

Tori line regulations

In 1993, a regulation was passed requiring commercial fishermen taking tuna to use a bird-scaring device (tori line) when lines are set. The Ministry of Fisheries set a minimum standard which vessels are required to comply with. The details of this are:

- The streamer line is to be suspended at the stern from a point approximately 4.5 m above the water.
- The streamer line must be attached to the vessel such that the line is directly above the point where the bait hits the water.
- The streamer line must be a minimum length of 150 m and the diameter of the streamer line must be approximately 3 mm.
- There must be a minimum of 5 branch streamers attached to the main streamer line between the vessel and where the main streamer line enters the water. Each branch streamer should comprise 2 strands of approximately 3 mm diameter cord.
- The interval between branch streamers must be a maximum of 5 m.
- Swivels must be incorporated at the towing point and before and after the point of attachment of each branch streamer
- The length of the branch streamers should range between approximately 3.5 m nearest to the ship to approximately 1.25 m for the fifth streamer.

The Ministry of Fisheries will also consider approving alternative designs, if vessel owners provide details to:

Manager
Operational Policy
Ministry of Fisheries
PO Box 297
Wellington.

What makes a good tori line?

A lot of what makes a good tori line is common sense - something which is effective, inexpensive, easy to construct and repair, and made from materials that are easily and commonly available. A good tori line must be designed so that the chances of catching the gear as it goes past are minimised.

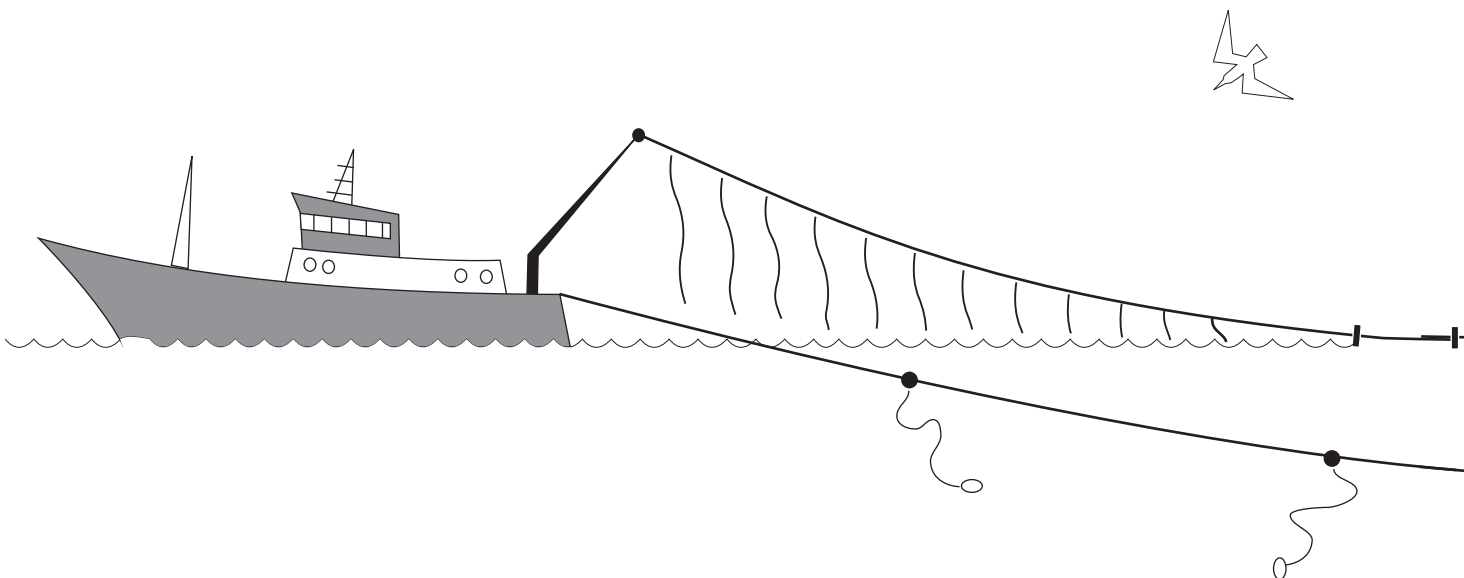
Really, the tori line design is up to you, but if you follow the simple guidelines set out in this folder, then you can be pretty much assured that you will be making a good tori line. Keep in mind that a tori line DOESN'T have to be a hassle. It's really up to you. Following this section is an article written by Mike Wells from the FV Kariqa, and Kim Duckworth, a scientist from SeaFIC, which describes a couple of designs for effective tori lines.

Firstly, the line needs to be at least 150m long. This may seem like it is much too long, but baited hooks have been recorded at the surface (or just under) up to 200m behind the boat. So basically, the longer the better. Having a longer tori line also gives a better drag in the water, with less risk of getting caught than a windy buoy.

Secondly, the line needs to be attached at a point that is as high as possible. A line attached to the highest point possible on the mast with a lazy line down to the gantry at the stern will ensure that you will get the best coverage from your tori line. This will also ensure that the line is high enough to prevent a snood accidentally being thrown over it.

In Australia and Japan they commonly use a "tori pole" to attach the tori line to. This can be attached to the stern, or on the gantry, to achieve even greater height advantage.

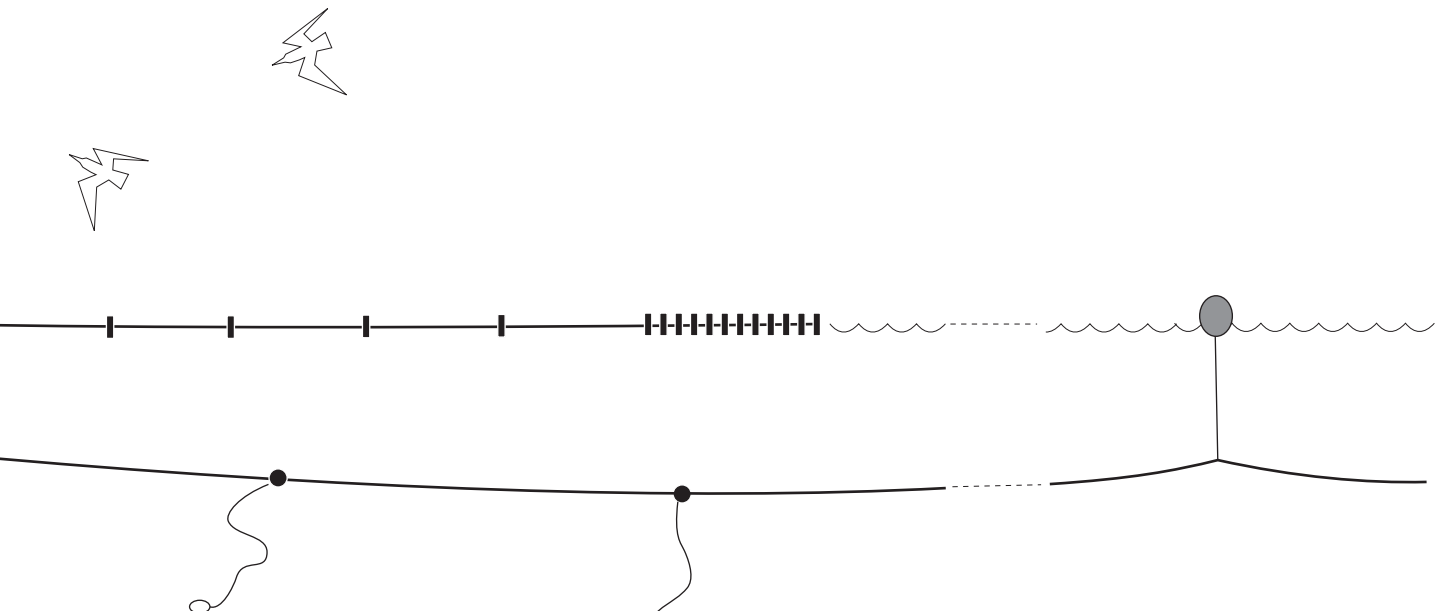
This is a long pole, bent at the base and set on a swivel, allowing the pole to be swung to port or starboard, meaning the tori line can be placed according to where the wind is coming from.



This is important because the streamers should be hanging over, or close to the area in the water where your baits land. If you send your baits out both sides, then you should use two tori lines. If this is not possible, set your tori line so that the streamers are over the opposite side from where the wind is coming from. This leaves the windward side baits uncovered, but because seabirds will tend to approach into the wind, they will be less likely to attempt to land on that side.

Thirdly, the drag section on your tori line should be enough to hold a good amount of the line out of the water. With a good high attachment point and an effective drag, you should be able to get around 70m of tori line out of the water behind your vessel. It is important that the drag section that you use is not likely to catch on a stray hook, or more likely, a float, as it travels past. A section of heavy rope is quite good, though hooks have been known to catch in knots, or in the lay of the rope itself. Another idea is to have a length (about 5m should do it) of moderate sized rope (say 9-12mm), with lots of strands of the same rope fed loosely through the lay. What you end up with is a big straggly bit at the end of your tori line. The strands eventually tease themselves out, and you end up with a big drag section that will not catch anything, because the strands are only loosely fed through the lay, they simply pull themselves out if they do catch a hook. If you do use rope, make sure that you use a couple of swivels in your design.

Finally, and also important, are the streamers that are attached to the tori line. Ideally these streamers need to be cut to a length that allows them to be just above the surface of the water, preventing birds from flying underneath them. They also need to be flexible enough that they flick around and act unpredictably, but not so light that they are easily wrapped around the backbone of the tori line. A good example of what is about the right weight is rubber or plastic tubing (like the luminous rubber tubing you can get) with sekiyama or 1.8mm monofilament fed through it. If possible they should be attached to the backbone using some kind of a swivel mechanism. This stops the streamers getting tangled with the backbone.



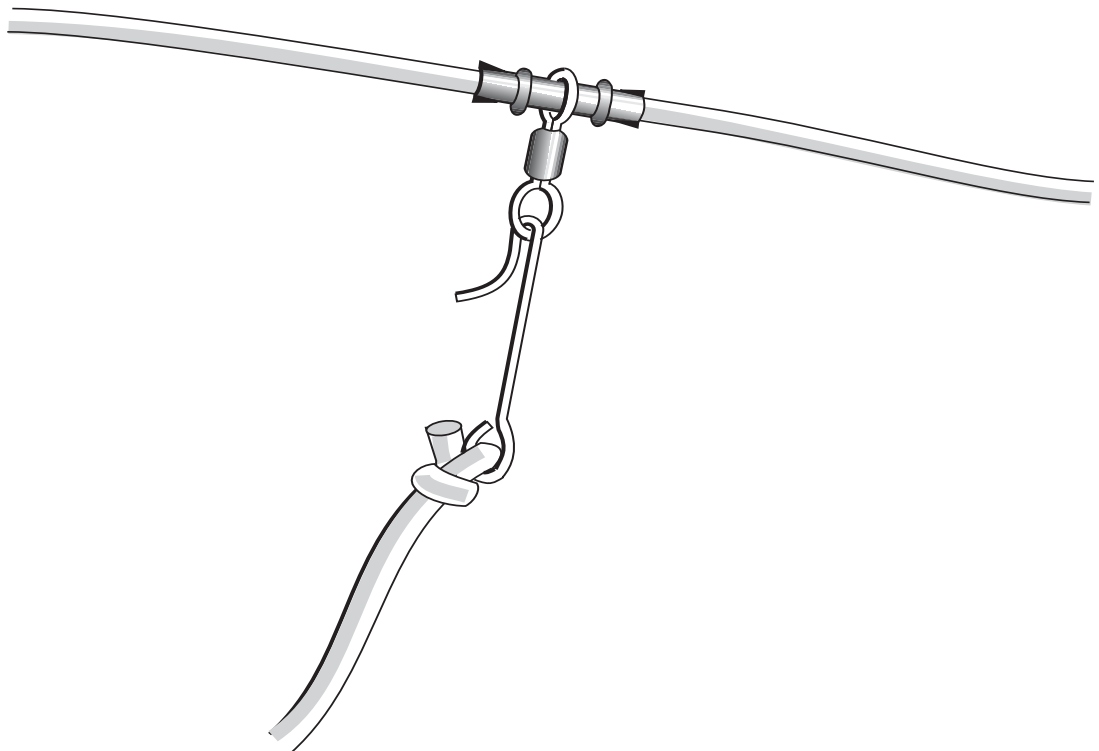
More tori lines!

Here are a couple more ideas that have been recently developed to provide a light, strong tori line that has very little chance of catching a stray hook or a float.

I have recently been developing a tori line made of monofilament. This is a good material to use because it is light and strong, and does not have much chance of being caught in your gear. It is also pretty likely that you will have some on board. A good way of using up that couple hundred metres of backbone from the tangle which has been wrapped around that fish bin for a couple of trips, ay?

WHAT YOU'LL NEED

- 150+ metres of monofilament backbone
- 15-20 metres of luminous rubber tubing
- a similar amount of 1.8 mm/2.02 mm monofilament
- stopper crimps
- 10 or so 5/0 sleeves with crane swivels, or whatever fits your backbone.
- 20 odd 18-20 mm rubber tap washers
- 10 or so longline/set line clips
- a good swivel



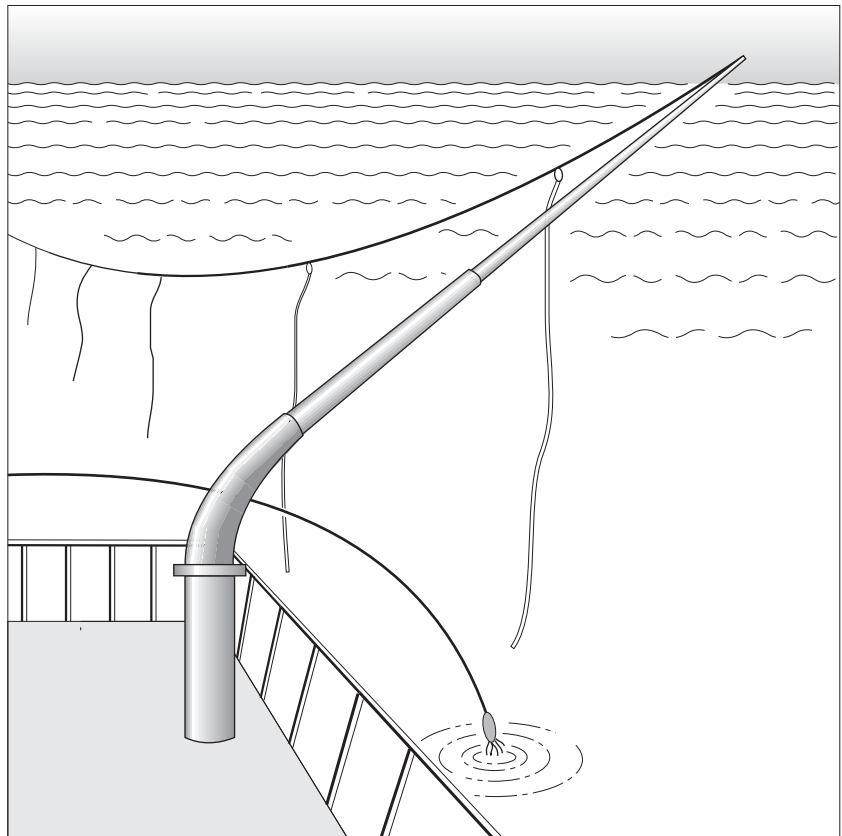
HOW IT'S PUT TOGETHER

At the end that will be attached to the boat, crimp the sleeves with crane swivels on to the backbone at roughly 5 m intervals. These are your streamer attachment points. For your drag section, make two cuts in each rubber washer. This creates a weak point in the washers, so that if there is a tangle with a float or a hook, the washers simply rip off (this works, I've tried it). After making the cuts, feed your rubber washers onto the other end of your tori line. Between each washer feed on a stopper crimp (see picture). Spread your washers so that the last 12 or so washers are crimped at 1/2 m intervals at the end of the line, but the rest of the washers are spread evenly to within 20 m of your last streamer. The splashing of these washers in the water can act as a deterrent to seabirds as well.

For your streamers, feed the monofilament through the rubber tubing. You can do the rubber in pieces, then crimp the final sections at either end after you have threaded the attachment clip on. This means you have removable streamers, which lets you store the backbone of the tori line on a reel (try an electric fence reel, or a hose reel), keeping it out of the way when you don't need it.

If you set up a lazy line system where you set the tori line, clip on the streamers as you need to, then attach the tori line to a separate line already attached up the mast, you will find this a simple system to use. To retrieve the line, stop or slow the boat, reel in the backbone, unclip the streamers, and you're away laughing.

Tunaline Tori Pole



and finally...

If the last one still seems like a bit of a hassle, try this tori line. It's extremely cheap, and can be quite effective if set properly.

YOU'LL NEED

- 150-180 m of 4 mm danline
- 20 m of 8 mm rope
- 20 m of 20 mm rope
- a couple of good swivels

HOW TO MAKE IT

It almost makes itself. Using the 4 mm danline, make up enough streamers to attach to the backbone rope at 5 m intervals from where the line meets the stern of the vessel. Make sure the streamers close to the boat are long enough that they nearly touch the water. This should be around 4 m, the next, 3 m, then 2.5 m, 2 m, 1.5 m, and several at around 1 m. Depending on your preference, you can either splice the rope streamers through the backbone, or you can make the streamers removable by using shark clips to attach the streamers. Be careful when you use the shark clips though, they are the most likely things to catch if something goes wrong, and you have to slow the boat down during the set.

At the end of your 4mm danline, splice the next size rope into the 4mm, and do the same for the next section. Make sure you include a swivel or two in the design (one after your streamers, one before them) because the lay of the rope causes the whole lot to spin in the water. Easy! Attach it to a high point on your mast, with a lazy line system for retrieval, then coil whatever is left over into a fish bin to keep it out of the way. Try to make the tori line sit over the area where your baits will be landing. The easiest way to do this is by using a tori pole.

That was a quick guide to on how to make a good tori line. However each boat is different, and these ideas may not work for you. For more assistance or ideas, contact the Advisory Officer.

Reduce your catch

KIM DUCKWORTH AND MIKE WELLS OFFER ADVICE ON HOW TO NOT CATCH SEABIRDS

The following advice on how to avoid hooking seabirds during long line setting comes from three sources. Practical experience gained during long lining operations by the FV "Kariqa", an analysis of the circumstances under which Japanese tuna long liners operating within the EEZ caught seabirds, and the comments made by scientists and fishermen at an international conference on Albatross conservation held in Hobart in August 1995. Most of the ideas are pretty obvious and you've probably heard of them all before. Give them a try and see which are practical and work for your vessel.

Set your lines at night

Seabirds hunt by looking for their prey. What they can't see they can't get. The more light there is falling on your bait the more likely they are to go for it. Try to keep line setting entirely within the hours of darkness. Keep vessel lights falling on the water astern of the vessel to a safe minimum. You may still catch a few birds around the time of the full moon but you'll catch far fewer than if you'd set during the day.

Get your baits to sink quickly

Some petrels can dive a long way but most of the birds you'll encounter won't bother going for a bait which is more than a couple of metres under the surface.

Make sure that all bait is thawed before it is used. Thawed baits sink faster than frozen baits.

Keep baits out of the vessel's wake. The turbulence of the wake will return baits to the surface well behind the vessel. This gives seabirds a second chance to grab them. The FV "Kariqa" tows a 20 metre length of monofilament line attached to the port side of the stern hand rail. Baited hooks are thrown over this and slide down its length. This helps reduce the chance that the bait will be sucked into the wake. Make sure that the crew member throwing the bait isn't so tired that he can't throw it clear of the wake (or buy a bait thrower).

Attach extra weight to snoods. The more weight it has attached to it the faster a bait will sink. The FV "Kariqa" uses 75 gm swivels attached 5 metres from the bait.

Use a high quality tori line

"Tori" is the Japanese word for bird. The purpose of a tori line is to deter birds from flying through the airspace underneath it.

Probably the most common type of tori line used in New Zealand is a 100m long length of rope with plastic packing straps woven through it every few metres. This design may work for a few days but the birds quickly get used to it. There are far more effective designs available.

In order to be effective a tori line must be positioned above

the location where the bait is landing in the water.

The effectiveness of a tori line is strongly influenced by how much of it is out of the water. Because tori lines stop birds from flying underneath them, if a tori line falls into the sea too soon it will only protect a small area behind the vessel. On a flat calm day at normal line setting speed a good tori line will not contact the sea until in excess of 60 metres behind the vessel. The "sag" of a tori line is determined by the height from which it is towed, the vessels setting speed, the weight of the tori line and how much drag is on the line. Because of this light materials make better tori lines.

A tori line should be towed from a point which is high enough up that the crew aren't accidentally throwing baited hooks onto it. Two and a half metres above the stern deck is about right. The attachment point will have to be a pole so that the line can be held over the point where the bait lands in the sea (which should be outside the vessel's wake).

The line should be constructed from a material that won't break if a crew member accidentally throws a baited hook over it.

To increase the drag on the line you could feed out more line or attach a windy buoy to the end. The problem with the latter is the increased chance of snags.

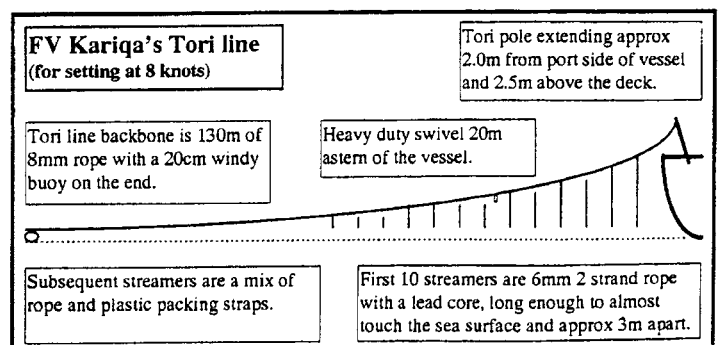
Some swivels will need to be included in the forward 50 metres of the tori line to lessen the chance that the spinning motion generated by dragging the line through the water will tangle the side streamers.

Except in rough conditions, tori lines don't move around much and birds eventually become less wary of them. Because of this a tori line should have side streamers which thrash around. It's important that the side streamers have enough weight that they aren't easily blown aside by the wind but not so much weight that they don't flap around at all. Side streamers should be slightly weighted.

If the side streamers are too far apart then birds will simply fly between them. Put your side streamers about 3 metres apart if you set at 6 knots, or 6 metres apart if you set at 12 knots.

This is also the distance that the first side streamer should be behind the stern of the vessel.

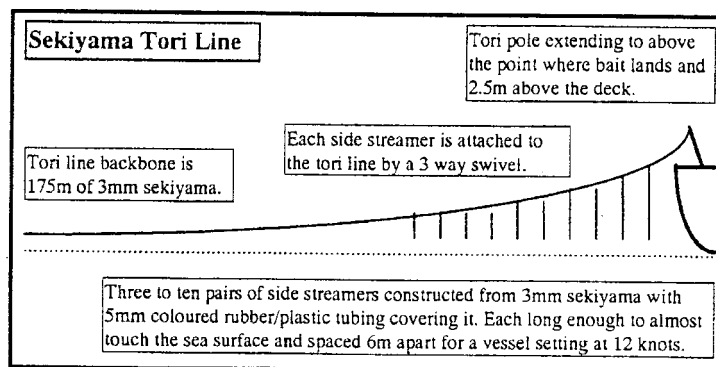
You will need enough side streamers to cover at least the first 30 metres behind the vessel.



If the side streamers aren't long enough then birds will fly underneath them. If side streamers are too long then they will hang in the water and not flap about. On a flat calm day when towing a tori line at line setting speed the tips of your side streamers should be skimming along about 40cms above the sea surface. This is important and along with getting the weighting of streamers correct is almost always overlooked.

It may sound complicated but it's not. And to prove it here are two examples.

The materials required are therefore 130 metres or more of 8mm rope, 30 metres of 6mm two strand lead cored rope, one 20cm windy buoy, one heavy duty swivel and some old rope or plastic packing straps. Any QFDH should be able to make this tori line in under an hour.



If you want to go one step further you could construct a tori line from Sekiyama. This is a light and strong 3mm cord used by Japanese Southern Bluefin Tuna vessels. Because it is so light it doesn't contact the water until it is a long way behind the vessel. Its one disadvantage is that being so thin it's pretty unpleasant to deploy and retrieve by hand. If you do have a spare winch which you could use for this purpose then this design is probably the "state of the art" (until someone proves differently).

The materials required for the Sekiyama tori line (with 5 paired side streamers) are 215 metres of 3mm Sekiyama, 35 metres of 5mm coloured rubber or plastic tubing, five 3 way swivels and a packet of aluminium crimp fittings.

No one is claiming that these ideas will work for everyone. Different solutions will work for different vessels. But the ideas given here have worked in the past under a wide range of conditions. The FV "Kariqa" didn't catch any seabirds while longline setting in the 1995 season despite fishing everywhere from the Snares to Westport. In the end it's a matter of you trying some of these ideas and seeing what works for you.

Whether fairly or unfairly, seabird bycatch is now an issue for long liners in New Zealand. This article isn't making any assumptions about whether or not you have a bird bycatch problem. If you don't catch any seabirds then you should probably tell the rest of us the secret of seabird-safe long lining. But be prepared to prove what you are saying. If you do catch seabirds then there are a variety of reasons why you should reduce the number you catch. They may be financial reasons. If you are losing baits to seabirds then you're catching less fish and taking less money home. Maybe you don't want to give environmental groups any excuse to complain. Maybe the idea of the sea without seabirds doesn't appeal.

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New Zealand Fishing Industry Board
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Wellington, New Zealand
Mike Wells (Tuna Fisherman)
Skipper of the FV "Kariqa"
Nelson, New Zealand



Do you know what your line is doing?

ARCHIVAL DATA RECORDERS—HOW THEY CAN HELP YOU OUT

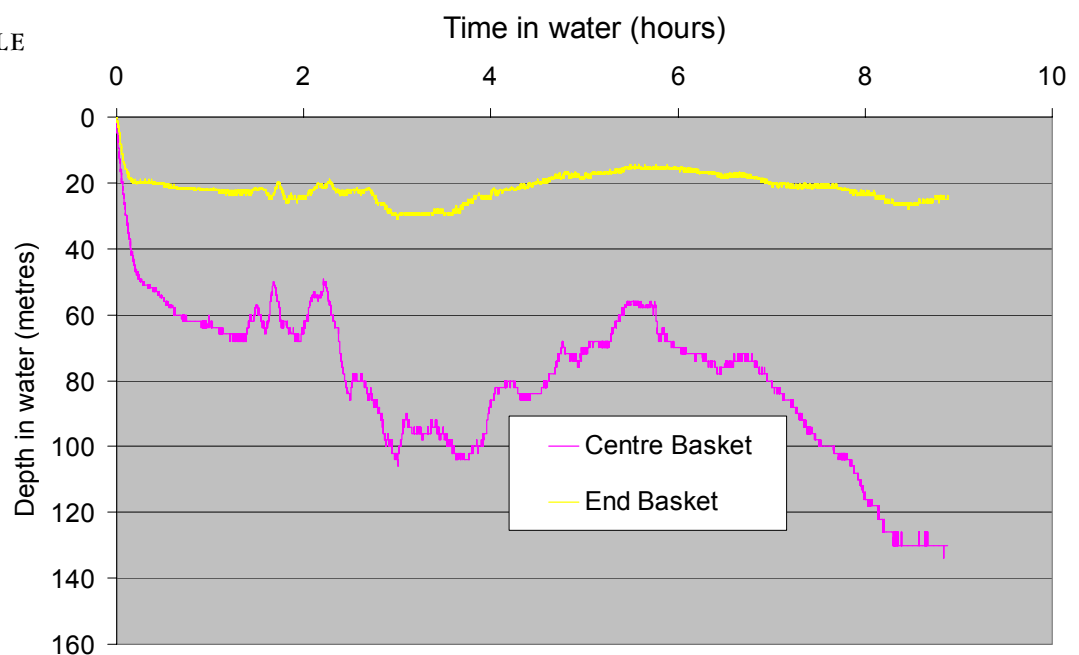
You may have heard something about archival tagging of bluefin tuna, and later on in this folder we provide some information on some of the projects that involve this tagging. We know how these tags can record what is happening to bluefin as they migrate through our oceans, and can determine where the fish are in the water column, when they feed, and even their whereabouts by satellite tracking.

We can now learn more about tuna than ever before. But do we know enough about how we catch them? Are you sure you know where your gear is going when you set it? If the thermocline is sitting at 50 m, can you be sure that your gear is set to cover the most effective depth range? Tides and surface weather conditions can affect your longline considerably.

We have archival data recorders, known as TDRs (or Time-Depth Recorders), which can determine where your gear sinks to after it leaves your boat. The use of TDRs to determine line-sink-rate and line-set-profiles is a useful way of learning more about your fishing.

The skipper of the vessel from which the set profile was taken (see figure) estimated that the snoods from the end of a basket, next to a

GEAR SET PROFILE
FOR A PELAGIC
LONGLINER



SPECIES	DAILY VERTICAL MOVEMENT	PREFERRED: TEMPERATURE RANGE	DEPTH RANGE
Broadbill Swordfish	Surface during night, deep during day	10–22°C (sst)	0–600 m (from literature)
Southern Bluefin Tuna	Shallow at night, deep during day	12–18°C	0–400 m (archival tags)
Bigeye Tuna	Surface at night, deeper during day	10–16°C	0–400 m
Yellowfin Tuna	Surface at night, deeper during day	18–28°C	0–150 m (sonic tracking)
Marlin (Black)	Surface more at night	23–27°C	0–120 m (sonic tracking)

After Whitelaw, W. and Campbell, R. 1997 **Longline Fishing – Where Are We Fishing and For What?** Asia Pacific '97 Fishing Papers pp. 21–24.

float, would settle at around 40 m, while the centre basket would settle around 60–80 m. As you can see, the gear moves around a lot over the course of the whole set, and is definitely not settling at the presumed depths. If the thermocline is sitting at around 45–50 m, or if the target species is shallow, does this mean that you are not fishing as efficiently as you could be? You be the judge!

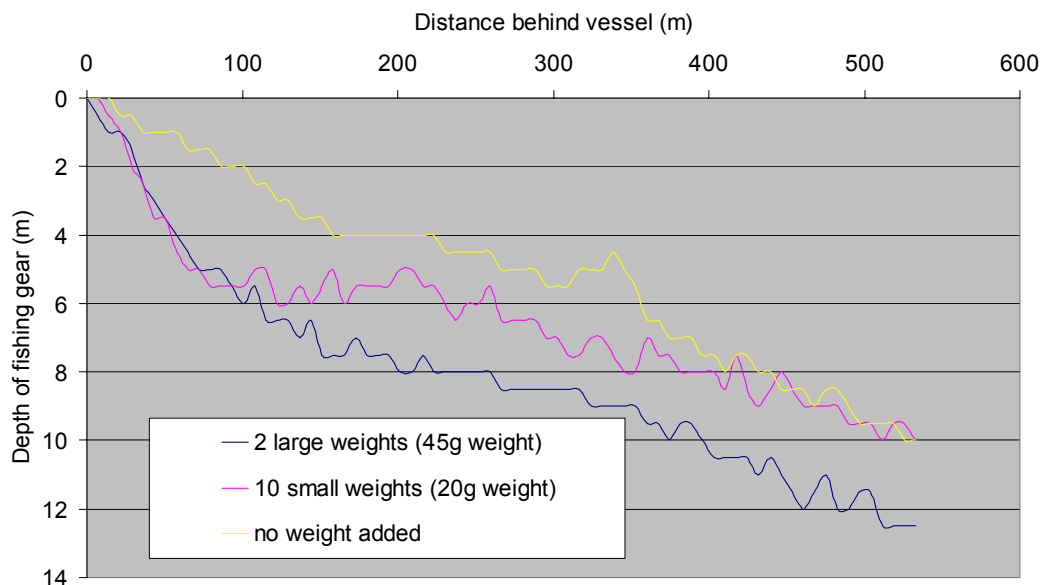
Our Archival Data Recorders also record temperature changes at depth, which could prove a valuable source of information on temperature change at the thermocline and temperature gradients beyond the sea-surface-temperature plots that are commonly used in this fishery. This information could be extremely valuable to you as a fisherman. All over the world—Hawaii, Eastern United States, Australia, even Indonesia—fishermen are gaining information on the behaviour of their line in relation to the behaviour of fish.

The table above includes descriptions of preferred depth and temperature ranges for several of the key species targeted in the New Zealand tuna fishery. How well are you targeting your fish? In the second table, hook depth by position and size of basket are given. Please note that these figures are for Australian longliners operating out of Cairns. No allowances are made for differences in setting, gear configurations, snood length or environmental conditions. Hook depths change a great deal over the course of a set due to current or wind pushing buoys closer together or further apart. The figures in the above table do not account for these changes, but do present a general guide to depths reached by hooks in baskets of different sizes.

NUMBER OF HOOKS IN BASKET	HOOK NUMBER	AVERAGE DEPTH OF HOOKS (m)
10	1	40.4
	3	64.9
	5	81.1
	6	84.4
12	1	52.6
	3	71.8
	4	118.7
	6	115.4
	7	120.6
	8	91.9
14	10	89.8
	1	39.4
	3	71.8
	4	83.5
	6	107.2
18	7	124.5
	9	94.2
20	10	210.5

After Whitelaw, W. and Campbell, R. 1997 **Longline Fishing – Where Are We Fishing and For What?** Asia Pacific '97 Fishing Papers pp. 21-24.

SINK PROFILE
CHART, CREATD
FROM TIME-DEPTH
RECORDER DATA
(SEE OVERLEAF).



Continue to next file: Tuna2001c.pdf