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Bycatch in the tuna longline fishery

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Pelagic longlining – the bycatch issue

Background

1. Bycatch, or the incidental catch of non-marketable, unwanted species taken as a result of fishing operations has become a key issue in a number of fisheries worldwide. The bycatch of large seabirds, especially albatross, marine turtles and other species in the tuna longline fishery, even though it does not constitute a problem in all fisheries, is clearly an issue of concern in some fisheries.
2. There is a clear need to ensure that there is minimal impact on other species while targeting tuna, as well as on the broader marine environment, both as a sound fisheries management strategy and as a result of the obligations arising from a number of international fisheries agreements including the UN Law of the Sea Convention (LOSC), the UN Implementing Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks (UNIA) and the recently adopted Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean. Other international agreements which have a bearing on the issue which are not so well known in the fisheries sector include both binding (e.g. Convention on Biological Diversity) and non-binding (e.g. Agenda 21) agreements.
3. The issue of bycatch has become particularly significant in this region following the closure in 2000 of the Hawaiian swordfish longline fishery and other follow-up actions as a result of a court decision. This decision was based on a case brought by an environmental non-governmental organisation (NGO), and is representative of the growing concern by the general public, particularly in developed or western countries, over bycatch and other environmental impacts of fishing. Within PICTs, tuna longlining continues to be promoted by SPC, FFA and others as a major opportunity for realistic economic development through participation in the fishery by locally based vessels, in addition to the returns available from access fee revenues. Given the significant consequences of making a wrong decision, in either direction, it is important that full consideration be given to the facts of longline bycatch.
4. Unfortunately, the publicity given to the longline bycatch issue over the last few years has been characterised by a high degree of emotive commentary: by information that is often inaccurate and which often inappropriately assumes that occurrences in one area can be extrapolated to another area. In some cases the motivation for making these claims is not primarily the conservation of the marine environment, but to undermine commercial fishing *per se*. As a result of these campaigns and in some instances, a reluctance by industry to address key conservation issues, fishers are frequently becoming engaged in reactive situations, attempting to disprove claims concerning the perceived impacts of longlining. Given the economic significance of the tuna longline fishery, the need for sound fisheries management practices, and learning from the Hawaiian and other bycatch experiences, it is suggested that the region gives increased priority to dealing with bycatch.
5. In the region, a number of initiatives on monitoring and documenting bycatch are currently being pursued, particularly by the OFP, following extensive discussions at Standing Committee. These initiatives, as well as actions being taken by individual states amount to a considerable effort to address the bycatch issue, something that is not always well understood or publicised. However, there is little doubt that more could and should be done.

6. In giving consideration to this matter, the Secretariat commissioned and contributed to the attached paper on the bycatch issue, to provide background to the topic and draw out the main areas for discussion at this meeting. The paper is not intended to be a scientific review, rather it seeks to outline key political, technical and biological issues and to provide a broad overview of the current status of longline bycatch.
7. Specifically, the paper outlines key areas of real and perceived concern in relation to major bycatch species, including turtles, seabirds and sharks and notes how catches of these vary with types of fishing gear and operations. It highlights current knowledge about bycatch and how ongoing analysis of logbook and observer data is helping to build a comprehensive view of the current and projected situation. Examples of how the bycatch issue has been raised and dealt with in a number of countries are outlined, providing an opportunity to learn from such experiences.
8. A number of strategies to reduce bycatch in the WCPO are discussed and it is emphasised that where fisheries managers, researchers and industry cooperate, considerable advances have been achieved. For the WCPO it is suggested that there are a range of proactive actions that can be taken by the region to address bycatch reduction, in conjunction with ensuring that the considerable ongoing and future efforts are communicated effectively in a range of forums.
9. The paper concludes that it is likely that poorly informed and politically motivated external interventions by lobby groups will continue, and have the potential to impact the emerging fishing industries of the PICTs. By meeting international responsibilities through the development of strategies to manage bycatch issues in the longline fishery, PICTs will be well equipped to deal with such interventions and maintain their credentials as responsible stewards of the world's largest tuna fishery.
10. In addition to this paper, the Fisheries Development Section is developing a pamphlet that will be distributed to local industry highlighting the issues associated with tuna longline bycatch. The pamphlet will focus on what can be done to minimise bycatch and where capture occurs, to increase the chances of survival upon release. Particular emphasis will be given to dealing with turtles.

Suggestions

11. The attention of Fisheries Heads is drawn to the issue of bycatch in relation to tuna longlining, especially domestic operations, and the need to:
 - Discuss the issues raised in this paper and by the accompanying presentations, and provide direction to the Secretariat as to how progress may be facilitated on this key issue;
 - Work with your domestic tuna longline industry to raise an awareness of the bycatch issue, and work together to reduce the take of unwanted species, such as turtles, releasing them alive with the best chance of survival;
 - Encourage accurate data collection from your domestic tuna longlining operations, especially key target and bycatch species, using the SPC logsheets/logbooks that are developed by the Regional Data Collection Committee;

- Consider changing future access agreements with distant water fishing nations, to include the need for reporting key bycatch species in addition to the data presently being provided, as a licensing condition; and
- Work towards implementing national observer programmes, so that accurate data can be collected on all species being caught by domestic vessels and DWFNs working in your zones.

Introduction

12. This paper discusses pelagic longline operations for tuna in the western and central Pacific, in the context of the incidental catch of unwanted species, or bycatch.
13. Monitoring and, where necessary, adopting strategies to reduce bycatch from longlines and other fishing methods are integral parts of sound fisheries management that need to be addressed at both national and regional levels. Pacific Island countries and territories (PICTs) have given consideration to the issue of longline and other fisheries bycatch and a number of initiatives are currently being pursued, primarily under the Oceanic Fisheries Programme (OFP) of the Secretariat to the Pacific Community (SPC). As responsible stewards of the resource, PICTs are committed to the sustainable harvest of longline target species (including yellowfin, bigeye and albacore) and the need to ensure that there is minimal impact on other species while targeting tuna, as well as on the broader marine environment.
14. Under the obligations arising from a number of international fisheries agreements, PICTs are required to manage bycatch in accordance with certain principles. These agreements include the UN Law of the Sea Convention (LOSC), the UN Implementing Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks (UNIA), and the recently signed Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean. The international community, including several PICTs, has also endorsed several specific but non-binding international plans of action (IPOAs) through the Food and Agricultural Organisation (FAO). The IPOAs cover certain aspects of longlining bycatch including separate plans on seabirds and sharks.
15. The issue of bycatch has become particularly significant following the closure in 2000 of the Hawaiian swordfish longline fishery as a result of a court decision. This decision was based on a case brought by an environmental non-governmental organisation (NGO), and is representative of the growing awareness by the general public over bycatch and other environmental impacts of fishing.
16. It has become clear that many NGOs are now providing the public with their interpretation of how particular fisheries operate, and the resulting environmental implications. Concerns have been expressed by the fishing industry that such interpretations are not always accurate and industry is frequently engaged in reactive situations, attempting to disprove claims concerning the impacts of longlining. In the Hawaiian (and other) cases, experience has shown that it is very difficult to alter the course of conservation initiatives, some of which have been politically motivated, once they have been initiated.
17. It is vital that the region learns from the Hawaiian and other bycatch experiences and deals with the issue in a pro-active manner, both in terms of increasing efforts to monitor, assess and deal with longline bycatch, and to ensure that these efforts are communicated effectively. In so doing, the public, including NGOs, will be presented with the facts about longline bycatch, which will contribute towards a more informed and rational debate on the sustainability of the fishery.

18. This paper seeks to lay out the key issues relating to pelagic longline bycatch and to promote the considerable current and planned work that the SPC region is devoting to bycatch issues. It will also demonstrate that in promoting longline developments in PICTs, full recognition is being given to ecosystem and other sustainable resource utilisation issues. Specifically the paper will:
- provide a simple description of pelagic longline fishing in the western and central Pacific and the techniques employed;
 - discuss the potential ecological impacts of pelagic longline fishing;
 - provide historic data on longline catches of both target and bycatch species;
 - highlight areas of concern¹ in relation to non-target species taken by pelagic longlining, including sharks, seabirds and turtles; and
 - describe what the region is doing about bycatch, including research efforts and consideration of a range of mitigation strategies that are available where bycatch is an issue.

The western and central Pacific Ocean tuna fishery

19. The pelagic longline fishery of the western and central Pacific Ocean (WCPO) is one of the most significant in the world. For the purpose of this paper, there is a focus on the area of most relevance to PICTs, the Pacific Island countries' tuna fishery area (PICTFA) as defined in Figure 1 below. Each year, the fleets of major distant water fishing nations (DWFNs) including Japan, Taiwan and Korea, and domestic fleets fishing in the PICTFA set around 300 million hooks on pelagic longlines, with tuna as their primary target. In addition to tuna, there are significant catches of other species, including billfish, sharks, and other smaller fish, as well as occasional encounters with turtles. While the catch of tuna taken by longlines in the PICTFA is only 10% of the total pelagic catch by volume, it is worth almost as much as the much larger purse seine fishery in dollar terms. This reflects the characteristics of the catch in terms of large size and high value as sashimi fish or premium canned and other tuna products.
20. The longline tuna fishery provides vital sustainable economic returns to PICTs both from access fees paid by DWFN vessels and through an already significant locally based longline fleet. Harvesting the resource using local vessels and processing locally increases the involvement of islanders in the fishery. It also provides a better economic return to Island economies. Over the last decade locally-based tuna longlining in the PICTFA has grown substantially (see Figure 2), while DWFN numbers have begun to decline to 1970 levels, following the largely unsuccessful attempt to enter the fishery by several hundred vessels from mainland China in 1993. In addition to this decline, Japan and other DWFNs, with the encouragement of Japan, are reducing longline numbers in line with the FAO initiative on fishing capacity reduction.

¹ Game fishers are also concerned about levels of billfish catch on longlines; the degree to which this concern is based on the grounds of conservation or competition (with commercial interests) is unclear.

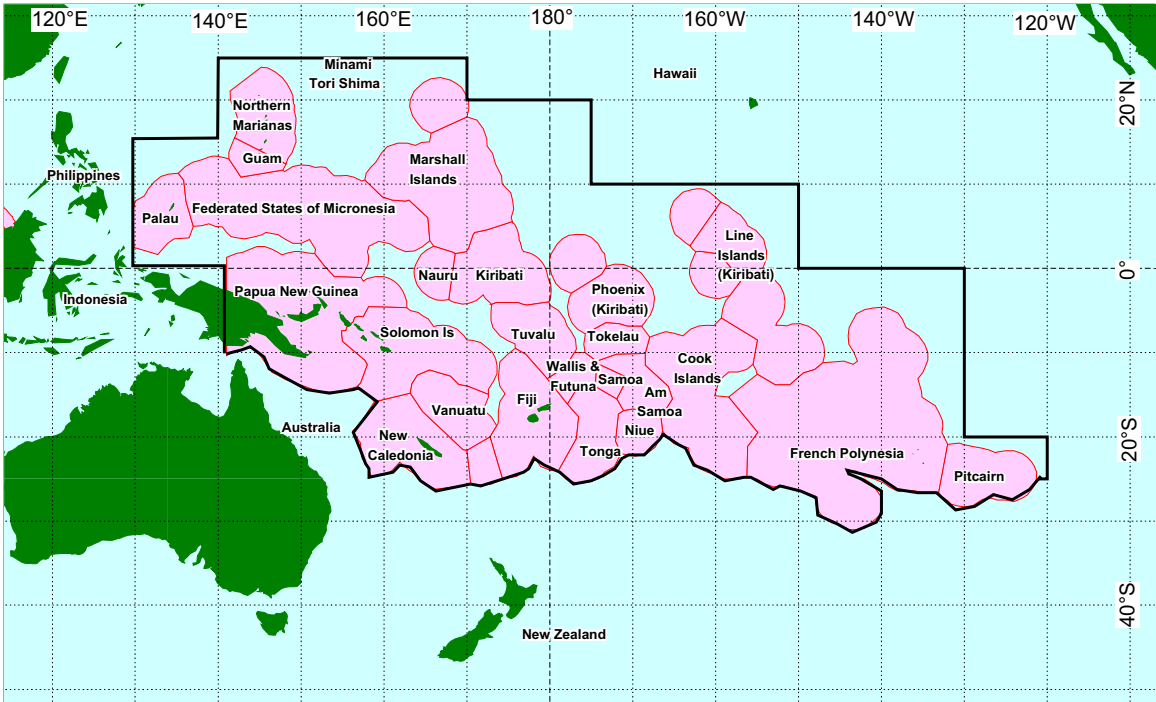


Figure 1. The Western and Central Pacific Ocean, showing the ‘Pacific Island countries’ tuna fishery area’ (PICTFA) used in this paper.

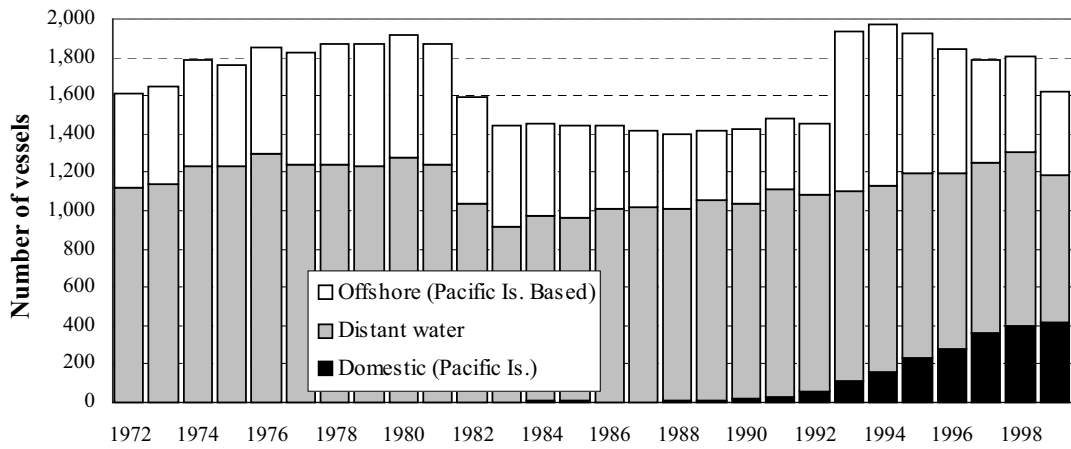


Figure 2. Number of longline vessels operating in the PICTFA (SPC data)

21. The amount of longline fishing activity (hooks) is currently declining in the PICTFA (Figure 3). The current fishing effort at around 500 hooks per 100 sq. kms per annum is in line with 1980 levels. While data for all fleets only available to 1997, the overall trend in longline activity in recent years is downwards.

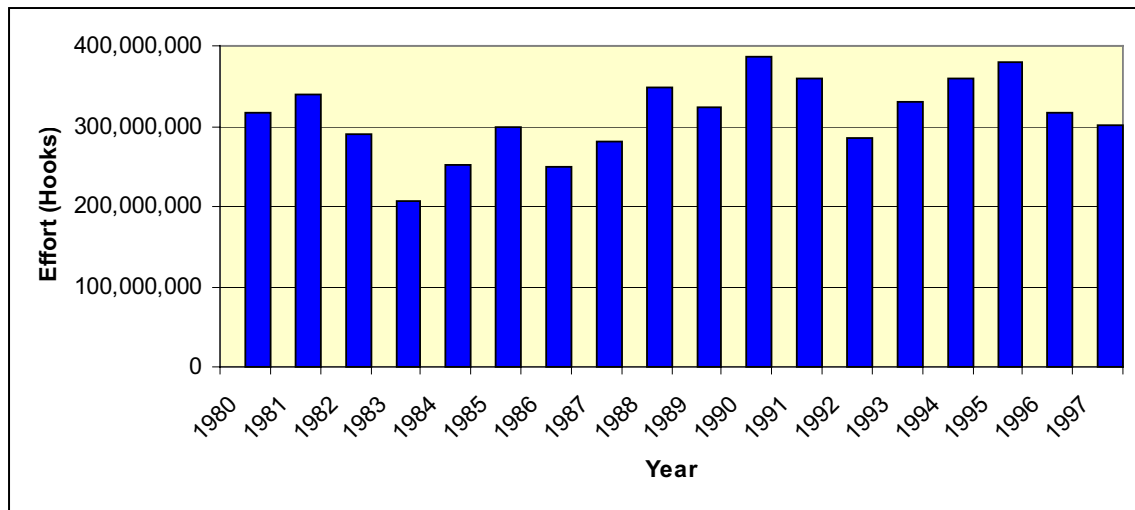


Figure 3. Estimated annual longline effort in the PICTFA (SPC data).

22. The renewable marine resources of the PICTFA, and in particular tuna, have been well researched for over 20 years, primarily through the work of the SPC. Japan has also made significant contributions to biological research, with some assessment contributions. This research indicates that the main tuna stocks in the PICTFA are considered to be generally healthy, although there is some biological uncertainty concerning bigeye.
23. Considerably less is known about billfish and sharks taken by longlines, although the Oceanic Fisheries Programme of the SPC and the National Marine Fisheries service (NMFS) in Hawaii have active research programmes looking at both groups of species. This research includes data collection and analysis, trophic interaction studies, joint studies with CSIRO on broadbill swordfish reproduction, population modelling of some sharks and billfish, and an observer programme. At a country level, there are a number of national observer programmes in place that are also collecting data on bycatch and these will be expanded in the coming years under a new project to be implemented by the OFP. The OFP has also established protocols for the collection of game and charter fishing data and established a Pacific-wide gamefish catch and effort database.
24. The SPC/FFA Tuna Fishery Data Collection Committee has developed observer data collection forms that are used by the regional US treaty observer programme and by national observer programmes of SPC and FFA member countries.

25. The longline fishery in the PICTFA focuses on sashimi-grade yellowfin and bigeye tuna, and whitemeat albacore tuna for canning. Significant catches of shark, billfish and other by-product fish species (e.g. wahoo, mahi mahi and opah) are taken, as well as varying amounts of bycatch (see definitions below). Longline fishing targeting sashimi-grade tuna has been developed over the last forty years, initially by the DWFN fleets of Japan, Korea and Taiwan. More recently Chinese longliners have fished extensively in the region, but this fleet has now declined considerably.
26. In comparison with the purse seine fishery, the longline fishery requires lower capital investment, infrastructure and expertise for entry. As such, it provides a major development opportunity for a number of PICTs and many have already built up small fleets of locally-based longliners, some of which are locally-owned and operated.
27. Targeted catches from pelagic longliners fishing in the PICTFA are mostly marketed overseas, particularly in Japan, Hawaii and on the US West Coast. Secondary markets are developing in Australia, New Zealand, Korea and parts of Europe. The local fleets are also increasingly servicing the local market, particularly through marketing by-product and lower grade target species.
28. It is noteworthy that apart from Japan and Korea, most other existing and emerging markets are sensitive to environmental issues. The US market in Hawaii and on the West Coast is of significance to locally based tuna longline operations and as mentioned previously, is particularly sensitive in terms of consumer and political awareness of environmental issues. The US has been known to embargo products from fisheries that are considered to be non-sustainable, including imports of prawns caught in association with turtles, and tuna that have been caught in association with dolphins. It is interesting to note that levels of bycatch in these fisheries have been significantly reduced by modifications to fishing gear and techniques.

Longline bycatch – a global issue

29. Worldwide, there is growing concern about the impacts of fishing, not just among those directly connected with fishing and processing, but also from the public at large who drive market demand for seafood products. Some of these concerns are related to the overfishing of target species, such as southern bluefin tuna (SBT), while others are related to the impacts of fishing on the habitat and wider ecosystem, including bycatch species.
30. Pelagic longlining has become the latest fishing method to attract the attention of those concerned with sustainability and ecosystem issues, including conservation groups. The dramatic declines in populations of swordfish, marlins and northern bluefin tuna in the Atlantic and SBT in the Indian, Southern and Pacific Oceans, as well as interactions with seabirds have been highlighted by a number of non-governmental organisations (NGOs) and have been strongly associated with longline fishing. These NGO groups, including both conservationists and recreational anglers, have run active campaigns calling for greater control over pelagic longlining. The following view was expressed by the National Coalition for Marine Conservation (a recreational NGO) and is not atypical of a growing number of lobby groups:
31. ‘.... longline hooks kill many juvenile fish that are essential to the recovery of any species, as well as fish that now receive some legal protection, like marlin, giant bluefin tuna and sharks. In 1991 the United Nations placed a moratorium on huge drift nets. Tough restrictions on longlines would be the next logical step. Even the fishing industry cannot afford to ignore the obvious.’

32. It should be noted that declines of large pelagic tunas and related species in the world's oceans cannot be totally attributed to longline fishing. For instance, the decline in SBT has resulted in part by large catches of relatively small, surface-caught schooling fish using purse seines and pole and line fishing.
33. Also indicative of growing interest in longlining, the Pew foundation (a US-based charity) announced in December 2000 a USD 1.2 million grant to conduct a comprehensive ecological study of the 'controversial' pelagic longline fisheries industry. A researcher employed by the major recipient of the grant, Duke University in Raleigh, North Carolina, US, has already stated that longlining is ... 'one of the most lucrative and perhaps destructive fishing techniques', flagging that the results of the study are likely to further raise the profile of the negative impacts of longline fishing. Some of the more extreme US NGOs (especially sportfishers) have gone on the record declaring their intention to lobby for an international ban on longlining.
34. It is to be hoped that these campaign intentions (negative statements and attitudes) are based on a clear understanding of all the issues and fisheries affected, and not just a few 'worst cases' based on misguided extrapolation, or even on political grounds.
35. Two major bycatch related impacts of tuna fishing in the Pacific that previously received extensive publicity are catches of dolphin by purse seiners in the eastern tropical Pacific and the use of oceanic drifting gillnets for the capture of albacore. Both these issues have now been addressed; dolphin mortality in purse seines has been cut by over 95% as a result of changes to gear and techniques, while oceanic gillnetting with long driftnets has been banned at an international level. A resolution to the driftnet issue was strongly pursued by PICTs, who were concerned at the rapid growth of the driftnet fleet, the likelihood of catching too many juvenile albacore and high levels of bycatch.
36. Concern over the impact of tuna fishing in the Pacific has recently resurfaced, particularly in the case of Hawaiian longline fisheries. In Hawaii, interactions between pelagic longlining and seabirds, turtles and monk seals have led to a range of management measures being introduced, some incorporating mitigation² strategies. In addition, recent court judgements have effectively closed down the Hawaiian swordfish longline fishery. The initial judgement was based on a finding that the National Marine Fisheries Service (NMFS) environmental impact statement (EIS) on the impact of management strategies to deal with longline-turtle interactions was out of date. A revised EIS which imposes a number of significant restrictions on the Hawaiian longline fleet has been subsequently issued and accepted by the court, although legal action continues.
37. Experience in a number of fisheries has shown that once sufficient resources and attention are directed at reducing bycatch where it is identified as a significant problem, then a number of useful mitigation strategies are possible and that a significant reduction can result. This paper is intended to help focus that attention.

² A mitigation strategy is considered to be one that seeks to reduce an effect of fishing (e.g. turtle mortalities from longlining) by modifying factors such as fishing area and gear type or technique used.

Defining longline catches

38. In setting a longline, an operator wants to maximise the catch of target species, for instance tuna (bigeye, yellowfin and albacore) or swordfish. Non-target species are also taken incidentally during longline sets, and comprise a significant proportion of the total catch taken in the PICTFA by longlines. Fishermen seek to maximise their catch of target species and in many cases try to avoid incidental catches of non-target species.
39. The catch of non-target species can be divided into two types:
- **bycatch** which is considered as unwanted catch and usually discarded³ (e.g. pelagic rays) because it has no or limited commercial value ; and
 - **by-product** that consists of species, other than target species, that are retained and sold.
40. In addition, small target species are also discarded at times, particularly on longline vessels, where hold space may be an issue.

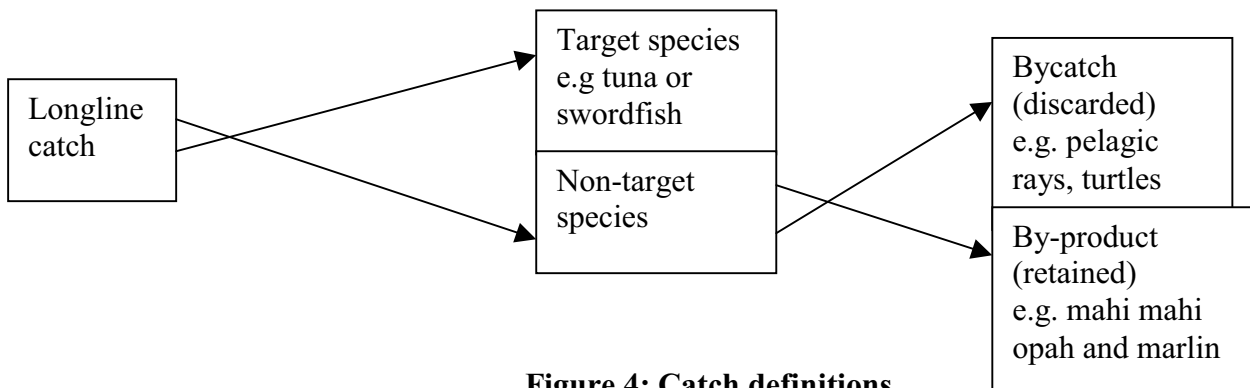


Figure 4: Catch definitions

41. The proportions of target, by-product and bycatch species will vary significantly depending on season, location and configuration of fishing gear. For instance, Tables 1 and 2 below provide an indication of the variation in catch types recorded from different types of longline set.

³ A locally-based longline vessel may regard certain species as a useable by-product (e.g. oilfish and pomfrets), whereas a DWFN vessel will consider it bycatch and discard these species.

Table 1. Comparison of pelagic longline catch components⁴ in the tropical waters (10°N — 10°S) of the PICTFA area, based on available observer data.

	% of total catch (in number)		
	Shallow set, night	Shallow set, day	Deep set (typically day)
Observed sets	878	240	670
Target species			
Bigeye	13.3	4.4	24.4
Yellowfin	16.3	19.3	30.4
Albacore	0.0	1.9	12.7
Sub Total	29.6	25.6	67.5
By-product			
Sharks	29.3	37.0	0.5
Billfish	8.7	8.8	3.4
Other by-product	5.6	7.0	3.6
Sub Total	43.6	52.8	7.5
Bycatch			
Turtles	0.2	0.1	0.0
Seabirds	0.0	0.0	0.0
Other bycatch	26.6	21.3	24.8
Sub Total	26.8	21.4	24.8

42. Some general observations may be drawn from Tables 1 and 2:

- Deepwater sets account for more target species (% by number) than shallow sets, with 67–68% taken in deep sets compared to around 30 % for shallow sets.
- The general notion that deep sets take less bycatch in both tropical and subtropical waters is evident from the available data.
- The day-night factor is probably not as significant as the shallow-deep factor in determining the amount of bycatch taken by longlines.
- Fewer billfish are taken by deep setting vessels.

⁴ Target species catch typically includes a small proportion of discards due primarily to shark/marine mammal damage and tuna that are too small for sale

43. The relatively high bycatch rate (to target species) from the deep sets of the fleets in the tropics (Table 1, Figure 5) is probably related to the fleet involved (i.e. Japanese offshore longline vessels). The species composition of this fleet shows that blue shark and pelagic stingrays are the major non-target catch and these are nearly always discarded⁵, hence the relatively high proportion of bycatch. By contrast, the fleets setting shallow in the tropical areas represent (predominantly) Taiwanese and Chinese offshore longliners. Their major non-target catch is silky shark, which is mostly retained. Other major non-target catch include oceanic whitetip, which is also retained by these fleets. Hence, a relatively large proportion of the total non-target catch is actually retained (as by-product) when compared to the deep setting vessels. In summary, the differences in the relative amounts of bycatch and by-product relative to target species shown in Tables 1 and 2 are a function of the value and marketability of certain non-target species.

Table 2. Comparison of pelagic longline catch components in the sub-tropical waters (south of 10°S) of the PICTFA area, based on available observer data

	<u>% of total catch (in number)</u>		
	<u>Shallow set, night</u>	<u>Shallow set, day</u>	<u>Deep set (typically)</u>
Observed sets	45	86	714
Target species			
Bigeye	9.4	1.5	7.3
Yellowfin	13.5	15.3	15.6
Albacore	3.6	34.4	43.8
Sub Total	26.5	51.2	66.7
By-product			
Sharks	16.8	4.4	1.8
Billfish	12.2	4.9	3.9
Other by-product	14.4	6.7	9.4
Sub Total	43.4	16.0	15.0
Bycatch			
Turtles	0.0	0.0	0.0
Seabirds	0.0	0.0	0.0
Other bycatch	29.9	32.6	18.1
Sub Total	29.9	32.6	18.1

⁵ In case of blue shark, the fins are usually retained and the shark killed and trunk discarded. In this case, shark has similarity to a by-product as it results in mortality and the retention of a marketable product

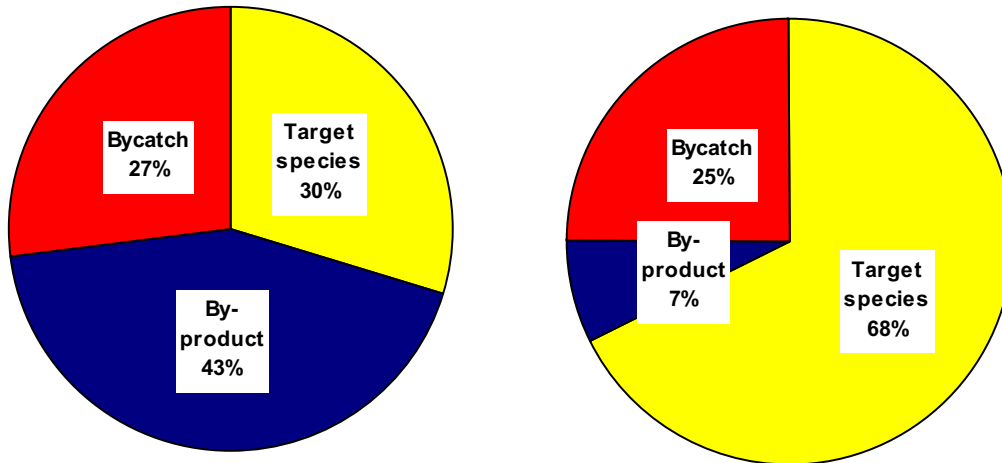


Figure 5. Breakdown of the PICTFA–tropical waters (10°N — 10°S) longline catch for vessels utilising the shallow-set, night strategy (left) and vessels using the deep-set strategy (right).

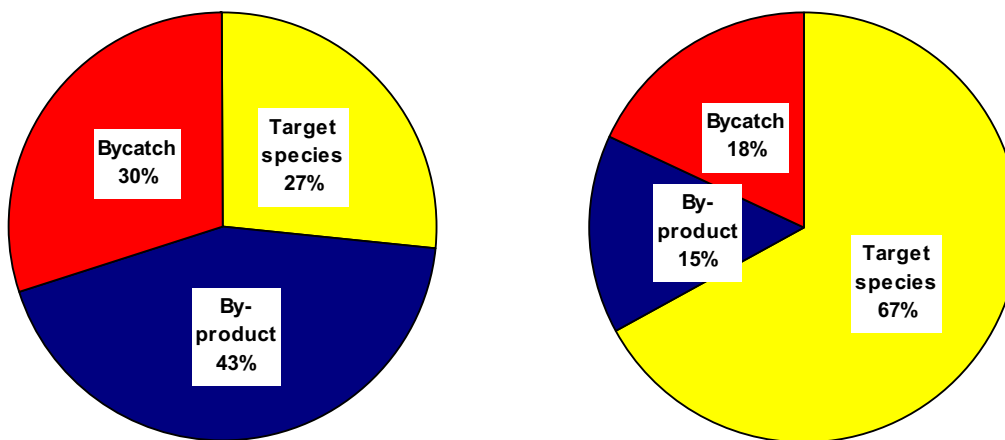


Figure 6. Breakdown of the PICTFA–subtropical waters (south of 10°S) longline catch for vessels utilising the shallow-set, night strategy (left) and vessels using the deep-set strategy (right).

44. In some cases species other than the key tuna species (bigeye, yellowfin and albacore) are targeted, e.g. sharks, marlin and swordfish.
45. Typically, the amount of fish discarded by locally based vessels is less than DWFN vessels. DWFN longline vessels freeze their catch and tend not to retain as much by-product or small target species due to competition for limited hold space with more valuable species. Local vessels tend to use ice and land fresh product, and can come in early from a trip if they fill their fish hold or run low of ice. They are usually able to find a ready market for a wide range of species.
46. In comparison with bottom trawling and other fisheries, longline bycatch is relatively small. In the case of prawn trawling for instance, bycatch is typically 80–90% of the total catch by weight. Even in some trap fisheries (e.g. the Alaskan crab fishery) bycatch can be as high as 90%. For longliners in the PICTFA, bycatch is typically 15–25% by weight depending on fleet behaviour (i.e. discard practices).
47. Sharks are a special case of non-target longline catch and Figure 7 below provides an indication of the quantities taken in the tropical longline fishery (10°N – 10°S) in comparison with the major target species. CPUE of catches of some species (including mako) would be higher in sub-tropical waters.

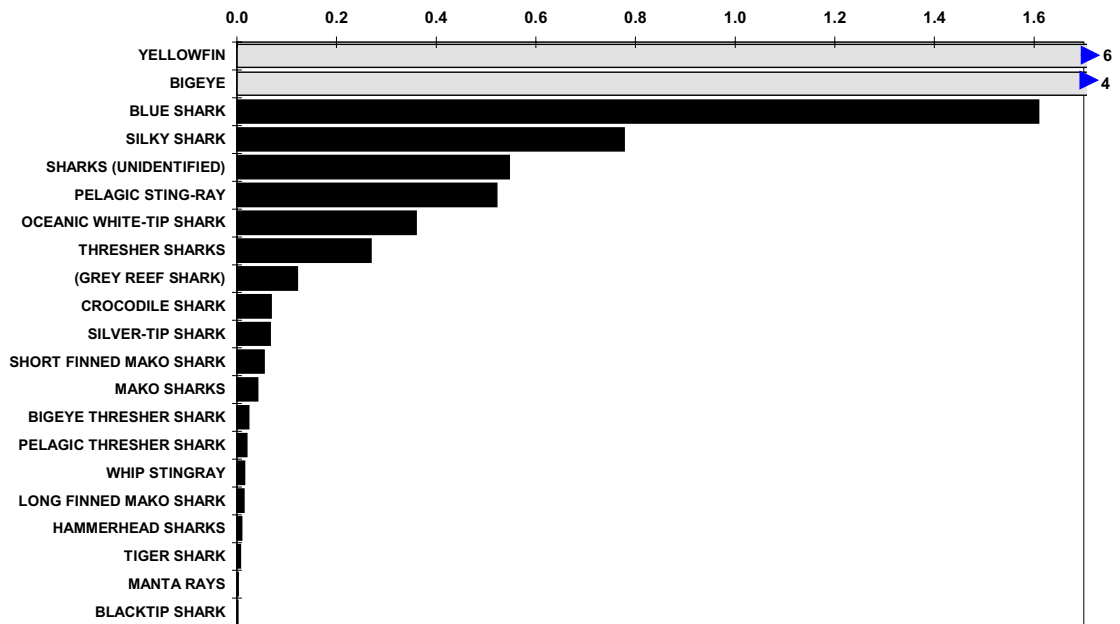


Figure 7. Nominal catch rates (fish per 1,000 hooks) of sharks and rays taken in the WTP longline fishery based on available observer data, 1993–1997 (SPC).

48. The way in which sharks are marketed will vary with the port of origin of the vessel by which they are caught and falls into two main categories:
- fleets that land the whole shark as a by-product catch, usually head off; and
 - others that land only the fins as by-product, and discard the carcass.
49. There are local sales of shark flesh in some island countries (e.g. Kiribati and Nauru) and occasional uses of other parts of sharks, including cartilage, teeth, skins and livers.
50. In many cases, the shark flesh is edible, but for economic reasons, is discarded. The categorisation of shark is thus rather more complex than with other species and for the purpose of this paper, shark is classified as by-product. The discarding of shark carcasses after finning is a practice that is drawing growing international criticism, both on the grounds of sustainability and waste and is also attracting attention from the animal rights movement as being excessively cruel.

The Pelagic longlining method

51. The horizontal pelagic longlining method is widespread in the PICTFA and is very significant in terms of value of catch. The method is considered passive in the sense that fish are attracted to baited hooks that are attached to drifting lines that range from 10–100 kms in length and have from 300 to 3,000 branchlines, each with a single hook. One hook catches only one fish at the most and the gear is not prone to continue fishing in the event of loss (ghost fishing), as is the case with driftnets, although lost gear may have other consequences (see companion leaflet on marine debris and derelict fishing gear).

52. Pelagic longline gear (Figure 8) consists of three major components:

- a mainline of approximately 3–6mm diameter which may be twisted polyester/nylon or nylon monofilament;
- floats and floatlines from which the mainline is suspended at a predetermined depth from the surface; and
- branchlines that are clipped to the mainline and terminate in a baited hook.

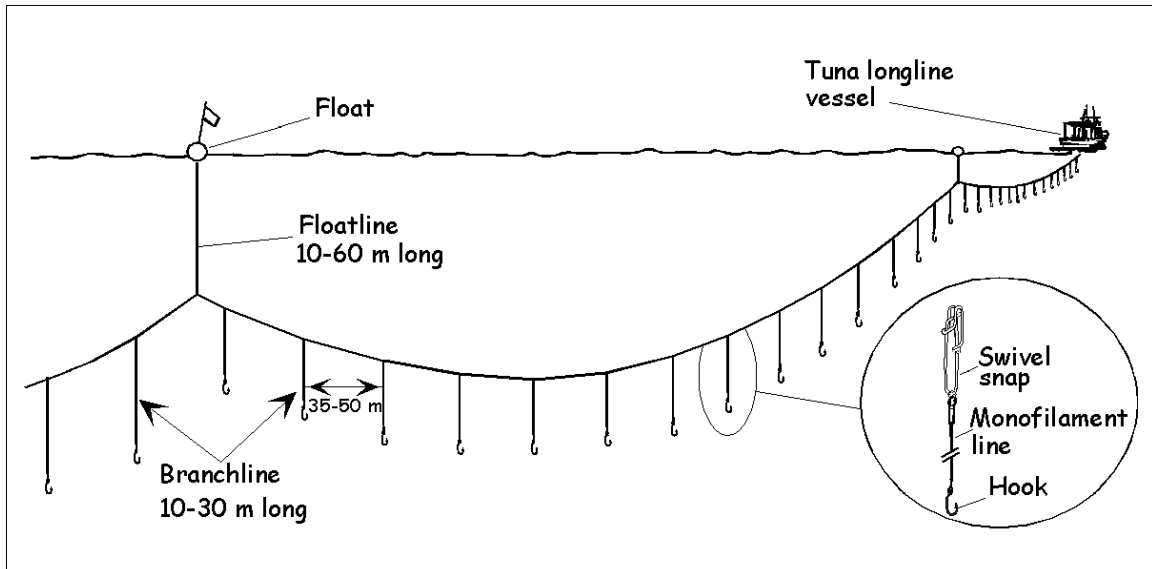


Figure 8: Pelagic longline gear

53. The configuration and components of a pelagic longline will vary depending on target species behaviour and skipper preference (Figure 9). For instance a relatively shallow (80–110m) set targeting swordfish may have a small number of branchlines between floats with chemical (fluorescent) light sticks attached to the branchline, just above the hook. The lightsticks are thought to work by attracting squid and baitfish (providing additional attraction), or luring the fish to the lightstick and thence to the bait. A deeper set (300–400m for the deepest hooks) longline configuration typically used for bigeye tuna would have a greater number of branchlines between floats resulting in longer loops of mainline. These deeper-set lines are usually deployed using a device known as a line setter or shooter. The depths at which lines are set have implications for catches of both target and by-product species including tuna and billfish, as well as bycatch species including turtles.

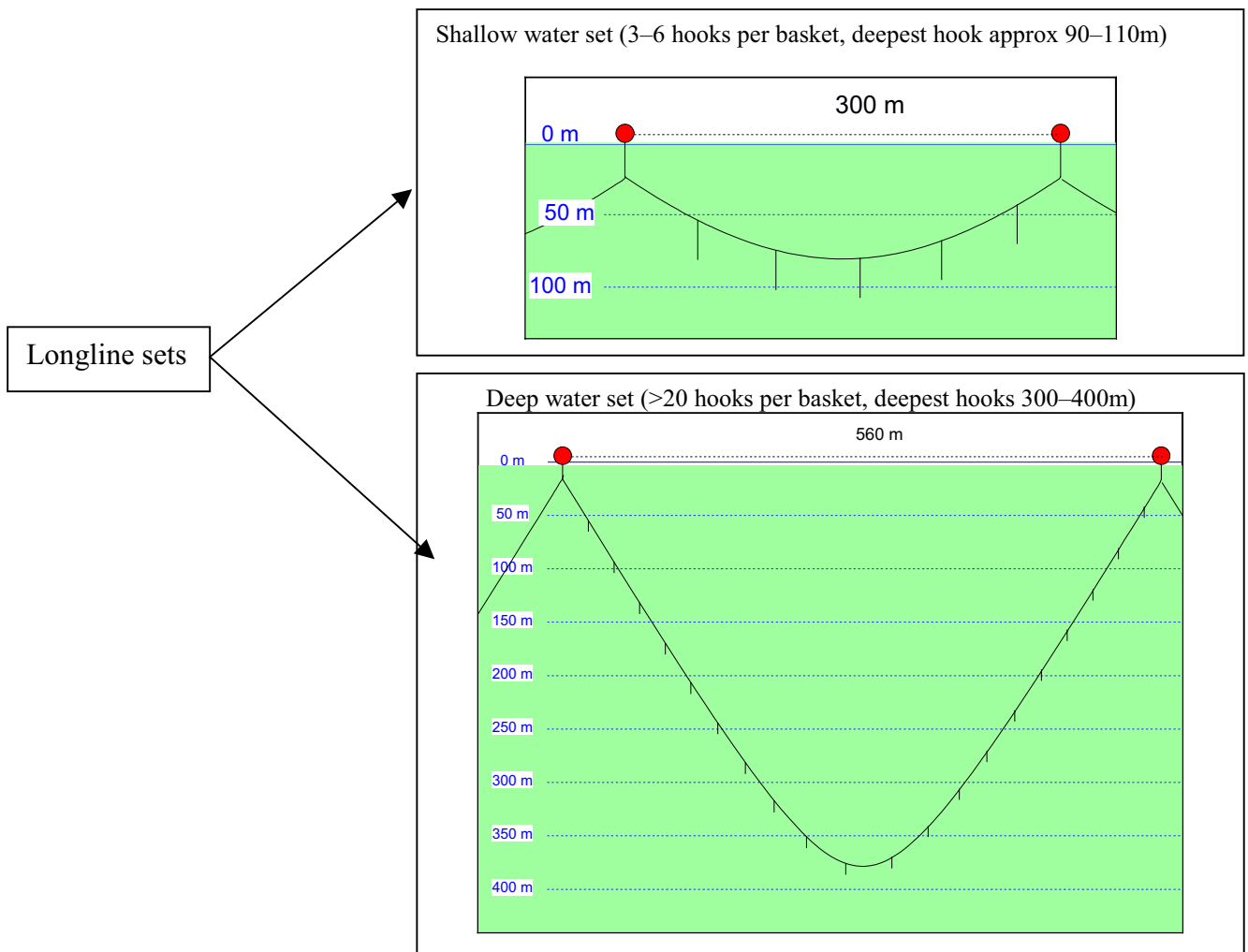


Figure 9. Artist's impression of shallow-set (top) and deep-set (bottom) longline gear

54. Pelagic longlining is characterised by the use of a large number of hooks spread over a wide area, catching relatively few targeted fish per 100 hooks. A catch rate of target species of 2–3 fish or around 50 kg of target species per hundred hooks is considered economically viable for a tuna longliner, although bycatch and by-product will also be taken, increasing the number of ‘occupied’ hooks.
55. Purse seining tends to target smaller, schooling tuna, such as skipjack, close to the surface, above the thermocline⁶. Longlines generally fish in relatively deep water (up to 400 m). This deeper water is the preferred habitat of the larger solitary fish targeted by pelagic longlining, e.g. bigeye, large yellowfin and albacore tuna. Longline-caught tuna are generally of higher (sashimi) quality, relative to those taken in net-based fisheries (e.g. purse seine).
56. It has been suggested that other fishing methods can be utilised to capture the range of tuna species currently taken by longlines. Such methods include pole and line fishing, trolling and harpooning. Unfortunately, such methods cannot be used as viable alternatives since they are carried out at or very near the surface, and cannot target fish in deeper water.

Types of ecological concern

57. Given that pelagic longline gear does not interact with the seabed, habitat sensitivity is not considered an issue. The sustainability of target species is dealt with extensively elsewhere, and particularly within the annual SPC Tuna Fishery Overview and Status of Stocks. Gear loss is an issue in all fisheries and is the subject of a companion information brochure.
58. It is the level of interaction with by-product species and bycatch, including significant amounts of shark, marlin and other fish species as well as turtles and seabirds that is the main issue. Estimates of the degree to which pelagic longlining affects the sustainability of bycatch and by-product species is hampered by limited observer and logbook data. It is often an effort to get fishing crews to comply with bureaucratic requirements, such as filling in catch return forms and counting bycatch.
59. Longline observer programmes are a relatively recent phenomenon in the PICTFA and face many difficulties in terms of the conditions under which observers have to carry out their duties. These include cramped crew conditions on small vessels, long trips (sometimes of several months) and cultural and language barriers. As well as these difficulties, the costs of boarding and recovering observers, wages and other costs are a limiting factor in the expansion of observer programmes. Despite these problems, considerable efforts are being made to improve data collection, both through the collection of enhanced logbook data and the use of observers.

⁶ A layer of the water column where water temperature changes rapidly with depth, from the warm, less dense surface water layer to colder, denser, deep water.

Seabirds

60. Seabirds occasionally take longline baits intended for tuna and other species and may be hooked as the lines are being set or retrieved. Albatross killed by longlines intended for southern bluefin tuna in waters below 30°S reached such a level that grave concerns were held for the long-term survival of some species. Albatross populations are particularly vulnerable to adult mortality due to the bird's long life cycle, small numbers of eggs, and the fact they mate for life. High mortalities of seabirds have also been recorded from longliners targeting patagonian toothfish in the Southern Ocean. Significant numbers of albatross were taken in waters close to albatross nesting sites on the Northwestern Hawaiian Islands, although a programme of measures has been implemented and this has reduced mortalities substantially. These and other measures are discussed in a later section of this paper.
61. However, reported catches of seabirds on longlines in the PICTFA, where a large proportion of longline effort occurs, are virtually nil and seabird mortality from pelagic longlining in the PICTFA is negligible. This may be due to the fact the birds found in the PICTFA area feed extensively on surface baitfish schools associated with surface feeding tuna including skipjack and small yellowfin, neither of which are generally taken on longlines. Also, the smaller birds found in the PICTFA area have correspondingly smaller mouths and even when attracted to line hauling or shooting operations, they would be unable to swallow the large tuna circle hooks used. The more vulnerable species of seabirds and in particular large albatross, do not occur in the PICTFA. Continued observations will monitor this situation.

Turtles

62. Turtles spend a considerable part of their lives in the pelagic environment, drifting and feeding in the upper layers of the ocean. It is therefore not surprising that there is some interaction between turtles and pelagic longlines set to target tuna and other species in the same region of the water column. Most of these encounters in the PICTFA are in tropical areas.
63. It is assumed that opportunistic-feeding turtles encounter and are attracted to baited longline hooks and typical interactions include hooking in the mouth and hooking or entanglement in flippers. Death is usually as a result of drowning. Research in Hawaii and analysis of observer data by SPC indicates that the main factor influencing turtle capture is the depth at which longline hooks are set, with shallow set hooks accounting for around ten times more encounters than those on deep set lines.

64. While there is some mortality caused by longline fishing, the effect of this source of mortality is considered much less than the substantial effects of the compromising of turtle nesting sites⁷. From SPC held observer data, (1992–1997) 21 turtles were captured from 700 observed sets⁸, of which 83% were released alive. More recent data for the western central Pacific longline fishery⁹ compiled in 2001 by SPC has provided a very preliminary estimate of 2,182 turtle encounters per year, of which 500–600 are expected to result in mortality, given current awareness in the fishery. It is considered likely (by SPC) that a large proportion of these would be olive ridleys, whose population levels are currently strongly increasing.
65. Work on turtle survival after capture indicates that correctly handled and released turtles stand a good chance of recovery. This recovery is also linked to the manner in which they are hooked. That is, lip-hooked turtles where hook removal is relatively easier are likely to fare better than those that swallow the hook, causing lodgement in the intestinal tract. To date however, NMFS research with satellite tracked loggerhead turtles has so far not been able to demonstrate any difference in post-release mortality of mouth hooked and gut hooked turtles. Initial indications are that survival is pretty high regardless.
66. The degree of different species of turtles' interaction with pelagic longline fishing in the PICTFA is not clear since most¹⁰ turtles have not been identified to the species level by observers and are simply listed only as 'marine turtles'. A new manual has been produced by the Tuna Fishery Data Collection Committee¹¹ to more accurately identify bycatch species, including individual species of turtles, has been developed to overcome such problems in the future.

Sharks

67. Pelagic sharks form a major proportion of the by-product on tuna longliners (around 20% by number of total catch in the area of interest, according to SPC observer data, 1993–1999), although the proportion tends to be less in tropical and more in temperate waters. The predominant species taken are blue shark (*Prionace glauca*), silky shark (*Carcharhinus falciformis*), oceanic whitetip (*C. longimanus*), thresher sharks (*Alopias* spp.) and the short-finned mako shark (*Isurus oxyrinchus*). Coastal or reef sharks are very rarely taken by vessels targeting tunas, but may be more common in the catch of vessels targeting shark, since the distribution of coastal species is more restricted and therefore provides an easier means of targeting.

⁷ By shoreline development, recreational disturbance and indigenous take.

⁸ Overall observer coverage of longline sets to date has been less than 1%

⁹ The Pacific Ocean west of 150°W and 10°N — 45°S.

¹⁰ In a review of SPC-held WCPO longline data (1992–1997), of a total of 21 turtles, only around 30% were identified to a species level.

¹¹ An informal SPC/Forum Fisheries Agency (FFA) group, including members of both Secretariats and interested member countries.

68. Much of the catch is finned at sea¹² and the trunks disposed of, since they are generally of low value and a number of operators do not wish to mix sharks with more valuable sashimi-grade tuna. The trunks of certain species may be retained and sold as by-product; for example, observer data show that the trunks of around 60% of the mako sharks taken were retained for later sale. That said, finning and retention or disposal of trunk usually varies between area and fleet. Where targeting of shark occurs, typically both the trunk and fins are retained.
69. Most shark species are particularly vulnerable to fishing pressure due to their long life cycles, delayed sexual maturity, low fecundity, and long gestation periods. However, the populations of blue sharks¹³ taken by the WCPO (and other) longline fisheries are relatively more robust under fishing pressure than many coastal and deep-water shark species, which have attracted much of the conservation lobby's attention during the past decade or so. Despite low fecundity, ovoviviparous sharks are more like humans, investing considerably in the survival of their offspring.
70. Although much of the information required for rigorous assessments is still lacking, preliminary assessments based on the best available data from joint research by Japan and the National Marine Fisheries Service (NMFS), suggest that Pacific blue shark populations are not over-fished. Observer reports indicate that blue shark dominates shark bycatch in the WCPO, representing around 30% of all bycatch by number and about 45% by weight. Data will continue to be collected and these assessments will be revisited over time to monitor blue shark populations in the Pacific.
71. The stock status of most other pelagic shark species is not known at this stage. Data will continue to be collected through observer programmes in the hope that future analyses can provide indications of the stock status for the main pelagic shark species taken by longliners in the PICTFA.
72. Coastal shark-target fisheries may be an area for closer review in the near future.

Billfish

73. Billfish as a group form the most distinctive part of the bycatch of longline vessels in the WCPO, and, in some cases, may be secondary or even primary target species. SPC logbook records of billfish catch go back to the 1960s and most fleets appear to provide representative information of the four main billfish species, namely blue marlin (*Makaira mazara*), black marlin (*M. indica*), striped marlin (*Tetrapturus audax*) and swordfish (*Xiphias gladius*), when comparisons to observer data have been made. In recent years, there have been efforts to estimate the catches of the four main billfish species from logsheet data, and trends in nominal catch rates for fleets known to provide reliable logbook data have been produced. The most common problems for those fleets where logbook coverage of billfish catches are poor are:

¹² Another issue is that of shark finning. A number of claims have been made that sharks are finned alive and the trunk thrown overboard to die slowly. This is for the most part incorrect; sharks are rarely finned alive – to do otherwise would make little sense and result in considerable risk of injury or loss of life to crew.

¹³ Using information output from the International Pelagic Shark Workshop (IPSW) in 1999 some would argue that the term 'blue shark' could be replaced with 'pelagic sharks'. At IPSW there appeared to be some debate on exactly where pelagic sharks appeared on the scale of the productivity spectrum with respect to other sharks.

- (i) misidentification of species; and
 - (ii) under and non-reporting of billfish catches when observer data suggest that higher catches should be attained.
74. Presently there is <1% observer coverage within the PICTFA though this is increasing with the development of national observer programmes. A gamefish and charter vessel catch and effort data collection programme has been implemented by SPC in conjunction with PICTs to obtain historic, current and future information on billfish catches.
75. There are presently no urgent concerns regarding the stock status of the billfish species in the PICTFA. Blue marlin, which is the most often-caught billfish species, has recently had a stock assessment completed by IATTC that deemed that '*stocks are in a healthy condition*'. Broadbill swordfish, which are targeted in Australia, and NZ to a lesser extent, may show some signs of local depletion of stocks, though this is still being investigated.
76. While billfish stocks are healthy there have still been some concerns expressed by recreational fishermen in places such as Hawaii, Australia, NZ and some of the PICTs (especially the Marshalls, PNG, Vanuatu and French Polynesia) that longliners are affecting the catch rates of billfish (mainly blue, black and striped marlin) caught by game fishermen and charter operators.
77. While the recreational catch of billfish is <5% of the commercially reported catch from longliners, the gamefish sector of the fishing industry can contribute significant foreign income to a PICT through the tourism industry. As a result, in some countries, there are now resource allocation issues that need to be addressed.

Current and planned research

78. PICTs are very aware of the sustainability issues associated with longlines and have already taken several significant steps in terms of documenting levels of bycatch, both at national and regional levels, including:
- national and regional (SPC and FFA) observer programmes;
 - appointment of an SPC-based Fishery Monitoring Supervisor to assist with the expansion and development of national observer programmes;
 - the SPRTRAMP observer programme (1995–2000);
 - establishment of the billfish and bycatch working group under the Standing Committee for Tuna and Billfish (SCTB);
 - collection and analysis of non-target catch data; and
 - appointment of an SPC-based billfish research scientist.
79. Logbooks provide the primary source of data on some species of bycatch and by-product, enhanced by national and regional observer programmes. The Fisheries Statistics section of OFP have produced a number of detailed analyses of bycatch in the WCPO, based on both logbook and observer data (see bibliography). It is difficult and usually impractical to expect species level bycatch identification by fishermen, especially of shark species, and there is likely to be a tendency to under-report bycatch of little value, since the fisherman sees it as unimportant.

80. In order to derive detailed bycatch statistics at a species level, an increase in the current overall longline observer coverage (less than 1% of all sets) will be required. It has been estimated that to increase overall observer coverage in the WCPO to around 20% would require 200 full time observers recruited with an operating budget far in excess of what has been required to date.
81. In addition to the work of the SPC, considerable research effort has been expended by national research organisations in the US, Australia, New Zealand, and Japan, as well as by other distant water fishing nations.
82. Much of this research will provide the information and advice that will be required for the development of management arrangements across the PICTFA, including more detailed consideration of the bycatch issue.

Regional and multilateral arrangements

83. The importance of an ecosystem approach to fisheries management, including consideration of the overall effects of fishing, has been given increased profile in the UNIA. The WCPO region is currently engaged in the development of multilateral management arrangements under the newly signed Convention, based on the principles of UNIA, to cover highly migratory fish stocks and their related fisheries, including pelagic longlining. The Convention contains strengthened provisions concerning bycatch species that will be developed and implemented by members of the Commission to be created under the Convention. The establishment of the Commission may take some time. In the interim, it would be prudent for PICTs to continue to expand their efforts to effectively deal with bycatch and by-product issues in their own zones, in line with their national responsibilities both under the Law of the Sea Convention and UNIA. Under the Commission arrangements, PICTs will retain the responsibility for licensing fishing vessels operating in their zones and setting the conditions of those licenses, including those regarding by-catch.
84. It is hoped that there will be harmonised protocols for data collection and analysis developed between national arrangements, and in future, national arrangements and those established under the new Convention.

FAO action plans

85. Global concern over bycatch issues is reflected in the FAO International Plans of Action (IPOAs) for sharks and seabirds. IPOAs have been concluded within the framework of the Code of Conduct for Responsible Fisheries and as such, they are considered to be an integral component of the Code. Although voluntary, there is a high degree of moral obligation for all stakeholders associated with the fisheries sector to take steps to ensure that fisheries are conducted in a responsible manner and that long-term sustainable goals are pursued. There is therefore a strong incentive to implement the Code and other instruments included within its framework.

86. The objective of the Seabird IPOA is to reduce the incidental catch of seabirds in longline fisheries where this occurs. As noted previously, seabirds are not considered to be an issue for the PICTFA. A review of data holdings and literature carried out by SPC in 1996 combined with anecdotal information provided by observers, found a catch of only five birds by longlines in the PICTFA. If there is no serious occurrence of seabird mortalities from longlines apart from those in temperate waters, then it is unlikely that national POAs for seabirds will be required in the region. The albatross problems in the SBT and Hawaiian fisheries are being tackled through national plans drawn up by Australian, New Zealand and US administrations, as well as through the Commission for the Conservation of Southern Bluefin Tuna (CCSBT).
87. The Shark IPOA is more relevant to the region, and some Pacific island states (e.g. Palau) are already beginning to incorporate shark bycatch regulations into their national tuna management plans. The IPOA calls for specific national plans of action for the conservation and management of sharks, where they are caught regularly in target and non-target fisheries. Given the issue of resources, it may be difficult for individual states to undertake the full IPOA implementation strategy as suggested by FAO, at least in the short to medium term. This issue has been discussed informally between SPC and FFA with input from member countries, and will be considered more during 2001.
88. There is as yet no turtle IPOA although calls were made at COFI 2001, but international communities considered the Illegal, Unregulated and Unreported (IUU) IPOA the highest priority.

Reducing longline bycatch

89. This section considers a number of strategies that have been applied to reduce longline bycatch. It is clear that where a problem is recognised, and industry, administrators, and researchers collaborate, effective mitigation strategies can be developed to great effect.

90. In a number of fisheries, bycatch concerns have been dealt with by the development of various strategies to reduce bycatch, including closed areas and changes to fishing gear and techniques. Some examples are given in Table 3.

Table 3: By-catch mitigation strategies

Fishery	Bycatch species	Mitigation strategy developed	Result
Eastern Pacific tuna purse seine	Dolphin	Changes to net design, 'backdown' procedure and hand release methods	97% reduction in mortality, 1986-1996. Change to marketing restrictions for tuna caught in association with dolphin
Southern bluefin tuna longline	Seabirds (Albatross)	'Tori' poles (bird lines), night shooting, weighted lines etc	30-75 % reduction for tori poles, 60-90% night setting and 60-96% weighted lines
Australian Prawn Trawl fisheries	Turtles	Turtle exclusion devices.	Estimated > 90% reduction in mortality and US embargo on Australian prawns lifted

Mitigation strategies/devices

91. One of the problems facing the region in terms of taking action on bycatch is that of compliance. While it is relatively easy to pass national legislation requiring, for instance turtles to be released alive, it is difficult to follow up on such regulations on distant water fishing nation vessels. Similar issues are a consideration with locally based fisheries, although the opportunities for education and extension and the motivation of local fishing crews are greater. Despite the effort required, it is important that Pacific island nations are at the forefront of the promotion of sustainable fishing practices, including keeping bycatch levels to a minimum.
92. There is a considerable amount of effort being expended to reduce pelagic longline bycatch and especially the take of rare or endangered species. The issue of what strategy to use will depend heavily on the characteristics of individual fisheries, including the makeup of target and bycatch species, oceanographic conditions and type of vessel and gear.
93. Fishing vessels have the incentive to avoid most bycatch. For instance, while sharks may be of some value (especially the fins) they can also cause considerable damage to valuable target species. In addition, bait is a significant cost in pelagic longline operations, therefore operators do not want to lose hooks to bycatch species.

Turtles

94. Research in Hawaii has shown that turtles are most likely to be taken with hooks baited with squid¹⁴ that are set relatively shallow, with most captures at 12-30 metres, adjacent to float lines. These hooks are set primarily for swordfish, and considerably lower takes (by one or two orders of magnitude) occur on lines set for deeper swimming bigeye and yellowfin tuna, as targeted in most of the PICTFA.
95. While the chance of an encounter with a turtle (entanglement or hooking) during a given set is very low for vessels targeting tuna, it is almost inevitable that at some point a swordfish longliner will have to deal with a hooked turtle.
96. The turtle species encountered by longliners are green, leatherback, olive ridley, hawksbill and loggerhead. According to the 2000 IUCN's (World Conservation Union) Red List of Threatened Species, green, olive ridley and loggerhead turtles are endangered, and leatherback and hawksbill critically endangered. Clearly, it is best to avoid the capture of the turtles in the first place, which for some species means avoiding shallow sets and sets close to reef areas. As mentioned previously, there is also a clear relationship between shallow sets and turtle encounters.
97. Building on the Hawaiian experience and elsewhere, it is recommended that longline vessels be equipped to enable them to release turtles so as to maximise the chance of their survival.
98. Means to do this include a dip net that may be used to facilitate the safe handling of smaller sea turtles and provide access to the hooked turtle with a minimum of disturbance and trauma. When the hooked turtle is brought aboard, the hook should be removed carefully by propping the mouth of the turtle open. If the hook cannot be seen, the line should be cut as close to the mouth of the turtle as possible. After hook removal or cutting the line short, the turtle should be released only if it is responsive. If the turtle is comatose, it should be revived by placing it on its belly or bottom shell with the hindquarters slightly elevated for a period of four hours or more, until it becomes responsive. During the time it is held on board pending recovery, the turtle should be kept cool using damp sacking cloths, in order to avoid dehydration.
99. If the turtle is too large to be brought onboard, then the crew may use a long handled line cutter (commercially-made brands are available), or a hand made alternative may be constructed. The cutter acts as a means of cutting the line as close as possible to a hooked turtle.
100. For turtles released after capture, the chances of survival after release are generally considered good, although the rate of survival will depend on a number of factors. These include the means of handling and release outlined above, as well as how the turtle has been hooked or fouled in the gear including whether or not the hook has been deeply ingested.

¹⁴ Squid is one of the preferred foods of the loggerhead turtle and broadbill swordfish.

Sharks

101. There is a marked difference in the amount of shark bycatch taken between deep and shallow sets as indicated earlier (see Tables 1 and 2). This difference provides an opportunity for operators to avoid high-level shark bycatch by configuring gear to fish deeper, which may well also increase bigeye catches.
102. Sharks that are hooked on pelagic longlines are usually able to easily bite through branch-lines made of monofilament. Some countries have used this behaviour and banned the use of wire traces or leaders (and long shanked hooks) in order to reduce shark bycatch. It is assumed that sharks that bite through the branchlines survive.
103. Palau is an example within the region where there has been a growing concern regarding the tuna longline bycatch, including sharks. In an effort to reduce the bycatch of sharks, Palau is now prohibiting the use of wire traces on longlines as a condition in all new access agreements. In addition, legislation has been proposed which includes several measures intended to address bycatch related issues including an increased tax on all shark retained, a requirement that all sharks caught be immediately released, and a prohibition on the finning of sharks.
104. It is expected that the need to control the capture of sharks by longliners will be an issue for other PICTs in the future, both for tourism (especially in the case of near-shore fishing and interaction with reef sharks) and broader conservation issues associated with coastal fisheries and ecosystems.

Seabirds

105. Available logbook and observer data indicate that there is not a problem with seabirds in the PICTFA.
106. Experience in higher latitudes in Hawaii and Australia, where significant seabird/longline interaction exists (particularly with albatross), has shown that there is a range of highly effective methods of reducing seabird predation of baits. These include:
 - The use of ‘tori’ poles from which bird scaring lines are streamed on the surface where the bait is available for predation, to deter seabirds;
 - Night setting, with a minimum of deck lighting, when the bait is impossible to detect by seabirds; and
 - Use of dyes, weighted branchlines, and bait thawing to sink the bait quickly once clear of the stern of the vessel.

Fisheries examples

107. The mitigation strategies described above have been applied in a number of fisheries as illustrated in the following examples. The examples also highlight the interest and concern being shown in regard to pelagic longline bycatch, and the application of mitigation measures, some of which may not be needed in the PICTFA.

The Hawaiian pelagic longline fishery

108. While the Hawaiian situation is atypical of most Pacific Islands, both in the perceived level and types of interactions, it is illustrative of the growing sentiment from conservation and other lobby groups concerning the effects of pelagic longlining. The end result of these activities has been to bring about fisheries closures and other stringent and expensive management measures, some of which are based on very little evidence, but where the precautionary approach has come into play.
109. The Western Pacific Regional Fisheries Management Council has been at the forefront of a number of initiatives to reduce unwanted bycatch, including protected species. Such actions have included the establishment of a mandatory closed area around the Northwest Hawaiian Islands to protect albatross and monk seal populations, further closures to protect the fishing areas of small commercial and recreational pelagic fisherman, and mitigation measures to reduce seabird mortalities.
110. A recent case brought against NMFS on behalf of the Center for Marine Conservation culminated in a court order handed down on the 4th August 2000 introducing a further suite of restrictions to the Hawaii-based longline fishery. Among the measures taken were the closure of an area to longline fishing north of the Hawaiian Islands, seasonal closures of other areas, specified levels of observer coverage when fishing in designated areas, and the prohibition of fishing for swordfish and its sale for profit. Vessels catching swordfish were required to report details to NMFS within five days of returning to port. The order required that NMFS complete an environmental impact statement (EIS) by April 1, 2001. The EIS was subsequently completed and accepted by the court and a wide range of restrictions on the longline fishery will remain in place¹⁵. These include regulations on turtle bycatch mitigation including shallow sets and closed areas, as well as the carriage of observers. The Hawaiian longline industry (Longline Association) has filed a suit against the Biological Opinion¹⁶ that underpins the EIS and legal action continues.
111. For turtle mitigation, regulations require all permit holders in the pelagic longline fishery to carry and use a line clipper and dip net to facilitate the release of hooked or entangled turtles. In addition there are sea turtle handling, resuscitation and release requirements, designed to minimise mortality after release from a longline vessel.
112. Further proposed regulations deal with the use of mitigation techniques for seabirds, and a mandatory requirement to attend, on an annual basis, a protected species workshop on bycatch mitigation techniques. A number of these courses have been run in 2000/2001.
113. An annual quota of 50,000 blue sharks has been placed on the Hawaiian fishery and a state law has been passed banning landing of shark fins, while a Federal law banning shark finning was signed in the US in December 2000.

¹⁵ These restrictions include a ban on longline swordfishing (shallow-set) in the North Pacific from the Equator to the North Pole and a ban on tuna longlining between 1 April and 31 May from the Equator to 15°N and west of 145°W east of 180°

¹⁶ A legal and policy document required under US environmental legislation on endangered species.

Australia

114. Australia is currently pursuing the development of a bycatch action plan for tuna fisheries within the Australian fishing zone, a significant proportion of which will be related to bycatch taken by all tuna longliners. One of the major Australian bycatch issues relates to seabird bycatch, particularly in southern waters south of 30°S. Most of the measures which have been put in place to address this issue, have primarily resulted from the 'Threat Abatement Plan for the Incidental Capture of Seabirds During Oceanic Longline Fishing Operations', which was released in 1998, and will be incorporated and further developed in the Tuna Bycatch Action Plan.
115. The Australian tuna bycatch action plan will also deal with other bycatch issues in the eastern tuna and billfish (ETBF) longline fishery, which has some commonality with the WCPO, particularly in respect of sharks, marlin and broadbill swordfish. The longline mortality of marine turtles, while considered to be at reasonably low level in the ETBF, may pose a risk to some species that are already under considerable pressure (loggerhead and leatherback) and actions that are likely to be considered include mitigation strategies, increased data collection and guidelines for the handling, care and release of turtles.
116. Australia is also in the process of finalising a national Shark Assessment Report as part of the development of a National Plan of Action for Sharks, under the FAO International Plan of Action. The national IPOA will cover all fisheries that either target shark species or take shark as bycatch.

New Zealand fisheries

117. Observers on pelagic longliners in New Zealand waters monitor the bycatch of non-target species such as seabirds, marine mammals, and non-target fish species. The issue of seabird bycatch is being dealt with through the development of a National Plan of Action, which is in its final stages. This plan will set annual limits (from 2001–02) on the bycatch of seabird species classified as 'at risk'. Initially, other than the mandatory use of tori lines, no further regulatory measures will be imposed on fishermen, but the adoption of a voluntary code of practice by the domestic fleet, similar to that in place for the joint-venture fleet, will be recommended. Further data are required for accurate analyses of these interactions.
118. Marine mammals, particularly fur seals, are also reported caught on tuna longlines in southern New Zealand waters, but most are released alive. Captures of marine reptiles have been very few, and animals have been released alive. A National Plan of Action for the incidental capture of sharks in tuna longline fisheries is at the initial stages of development. The incidental catches of species such as blue, porbeagle, and mako sharks in New Zealand waters are unlikely to seriously affect the stocks of these species, but because the Pacific populations are poorly understood, monitoring of this bycatch (and that of other non-target species) will continue.

Pacific Island countries and territories

119. A number of PICTs have, or are in the process of, developing national tuna fisheries management plans in accordance with their international obligations and are including specific measures for the management of bycatch. For instance, coastal areas of the Solomon Islands are closed to vessels targeting sharks, and Palau has introduced regulations for longline gear (no wire traces) to reduce reef shark catches, as discussed previously.

Domestic vs. foreign fishing operations

120. The comments made in this paper have concerned bycatch (and by-product) taken by pelagic longlines by both domestically based operations and DWFN vessels fishing in the EEZ of island states, under access agreements. It is clear that the proportion of fishing capacity and hence bycatch is very much smaller in the case of locally-based operations.
121. As noted earlier, locally-based longliners tend to land a much greater proportion of their overall catch, since their trips are usually of shorter duration and there is a ready market for many of the bycatch species otherwise discarded by DWFN longliners. Local operations also tend to be smaller than those of DWFNs in terms of unit operations, usually using on average 1000 hooks per set, in comparison with DWFNs that typically deploy about 1500–3000 hooks per set.
122. It is likely to prove easier in the short term to introduce strategies to manage bycatch on locally based vessels rather than those of DWFNs and this paper is aimed primarily at local operations. SPC will be publishing and circulating additional information to fishermen on longline bycatch issues, and strategies for bycatch reduction and/or mitigation.
123. There will be an additional need for coastal states to ensure that vessels fishing under access agreements also have due regard for bycatch, and this is occurring under:
- the requirement for vessels to complete standardised logbooks¹⁷, including bycatch information;
 - specific terms of access outlined in the regionally-agreed minimum terms and conditions of fishing; and
 - carrying of observers.

¹⁷ Currently, the recording of bycatch has been hampered in part by the lack of space on the logsheets that are currently used in the region. The Data Collection Committee has agreed to develop and test prototype longline and purse-seine logbooks, which will allow detailed information on non-target species to be recorded.)

124. In addition to in-zone areas, it is important that PICTs have access to bycatch data for adjacent areas of high seas. For this to occur, DWFNs must implement their own national scientific observer programmes (as now occurs for the longline fleets of Hawaii and New Zealand and which will soon happen in Australia). At present, neither Japan, Korea, nor Taiwan have implemented national observer programmes for their longline fleets in the WCPO. If PICTs are informed, then they can put pressure on the DWFNs, particularly through the new Commission.

Conclusion

125. The issue of longline bycatch is best addressed in a pro-active and precautionary manner. Through national and regional observer programmes and research projects, the members of SPC are collecting and analysing logbook and other data to determine the full extent of non-target catches, including bycatch.
126. If it is believed that certain problems do not exist (e.g. seabirds) there will be a requirement for scientific research to confirm such a belief in a transparent manner. Where there are catches of vulnerable bycatch species, such as turtles and some species of shark, the results of the improved data collection and analysis now underway should provide the basis for management decisions, including the implementation of appropriate mitigation strategies. PICTs may wish to consider setting up voluntary codes of conduct regarding longline bycatch and SPC will be able to facilitate and coordinate this activity.
127. It is likely that poorly informed and politically motivated external interventions by the more extreme NGOs and other lobby groups will continue, and have the potential to impact the emerging fishing industries of the PICTs. By meeting international responsibilities through the development of strategies to manage bycatch issues in the longline fishery, PICTs will be well equipped to deal with such interventions and establish their credentials as responsible stewards of the world's largest tuna fishery.

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