F, is a quick way to get numerous free-drifting individual lines into the water. The float-first method allows the setting of up to ten lines per hour—probably the maximum that any fisherman would want to set, since once this many lines are in the water it will be necessary to move around checking them and, hopefully, hauling in some fish.

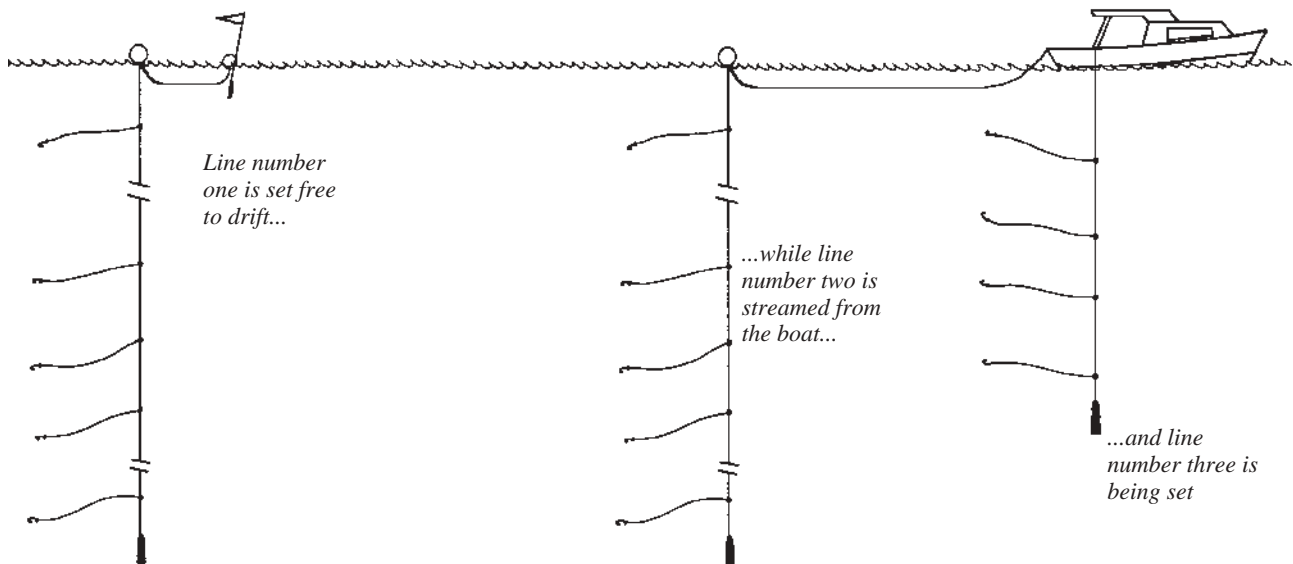
The sinker-first method results in slower setting, but can be carried out without using the engine, so that the boat can fish while drifting or tied to the FAD. When using this method it does not really matter whether the gear is being fished from a basket or from a handreel, although there are some extra precautions to be taken if a handreel is being used.

The first mainline—mainline number one—is set as described in sections 2E and 2F. Once this line has been set, it needs to be got out of tangling distance to make room for mainline number two. To do this a floatline is prepared by attaching a longline float to the eye-splice at the 'two-eye' end, as described in section 2D. Once setting is complete, mainline number one is then clipped onto the hanging loop of the floatline and released, allowing it to drift away from the boat.

If using a handreel, some fishing arrangements require that the mainline be completely disconnected from the reel for a few moments in order to attach it to the floatline. Great care must be taken at this point not to drop the line, otherwise the gear will sink and be lost. Ideally the crew should take a couple of turns of the mainline around a strong point on the vessel or otherwise temporarily attach it to something while the clip is disconnected, just in case a large fish strikes at this exact moment.

Line number one will gradually drift further and further away from the boat. Once the floatline is fully extended, it can be tied off and allowed to fish at a distance, while line number two is buoyed off close to the boat. Alternatively, if more lines are to be deployed, then a flagpole can be attached to line number one and the whole assembly set free to drift. The procedure can then be repeated with line number two, allowing it to drift away while setting of line number three commences. If this procedure is repeated without stopping then it is possible to set three or four drifting lines per hour.

Setting vertical longlines to drift free

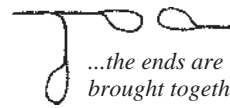


## SETTING LINES IN STRINGS

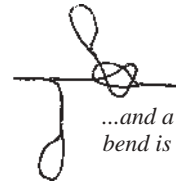
Although setting of numerous individual lines can be done quickly if the float-first method is used, there are some disadvantages to this technique. The lines drift independently of each other and the vagaries of wind and current, plus the movement of hooked fish, will cause the lines to move at different speeds and, sometimes, even in different directions. This makes it hard to keep track of the individual lines, so more time is spent looking for them in order to retrieve them, and there is always the prospect that some lines will be lost.

An alternative to allowing the lines to drift individually is to connect them together in strings, preventing them from drifting too far apart. To do this, instead of line number one being set free, it is attached to line number two by tying a sheet bend (see section 1G) between the ends of the two floatlines. It may be necessary to use longer floatlines (up to 100 m) or to add extra lengths of rope between the floatlines so that the mainlines are well separated (at least 60 m apart) and not at risk of tangling with each other. Once the two floatlines are connected, a float is clipped on and the assembly allowed to drift away.

To connect the two floatlines...



...the ends are brought together...



...and a sheet bend is made

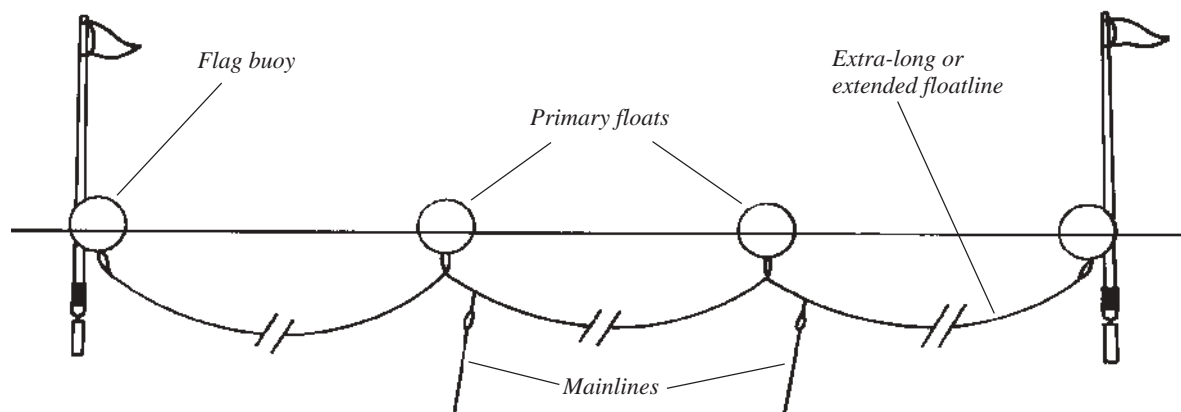
The float is then attached to the eye-splice protruding from the sheet bend...



...and the mainline clipped into the hanging loop

The result is two lines fishing while tied off in sequence from the boat. Additional lines can be connected to the end of the string, which can either be left tied to the vessel or can be detached once a sufficient number of lines have been strung together.

A free-drifting string of vertical longlines



Normally strings of lines are set using the sinker-first method. Technically it should also be possible to set strings using the float-first method, but this would require motoring the boat back to the float of each line after it had been set in order to connect the next line to it. Since this rather defeats the object of the float-first method, whose main advantage is speed, this technique does not actually appear to have been used.

## PROS AND CONS OF STRINGS

Setting lines in strings has both advantages and disadvantages. On the positive side, the lines stay together and are a lot easier to find and quicker to haul. In addition, if the fish are concentrated in a small area—for instance, huddled around a FAD or on top of a seamount—then stringing the lines together keeps the hooks in a tighter area and may increase the catch. However there is more chance of the lines tangling with each other, especially in rough weather, or if a large fish or shark is hooked on one line and decides to go for a swim among the others. In addition, while an individual line drifting into and tangling with the FAD is bad enough, a string of lines tangling with the FAD is a disaster which can result in the loss of most or all of the fisherman's gear.

In general, therefore, while it is important to know the method of stringing mainlines together, it is also important to understand the limitations of the technique. Strings of mainlines may improve the efficiency of fishing in calm weather when currents are not too strong and the lines will not be set too close to a FAD. They are also practical when tied to the FAD itself, as the current tends to keep them well separated and helps avoid any tangles. At other times it may be better to set the lines individually, even if this means more time spent retrieving them.

## SECTION 2H: HAULING THE LINE

As explained in the preceding sections, vertical longlines can be set in a number of different ways. However the hauling process is essentially universal since, for obvious reasons, hauling always takes place float-first. The use of reels or a hand-hauling system makes very little difference to the actual hauling procedure.

### SOAK TIME

Hauling begins after the lines have soaked for a sufficiently long time (2–5 hours) or when it is obvious that fish have been hooked. In many cases the movement of the floats on the surface will give away the presence of fish on the line. When a fish is hooked it is a good idea to wait for 15–20 minutes to allow the fish to tire itself before hauling. In addition, further strikes may occur during this period, as large tuna usually move around in small groups. Even if no fish appear to have been hooked, the lines should still be hauled for checking every couple of hours.

### HAULING PROCEDURE

#### Recovering the mainline

If the vertical longline is being fished directly from the boat (rather than being streamed out or buoyed off to drift free) then hauling of the mainline can start straight away.

If the gear is being fished from the handreel, as described in section 2F, then the mainline clip is transferred from the floatline to the backing on the reel. As in the setting procedure, great care must be taken not to lose the line if it has to be disconnected, especially if it is clear that there is a fish on it. Once the mainline is securely connected to the reel, the line-man begins winding to recover it. If the gear is being fished from a basket, then the line-man starts hand-hauling the mainline, coiling it into the basket as he goes.

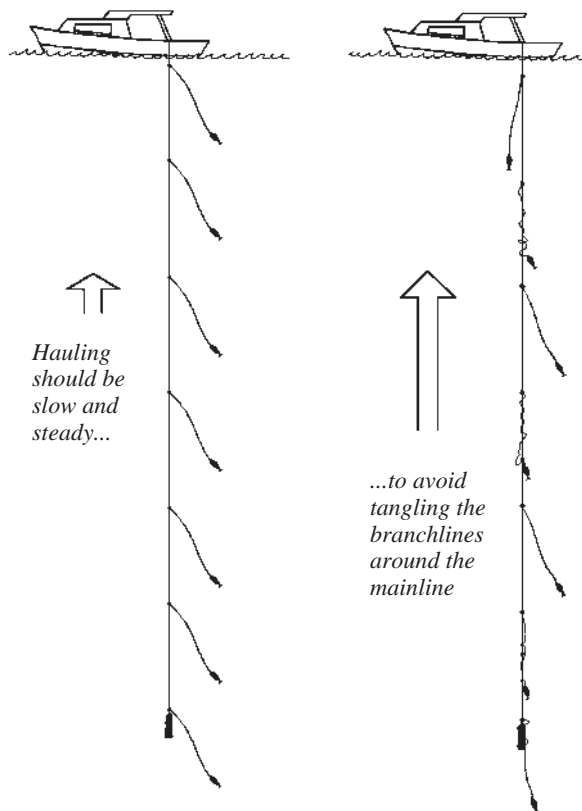
As with setting, hauling should not be done too quickly. If the line is pulled in too fast the branchlines will stream vertically downwards and will tend to tangle or twist around the mainline. The line should be hauled relatively slowly and with as steady a motion as possible.

When the first swivel appears, the line-man stops hauling so that the branchline can be checked. If there is no fish, the branchline is first disconnected and then brought aboard. As with setting, care is taken to ensure that the hook always remains in the water as long as the branchline is attached to the mainline. This way if a fish lower down on the line makes a run, no-one in the boat will get hurt by a trailing hook.

If there is a fish on the hook, the branchline is left connected to the mainline while the fish is gaffed, stunned and boated. Once the catch is safely on board, the branchline can be unclipped from the mainline, unhooked from the fish, and put away.

If the line is to be re-set and the bait is in good condition, it may be put aside with the bait still on the hook (see below). Otherwise the bait is stripped, the hook rinsed and the branchline put away on a handcaster or in a branchline bin as shown in section 2D.

The procedure continues, with branchlines being disconnected until the bottom swivel is reached. Once the last branchline has been removed the end of the mainline is brought on board and the sinker unclipped.





## Recovering lines streamed from the boat

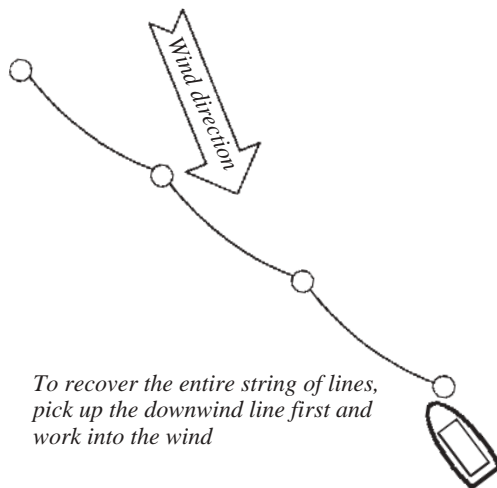
If one or more vertical longlines are being streamed from the boat, as shown in section 2G, it is a simple matter to recover them by pulling in the floatlines so they can be hauled one at a time. The floatline and float are detached, the end of the mainline is recovered, and the mainline is hauled as described opposite.

Alternatively, the lines can be set adrift so the boat can then motor to the other end of the string and recover them as for drifting lines, as described in the next paragraph.

## Recovering drifting lines

If the vertical longlines have been set adrift, either singly or in strings, then they will need to be recovered and the surface lines disconnected before hauling can begin. For single drifting lines, the gear can be picked up in the order it was set so that each line has a roughly equal soak-time. For strings of drifting lines, the gear can be recovered from either end, but again it is preferable to start from the line that was set first to equalise the soak-time.

The main consideration when recovering drifting strings is that the boat should always approach the string from a downwind direction so that the wind will not push the boat over the lines as the crew are trying to get organised for hauling.



*To recover the entire string of lines, pick up the downwind line first and work into the wind*

Alternatively, if it can be seen that there is a fish on one of the lines, this line can be hauled and re-set individually without disconnecting the floatlines from each other and without disturbing the other mainlines.

Once the primary float of the selected line has been retrieved, the boat is allowed to drift away from the other lines. Hauling is then conducted as described on the opposite page.

*To land a hooked fish without hauling the whole string...*

*...approach the line from downwind and disconnect it*

*Allow the boat to drift while the line is being hauled...*

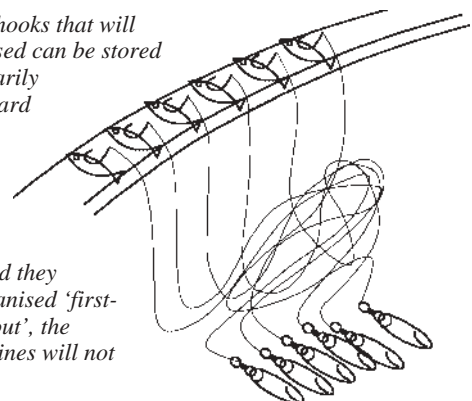
*...then re-set the line and reconnect it into the string*

## RE-USING BAITED BRANCHLINES

Sometimes a vertical longline will catch a fish soon after setting and have to be hauled again quite quickly. In such a case the branchlines can be put aside with their bait still intact so that they can be re-used once the fish has been boated and the line is re-set. In this case the baited hooks should be arranged systematically on a board or along the edge of the boat so that they will not become tangled, and where they will not be left in the sun for any length of time. The principle of 'first in, last out', as used in a normal branchline bin (see section 2D) should be used here too, so that there is no chance that the branchline on the bottom of the stack will be picked up first and become tangled with the others.

*Baited hooks that will be re-used can be stored temporarily on a board or rail*

*Provided they are organised 'first-in last-out', the branchlines will not tangle*

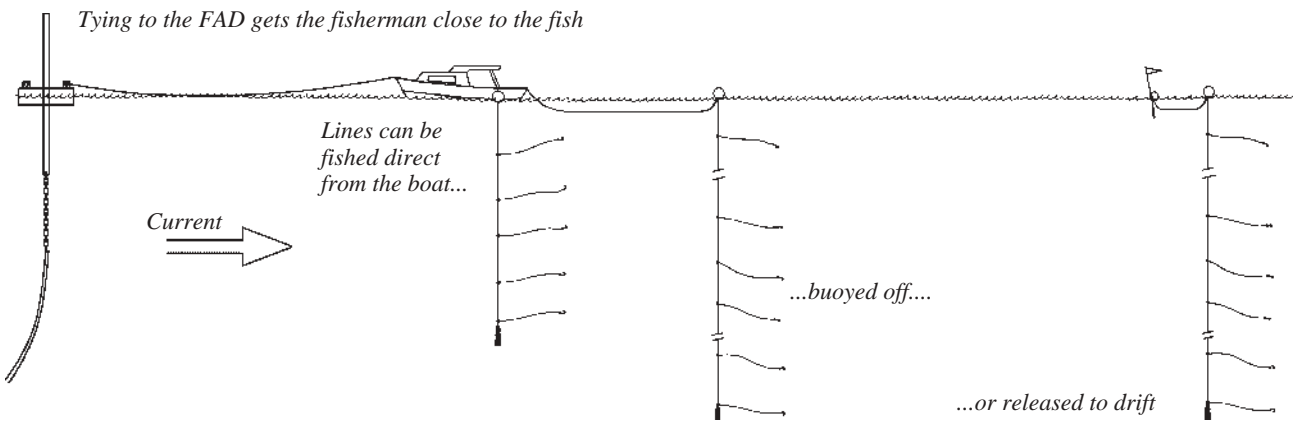


## SECTION 2I: TARGETING FISH CONCENTRATIONS

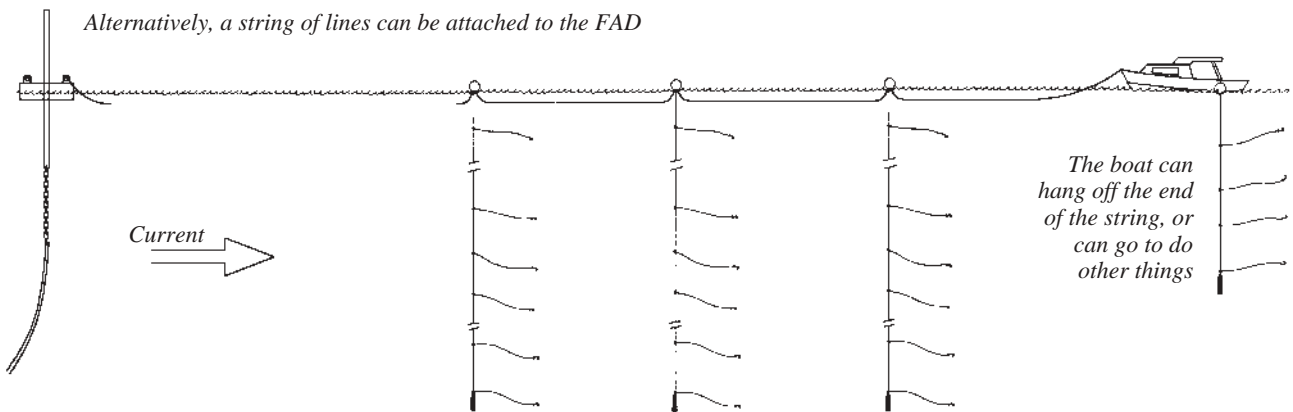
If the catches from vertical longline fishing are to be maximised, it is important to make sure the gear is operating in the areas where the target fish are concentrated. If fishing is being carried out in the open ocean, the location of fish concentrations may not be known, and may need to be located through trial and error. However if the fishing is taking place around FADs, over seamounts or in ‘tuna holes’ (places of known tuna abundance) then it can be reasonably supposed that fish will be concentrated in those areas. The fisherman needs to ensure his lines are set close to the fish concentrations in order to increase his chances of catching them.

### FISHING TIED TO THE FAD

When fishing around a FAD, the easiest way to ensure the lines are close to the FAD is to tie the boat to the FAD and fish from that position. Once the boat is tied off to the FAD the first mainline can be set using the sinker-first technique (sections 2E and 2F) and then streamed off to the stern or buoyed off and allowed to drift free so that another line can be set. Alternatively the lines can be set to form a string which remains attached to the FAD, with the boat tied off at the end.



Another technique is to set the lines in a string and leave this tied to the FAD while the boat goes to do something else (trolling, for instance). These various options ensure that all the lines set are exposed to the concentrations of fish that may be around the FAD.



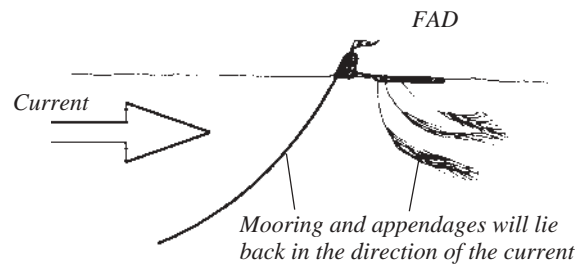
There are nevertheless a number of problems with fishing while tied up to the FAD. For one thing, fisheries authorities in many places discourage or prohibit fishermen from doing this (because of the risk of large boats dragging or damaging the FAD mooring) in which case the rules should be respected. Another problem is that if there are several boats wanting to tie up to the FAD, conflict may arise about who gets to do so. If a number of boats tie up end-to-end, as is the practice in some locations, then all but one of the boats is restricted to fishing only one line, since only the boat at the end of the queue will be able to drift lines off the stern. Finally, if there are troll fishermen operating in the area, they will want to make passes close to the FAD and may finish by hooking up on the vertical longline gear, causing problems for both sides. Therefore, while tying up to the FAD is a good idea in theory, it may be hard to get away with in practice.

## DRIFTING LINES THROUGH FISH CONCENTRATIONS

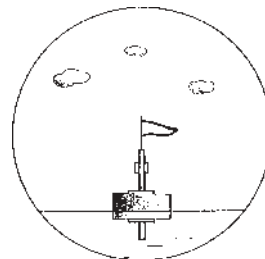
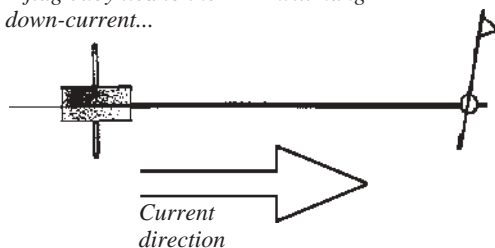
Another way to ensure that the fishing gear passes through the area where fish are supposed to be concentrated is to set it up-current so that it can drift through the area in question. This technique is useful whether the fish concentration is around a FAD, over a seamount, in a tuna hole, or wherever. Fish are often found in the area up-current of a FAD or seamount, and drift-fishing allows the fisherman to fish these areas.

### Drifting lines past the FAD

To have the line drift correctly it is first necessary to know which way the current is running. With a FAD this can usually be determined quite easily by approaching closely to the FAD and looking which way the mooring, appendages or strings of algae under the FAD are lying.



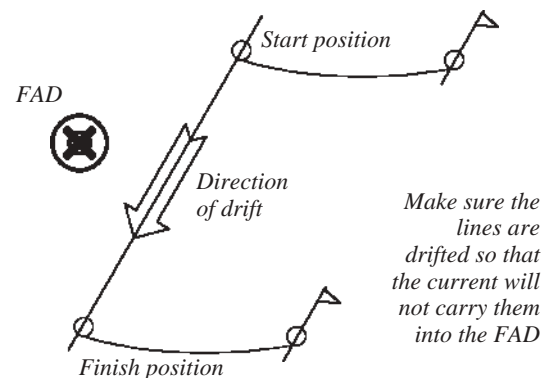
A flag buoy tied to the FAD will hang down-current...



...so the up-current position can be determined by lining up the buoy behind the FAD

If there is nothing to give an obvious clue, an alternative is to attach a length of floatline and a flag buoy or easily visible small float to the FAD. The buoy will orient itself with the current and will be visible from a distance, so the boat can position itself up-current of the FAD by simply lining up the buoy and the FAD.

Once the current direction has been determined, lines can be set to drift using either the sinker-first or the float-first method. Care should be taken to set the vertical longlines off to one side of the alignment between the FAD and the flag buoy so that they will drift past the FAD and not straight into it, causing a tangle. The direction of sub-surface currents may not be the same as those in the surface layers, and hooked fish may drag the vertical longline away from its expected path of drift. In addition, FADs are usually set with 20-25 per cent of scope, so in calm weather the FAD mooring line may be floating close to the surface even at a distance from the raft itself. A margin of error of at least 200–300 m should therefore be allowed.



### Drifting lines in open water

In the case of seamounts and tuna holes, assessing the direction of the current is more difficult, but it is also less critical since there are no obstacles for the line to drift into. The best method is to make a preliminary assessment of the current by throwing a piece of bait (or some other neutrally buoyant material) into the water and watching which way it drifts. Once a rough assessment of the current direction has been made, the first longline is set and allowed to drift. This is then observed for a few minutes to get a better assessment of current direction before setting further lines.

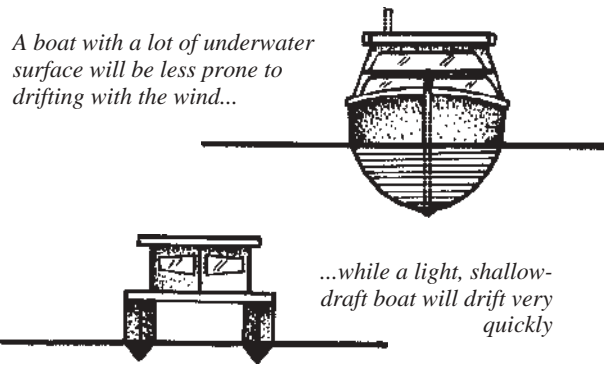
### Drifting lines in strings

As mentioned in section 2G, vertical longlines can be set to drift individually, or they can be set in strings. Setting in strings keeps the lines closer together, helping to concentrate the fishing effort in a narrow area, and makes them easier to locate for retrieval. However it also significantly increases the potential for tangles. In general, longline strings are suitable for use in calm weather, when fishing tied to the FAD or in the area down-current of it. They are also suitable for use over seamounts and in tuna holes where there are no obstacles for them to tangle on. However longline strings should not be set to drift past the FAD from the up-current side, and should not be used when the weather is rough.

## SECTION 2J: FISHING WITH A SEA ANCHOR

When setting vertical longlines to drift, their distance from the boat quickly increases and they can soon be lost from view, especially if the crew are busy setting more lines. Searching for the lines in order to retrieve them can be very time-consuming and motoring the boat over long distances during the search can waste a lot of fuel.

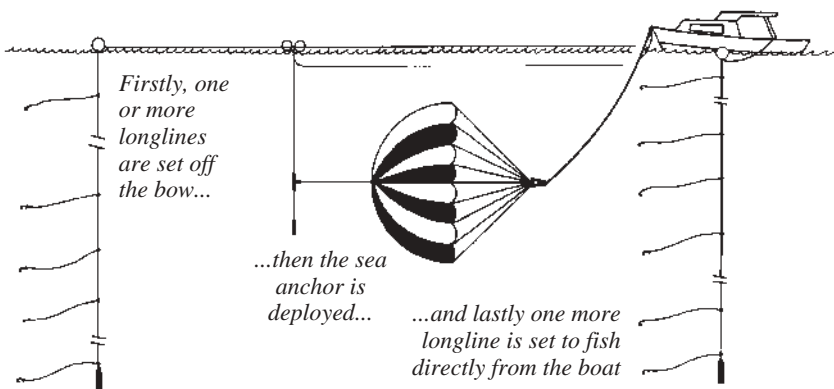
In fact the usual reason that the lines and the boat become separated is not because of the lines drifting away from the boat, but because the boat is pushed away from the lines by the wind. While the lines, which are almost entirely submerged apart from the tops of the floats, are affected mostly by the current, the boat is affected by both, and usually the wind is more important. A displacement hull with plenty of volume below the water line will offer a certain amount of resistance to wind movement, but a light, shallow-draft boat such as an 'alia' catamaran will quickly be blown long distances if there is much wind.



A sea anchor, as described in section 1J, is the solution to most of these problems. The sea anchor provides a huge underwater area which gives the boat a great deal of resistance to movement by the wind, and instead makes it move in the direction of the current. Using a sea anchor thus slows the boat down so that more lines can be set in a narrow area, such as around a FAD. Once the lines have been set to drift the boat will remain close to them, making it easier to spot any strikes and quicker to recover the line. Even in light winds the use of a sea anchor is a valuable tactic in vertical longlining.

### FISHING WHILE USING A SEA ANCHOR

The method of operating a vertical longline when using a sea anchor is similar to fishing while tied to the FAD (see section 2I). The first longline is set sinker-first and then either streamed out from the boat or allowed to drift free in order to make room for the second longline, as described earlier. The main difference is that, because the boat is moving in a path that more closely resembles that of the longline, the line will not drift away from the boat so quickly. In most cases the line will move ahead of the boat instead of drifting astern, with a chance of it tangling with the sea anchor.



Vertical longlining using a sea anchor

Because of these considerations many fishermen prefer to get the lines set and in position first, either streamed out from the boat, or drifting free. Only then do they deploy the sea anchor, manoeuvring the lines as required as the boat settles in to its new position. The final result is usually that, if a string of vertical longlines has been streamed out from the boat, they will end up drifting ahead of the boat, with the sea anchor in between.

Once the whole system has stabilised it will drift together and an additional mainline can be set to fish close to the boat.

### HAULING THE LINES

When a fish is caught on one of the longlines set forward of the bow, the longline at the side of the boat can be released to free-float with the current. The sea anchor is then hauled aboard the boat and the floatline connecting the vertical longlines to the boat is released from the bow. The line can then be approached and recovered in the usual way, as described in section 2H.

## SECTION 2K: GEAR CARE AND MAINTENANCE

No matter what fishing method is being carried out, fishing gear becomes worn and damaged during use, and needs to be regularly maintained and repaired. If this is not done the gear will be weakened and will eventually fail at the moment of greatest stress—when there is a large fish on the line.

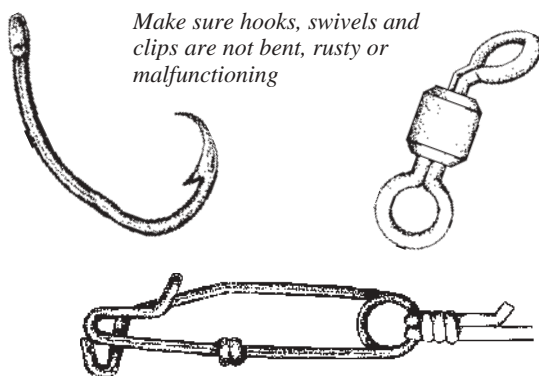
### NYLON MONOFILAMENT

Monofilament nylon is very prone to wear and nicking which weakens the line and causes breakage. The branchlines and any mainlines made of nylon monofilament should be checked regularly for rough patches which signal abrasion, and tiny cuts. When sharks have been caught on the line, check the section of mainline close to the branchlines on which sharks have been taken to see whether their rough skin has caused any damage.

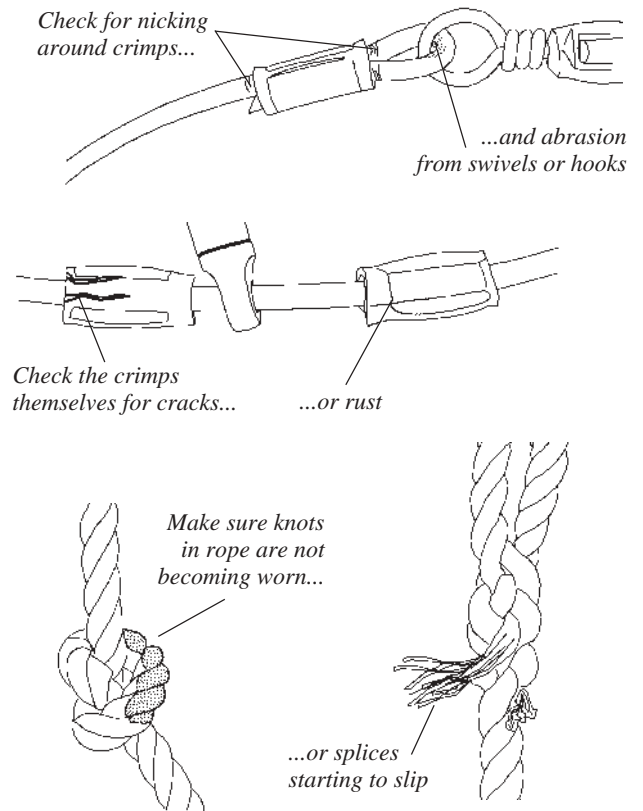
Knots or crimps require special attention. As well as being weak points already, knots are also the places where the greatest amount of abrasion occurs through normal wear and tear. Check to make sure that the 'knuckles' of knots are not showing signs of excessive wear. Crimps may cause nicking of the line at their edges, and may themselves start to lose their grip if they develop any oxidation or hairline cracking. Cut out any suspect knots or crimps and rejoin the line.

### ROPES

Rope materials are not so prone to wear and tear as nylon monofilament, but should still be checked from time to time. Keep an eye out for abraded knots, and for any splices that look like they might be starting to slip or wear.



### Line wear and tear



### HOOKS, SWIVELS AND CLIPS

Hooks which have been in use for a while are prone to become blunt and rusty from wear. They can sometimes be sharpened with a file or stone but this then removes the galvanised coating from the hook and increases the rate of rusting. Once the hooks become too rusty they should be replaced. 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 and replaced, not bent back into shape, as this will weaken them and they may break or straighten when taken by the next big fish.

Swivels should be checked regularly to see that they have not become rusty or bent and that they are still turning properly. Longline clips should be checked to see that they are not bent and that they still close properly. Any suspect item should be replaced before it gets a chance to fail at an important moment.

Maintenance inspections should be a regular part of the fishing operation. The time when the gear is most visible is when it is being used, so the fisherman and his crew should get into the habit of keeping their eyes open for gear damage or wear during the fishing operation. Any damage that cannot be fixed on the spot should be noted down so that repairs can be carried out after the fishing trip is over.

## SECTION 2L: SCALING UP THE FISHING OPERATION

### HANDLING MORE LINES

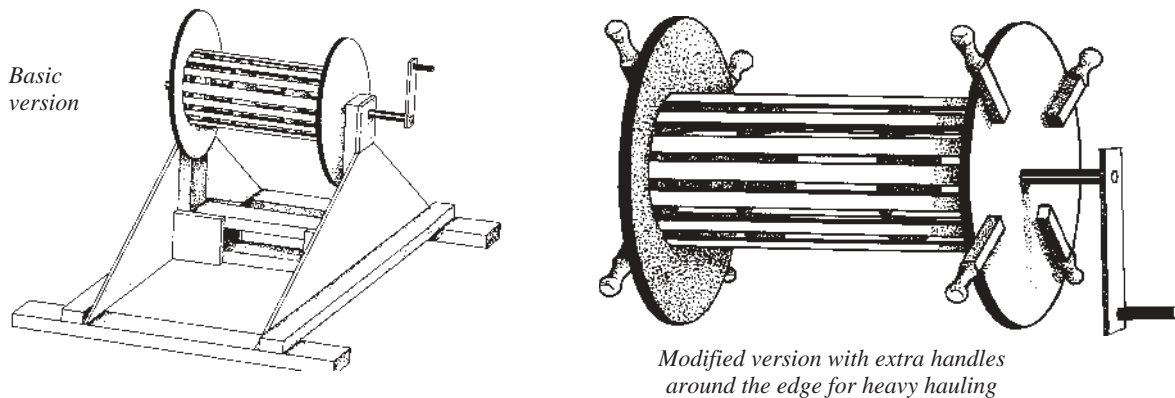
If a fisherman finds that fishing vertical longlines is productive and he wants to set more gear, he will be faced with the problem of managing hundreds of metres of mainline during a single fishing trip. The best way to handle and control all this line for easy use is to build a larger-scale longline drum which can be used for setting, hauling and storage of the mainlines.

### A LONGLINE DRUM DEVELOPED BY SPC

#### Description

An example of a suitable drum, developed by SPC Masterfishermen over a long period of fishing trials, is shown below. The wooden hauling drum resembles a scaled-down version of the mechanised reels used by industrial monofilament longline fishermen. It can carry ten 300 m mainlines and is used both to set and haul the gear. The reel can be made using simple hand tools and is easy to build from materials that are locally available throughout the Pacific Islands.

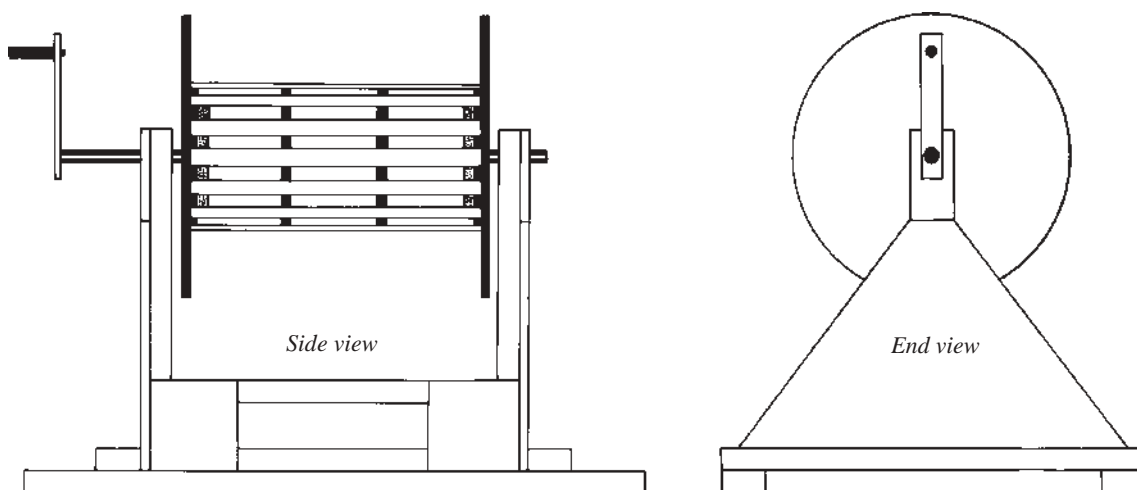
*A longline drum developed by SPC*



#### Specifications

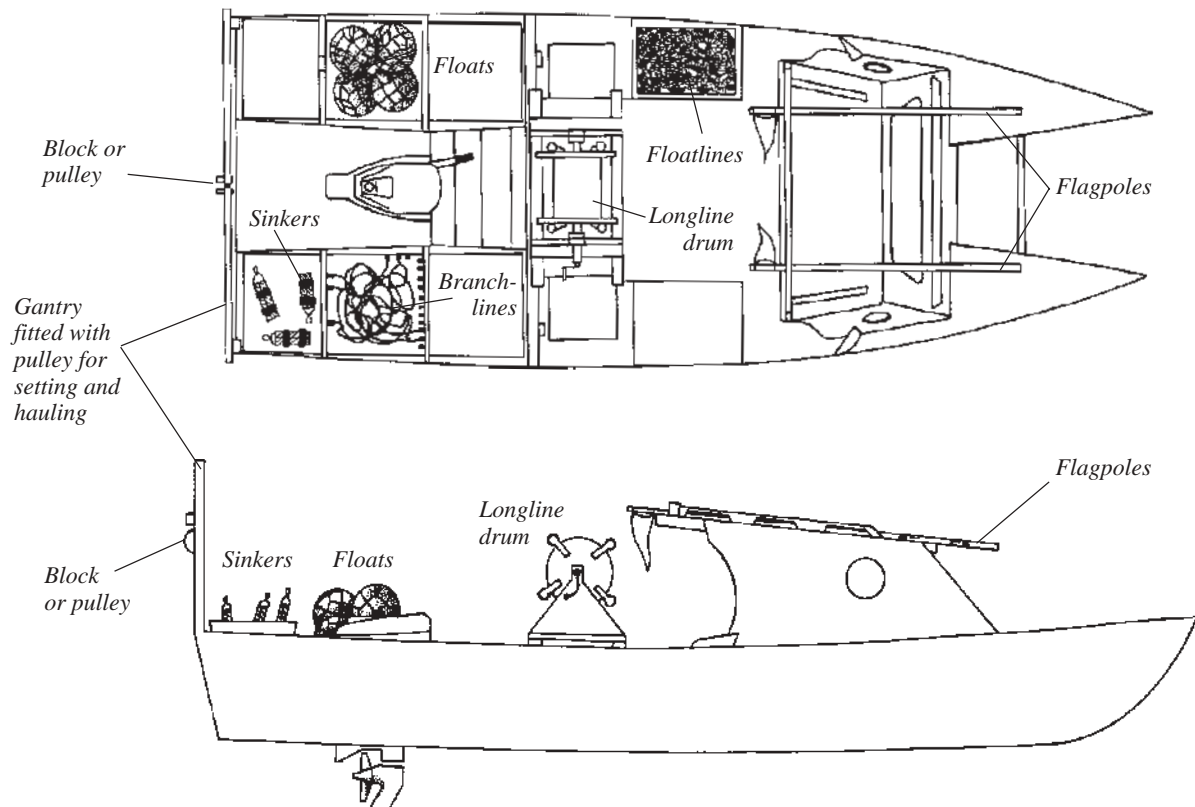
Many variations on this basic design have been built by fishermen according to their own particular needs and preferences. Details of the longline drum developed by SPC, including specifications, a full materials list and instructions for building, are contained in the SPC Capture Section Unpublished Report No. 22, entitled *Report on small-scale tuna fisheries development in Western Samoa, 27 September 1990–27 July 1991*, by Peter Watt, Lindsay Chapman and Peter Cusack. This report can be obtained by writing to SPC at the address on the last page of the present manual.

*Schematic diagram of a longline drum developed by SPC*



## Operating the drum

The procedure for setting and hauling of the gear using the drum is very similar to the methods already described. The drum is secured in a convenient place on the deck and a 15 cm block or pulley, the same as the one described in section 2F, is rigged above the transom of the boat so the line can be set and hauled over the stern, as shown below.



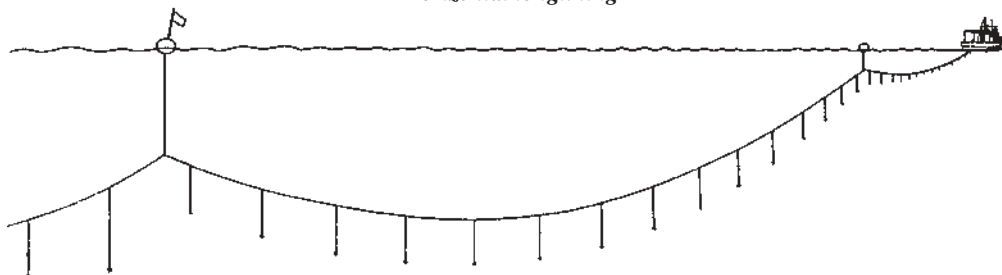
*A possible deck arrangement for fishing with a longline drum from an 'alia' catamaran*

Once this is done, vertical longlines can be set sinker-first or float-first, as individual lines or in strings, following the principles already described in sections 2E–2G.

## SCALING UP FURTHER: HORIZONTAL LONGLINING

The construction of a longline drum takes the fisherman one step further in his progress towards larger-scale fishing operations. Once the drum is constructed and experience gained in its use he can, if he so desires, move up to horizontal longlining. This method involves setting lines which may be several kilometres long using a nylon monofilament mainline. Setting horizontal longlines is perfectly feasible using a hand-operated drum as shown above, and is the basis of an important commercial fishery in at least one Pacific Island country.

*Horizontal longlining*



Horizontal longlining is not a fishing method used in association with FADs, and will be treated in more detail in another SPC fishing manual which is expected to be published in 1999.

