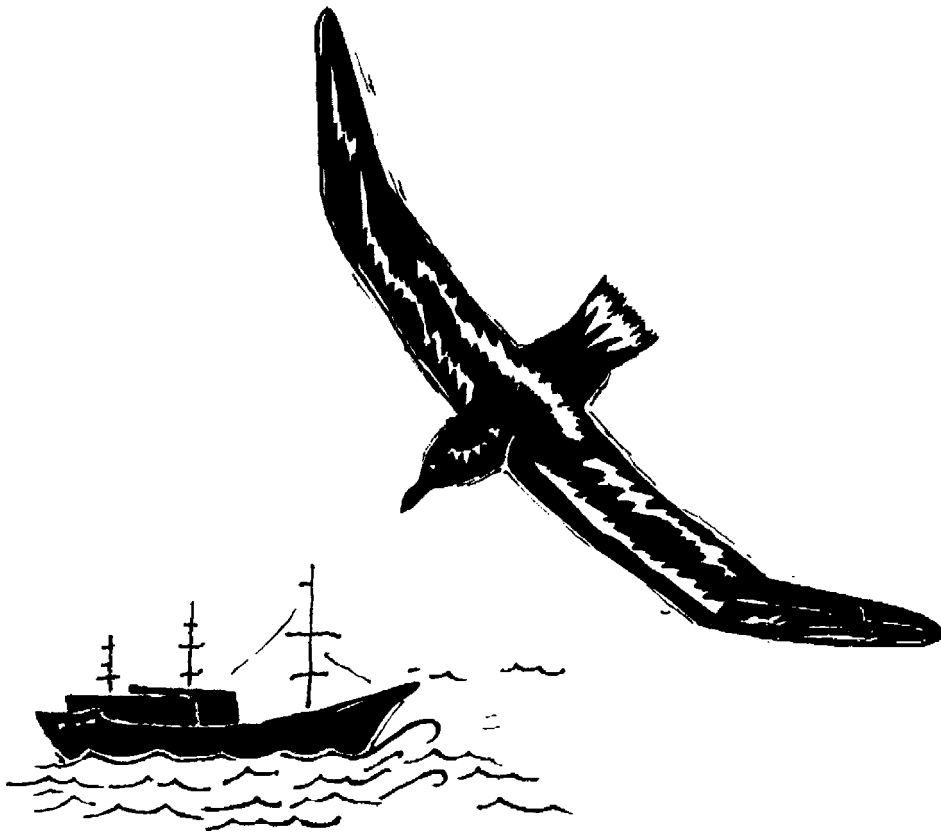


***Threat Abatement Plan for the incidental catch (or
by-catch) of seabirds during oceanic longline
fishing operations***



Prepared by



Biodiversity Group

in consultation with the Threat Abatement Team

Executive Summary

Oceanic longline fishing is a technique used to target pelagic and demersal finfish and shark species. Longline fishing commenced in the southern oceans in the 1950's, and longline fisheries operate in almost all Australian waters today. The impact of longline fishing activities on seabirds was not fully realised until the 1980's when seabird by-catch was first reported and then documented.

The incidental catch (or by-catch) of seabirds during oceanic longline fishing operations was listed as a key threatening process on Schedule 3 of the *Endangered Species Protection Act 1992* on 24 July 1995. The Act requires the preparation and implementation of a threat abatement plan for nationally coordinated action to alleviate the impact of longline fishing activities on seabirds in Australian waters. This Threat Abatement Plan has been prepared to meet the requirements of the Act.

The objective of this Plan is to reduce seabird by-catch in all fishing areas, seasons or fisheries to below 0.05 seabirds per thousand hooks, based on current fishing levels. This represents a reduction of up to 90% of seabird by-catch within the Australian Fishing Zone, and should be achievable within the five year life of this Plan. The ultimate aim of the threat abatement process is to achieve a zero by-catch of seabirds, especially threatened albatross and petrel species, in longline fisheries. However, using currently available mitigation methods, it is not possible to achieve this goal in the short term.

The Plan aims to significantly reduce the by-catch of seabirds during oceanic longline operations in the Australian Fishing Zone within 5 years by:

- prescribing the appropriate modifications to fishing practices or equipment (mitigation measures);
- providing for development of new mitigation measures;
- educating fishers and the public; and
- collecting information necessary to improve knowledge of seabird-longline fishery interactions.

Specific actions in the plan prescribe the mitigation measures which must be used by domestic and foreign longline vessels in longline fisheries, fishing areas and fishing seasons to minimise the by-catch of seabirds.

Below is a summary of the estimated costs to the Commonwealth associated with implementing actions outlined in the Plan. Note that there are some costs that will be determined at later stages.

	Year 1	Year 2	Year 3	Year 4	Year 5
AFMA	81,000	54,000	54,000	54,000	54,000
Environment Australia	151,000	126,000	126,000	126,000	126,000

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1. Introduction

This Threat Abatement Plan has been written to meet the Commonwealth Government's obligations under the *Endangered Species Protection Act 1992* following listing of the incidental catch (or by-catch) of seabirds during oceanic longline fishing operations as a key threatening process on Schedule 3 of the Act on 24 July 1995.

Management of seabird by-catch in longline fisheries requires a long term approach. It is highly desirable from a conservation and fisheries sustainable management point of view for there to be no by-catch of seabirds in longline fisheries. The ultimate aim of the threat abatement process is to achieve a zero by-catch of seabirds, especially threatened albatross and petrel species, in longline fisheries. However, using currently available mitigation methods, it is not possible to achieve this goal in the short term. The primary objective of this Plan is to reduce the seabird by-catch in longline fisheries to below 0.05 birds per thousand hooks, which represents a reduction of 90% at current fishing levels. Use of currently available mitigation measures should be capable of achieving this within the five year life of this Plan.

Practical implementation of mitigation strategies will enhance the ecological sustainability of longline fishing operations in Australia, which is a key element of the objectives under the *Fisheries Management Act 1991*. The Plan outlines actions which implement available mitigation measures effective in reducing seabird by-catch, provide for development of new measures or improvements to existing measures, educate fishers about threat mitigation and collect information to support future management decisions.

It is important to note that this plan is binding on the Commonwealth and its agencies. As such the prescriptions outlined in this plan are limited to Australian waters outside of coastal State waters. Commonwealth waters include only a small portion of the oceans being fished with longlines where seabirds are being caught. The plan encourages complementary action in State waters and on the High Seas and within the exclusive economic zones of countries where longline fishing vessels operate.

2. Background

Oceanic longline fishing is a technique used to target pelagic and demersal finfish and shark species. A longline consists of a main line with numerous baited hooks attached on branchlines. The configuration of the longline can vary considerably depending on the target species, fishing area and the size of the fishing vessel. The line can be set parallel to the surface on floats or anchored vertically. The number and type of hooks and the length of the branchlines also depend on the target species (Chapman 1990). Longlines targeting pelagic species can be up to 100km long and carry 600 – 3500 barbed steel hooks on 40m long branchlines (Brothers 1991; AFMA observer data). Demersal longlines have up to 10 000 hooks on 1m branchlines (Chapman 1990, Brothers 1995). Generally, Australian demersal longline operators set around 1000 hooks.

Longline fishing in the southern oceans is undertaken by fleets operating on the High Seas and in the territorial waters of Australia, New Zealand and southern African and American countries. In Australian waters, longlining is used by domestic vessels and Japanese vessels operating under access agreements with the Australian Government.

Longline by-catch is one of the greatest threats to seabirds (Birdlife International 1995). By-catch during longline fishing occurs when seabirds are attracted to fishing vessels by discards and baits and ingest baited hooks during the setting or, less commonly, hauling of the longline. The hooked birds are subsequently pulled under the water by the weight of the line and drown.

Longline fishing commenced in the southern oceans in the 1950's. By-catch of seabirds by longlines was first reported from band returns by Morant (1983). Subsequently, Weimerskirch and Jouventin (1987) documented a dramatic decline in wandering albatross *Diomedea exulans* populations on the Crozet Islands, and implied that longline and trawl fisheries may have been the cause. However, the magnitude of the problem was not fully realised until 1988 when Nigel Brothers (1991) calculated the number of albatrosses killed annually on Japanese longlines in southern oceans.

Studies by Brothers (1991) and Murray *et al.* (1993) based on direct observation of by-catch rates aboard Japanese pelagic longline vessels targeting southern bluefin tuna *Thunnus maccoyii* in Australian and New Zealand waters, respectively, confirmed the threat to seabirds from longline fishing operations.

The Australian Government recognised the threat and listed the *incidental catch (or by-catch) of seabirds during oceanic longline fishing operations* as a key threatening process on Schedule 3 of the *Endangered Species Protection Act 1992* on 24 July 1995.

The current worldwide albatross by-catch rate on pelagic longlines is, on average, approximately 0.4 birds observed caught per thousand hooks set (Alexander *et al.* 1997). The actual catch rate varies between fishing areas and seasons. When combined with the millions of hooks set each year, longlining is a significant threat to a number of albatross species.

The impact of increases in mortality above natural levels is particularly significant in albatrosses. Albatross species are very long lived. If successful, pairs produce a single chick every one or two years (depending on the species) and the chicks can take as long as 11 months to fledge. Breeding does not occur until 5 -12 years of age. This reproductive strategy results in low levels of recruitment. Even slight additional mortality affecting young or adult birds may significantly reduce the viability of most seabird species. For example, the demographic characteristics of most seabird

species make them unusually sensitive to increases in mortality rates (Weimerskirch and Jouventin 1987).

In most cases, the level of additional mortality that any seabird species can sustain is difficult to determine because each of the affected seabird species has at least one population which is vulnerable or has unknown status. There is insufficient information on the origin of the seabirds killed on longlines and hence the impact of longline by-catch on individual breeding populations.

This plan therefore takes the approach of prescribing an overall reduction in seabird by-catch and concentrates on mitigating the threatening process which can be measured, and not on seabird population status which cannot be adequately measured within the life of this Plan due to logistic, biological and resource constraints. Further research on monitoring of endangered seabird populations will be addressed in relevant recovery plans.

It is encouraging to note that some members of the fishing industry are already implementing practices to minimise seabird interactions. A number of modifications to fishing equipment or practices have been developed to reduce the by-catch of seabirds on longlines. Many of these mitigation measures prevent birds accessing baits during the line setting process. During line setting baits are available to seabirds from the point at which they are cast from the fishing vessel until they have sunk out of diving range of the birds (Brothers 1991). Precisely how fast a bait needs to sink so that birds cannot take it is governed by three factors: whether additional bait protection (such as a bird scaring line) is being used, the vessels' line setting speed and the diving capabilities of the seabirds present. For example, a vessel setting at 3 knots provides a baited hook with protection for longer than does one setting at 10 knots. Depending on bait type, weather and sea conditions, pelagic longline baits might be vulnerable to bird attack for up to 20 seconds after deployment.

This plan focuses on implementing a range of mitigation measures as a key action in reducing seabird by-catch to an acceptable level.

The impacts of demersal longline fishing operations in Australian waters on seabirds has not been determined and will be investigated in the early stages of this Plan's implementation.

3. Methods

This Plan was developed in consultation with the pelagic longline fishing industry, non-government conservation groups, scientists and government authorities responsible for conservation and fisheries management.

The Biodiversity Group initiated preparation of the Plan by convening four focus group meetings with stakeholders in 1996. Meetings were held with the longline fishing industry, non-government conservation organisations, scientists and government agencies. The purpose of the meetings was to identify issues which the groups felt needed to be considered in the Plan. The outcomes of the meetings were compiled into an issues paper for reference in drafting the Plan.

At the focus group meetings, representatives of each stakeholder group were nominated to participate in the Threat Abatement Team. The Team advised the Biodiversity Group on issues that arose during the drafting of the Plan and provided comments on the draft plan. The Team was formed in early 1997 and met five times. The current members of the Team are:

Mr Nigel Brothers	Parks and Wildlife Service, Tasmania
Ms Katrina Maguire	Australian Fisheries Management Authority
Mr Ian Freeman	Eastern Tuna and Billfish Fishery Management Advisory Committee
Mr Brian Jeffriess	Tuna Boat Owners Association of Australia
Mr Hans Jusseitt	East Coast Tuna Boat Owners Association
Mr Alastair Graham	Humane Society International
Ms Marg Moore	World Wide Fund for Nature Australia
Mr Andrew McNee	Biodiversity Group, Environment Australia
Mr Barry Baker	Biodiversity Group, Environment Australia
Ms Narelle Montgomery	Biodiversity Group, Environment Australia

During the development of the Threat Abatement Plan, other Team members included:

Mr Jason Ferris	Consultant to Biodiversity Group, Environment Australia
Mr Nick Rayns	Australian Fisheries Management Authority
Ms Karen Weaver	Australian Fisheries Management Authority
Mr Ray Nias	World Wide Fund for Nature Australia
Mr Bill Foster	Humane Society International
Mr Steve Bolton	East Coast Tuna Boat Owners Association

To provide advice on matters of a scientific or technical nature, the Biodiversity Group formed a Technical Working Group. This group included the CSIRO, Tasmanian Parks and Wildlife Service, Australian Antarctic Division, AFMA and Biodiversity Group representatives.

Drafts of the Plan were prepared in consultation with the Threat Abatement Team. The final draft Plan was distributed for comment to the Management Advisory Committees for each of the longline fisheries in the AFZ and the Board of AFMA.

The draft Plan was released for a three month public comment period, as required under the *Endangered Species Protection Act 1992*. A diagram summarising the process of preparing the TAP is at Figure 1.

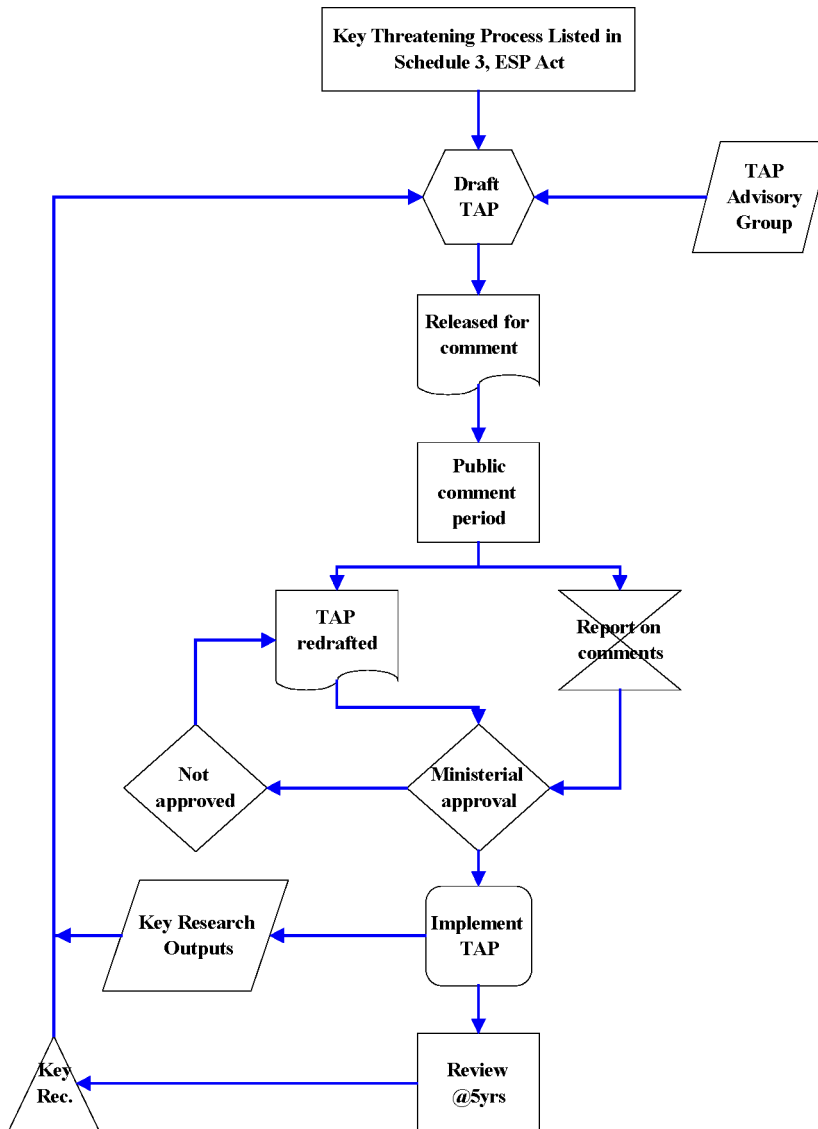


Figure 1: Process of Preparing the Threat Abatement Plan

4. Legislative Framework

This Plan is developed to meet the requirements of the *Endangered Species Protection Act 1992*. The Plan also influences the management of fisheries in the Australian Fishing Zone under the *Fisheries Management Act 1991*.

The *Endangered Species Protection Act 1992* (ESP Act) is the primary instrument for Commonwealth actions to protect and assist the recovery of endangered or vulnerable plants, animals and ecological communities. The Act lists endangered and vulnerable species, endangered ecological communities and key threatening processes which impinge upon those species and communities. The Act provides for the preparation of recovery plans for listed species and ecological communities and threat abatement plans to guide actions to reduce the effect of key threatening processes.

The objects of the ESP Act (s.3.(1)) are to:

- (a) promote the recovery of species and ecological communities that are endangered or vulnerable; and
- (b) prevent other species and ecological communities from becoming endangered; and
- (c) reduce conflict in land management through readily understood mechanisms relating to the conservation of species and ecological communities that are endangered or vulnerable; and
- (d) provide for public involvement in, and promote public understanding of, conservation of such species and ecological communities.

The ESP Act provides for listing of key threatening processes. A key threatening process is one that threatens, or may threaten, the survival, abundance or evolutionary development of a native species or ecological community.

The ESP Act requires preparation of a Threat Abatement Plan for each key threatening process listed. The Threat Abatement Plan must provide for the research and management actions necessary to reduce the key threatening process to an acceptable level in order to maximise the chances of the long-term survival in nature of native species and ecological communities affected by the process.

The Threat Abatement Plan (TAP) has been developed through a whole of government approach. It was recognised that the incidental capture of seabirds is essentially a fisheries issue and one that is contemplated in the objectives of the *Fisheries Management Act 1991*. The *Fisheries Management Act* states, among other things, that “.....the exploitation of fisheries resources.....need(s) to have regard to the impact of fishing activities on non-target species....”. Further, AFMA has already established a network of multi-sectoral, fisheries specific management advisory committees (MACs) through which issues like the TAP can be progressed. Therefore, the government is of the view that the implementation of aspects of the TAP should occur under the *Fisheries Management Act* rather than environmental legislation.

The *Fisheries Management Act 1991* and the *Fisheries Administration Act 1991* (the Acts) provide the legislative framework for the management of the Commonwealth fisheries. The Acts enable the Australian Fisheries Management Authority (AFMA) to grant fishing concessions to eligible persons to undertake prescribed fishing activities in the Australian Fishing Zone (AFZ). Further, AFMA may

develop and implement statutory management plans for fisheries. With regard to this Threat Abatement Plan, the Acts require AFMA and the Minister for Resources and Energy "...to have regard to the impact of fishing activities on non-target species...", which includes seabirds.

The following objectives for Commonwealth fisheries management must be pursued by the Minister in the administration of this Act and by AFMA in the performance of its functions:

- (a) implementing efficient and cost-effective fisheries management on behalf of the Commonwealth; and
- (b) ensuring that the exploitation of fisheries resources and the carrying on of any related activities are conducted in a manner consistent with the principles of ecologically sustainable development and the exercise of the precautionary principle, in particular the need to have regard to the impact of fishing activities on non-target species and the long term sustainability of the marine environment; and
- (c) maximising economic efficiency in the exploitation of fisheries resources; and
- (d) ensuring accountability to the fishing industry and to the Australian community in AFMA's management of fisheries resources; and
- (e) achieving government targets in relation to the recovery of the costs of AFMA.

In addition to the objectives mentioned above, the Minister, AFMA and Joint Authorities are to have regard to the objectives of:

- (a) ensuring, through proper conservation and management measures, that the living resources of the AFZ are not endangered by over-exploitation; and
- (b) achieving the optimum utilisation of the living resources of the AFZ.

5. Defining the Key Threatening Process

This section of the Plan describes the fisheries affected by the actions outlined under the Plan and the seabird species which are threatened by longline fishing by-catch.

5.1 What are longline fishing operations?

Longline fishing involves setting a single line (mainline) containing many individual hooks on branch lines or snoods. The mainline can either be anchored or drifting. It can be oriented vertically or horizontally and vary considerably in length and number of hooks.

Longlining methods can be grouped into mid-water set and bottom set longlines. They are described by Alexander *et al.* (1997) as follows:

Pelagic (Mid-water Set) Longlining

Mid water set longlining involves a single longline up to 130km in length holding between 600 and 3000 branch lines, each about 35m in length terminating in a baited hook. Hooks are usually suspended 50 – 150m below the surface of the water from lines suspended by floats (AFMA observer data). This method is mainly used to target various species of tuna and broadbill, and is used by Japan, Korea, Taiwan, Indonesia, Australia and New Zealand. The principal market for longline caught tuna is the lucrative Japanese sashimi market. In the AFZ pelagic longlining is used by domestic operators and Japanese vessels operating under a Bilateral Access Agreement. The two fisheries differ in scale and methods of operation.

Domestic Pelagic Longlining

The domestic pelagic longline fishery is centred on the East Coast of Australia. Only two Australian vessels currently longline in the rest of the AFZ and this fishing effort is largely in north-western Australia, an area with a low probability of seabird by-catch, although there is little data to confirm this view. It is expected there will be a gradual increase in longline activity off the west coast and in external territories in future years. The Australian fleet is comprised of around 65 active vessels, each typically 18 – 25m in length, although there is considerable variability within the fleet. The fleet operates largely within 100 nautical miles of shore and is opportunistic depending on weather conditions. The longlines used by Australian vessels have 800 – 1400 hooks (Brian Jeffriess, pers. comm). There is currently no formal observer program in this fishery.

Foreign (Japanese) Pelagic Longlining

Japanese longline fishing vessels have access to Australian tuna and billfish stocks under an annual Bilateral Access Agreement between the governments of Australia and Japan. Japan pays an access fee which funds an observer program and contributes to research on tuna and ecologically related species, including seabirds. Japanese effort has declined in the AFZ in recent years as the Japanese vessels have been excluded from areas of the AFZ. In 1996 the Japanese pelagic longline fishery consisted of a fleet of about 60 vessels. Eight of these fished in the Tasmanian sector of the AFZ where seabird by-catch is highest. Japanese vessels are typically larger than Australian vessels

(40 - 60m) and fish further offshore and on the High Seas. The longlines set by the Japanese vessels are up to 135km long and have up to 3500 hooks. It appears that in 1998 there will be no bilateral agreement to allow Japanese pelagic longline fishing vessels to fish inside the Australian Fishing Zone.

Demersal (Bottom Set) Longlining

Bottom-set longlines are principally used to target ling *Genypterus* sp., and school *Galeorhinus galeus* and gummy shark *Mustelos antarcticus* in the AFZ. Bottom-set longlines may be set in water depths ranging from 100 – 2500m. This method of fishing is also used extensively in Antarctic waters to target toothfish *Dissostichus* sp., although there is currently no *Dissostichus* fishing occurring in the AFZ. There are three methods: Dropline, Demersal Longline and Trotline.

Dropline Fishing

A dropline comprises a series of baited hooks attached by (generally) short snoods to a main line. A buoy is attached at one end of the mainline and a weight is attached to the other end. The mainline extends from the water surface (buoy end of line) to the sea bed (weighted end of line), and because most target species of Australian dropline operations commonly aggregate within 100 metres of the seabed, the hooks are usually attached to the bottom 100 metres of the line (the weighted end), approximately 1 metre apart. This can be varied for other target species with different behavioural characteristics.

Demersal Longline Fishing

Demersal longlines comprise a series of baited hooks that are attached by (generally) short snoods to a rope mainline which is anchored to the ocean floor at each end. This method is most often used by fishers to target shark or ling. Other scale fish species are also caught, but usually as commercial by-catch of their shark fishing operations. A buoy and dahn pole carrying a flag are attached by way of a buoy-line to the main-line at each of its ends, for retrieval of the gear. The main-line is hauled by a line hauler from one end of the main-line, usually over a roller mounted on the vessel gunnels in the mid-section of the boat. Within the southern shark fishery there is a limit of 2000 hooks for a single operation.

Trotline Fishing

A trotline usually comprises two main-lines, suspended from the water surface (buoy end) to the sea bed (weighted end). These are joined by a rope fastened at each end, at a predetermined depth, to one of the main-lines. Sets of 'droppers' suspend from the cross-rope, each of which may have up to 20 - 30 baited hooks attached to it by short snoods. To counter the weight of these droppers, the cross-rope usually has a certain number of floats attached to it at regular intervals.

Table 1 summarises the target fish species, fishing areas, fishing seasons, methods and equipment and effort for oceanic longline fisheries operating in Australian waters. These fisheries vary in their impact on seabirds. Statistically robust data on seabird by-catch are scarce because most data come from observers on fishing vessels tasked with recording data on fishing operations, not on non-fish by-catch. High relative rates of by-catch are defined as being a regularly reported by-catch rate exceeding 0.1birds/1000 hooks. Many fisheries have limited or no interactions with seabirds due to the method of operation or the location of activity.

Table 1: Summary of Longline Types and Target Fish Species Currently Used in the Australian Fishing Zone

Fishery	Target Species	Fishing Areas (see diagrams)	Fishing Seasons	Methods and Equipment	Effort (hooks/yr in 1995/6)	Relative Rate of Seabird By-catch
Foreign (Japanese) Tuna Longline	Southern Bluefin Tuna (SBT) <i>Thunnus maccoyii</i> , Yellowfin Tuna <i>T. albacores</i> , Big eye Tuna <i>T. obesus</i> and Albacore <i>T. alalunga</i> Broadbill	SBT - Southern Waters (Tas) Other tuna species - off NSW, Tasmania, WA and Qld	Dependent on Bilateral Access Agreement but usually May - July SBT. June - Sept other species	Pelagic drifting horizontal set longlines	East Coast 6.8 million West Coast 1.4 million Tasmania 1.48 million	High ³
Domestic Tuna Longline	Southern Bluefin Tuna <i>Thunnus maccoyii</i> , Yellowfin Tuna <i>T. albacores</i> , Big eye Tuna <i>T. obesus</i> and Albacore <i>T. alalunga</i> Broadbill	Predominantly near Continental Shelf but expanding seaward	May - Feb SBT. All year with some fishery-by-fishery seasonality	Pelagic drifting horizontal set longlines	East Coast 3.7 million West Coast 580,000 Tasmania 370,000	High ³
South East Non Trawl Fishery: Dropline and Trotline	Deep sea trevalla (blue eye) (<i>Hyperoglyphhe antarctica</i>) Other finfish species	Commonwealth waters off southern Qld, NSW, Victoria, SA and Tasmania	Permits are issued 1 January to 31 December (fishing takes place all year round)	Vertically set demersal dropline and trotlines		Low ² / Insufficient data
South East Non Trawl Fishery: Longline	Ling (<i>Genypterus</i> sp) Other finfish species	Commonwealth waters off southern Qld, NSW, Victoria, SA and Tasmania	Permits are issued 1 January to 31 December (fishing takes place all year round)	Horizontal set demersal longlines		Low ² / Insufficient data
Southern Shark Fishery: Longline	School shark (<i>Galeorhinus galeus</i>) & Gummy shark (<i>Mustelos antarcticus</i>)	Commonwealth waters off Victoria, SA and Tasmania	Permits are issued 1 July to 3 June each year (fishing takes place all year round)	Horizontal set demersal longlines	2.4 million	Low ¹
Tropical Shark Fishery: Longline	Tropical pelagic shark species	Northern waters		Surface or floatline set horizontal longline		Unknown

¹ based on anecdotal accounts provided by Tasmanian Parks and Wildlife Service

² based on documented accounts but insufficient data exists to quantify catch rates with accuracy

³ based on documented accounts and able to be quantified with some degree of accuracy

5.2 Sources of mortality

There are a number of sources of seabird mortality which arise from interactions with longline vessels, including:

Hooked during line setting and drown

This is the most common form of incidental mortality (Murray *et al.* 1993). Brothers (1991) documented this mortality in seabirds on Japanese longline vessels operating in the AFZ. The mortality arising from this source is usually quantified by counting birds which are on hooks when the line is hauled. This underestimates the rate of by-catch because:

- 1) birds can be hooked and then be eaten by sharks or fall off the hooks; or
- 2) longline operators can cut dead birds off the line before they are hauled aboard the vessel and recorded by the observer.

These two sources of error are significant and are difficult to quantify and serve to reduce the accuracy of by-catch data.

The likelihood of seabirds being caught on longlines depends on the type of fishing activity and gear used. For example, the availability of baited hooks to seabirds depends upon a number of factors, which include the buoyancy of the line and bait, weight on the end of the line, speed of deployment and boat speed and degree of shielding of the line from bird attacks.

Hooked during line hauling and killed or released with critical injuries

Huin and Croxall (in press) record seabirds being hooked during line hauling and either escaping or being released alive. Injuries sustained may account for the injured birds found dying at breeding colonies by Weimerskirch and Jouventin (1987).

Entangled in gear or hooked by adjacent hooks when attempting to remove bait from nearby hooks

Seabirds can become entangled in longline branch lines or collide with the mainline above the water to the stern of the fishing vessel. Brothers (1995) recorded birds being caught on hooks adjacent to the bait they were attempting to catch.

Ingestion of hooks in discarded fish heads

Regurgitated longline hooks have been recorded near albatross nests at South Georgia. It is possible that these hooks come from either:

- 1) baits caught by a bird during line hauling which are cut off to release the bird; or
- 2) hooks which are left in discarded baits and fish heads.

Brothers (1995) recorded hooks in 9.4% of grenadier discarded as fish by-catch from the south Atlantic *Dissostichus* fishery. 23% of the discarded heads of the target species in that fishery also contained hooks.

Mortality of chicks due to death of parent birds

Given the high parental investment in raising a chick by albatrosses and other seabirds, it is likely that the death of a breeding adult would also result in the death of the egg or chick. In addition, there is often a considerable delay before new partnerships are formed and lower reproductive success in

new pairings between albatrosses has been reported. The remaining parent is therefore less likely to breed successfully in the years following the death of their mate.

Shooting of birds

There have been reports of seabirds being shot by crew on longline vessels and recreational fishers (Adams 1992, Tomkins 1985). The rate or incidence of mortality from shooting is not known. This deliberate take of seabirds is illegal under the Commonwealth *National Parks and Wildlife Conservation Act 1975* and equivalent State/Territory legislation.

5.3 Spatial distribution of pelagic longline fishing operations

The distribution of pelagic longline fishing effort in the Australian fishing zone for 1997 is summarised in figures below. These figures were compiled by Australian Fisheries Management Authority.

Figure 2: Domestic Pelagic Longline Fishing effort in 1997 **(TO BE INSERTED AT DESIGN STAGE)**

Figure 3: Japanese Pelagic Longline Fishing effort in 1997 **(TO BE INSERTED AT DESIGN STAGE)**

5.4 Seabird species recorded as by-catch taken during oceanic longline fishing operations in the AFZ

Fourteen species of seabirds were identified as being affected by the key threatening process when it was listed in July 1995. Since the listing, a further seven species have been recorded as by-catch in Australian or Japanese longline fisheries operating in the AFZ.

The taxonomy of the albatrosses has also been revised since the listing of the key threatening process, following genetic and morphometric studies by Robertson and Nunn (1997). This review has resulted in an increase in the number of albatross species from 14 species to 24 full species.

The species known to be affected by pelagic longline fishing in the AFZ are listed in tables 2 and 3. These species are typically large seabirds which naturally feed on fish and squid found on or close to the surface. They all exhibit behaviours which make them susceptible to being caught on longlines, such as diving for baits. They have learned to follow vessels and forage on discards. They are aggressive feeders, and in most cases travel large distances seeking food. The worst affected group are the albatrosses and petrels because of their limited population sizes and low reproductive rates. Gales and Brothers (1995) reported that 75% of the birds killed on longlines and retained for identification were albatrosses. It is likely that other seabirds were caught but not retained.

There is limited or no data available on bird species taken as by-catch in demersal longline fisheries within the AFZ.

5.5 Spatial Distribution of Affected Species

The seabird species affected by the key threatening process are principally found in waters south of 25°S (Fraser Island on the east coast and Shark Bay on the west coast) and more commonly below

30°S. Tables 2 and 3 summarises the distribution of each species based on distribution data presented in Marchant and Higgins (1990).

Other seabird species which are found in northern areas where longline fishing operations occur are not caught as by-catch because they are not attracted to the fishing vessels or the longline baits (Brothers pers. comm.).

5.6 Conservation Status of Affected Species

The seabird species caught on longlines are highly varied in conservation status. They include endangered species such as the northern royal albatross *Diomedea sanfordi* and prolific species such as the short-tailed shearwater *Puffinus tenuirostris*. The *Endangered Species Protection Act 1992* requires this Plan to consider not only endangered and vulnerable seabird species but other seabird species which could become endangered or vulnerable as a result of the key threatening process.

This Plan is closely linked to recovery plans for the threatened seabirds which are caught on longlines. The Threat Abatement Plan relies on these recovery plans to collect specific data on population trends in the breeding populations of those threatened species found breeding in Australia.

5.7 Longline Methods Covered by this Plan

This Plan considers all longline operations and makes specific prescriptions where required for particular fishery types, target species, methods, areas and seasons in order to minimise by-catch and mortality of seabirds.

This Plan does not cover by-catch of seabirds in State waters in Australia inside the 3 nautical mile state boundary. There are a number of Joint Authority arrangements that exist between the Commonwealth and the Northern Territory, Western Australia, New South Wales and Queensland Governments for fisheries. These arrangements mean that some fisheries, particularly shark fisheries which use longline techniques, are managed under State/Territory law out to 200nm. Given that the ESP Act applies to Commonwealth waters (which are all waters beyond 3nm), where fisheries are managed by State agencies in Commonwealth waters, actions prescribed under the Threat Abatement Plan would need to be taken into consideration.

Table 2: Summary of the albatross species affected by pelagic longline fishing by-catch in the AFZ

Common Name <i>Species name</i>	Proposed new name <i>Species name</i>	International Conservation Status (Croxall and Gales in press)	Likely Incidence in Longline By-catch	Pelagic distribution in Australia	Jurisdiction and location of breeding areas
Wandering albatross <i>Diomedea exulans exulans</i>	Wandering albatross <i>Diomedea exulans</i>	Vulnerable Listed as a vulnerable species under the ESP Act Listed on the schedules of the <i>Parks and Wildlife Conservation Act 1975</i>	Moderate	Offshore in southern waters from the NSW/Qld border in the east to Fremantle in the west Vagrant to Qld Off Macquarie Island, Heard Island and the McDonald Islands	Australia: Macquarie Island France: Kerguelen Island Crozet Islands (Ile de la Possession, Ile aux Cochon, Ile de l'Est) South Africa: Marion Island Prince Edward Island U.K.: South Georgia
<i>Diomedea exulans dabbenena</i>	Tristan albatross <i>Diomedea dabbenena</i>	Endangered Listed as an endangered species under the ESP Act	Low	One record off Wollongong, NSW	No sites recorded in Australia U.K.: Gough Island Tristan da Cunha (Inaccessible Island)
<i>Diomedea exulans antipodensis</i>	Antipodean albatross <i>Diomedea antipodensis</i>	Vulnerable Listed as a vulnerable species under the ESP Act	Low	Offshore central NSW Extent of range not yet defined	No sites recorded in Australia New Zealand: Antipodes Island Campbell Island
<i>Diomedea exulans gibsoni</i>	Gibson's albatross <i>Diomedea gibsoni</i>	Vulnerable Listed as a vulnerable species under the ESP Act	Moderate	Offshore in southern waters from Coffs Harbour south to Wilsons Promontory Extent of range not yet defined	No sites recorded in Australia New Zealand: Auckland Islands (Adams Island, Disappointment Island, Auckland Island)
Southern royal albatross <i>Diomedea epomophora epomophora</i>	Southern royal albatross <i>Diomedea epomophora</i>	Vulnerable Listed as a vulnerable species under the ESP Act	Low	Offshore in south-eastern waters from Coffs Harbour in the east to Eyre Peninsula in the west; especially around Tasmania; Vagrant in Western Australian waters	No sites recorded in Australia New Zealand: Campbell Island Enderby Island Auckland Islands (Adams Island, Auckland Island)
Northern royal albatross <i>Diomedea epomophora sanfordi</i>	Northern royal albatross <i>Diomedea sanfordi</i>	Endangered Listed as an endangered species under the ESP Act	Low	Offshore in south-eastern waters from Coffs Harbour in the east to Eyre Peninsula in the west; especially around Tasmania	No sites recorded in Australia New Zealand: South Island (Taiaroa Head) Chatham Islands (Big Sister Island, Little Sister Island, Forty-fours Island)
Amsterdam albatross <i>Diomedea amsterdamensis</i>	Amsterdam albatross <i>Diomedea amsterdamensis</i>	Critically Endangered Listed as an endangered species under the ESP Act	Low	Vagrant in waters south of Tasmania	No sites recorded in Australia France: Amsterdam Island

Common Name <i>Species name</i>	Proposed new name <i>Species name</i>	International Conservation Status (Croxall and Gales in press)	Likely Incidence in Longline By-catch	Pelagic distribution in Australia	Jurisdiction and location of breeding areas
Black-browed albatross <i>Diomedea melanophrys melanophrys</i>	Black-browed albatross <i>Thalassarche melanophrys</i>	Lower Risk - Near Threatened	High	Offshore in southern waters from the NSW/Qld border in the east to Shark Bay in the west Off Macquarie Island, Heard Island and the McDonald Islands	Australia: Heard Island McDonald Islands Macquarie Island (incl. Bishop and Clerk Islets) Chile: Diego Ramirez Island Ildefonso Isla Isla Diego de Almagra France: Crozet Islands Kerguelen Island New Zealand: Bollons Island Campbell Island Snares Island U.K.: South Georgia Falkland islands (Steeple Jason Island, South Jason Island, Elephant Jason Island, Beauchene Island, Bird Island, Grand Jason Island, West Point Island, New Island, North Island, Saunders Island, Keppel Island, Grave Cove)
<i>Diomedea melanophrys impavida</i>	Campbell albatross <i>Thalassarche impavida</i>	Vulnerable Listed as a vulnerable species under the ESP Act	High	Offshore in southern waters from the NSW/Qld border in the east to Ceduna, S.A. (134°E) in the west	No sites recorded in Australia New Zealand: Campbell Island
Buller's albatross <i>Diomedea bulleri bulleri</i>	Buller's albatross <i>Thalassarche bulleri</i>	Vulnerable Listed as a vulnerable species under the ESP Act	Low	Offshore in south-eastern waters from Coffs Harbour in the east to Eyre Peninsula in the west; around Tasmania	No sites recorded in Australia New Zealand: Snares Island Solander Island Little Solander Island
<i>Diomedea bulleri platei</i>	Pacific albatross <i>Thalassarche nov. sp.</i>	Vulnerable Listed as a vulnerable species under the ESP Act	Low	Vagrant in south-eastern waters; not yet seen around Tasmania Extent of range not yet defined	No sites recorded in Australia New Zealand: Three Kings Island Chatham islands (Big Sister Island, Little Sister Island, Forty-fours Island)
Shy albatross <i>Diomedea cauta cauta</i>	Shy albatross <i>Thalassarche cauta</i>	Vulnerable Listed as a vulnerable species under the ESP Act	Moderate	Offshore in waters south of Fraser Island in the east to Barrow Island (20°S) in the west Off Macquarie Island	Australia: Tasmania (Albatross Island, Mewstone, Pedra Branca)
Shy albatross <i>Diomedea cauta steadi</i>	White-capped albatross <i>Thalassarche steadi</i>	Vulnerable Listed as a vulnerable species under the ESP Act	Moderate	Offshore in south-eastern waters, especially around Tasmania Extent of range not yet defined	No sites recorded in Australia New Zealand: Auckland Islands (Adams Island, Auckland Island, Disappointment Island) Bollons Island

Common Name <i>Species name</i>	Proposed new name <i>Species name</i>	International Conservation Status (Croxall and Gales in press)	Likely Incidence in Longline By-catch	Pelagic distribution in Australia	Jurisdiction and location of breeding areas
<i>Diomedea cauta salvini</i>	Salvin's albatross <i>Thalassarche salvini</i>	Vulnerable Listed as a vulnerable species under the ESP Act	Low	Offshore in south-eastern waters, especially around Tasmania Extent of range not yet defined	No sites recorded in Australia France: Crozet Islands (Ile des Pingouins) New Zealand: Bounty Island Snares Island
<i>Diomedea cauta eremita</i>	Chatham albatross <i>Thalassarche eremita</i>	Critically Endangered Listed as an endangered species under the ESP Act	Low	Rare in south-eastern waters around Tasmania Extent of range not yet defined	No sites recorded in Australia New Zealand: Chatham Island
Yellow-nosed albatross <i>Diomedea chlororhynchos chlororhynchos</i>	Atlantic yellow-nosed albatross <i>Thalassarche chlororhynchos</i>	Data deficient	Low	Vagrant in south-eastern waters Extent of range not yet defined	No sites recorded in Australia U.K.: Gough Island Tristan da Cunha (Tristan da Cunha Island, Nightingale Island, Inaccessible Island, Middle Island, Stoltenhoff Island)
<i>Diomedea chlororhynchos bassi</i>	Indian yellow-nosed albatross <i>Thalassarche carteri</i>	Vulnerable Listed as a vulnerable species under the ESP Act	Moderate	Offshore in southern waters from NSW/Qld border in the east to Barrow Island (20°S) in the west	No sites recorded in Australia France: Amsterdam Island St Paul Island Kerguelen Islands (Ile de Croz) Crozet Islands (Ile des Pingouins, Ile des Apotres) South Africa: Prince Edward Island
Grey-headed albatross <i>Diomedea chrysostoma</i>	Grey-headed albatross <i>Thalassarche chrysostoma</i>	Vulnerable Listed as a vulnerable species under the ESP Act	Moderate	Offshore off Tasmania, Victoria and south-eastern South Australia Off Macquarie Island	Australia: Macquarie Island Chile: Diego Ramirez Island Isla Iledefonso France: Kerguelen Islands Crozet Islands Marion Island Prince Edward Island New Zealand: Campbell Island U.K.: South Georgia

Common Name <i>Species name</i>	Proposed new name <i>Species name</i>	International Conservation Status (Croxall and Gales in press)	Likely Incidence in Longline By-catch	Pelagic distribution in Australia	Jurisdiction and location of breeding areas
Laysan albatross <i>Diomedea immutabilis</i>	Laysan albatross <i>Phoebastria immutabilis</i>	Lower Risk - Least Concern	Low	One or two sightings at Norfolk Island	No sites recorded in Australia Hawaii: Hawaiian Leeward Islands (Necker Island, French Frigate Shoals, Gardner Pinnacles, Laysan Island, Liannski Island, Pearl and Hermes Reef, Midway Atoll, Kauai Island, Niihau Island, Kaula Island, Oahu Island) Japan: Bonin Islands (Mukojima) Mexico: Isla Guadalupe Isla Benedicto Isla Clarion
Sooty albatross <i>Phoebetria fusca</i>	Sooty albatross <i>Phoebetria fusca</i>	Vulnerable Listed as a vulnerable species under the ESP Act	Low	Offshore in seas south of Australia; off Tasmania Off Macquarie Island	No sites recorded in Australia France: Amsterdam Island St Paul Island Kerguelen Island Crozet islands (Ile de la Possession, Ile de l'Est, Ile aux Cochons, Ile des Pingouins, Ile des Apotres) South Africa: Prince Edward Island Marion Island U.K.: Gough Island Tristan da Cunha (Nightingale Island, Inaccessible Island, Stoltenhoff Island)
Light-mantled sooty albatross <i>Phoebetria palpebrata</i>	Light-mantled albatross <i>Phoebetria palpebrata</i>	Data deficient	Low	Offshore in seas south of Australia; off Tasmania. Off Macquarie Island, Heard Island and the McDonald Islands	Australia: Heard Island McDonald Islands Macquarie Island France: Kerguelen Island Crozet Islands (Ile de la Possession, Ile de l'Est, Ile aux Cochons, Ile des Pingouins, Ile des Apotres) New Zealand: Auckland Island Campbell Island Antipodes Island South Africa: Prince Edward Island Marion Island U.K.: South Georgia

Table 3: Summary of additional seabird species affected by longline fishing by-catch in the AFZ

Common Name <i>Species name</i>	International Conservation Status (Baillie and Groombridge 1996)	Likely Incidence in Longline By-catch	Pelagic distribution in Australia	Jurisdiction and location of breeding areas
Southern Giant Petrel <i>Macronectes giganteus</i>	Not listed	Low	Offshore in southern waters from Fraser Island in the east to Shark Bay in the west Off Macquarie Island, Heard Island and the McDonald Islands	Australia: Heard Island McDonald Islands Macquarie Island Australian Antarctic Territory France: Crozet Islands Kerguelen Islands Norway: South Sandwich South Orkney Bouvet Island South Africa: Prince Edward Island Marion Islands U.K.: South Georgia
Northern Giant Petrel <i>Macronectes halli</i>	Lower Risk - Near Threatened	Low	Offshore in southern waters from Fraser Island in the east to Shark Bay in the west Off Macquarie Island	Australia: Macquarie Island France: Crozet Islands Kerguelen Islands New Zealand: Antipodes Islands Auckland Island Campbell Islands Chatham Island Stewart Island South Africa: Prince Edward Island Marion Islands
Great-winged Petrel <i>Pterodroma macroptera</i>	Not listed	Low	Offshore in southern waters from Fraser Island in the east to Geraldton (28°S) in the west	Australia: Western Australia (Recherche Arch., Bald Island, Coffin Island, Gull Island, Rabbit Island, Remark Island, Breaksea Island, Eclipse Island, Mistaken Island) France: Kerguelen Islands Crozet Islands (Ile de l'Est, Ile des Pinguoins, Ile des Apotres) New Zealand: North Island (north-east coast) South Africa: Prince Edward Island Marion Islands U.K.: Gough Island Tristan da Cunha Islands

Common Name <i>Species name</i>	International Conservation Status (Baillie and Groombridge 1996)	Likely Incidence in Longline By-catch	Pelagic distribution in Australia	Jurisdiction and location of breeding areas
White-chinned Petrel <i>Procellaria aequinoctialis</i>	Not listed	Moderate	Offshore waters along the southern edge of the mainland and around Tasmania	No sites recorded in Australia France: Kerguelen Island Crozet Islands (Ile de la Possession, Ile de l'Est, Ile des Pinguoins, Ile des Apotres) New Zealand: Antipodes Island Campbell Islands (Campbell Island, Dent Island, Jaquemart Island) Auckland Islands (Auckland Island, Adams Island, Disappointment Island) South Africa: Prince Edward Island Marion Islands U.K.: South Georgia
Westland Black Petrel <i>Procellaria westlandica</i>	Vulnerable	Low	Oceanic waters off southern NSW coast and east coast of Tasmania	No sites recorded in Australia New Zealand: South Island (Punakaiki River)
Grey Petrel <i>Procellaria cinerea</i>	Not listed	Moderate	Rare visitor to southern waters from Ballina (29°S) in the east to Bunbury (34°S) in the west; Slightly more common around south and west coasts of Tasmania	Australia: Formerly on Macquarie Island France: Crozet Islands Kerguelen Islands Amsterdam Island New Zealand: Campbell Island Antipodes Islands South Africa: Prince Edward Island U.K.: Tristan da Cunha Islands
Wedge-tailed shearwater <i>Puffinus pacificus</i>	Not listed	Moderate	Waters off the east coast from Torres Strait in the north to Montagu island in the south; Waters off the west coast from King's Sound in the north to Bunbury (34°S) in the south; Vagrant off northern and southern coasts Off Lord Howe Island Off Norfolk Island	Australia: Numerous islands off NSW and Western Australia Lord Howe Island Norfolk Island Cocos-Keeling Islands: North Keeling Island Indonesia: Christmas Island New Zealand: Kermadec Island

Common Name <i>Species name</i>	International Conservation Status (Baillie and Groombridge 1996)	Likely Incidence in Longline By-catch	Pelagic distribution in Australia	Jurisdiction and location of breeding areas
Flesh-footed shearwater <i>Puffinus carneipes</i>	Not listed	Moderate	Coastal in southern waters from Fraser Island in the east to Shark Bay in the west Off Lord Howe Island	Australia: Lord Howe Island South Australia (Smith Island) Western Australia (Seal Island, Sandy Island, Chatham Island, Saddle Island, Stanley Island, Mutton-bird Island, Eclipse Island, Breaksea Island, Michaelmas Island, Doubtful Island, Recherche Arch., Cape Hamelin Islet) France: St Paul Island New Zealand: North Island (north-east and west coasts) Cook Strait
Sooty shearwater <i>Puffinus griseus</i>	Not listed	Low	Waters south of the NSW/Qld border in the east and Bunbury (34°S) in the west Off Macquarie Island	Australia: NSW (Broughton Island, Little Broughton Island, Cabbage Tree Island, Boondelbah Island, Bird Island, Lion Island, Bowen Island, Montagu Island, Tollgate Island) Tasmania (Tasman Island, Hippolyte Rocks, Courts Island, Flat Witch Island, Flat Island, Breaksea Island, Green Island) Macquarie Island Chile: Cape Horn New Zealand: North Island (north-east coast) South Island (south coast) Cook Strait Solander Island Snares Island Antipodes Island Auckland Island Campbell Island Chatham Island U.K.: Falkland Islands
Short-tailed shearwater <i>Puffinus tenuirostris</i>	Not listed	Low	Waters south of Fraser Island in the east to Bunbury (34°S) in the west	Australia: Numerous islands off NSW, Victoria, Tasmania, South Australia and Western Australia
Australasian Gannet <i>Morus serrator</i>	Not listed	Moderate	Eastern and southern coasts from Mackay (22°S) in the east to Shark Bay in the west Off Lord Howe Island Off Norfolk Island	Australia: Victoria (Port Phillip Bay, Lawrence Rocks) Tasmania (Cat Island, Black Pyramid, Pedra Branca, Eddystone Rock) Norfolk Island (Phillip Island, Nepean Island) New Zealand: North Island (west, north-east and south-east coasts) South Island (south-west and north-east coasts)

Common Name <i>Species name</i>	International Conservation Status (Baillie and Groombridge 1996)	Likely Incidence in Longline By-catch	Pelagic distribution in Australia	Jurisdiction and location of breeding areas
Southern Skua <i>Catharacta antarctica</i>	Not listed	Low	Offshore in southern waters from Fraser Island in the east to Geraldton (28°S) in the west Off Macquarie Island and Heard Island	Australia: Macquarie Island Heard Island Antarctic Peninsula: Elephant Island Argentina: Cape Horn France: Kerguelen Islands Crozet Islands Amsterdam Island New Zealand: Chatham Island Auckland Island Snares Island Campbell Island Antipodes Island Stewart Island Norway: Bouvet Island South Africa: Prince Edward Island Marion Islands U.K.: South Georgia Gough Island Tristan da Cunha Islands Falkland Islands South Sandwich Islands South Shetland Islands South Orkney

Data derived from Marchant and Higgins (1990) and Gales (in press)

Incidence information from Gales and Brothers (1995) and unpublished data held by the Parks and Wildlife Service, Tasmania.

6. Existing Measures to address the Key Threatening Process

A & B Mitigation - Pelagic and Demersal Longline Fisheries

Background

The longline fishing practices and equipment described in Section 5 can be modified in a number of ways to reduce the likelihood of seabird by-catch. These modifications are termed mitigation measures. The measures focus on reducing by-catch during the critical period following release of the bait from the stern of the longline vessel until it has sunk out of reach of diving seabirds. Brothers (1991) estimates this period at approximately 10 seconds per hook in pelagic longline fisheries.

Effective mitigation of the threat relies on measures which:

- reduce seabird access to baits by:
 - ◆ increasing the sink rate of bait;
 - ◆ deterring birds from foraging where baits are being set; and
 - ◆ blocking access to baits
- reduce the chance of a seabird being hooked if it does take a bait
- minimise the attractiveness of longline baits to seabirds
- minimise the congregation of seabirds around vessels

The aim of this action is to develop a package of mitigation measures for each type of longline fishery operation which will minimise the seabird by-catch of that fishery.

The measures considered include existing measures which are known to be effective in reducing seabird by-catch and potential measures which are still under development.

Currently, there is limited or no data available on the level of seabird by-catch taken by demersal longline fisheries within the AFZ.

Existing Practices

A number of mitigation measures are currently used by domestic and Japanese vessels in the AFZ. Bird scaring lines are mandatory equipment under Fisheries Management Regulation 19A of the *Fisheries Management Act 1991*. The Regulation requires all domestic vessels and Japanese vessels fishing south of 30°S to use a bird scaring line constructed in accordance with the regulation when setting their lines.

Other mitigation measures currently used on a voluntary basis in the AFZ include bait casting machines, night setting and bait thawing. The use of these measures can be attributed in part to the developmental work and education campaign being conducted by the Tasmanian Parks and Wildlife Service which highlights the conservation concerns and economic losses associated with seabird by-catch.

Some fishing industry and conservation groups in other parts of the world are developing mitigation measures. Australia and New Zealand are currently collaborating to develop economical underwater setting methods.

There are seven measures which have proven to be effective and a number of potential measures which are being developed. These measures are described below and summarised in tables 4 and 5.

Mitigation measures which are known to be effective in reducing seabird by-catch

Night Setting

Most seabirds caught on longlines are active during the day. Fishers can avoid catching birds by setting their lines at night (Harper 1987, Weimerskirch and Wilson 1992). This can result in a 60 – 96% reduction in seabird by-catch (Cherel *et al.* 1996, Alexander *et al.* 1997). This reduction in catch rate decreases around the time of a full moon. The deck lighting on the vessel can attract birds during night setting and should be minimised while ensuring the safety of the crew (Brothers 1991).

Line Weighting

Weights can be added to the branchlines in pelagic longlines and the mainline in demersal longlines to hasten the sinking of baits, thereby reducing the time that a bait is available to birds. Weights in demersal longlines must be pushed overboard before the line tenses to avoid jerking the line to the surface and exposing the hooks (Brothers *et al.* 1995).

Area Closures

Seabirds congregate at natural feeding grounds and breeding sites at different times. These areas are often rich fishing grounds. Areas of high seabird by-catch can be closed to longline fishing on a temporary, seasonal or permanent basis to minimise the overlap between fishing operations and bird activity. For example, Croxall and Prince (1996) have identified the South Georgia shelf as an area of unacceptably high probability of seabird by-catch during March and May when the resident breeding albatrosses are consistently foraging in the area.

Bird Scaring Lines

Seabirds sit on, or fly low over, the water behind the vessel when diving and attacking baits. A bird line suspended over the water above the area where the baits are being set deters birds from entering this area. The bird line consists of a main cord suspended over the stern of the vessel with a number of streamer cords attached which hang down over the water and move in an unpredictable way deterring seabirds from foraging on the baits. When constructed and set properly, bird lines can reduce mortality by 30 – 75% (Brothers 1991, Klaer and Polacheck 1995). The bird line is not uniformly effective in deterring all species. Skuas are bold foragers and will avoid the line by foraging near the back of the vessel (Brothers 1993). Bird scaring lines are currently the only mandatory mitigation measure in Australian waters.

Bait Casting Machines

One of the main problems with pelagic longlines is the sink rate of the baits. When baits are hand thrown from the vessel during setting they often get caught in the vessel's propeller turbulence which keeps them on the surface of the water. Bait casting machines provide for faster sinking of the bait by throwing the bait clear of the propeller turbulence (Brothers 1993). When used in conjunction with properly configured bird scaring lines, bait casting machines which contain a low arc of throw and facilities to vary the distance and side thrown, can achieve 40 - 80% reductions in seabird by-catch (Brothers 1993).

Offal Discharge

Seabirds are attracted to vessels by offal and discarded fish by-catch. This discharge typically occurs near the point of line hauling. Both the timing and location of discharge can be modified to make the vessel less attractive to birds during line setting and hauling (Cherel *et al.* 1996, Alexander *et al.* 1997).

Bait Thawing and Swim Bladder Puncturing

Baits are stored frozen on board longline vessels. It is common practice to bait hooks with frozen baits and allow the bait to thaw in the water after setting. Frozen baits set in this manner float for longer than baits which are thawed prior to line setting (Brothers 1995). Reductions in by-catch of 50 – 70% have been suggested from use of thawed baits by Klaer and Polacheck (1995).

Most species of bait fish have swim bladders which are filled with air making them buoyant. These bladders decrease the sink rate of baits and should be punctured (Brothers 1995).

Mitigation measures which require further development and testing

Smart Hooks

Seabirds often attack baits without being hooked (Brothers 1991). Smart hooks prevent birds from being caught by retracting the point of the hook until it has reached a safe depth. This measure is in the early stages of development.

Underwater Setting

As previously discussed, seabird by-catch occurs when baits are on or near the surface of the water during line setting or hauling. Underwater setting protects the baits during line setting by enclosing them in a chute or tube until they are outside the diving range of seabirds. This is a potential solution to the threat but also requires the greatest modification to vessels. Successful underwater setting methods must ensure that baits do not float to the surface after they have been set.

Deck Lighting

It is possible that during night setting deck lighting attracts birds and makes bait more visible, but the effect of deck lighting on seabird by-catch is yet to be determined. New vessel designs can consider seabird by-catch when designing lighting for their vessels. The safe operation of the vessel must be considered.

Towed Deterrents

In addition to bird scaring lines described earlier there are a number of towed deterrents which could be used to reduce bird activity around the stern of the vessel during line setting. Buoys and other devices can be towed behind the vessels to disturb birds as they land to feed. This method is being advocated by fishers in North Pacific fisheries but its effectiveness has not been properly determined. Further international activities are underway to determine its efficacy.

Magnetic Deterrents

Seabirds navigate using a geomagnetic compass. There have been some experiments conducted using magnetic fields to disturb the birds' compass to confuse them while in close proximity to the vessel. There has been no success in deterring seabirds using this method in tests (Brothers pers. comm.). The method also has potential Occupational Health and Safety considerations for the crew.

Sound Deterrents

Sound is used to deter birds from airports and crops. A field study using equipment developed jointly by Japan Tuna and Blasting Technologies (a Japanese engineering company), assisted by the Tasmanian Parks and Wildlife Service through 1997 was unsuccessful. Responses by birds to the “scaring sound” were negligible.

Water Cannon

A water cannon is used to prevent birds from entering the area astern of the vessel where the baits are sinking. This method has been used by Foreign longliners in the AFZ during winter 1997 with mixed results (AFMA Observer Reports).

Lures and Baits Types

In some fisheries fish or squid baits are replaced with lures which are potentially less attractive to seabirds. This measure shows potential for further development.

Live bait is used in some fisheries which can reduce by-catch rates.

Dyes

To reduce the attractiveness of baits to birds and/or conceal them, baits could be dyed. The impact on fishing efficiency of this measure must be investigated.

Table 4: Analysis of mitigation measures known to reduce seabird by-catch in pelagic longline fisheries

Measure	Stage of Development	Methods of Monitoring Use	Operational Use (Safety implications for crew)	Relative Cost to Fishers in the AFZ	Nature of Cost (fixed or ongoing)	Impact of Catch per Unit Effort	Relative Effectiveness	Impact on by-catch of non-seabird species
Night setting	Developed and tested	Observations	Safe provided lighting is adequate	High for domestic vessels	Ongoing	Reduced bait loss to birds	High	Increased by-catch of other species e.g. sharks
Line weighting	Partially developed	Observations	Caution required	Med	Fixed + Maintenance	Unknown	High (if weight sufficient)	Not known
Area closures	Developed and tested globally, but not for the AFZ	VMS, Aerial, Observations	–	High	Ongoing	Reduced access to stock	High	No by-catch in the closed area
Bird scaring lines	Developed and tested	Aerial, Observations	Safe	Low	Fixed + Maintenance	Reduced bait loss to birds	Med - High	None
Bait thawing and swim bladder puncturing	Developed and partially tested	Observations	Safe	Low	Ongoing	Reduced bait loss to birds Increased setting preparation	Med	Not known
Bait casting machines	Developed and partially tested	Observations	Safe	Med	Fixed + Maintenance	Reduced bait loss to birds Improved bait condition	Med (increased with use of bird scaring line)	None
Offal discharge	Developed and partially tested	Observations	Safe	Low	Fixed	Reduced bait loss to birds	Low	Not known Impacts include artificial food provision

Table 5: Analysis of mitigation measures which have potential to reduce seabird by-catch in pelagic longline fisheries

Measure	Stage of Development	Methods of Monitoring Use	Operational Use (Safety implications for crew)	Relative Cost to fishers	Nature of Cost (fixed or ongoing)	Impact of Catch per Unit Effort	Relative Effectiveness	Impact on by-catch of non-seabird species
Smart hooks	Not developed	Observations	Safe	Med	Initial equipment cost + replacement of lost equipment	Unknown	Unknown	Unknown
Underwater setting	Being developed outside Australia	Observations	Safe	Low - High depending on method	Fixed + Maintenance	Reduced bait loss to birds Improved bait condition	High if baits are set deep enough so as to not resurface in turbulence	Enables fishers to operate day or night and potentially reduces by-catch of other species
Deck lighting	Partially developed	Observations	Safety needs to be considered in planning	Low - Med	Fixed	Reduced bait loss to birds	Low (High in combination with night setting)	Reduced by-catch of species attracted to vessel by lights
Towed deterrents	Used in US fisheries	Observations	Potential gear conflict	Low	Fixed	Unknown	Unknown	Unknown
Magnetic deterrents	Tested	Observations	Unknown	Med	Fixed	Unknown	None	None
Sound deterrents	Limited testing	Observations	Unknown	Med	Fixed	Unknown	Very limited	Very limited
Water cannon	Partially developed	Observations	Wet crew	Med	Fixed	Unknown	Unknown	Unknown
Lures	Not developed	Observations	Safe	Med	Ongoing (considerable savings in bait costs)	Unknown	Unknown	Unknown
Dyes	Not developed	Observations	Safe	Med	Ongoing	Unknown	Unknown	Unknown

C. Education

Background

Effective abatement of the threat to seabirds from longline by-catch relies on correct implementation of mitigation strategies by the longline fishers as part of their everyday operations. This Plan prescribes actions which will facilitate this by providing fishers with education material and an extension program to ensure that they are aware of their obligations and correct procedures for meeting them.

Existing Practices

The Tasmanian Parks and Wildlife Service has worked with the longline fishing industry and AFMA to develop education materials highlighting the bird by-catch problem and potential solutions. These include the booklet 'Catch fish not birds' written by Nigel Brothers for Japanese fishers and adapted for domestic and Spanish fishers, stickers and brochures, port meetings with fishers and at-sea demonstration of mitigation measures.

D. Information

Background

There are a number of areas of uncertainty in the management of seabird by-catch in longline fisheries. The reliability of by-catch data available is also questionable.

Existing Practices

Currently AFMA manages an observer program on the Japanese longline fishing fleet within the AFZ that aims at 10% coverage of the total number of hooks hauled during each season (A. de Fries, AFMA observer program coordinator, pers. comm.). This "level and distribution of coverage provides a reasonable indication of the magnitude of the seabird by-catch within the AFZ" (Klaer and Polacheck 1995). However, this program was established principally to collect data on fish and not on seabird by-catch. Currently, there is no observer program for either the domestic pelagic or demersal fleet. Domestic and foreign longline vessels operating in the AFZ provide data to AFMA via a log book system. The fisher records the following information in the logbook:

- fishing effort
- location
- methods including bait details
- catch information including target species and species caught
- wildlife interactions - for albatrosses and other seabirds and other wildlife recording number caught, life status on release and other comments

Under the *National Parks and Wildlife Act 1975* fishers are obliged to report all catch of species protected under that legislation. This protection includes all species of seabirds.

7. Objectives, Criteria and Actions

The term of this Threat Abatement Plan is 5 years. The objective of this Plan is to significantly reduce the by-catch of seabirds during oceanic longline operations in the Australian Fishing Zone at current fishing levels. This will be achieved by implementing currently available mitigation techniques, providing for development of new techniques, educating fishers and the public and collecting information to improve our knowledge of seabird longline interactions.

The criterion for measuring success of the plan in achieving this objective will be:

- a decline in seabird by-catch mortality in all fishing areas, seasons or fisheries to 0.05 birds per thousand hooks (at current fishing levels); and
- the rate of uptake by fishers of prescribed mitigation measures.

The 0.05 by-catch level was chosen to reflect the ability of currently available mitigation measures to reduce seabird by-catch. In evaluating the implications of the by-catch composition, consideration will be given to the conservation status of the seabird species concerned. This catch rate represents a reduction of up to 90% in the AFZ. It has been calculated based on reductions thought to be achievable with the use of known by-catch mitigation methods, and on the fishing levels in place at 1997. If fishing levels increase significantly, it will be necessary to review the by-catch target of 0.05 birds per thousand hooks.

To achieve the threat abatement objective and meet the criterion, action is prescribed by this plan in three key areas:

- Mitigation of the threat
- Education of fishers and relevant organisations to improve their knowledge of the seabird by-catch problem and improve threat mitigation application
- Information collection to measure progress of the Threat Abatement Plan and provide information necessary for decision making.

Specific objectives, criteria and actions in each of these areas are detailed below and outlined in Appendix A. It should be noted that there are no mitigation measures prescribed for demersal fisheries at this stage; only quantification of the level of seabird by-catch followed by development of appropriate mitigation measures where necessary for these fisheries. This is because there is no data on the level of seabird by-catch occurring in these fisheries in the AFZ.

A. Mitigation - Pelagic Longline Fisheries

OBJECTIVE 1

Ensure that measures which are known to be effective in mitigating seabird by-catch are required by appropriate legislative frameworks for use in pelagic longline fishing operations in the AFZ.

CRITERIA FOR SUCCESS

- Compliance with Commonwealth fisheries law relating to by-catch mitigation by pelagic longline fishers operating in the AFZ.
- Seabird by-catch mortality in all fishing areas, seasons or fisheries will be less than 0.05 birds/1000 hooks.

ACTIONS

Action 1.1

AFMA and DPIE will require domestic and foreign pelagic longline fishers respectively to adopt one of three options on an annual basis when setting all or part of a longline south of 30°S in the AFZ.

Mitigation measures relating to use of bird scaring lines and offal discharge apply to all options.

All options will require monitoring by an approved observer program (described in Objective 8, Action 3 & 4).

There is no restriction on fishers using mitigation measures from other options in addition to those required by their chosen option. For example a fisher may choose to weight lines and set at night. At any time the fisher must adhere to the minimum standards prescribed in their nominated option.

It should be noted that, due to the difficulty of implementing some mitigation measures on smaller boats (those under 20m), flexibility will be built into the regulations enacted under the *Fisheries Management Act 1991* to allow fishers to apply for variations on the prescribed measures.

OPTION 1

All baits will be set at night. In order to meet the requirements under this action line setting activity must not commence until 60 minutes after sunset and must cease 60 minutes before dawn.

No costs to the Commonwealth have been identified against this action. The costs to a significant number of fishers will be large. This includes fishers who currently are only able to fish opportunistically when the weather is suitable; fishers who set 2-3 times per day with smaller numbers of hooks for efficiency or boat capacity

reasons; and fishers operating in short darkness areas/periods such as southern Tasmania in summer.

OPTION 2

All vessels fishing during the day will:

- use lines which are sufficiently weighted to cause the baits to sink out of reach of diving seabirds immediately after they are set. This weight will be determined by experimental trials;
- demonstrate an ability to thaw baits before lines are set; and
- use thawed baits on their hooks.

Operators should note that day setting operations will require a higher level of observer coverage.

No costs to the Commonwealth have been identified against this action. There will be a cost for fishers in equipping their vessels with thawing apparatus and line weights.

OPTION 3

Vessels which can demonstrate a technique of setting and hauling longlines which does not make the hooks/baits available to seabirds can be issued with a permit to operate without any of the restrictions in Options 1 and 2 above. These fishers may also be exempt from compliance with Actions 2, 3 and 4.

Action 1.2

Bird Scaring Lines.

Fisheries Management Regulation 19A prescribes use of a bird scaring line by pelagic longline fishers south of 30°S in the AFZ.

AFMA will make recommendations to the Minister for Resources and Energy that the Regulation be amended to require all pelagic longline vessels operating in the AFZ to carry a bird scaring line of approved design north of 30°S and use where necessary.

No costs to the Commonwealth have been identified against this action. There will be a cost for fishers in operating north of 30°S equipping their vessels with a bird scaring line. Fishers operating south of 30°S are already required to be equipped with and use bird scaring lines and bird lines.

Action 1.3

DPIE will, through international agreements for access to fish stocks in the AFZ, continue to apply Fisheries Regulation 19A to all foreign pelagic longline vessels operating in the AFZ.

No costs have been identified against this action as DPIE is able to conduct the activity as part of its established negotiations relating to access agreements.

Action 1.4

Offal Discharge.

AFMA will prepare recommendations to the Minister for Resources and Energy that regulations be made to ensure that all foreign and domestic longline vessels

operating in the Australian Fishing Zone retain all offal during line setting or hauling and discharge it when not line setting or hauling. Offal is defined for the purposes of this plan as including all dead and discarded catch and fish by-catch with a total length of less than 50cm and all by-products of processing on board the vessel. Live fish and other live by-catch can be discarded during the haul.

No costs to the Commonwealth have been identified against this action. There will be a cost for fishers in fitting their vessels with offal storage and handling equipment.

OBJECTIVE 2

Encourage voluntary use of measures which are known to be effective in mitigating seabird by-catch.

CRITERIA FOR SUCCESS

- Level of voluntary adoption of mitigation measures.

ACTIONS

Action 2.1 Fishers operating pelagic longline vessels in the AFZ should adopt a Code of Practice which requires voluntary adoption of seabird by-catch mitigation measures in addition to the mandatory measures. These measures should include:

- Puncturing swim bladders on bait fish
- Use of bait casting machines on all suitable vessels
- Use of bird scaring lines when birds are encountered during line setting in fishing areas north of 30°S
- Selection of fishing gear which minimises the probability of seabird by-catch
- Promoting safe release of all seabirds caught alive on longlines
- Promoting correct use of appropriate fishing gear
- Promoting the correct use of mitigation measures
- Night setting north of 30°S
- Promoting the removal of hooks from fish discards

No costs to the Commonwealth have been identified against this action. There will be a cost for fishers in establishing the Code of Practice and adoption of measures which require fishers to purchase equipment.

OBJECTIVE 3

Encourage and provide for development of new mitigation measures and refinement of existing measures.

CRITERIA FOR SUCCESS

- A research and development program is established which provides funding, incentives and assessment for development of new mitigation measures and refinement of existing measures.

ACTIONS

Action 3.1 The Commonwealth and relevant agencies will make funds available for cooperative research into development of new mitigation measures and refinement of existing measures.

Estimated Cost of Action (x\$1000)					
Source	Year 1	Year 2	Year 3	Year 4	Year 5
AFMA*	50	50	50	50	50
ESP/NHT Funds	50	50	50	50	50
FRDC**					

*subject to continued Bilateral Access Agreements

**potential source for approved research proposals

Action 3.2 Commonwealth agencies will collaborate in setting research priorities in consultation with stakeholders.

No additional costs to the Commonwealth have been identified against this action. Agencies involved in consultation will fund their officers from existing operating budgets.

Action 3.3 AFMA will ensure that regulations provide for scientific permits for development and experimental testing of new measures and refined existing measures, and that the permits include appropriate evaluation. The testing must take place under the following guidelines:

- permit proposals are to be forwarded to Environment Australia for consideration prior to approval;
- there is an observer on board the vessel for initial testing of the proposed mitigation measure; and
- permits include an experimental protocol which details the duration, timing and location of testing of the measure.

Costs of this action cannot be accurately determined as they are driven by the demand for experimental testing of mitigation measures. The principal cost will be in providing observation of experimental trials. Costs will be determined by AFMA on a case by case basis.

Action 3.4 Environment Australia will review and promote appropriate incentives and funding sources for research and development.

This action will involve Environment Australia gathering information on potential funding sources, including those mentioned in Action 1, and ensuring that parties involved in mitigation measure development are informed of the process of applying for funding.

No additional costs to the Commonwealth have been identified against this action. Environment Australia will fund officers from operating budgets to implement this action.

B. Mitigation - Demersal Longline Fisheries

OBJECTIVE 4

Identify the rates of seabird by-catch in demersal longline fisheries operating in the AFZ.

CRITERIA FOR SUCCESS

- By-catch rates have been quantified and described in a manner adequate to allow management actions to be taken where necessary.

ACTIONS

- Action 4.1** AFMA will assess the by-catch rate of seabirds on domestic demersal longline vessels using an observer program (described under Objective 8, Action 4).
- The costs associated with the assessment of the seabird by-catch rates in demersal longline fisheries are covered as part of the domestic observer program (see Objective 8, Action 4).

OBJECTIVE 5

Apply appropriate mitigation measures to demersal longline fisheries which are shown to have significant seabird by-catch.

CRITERIA FOR SUCCESS

- Compliance with Commonwealth fisheries law and directions given by AFMA in relation to seabird by-catch mitigation.

ACTIONS

- Action 5.1** AFMA will develop and implement necessary mitigation measures to reduce the seabird by-catch in demersal fisheries to below 0.05 birds per 1000 hooks.
- Action 5.2** Should demersal longlining activities be considered around Heard, McDonald and Macquarie Islands, suitable mitigation measures will be developed in conjunction with Environment Australia and the Threat Abatement Team before the fishery proceeds.
- Action 5.3** Offal Discharge.
- AFMA will recommend to the Minister for Resources and Energy that regulations be made to ensure that all demersal longline vessels operating in the Australian Fishing Zone retain all offal during line setting or hauling and discharge it when not line setting or hauling.

No costs to the Commonwealth have been identified against this action. There will be a cost for fishers in fitting their vessels with offal storage and handling equipment.

C. Education

OBJECTIVE 6

Implement a fisher extension and training program for longline fishers operating in the AFZ.

CRITERIA FOR SUCCESS

- An education, extension and information transfer program is established targeting longline fishers operating in the AFZ.

ACTIONS

Action 6.1 AFMA, in cooperation with Environment Australia, will inform pelagic and demersal longline fishers about new mandatory measures and their obligations under the *Endangered Species Protection Act 1992* and *National Parks and Wildlife Conservation Act 1975* to report all seabirds killed.

Estimated Cost of Action (x\$1000)					
Source	Year 1	Year 2	Year 3	Year 4	Year 5
AFMA	1	1	1	1	1
ESP/NHT Funds	5	5	5	5	5

Action 6.2 A steering group of longline fishing industry, AFMA and Environment Australia representatives will guide the implementation of an education strategy, including considering the need for employment of an extension officer.

The costs identified below are to fund the initial development of the education strategy. This development will include forward budget estimates for years 2 - 5 of this Plan.

Estimated Cost of Action (x\$1000)					
Source	Year 1	Year 2	Year 3	Year 4	Year 5
AFMA	15	To be determined			
ESP/NHT Funds	15	To be determined			

OBJECTIVE 7

Communicate results of the TAP actions through international conservation and fisheries.

CRITERIA FOR SUCCESS

- An Australian representative attends appropriate international commission and convention conferences to present the results of the TAP.

ACTIONS

Action 7.1 Australia will communicate results of mitigation trials and promote seabird by-catch mitigation with foreign fishers through international fisheries fora including the CCSBT, IOTC, CCAMLR, COFI and FFC to member and non-member countries.

No costs to AFMA and DPIE have been identified against this action as these organisations are involved with the international fisheries fora through other programs.

Estimated Cost of Action (x\$1000)					
Source	Year 1	Year 2	Year 3	Year 4	Year 5
AFMA	-	-	-	-	-
ESP/NHT Funds	5	5	5	5	5
DPIE	-	-	-	-	-

Action 7.2 Environment Australia will communicate the results of seabird by-catch minimisation strategies through relevant international conservation fora, including CMS and CCAMLR.

No costs to the Commonwealth have been identified against this action as the participation by Environment Australia in these fora is funded through other programs.

D. Information

OBJECTIVE 8

Collect data on seabird by-catch to assess the performance of mitigation measures and improve knowledge of seabird-longline interactions.

CRITERIA FOR SUCCESS

- Data are collected and analysed from a significant sample of the longline fishing effort in the AFZ to accurately and precisely describe:
 1. how many of each seabird species caught in each longline fishery, area, season and gear type; and
 2. the time of day/night that longlines are set and hauled.
- All seabirds killed on longlines in the AFZ are collected for analysis to determine their sex, age class and provenance/population.

ACTIONS

Action 8.1 Data sharing arrangements.

AFMA and Environment Australia have established the framework for a Marine Wildlife/Fisheries Interaction Working Group to establish protocols for data collection and exchange.

This group should consider seabird/fisheries interactions data to ensure that data is collected and exchanged in order to assess progress of the Threat Abatement Plan.

No costs to the Commonwealth have been identified against this action as the participation by Environment Australia and AFMA in this forum is funded through other programs.

Action 8.2 AFMA will modify the domestic and foreign pelagic and demersal longline fisheries logbooks and Vessel Monitoring System (VMS) information collection procedures to accurately record:

- the number of seabirds caught;
- the species of seabirds caught;
- the fishing gear and mitigation measures used and stage of the fishing operation when the catch occurred;
- the time of day and date of the catch;
- the location of the catch; and
- external factors (weather conditions, ambient light) which may influence by-catch.

Estimated Cost of Action (x\$1000)					
Source	Year 1	Year 2	Year 3	Year 4	Year 5
AFMA	15	3	3	3	3

Action 8.3 AFMA will continue observation of Japanese longline fishing operations in the AFZ and will ensure that the information specified for domestic logbooks is collected.

No additional costs to the Commonwealth have been identified against this action because the costs are covered by existing AFMA programs

Action 8.4 AFMA will develop a domestic pelagic and demersal longline observer program to validate seabird by-catch data collected by the logbook system and address deficiencies in existing programs. These deficiencies relate to the quality and detail of seabird data collected.

The observers will be responsible for information collection and education.

The level and coverage by observers will be determined by an independent study based on an agreed brief prepared by AFMA, Environment Australia and the longline fishing industry. A pilot observer program will be used to better target the actions of the Plan and develop the framework for the full observer program. The pilot observer program will include the following domestic fishing industries:

- Eastern Tuna and Billfish Fishery;
- Western Tuna and Billfish/Southern Tuna and Billfish Fishery;
- Southern Bluefin Tuna Fishery longline sector;
- South East Fishery Non-Trawl; and
- Southern Shark Fishery, demersal line sector.

The pilot observer program will examine geographical, inter- and intra-fishery variation in the catch rates of seabirds in the domestic pelagic, demersal and semi-demersal longline fisheries within the AFZ.

It is not possible to accurately determine the costs associated with the implementation of a full observer program until the pilot study is completed. There will be negotiations between Environment Australia, the Australian Fisheries Management Authority and the fishing industry regarding the apportioning of costs associated with the implementation of the domestic observer program. The implementation of the recommended program will be overseen by AFMA, Environment Australia and the longline fishing industry.

It may be necessary to have a period of more intensive sampling to establish the boundaries for compulsory mitigation and test assumptions on the level of ongoing observer coverage.

The exact cost of this actions will be governed by the recommendations of the consultant. It is therefore not possible at this stage to determine the likely cost of this action.

Estimated Cost of Action (x\$1000)					
Source	Year 1	Year 2	Year 3	Year 4	Year 5
AFMA - Pelagic	to be determined				
AFMA - Demersal	to be determined				
ESP/NHT Funds	to be determined				

Action 8.5 AFMA will recommend to the Minister for Resources and Energy that regulations be made to ensure that all seabirds killed on pelagic or demersal longlines in the AFZ are:

- reported to AFMA;
- reported to the Australian Bird and Bat Banding Schemes if banded;
- collected for scientific analysis;
- stored on board the vessel in manner which will limit decay of the specimen and meet AQIS regulations; and
- deposited at a storage and analysis facility nominated by Environment Australia in each port.

Any hooked birds must be brought aboard the vessel. No birds are to be cut off the line.

Environment Australia will provide seabird collection kits to facilitate handling of seabirds killed on longlines for analysis. Collection practices will be consistent with AQIS requirements.

Environment Australia will arrange for seabird collection points in the major longline fishing ports to store and transport birds collected from longline fishers.

Data on provenance of seabirds killed will be used to determine the impact of longline fishing seabird by-catch in the Australian Fishing Zone on populations of seabirds.

Estimated Cost of Action (x\$1000)					
Source	Year 1	Year 2	Year 3	Year 4	Year 5
AFMA	-	-	-	-	-
ESP/NHT Funds	25	15	15	15	15

OBJECTIVE 9

Supply and analyse data to assess the performance of mitigation measures and improve knowledge of seabird-longline interactions.

CRITERIA FOR SUCCESS

- Data are supplied within three months of the end of a fishing season and analysed appropriately.

ACTIONS

Action 9.1 AFMA will supply seabird by-catch data sourced from logbooks and other methods to Environment Australia in computerised format for analysis on a six monthly basis. These data are to be subject to agreements set out by the Marine Wildlife/Fisheries Interaction Working Group.

AFMA is to supply these data within three months of receiving them from fishers.

No costs to the Commonwealth have been identified against this action as the costs will be minimal once appropriate changes have been made to the AFMA database. These changes are funded under Objective 8, Action 2.

Action 9.2 Environment Australia will analyse the seabird by-catch data collected to assess:

- seabird by-catch rates by area, season, fishery and fishing method; and
- seabird by-catch mitigation effectiveness.

Estimated Cost of Action (x\$1000)					
Source	Year 1	Year 2	Year 3	Year 4	Year 5
ESP/NHT Funds	20	20	20	20	20

Action 9.3 Environment Australia and AFMA will collaborate to assess the impact of TAP actions on other marine species.

No costs to the Commonwealth have been identified against this action as the participation by Environment Australia and AFMA in this forum is funded through other programs.

Action 9.4 Environment Australia will analyse the seabirds collected to determine:

- species, subspecies;
- provenance (where possible);
- age;
- sex; and
- breeding status.

Estimated Cost of Action (x\$1000)					
Source	Year 1	Year 2	Year 3	Year 4	Year 5
ESP/NHT Funds	20	20	20	20	20

OBJECTIVE 10

Communicate the results of the Threat Abatement Plan actions to fishers, management agencies and the public.

CRITERIA FOR SUCCESS

- Progress reports will be produced.

ACTIONS

Action 10.1 Environment Australia will report biannually to the Threat Abatement Team on the analysis of by-catch data and seabirds collected in relation to achieving the objectives of the Threat Abatement Plan.

Estimated Cost of Action (x\$1000)					
Source	Year 1	Year 2	Year 3	Year 4	Year 5
ESP/NHT Funds	1	1	1	1	1

Action 10.2 The Threat Abatement Team will meet at least annually to review the report and revise the actions and priorities of the Plan.

Estimated Cost of Action (x\$1000)					
Source	Year 1	Year 2	Year 3	Year 4	Year 5
ESP/NHT Funds	5	5	5	5	5

Action 10.3 AFMA, Environment Australia and DPIE will communicate results of seabird by-catch analysis to fishers through established fora.

No costs to the Commonwealth have been identified against this action as the activities by AFMA, Environment Australia and DPIE in this action are funded through other programs.

Action 10.4 The Threat Abatement Team will oversee production of an annual report to communicate progress of the Threat Abatement Plan. Environment Australia will produce the report.

Estimated Cost of Action (x\$1000)					
Source	Year 1	Year 2	Year 3	Year 4	Year 5
ESP/NHT Funds	5	5	5	5	5

8. Assessing the Impact of the Plan on Non-target Species

All actions under this Plan will be conducted taking into account any impacts of the plan on the conservation status of non-seabird species including fish, sharks, marine mammals and marine reptiles.

9. Relationship with International Actions

This Plan represents Australia's domestic contribution to the global conservation of seabirds by managing the threat from longline fishing by-catch. However, conservation of many of these

migratory seabird species will rely on more than Australian action. Mitigation strategies such as those outlined in the plan should be pursued in international waters and the Exclusive Economic Zones of other Southern Hemisphere nations. The Australian Government is pursuing such action through international fora such as the Convention for Conservation of Migratory Species of Wild Animals, the Ecologically Related Species Working Group of the Commission for the Conservation of Southern Bluefin Tuna, the IMALF of the Convention for the Conservation of Antarctic Marine Living Resources, the Food and Agriculture Organization of the United Nations and its Committee on Fisheries.

10. Implementation Schedule

Actions prescribed in this Plan will be implemented as follows:

Action	Description	Year 1	Year 2	Year 3	Year 4	Year 5
1.1	Night setting, thawed baits and weighted lines or successful new mitigation measures		—————→			
1.2	Bird Scaring Lines - Domestic		—————→			
1.3	Bird Scaring Lines - Foreign	—————→				
1.4	Offal Discharge - Pelagic fisheries		—————→			
2.1	Code of Practice for voluntary adoption of seabird mitigation measures		—————→			
3.1	Fund research into mitigation measures	—————→				
3.2	Commonwealth agencies set priorities for mitigation research	—————→				
3.3	Provide for development and testing permits		—————→			
3.4	Promote funding sources for research and development	—————→				
4.1	Assess the by-catch rate on demersal longlines		—————		→
5.1	Implement mitigation measures – demersal fisheries			-----→		
5.2	Development of mitigation measures for demersal fisheries around Heard, McDonald and Macquarie Islands		-----→			
5.3	Offal Discharge - demersal vessels		—————→			
6.1	Inform longline fishers about new mandatory measures and their obligations		—————→			
6.2	Guide the implementation of an education strategy	———				

Action	Description	Year 1	Year 2	Year 3	Year 4	Year 5	
7.1	Communicate results of mitigation trials and promote seabird by-catch mitigation with foreign fishers	→					→
7.2	Communicate results of TAP through international conservation fora	→					→
8.1	Data sharing	—					
8.2	Modify longline fisheries logbooks	—					
8.3	Observation of Japanese longline operations	→					→
8.4	Domestic longline observer program		→				→
8.5	Ensure that all seabirds killed on longlines are collected		→				→
9.1	Supply seabird by-catch data	→					→
9.2	Analyse seabird by-catch data	→					→
9.3	Assess the impact of TAP actions on other marine species	→					→
9.4	Analyse the seabirds collected	→					→
10.1	Report biannually to the Threat Abatement Team		→				→
10.2	Threat Abatement Team meet at least annually	•	•	•	•	•	
10.3	Communicate results of seabird by-catch analysis to fishers		→				→
10.4	Threat Abatement Team produce report	•	•	•	•	•	

Dashed lines indicate actions which will be implemented if necessary

11. Estimated Cost of Threat Abatement

Action	Description	Priority	Feasibility	Party	Estimated Cost to Commonwealth (x\$1000)						
					Source	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Total
1.1	Night setting, thawed baits and weighted lines or successful new mitigation measures	1	High	AFMA		0	0	0	0	0	0
1.2	Bird Scaring Lines - Domestic	1	High	AFMA		0	0	0	0	0	0
1.3	Bird Scaring Lines - Foreign	1	High	DPIE		-	-	-	-	-	-
1.4	Offal Discharge - Pelagic fisheries	2	High	AFMA		0	0	0	0	0	0
2.1	Code of Practice for voluntary adoption of seabird mitigation measures	2	High	N/A		0	0	0	0	0	0
3.1	Fund research into mitigation measures	1	High	AFMA EA	AFMA ESP	50 50	50 50	50 50	50 50	50 50	250 250
3.2	Commonwealth agencies set priorities for mitigation research	2	High	AFMA EA DPIE	AFMA ESP DPIE	- - -	- - -	- - -	- - -	- - -	- - -
3.3	Provide for development and testing permits	1	High	AFMA	AFMA	To be determined					
3.4	Promote funding sources for research and development	2	High	EA	ESP	-	-	-	-	-	-
4.1	Assess the by-catch rate on demersal longlines	1	High	AFMA	AFMA	Costs are included in Objective 8, Action 4					
5.1	Implement mitigation measures – demersal fisheries	1	Unknown	AFMA	AFMA	To be determined					
5.2	Development of mitigation measures for demersal fisheries around Heard, McDonald and Macquarie Islands	1	High	AFMA EA	AFMA EA	- -	- -	- -	- -	- -	- -
5.3	Offal Discharge - demersal vessels	2	Mod	AFMA		0	0	0	0	0	0
6.1	Inform longline fishers about new mandatory measures and their obligations	1	High	AFMA EA	AFMA ESP	1 5	1 5	1 5	1 5	1 5	5 25
6.2	Guide the implementation of an education strategy	1	High	AFMA EA	AFMA ESP	15 15	To be determined To be determined				15 15

Action	Description	Priority	Feasibility	Party	Estimated Cost to Commonwealth (x\$1000)						
					Source	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Total
7.1	Communicate results of mitigation trials and promote seabird by-catch mitigation with foreign fishers	1	Mod	AFMA DPIE EA	AFMA DPIE ESP	- - 5	- - 5	- - 5	- - 5	- - 5	- - 25
7.2	Communicate results of TAP through international conservation fora	2	Mod	EA	ESP	-	-	-	-	-	-
8.1	Data sharing	1	High	AFMA EA	AFMA ESP	- -	- -	- -	- -	- -	- -
8.2	Modify longline fisheries logbooks	2	High	AFMA	AFMA	15	3	3	3	3	27
8.3	Observation of Japanese longline operations	1	High	AFMA DPIE	AFMA DPIE	- -	- -	- -	- -	- -	- -
8.4	Domestic longline observer program	1	High	AFMA EA	AFMA ESP	To be determined To be determined					
8.5	Ensure that all seabirds killed on longlines are collected	1	Mod	AFMA EA	AFMA ESP	- 25	- 15	- 15	- 15	- 15	- 85
9.1	Supply seabird by-catch data	2	High	AFMA	AFMA	Costs are included in Objective 8, Action 2					
9.2	Analyse seabird by-catch data	2	High	EA	ESP	20	20	20	20	20	100
9.3	Assess the impact of TAP actions on other marine species	3	Mod	AFMA EA	AFMA ESP	- -	- -	- -	- -	- -	- -
9.4	Analyse the seabirds collected	1	High	EA	ESP	20	20	20	20	20	100
10.1	Report biannually to the Threat Abatement Team	2	High	EA	ESP	1	1	1	1	1	5
10.2	Threat Abatement Team meet at least annually	2	High	EA	ESP	5	5	5	5	5	25
10.3	Communicate results of seabird by-catch analysis to fishers	2	High	AFMA DPIE EA	AFMA DPIE ESP	- - -	- - -	- - -	- - -	- - -	- - -
10.4	Threat Abatement Team produce report	2	High	EA	ESP	5	5	5	5	5	25
Estimated cost (x\$1000) for each source					AFMA	81	54	54	54	54	297
					EA ESP	151	126	126	126	126	655
					DPIE	-	-	-	-	-	-
Estimated cost (x\$1000) overall						232	180	180	180	180	952

Priorities: 1=critical to threat abatement, 2=key actions which assist threat abatement, 3=other actions.

Costs: - = cost to organisation has been identified, but is covered under existing programs.

Note that this table does not include costs for Actions 3.3, 5.1, 6.2 and 8.4. These are to be determined throughout the life of the Plan.

12. Evaluation and Revision of the Plan

As outlined in the actions relating to objective 10, the Plan prescribes the production of an annual report which presents collated data collected through the actions outlined in this Plan. These data should also be published in a peer reviewed scientific journal publication where appropriate.

The progress of the plan will be evaluated each year at a meeting of the Threat Abatement Team. The Team will maintain its current composition but may change members. New members must be nominated by the stakeholder group they are representing.

The *Endangered Species Protection Act 1992* provides for review of the TAP at any time at the discretion of the Director of Parks and Wildlife. Environment Australia will advise the Director to request a revision of the Plan if the following conditions occur:

- A new method of longline fishing is developed which requires mitigation prescriptions which are not covered in this Plan, such as the development of a demersal longline fishery at Heard, McDonald and Macquarie Islands.
- A mitigation measure is developed which is completely effective in preventing seabird by-catch thus negating the need for other mitigation prescriptions in this Plan.
- Seabird by-catch increases as a result implementing any of the prescribed actions.

If the adoption rates of mitigation measures are inadequate and if seabird by-catch rates do not decrease throughout the initial five year life of the Plan, other mitigation measures, such as area or seasonal closures, will be investigated during the review.

13. Glossary

AFMA:	Australian Fisheries Management Authority
AFZ:	Australian Fishing Zone
BSL:	Bird Scaring Line, also known as a tori pole
CCAMLR:	Convention for the Conservation of Antarctic Marine Living Resources
CCSBT:	Convention for the Conservation of Southern Bluefin Tuna
CMS:	Convention for the Conservation of Migratory Species of Wild Animals
COFI:	FAO Committee on Fisheries
Demersal:	Longlines which are set on the bottom of the ocean
DPIE:	Department of Primary Industries and Energy
EA:	Environment Australia
ESP:	Endangered Species Program of the Natural Heritage Trust
ERS:	Ecologically Related Species Working Group of CCSBT
FAO:	Food and Agriculture Organization of the United Nations
FFC:	Forum Fisheries Committee
FRDC:	Fisheries Research and Development Corporation
IMALF:	Incidental Mortality Arising from Longline Fishing - ad hoc Working Group of the Working Group on Fish Stock Assessment of CCAMLR
IOTC:	Indian Ocean Tuna Commission
Marine Wildlife/Fisheries Interaction Working Group:	an ad hoc working group established between Environment Australia and AFMA to establish protocols for data exchange in relation to marine wildlife
NHT:	Natural Heritage Trust
Offal:	remains of target fish species, fish by-catch species and unused baits
Pelagic:	Longlines which are set in the water column above the bottom of the ocean
VMS:	Vessel Monitoring System

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Appendix A: Summary of Objectives, Criteria and Actions

A. MITIGATION - PELAGIC LONGLINE FISHERIES		
Specific Objectives	Criteria	Prescribed Actions
<p>1. Ensure that measures which are known to be effective in mitigating seabird by-catch are required by appropriate legislative frameworks for use in pelagic longline fishing operations in the AFZ</p>	<p>Compliance with Commonwealth fisheries law relating to by-catch mitigation by pelagic longline fishers operating in the AFZ</p> <p>Seabird by-catch mortality in all fishing areas, seasons or fisheries will be less than 0.05 birds/1000 hooks</p>	<p>1. AFMA and DPIE will require domestic and foreign pelagic longline fishers respectively to adopt one of three options on an annual basis when setting all or part of a longline south of 30°S in the AFZ.</p> <p>Mitigation measures relating to use of bird poles and lines and offal discharge apply to all options.</p> <p>All options will require monitoring by an approved observer program (see Objective 8 Action 3 + 4).</p> <p>There is no restriction on fishers using mitigation measures from other options in addition to those required by their chosen option.</p> <p>It should be noted that, due to the difficulty of implementing some mitigation measures on smaller boats (those under 20m), flexibility will be built into the regulations enacted under the <i>Fisheries Management Act 1991</i> to allow fishers to apply for variations on the prescribed measures.</p> <p>OPTION 1</p> <ul style="list-style-type: none"> - All baits will be set at night (as defined by this Plan). <p>OPTION 2</p> <p>All vessels fishing during the day will:</p> <ul style="list-style-type: none"> - use lines which are sufficiently weighted to cause the baits to sink out of reach of diving seabirds immediately after they are set. This weight will be determined by experimental trials - demonstrate an ability to thaw baits before lines are set - use thawed baits on their hooks - operators should note that day setting operations will require a higher level of observer coverage <p>OPTION 3</p> <ul style="list-style-type: none"> - Vessels which can demonstrate a technique of setting and hauling longlines without making the hooks/baits available to seabirds can be issued with a permit to operate without any of the restrictions in Options 1 and 2 above. These fishers may also be exempt from compliance with Actions 2, 3 and 4.
		<p>Bird Scaring Lines</p> <p>2. Fisheries Management Regulation 19A prescribes use of a bird scaring line by pelagic longline fishers south of 30°S in the AFZ.</p> <p>AFMA will make recommendations to the Minister for Resources and Energy that the Regulation be amended to require all pelagic longline vessels operating in the AFZ to carry a bird scaring line of approved design north of 30°S and use where necessary.</p> <p>3. DPIE will, through international agreements for access to fish stocks in the AFZ, continue to apply Fisheries Management Regulation 19A to all foreign pelagic longline vessels operating in the AFZ.</p>

A. MITIGATION - PELAGIC LONGLINE FISHERIES

Specific Objectives	Criteria	Prescribed Actions
		<p>4. Offal Discharge</p> <p>AFMA will prepare recommendations to the Minister for Resources and Energy that regulations be made to ensure that all foreign and domestic longline vessels operating in the Australian fishing zone retain all offal during line setting or hauling and discharge it when not line setting or hauling.</p>
<p>2. Encourage voluntary use of measures which are known to be effective in mitigating seabird by-catch</p>	<p>Level of voluntary adoption of mitigation measures</p>	<p>1. Fishers operating pelagic longline vessels in the AFZ should adopt a Code of Practice which requires voluntary adoption of seabird mitigation measures in addition to the mandatory measures. The code of practice should include:</p> <ul style="list-style-type: none"> • Puncturing swim bladders on bait fish where practical • Use of bait casting machines on all suitable vessels • Use of bird scaring lines when birds are encountered during line setting in fishing areas north of 30°S • Selection of fishing gear which minimises the probability of seabird by-catch. • Promoting safe release of all seabirds caught alive on longlines • Promoting correct use of appropriate fishing gear • Promoting the correct use of mitigation measures • Night setting north of 30°S • Promoting the removal of hooks from fish discards
<p>3. Encourage and provide for development of new mitigation measures and refinement of existing measures</p>	<p>A research and development program is established which provides funding, incentives and assessment for development of new mitigation measures and refinement of existing measures</p>	<p>1. The Commonwealth and relevant agencies will make funds available for cooperative research into development of new mitigation measures and refinement of existing measures.</p> <p>2. Commonwealth agencies will collaborate in setting research priorities in consultation with stakeholders.</p> <p>3. AFMA will ensure that regulations provide for scientific permits for development and experimental testing of new measures and refined existing measures within the guidelines set out in this plan, and that the permits include appropriate evaluation.</p> <p>4. Environment Australia will review and promote appropriate incentives and funding sources for research and development.</p>

B. MITIGATION - DEMERSAL LONGLINE FISHERIES

Objective	Criteria	Prescribed Actions
4. Identify the rates of seabird by-catch in demersal longline fisheries operating in the AFZ.	By-catch rates have been quantified and described in a manner adequate to allow management actions to be taken where necessary	1. AFMA will assess the by-catch rate of seabirds on domestic demersal longline vessels using an observer program (described under Objective 8, Action 4).
5. Apply appropriate mitigation measures to demersal longline fisheries which are shown to have significant seabird by-catch	Compliance with Commonwealth fisheries law and directions given by AFMA in relation to seabird by-catch mitigation	1. AFMA will develop and implement, if found to be necessary, mitigation measures to reduce the seabird by-catch in demersal fisheries to below 0.05 birds per 1000 hooks.
		2. Should demersal longlining activities be considered around Heard, McDonald and Macquarie Islands, suitable mitigation measures will be developed in conjunction with Environment Australia and the Threat Abatement Team before the fishery proceeds.
		3. Offal Discharge AFMA will recommend to the Minister for Resources and Energy that regulations be made to ensure that all demersal longline vessels operating in the Australian fishing zone retain all offal during line setting or hauling and discharge it when not line setting or hauling.

C. EDUCATION

Objective	Criteria	Prescribed Actions
6. Implement a fisher extension and training program for longline fishers operating in the AFZ	An education, extension and information transfer program is established targeting longline fishers operating in the Australian fishing zone	1. AFMA, in cooperation with Environment Australia, will inform pelagic and demersal longline fishers about new mandatory measures and their obligations under the <i>Endangered Species Protection Act 1992</i> and <i>National Parks and Wildlife Conservation Act 1975</i> to report all seabirds killed.
		2. A steering group of longline fishing industry, AFMA and Environment Australia representatives will guide the implementation of an education strategy, including considering the need for employment of an extension officer.
7. Communicate results of the TAP actions through international conservation and fisheries fora	An Australian representative attends appropriate international commission and convention conferences to present the results of the TAP	1. Australia will communicate results of mitigation trials and promote seabird by-catch mitigation with foreign fishers through international fisheries fora including the CCSBT, CCAMLR, COFI, IOTC and FFC to member and non-member countries.
		2. Environment Australia will communicate the results of seabird by-catch minimisation strategies through relevant international conservation fora including CMS and CCAMLR.

D. INFORMATION

Objective	Criteria	Prescribed Actions
<p>8. Collect data on seabird by-catch to assess the performance of mitigation measures and improve knowledge of seabird-longline interactions</p>	<p>Data are collected and analysed from a significant sample of the longline fishing effort in the AFZ to accurately and precisely describe:</p> <ol style="list-style-type: none"> 1. How many of each seabird species are caught in each longline fishery, area, season and gear type. 2. The time of day/night that longlines are set and hauled. 	<p>1. Data sharing arrangements</p> <p>AFMA and Environment Australia have established the framework for a Marine Wildlife/Fisheries Interaction Working Group to establish protocols for data collection and exchange.</p> <p>This group should consider seabird/fisheries interactions data to ensure that data is collected and exchanged in order to assess progress of the Threat Abatement Plan.</p>
		<p>2. AFMA will modify the domestic and foreign pelagic and demersal longline fisheries logbooks and VMS information collection procedures to accurately record:</p> <ul style="list-style-type: none"> • the number of seabirds caught • the species of seabirds caught • the fishing gear and mitigation measures used and stage of operation when the catch occurred • the time of day/night of the line setting and haul • date of the catch • the location of the catch • external factors (weather conditions, moon phase) which may influence by-catch
		<p>3. AFMA will continue observation of Japanese longline fishing operations in the AFZ and will ensure that the information specified for domestic logbooks is collected.</p>
		<p>4. AFMA will develop a domestic pelagic and demersal longline observer program to validate seabird by-catch data collected by the logbook system and address deficiencies in existing programs (described under Objective 8, Action 4).</p> <p>The observers will be responsible for information collection and education.</p> <p>The level and coverage by observers will be determined by AFMA and Environment Australia in consultation with the longline fishing industry. The observer program will be based on a design prepared by an expert consultant.</p>

D. INFORMATION

Objective	Criteria	Prescribed Actions
	<p>All seabirds killed on longlines in the AFZ are collected for analysis to determine their sex, age class and provenance/population.</p>	<p>5. AFMA will recommend to the Minister for Resources and Energy that regulations be made to ensure that all seabirds killed on pelagic or demersal longlines in the AFZ are:</p> <ul style="list-style-type: none"> • reported to AFMA • reported to the Australian Bird and Bat Banding Schemes if banded • collected for scientific analysis • stored on board the vessel in manner which will limit decay of the specimen and meet AQIS regulations • transported to a storage and analysis facility nominated by Environment Australia <p>All hooked birds must be brought aboard the vessel. No birds are to be cut off the line.</p> <p>Environment Australia will provide seabird collection kits to facilitate handling of seabirds killed on longlines for analysis. Collection procedures will be consistent with AQIS requirements.</p> <p>Environment Australia will arrange for seabird collection points in the major longline fishing ports to store and transport birds collected from longline fishers.</p>
<p>9. Supply and analyse data to assess the performance of mitigation measures and improve knowledge of seabird-longline interactions</p>	<p>Data are supplied within 3 months of the end of a fishing season and analysed appropriately.</p>	<p>1. AFMA will supply seabird by-catch data sourced from logbooks and other methods to Environment Australia in computerised format for analysis on a six monthly basis.</p> <p>These data are to be subject to agreements set out by the Marine Wildlife/Fisheries Interaction Working Group.</p> <p>AFMA is to supply these data within three months of receiving them from fishers.</p> <p>2. Environment Australia will analyse the seabird by-catch data collected to assess:</p> <ul style="list-style-type: none"> • seabird by-catch rates by area, season, fishery and fishing method • seabird by-catch mitigation effectiveness <p>3. Environment Australia, AFMA and industry experts will collaborate to assess the impact of TAP actions on other marine species.</p> <p>4. Environment Australia will analyse the seabirds collected to determine:</p> <ul style="list-style-type: none"> • species, subspecies • provenance (where possible) • age • sex • breeding status
<p>10. Communicate the results of the Threat Abatement Plan actions to fishers, management agencies and the public</p>	<p>Progress reports</p>	<p>1. Environment Australia will report biannually to the Threat Abatement Team on the analysis of by-catch data and seabirds collected in relation to achieving the objectives of the Threat Abatement Plan.</p> <p>2. The Threat Abatement Team will meet at least annually to review the report and revise the actions and priorities of the plan.</p>

D. INFORMATION

Objective	Criteria	Prescribed Actions
		<p>3. AFMA, Environment Australia and DPIE will communicate results of seabird by-catch analysis to fishers through established fora.</p> <p>4. The Threat Abatement Team will oversee production of an annual report to communicate progress of the Threat Abatement Plan. Environment Australia will produce the report.</p>

Appendix B: Global threats to albatross species

Albatrosses are the most threatened and vulnerable of all groups of marine birds and the best available evidence indicates that longline fishing is both the most recent and the most serious threat facing albatrosses today (Birdlife International 1995; Croxall and Gales in press; Gales in press). Other processes do, however, also impact on albatrosses and the nature and extent of these threatening processes have been reviewed by Gales (1993; in press), Birdlife International (1995), Alexander *et al.* (1997) and Croxall (in press). The direct and chronic persecution of albatrosses on land which peaked in the 19th Century has largely ceased but lesser threatening processes, other than longline fishing, continue to impact on albatrosses both in their marine and terrestrial domains. Some of these are briefly described below. The summary refers to threats to albatrosses globally.

Impacts in the Marine Environment

Driftnet Fishing

Large-scale driftnet fisheries operated from the late 1980s until the end of 1992 when a global moratorium was declared due to concerns regarding the level of by-catch. During 1990 an estimated 500 000 seabirds were killed in the North Pacific driftnet fisheries, including 17 548 Laysan albatrosses and 4 246 Black-footed albatrosses (Johnston *et al.* 1993). These rates of mortality (2.5 and 1.5% of world populations) were sufficient to cause the decline of populations. An unknown level of illegal High Seas driftnetting persists. Similar rates of seabird mortality to those incurred in driftnet operations are suspected for the North Pacific longline fisheries which have flourished since the cessation of drift netting (Ludwig *et al.* in press).

Pelagic gillnet fishing in the North Pacific has also killed many thousands of seabirds, including albatrosses (King 1984). The extent of mortality of albatrosses in this fishery, however, is not well known for either the North Pacific region or for any other oceanic sectors (Croxall in press).

Trawling

Seabirds are attracted to trawling operations as a result of the availability of discarded by-catch and offal dumped during processing at-sea. The changes in seabird foraging ranges and dynamics which result from discarding at sea (e.g Ryan and Molony 1988; Adams 1992; Acros and Oro 1996; Weimerskirch in press) are not acceptable outcomes of trawl fishing practices and the excessive and wasteful practices of *ad lib* dumping should be redressed (Birdlife International 1995).

Seabirds are also killed during trawling operations as a result of collisions with trawl gear. In the New Zealand squid trawl fishery, 2300 Shy albatrosses were killed by collision with net-sonde monitor cables in 1990 alone (Bartle 1991). The same source of mortality has been described for Black-browed albatrosses during trawl operations off Kerguelen Island (Duhamel 1991). Since these observations, the use of net-sonde monitor cables has been prohibited in the New Zealand Exclusive Economic Zone and also in the CCAMLR Convention Area. These prohibitions have reduced trawler related albatross deaths in these areas (although casualties still persist, albeit in low numbers; see Williams and Capdeville 1996) but casualties persist in other areas as a result of albatrosses becoming caught and drowned in the nets (e.g. in the hake fishery off South America,

Stagi *et al.* 1995) and collisions with other trawl warps (e.g during demersal trawling operations off South Africa, Adams 1992, D. Pemberton, pers. obs.). Collisions between albatrosses and trawl warps have more recently been observed during demersal trawl operations off Macquarie Island but the degrees of injuries and fate of the birds is unknown (T. Reid pers. obs).

Whilst the problem of mortality of seabirds resulting from trawl operations, at least in areas where net sonde cables are not used is minor compared to the problem of deaths on longlines, localised problems may occur where trawl operations are concentrated in regions close to the breeding sites of small populations of vulnerable species.

Marine Debris

The major forms of marine debris observed with albatrosses are the ingestion of plastics and more recently, fishing hooks.

Albatrosses have been known to ingest plastics since the 1960s, with Laysan albatrosses exhibiting the greatest incidence and volumes of plastic ingest for any seabird. The direct effects on adult albatrosses do not appear to be severe but when the plastics are transferred to chicks via regurgitation the sub-lethal effects of impaction and ulceration are likely to lower post-fledging survival (Sileo *et al.* 1990). Plastic ingestion is not confined to Pacific species, a high incidence of plastics has recently been observed at the nesting sites of Royal albatrosses at Campbell Island (J. Scott pers. comm). As recommended by Adams (1992) and Croxall (in press), the incidence of plastic ingestion by albatrosses across their range should be monitored

The incidence of longline hooks being regurgitated at the nest sites of wandering and black-browed albatrosses has increased six-fold in recent years (Cooper 1995, Huin and Croxall in press). An estimated 20% of albatross chicks at South Georgia ingest regurgitated hooks which are swallowed by the adults scavenging discarded fish heads during longline fishing operations.

Chemical Pollutants and Heavy Metals

It has been suggested that albatrosses be used as global indicators of contamination of oceanic systems because they are characteristically long lived and because of their wholly pelagic feeding habit (Croxall in press; Ludwig *et al.* in press). Cadmium has been shown to accumulate with age in Wandering and Royal albatrosses (Hindell *et al.* 1995), but the implications of this is not clear. North Pacific albatrosses are potentially at the greatest risk from organochlorine contaminants and such contamination has been ascribed to reduced reproductive success in Black-footed albatrosses (Ludwig *et al.* in press). In the populations of Black-footed albatrosses nearest to Honolulu, contaminants were believed to cause about 9% of the excessive human-caused mortalities in the population, the remaining 91% being ascribed to longline fishing by-catch (Ludwig *et al.* in press). Recent evidence of egg shell thinning and chick deformities in Royal albatrosses breeding at the Chatham Islands may be related to increases in contamination in more southern foodchains; these observations reinforce the need for the initiation of baseline monitoring programs (Robertson in press).

Foraging Habitat Degradation

An issue of concern has recently been highlighted by Croxall (in press) which focuses on the progressive degradation of albatross marine habitat, particularly in terms of the potential consequences of the global over-exploitation of components of the food webs to which albatrosses belong. The major fisheries for bait fish and fish meal in some areas target fish species which form major components of the "natural" diets of albatrosses (eg: Jack mackerel fishery off Tasmania). Croxall (in press) maintains that the chronic deterioration of marine habitats may have long-term effects on the status of albatrosses as serious as the more direct and acute effects which currently command our attention.

Impacts on Land

Breeding Habitat Degradation

Habitat erosion of nesting areas due to the introduction of stock and rabbits has contributed to breeding failures in a number of albatross species including Laysan, Black-footed, Waved, Amsterdam, Grey-headed and Black-browed albatrosses (see Gales 1993). Habitat changes resulting from fire, as well as the direct threats of fire through breeding colonies, have been realised by Yellow-nosed and Amsterdam albatrosses. Climatically induced changes in nesting habitat (resulting from storm and elevated temperatures causing drying of soils) are expected to have a significant effect on Royal albatrosses at the Chatham Islands due to lack of suitable nesting materials and substrates (Robertson in press).

The vulnerability of the Endangered Short-tailed albatross is exacerbated by Torishima (the major breeding site) being an active volcano and the resultant instability of the ash slopes where the birds breed. Efforts to attract the birds to breed in more stable areas however have recently been successful (Hasegawa pers. comm., in Gales in press).

Introduced Predators

Predation of eggs and chicks by introduced rats has been recorded for Laysan albatrosses and Black-footed albatrosses and rats are also implicated in the deaths of eggs and newly hatch chicks of Short-tailed, Yellow-nosed and Sooty albatrosses (Moors and Atkinson 1984, Hasegawa 1984, Weimerskirch pers. comm)

Cats have been responsible for the death of albatross chicks at both Marion and Amsterdam islands (Weimerskirch pers. comm) and they are suspected as contributing to the death of Light-mantled sooty albatross chicks at Macquarie Island (Gales 1993). Dogs and pigs are responsible for the deaths of eggs, chicks and adult Laysan albatrosses (Moors and Atkinson 1984, Harrison 1990).

Human depredation of albatross eggs and chicks has largely ceased with possible sporadic occurrences persisting at the Chatham Islands and Tristan da Cunha (C.J.R. Robertson pers. comm and J. Cooper pers. comm in Gales 1993).

Viral Disease

Mosquitoes have been implicated as vectors of an avian pox virus to Black-footed albatrosses (Harrison 1990), whereas ticks and fleas transfer avian pox virus in other albatross species, including Black-browed, Shy, Grey-headed albatrosses (Gales 1993 and references therein; C.J.R. Robertson pers. comm). In Shy albatrosses repeated infection of the virus causes death as a result of liver and kidney failure, breeding success being reduced to 20% in some years (N. Brothers in Gales 1993).