

Appendix 1.1

SOUTH AFRICAN NATIONAL PLAN OF ACTION FOR REDUCING THE INCIDENTAL CATCH OF SEABIRDS IN LONGLINE FISHERIES

Compiled by John Cooper¹ and Peter G. Ryan²

¹**Avian Demography Unit, Department of Statistical Sciences, University of Cape
Town, Rondebosch 7701, South Africa
jcooper@botzoo.uct.ac.za**

²**Percy FitzPatrick Institute of African Ornithology, University of Cape Town,
Rondebosch 7701, South Africa
pryan@botzoo.uct.ac.za**

For

**Marine & Coastal Management
Department of Environmental Affairs & Tourism**

November 2002

EXECUTIVE SUMMARY

The South African National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries (NPOA-Seabirds), following guidelines set by the Committee on Fisheries of the Food and Agriculture Organization of the United Nations (FAO), is comprised of two main parts, an assessment of the problem, and the recommended mitigation measures and other activities that form the national plan itself.

Part One: Assessment has five chapters. The history leading up to the FAO adopting its International Plan of Action (IPOA-Seabirds) in 1999 is given in **Chapter One**.

Chapters then follow on:

- (i) legislation, agreements and resolutions,
- (ii) seabirds at risk in South African waters,
- (iii) South African longline fisheries, and
- (iv) a description of mitigation measures,

as summarized below.

Chapter Two describes South African national legislation of relevance to seabird mortality on longlines. A consideration of selected international agreements in chronological order assesses their relevance to the issue and states South Africa's level of involvement with each one. A few international resolutions on the subject by the United Nations and the World Conservation Union are then described.

Chapter Three considers in detail aspects of the biology of the 19 species of seabirds known to have been killed on longlines in South African territorial and EEZ waters around the African Continent and the sub-Antarctic Prince Edward Islands. Sixteen species belong to the order Procellariiformes (albatrosses and petrels). Subjects reviewed include taxonomy, identification, distribution (both breeding and at sea), population size and trends, breeding, foraging behaviour and diet, and conservation status.

Chapter Four describes South African longline fisheries, divided into six fisheries targeting the following taxa:

- (i) demersal hakes,
- (ii) demersal Patagonian Toothfish,
- (iii) demersal and pelagic sharks,
- (iv) domestic pelagic tunas and Swordfish,
- (v) foreign-licensed pelagic tunas and Swordfish, and
- (vi) various species in international and non-South African waters.

Each fishery is treated under the heads: history, targeted species, fishing areas, size, vessel and gear types and fishing methods, seabird mortality, mitigation regulations currently in place, and compliance with the prescribed measures.

Chapter Five describes a suite of mitigation measures, including night setting, line weighting, use of bird-scaring lines, thawing bait, underwater setting, bait-casting machines, offal and bycatch discharge practices, line hauling, line tension prevention, and fishing season and area closures.

Part Two: NPOA-Seabirds, also has five chapters. Chapter Six is an introductory one, setting out the principles that the ultimate aim is to reduce seabird mortality in South African longline fisheries to zero, but that an interim target of less than 0.05 birds/thousand hooks is set, to be achieved by all fisheries in the short term (three years from adoption of the NPOA-Seabirds). It is noteworthy that only the toothfish fishery has attained this target.

Chapter Seven first summarizes existing prescribed measures in three South African longline fisheries for hake, toothfish and tuna. It concludes that these measures should remain in place, and recommends the adoption of further measures, especially to quantify line weighting and line-setting speeds in the hake and tuna fisheries.

Chapter Eight outlines several research activities that should take place, both to improve on mitigation measures (and consider new ones), and to assess the conservation status of affected seabird species.

Chapter Nine describes various activities that will help create awareness of the problem and educate fishers and other interested and affected parties. Importantly, training courses for fishers and observers are recommended.

Chapter Ten sets out the types of data that need to be collected to allow for the regular monitoring of both the levels and rates of seabird bycatch and compliance with prescribed mitigation measures. It also recommends an investigation of the shark fishery to ascertain whether any seabird mortality occurs.

A comprehensive **Bibliography** of references that deals with the history of seabird mortality in longlines, the South African longline fisheries concerned, mitigation measures and the biology of the affected species, is followed by two **Appendices**, the first giving the full text of the FAO's IPOA-Seabirds, the second giving the text of Conservation Measure 29/XIX of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), on the subject of reducing seabird mortality in toothfish longline fishing.

TABLE OF CONTENTS

	Pages
Executive summary	i
PART ONE: ASSESSMENT	
1. Introduction	1
2. Legislation, Agreements and Resolutions	4
2.1 Introduction	4
2.2 National legislation	4
2.3 International agreements	5
2.4 International resolutions	13
3. Seabirds at risk from longlining in South African waters	16
3.1 Introduction	16
3.2 Species accounts	16
4. South African longline fisheries	36
4.1 Introduction	36
4.2 Hake fishery	36
4.3 Patagonian Toothfish fishery	40
4.4 Shark fishery	46
4.5 Domestic pelagic fishery	47
4.6 Foreign-licensed pelagic fishery	51
4.7 International and non-South African waters fisheries	54
5. A description of mitigation measures	56
PART TWO: NPOA-SEABIRDS	
6. Introduction, purpose and key objectives	63
7. Prescription of mitigation measures	65
8. Research and development	68
9. Education, training and publicity	70
10. Data collection	73
11. Acknowledgements	75
12. Bibliography	76
Appendix 1: International Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries	86
Appendix 2: CCAMLR Conservation Measure 29/XIX. Minimisation of the Incidental Mortality of Seabirds in the Course of Longline Fishing or Longline Fishing Research in the Convention Area	96

PREFACE

“I now belong to a higher cult of mortals, for I have seen the albatross!”

R.C. Murphy (1912)

“The question of bird mortality is “Greens” motivated and somewhat suspect. Firstly, many of the birds who pick up the bait, and drown as the lines are being laid, are just as avid feeders in the dark. Secondly, with modern technology there are various means of ensuring that methods of laying these lines severely reduces the chance of bird strikes. One is tempted to believe that the somewhat strange regulations are purely a sop to the conservationists with their normal well meaning irrationality.”

J. Walsh (1998)

Chapter One

Introduction

In the early 1990s concern started to grow over the numbers of seabirds, especially albatrosses, being killed by longline fishing vessels in the Southern Ocean. That this occurred had been known for many years, as a result of the few recoveries of banded birds reported by tuna boats, but this had not led to any great alarm. But from the 1980s long-term studies of breeding seabirds at several sub-Antarctic islands had shown decreases in population sizes, leading researchers to assess just how many birds were being killed on longline hooks. The results were alarming; an early study estimated that 44 000 albatrosses were being killed annually by one Southern Ocean fishery alone.

In 1994 the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) set up its Working Group on Incidental Mortality Arising from Longline Fishing (WG-IMALF) to gather data on seabird mortality by longline vessels in the Southern Ocean. Reports also started to emerge of substantial seabird mortality from longliners in other parts of the world: the North Atlantic, in Alaskan waters, around Hawaii in the North Pacific and off the coasts of southern Africa, South America and New Zealand. It was clear that seabird mortality from longlining was a global issue, and one that needed to be addressed on the international stage.

This realization has led to a number of initiatives, by governments, by non-governmental organizations (NGOs) and by inter-governmental bodies, including fishery management organizations. In October 1996 a group of concerned NGOs sponsored a resolution at the First Session of the World Conservation Union (IUCN) World Conservation Congress, held in Montreal, Canada, that called for concerted action to reduce seabird mortality. Importantly, only one State member of IUCN voted against the resolution, that put the issue firmly into the international arena.

Shortly after the IUCN Congress it became the turn of an intergovernmental organization to act. Undoubtedly influenced by the IUCN resolution, the 22nd Session of the Committee of Fisheries (COFI) of the Food and Agriculture Organization of the United Nations (FAO), meeting in Rome, Italy in March 1997, called for a consultation with regional experts from within and outside governments to develop and propose guidelines that would lead to a plan of action aiming at a reduction in seabird mortality. What was most significant about this proposal is that one of the two countries that indicated their willingness to take the lead in organizing the expert consultation was Japan, the country that objected to the IUCN resolution not six months before. It was clear that the issue of seabird mortality from longlining had reached centre stage. At about this time BirdLife International, the world's leading international NGO concerned with the conservation of birds and their habitats, inaugurated its Seabird International Conservation Programme with a primary aim of working towards reductions in seabird mortality from longliners worldwide.

The FAO's Seabird Technical Working Group met in Tokyo, Japan in March 1998 to address the issue. Among its 16 members was the Coordinator of BirdLife's Seabird Conservation Programme. This was a significant development as it meant that a major fishing nation was now prepared to work closely with an international NGO to resolve a common problem: saving seabirds from the hook and conducting responsible fishing. At the Tokyo meeting three commissioned background papers on longlining, seabird mortality and mitigation measures that had been written by experts attending the meeting were reviewed, as was a draft action plan to address the problem. The three background papers were subsequently combined into one document and published the next year by the FAO in its *Fisheries Circular Series* as No. 937, entitled "The incidental catch of seabirds by longline fisheries: worldwide review and technical guidelines for mitigation". The report was authored by Nigel Brothers, John Cooper and Svein Løkkeborg, all members of the working group.

During the course of 1998, the FAO Committee on Fisheries held two expert consultations at its Rome headquarters. The two meetings discussed and amended what became entitled the International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries, abbreviated to IPOA-Seabirds. The IPOA-Seabirds was to be a voluntary one, and countries that undertook longline fisheries were encouraged by it to assess their fisheries in terms of the levels of seabird mortality, and if thought warranted, to develop their own National Plans of Action (NPOA-Seabirds), following the guidelines set out in the IPOA-Seabirds.

At its 23rd Session, held in February 1999, the Committee on Fisheries adopted a final text of the IPOA-Seabirds (see Appendix 1), and made a call for fishing nations to report to its next meeting, in two years' time in 2001, on progress in implementing their NPOA-Seabirds. Subsequently that year, the IPOA-Seabirds was commended by an FAO Fisheries Ministerial and endorsed by the FAO Council and then by the FAO Conference (the highest FAO body). The international community, both NGO and IGO, had now done its bit: it had become the task of governments to act.

In the two years until the next meeting of the Committee on Fisheries, a few countries commenced working on their National Plans of Action. Following an exhaustive review process, the United States was first out of the block, publishing its final NPOA-Seabirds in February 2001. Prior to that New Zealand had released its draft NPOA-Seabirds for comment in June 2000, but has not yet produced the final version. Arguably, Australia had beaten the pack, because even prior to the adoption by the FAO of the IPOA-Seabirds, it had produced a Threat Abatement Plan to address seabird mortality from longliners. Other than for these three countries, progress has been slow, however, in adopting national plans.

The Committee on Fisheries next met, in its 24th Session, in February-March 2001. At this meeting State members were expected to report on their progress with developing NPOA-Seabirds as part of their reporting on implementation of the FAO's Code of Conduct for Responsible Fisheries. To aid in making national reports the FAO had developed a questionnaire which it distributed to members in May 2000. This document

asked if Members had longline fisheries, if a seabird longline mortality assessment had been undertaken, if a NPOA-Seabirds was warranted, and if mitigation measures were practiced. The results of this questionnaire were summarized in a written report to the 24th Session, which showed that about a dozen countries were planning to produce NPOA-Seabirds. Several other countries also reported on progress from the floor of the meeting. Additionally, Japan made the text of its NPOA-Seabirds available at the meeting, although it was unclear as to whether it was a draft or a final text.

In its written submission on the status of implementation of the Code of Conduct, South Africa informed the Committee on Fisheries Session that it considered a NPOA-Seabirds was necessary and listed the mitigation measures then in use. At the 24th Session, Members were informed that the FAO had provided for technical assistance to support the production of NPOA-Seabirds by developing countries. This resulted in an application by South Africa for such support. Accordingly, a letter of Agreement was drawn up during the course of 2001 between the FAO and the Marine and Coastal Management Branch of the South African Department of Environmental Affairs & Tourism to fund the production of a NPOA-Seabirds. The agreement allowed for the production of draft text, to be followed by a public participation process, after which a revised final text would be produced. In late 2001 the Marine and Coastal Management Branch contracted with the Avian Demography Unit of the University of Cape Town to produce the draft NPOA-Seabirds.

The draft South African National Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries that follows is composed of two main parts. Firstly, a detailed assessment of South African longline fishing activities is made, describing the history of and current situation with each fishery, emphasizing what is known about seabird mortality and outlining mitigation measures currently in place. Integral parts of this assessment are a review of national and international legislation, to which South Africa is a party, that is relevant to the problem of seabird mortality from longlining, biological information for each species of seabirds known to be affected by South African longline fisheries, and a brief review of the various mitigation measures that have been tried and adopted around the world.

The second part of the document, following the guidelines given in the FAO's IPOA-Seabirds, sets out the actions that South Africa should take to address seabird mortality in its longline fisheries, under the heads of prescribed mitigation measures, research and development needs, education, training and publicity, and data collection. This section is followed by a comprehensive bibliography and appendices, the first of which gives the full text of the IPOA-Seabirds.

Chapter Two

Legislation and agreements

2.1 Introduction

Although mortality of seabirds in longline fisheries has been known to occur for many years, due to reports of banded birds being killed, it is only in the last two decades that it has been recognized as a serious conservation problem. This growing concern has led to a number of initiatives in terms of regulations and legislation to address the problem. Such initiatives have taken place at both national and international levels. In some cases existing legislation is relevant to the issue. In other cases, existing legislation or agreements have been amended, and new legislation and regulations have been or are in the process of being developed and adopted.

This Chapter reviews the legal situation as it pertains to seabird mortality in South African longline fisheries at both the national and international levels. A chronological order is followed.

2.2 National legislation

Sea Birds and Seals Protection Act

All seabirds affected by longline fisheries within South African territorial and fishing zone (equivalent to Exclusive Economic Zone - EEZ) waters are protected in terms of the Sea Birds and Seals Protection Act, 1973 (Act No. 46 of 1973). The Act is specifically extended to include the Prince Edward Islands and its territorial and EEZ waters, as defined by the Maritimes Zone Act of 1994 (see below). The term seabird in the Act is defined broadly, and it includes all longline-affected species in the families Diomedidae (albatrosses), Procellariidae (petrels), Spheniscidae (penguins), Stercorariidae (skuas) and Sulidae (gannets) that are affected by South African longliners (see Chapter Three).

The 1973 Act prohibits the killing, capture or willful disturbance of seabirds unless sanctioned in terms of a permit issued by the Minister of Environmental Affairs and Tourism or his/her delegated representative. Thus in terms of this act killing seabirds during longline fishing is illegal within South African waters.

In February 2002 a workshop was convened by the Marine and Coastal Management Branch of the Department of Environmental Affairs & Tourism in Cape Town to produce a policy document to lead to a revision of the Act, now considered to be out-of-date in a number of respects. The Workshop decided that a new policy should include the adoption of a National Plan of Action – Seabirds.

Maritimes Zones Act

The Maritime Zones Act, 1994 (Act No. 15 of 1994) defines territorial waters (out to 12 nautical miles from low-water mark) and the Exclusive Economic Zone (extending 200 nautical miles), which together with internal waters, form the South African waters. This Act applies both to continental and Prince Edward Island waters. [check this all correct].

Marine Living Resources Act

The Marine Living Resources Act, 1998 (Act No. 18 of 1998) provides for the conservation of the marine ecosystem and the long-term sustainable utilization of marine living resources, including the management of South African marine fisheries. In terms of this act regulations pertaining to the management and control of fisheries (including conservation measures) and the establishment of measures for the protection of specified species may be proclaimed by the Minister of Environmental Affairs & Tourism. The Act, *inter alia*, also provides for such matters as determination of fishery catches, issuing of foreign and high-seas licenses, and the appointment of observers and fisheries control officers, the latter with powers of arrest.

On 2 September 1998 regulations were published (Government Gazette Vol. 399, No. 19205) setting out gear restrictions with the effect of reducing seabird mortality by the hake-directed longline fishery, as quoted in full in Section 4.2 below. These gear restrictions are listed in permits issued to permit holders in the fishery and are legally binding on them.

2.3 International agreements

International Commission for the Conservation of Atlantic Tunas

The International Commission for the Conservation of Atlantic Tunas (ICCAT) was adopted in Rio de Janeiro, Brazil in 1966, and came into force in 1969. South Africa has been a member since 1967. ICCAT exists to manage populations of tuna and tuna-like species (including Swordfish) at levels which will permit maximum sustainable catches in the Atlantic Ocean and adjacent seas. The Convention sets annual fishing quotas for tuna and Swordfish. The basic text of the Convention does not address the issue of ecologically related species, but a Sub-committee on Bycatch of the Commission's Standing Committee on Research and Statistics was formed in 1996, primarily to consider bycatch of sharks. This sub-committee has as yet not considered mortality of seabirds by vessels fishing for tuna and Swordfish in the Atlantic Ocean, although the ICCAT web site (www.iccat.es) lists nine seabird taxa as "...recorded as being ever caught by any major tuna fishery in the Atlantic/Mediterranean". It is expected that three draft proposals for resolutions on seabird bycatch will be considered at ICCAT's November 2002 meeting, following their presentation at the 2001 meeting.

Convention on International Trade in Endangered Species of Wild Fauna and Flora

The Convention on International Trade in Endangered Species of Wild Fauna and Flora was adopted in Washington, USA in 1973, and came into force in July 1975. South Africa became a member of CITES in 1975. CITES (www.cites.org) exists to regulate international trade in threatened species and to protect them against over-exploitation caused by such trade by its Members adopting a legislative and regulatory system of import and export permits and restrictions. No bird species affected by longlining in South African waters are listed within the Convention's appendices, and no international trade is known for any of them.

However, Australia has nominated the Patagonian Toothfish *Dissostichus eleginoides* to Appendix II of CITES, to be considered at its 12th Conference of Parties in November 2002 [update with outcome]. Appendix II includes “species which although not necessarily now threatened with extinction may become so unless trade in specimens of such species is subject to strict regulation in order to avoid utilization incompatible with their survival”.

Patagonian Toothfish is the target species of a South African longline fishery (see Section 4.3) and its over-exploitation by “pirate” (Illegal, Unreported and Unregulated - IUU) fishers, including within South African waters, has led to its nomination by Australia. These high levels of pirate fishing are considered to have led to unsustainable levels of incidental mortality of a number of species of Southern Ocean seabirds, especially albatrosses and the larger petrels (see section on CCAMLR, below). Listing of the toothfish within CITES is expected to reduce pirate fishing by making export and import permits obligatory, leading in turn to reduced mortality of seabirds. South Africa has decided not to support the Australian nomination of toothfish to Appendix II of CITES at its 12th CoP.

Convention on the Conservation of Migratory Species of Wild Animals

The Convention on Migratory Species (Bonn Convention or CMS) was adopted in 1980. A fundamental principle of the CMS is to “take action ... whenever possible and appropriate, paying special attention to migratory species the conservation status of which is unfavourable, and taking individually or in co-operation appropriate and necessary steps to conserve such species and their habitat”. (Article II.1). Migratory species as defined by the Convention are those that regularly cross international boundaries, including into international waters. Importantly, nations whose flagged vessels interact with listed migratory species on the high seas are regarded as Range States of the species under consideration. All the seabird species affected by longlining in South African waters (See Chapter Three) may be regarded as migratory in terms of the Convention. The Bonn Convention makes allowance for Range States of migratory species listed in Appendix II to conclude Agreements “where these should benefit the species...” (Article IV. 4).

South Africa is an active Party to the Bonn Convention, and was instrumental in successfully nominating seven *Macroneustes* and *Procellaria* petrels to its Appendix II at

the 6th Conference of Parties (CoP), held in Somerset West, South Africa, in November 1999. In its nomination, South Africa specifically referred to mortality from longlining as a contributing reason for these species' unfavourable conservation status. Their inclusion within the CMS allowed in turn for their inclusion within the Agreement for the Conservation of Albatrosses and Petrels (ACAP, see below). All southern hemisphere albatross species had been previously listed on the appendices of the CMS at its 5th CoP held in Geneva, Switzerland in April 1997. At the 6th CoP, Parties also adopted resolutions on bycatch of seabirds by longline fisheries and on supporting the development of ACAP.

Convention on the Conservation of Antarctic Marine Living Resources

The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR, www.ccamlr.org) came into force in 1982 following signature in 1980. The Convention, and its Commission, aims to take an ecosystem approach to conserving marine living resources in the Southern Ocean that will maintain ecological relationships and prevent or minimize risks of changes not potentially reversible within two to three decades.. Conservation is defined as including “rational use” in the Convention’s Articles.

In 1989 the Commission first noted the problem of seabird mortality in longline fisheries in the Southern Ocean and urged its Members to introduce mitigation measures as soon as possible. In 1991 it adopted its first mitigation measure: the requirement to use bird-scaring “streamer” lines.

CCAMLR’s *ad hoc* Working Group on Incidental Mortality Arising from Longline Fishing (WG-IMALF, now WG-IMAF) was established in 1993. It annually reviews information on seabird mortality from longline fishing within the CCAMLR Area and estimates the total numbers of birds killed each year by both sanctioned and IUU fishing for Patagonian Toothfish *Dissostichus eleginoides*. At its meeting in October 2002 it estimated that 39 000 – 93 000 birds had been killed by IUU fisheries for toothfish in the Southern Ocean in 2001/02.

It recommends conservation measures to reduce such mortality to the Commission via the Scientific Committee (See Section 4.3 and Appendix 2). In 1994 its proposals to restrict line setting to night-time and not to dispose of offal during line setting were adopted by the Commission. In 1995, WG-IMALF expressed concern over IUU fishing causing very high levels of bird mortality and also noted the higher rates of mortality in summer months due to the presence of breeding birds close to their islands. In 1997 and 1998, as a consequence of the latter observation the Commission postponed the opening of the longline fishing season successively from 1 March, to 1 April and then to 15 April. [current date?].

A booklet, describing mitigation measures “Fish the sea not the sky” and a seabird identification book for the use of scientific observers have been produced by CCAMLR in several languages and distributed via Members.

CCAMLR adopted its catch documentation scheme (CDS) in 1999, and it became binding on CCAMLR Members in May 2000. The CDS aims to monitor and certify international trade in toothfish in an effort to reduce IUU fishing, which is expected in turn to lead to a reduction in seabird mortality.

South Africa is a founder [correct?] member of CCAMLR. It has been particularly active within WG-IMAF since its establishment, both by attending its annual meetings and submitting detailed information on seabird mortality from longline fishing within and adjacent to the Convention Area.

United Nations Convention on Law of the Sea

The United Nations Convention on Law of the Sea (UNCLOS or LOSC; www.un.org/Depts/los) of 1982, which entered into force 12 years later in November 1994, requires coastal States and States fishing on the high seas to consider the effects of fishing on "... species associated with or dependent upon harvested species with a view to maintaining or restoring populations of such associated or dependent species above levels at which reproduction may become seriously threatened" (Article 61, Paragraph 4).

South Africa joined UNCLOS in December 1997.

United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks

The UN Straddling/Highly Migratory Fish Stocks Agreement or High Seas Agreement (UNFSA; www.un.org/Depts/los) of 1995 requires coastal States and States fishing on the high seas to "... minimize ... catch of non-target species, both fish and non-fish species ... and impacts on associated or dependent species, in particular endangered species, through measures including, to the extent practicable, the development and use of selective, environmentally safe and cost-effective fishing gear and techniques" (Article 5). UNFSA came into force in December 2001.

South Africa is not yet a Party to UNFSA, although it has signalled its intention to become one.

FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas

The FAO Compliance Agreement (www.fao.org/fi) was approved at the 27th Session of the FAO Conference in 1993. The Agreement requires that Parties "shall take such measures as may be necessary to ensure that fishing vessels entitled to fly its flag do not engage in any activity that undermines the effectiveness of international conservation and management measures" (Article 11 1.(a)).

South Africa has as yet not accepted the Compliance Agreement, although it signalled its intention to do so to the FAO Committee on Fisheries at its 24th Session in 2001. The Agreement would apply to South African demersal and pelagic longliners fishing outside territorial waters and EEZs (see Section 4.7 below). The Agreement has not yet come into force.

Convention for the Conservation of Southern Bluefin Tuna

The Convention for the Conservation of Southern Bluefin Tuna (CCSBT, www.csbt.org) entered into force in 1994 between Australia, Japan and New Zealand. The Republic of Korea joined in 2001, and “the Fishing Entity of Taiwan” joined in 2002. The Convention applies to Southern Bluefin Tuna *Thunnus maccoyii* and has the objective of ensuring through appropriate management the conservation and optimum utilization of the species. The Convention recognizes ecologically related species as living marine species, including seabirds, that are associated with Southern Bluefin Tuna.

The Commission of the CCSBT at its Annual Meeting in 1995 established an Ecologically Related Species Working Group (WG-ERS) to report to its Scientific Committee, with terms of reference, *inter alia*, that it “... provide advice on measures to minimize fishery effects on ecologically related species, including but not limited to gear and operational modifications”. At the first meeting of the WG-ERS use of bird-scaring lines was promoted (with the Working Group adopting guidelines for their design and deployment), as was the avoidance of dumping offal during both setting and hauling. Collection of data on mortality of seabirds from longlining for Southern Bluefin Tuna was to commence in 1995. At its Third Annual Meeting, in February 1997 the Commission recommended that Parties to the CCSBT adopt a suite of mitigation measures to reduce seabird mortality by longliners fishing for Southern Bluefin Tuna. At its Fourth Meeting in September 1997, the Commission adopted the proposal of the WG-ERS that use of bird-scaring lines (described as “Tori poles”) be mandatory for vessels of Parties south of 30° South, and requested their use north of this.

South Africa is not a member of the CCSBT, nor does it currently fish actively for Southern Bluefin Tuna (see Section 4.5). However, South Africa sent an observer to the 7th Meeting of the Commission in April 2001, when it expressed its interest in attaining full membership, stating that the matter was still under consideration by the government. The 8th Meeting of the Commission met in October 2001, when its report recorded that South Africa was seeking an allocation of 50 t of fish. South Africa also attended the 9th Meeting of the Commission in October 2002 when its accession and allocation of a quota was once more discussed. To date, South Africa has not joined the CCSBT.

Japan and Taiwan actively fish for this species of tuna, currently including within South Africa’s EEZ. Thus the CCSBT’s mandatory mitigation measure of deploying bird-scaring lines should apply to Japanese longliners licensed to fish within South African waters that target Southern Bluefin Tuna south of 30°S (see Section 4.6).

FAO Code of Conduct for Responsible Fisheries

The Food and Agriculture Organization of the United Nations (FAO) adopted at the 28th Session of the FAO Conference in October 1995 a Code of Conduct for Responsible Fisheries (www.fao.org/fi). This initiative followed the Conference on Responsible Fishing held in Cancun, Mexico in 1992. This Conference adopted the Cancun Declaration which called on the FAO to develop the Code.

The Code, which is a voluntary one, “sets out principles and international standards of behaviour for responsible practices with a view to ensuring the effective conservation, management and development of living aquatic resources, with due respect for the ecosystem and biodiversity”. Article 6.6 of the Code states as a general principle that fishing gear should be developed and applied “...in order to maintain biodiversity and to conserve the population structure and aquatic ecosystems...”. Further this article states that “States and users of aquatic ecosystems should minimize waste, catch of non-target species, both fish and non-fish species, and impacts on associated or dependent species.” Later the Code gives the minimization of catch of non-target species as a management objective (Section 7.2.2 g). Thus, in terms of the Code, mortality of seabirds by longline fisheries should be avoided to the extent practicable. State members of the FAO are asked to report biennially to its Committee on Fisheries on their progress in implementing the Code.

In March 1999 the FAO Ministerial Meeting on Fisheries (which included South Africa) adopted The Rome Declaration on the Implementation of the Code of Conduct for Responsible Fisheries. The Declaration *inter alia* attached high priority to the implementation of the IPOA-Seabirds (see below).

South Africa, in its report on the Code of Conduct to the 24th Session of the FAO Committee on Fisheries in February-March 2001, considered that fisheries legislation and policy within the country already conformed to the provisions of the Code. Specifically, South Africa stated that a NPOA-Seabirds was necessary and listed mitigation measures already in place within its longline fisheries. These included “night-fishing, reduction of discharges of offal, deployment of scare-lines, the weighting of lines, and the presence of observers aboard”.

Indian Ocean Tuna Commission

The Indian Ocean Tuna Commission (IOTC, www.seychelles.net/iotc) was adopted by the FAO Council in 1993 and came into force in March 1996. The Commission took over the work of the Indo-Pacific Tuna Development and Management Programme (IPTP) which was set up in 1982. The objective of the IOTC is to ensure, through appropriate management, the conservation and optimum utilization of tuna and tuna-like species (including Swordfish) in the Indian Ocean and adjacent seas within FAO Statistical Areas 51 and 57. The western boundary of Area 51 is 30°E, which reaches South African waters on the East Coast. The southern boundary is at 45°S.

The IOTC has established a Working Party on Data Collection and Statistics, which at its Third Session in December 2001 considered bycatch issues (most notably of sharks) and recommended that an observer scheme be adopted. However, until now, it appears that the IOTC has not considered directly the bycatch of seabirds by longliners within its area of competence. However, it would appear most likely that seabird mortality by longliners does occur within the southern parts of its jurisdiction, which extend into the known foraging ranges of affected species of southern albatrosses and petrels.

South Africa is not currently a member of the IOTC, although it has sent observers to some of its meetings. If it does become a member then South African pelagic longlining in the Indian Ocean east of 30°E would fall under the Convention.

Agreement on the Conservation of African-Eurasian Migratory Waterbirds

The African-Eurasian Waterbird Agreement (AEWA; www.unep/wcmc.org/aewa) came into force in November 1999, at its first Meeting of Parties (MoP), held in Somerset West, South Africa. AEWA is a “daughter” Agreement of the Convention on Migratory Species (see above). The Agreement works to conserve 170 species of migratory waterbirds and their flyways between Eurasia and Africa and up to now has not considered strictly marine birds. However, South Africa, which became a Party in January 2002, nominated a suite of southern African coastal seabirds to the Agreement, which was adopted at its 2nd MoP, held in Bonn, Germany in September 2002. One of these species, the Cape Gannet *Morus capensis*, has been killed by longliners in South African continental waters (see Chapter 3). It is now intended that a Southern African Coastal Seabirds Working Group will be set up by AEWA’s Technical Committee, which will then develop a multi-species action plan to enhance the species’ conservation in the adjoining countries of Angola, Namibia and South Africa. This action plan will *inter alia* address the problem of gannets being killed on longlines.

FAO International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries

The International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries (IPOA-Seabirds) is a voluntary instrument that was endorsed by the FAO Conference in November 1999, following a Technical Working Group meeting and two consultations to discuss and adopt text. In terms of the IPOA-Seabirds, Member States which undertake longline fishing are encouraged to undertake an assessment to ascertain whether seabird mortality occurs, and at what level, and then if thought necessary, to develop and apply a National Plan of Action. States that have adopted NPOA-Seabirds are expected to report biennially to the FAO Committee on Fisheries on their activities. The full text of the IPOA-Seabirds is given in the Appendix below.

This document forms both South Africa’s Assessment and its National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries.

FAO International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing

Following on from proposal made at the 23rd Session of the Committee on Fisheries in 1999, an endorsed by the FAO Ministerial Meeting on Fisheries the next month, an Expert Consultation on IUU Fishing was convened in Sydney, Australia in May 2000, followed by Technical Consultations in Rome, Italy in October 2000 and February 2001. The International Plan of Action – IUU Fishing developed at these three meetings was adopted by the 24th Session of the FAO’s Committee of Fisheries in March 2001 and endorsed by the FAO Council at its 120th Session in June 2001.

The objective of the IPOA-IUU Fishing “is to prevent, deter and eliminate IUU fishing by providing all States with comprehensive, transparent measures by which to act, including through appropriate regional fisheries management organizations established in accordance with international law”. The IPOA calls for States to adopt national legislation and to join regional agreements to control IUU fishing and to develop and implement National Plans of Action.

Since IUU fishing vessels are not expected to practice mitigation measures, their bird catch rates are thought to be high. Thus, any action that reduces IUU fishing will serve to reduce the mortality of seabirds by a substantial amount in this fisheries where IUU fishing is rife.

To date, South Africa has not as yet acted to produce its NPOA-IUU Fishing.

Convention on the Conservation and Management of Fishery Resources in the South-East Atlantic

This new regional convention was opened for signature in April 2001. SEAFO aims to improve the management of living marine resources on the high seas by coastal states bordering the South-East Atlantic Ocean. These states are Angola, Namibia, South Africa and the United Kingdom (in respect of St Helena and its dependencies, which include the Tristan da Cunha and Gough Islands). The objective of the Convention is to “ensure the long-term conservation and sustainable use of the fishery resources in the Convention Area...”. “Living marine resources” are specifically defined to include seabirds. A general principle is to take “...due account of the impact of fishing operations on ecologically related species such as seabirds...”. Further, Article 7 of the Convention states that the precautionary approach shall be applied widely to “...preserve the marine environment”. It is thus clear that State members will be obliged to avoid seabird mortality by longline fisheries within the Convention Area, which includes all South African continental waters west of 30°E. The Convention Area (which extends to 50°S) does not include the Prince Edward Islands.

The Convention has not yet been ratified by South Africa and is not yet in force.

Agreement on the Conservation of Albatrosses and Petrels

The Agreement on the Conservation of Albatrosses and Petrels (ACAP) was opened for signature in June 2001. ACAP is a “daughter” Agreement in terms of the Bonn Convention on Migratory Species (see above). Article V.1 of the Bonn Convention states that the object of an Agreement “...shall be to restore the migratory species concerned to a favourable conservation status or maintain it in such a status”.

ACAP notes that albatrosses and petrels are integral parts of marine ecosystems, and that their conservation status can be adversely affected by the “...use and abandonment of non-selective fishing gear, and specifically...by incidental mortality as a result of commercial fishing activities...”. ACAP covers all species of albatrosses and petrels of the genera *Macronectes* and *Procellaria*. This means that nearly all the seabird species (and nearly all individuals) killed by the longline fisheries operating within South African waters are included within the Agreement (see Chapters Three & Four). A general conservation measure of ACAP (Article III, 1c) is to “develop and implement measures to prevent, remove, minimize or mitigate the adverse effects of activities that may influence the conservation status of albatrosses and petrels...”. The Agreement’s Action Plan (Paragraph 3.2.1) requires that “The Parties shall take appropriate operational, management and other measures to reduce or eliminate the mortality of albatrosses and petrels resulting incidentally from fishing activities. Where possible, the measures applied should follow best current practice.” Paragraph 3.2.4 of the Action plan states that “The Parties shall endeavour, within the content of the Agreement, to adopt additional measures to combat illegal, unregulated and unreported fishing activities that may have an adverse effect on albatrosses and petrels.”. It is thus clear that ACAP can (and is intended to) become an important force for reducing seabird mortality from longline fishing.

At the time of writing South Africa has not signed and ratified ACAP, although both Cabinet and Parliamentary approval have been gained to do so. To date, Australia and New Zealand have ratified the Agreement; three more ratifications are required for it to come into force. ACAP has not been signed or ratified by Japan, which did not take part in the negotiation meetings. Taiwan attended the second and final negotiation meeting in Cape Town in January–February 2001 as a [name of body], but has as yet not signalled its intentions in regard to ACAP.

2.4 International resolutions

United Nations General Assembly

The United Nations Conference on Environment and Development (UNCED) addressed the issue of fisheries bycatch under its Agenda 21. It promoted the use of selective fishing gears and processes that minimize catch of non-target species.

In November 1994 at its 49th Session the United Nations General Assembly adopted a resolution which referred to fisheries bycatch provisions and mitigation practices. Four years later in 1998, the 53rd Session of the General Assembly adopted a resolution noting its concern with “reports of the continued loss of sea birds”, following the report of the UN Secretary General to the General Assembly on the subject of “Oceans and the Law of the Sea”, which included information on seabird mortality from longline fishing.

World Conservation Union

In the last decade the World Conservation Union (IUCN) has adopted a number of resolutions and recommendations at its meetings that have addressed incidental mortality of seabirds by marine fisheries, including longlining.

[Recommendations 18.35 and 18.36 of the 18th Session of the IUCN General Assembly]

Resolution 19.61 “By-catch of non-target species” adopted at the 19th General Assembly of IUCN in Buenos Aires, Argentina in January 1994 noted that seabirds could have their breeding populations significantly reduced as a result of fishery by-catch. It urged “States to require fishing vessels to adopt all; reasonable measures to minimize the by-catch of non-target species, including if necessary limiting the catch of target species, to maintain dependent species above levels at which their reproduction may become seriously threatened.”

At IUCN’s first session of the World Conservation Congress (that replaced General Assemblies), held in Montreal, Canada in October 1996, two resolutions addressed seabird mortality from longline fishing. Resolution 1.15 “Incidental Mortality of Seabirds In Longline Fisheries urged States to act to reduce mortality. Resolution 1.16 “Fisheries By-catch” also called for a reduction in seabird mortality caused by fisheries. At the same meeting, Recommendation 1.110 “Antarctica and the Southern Ocean” also called for such a reduction of mortality, referring specifically to southern albatrosses.

Four years later, at IUCN’s second session of the World Conservation Congress, held in Amman Jordan in October 2000, Resolution 2.66 “Pirate fishing and seabird mortality from longlining in the Southern Ocean and adjacent waters called on States to combat pirate (IUU) fishing, noting that it lead in the Southern Ocean to the deaths of large numbers of albatrosses and petrels. At the same session, recommendation 2.75 “Southern Hemisphere albatross and petrel conservation” called on relevant States to implement their NPOA-Seabirds. Lastly, Resolution 2.54 “Antarctica and the Southern Ocean” at this meeting also referred to the issue.

South Africa (a State Member of IUCN) voted in favour of all the above resolutions and recommendations.

Antarctic Treaty Consultative Meeting

At the 23rd Meeting of the Antarctic Treaty, held in Lima, Peru in May-June 1999, a resolution was adopted that supported the efforts of CCAMLR to reduce IUU fishing that causes much seabird mortality in the Southern Ocean by way of adopting a catch documentation scheme.

Chapter Three

Seabirds at risk from longlining in South African waters

3.1 Introduction

A total of 19 species of seabirds has been recorded as being killed by longline fisheries within South Africa's territorial and EEZ waters around the sub-Antarctic Prince Edward Islands and the African Continent. Of these, nine are albatrosses (Family Diomedidae) and seven are petrels (Procellariidae). Other species known to have been killed are the Macaroni Penguin *Eudyptes chrysolophus* (Spheniscidae), Cape Gannet *Morus capensis* (Sulidae) and Subantarctic Skua *Catharacta antarctica* (Stercorariidae). Unlike in the northern hemisphere, no gulls (Laridae) have been reported killed on longlines in South African waters.

Available knowledge is summarized for each species reported killed on its taxonomy, identification, distribution (both breeding and at-sea), population size and trends, breeding, foraging behaviour and diet, and conservation status. The South African fisheries known to kill the species are listed, along with what information is available on mortality levels.

3.2 Species accounts

Wandering Albatross *Diomedea exulans*

Taxonomy and identification: One of the five species of congeneric great albatrosses, recently separated specifically from the Tristan Albatross *D. dabbenena* of Gough and Inaccessible Islands. A very large albatross, primarily white with black upper wings which become progressively whiter with age. The bill is pink. Juveniles are brown with white face and under wings.

Distribution: Breeds on the sub-Antarctic South Georgia (UK), Prince Edward (SA), Crozet, Kerguelen (France) and Macquarie Islands and once bred on Heard (Australia). At-sea distribution encompasses the Southern Ocean extending north to 30°S. A deep-water species, it is uncommon on continental shelves, although numbers may gather at certain localities, such as in eastern Australia. Birds banded at Marion Island have shown movements to Australian and South African continental waters. Banded birds from South Georgia and the Crozets have reached the African Continent. Satellite-tracking shows that birds breeding at Marion Island forage in the southern Indian Ocean, with non-breeding birds making the largest movements. Males tend to forage farther south than do females.

Population size and trends: Total annual population estimated in 1998 as 8438 breeding pairs, equivalent to a mature population of 28 000 individuals and an estimated 55 000 birds in total. In summer 2001/2002 the Prince Edward Islands supported 3723 breeding pairs based on counts of incubating birds (Marion 1869, Prince Edward 1854). Using this updated total, the Prince Edward Islands supports 41% of the species' annual breeding population. Overall, populations of Wandering Albatrosses have decreased at breeding localities where long-term monitoring has been undertaken. At the Prince Edward Islands, the breeding population decreased between the 1970s and 1980s at a rate of – 1.5% a year, remained relatively constant in the 1980s and increased during the 1990s at a rate of *c.* 5% a year.

Breeding: Successful breeders are biennial, since courtship, incubation and chick-rearing take up to 14 months. At the Prince Edwards, a single egg is laid in December-January in large nest made of surrounding vegetation. Eggs hatch February-March and chicks fledge during November-January. Breeding success (number of chicks fledged expressed as a percentage of eggs laid) is of the order of 75%. Pairs typically mate for life, commencing to breed at 10 years of age on average.

Foraging behaviour and diet: Feeds by surface seizing fish and squid, primarily by day. Follows ships and scavenges on discarded galley refuse and fishery wastes. Can dive to about one metre below the sea surface.

Conservation status: Listed as Vulnerable in both the international (IUCN) and South African Red Data Books. Mortality from being caught and drowned on longline hooks set in the Southern Ocean for tuna *Thunnus* spp. and Patagonian Toothfish *Dissostichus eleginoides* is the major threat, leading to a skewed sex ratio with a preponderance of adult males, since more females are killed in the tuna fishery. It is estimated that the Prince Edwards' EEZ toothfish fishery killed 10-25 birds over the period 1996-2000 (<1% of the islands' breeding population). The Prince Edward Islands are a Special Nature Reserve, equivalent to the highest level of international protection. Entry without permit is prohibited in terms of the islands' management plan, which also controls activities ashore, including research. Banded birds from several populations (including the Prince Edwards) have been killed by pelagic longliners in the vicinity of southern Africa. Protected in South African waters under the Sea Birds and Seals Protection Act of 1973.

Tristan Albatross *Diomedea dabbenena*

Taxonomy and identification: One of the five species of congeneric great albatrosses, recently separated specifically from the Wandering Albatross *D. exulans* of the Prince Edward Islands. A very large albatross, primarily white with black upper wings which become progressively whiter with age. The bill is pink. Juveniles are brown with white face and under wings. Very difficult to separate from the Wandering Albatross at sea; averages smaller and plumage takes longer to become predominantly white.

Distribution: Breeds only on Gough and Inaccessible Islands in the Tristan group (UK). Previously bred on the main island of Tristan da Cunha. Information from band recoveries, longline mortality and satellite-tracking shows that birds range within the South Atlantic reaching the continental shelves of both southern Africa and South America.

Population size and trends: The Tristan Albatross is almost totally restricted to Gough Island with only a remnant population of 2-3 pairs breeding on Inaccessible Island. The annual breeding population of Gough was estimated as 2400 pairs in 2001, a figure higher than previous estimates of 1500 – 2000 pairs over the period 1956 - 2000, but this may be due to a poor previous breeding year, leading to a larger than normal demi-population in this biennially-breeding species. The total species' population is likely to be less than 10 000 birds. Information on long-term trends is equivocal, with uneven rates of change in different parts of the island.

Breeding: Successful breeders are biennial, since courtship, incubation and chick-rearing takes more than 12 months. A single egg is laid in large grass nests in loose colonies in upland valleys and plains in December, with chicks fledging about a year later. Breeding success is variable (average for one colony over five years 70%, but only 27% for the whole island in 2001). Most failures occurred during chick-rearing. Main age of first breeding was 11 years (range 6-18).

Foraging behaviour and diet: Little known but takes fish and squid, most probably by surface-seizing. Known to be attracted to fishing vessels.

Conservation status: Listed as Endangered in both the international (IUCN) and southern African Red Data Books. Mortality has been recorded from longliners in Brazilian waters (in large numbers) and from close to the coast of southern Africa by pelagic tuna longliners. The species has been recorded associating with demersal longliners fishing in Tristan waters, but there are as yet no records of mortality. Both populations are protected by the Tristan da Cunha Conservation Ordinance of 1976 and its subsequent amendments. Gough and Inaccessible Islands are Nature Reserves with existing management plans that strictly control activities ashore. Gough Island and its territorial waters are a World Heritage Site. There is a small possibility the bird may have commenced to breed once more on the main island of Tristan da Cunha. Protected in South African waters under the Sea Birds and Seals Protection Act of 1973.

Grey-headed Albatross *Thalassarche chrysostoma*

Taxonomy and identification: One of the southern mollymawk group of albatrosses, recently separated taxonomically at the generic level from other species. No subspecies described. A medium-sized albatross with a white body and black upper wings and tail. The bill is black with, when adult, yellow stripes on top and bottom. The head is grey. The juvenile has all-dark underwing and dark bill, easily confused with the juvenile Black-browed Albatross.

Distribution: Breeds on Diego Ramirez and Ildefonso (Chile), South Georgia (UK), Prince Edward (SA), Kerguelen and Crozet (France), Macquarie (Australia) and Campbell (New Zealand) Islands. At-sea distribution encompasses the Southern Ocean north to 35°S off southern Africa. It is a deep-water mollymawk, uncommon on continental shelves. Breeding birds from Marion Island have been satellite-tracked, travelling to areas of high productivity at both the Sub-tropical and Polar Antarctic Fronts.

Population size and trends: The total annual population was estimated as 92 300 breeding pairs in 1998, representing *c.* 250 000 mature individuals or 600 000 birds in total. In summer 2001/2002 the Prince Edward Islands supported 8126 pairs (Marion 6629 pairs, Prince Edward 1897 pairs), *c.* 9% of the species' annual breeding population. The species has decreased a several localities (South Georgia, Campbell) where long-term data sets exist. The breeding population at the Prince Edward Islands appeared stable between the mid-1980s and 1990/91, and then increased to 1998/99 at a rate of +3.6% a year, followed by a large decrease (28%) in 1999/2000.

Breeding: Grey-headed Albatrosses are biennial breeders, the only southern mollymawk that is. At the Prince Edward Islands, single eggs are laid on pedestal mud nests on cliffs in colonies (Grey-headed Albatross Ridge and other sites, Marion and Albatross Valley, Prince Edward) in October. Chicks fledge in April-May. Breeding success at Marion Island has varied from xx to yy% (mean of xx years, yy%). Fidelity to mate is high, with breeding commencing at about xx years of age.

Foraging behaviour and diet: A mainly surface-feeder on squid and fish, as well as on krill in high latitudes. Also scavenges on carrion and behind ships, but less commonly than other mollymawks. Feeds nocturnally as well as during the day. Able to plunge dive to a depth of 15 m.

Conservation status: Listed as Vulnerable in both the international (IUCN) and southern African Red Data Books. Mortality from both tuna and Patagonian Toothfish longline fisheries is considered to be the major threat. The toothfish fishery around the Prince Edwards kills mainly adult male birds. An estimated 1150-2650 birds were killed by the sanctioned and the illegal toothfish fishery within the Prince Edwards' EEZ during the four-year period 1996-2000 (5-12% of the islands' annual breeding population, a level not considered sustainable). The Prince Edward Islands are a Special Nature Reserve, equivalent to the highest level of international protection. Entry without permit is prohibited in terms of the islands' management plan, which also controls activities ashore, including research. Protected in South African waters under the Sea Birds and Seals Protection Act of 1973.

Indian Yellow-nosed Albatross *Thalassarche carteri*

Taxonomy and identification: One of the southern mollymawk group of albatrosses, recently separated taxonomically at the generic level from other species, and specifically from the Atlantic Yellow-nosed Albatross *T. chlororhychos*. A small albatross with a white body and head and black upper wings and tail. Adults have a black bill with a yellow stripe along the top and cherry-red tip. Juveniles are similar to adults but the bill is black.

Distribution: Restricted as a breeding bird to the southern Indian Ocean (Prince Edward (SA), Amsterdam, St Paul, Crozets and Kerguelen (France) Islands. Does not breed on Marion Island. Known at-sea distribution extends from continental South African to Australian and New Zealand waters. Regularly visits continental shelves of southern Africa and Western Australia. There are no banding or satellite-tracked movements from Prince Edward Island.

Population size and trends: The total breeding population has been estimated as 36 500 pairs, corresponding to 160 000 – 180 000 individuals. In summer 2001/2002 the Prince Edward Island colony in Albatross Valley was estimated to contain 4869 pairs, or c. 13% of the total breeding population. Little information is available on trends at Prince Edward Island. The Amsterdam Island population decreased at a rate of 3.6% a year over the period 1978 to 1995.

Breeding: An annual breeder, laying a single egg in the austral summer in September on pedestal mud nests on cliffs, sometimes in mixed colonies with Grey-headed Albatrosses on Prince Edward Island. Chicks fledge in March-April. The species' ecology has not been studied at Prince Edward Island.

Foraging behaviour and diet: Forages by day and night on squid and fish. Follows trawlers in continental waters, scavenging on discards. Feeds mainly on the surface but is able to make shallow plunges after prey.

Conservation status: Listed as Vulnerable in both the international (IUCN) and southern African Red Data Books. Mortality from both tuna *Thunnus* spp. and Patagonian Toothfish *Dissostichus eleginoides* longline fisheries is considered to be the major threat. The toothfish fishery around the Prince Edwards kills mainly adult male birds. An estimated 510-1180 birds were killed by the sanctioned and the illegal toothfish fishery within the Prince Edwards' EEZ during the four-year period 1996-2000 (3-7% of the islands' breeding population, a level probably not sustainable). The Prince Edward Islands are a Special Nature Reserve, equivalent to the highest level of international protection. Entry without permit is prohibited in terms of the islands' management plan, which also controls activities ashore, including research. Prince Edward Island is uninhabited, and very few visits are allowed, when strict quarantine measures are imposed. Protected in South African waters under the Sea Birds and Seals Protection Act of 1973.

Atlantic Yellow-nosed Albatross *Thalassarche chlororhychos*

Taxonomy and identification: One of the southern mollymawk group of albatrosses, recently separated taxonomically at the generic level from other species, and specifically from the Indian Yellow-nosed Albatross *T. carteri*. A small albatross with a white body and black upper wings and tail. The head is washed grey other than a white fore-crown. When adult the black bill has a yellow stripe along the top.

Distribution: Breeds only within the Tristan da Cunha Group and Gough Island (UK) in the South Atlantic. Known at-sea distribution from banding and longline recoveries extends across the south Atlantic between xx and yy°S. Common on South American and southern African continental shelves. Satellite-tracking has been undertaken on birds from Gough Island.

Population size and trends: The total breeding population has been estimated roughly as 36 800 pairs, corresponding to 165 000 – 185 000 birds. More recently the Gough island population was estimated as 5250 breeding pairs in the 2000/01 breeding season. Trends are only available for Gough Island, suggesting a decrease from 1982 to 1995, followed by an increase. However, these conclusions are based on trends in a small study colony only.

Breeding: Breeds annually (not all pairs), laying a single egg on mud pedestal nests in loose colonies among sometimes thick vegetation. Eggs are laid September and chicks fledge in April-May. Breeding success on Gough Island averaged 66.2% over the period 1982 to 2001. Average age of first breeding was 10 years. Pairs show high fidelity to mate.

Foraging behaviour and diet: Not well known. Forages on squid and fish. Follows trawlers and longliners in continental waters, scavenging on discards and taking baited hooks. Feeds mainly on the surface but is able to make shallow plunges after prey.

Conservation status: Listed as Lower Risk/Near Threatened in the IUCN Red Data Book and as Near-Threatened on the South African version. The category of threat is currently being re-assessed, with an aim to reclassify it as Vulnerable. It is taken in numbers (hundreds a year) on longlines off the coast of Brazil, and has been recorded as bycatch of tuna longliners in southern African waters (mainly adults) and in association with both demersal and pelagic longliners fishing around Tristan da Cunha. Past human exploitation in the Tristan da Cunha Islands has now virtually ceased. All populations are protected by the Tristan da Cunha Conservation Ordinance of 1976 and its subsequent amendments. Gough and Inaccessible Islands are Nature Reserves with existing management plans that strictly control activities ashore. Gough Island with its territorial waters is a World Heritage Site. Protected in South African waters under the Sea Birds and Seals Protection Act of 1973.

Black-browed Albatross *Thalassarche melanophrys*

Taxonomy and identification: One of the southern mollymawk group of albatrosses, recently separated taxonomically at the generic level from other species. A medium-sized albatross with a white body and head, with a conspicuous eye stripe, and black upper wings and tail. The bill is yellowish-orange with a reddish tip when adult, but dull grey-black when juvenile. The juvenile has a dark underwing, which becomes white centrally with age, retaining a broader black margin than other mollymawk species.

Distribution: Breeds Cape Horn vicinity (Chile), Falklands and South Georgia (UK), Crozet and Kerguelen (France), Heard and McDonald and Macquarie (Australia), Antipodes, Snares and Campbell (New Zealand) Islands. At-sea distribution includes most of the Southern Ocean. The species is abundant on the continental shelves of Africa, Australia, South America and New Zealand. Satellite-tracking and band recoveries show that birds reaching South African continental waters are mainly from the South Georgian population. The species does not breed on the Prince Edward Islands (although single birds have occasionally been seen ashore) but does occur within the islands' territorial waters and EEZ.

Population size and trends: The most abundant albatross of the southern hemisphere, with an estimated breeding population of 682 000 pairs, approximating to a total population of three million birds. Eighty per cent of the species' population occurs in the Falkland Islands. Recent decreases have been recorded in the Falkland, South Georgia and Kerguelen populations.

Breeding: An annual breeder, laying a single egg on mud pedestal nests in sometimes vast colonies, usually but not always on coastal cliffs. Breeding takes place from September to April.

Foraging behaviour and diet: Feeds by surface-seizing and shallow-plunging. Similarly to the other southern mollymawks, feeds on fish, squid, krill and carrion (especially fishing discards and offal). A notable ship follower, concentrating in sometimes large numbers behind fishing vessels (both longliners and trawlers) on continental shelves.

Conservation status: Listed as Lower Risk/Near Threatened in the IUCN Red Data Book and as Near-Threatened in the South African version. Because of the alarming decrease of the very large Falklands Islands' population (estimated as 25% in the last 20 years, for 70% of the total species' population), the Black-browed Albatross has been subsequently recommended for reclassification as Vulnerable. The major threat is from longline fishing mortality, as reported from a number of fisheries throughout its range, due to the species' habit of visiting continental shelves where fishing levels are generally high. Some populations benefit from discards, leading to complex interactions with fisheries. An estimated 20-50 birds were killed by the sanctioned and the illegal toothfish fishery within the Prince Edwards' EEZ during the four-year period 1996-2000. Birds have been reported killed in pelagic tuna and Swordfish (both domestic and foreign-licensed) and demersal hake *Merluccius* spp. longline fisheries within South Africa's continental EEZ.

Most birds killed were juveniles and sub-adults in summer. Protected in South African waters under the Sea Birds and Seals Protection Act of 1973.

Shy Albatross *Thalassarche cauta*

Taxonomy and identification: One of the southern mollymawk group of albatrosses, recently separated taxonomically at the generic level from other species. The specific status is unsettled, with several subspecies being recently accorded full species status. The New Zealand populations have been accorded full species status as the White-capped Albatross *T. steadi*, but are included within *T. cauta* here as a subspecies. A medium-sized albatross with a white body and head and black upper-wings and tail. The bill is a grey-horn colour with a yellowish tip when adult.

Distribution: Breeds on three small islands off Tasmania (Australia) and on the Antipodes Islands (New Zealand). At-sea distribution is widespread but complex: Tasmanian birds from the southern Mewstone colony only reach South African continental waters based on band recoveries, as do New Zealand birds. Measurements of birds killed by longliners in South African continental waters suggest they come from the New Zealand White-capped *T. c. steadi* populations. This uncertainty is likely to be resolved by ongoing genetic studies.

Population size and trends: The breeding population has been estimated as 12 000 [check] pairs (*T. c. cauta*, Australia) and 75 000 (*T. c. steadi*, New Zealand). Total population for the two subspecies combined is of the order of 405 000 – 435 000 birds. Information on trends is poor, but some populations may be increasing.

Breeding: Poorly studied. At least some pairs breed annually (*T. c. cauta*), laying a single egg in colonies in summer in September –November, fledging chicks in April – August, with differences in timing at different colonies.

Foraging behaviour and diet: Poorly studied, but includes fish, squid, cuttlefish and crustaceans taken by surface-seizing and by shallow dives. A ship-follower, the species is attracted to trawlers and longliners in South African continental waters where it feeds on discards and offal.

Conservation status: Listed as Lower Risk/Near Threatened in the IUCN Red Data Book and Vulnerable (but as *T. c. cauta* only) in the South African version. Longline mortality is the major threat, but birds are affected by alien predators and interactions with trawlers in New Zealand. Shy Albatrosses have been recorded killed in numbers by tuna longliners (both domestic and licensed Japanese) within South African continental EEZ waters, mainly as immature and subadult birds caught in summer. Breeding colonies are protected as nature reserves, some fall within World Heritage Sites. Protected in South African waters under the Sea Birds and Seals Protection Act of 1973.

Sooty Albatross *Phoebetria fusca*

Taxonomy and identification: There are two species in this genus, distinctive from all other albatrosses. All-over grey-brown with a noticeable long, pointed tail and long narrow wings. A yellow line along the side of the lower mandible and the lack of contrast on the back is diagnostic of this species when adult. Juveniles have an all-dark bill.

Distribution: Breeds on Tristan da Cunha and Gough Islands (UK) in the South Atlantic, Prince Edwards (SA), Amsterdam, St Paul, Crozet and Kerguelen (France) Islands in the Southern Indian Oceans. At-sea distribution in the Southern Ocean is mainly south of 32°S, more abundant north of the Antarctic Polar Front. Rare on the South African continental shelf. There are no records of movements of Prince Edward birds from band recoveries or by satellite-tracking.

Population size and trends: The total annual breeding population has been estimated as 15 655 pairs, corresponding to approximately 100 000 birds in total. The 2000/01 estimate for the Prince Edwards Islands is 1031 pairs (Marion) and 657 pairs (Prince Edward). Together this represents c. 11% of the species' total population. Long-term trends are known only for the small Crozet population: a decrease of 58% since 1980 (5.1% a year).

Breeding: Breeds biennially if successful, laying a single egg on small colonies on coastal cliffs at the Prince Edward Islands. Lays in October, and fledges in May. Breeding success is often low.

Foraging behaviour and diet: Usually forages by surface-seizing but is able to make shallow dives. May feed primarily at night. Mostly feeds on squid and krill, as well as scavenging on carrion. Does not follow ships as much as do other albatross species.

Conservation status: Listed as Vulnerable by the IUCN Red Data Book, but only as Near Threatened in the older South African Red Data Book. Sooty Albatrosses have been taken on longlines set for tuna in Australian waters and south of Africa. An estimated 10-25 were killed by the sanctioned and the illegal Patagonian Toothfish *Dissostichus eleginoides* fishery within the Prince Edwards' EEZ during the four-year period 1996-2000 (<1% of the islands' annual breeding population). Past human exploitation in the Tristan da Cunha Islands has now virtually ceased. South Atlantic populations are protected by the Tristan da Cunha Conservation Ordinance of 1976 and its subsequent amendments. Gough and Inaccessible Islands are Nature Reserves with existing management plans that strictly control activities ashore. Gough Island with its territorial waters is a World Heritage Site. The Prince Edward Islands are a Special Nature Reserve, equivalent to the highest level of international protection. Entry without permit is prohibited in terms of the islands' management plan, which also controls activities ashore, including research. Protected in South African waters under the Sea Birds and Seals Protection Act of 1973.

Light-mantled Sooty Albatross *Phoebastria palpebrata*

Taxonomy and identification: There are two species in this genus, distinctive from all other albatrosses. All-over grey-brown except for paler grey back with a noticeable long, pointed tail and long narrow wings. A blue line along the side of the lower mandible and paler back is diagnostic of adults; juveniles have an all-dark bill..

Distribution: Breeds on South Georgia (UK), Prince Edwards (SA), Crozet, Kerguelen (France), Heard and Macquarie (Australia) and Auckland, Campbell and Antipodes (New Zealand) Islands. At-sea distribution is mainly south of 40-45°S, more abundant south of the Antarctic Polar Front. Uncommon on continental shelves and very rare in South African continental waters. There are no band recoveries from the Prince Edwards, but a single satellite-tracked breeding bird travelled south of Bouvet Island into Antarctic waters.

Population size and trends: The total annual breeding population has been estimated as 21 600 pairs, corresponding to a species' total of 14 000 [check] birds. The 2001/02 estimate for the Prince Edwards Islands is 1279 pairs (Marion) and 92 pairs (Prince Edward). Together this represents 1.3 % of the species' population. There are no data on long-term trends at the Prince Edward Islands. The species has decreased 13% in 15 years at the Crozets, and at sea in the Prydz Bay region of Antarctica.

Breeding: Breeds biennially if successful, laying a single egg on small colonies on coastal and inland cliffs. Lays in October, and fledges in May - June. Breeding success is often low, birds commence breeding at a late age, so birds are long-lived to compensate.

Foraging behaviour and diet: Usually forages by surface-seizing but is able to make shallow dives. May feed primarily at night. Mostly feeds on squid and krill, as well as scavenging on carrion.

Conservation status: Listed as Lower Risk/Near Threatened in the IUCN Red Data Book and as Near-Threatened in the South African version. Longline mortality is a major threat, recorded in Australian and New Zealand waters by tuna vessels. Mortality has not been reported in the Patagonian Toothfish *Dissostichus eleginoides* fishery around the Prince Edwards, perhaps because the birds forage mainly farther south. A single bird was killed by a tuna fishing vessel that visited South Africa but the locality of capture is unknown. The Prince Edward Islands are a Special Nature Reserve, equivalent to the highest level of international protection. Entry without permit is prohibited in terms of the islands' management plan, which also controls activities ashore, including research. Most other breeding sites are protected as nature reserves with management plans. Protected in South African waters under the Sea Birds and Seals Protection Act of 1973.

Northern Giant Petrel *Macronectes halli*

Taxonomy and identification: Closely related to its congener, the Southern Giant Petrel *M. giganteus*. A very large petrel, plain brown when juvenile, mottled grey-brown when adult. The yellowish bill has a reddish tip which is the main identifying feature.

Distribution: Breeds at South Georgia (UK), Prince Edward (SA), Crozet and Kerguelen (France), Macquarie (Australia), Antipodes, Auckland, Chatham and Campbell (New Zealand) Islands. Occurs at-sea throughout the Southern Ocean, including on continental shelves, and, unlike albatrosses and other petrels, may come ashore away-from natal breeding colonies. Banding recoveries show that birds from the Prince Edward Islands visit continental southern African waters, as do birds from several other breeding localities. One bird banded as a chick on Marion Island has been subsequently found breeding on Prince Edward Island.

Population size and trends: The total breeding population was estimated as 11 500 pairs in the mid 1990s. The 2001/02 estimate for the Prince Edwards Islands is 140 pairs (Marion) and 133 pairs (Prince Edward). Together this represents *c.* 2% of the species' total population. Information on trends is confounded by increased monitoring at some localities. The Marion Island population decreased from the mid 1980s to 1989/90 at annual rate of -1.9%. From 1989/90 to 1997/98 the population increased at a rate of 5.5% a year, followed by a dramatic decrease of -11.3% a year in the last two years of the 1990s. The 2001/2002 Marion Island census is the lowest ever recorded (140 pairs). Elsewhere, Northern Giant Petrels (South Georgia, Crozets (after an earlier decrease)) have increased in numbers in recent years. Numbers at-sea in the Prydz Bay region of Antarctica have decreased.

Breeding: Lays a single egg in summer. Normally nests singly against shelter such as rocky outcrops, but sometimes in small groups. At Marion Island eggs are laid in August and chicks fledge in February. Breeding success at Marion Island averaged 54% in monitored study colonies (over 16 years) and 60% calculated from complete-island counts (over five years). Fidelity to mate is high.

Foraging behaviour and diet: Feeds both at sea and on land, unusually for a procellariiform seabird. Females feed more at sea than do males, which may be able to displace smaller females from seal and penguin carcasses ashore. At sea forages by surface seizing and shallow dives. Feeds by active predation and by scavenging on fish, squid, marine mammals and seabirds.

Conservation status: Listed as Lower Risk/Near Threatened in the IUCN Red Data Book and as Near-Threatened in the South African version. The population crash at Marion Island would suggest that reclassification to Vulnerable is warranted for the South African population at least. Some thousands have been estimated by CCAMLR to have been killed by Patagonian Toothfish fisheries in the Southern Ocean. An estimated 90-190 birds (nearly all adult males) were killed by the sanctioned and illegal toothfish fishery within the Prince Edwards' EEZ during the four-year period 1996-2000 (7-16%

of the islands' population, a level not thought to be sustainable. Giant petrels (unidentified to species) have been reported killed in small numbers in the South African demersal hake longline fishery and by foreign-licensed tuna vessels fishing within South Africa's continental EEZ and in adjacent waters. The Prince Edward Islands are a Special Nature Reserve, equivalent to the highest level of international protection. Entry without permit is prohibited in terms of the islands' management plan, which also controls activities ashore, including research. Protected in South African waters under the Sea Birds and Seals Protection Act of 1973.

Southern Giant Petrel *Macronectes giganteus*

Taxonomy and identification: Closely related to its congener, the Northern Giant Petrel *M. halli*. A very large petrel, plain brown when juvenile, mottled grey-brown when adult (a small percentage of birds are wholly white). The yellowish bill has a greenish tip which is the main identifying feature. This is not so noticeable on juveniles or on birds after death.

Distribution: Breeds on the Antarctic Continent, Diego Ramirez and Isla Noir (Chile), Falkland, South Georgia and Gough (UK), Prince Edward (SA), Crozet and Kerguelen (France), and Heard and Macquarie (Australia) Islands. Occurs throughout the Southern Ocean. Occurs regularly on continental shelves, and, unlike albatrosses and other petrels, may come ashore away from natal breeding colonies. Banding recoveries show that birds from the Prince Edward Islands visit continental southern African waters, as do birds from several other breeding localities. Two birds banded as chicks on Marion Island have been found breeding on Prince Edward Island.

Population size and trends: The total breeding population was estimated as 31 000 pairs in the mid 1990s. The 2001/02 estimate for the Prince Edwards Islands is 1430 pairs (Marion) and 567 pairs (Prince Edward). Together this represents *c.* 6% of the species' total population. Overall most populations have decreased in recent years (although not at South Georgia, where an increase has been recorded). At Marion Island, the breeding population decreased at a rate of -4.0% a year from the mid 1980s to 1990/91, then increased at 6.5% a year until 1994/95. The 1997/98 population was 26% lower than in 1994/95, but subsequently has been stable.

Breeding: Lays a single egg in summer, in small to large loosely-spaced colonies in open sites. At Marion Island eggs are laid in September and chicks fledge in March-April. Breeding success at Marion Island averaged 31% in monitored study colonies (over 10 years) but 42% calculated from complete-island counts (over 11 years). Fidelity to mate is high.

Foraging behaviour and diet: Feeds both at sea and on land, unusually for a procellariiform seabird. Females feed more at sea than do males, which may be able to displace smaller females from seal and penguin carcasses ashore. At sea forages by

surface seizing and shallow dives. Feeds by active predation and by scavenging on fish, squid, crustaceans, marine mammals and seabirds.

Conservation status: Listed as Vulnerable in the IUCN Red Data Book but as Near-Threatened in the earlier South African version. Some thousands have been estimated killed by Patagonian Toothfish *Dissostichus eleginoides* longline fisheries in the Southern Ocean by CCAMLR. An estimated 200-430 birds (mostly adult females) were killed by the sanctioned and the illegal Patagonian Toothfish *Dissostichus eleginoides* fishery within the Prince Edwards' EEZ during the four-year period 1996-2000 (4-10% of the islands' annual breeding population, a level not thought to be sustainable). Giant petrels (unidentified to species) have been reported killed in small numbers in the South African demersal hake longline fishery and by foreign-licensed tuna vessels fishing within South Africa's continental EEZ and in adjacent waters. The Prince Edward Islands are a Special Nature Reserve, equivalent to the highest level of international protection. Entry without permit is prohibited in terms of the islands' management plan, which also controls activities ashore, including research. All Southern Giant Petrel colonies at the Prince Edwards may only be approached within 100 m by special permit, due to their propensity to desert their nests. Protected in South African waters under the Sea Birds and Seals Protection Act of 1973.

Pintado Petrel *Daption capense*

Taxonomy and identification: Two subspecies are recognized, but only the nominate one occurs in the African sector of the Southern Ocean and off southern Africa. A small fulmarine petrel with distinctive chequered black and white pattern on its upper-parts.

Distribution: Breeds on the Antarctic Continent and Peninsula, South Georgia and South Sandwich (UK), Bouvet (Norway), Crozet and Kerguelen (France), Heard and Macquarie (Australia) and Antipodes, Bounty, Campbell and Snares (New Zealand) Islands. At-sea distribution is widespread, from Antarctica to cool temperate waters off the southern continents, including southern Africa.

Population size and trends: The global population has been conservatively estimated to be at least 135 000 breeding pairs, distributed at 248 known breeding sites. Long-term information comes only from Pointe Géologie, Adélie Land, Antarctica, where no clear trend is discernable over the period 1985 to 1999.

Breeding: Lays a single egg in November-December, fledging chicks in February-March.

Foraging behaviour and diet: Feeds by surface seizing small items, but can execute shallow dives from the surface or from flight. A regular ship-follower throughout its at-sea range. Diet includes crustaceans, squid, fish, carrion and fishery discards and offal.

Conservation status: Not considered to be threatened. One bird was killed by the Patagonian Toothfish *Dissostichus eleginoides* fishery at the Prince Edward Islands in 1998/99. Taken in small numbers during line-hauling by the experimental hake longline fishery in South African continental waters in 1994. Five Pintado Petrels were reported as taken by Japanese tuna longliners fishing under license within South Africa's EEZ in the period 1998-2000. Protected in South African waters under the Sea Birds and Seals Protection Act of 1973.

White-chinned Petrel *Procellaria aequinoctialis*

Taxonomy and identification: One of a genus of five large petrels. A large, all-brown petrel save for an inconspicuous (in flight) white chin. The bill is white.

Distribution: Breeds at the Falkland and South Georgia (UK), Prince Edward (SA), Crozet and Kerguelen (France) and Antipodes, Auckland and Campbell (New Zealand) Islands. At-sea distribution in the Southern Ocean is widespread, extending to continental shelves of Africa and South America. Satellite-tracking has shown that breeding birds can undertake very large movements, as far as cool temperate waters. A satellite-tracked bird from the Crozets has reached South African continental waters.

Population size and trends: No good global population estimate exists, but with an estimated two million pairs at South Georgia and 100 000 – 300 000 pairs on Kerguelen it is an abundant bird. Counts at Bird Island, South Georgia reveal a 28% decrease from 1981 to 1998. At-sea numbers in the Prydz Bay region of Antarctica have shown a decrease since 1980/81. Monitoring at Marion Island over four seasons from 1996/97 showed a population decrease of 34% (-14.1% a year).

Breeding: Lays a single egg in burrows it excavates in vegetated areas. Burrows usually have a puddle of water at their entrances. At Marion Island lays eggs in November, fledging chicks in April. Breeding success at Marion was 36% in 1980/81, and 22% in 1991/92 after the removal of feral cats *Felis catus*.

Foraging behaviour and diet: Forages by surface seizing and by making dives to as deep as 10 m when it swims actively underwater. Much of its foraging takes place at night. Diet of breeding birds at Marion Island was comprised of fish, crustaceans and squid. The species is a prolific scavenger behind ships, obtaining galley wastes and fishery discards and offal.

Conservation status: Listed as Vulnerable in the IUCN Red Data Book and as Near-Threatened in the earlier South African version. The major threat to the species is mortality from longline fisheries in all parts of its at-sea range. An estimated 6500-14 000 birds (nearly all breeding males) were killed by the sanctioned and the illegal Patagonian Toothfish *Dissostichus eleginoides* fishery within the Prince Edwards' EEZ during the four-year period 1996-2000 (c. 8-18% of the islands' estimated annual breeding population, a level not thought to be sustainable). The White-chinned Petrel is

the species killed in the highest numbers (80% of all birds) in this fishery. Unlike albatrosses, most White-chinned Petrels were killed on night sets. White-chinned Petrels have been killed in numbers by South African demersal hake longliners, estimated to be at rate of 8000 ± 6400 birds year in 1994 in the then experimental fishery. Seventeen (60%) of 26 birds reported killed by observers in the hake fishery in 2000/01 were of this species. The White-chinned Petrel is also the species most abundantly killed by both domestic and foreign-licensed tuna and Swordfish longliners operating within the South African EEZ. The Prince Edward Islands are a Special Nature Reserve, equivalent to the highest level of international protection. Entry without permit is prohibited in terms of the islands' management plan, which also controls activities ashore, including research. Protected in South African waters under the Sea Birds and Seals Protection Act of 1973.

Spectacled Petrel *Procellaria conspicillata*

Taxonomy and identification: The species has recently been separated as a full species from the White-Chinned Petrel *P. aequinoctialis*. A large all-brown petrel with a white semicircle marking below the eye and a black bill.

Distribution: Breeds only on Inaccessible Island, Tristan da Cunha Group (UK), in the South Atlantic. It may have previously bred on Amsterdam Island (France) in the southern Indian Ocean. At-sea distribution is now largely restricted to the South Atlantic with large numbers to be found on the continental shelf of Brazil, and less commonly but regularly off southern Africa.

Population size and trends: In 1999/2000 the breeding population was estimated as 3800 - 4600 pairs. The global population is thought to not exceed 10 000 birds. This figure is considerably higher than the 1000 occupied burrows estimated in 1982/83, but it is unclear whether this represents a real trend or is due to differences in counting methods.

Breeding. Little known. Lays a single egg in excavated burrows among vegetation in October, fledging chicks in March. There is no information on breeding success.

Foraging behaviour and diet: Little known. Feeds by surface seizing and diving on squid, fish, crustaceans and carrion. Is attracted to fishing vessels where it feeds on discards and offal.

Conservation status: Listed as Critical in the international (IUCN) and as Endangered in the South African Red Data Books because of its single population at serious risk from longline mortality. The species is killed in the hundreds annually by Brazilian longliners. Three (11%) of 26 birds reported killed by observers in the South African hake longline fishery in 2000/01 on the west coast were identified as of this species, although no corpses were returned to port for verification. The species is protected by the Tristan da Cunha Conservation Ordinance of 1976 and its subsequent amendments. Inaccessible Island and its territorial waters are a Nature Reserve with an existing management plans that strictly controls activities ashore. The island has been proposed for World Heritage

status. Protected in South African waters under the Sea Birds and Seals Protection Act of 1973.

Grey Petrel *Procellaria cinerea*

Taxonomy and identification: One of a genus of five large petrels. Upper-parts greyish brown, under-parts white save for greyish under-wing. The bill is yellowish-grey.

Distribution: Breeds at the Tristan da Cunha and Gough (UK), Prince Edward (SA), Crozet, Kerguelen and Amsterdam (France), Macquarie (Australia) and Antipodes and Campbell (New Zealand) Islands. Occurs at sea throughout much of the Southern Ocean but is uncommon in South African continental waters.

Population size and trends: There is no good estimate of the species' total population, but is likely to reach the hundreds of thousands. The Prince Edward Islands population has been roughly estimated as several thousand pairs. No current trend data exist, although the species had decreased in numbers historically, probably due the effects of introduced predators at a number of breeding localities. The species has very recently commenced breeding again at Macquarie Island, following the elimination of feral cats *Felis catus* in 2000.

Breeding: A winter-breeding species, laying a single egg in burrows or in crevices among rocky outcrops. Eggs are laid at Marion Island in March - April and chicks fledge in September - October. In 1979-1980, 1982 and 1984 breeding success was only 13%, reaching zero in three seasons, although these studies was based on only 23 observed burrows. No breeding success data are available for Marion Island after the elimination of feral cats.

Foraging behaviour and diet: Little known. Feeds by surface seizing but is able to dive and swim underwater using its wings. Diet includes fish, squid and crustaceans. Follows and scavenges from behind ships, including fishing vessels.

Conservation status: Listed as Lower Risk/Near Threatened in the IUCN Red Data Book and as Near-Threatened in the South African version. The species' status should be reassessed, since the various threats it faces may warrant a Vulnerable status. Longlining mortality as well as continuing predation by introduced cats and rats *Rattus* sp. at some breeding localities are the major threats. It is the most frequently killed bird in the New Zealand pelagic longline fishery, where mostly females have been killed. An estimated 80-180 birds (nearly all breeding males, caught only in winter months) were killed by the sanctioned and the illegal Patagonian Toothfish *Dissostichus eleginoides* fishery within the Prince Edwards' EEZ during the four-year period 1996-2000 (c. 1-5% of the islands' estimated annual breeding population). The species has not been reported killed by continental South African longliners. The Prince Edward Islands are a Special Nature Reserve, equivalent to the highest level of international protection. Entry without permit is prohibited in terms of the islands' management plan, which also controls activities

ashore, including research. Protected in South African waters under the Sea Birds and Seals Protection Act of 1973.

Great Shearwater *Puffinus gravis*

Taxonomy and identification: Member of a large, widespread genus. A large shearwater, with grey-brown upper-parts and dark brown cap separated by a white collar. Underparts are mainly white with a dark belly patch. The black bill is long and slender.

Distribution: Breeds in the Falkland Islands (UK, very few numbers), Tristan da Cunha Group (Nightingale and Inaccessible) and Gough Island (UK) in the south Atlantic. Undertakes a trans-equatorial migration after breeding into the North Atlantic, but also is common at sea off the Atlantic coasts of South America and southern Africa.

Population size and trends: The global population has been estimated as four to eight million pairs. Trend data are also few, although the species may have increased in numbers on Inaccessible Island in recent years. Historically, the main island of Tristan must have supported a large population before the eradication of lowland tussock grass in which the species breeds and the introduction of domestic cats.

Breeding: Not well known, with no detailed study as yet undertaken. A single egg is laid in burrows excavated in vegetated peat in November. Chicks fledge in April[?]. There is no published information on breeding success.

Foraging behaviour and diet: Forages by surface dives and shallow plunges, swimming actively under-water. Food includes squid and fish but is not well studied at breeding localities. Is not a regular ship-follower, although it does accumulate behind fishing vessels when it takes discards and offal.

Conservation status: Not considered to be threatened. Birds have been reported killed on longlines in Brazilian waters in the southern hemisphere and in the North Atlantic by Canadian and USA vessels. Taken in small numbers during line-hauling by the experimental hake longline fishery in South African continental waters in 1994. Three (11%) of 26 birds reported killed by observers in the hake fishery in 2000/01 were of this species. Great Shearwaters have been recorded associating with demersal and pelagic longliners fishing in Tristan waters, a with single bird being reported killed in the former fishery. The Gough and Inaccessible populations are protected by the Tristan da Cunha Conservation Ordinance of 1976 and its subsequent amendments. Exploitation of eggs and chicks on Nightingale is allowed by the islanders. Gough and Inaccessible Islands and their territorial waters are Nature Reserves with existing management plans that strictly control activities ashore. Gough Island and its territorial waters are a World Heritage Site, a status that is being promoted for Inaccessible as well. Protected in South African waters under the Sea Birds and Seals Protection Act of 1973.

Cape Gannet *Morus capensis*

Taxonomy and identification: One of three closely-related species of gannets. A large essentially white bird with black tail and flight feathers and a golden head and ivory-coloured, dagger-like bill. Juveniles are brown with small white spots. Immatures are variously mottled brown and white. In the hand easily separated from albatrosses and petrels by the absence of external nostrils.

Distribution: Breeds at six coastal islands off South Africa and Namibia. At-sea distribution is primarily coastal, but with some individuals having reached St Paul Island (France) and Australia, where they have attempted to breed. Juveniles migrate as far as West Africa and Mozambique.

Population size and trends:

[to come]

Breeding: Breeds in densely-packed colonies on flat terrain, making a guano nest in which it lays a single egg around September. Chicks fledge in xx. Birds commence breeding at four years of age.

Foraging behaviour and diet: Forages by plunge diving on shoaling pelagic fish, especially Anchovy *Engraulis capensis* and Sardine *Sardinops sagax*. Also scavenges behind trawling and longlining vessels, feeding on discards and offal.

Conservation status: Listed as Vulnerable in both the international (IUCN) and southern African Red Data Books because of its small number of breeding localities and decreasing population (especially in Namibia), thought due to paucity of prey as a result of commercial fishing, oiling, and predation and colonization of breeding space by seals. Longline hooks have been found in the past among Namibian gannet breeding colonies, thought to be from the local hake fishery. Juvenile, sub-adult and adult birds have been reported killed by pelagic longliners operating within southern African continental waters during the period 1998-2000. All three South African breeding colonies are protected as provincial nature reserves (Bird Island, Lambert's Bay, and Bird Island, Algoa Bay) or fall within the West Coast National Park (Malgas Island). Landing without permit is not allowed, and the commercial collection of guano no longer takes place in South Africa. Protected in South African waters under the Sea Birds and Seals Protection Act of 1973.

Subantarctic Skua *Catharacta antarctica*

Taxonomy and identification: One of four species of *Catharacta* skuas, although the taxonomic status is unsettled, Prince Edward Island birds belong to the subspecies *C. a. lonnbergi*, sometimes treated specifically as the Brown Skua. A heavily-built gull-like bird, dark brown with white flashes in the wings.

Distribution: Widespread in the Southern Ocean, it breeds at most sub-Antarctic and southern cool-temperate islands, including the Prince Edwards, as well as on the Antarctic Continent. At sea it occurs throughout the Southern Ocean, reaching the continental shelf of southern Africa.

Population size and trends: No good global estimate exists. In 2000/2001 the Prince Edward Islands' breeding population was counted as 743 pairs. The population at Marion Island may have decreased since the 1970s, perhaps on account of a reduced population of burrowing petrels due in turn to cat predation. Trend data are generally few, but with some evidence of decreases in populations breeding on the Antarctic Peninsula.

Breeding: At Marion Island lays usually two eggs in a grass nest in November with chicks fledging in February, although there is a wide spread in timing.

Foraging behaviour and diet: Feeds both on land and sea by scavenging and kleptoparasitism, on live prey and carrion. Attracted to ships and scavenges from fishing vessels. Its prey is catholic, made up of eggs, chicks and carrion, as well as crustaceans taken by surface-seizing at sea.

Conservation status: Not considered to be threatened. One bird was killed by the sanctioned Patagonian Toothfish fishery at the Prince Edward Islands in 1996/97, leading to an estimate of 10-25 killed by the combined legal and illegal fishery over the period 1996-2000. This represents *c.* 1-2% of the Prince Edward Islands' breeding population. One bird has been reported killed by a pelagic tuna longliner operating within the South African continental EEZ. The Prince Edward Islands are a Special Nature Reserve, equivalent to the highest level of international protection. Entry without permit is prohibited in terms of the islands' management plan, which also controls activities ashore, including research. Protected in South African waters under the Sea Birds and Seals Protection Act of 1973.

Other species

Several other species that occur regularly, some in large numbers, within South African waters have been recorded as being killed by longlines elsewhere in the world, but for which there are no local records. These include the Southern Royal Albatross *Diomedea epomophora* (Vulnerable), Northern Royal Albatross *D. sanfordi* (Endangered), Cory's Shearwater *Calonectris diomedea* and Sooty Shearwater *Puffinus griseus*. Several other affected species of albatrosses have only been recorded in South African waters as very rare vagrants and are therefore not considered further. Lastly, five Macaroni Penguins *Eudyptes chrysolophus* (Vulnerable) were foul-hooked in the body by longlines set for Patagonian Toothfish close to the Prince Edward Islands in 1997/98. Penguins are very rarely caught on longlines elsewhere in the Southern Ocean, and so the species is not considered further.

Chapter Four

Longline fisheries in South African waters

4.1 Introduction

Longline fishing takes place within South African territorial (out to 12 nautical miles) and Exclusive Economic Zone (EEZ, 200 nm, declared in 1977) waters around the sub-Antarctic Prince Edward Islands and the African Continent. With the exception of the tuna fishery, longlining is a relatively new fishing practice for South Africa: most fisheries have only commenced operating in the last two decades. There are two main longline fishing practices: demersal and pelagic. Demersal longline fisheries take place in continental and sub-Antarctic waters. Pelagic longlining (three fisheries) takes place within continental waters and is conducted by both domestic and foreign-licensed vessels. In addition to these “home-water” fisheries, South African-flagged vessels undertake longline fishing outside South African territorial and EEZ waters.

These fisheries are described separately, giving information first on their history and then on the current situation under the heads: targeted species, fishing areas, size, vessel and gear types and fishing methods, seabird mortality, and seabird mortality mitigation regulations and practices.

4.2 Hake longline fishery

History

Demersal longlining for the hakes *Merluccius capensis* (mainly inshore) and *M. paradoxus* (mainly offshore) in southern African continental waters commenced in 1983, mainly off the west (Atlantic) and south coasts, following the first request for a permit in the previous year. Ten permits were issued in 1983 (nine were utilized), reduced to seven permitted vessels in 1984. Six new permits were issued in late 1985, and a further one in 1986, bringing the number of licensed vessels to 14. Unexpectedly good catches of the more valuable Kingklip *Genypterus capensis* (for which there was no quota in the first years of the fishery) resulted in this species being targeted nearly exclusively. Catches of Kingklip peaked at 8684 tonnes in 1986, and hake catches peaked at 5514 tonnes in 1988. In 1989 a quota of 5000 tonnes was set for Kingklip, which was halved the following year, along with a closed season on the south coast to protect spawning fish. By 1990, over-exploitation of Kingklip led to reduced catch rates by this fishery (which allowed large fish to be exploited on broken ground or rocky areas not favoured by trawlers, thereby reducing the size of the spawner stock) and the fishery was closed from the end of 1990. Illegal longlining for hake and Kingklip was reported to have taken place in 1991 and 1992. During this period calls were made to allow longlining to recommence.

In May 1994 a five-year pilot/experimental longline fishery directed at hake began, following a recommendation by the Sea Fisheries Advisory Committee in July 1993. Fishing took place initially on the west coast and then as well on the south coast. Up to May 1995, 55 vessels operated, utilizing a total annual quota of 4000 tonnes. This fleet caught 2204 tonnes of hake in 1994 and 1607 tonnes in 1995. The total quota in 1996 was 4300 tonnes. In the five years of the pilot/experimental fishery the number of vessels varied from 32 to 71 (mean 53). Annual fishing effort varied from 2.5 to 13.4 million hooks. In 1997 the catch of hake was 4478 tonnes, against an allowed quota of 4700 tonnes. Modal fish size for longlined hake of both species in 1997 was 75 cm (range 41-101 cm). In that year other bycatch (totalling 82 tonnes) consisted of sharks, Chub Mackerel *Scomber japonicus*, Jacopever *Helicolenus dactylopterus* and Panga *Pterogymnus lanarius*. In the final year of the pilot/experimental fishery (1998, but extended to March 1999) 4385 tonnes were caught on 443 fishing trips setting 13.4 million hooks. Bycatch totalled 341 tonnes (55% Chub Mackerel, 42% Jacopever and 4% sharks).

Little information is available on seabird bycatch by the 1980s fishery, although catch rates have been reported to be high at one to three (up to 10) White-chinned Petrels and albatrosses being killed on each set.

According to a study, the pilot/experimental fishery in the 1990s resulted in the mortality of large numbers of White-chinned Petrels (estimated 8000 ± 6400 birds in 1994, at a catch rate of 0.44 birds/thousand hooks). Most birds were killed on the West Coast. A few Great Shearwaters and Pintado Petrels were also caught during hauling. No albatrosses were reported killed by the experimental fishery, probably because line-setting took place mainly at night. When line setting extended into predawn hours, more White-chinned Petrels were active and thus were killed, as happened during moonlit nights. There was no significant skewed sex ratio in White-chinned Petrels examined ($n=39$), and most birds were killed in winter months, when the at-sea population of White-chinned Petrels peaks within South African continental waters. In 1996/97 an estimated 499 birds were killed by 75 vessels setting 11.7 million hooks at a rate of 0.043 birds/thousand hooks. This ten-fold reduction from 1994 is considered to have been due to the partial adoption of mitigation measures (primarily restriction to night-setting, ending at least two hours before dawn) that were recommended after the 1994 study.

In 1998 this fishery became a commercial one, as described below, which continues to operate to the present.

Targeted species

Hake, with Kingklip, linefish and sharks as bycatch. Bycatch of Kingklip is not to exceed 10% of the hake allocation, nor are the other bycatch species combined. In 2000 mean fish length was 66 cm for hake (a 4-cm reduction since the end of the experimental fishery in 1997) and 79 cm for Kingklip. Sex ratio in longlined hake is skewed to females.

Fishing areas

Fishing takes place on the continental shelf of South Africa, on the west, south and east coasts extending from Port Nolloth to Port Elizabeth, but concentrated off Cape Point (targeting *M. paradoxus* and Kingklip) and between Mossel Bay and Cape St Francis (*M. capensis*). Fishing depths vary from 50–600 m, with most effort between 350 and 450 m.

Size

In 2000, 193 rights holders with 69 active vessels shared an allocation of 10 000 tonnes. Forty-three applicants were awarded 5250 tonnes, followed by a further 150 applicants being awarded 4759 tonnes on appeal. A total of 15.2 million hooks was deployed for a catch of 6998 tonnes of hake. In 2001, following a moratorium on rights allocations, the initial 43 rights holders were allocated 5691 tonnes, with 41 vessels deploying 14.3 million hooks. A further allocation brought the total allowable catch for 2001 to 10 800 tonnes [correct?].

In 2002, 9825 tonnes were initially allocated to 115 applicants, with 4620 tonnes being caught up to 5 August by 64 vessels setting 10.6 million hooks. A further allocation following appeals has brought the number of successful allocations in 2002 to 141.

Vessel and gear types and fishing methods

Most vessels are 13-40 m in length (modal length 19 m) and undertake fishing trips of three to four days. Inshore-fishing vessels are typically less than 15 m in length and are restricted to setting 4000 hooks a day. Offshore licensees use larger vessels and must fish in water deeper than 110 m, but may use more hooks a day.

The locally developed “bottom double longline” gear is used by most vessels with buoyant safety lines (top lines) attached to the less buoyant bottom line, that carries the hooks, at 50-60-m intervals. Some small inshore-fishing vessels have used a single-line system in shallow waters. Longlines, set daily, are on average 15 km long (up to 30 km), with an average of 9000 (range 1000 – 19 000) hooks (sizes 4/0 – 7/0) attached to the 8-mm diameter bottom line by short leaders at intervals of 1.5 to 2 m. Hooks (mainly “J” type) are individually baited with pieces of Pilchard *Sardinops sagax* and Horse Mackerel *Trachurus trachurus*. Bottom lines are weighted at intervals with concrete blocks, bricks, or stones enclosed in netting. Lines are normally shot after midnight and hauled from first light after the fish (that undertake vertical migration in the water column) return to the sea bed.

Seabird mortality

From August 2000 to the end of 2001, a total of 196 056 hooks was monitored by scientific observers. Twenty-eight bird mortalities were reported, made up of White-chinned Petrels (17, 60%), giant petrels (3, 11%), Spectacled Petrels (3, 11% but identification unconfirmed), Great Shearwaters (3, 11%), and Black-browed Albatrosses

(2, 7%). All but three birds were reported killed off the west coast. Twenty-two birds were reported killed in the second half of 2000, and only six (all White-chinned Petrels from the west coast) in 2001.

For 2000-2001 overall catch rate was 0.14 birds/thousand hooks (0/15 birds/thousand hooks in 2000 and 0.11 birds/thousand hooks in 2001). This translates to an estimated 4213 birds killed by the whole fishery of 29.5 million hooks in an 17-month period, of which c. 2530 were White-chinned Petrels, providing that bird catch rates were similar on both observed and unobserved vessels. In 2001, the slightly lower catch rate resulted in a estimated mortality of 1615 birds, all White-chinned Petrels. Because only a very small percentage (0.7%) of hooks were observed, these estimates must be treated with caution.

Most vessels reported zero bird mortality.

Seabird mortality mitigation regulations

Mitigation measures for the hake longline fishery were gazetted on 2 September 1998 under the terms of the Marine Living Resources Act, 1998 (No. 18 of 1998), and an observer scheme was initiated in 2000 (although no observers were deployed in the first half of 2001). During 2002 and 2003 it is intended that between 15 and 20% of voyages will be have scientific observers aboard (but whose duties will not include compliance functions).

Mitigation regulations to reduce seabird mortality as gazetted consist of:

- All birds caught while fishing by means of a longline shall be released if alive, or if dead be handed over to a fisheries control officer at the end of a voyage.
- Longlines may only be shot during the hours of darkness and gear deployment shall cease at least one hour before nautical dawn.
- Both the main line and the branch lines (snood) must be properly weighted and setting speed must be such that sinking rates are maximized.
- Offal dumping or discharging must be minimized; shall take place on the opposite side of the vessel from that on which lines are hauled; and may not take place during setting of the lines.
- Fishing hooks, fishing line or plastic may not be discarded, except where the removal of the hooks from live discards (e.g. sharks) may endanger the safety of the crew or be detrimental to the survival of the animal.
- Deck lighting shall be kept to a minimum without compromising safety and must be shaded in such a way that the beam is directed towards the deck.
- An approved streamer line (tori line) must be flown during setting of each longline and the said streamer must be deployed directly above the main line, unless two streamers are used, in which case they must be deployed on either side of the main line.
- No person shall discard or abandon any longlining gear at sea.

In addition to the above, Annexure A on seabird by-catch to the 2002 permit conditions for both inshore and offshore hake longlining requires that observers bring back to port whole specimens of seabirds killed, and that in the absence of onboard observers, vessels on a voluntary basis are to return seabirds, or their heads and feet. Vessels without observers are also required to keep records of all birds killed and to report any found with bands. The 2002 permits contain the same provisions as those gazetted in 1998, with some minor rewordings.

Section B of the 2002 permit conditions under the head of Catch Statistics, paragraph 8.3 requires that “A record of the numbers and species of all sea birds killed shall be kept on a daily basis in the prescribed Marine and Coastal Management logbook (HK/LL1). Where species identification is uncertain, heads shall be kept and handed over to the Fishery Control Officer on landing.” This requirement to return heads of unidentified birds (“shall”), contradicts the voluntary requirement to do so in Annexure A, but is in agreement with the gazetted regulations.

Further, all hake longliners are required to be fitted with a functional vessel monitoring system (VMS), although by August 2002 not all vessels had been so fitted, and to use “appropriately thawed” bait and “where necessary, the swim bladders of bait fish punctured to ensure rapid sinking of bait.

Compliance

In 2000 bird-scaring lines were deployed on only 13% of 537 sets monitored by observers, who reported that the seabird mortality mitigation measures were largely disregarded. Observer reports revealed that many fishers remained unconvinced of the necessity for and practicality of bird mitigation measures, as well being concerned with the costs involved. The permit conditions make no attempt to quantify “proper” line weighting or setting speeds.

4.3 Patagonian Toothfish longline fishery

History

Experimental longline fishing by five South African-flagged vessels for Patagonian Toothfish *Dissostichus eleginoides* commenced within the Prince Edward Islands’ EEZ in October 1996, following both applications from fishers and legislation (in August 1996) which made fishing for, carrying or landing toothfish by any vessel within South Africa’s EEZ dependent on the issuing of a deep-water permit. This latter action came after observations and reports of a considerable amount of illegal fishing earlier in the same year. It has been estimated that IUU (Illegal, Unreported and Unregulated) fishing vessels removed over 25 000 tonnes of toothfish from the Prince Edwards’ EEZ in the 18-month period prior to November 1998, with as many as 13 vessels operating at one time.

In 1996, a quota of 1200 tonnes was divided equally among five licensed vessels and 1663 tonnes were caught. A quota of 2500 tonnes, or 500 tonnes a vessel, was set for the 1996/97 CCAMLR fishing season, subsequently increased to 600 tonnes a vessel once year-round fishing was permitted from 1998 (see below). The vessel quota was thereafter reduced in stages to 450 tonnes for each of the five operators for the 2000/01 season. In 1997 six sanctioned vessels set 3.62 million hooks and took 1108 tonnes of toothfish at a rate of 0.306 kg/hook in 13 trips. In 1998 13 trips set 5.58 million hooks and caught 1011 tonnes of toothfish against a total quota of 1200 tonnes. During the short history of this fishery the total catch and catch per unit effort have both dropped dramatically and fish size caught has also been reduced, as has the licensed catch quota.

Target species

Patagonian Toothfish *Dissostichus eleginoides*. Bycatch species include skates and rays Rajidae, grenadiers *Macrourus* spp. and other species.

Fishing areas

Fishing takes place primarily within the 200-nautical mile Exclusive Economic Zone surrounding the Prince Edward Islands (falling within FAO Fishing Area 51, Subareas 58.6 and 58.7 and Division 58.4.4). Longlining is concentrated on sea mounts with depths generally not exceeding 1500 m. At times, South African flagged vessels have fished outside the EEZ within the general vicinity of the Prince Edward Islands, including within Area 51.

Size

Between August 1996 and September 2000, 12 sanctioned vessels undertook 52 fishing trips. Total catch over the period 1997-2001 has been estimated at 7047 tonnes. In the 2000/01 CCAMLR fishing season 224 tonnes of toothfish were caught by five sanctioned vessels fishing within the EEZ. In 2001/02 the total quota was set at 600 tonnes, to be shared among five permit holders utilizing four vessels. A total of nine trips was undertaken, making a total of 340 sets (2.95 million hooks) for a catch of only 177 tonnes within the EEZ.

Vessel and gear types and fishing methods

All but one sanctioned vessel used the Spanish (double-line), hand-baited system. The remaining vessel used the single-line system with an autobaiter during 10 fishing trips. Single lines represented 88% of all sets, averaged 3900 \pm 2400 hooks (range 1000 – 20 000) and took 23 minutes to set on average. Double lines averaged 6300 \pm 2600 hooks (range 1800 – 15 800) and took an average of 62 minutes to set. Lines are set to depths reaching 2300 m, but generally less. From 1998 to 2001 the autobaiter vessel made intermittent use of an underwater-setting funnel. Both fish and squid are used as bait. No similar information is available for the IUU fishery.

Seabird mortality

Because of the high level of coverage (100% in recent years, but note that the percentage of hooks actually observed during hauling can be as low as <10%) by Scientific Observers (operating in accordance with the CCAMLR “Scheme of International Scientific Observation”), the use of satellite-linked Vessel Monitoring Systems (VMS), and the fact that bird corpses are retained aboard and returned to port for study, detailed statistics are available on the mortality of seabirds. Such statistics have been submitted to annual meetings of CCAMLR, of which South Africa is a founder member. These statistics have been studied and reported on by CCAMLR’s *ad hoc* Working Group on Incidental Mortality Arising from Longline Fishing (WG-IMALF, now WG-IMAF).

During the six-year period 1996/97 to 2001/02, estimated annual catch rate decreased from 0.29 birds/thousand hooks to 0.001 birds/thousand hooks (Table 1), and the numbers of birds killed declined from 911 in the first year to only three in the last, despite an increase in fishing effort in the early years. The marked improvement in mortality rates is thought due to a gain in fishing experience, improved compliance with mitigation measures, especially night-setting, and the fact that increased fishing effort in the more recent years took place at greater distances from the islands, where catch rates have been lower. Fifty-five percent of sets were made during the day in the first year of the fishery, decreasing to 1% in 2001/01. Mortality rates were significantly higher on day sets for albatrosses and giant petrels but not for White-chinned Petrels.

TABLE 1

**CHANGES IN ANNUAL SEABIRD BYCATCH RATES AND COMPLIANCE
WITH THE BAN ON DAYTIME SETS IN THE PATAGONIAN TOOTHFISH
FISHERY OFF THE PRINCE EDWARD ISLANDS**

Year	Bycatch rate (birds per 1000 hooks set)			% daylight sets*
	<i>Procellaria</i>	Other birds	All species	
1996/97	0.210	0.079	0.289	55%
1997/98	0.111	0.006	0.117	15%
1998/99	0.012	0.004	0.016	18%
1999/00	0.034	0.002	0.036	19%
2000/01	0.008	0.001	0.009	16%
2001/02	0.001	0.000	0.001	1%

Overall, 1840 birds of 12 species were reported killed by observers from 23 million hooks set, at an average rate of 0.08 birds/thousand hooks. Eighty percent of birds killed were White-chinned Petrels. Most other species killed (see species accounts, Chapter Three) were killed in the first year of the fishery, notably 126 Grey-headed Albatrosses. Most birds were killed during their summer breeding seasons, although Grey Petrels were killed during winter months, when they breed. Most birds killed were breeding adults, assumed to have come from the Prince Edward Islands (as supported by a number of band returns). Albatrosses were caught closer to the islands than were White-chinned Petrels. Most petrels were foul-hooked, whereas albatrosses tended to be caught by the bill.

Dissections of birds killed by the sanctioned fishery revealed that the large majority of several species were breeding males (over 80% for White-chinned and Grey Petrels and Grey-headed and Indian Yellow-nosed Albatrosses) which is likely to cause skewed sex ratios in their breeding populations. Skewed sex ratios would further depress breeding production in the monogamous species affected, which have high fidelity to their mates. The sex bias may be due to the larger males out-competing with females in feeding melees behind fishing vessels.

Using CCAMLR statistics, a four-year analysis estimated that the IUU fishery within the Prince Edwards' EEZ had killed 6800 - 16 700 birds from a minimum of 25 million hooks set. Overall the sanctioned and IUU fisheries were estimated to have killed 8500 - 18 500 birds over the period 1996 - 2000. This level of mortality was considered to be unsustainable for several species, whose populations have decreased at the Prince Edward Islands (see Chapter 3).

In the CCAMLR 2000/01 fishing season the five sanctioned vessels were reported to CCAMLR by South Africa to have killed 76 birds of six species (86% White-chinned Petrels) from 8.07 million hooks set, giving a catch rate of 0.009 birds/thousand hooks. Catch rate per voyage varied from zero to 0.046 birds/thousand hooks. Most birds were caught in the wing or body during setting. A total of 81 birds was released alive after being caught during hauling. The average catch rate was lower than in the three previous seasons.

A somewhat different data set analyzed by CCAMLR for the same season (but for a slightly different set of voyages) reported that catch rate was 0.018 birds/thousand hooks. Estimated mortality (based on percentage of hooks observed) was 199 seabirds (White-chinned Petrel 92%, Black-browed Albatross 4%, Grey Petrel 4%).

In the 2001/02 fishing season reported bird mortality from the four vessels (nine trips, 340 sets, 2.95 million hooks) was restricted to two White-chinned Petrels caught in March-April, and one Grey Petrel killed in an August-September fishing trip; a catch rate of 0.001 birds/thousand hooks. All these birds were caught outside the CCAMLR Area. Within CCAMLR Subareas 58.6 and 58.7 South Africa reported no birds killed (two vessels, three cruises, 131 sets, 1.31 [1.67?] million hooks) for the 2001/02 season.

Seabird mortality mitigation regulations

Independent Scientific Observers travelled on all but two of the 52 sanctioned fishing trips undertaken to the Prince Edwards' EEZ between 1996 and 2000. During 2002 and 2003 it is intended that between 15 and 20% of voyages will have scientific observers aboard (but whose duties will not include compliance functions).

Mitigation measures for South African-flagged vessels in the toothfish fishery have largely followed those of CCAMLR Conservation Measure 29/XIX ("Minimisation of the Incidental Mortality of Seabirds in the Course of Longline Fishing and Longline Fishing Research"; Appendix 2), and its previous versions going back to 1996. Formally, this conservation measure does not apply to "waters adjacent to the Prince Edward Islands", i.e. within South Africa's EEZ, Appendix 2). The regulations may be summarized as:

- Use of a bird-scaring line to CCAMLR specifications.
- Line setting to be only undertaken at night (defined as nautical dusk to dawn, but see below)
- No offal to be discarded during line-setting.
- Offal to be jettisoned on the opposite side of the ship from the hauling station.
- Appropriate line weighting (6-kg weights at no more than 20-m intervals, or 8.5-kg weights at no more than 40-m intervals for the Spanish system).
- Use of thawed bait.

From 1997, fishing has not been allowed within five nautical miles of the Prince Edward Islands, increased to eight nautical miles (and not between the two islands in the group) from 1 December 2001, measures taken to reduce seabird mortality.

From August 1998 to August 2001 a single South African vessel equipped with a Mustad underwater-setting funnel was allowed to set lines in daylight hours, providing the funnel was then used. Use of this funnel in conjunction with a bird-scaring line resulted in a significant reduction in bird mortality, based on an analysis of the seven trips (setting 5.1 million hooks) undertaken. This vessel has not fished within the Prince Edward Islands' EEZ since August 2001.

At its 2001 meeting, CCAMLR-WG-IMALF recommended (subsequently supported by the Scientific Committee) that no hooks be discarded in fish heads, following concerns over the increasing numbers of hooks found associated with seabirds at their breeding islands, including the Prince Edwards. This proposed measure is already largely followed by South African vessels within the EEZ (although primarily due to the retention of toothfish heads for commercial purposes). However, some hook loss still occurs, notably in discarded grenadiers caught as bycatch.

In order to reduce seabird mortality CCAMLR operates a closed season for toothfish longliners within its Convention Area. Fishing is currently only permitted to commence

from 1 May and the season closes on 31 August. The 1 May opening date was chosen following studies that showed a much-reduced bird mortality after the summer-breeding species had fledged their chicks and dispersed away from their breeding localities (around which toothfish fishing occurs). Such reduced mortality in winter months was matched by a noticeable fall off in the numbers of species at risk that were present in fishing waters at several localities within the CCAMLR Convention Area. However, South Africa elected from 31 August 1998 not to impose a closed season within its EEZ around the Prince Edward Islands since it considered that the presence of sanctioned vessels fishing in summer will deter IUU fishing at that time of year. At its 2001 meeting, the CCAMLR Scientific Committee endorsed the recommendation of its WG-IMAF that fishing within its EEZ by South Africa be prohibited in the months of September - April, based on information which showed that mortality of especially White-chinned Petrels was highest in summer months in this fishery (as elsewhere). However, if South Africa continued to consider it necessary to maintain a regulated fishing presence, then fishing within the EEZ should be prohibited from at least January to April. At its two previous meetings (1999 and 2000) WG-IMAF had recommended a January-to-March closed season, especially to reduce mortality of summer-breeding White-chinned Petrels. However, this recommendation should be balanced against the minimal mortality of seabirds in 2001/02 (zero within the CCAMLR Area).

Compliance

Analyses based on observer reports submitted to CCAMLR have shown incomplete compliance with these measures by vessels fishing within the Prince Edwards's EEZ. In the 2000/01 CCAMLR fishing season, five South African vessels fished within the Prince Edwards' EEZ. Compliance was 100% (all vessels fully complied on all sets) with the offal discharge and use of bird-scaring lines measures, but was incomplete (no vessel fully complied) with the line-weighting and night-setting measures (only one vessel fully complied). Additionally, only one vessel had a bird-scaring line manufactured to CCAMLR specifications in terms of length and number and interval of streamers deployed during all sets. One vessel (an autoliner) did not comply fully with the requirement to use thawed bait on all occasions. Further, CCAMLR-WG-IMAF reported at its 2001 meeting that three of the five vessels that fished in 2000/01 had a poor record of compliance with Conservation Measure 29/XIX over the period 1998-2001. As a consequence of this analysis the CCAMLR Scientific Committee recommended to the Commission, as it had for some of the measures in the previous year, that vessels that do not fully comply with night-setting, streamer-line, offal-discharge and line-weighting measures should be prohibited from fishing within the CCAMLR Convention Area. WG-IMAF repeated this call at its 2002 meeting.

At its 2002 meeting WG-IMAF noted high compliance for the three South African cruises (by two Spanish-system vessels) within the CCAMLR Area in the vicinity of the Prince Edward Islands, specifically noting an improvement in night-setting to 99% of sets, from 78% the previous season (Table 1). Two of the three cruises complied fully as to the line-weighting regime, and all three fully complied with design and use of streamer lines, and with offal discharge. However, it was noted that only 9% of hooks were

observed on one cruise (overall 37%). IMAF recommends that at least 25% of hooks should be observed by each vessel to allow for valid statistical estimates of total mortality.

4.4 Shark longline fishery

History

Directed longline fishing for sharks under permit has taken place in South African continental waters since 1991, mainly in winter, although essentially uncontrolled longlining for sharks had taken place in South Africa for a number of years previously [1940s?]. In 1996 the fishery caught 69 tonnes (67% Soupfin Shark *Galeorhinus galeus*). During 1997 the shark fishery reported a total catch of 49 tonnes (68% Shortfin Mako Shark *Isurus oxyrinchus*) and in 1998 270 tonnes (55% Mako Shark). The 1998 catch was the highest since the inception of the fishery.

Target species

Catches consist mainly of Mako Shark, Soupfin Shark, Blue Shark *Prionace glauca*, Cowshark *Notorhynchus cepedianus*, and hound sharks *Mustelus* spp. Bycatch includes tuna species and Swordfish.

Fishing areas

West and south coasts of the Western Province.

Size

Thirteen fishing vessels are currently active in the fishery, although fishing rights were awarded to 21 applicants in 2001 for a four-year period. The catch ranged from 49 to c. 375 tonnes between 1992 and 2001, peaking in 1998.

Vessel and gear types and fishing methods

This fishery is both a pelagic (i.e. mid-water) and a demersal fishery. Vessels are 12 to 23 m in length. Soupfin and hound sharks are targeted by setting lines on the sea bottom inshore waters. Mako and Blue Sharks are targeted by setting lines in the water column offshore. Longlines are weighted to sink immediately on setting when fishing on the bottom.

Seabird mortality

There are no known reports of bird mortality in this fishery.

Seabird mortality mitigation regulations

No mitigation measures are practiced, and there is currently no observer scheme in place, nor is one apparently planned under the new scientific observer programme announced for 2002 and 2003. However, a Chondrichthyan Working Group has been formed to supply management advice to the fishery. In 2002 a draft National Plan of Action for the Conservation and Management of Sharks in South African Waters was produced by Enviro-fish Africa for Marine & Coastal Management, following guidelines set out by the FAO.

4.5 Domestic pelagic fishery

History

Pelagic longline fishing, initially directed at tuna, has the oldest history of all longline fisheries undertaken by South African vessels. Fishing for mainly Albacore *Thunnus alalunga*, Southern Bluefin *T. maccoyii* and Bigeye *T. obesus* Tunas commenced in the late 1950s [1960?] on the West Coast, following the entry of Japanese longliners into the Atlantic Ocean in the 1950s. Catches increased to c. x000 tonnes in 1962 and 1963. Catches then declined to 1500 tonnes by 1965, and became negligible thereafter, with a few vessels switching their longlining activities to other species of fish, including sharks. Exploratory research utilizing longlining had been conducted off the West and South Coasts during the period 1960-1964, leading to the discovery of Albacore, Southern Bluefin and Yellowfin *T. albacares* tunas in numbers (with a significant shark bycatch), but this did not lead to the establishment of a long-term fishery.

Interest in longlining for tuna by South African vessels was reawakened following the developments in demersal longlining directed at hake and Kingklip in the 1980s. An experimental permit issued in 1995 to conduct joint-venture longlining with a Japanese vessel confirmed that tuna of a sashimi-grade quality could be caught, and also showed that high and profitable catches of large, good quality Broad-bill Swordfish *Xiphias gladius* could be made. These catches led to the issuing of 30 experimental pelagic longline permits in 1997, primarily to target tuna species. Longlining caught 47 tonnes of tuna (3 t) and Swordfish (38 t), with shark (1 t) as a bycatch in 1997 (with only one vessel fishing). In 1998 the total catch rose to 644 tonnes, of which 440 tonnes (68%) was Swordfish, taken by 17 vessels.

Although an observer scheme was in operation, there is no direct information on seabird mortality in the early years of this fishery. It is considered most likely that mortality of albatrosses regularly occurred, given that several banded birds were reported caught by longliners in the region, and that no mitigation measures were in place.

Target species

Tunas, mainly Albacore (24% by numbers of individual fish between July 1998 and July 2001), Yellowfin (14%) and Bigeye (7%), and Swordfish (21%). Elasmobranchs (28%), mostly Blue and Mako Sharks, are caught as bycatch. Few Southern Bluefin Tuna have been caught to date by the fishery. Swordfish averaged a mean lower jaw-fork length of 182 cm (range 80-290 cm). Tuna varied from 70 to 190 m fork length. Sharks reached up to 3 m or more in length. Gear damage from sharks is high, leading to movement of fishing positions at times. Minimum length and mass limits for tuna and Swordfish have been set. South African vessels have concentrated on catching Swordfish, but with the phasing out of the foreign-licensed vessels (see below) are likely to switch to targeting the more lucrative tuna species as well.

Fishing areas

From 1997 to 1998 fishing was concentrated between the Namibian border on the West Coast and East London on the East Coast, mostly between 50 and 200 nautical miles offshore, along the edge of the continental shelf. Most recently vessels have also fished farther offshore in the Atlantic Ocean, outside the South African EEZ.

Size

Twenty-four vessels were active in 2002, out of 25 licensed to catch tuna. South Africa declared a Swordfish quota of 1500 tonnes for 2001 and 2002 in terms of the International Commission for the Conservation of Atlantic Tunas (ICCAT). Over the period 1998-2000, South African vessels set an average of 460 000 hooks annually. [more recent statistics available?]. It is intended that the experimental fishery will be reclassified a commercial one from 2003, when it is likely to expand in size, perhaps to as many as 50 vessels, following the non-renewal of foreign-licenses after the end of 2002 (see below).

Vessel and gear types and fishing methods

A variety of vessels is used, ranging from converted trawlers and yachts to chartered and purchased second-hand longliners. Vessels range in size from 18-50 m in length (mean 29 m). Typically, 3-5-mm monofilament fishing gear (American-type) is used, with 17-20-m long buoy lines and 16-m branch lines weighted with 60-g lead swivels positioned 1-3 m from the hook, to allow fishing at a depth of 40 m. Lines are typically set at night, with squid as bait and lightsticks attached within a few metres of the hook, to target Swordfish, and are hauled during the following day. Length of the longline varies from 30 to 40 nautical miles, with 750 to 1500 hooks per set. Catch rates varied substantially with Swordfish CPUE (catch per unit effort) ranging from zero to 9 kg/hook. The fishery remains an experimental one, and may expand to as many as 50 vessels once it becomes a commercial fishery from 2003 (and as foreign-licensed vessels fishing within South Africa's continental EEZ are phased out – see below). Phasing out of foreign vessels may result in some of the domestic fleet targeting tuna, both by adopting heavier

Japanese style gear and by fishing at greater depths. Interest in directing fishing at tuna by South Africans is indicated by the establishment of a training school in Cape Town, set up by Japanese fishers in 2001.

Seabird mortality

During 1998-2001, 36 trips inside the EEZ were accompanied by observers, fishing along the outer edge of the continental shelf between the Orange River and KwaZulu-Natal. Observers reported 101 birds killed on 294 000 hooks, at an average rate of 0.34 birds per 1000 hooks. However, bycatch rates varied greatly among trips, and between different areas within the EEZ. Most birds were killed by vessels fishing off the south and west coasts (30 trips killed 99 birds at an average rate of 0.45 birds per 1000 hooks), with very few killed off the east coast (two birds killed in six trips at an average rate of 0.03 birds per 1000 hooks). These regional differences are determined at least in part by differences in the abundance of seabirds, resulting in fewer birds attending vessels fishing off the east coast than off the south and west coasts.

Most (85%) of the birds reported killed were albatrosses, with smaller numbers of White-chinned Petrels (12%) and giant petrels (3%). Not all birds were returned to port, so the specific identification of the birds killed could not be confirmed. Two birds identified as Great-winged Petrels *Pterodroma macroptera* were likely to have been misidentified, because this species has not been reported to be killed on longlines elsewhere in its range. However, combined with voluntary returns made by vessels without observers, a total of 133 birds of 14 species has been examined. White-chinned Petrels (36%) were killed most frequently, followed by Shy (23%), Black-browed (23%) and yellow-nosed (8%) albatrosses. Both Atlantic (two of five adult birds) and Indian Yellow-nosed Albatrosses (three of five) were killed. The other species all contributed 2% or less of the total bycatch, but included several species of conservation concern: Cape Gannet (3), Grey-headed Albatross (3), Tristan Albatross (2), Wandering Albatross (1), Sooty Albatross (1) and Spectacled Petrel (1). Some of these birds may have been killed outside the EEZ, and some may have come from foreign-licensed vessels, because documentation for many of the birds returned voluntarily is scanty.

Based on 1999 effort (460 000 hooks set within the EEZ), the domestic fleet kills an estimated 150 birds annually. However, fishing effort within this sector has increased rapidly, and so the total number of birds killed currently is likely to be considerably larger than this estimate. Also, to date South African vessels have primarily targeted swordfish, setting most lines at night. If, as envisaged, there is a switch to targeting tuna, more setting is likely to take place during the day, with increased rates of seabird bycatch.

Seabird mortality mitigation regulations

A fishery observer scheme commenced in 1998. In the period 1998-2000, c. 17% (80 039) of hooks set were observed on 11 trips within the EEZ. During 2002 and 2003 it is intended that between 15 and 20% of voyages will have scientific observers aboard (but whose duties will not include compliance functions).

Seabird mortality regulations for the experimental fishery, introduced from 1999[?] in terms of the Marine Living Resources Act, 1998 and the Sea Birds and Seals Protection Act, 1973, are described in permits as follows:

- All tuna longline operators fishing in South African waters will be required to use a tori pole and bird line during setting of longlines.
- An appropriate streamer line (tori line) must be flown for each line that is set. The streamer line must be deployed directly above the main line, unless two streamers are used in which case they must be deployed on either side of the main line.
- Both the main line and the branch lines (snood) must be properly weighted to ensure optimal sink rates.
- Dumping of offal must be minimized. Offal dumping must take place on the side opposite to where hauling occurs. No dumping of offal may take place during setting.
- No hooks may be discarded; all hooks must be removed from offal and fish by-catch before these are dumped.
- Observers on board shall bring back whole specimens of all seabirds killed in the EEZ of South Africa. When no observer is on board and if the vessel returns to a South African Port after its fishing operations, the vessel shall, on a voluntary basis, bring all seabirds killed (or their heads and feet) to the port and notify the Senior Manager: Resource Management, fax no. 021-421-7406. Attention: Seabird Section, Dr R Crawford, for collection. To cater for the eventuality that the vessel may dock, all seabirds killed (or their heads and feet) in the South African EEZ shall, on a voluntary basis, be preserved on board and may only be discarded on leaving South African waters when no docking occurred. Records must be kept on catch forms of all birds killed during longline operations, numbers killed and species identification (as accurately as possible). Seabird mortality forms and a seabird identification chart will be provided with the license. After each trip, a reporting form must be returned to the Senior Manager: Resource management: Attention; Dr Rob Leslie, Private Bag X2, Roggebaai, 8012, fax no. 021-421-7406. This measure shall be evaluated after the first 6 months of the license.
- All information contained on bands recovered from seabirds must be reported to Central Data Bank for Antarctic Bird Banding, SAFRING, University of Cape Town, Rondebosch 7701, South Africa, or faxed to +27 21 689 7578. Where possible the whole specimen plus the band should be retained (frozen) and returned to port.
- All bait must be appropriately thawed, and where necessary, the swim bladders of bait fish punctured to ensure rapid sinking of bait.
- Preferably, lines should be set at night (defined by nautical dawn/dusk). During setting of lines at night, deck lighting must be minimized without compromising crew safety. Deck lights shall be shaded and where possible, directed downwards towards the deck to minimize light on sea, without compromising the safety of the crew.

Compliance

Compliance with the above regulations is reported to be poor, with no bird-scaring lines deployed on any vessels carrying observers in 1998-2000. Excessive deck lighting at

night may account for the unusually large numbers of albatrosses caught at night. In at one case, an estimated 40 albatrosses were killed during a fishing trip in 2002, none of which was retained. Most lines (94% in 1998-2000) are set at night, but this is a requirement for targeting Swordfish, rather than the result of applying a mitigation measure. This requirement may lessen if some vessels in the fleet switch to targeting tuna (see above). Observers did not comply well with the requirement to bring back corpses of birds killed.

4.6 Foreign-licensed pelagic fishery

History

Longlining for tuna by Japanese and Taiwanese vessels is the oldest commercial longline fishery practiced in South African waters. Japanese vessels commenced longlining for tuna in the Indian Ocean in 1952 and in Atlantic Ocean in 1956. Taiwanese vessels started longlining from the late 1960s. In the 1960s some South Korean vessels also fished in the region. Since the 1970s, vessels from both Japan (1977) and Taiwan (1978) have been issued with permits to undertake pelagic longlining in South African waters, in terms of bilateral fisheries agreements. Catches peaked in the early 1990s. In 1994, 90 Japanese and 30 Taiwanese vessels reported a total catch of 9320 tonnes of tuna, Swordfish, sharks and other species. In 1996 quotas of 600 and 50 tonnes of Swordfish were allocated for Japanese and Taiwanese permit holders, respectively. In 1998 the combined foreign fleet set 11.4 million hooks.

No historical information in bird mortality is available, other than a few reports of banded albatrosses caught by foreign fishing vessels in the vicinity of southern Africa.

The numbers of vessels licensed has been successively decreased from 100 to 55 in the case of Japan, and from 60 to 12 for Taiwan. From June 2001 Japanese vessels have not been allowed to fish within 24 nautical miles of the shore (so as to protect the domestic fishery) and must carry observers and vessel monitoring equipment (Inmarsat C). No more fishing permits will be issued to Japan and Taiwan after the end of 2002, allowing for an expansion of the South African domestic fishery. The ending of the bilateral agreement with Japan may result in joint-venture arrangements in the future.

Targeted species

Over the years, Japan has mainly targeted Southern Bluefin, Bigeye and Yellowfin Tuna, whereas Taiwan has concentrated on Albacore, Bigeye Tuna and Swordfish. Inshore-fishing Taiwanese vessels targeting Albacore have also caught substantial numbers of sharks (for their fins).

Fishing areas

Foreign-licensed vessels have fished off all the South African coasts in both Indian and Atlantic waters, concentrating on the South and East Coasts. Fishing tends to be concentrated on the continental shelf edge. Japanese vessels tend to be concentrated in Atlantic waters, while Taiwanese vessels have fished more in the Indian Ocean [check].

Size

Fishing took place all year. The total Japanese catch from 1997 to 2000 was 12 394 tonnes, of which 46% was Yellowfin Tuna, 27% Bigeye Tuna, 13% Albacore, only 2% Southern Bluefin Tuna, 7% Swordfish and 2% sharks. In 1999 a combined foreign fleet (86 Japanese and 24 Taiwanese) set a total of 5.6 million hooks within the South African continental EEZ. In 2002 55 Japanese and 12 Taiwanese vessels were licensed.

Vessel and gear types and fishing methods

Vessels averaged 53 m in length in the Japanese fishery. Foreign-licensed vessels used woven monofilament lines with long branch lines (average 37 m) weighted with short lengths of lead-core rope attached near the main line. Buoy lengths were about 17 m, and main lines averaged 45 nautical miles in length. Bait consisted of squid and fish. Japanese vessels set their lines at night, but without the use of lightsticks. In 1998-2000 one Japanese vessel used an automatic bait-casting machine.

Taiwanese vessels set lines from 03h00 to 04h00 using lines hand-baited with squid and fish. Branch lines were weighted with leaded swivels about 15-20 m from the hooks. Because tuna were generally frozen whole, little offal is discarded.

Seabird mortality

Dockside interviews conducted in 1996 with 25 skippers of licensed Taiwanese longliners showed that bird mortality during setting occurred regularly, with the Yellow-nosed Albatross being the most frequently-caught species, as identified from pictures. Other taxa identified as being caught were great albatrosses *Diomedea* spp., Shy Albatross, Black-browed Albatross, giant petrels, White-chinned Petrel and Pintado Petrel.

Observers placed aboard two Japanese licensed vessels fishing within the South African EEZ in 1998-2000 observed only 1.0% (63 221 hooks, 26 sets) of 6.6 million hooks set annually by Japan. There were no observers aboard Taiwanese vessels, (4.8 million hooks set) during this period. The two Japanese longliners fished off the South and East Coasts and killed 167 birds, at a bycatch rate of 2.64 birds/thousand hooks. All but three of this total were killed by one vessel which made 12 sets. Nearly all the birds reported killed (165) were from the South Coast. Of the birds killed, 101 (61%) were reported as albatrosses (specific identity uncertain), 61 (37%) were White-chinned Petrels and five were Pintado Petrels, although the latter species may have been misidentified. None of

the reported birds were retained for expert identification. The high catch rate by one Japanese vessel is noteworthy, both when compared to other longline fisheries, and that large numbers of albatrosses were killed during night-setting (see below).

Data from observers in the Japanese Real Time Monitoring Programme reported bycatch on tuna longliners off southern Africa in the 1990s of 0.36 birds/thousand hooks. This statistic includes fishing in oceanic waters where bycatch rates are lower.

It has been estimated that the combined South African and foreign-licensed pelagic longline fishery resulted in an annual mortality of 19 000 – 30 000 birds, a level stated to be much higher than estimated for similar fisheries off Australia, Brazil and New Zealand, due primarily to high catch rates.

Seabird mortality mitigation regulations

Permit regulations set from 1999 for both Japanese and Taiwanese vessels required the use of bird-scaring lines during setting, adequate line-weighting to ensure “optimal sink rates”, and not to dump offal during setting. Bird corpses must be collected and returned to port for identification, but setting was not restricted to night-time. [check]

Both Japan and Taiwan have produced National Plans of Action, following the FAO initiative.

In terms of the Japanese NPOA-Seabirds, dated February 2001 and then tabled at the 23rd Session of the FAO Committee on Fisheries, distant-water tuna longliners in the "Southern Bluefin Tuna area" are obliged to use bird-scaring lines, and to release birds caught alive, after removing hooks if possible. Disposal of offal during setting is to be avoided as much as possible. Additionally, one or more of the following measures should be applied "taking into account the situation of seabirds gathering and sea conditions":

- Night line-setting.
- In baiting, the use of weighted branch line or cone (sic) which sink as speedily as possible after line setting.
- The use of automatic bait casting machine.
- The use of properly defrosted (sic) bait.

Lastly, seabird mortality is to be reported to the "central government" of Japan.

It is not clear whether these national regulations were meant to apply to vessels licensed to fish within South African EEZ waters, since the area covered by them is only loosely defined.

Measures taken by Taiwan to reduce seabird mortality by its longliners in terms of its NPOA-Seabirds are:

- Installation of bird-scaring lines.

- Setting lines at night.
- Thawing of bait.
- Weighting branch lines to increase sinking speed.

These methods are described as being used by "most of Taiwan tuna longliners", but it remains unclear both whether they are obligatory measures, and if so, whether they all applied to licensed vessels that fished within South African waters. However, the Taiwanese NPOA-Seabirds specifically refers to the 1997 agreement with South Africa in which the use of bird-scaring lines is required, and that they had been installed on the 21 vessels licensed in that year.

Compliance

Compliance appears to have been reasonably high in respect of the use of bird-scaring lines for both Japanese and Taiwanese vessels, although there is little conformity in their design and thus, it is assumed, in their effectiveness. Some skippers reported they used them only during the day and when bird numbers were high. The two Japanese vessels with observers aboard in 1998-2000 set all their lines at night. However, excessive deck lighting has been reported, with a minimum of four 400-W mercury lamps illuminating the stern deck area, probably responsible for the high catch rate of albatrosses at night (see above). This level of lighting was claimed to be necessary for safety reasons during the interviews.

4.7 International and non-South African waters fisheries

South Africa does not have a long history of fishing outside its own waters. Available information on longlining is summarized below.

Demersal longline fisheries

In the early 1990s, exploratory longlining took place over sea mounts (e.g. Vema, off the Northern Cape of South Africa, Mallory and Shackleton off the South Coast (Agulhas), Erica, Protea and Schmitt-Ott off the West Coast (Cape Point) and Walters Shoal (off Natal) in both the Atlantic and Indian Oceans. Species caught included Atlantic Pomfret *Brama brama*, Tristan Bluefish or Antarctic Butterfish *Hyperoglyphe antarctica* and Vema Five Fingers *Acantholatris vema*. Catches of these species were reported as 423 tonnes in 1991 and 217 tonnes in 1992, considered to be underestimates. A few banding recoveries of albatrosses by longliners made at this time suggests that bird mortality occurred but at an unknown level.

From 1995 to 1999 vessels operating from South Africa undertook three demersal and mid-water longlining trips to sea mounts within Tristan da Cunha EEZ waters under license, targeting Tristan Bluefish and Alfonsino *Beryx splendens*. Fishing was only allowed more than 50 nautical miles from the islands. Tristan observers were placed aboard all the trips as a requirement of the issued permits. A total of 693 700 hooks was

set. Daylight setting was permitted on the understanding that it would be prohibited should bird bycatch become significant. Although not a permit requirement, bird-scaring lines were deployed on all sets. Only one bird was reported killed, a Great Shearwater, at a overall bycatch rate of 0.001 birds/thousand hooks.

A few South African vessels have fished for toothfish, including Antarctic Toothfish *Dissostichus mawsoni*, in the Ross Sea (FAO Fishing Subarea 88.1) and South Georgia (FAO Areas 47 and 48.3) regions of the Southern Ocean, as well as in the vicinity of the Prince Edward Islands' EEZ in Area 51 and those parts of Subarea 58.6 outside the EEZ. In 2001/02, two South African vessels made 11 sets (87 450 hooks) in these last two areas, but reported no bird mortality. One South African vessel fished within Subarea 48.3 in 2001/02. It set 1.41 million hooks (100 sets) with no seabird mortality reported. Such vessels are required to practice both CCAMLR and domestic Patagonian Toothfish longlining mitigation measures (see Section 4.3 above). In 2001/02 compliance of the single vessel fishing within Subarea 48.3 with CCAMLR measures was high (100% for night setting, offal discharge and line-weighting, and 97% for streamer line setting).

Pelagic longline fishery

South African tuna and Swordfish longliners have in recent years fished in international waters outside the continental EEZ. During 1999-2001, fishery observers accompanied 15 trips by South African vessels to international waters in the central South Atlantic (as far as 13°W) and the Mozambique Channel. Observers reported four birds killed on 222 000 hooks, at an average rate of 0.02 birds per 1000 hooks. All four birds were killed while fishing in the central South Atlantic, and were reported to be two Spectacled Petrels, one albatross and one giant petrel. Observers reported very few birds attending fishing operations in these waters.

South African pelagic longliners have also fished in Namibian waters in recent years. Mitigation measures in place for the domestic pelagic fishery apply to these fishing trips as well (see Section 4.5 above).

Chapter Five

A description of mitigation measures

5.1 Introduction

This chapter is summarised and updated from a much more detailed account published in Brothers *et al.* (1999) *FAO Fisheries Circular* No. 937. Additionally, various manuals exist that describe and illustrate mitigation measures.

A mitigation measure is defined here as a modification to fishing operations and/or equipment that reduces the likelihood of seabird mortality. Understanding the circumstances that lead to the death of birds in longline fisheries is essential in the process of determining how mortality can be prevented.

The most common cause of incidental mortality is that birds take baited hooks during line setting and drown. Birds may also be caught during line hauling but are less often killed and thus can be released alive. Further, mortality occurred from hooks remaining in released birds or hooks ingested in discarded offal and fish bycatch. Additionally birds may become entangled in line or impaled on hooks.

5.2 Night setting

Night setting alone as a mitigation measure can virtually eliminate seabird mortality in some fisheries and in others will assist greatly in minimising mortalities because most of the seabirds that are caught forage mainly during the day. Darkness also affords baited hooks additional protection by concealing them from birds which is particularly beneficial if slow-sinking baits are being set and if bird-scaring lines are not in use.

Bird catch rate reductions due to night setting reach 60-96%. Effectiveness varies between fisheries and seasonally within a fishing region due to some birds (e.g. White-chinned Petrels) being more active than others during the night. Night setting is less effective during bright moonlight and in high latitudes during summer, when hours of darkness are few or even absent. Birds are three to six times more likely to be caught in bright moonlight than when there is no moon. Avoiding line setting in the last few hours before dawn has been shown to reduce mortality of White-chinned Petrels in the South African hake longline fishery.

5.3 Line weighting

The amount of time that a baited hook remains near the sea surface or how fast it sinks determines the likelihood of it being taken by a bird. How fast a bait needs to sink is governed by three factors: i) whether additional bait protection such as a bird-scaring line

is being used; ii) the vessels' line-setting speed; and iii) the foraging capabilities of the seabirds present. Foraging capabilities of seabird species vary. Some are only capable of surface feeding. Some have poor diving capability (to about one metre) while others are proficient divers (to 20 m or more).

Pelagic longlining

Pelagic longlines are usually unweighted or weighted 7-10 m from the hook with a 30-80-g swivel.. Unweighted hooks sink slowly and the addition of a 20-g weight at or near the hook can almost double the sink rate to 0.5 m/s. Appropriate line weighting is particularly important with monofilament lines. Although 200-g lead sinkers are used regularly along monofilament lines their position on the main line (up to 200 m from the hook) is of little consequence to sink rate.

Demersal longlining

In demersal longlining the consequence of weighting lines is different to that in pelagic operations. There is an incentive to attach additional weights to reduce descent time where the ocean floor can be 2500 m deep. An additional advantage in demersal longlining is that snoods or branch lines are generally less than 1 metre in length so irrespective of where a weight is attached it will have an immediate impact on hook sink rate. An investigation of appropriate line weighting in the Spanish double-line system prescribed the attachment of 6-kg weights at 20-m intervals. Unlike double-line systems in which deliberately buoyant lines are used and therefore must be weighted so they sink, the single line systems such as the Mustad Autoline use negatively buoyant line material. In both single and twin-line demersal systems line buoyancy is radically increased when Line floats are used to alter setting characteristics for targeting certain species.

5.4 Bird-scaring lines

A bird-scaring line (BSL) is a device that when deployed astern during line setting deters birds from taking baited hooks. BSLs are either lines with suspended streamers, as used in pelagic and demersal longline fisheries in the Southern Hemisphere, or towed objects such as “buoy bags”, as used in the Alaskan fisheries. With the recommended and commonly used streamer BSL, a mounting (tori) pole on the vessel's stern should be used to gain sufficient height above the sea surface. The higher the mounting position, the greater the distance of bait protection. Correct height also prevents the fishing longline interfering with the bird line. The mounting position must ensure that the bird line with streamers attached is towed astern directly above the area where baits enter the water. Construction materials are very important to operating efficiency. Appropriate materials will help prevent birds becoming used to a BSL, reduce line stress on the pole, cross wind effects, tangles with fishing gear and also make setting and retrieval easier.

Tension is required to keep a BSL correctly positioned, irrespective of weather conditions, best done by line drag alone, which can be increased by using larger diameter

line from aft of the point where the BSL enters the water (about 100 m if mounting height is adequate). In demersal fisheries the usually central line-setting position makes the deployment of two BSLs feasible.

Use of a well-designed bird-scaring line can reduce bird mortality by between 30% to 70% in pelagic longline fisheries. It is more difficult for a BSL to be as effective in pelagic compared to demersal longline fisheries. Baited hooks in pelagic fisheries generally sink more slowly and are thus exposed to birds for longer and because these are on long branch lines thrown away from the vessel it is more difficult to protect them with a BSL.

Weather conditions influence the effectiveness of BSL, particularly wind direction and speed in relation to line setting course. This influence is an important factor determining most appropriate BSL material to minimise deflection by wind but with consideration to line strength and the preference for a less conspicuous (habituation factor) line.

5.5 Thawing bait

There are two features of a bait that can affect its buoyancy and therefore its availability to birds. A frozen bait will float or sink slowly as will one that has sufficient air retained in its swim bladder. For pelagic longlining each hook is manually baited with a whole fish or squid and then thrown clear of the ship's stern. The line to the hook is used to swing the bait to a preferred distance away from the vessel which can jeopardise bait retention on the hook, more-so if the bait is soft rather than frozen or partially thawed. There is thus an incentive to use frozen bait to avoid such loss. Studies have reported a 69% reduction in catch rates when thawed baits rather than frozen baits were used.

Bait thawing in demersal longline fisheries is not considered necessary.

5.6 Underwater setting

There are at least four methods that have been or are being developed to set lines underwater. Three of the four devices are attachments to the stern of a vessel, the fourth is a system of integration within the vessel's hull.

Mustad underwater setting funnel

A funnel attached to the vessel's stern for use in single-line demersal fisheries is manoeuvred hydraulically from its stern-facing setting position to stowing position against the hull. The setting funnel allows hooks, buoys, etc. to pass down it and exit underwater astern or has a slotted side for external deployment of buoys, weights, etc.. In its present form it delivers baits only about 1.5 m below the surface in calm seas, insufficient considering the potential sink rate of the gear, the reduction in setting depth

in rough seas, and seabird diving abilities of pursuit divers, such as the White-chinned Petrel.

Underwater setting chute

The chute system has the potential to be applied to demersal as well as pelagic operations. This is because the small-diameter pipe has a continuous slot along its entire length. This provides the opportunity for externally deploying radio beacons, line floats, weights, etc. while the line and hooks attached remain within the chute (demersal gear) or the only items to travel within the slotted pipe would be the baited hooks (pelagic gear). The chute can be withdrawn from the water when not in use. To achieve a setting depth of three metres the chute system relies upon a winch/paravane mechanism. A combination of water injection and venturi force accelerates baited hook passage down the chute.

Underwater setting capsule

Unlike the previous three systems that use a passive means of transporting baited hooks underwater, this one is an active system. The baited hook is transported within a retrievable capsule to a predetermined depth where it is released. Suitable only for pelagic systems, it has the added advantage of being compact and easily fitted to any size vessel, irrespective of associated gear configuration. The depth to which it can deliver baits is more versatile than the previous systems.

Hull integrated underwater setting system

This system remains a concept only. An integrated underwater setting system would entail the construction of a tunnel through the ship that emerges at or near the keel. Alternatively, a slotted hull section within or added to the side of the hull leading aft and downward (not unlike a chute system but as part of the hull itself) could be constructed.

5.7 Bait-casting machines

Bait-casting machines (BCMs) are used in pelagic longlining where hooks are attached to long branch lines necessitating being placed in the water at a distance from the longline to which they are attached to minimise line tangles. It is particularly desirable on larger vessels to put baits in the water outside propeller and hull turbulence. To achieve this each bait is thrown by hand as far out away from the vessel as possible.

To avoid the deficiencies of manual throwing the BCM evolved with the following facilities: i) 3.5-4.0 s cycle time, ii) immediate direction reversal switching in order to permit port or starboard side throwing, iii) immediate distance dial facility for varying throw distance according to requirements of weather, BSL placement etc. to maximum distance of 23 m, iv) low arc of throw coupled with gimballed rotation to contend with ship

movement in rough conditions and minimise any consequential interference of bird-scaring lines to the fishing line.

5.8 Offal and bycatch discharge and bird-attraction reduction

To reduce numbers of following birds, discarding any item of an edible nature, even cardboard packaging from bait boxes, must be avoided during line setting. Containment of loose bait particles from auto-baiting devices is also necessary. Dumping offal and bycatch during setting can distract birds from baited hooks, but this practice has the disadvantage of attracting birds to the vessel, potentially increasing bird catch, and so is not recommended.

Longliners can produce large quantities of offal, often discharged continuously during hauling. Hauling is often done at a slow speed enabling discharged offal to remain near the discharge outlet usually located immediately adjacent to the line haul position. Large numbers of birds are then attracted to the immediate vicinity of incoming hooks and can get caught). An exclusion device such as the Brickle Curtain reduces the problem.

Ensuring minimum opportunities for birds to obtain food must be the objective. If any material edible or otherwise must be discharged then a once-only event each night, preferably not during hauling or setting, would be the most appropriate strategy.

5.9 Line hauling

Birds can be caught during line hauling, though less frequently than in line setting, and often then come aboard alive, when they can be released. There are a number of reasons why fatalities during hauling occur. In pelagic fisheries long branch lines, after being unclipped from the main line are either pulled aboard manually or with snood pullers or branch line coilers. Manual recovery is slow and leaves any baited hooks exposed on the surface for birds. If mechanising line recovery is not an option then consideration to branch line length in relation to the distance between the hauling position and the stern of the vessel can help. Provided branch line length is the same or less than this distance baited hooks usually receive adequate protection from the hull of the vessel. A vessel being driven faster than the rate crew can haul in branch lines aggravates the above problem because baited hooks trail astern for longer.

5.10 Fishing season and area closures

Where and when fishing occurs may be more important than the actual amount of fishing. For example, to reduce the total fishing effort and have no regard for when and where fishing will take place could conceivably increase bird bycatch. For regions where vulnerable seabird species are particularly abundant (e.g. in the vicinity of breeding islands) there may be clear benefits from area/season closures.

5.11 Line tension prevention

In pelagic fisheries a main line can be set slack (no tension astern) with the aid of a line shooter. In demersal operations line tension astern keeps baits available to birds for longer and line sinking is delayed. The higher a line departs the ship above the water the worse the problem becomes.

If weights are being used to sink the line (demersal Spanish twin-line system for example) they should not be left to be pulled off astern by line tension, but pushed off to avoid increased line tension which allows birds to be caught more easily.

5.12 Additional mitigation measures

Several mitigation measures are not in common use, and some that have been tested do not seem to reduce seabird mortality. They are briefly described here for completeness.

Artificial baits, lures and live bait

Artificial baits may be made of waste fish material that are still scent-attractive to target species or synthetic baits (lures) that use visual stimulus as an attractant. The former type, made of waste fish and offal, has not yet been assessed for its affect on seabird catch rates.

Synthetic baits or lures are commonly used in pelagic fisheries either on their own at hooks or combined with a baited hook. Generally they are crude imitations of natural bait items such as fish or squid. Seabirds are generally highly discerning of food items and synthetic lures would therefore pose little threat. As yet there are no records of seabirds having been caught on synthetic lures in longline fisheries.

Although no assessments have been undertaken of live bait anecdotal reports suggest that seabird bycatch does not occur because such bait descends rapidly by active swimming.

Dying baits

Dying bait (mainly squid) blue has been shown to reduce seabird mortality of albatrosses by Swordfish longliners in the North Pacific. Its efficacy in other fisheries remains to be fully tested.

Hook design

In demersal longlining hook shape and diameter may affect bird catch. Smaller hooks may more easily catch smaller species. Hook size (weight) will influence bait sink. The development of hooks with disarming mechanisms that would delay the catching ability to a predetermined time or depth is under investigation in Australia.

Water cannons

The use of water from a vessel as a means of concealing baited hooks may reduce bait loss and incidental catch of birds, providing baits do not remain accessible too far astern

Acoustic deterrents

A sudden loud noise (e.g. firearm discharge or hitting the steel hull) may cause nearby seabirds to fly away, a technique erratically used by fishers to frighten birds. However, loud noises frighten seabirds only briefly and at close range. Also, the more often the frightening sound is produced, the less effect it has due to rapid habituation. Other commercially available acoustic bird-scaring devices emit high frequency and loud noises or distress calls. These may be effective if used sparingly to avoid habituation.

Magnetic deterrents

Several commercially available bird-scaring devices produce a magnetic field, claimed to interfere with receptors that birds have for detecting such forces. A wind-driven propeller with attached magnets had no significant effect on seabird catch.

Smoke deterrents

In favourable conditions (line setting against the wind) smoke emitted from refuse disposal incinerators has been reported to have a discouraging effect on seabirds. Inability to control wind direction makes this most unlikely to be of value as a deterrent.

PART TWO: NPOA SEABIRDS

Chapter 6

Introduction, purpose and key objectives

South Africa's National Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries sets out procedures and practices that are to be followed to reduce seabird mortality in its longline fisheries. Following the FAO's IPOA-Seabirds (Appendix 1), these include prescription of mitigation measures for each fishery, research and development, education, training and publicity, and data collection.

6.1 Purpose of South Africa's NPOA-Seabirds

The ultimate purpose of this NPOA-Seabirds is to reduce seabird mortality in South African longline fisheries to zero, so that there are no adverse effects on seabird populations. However, given the currently available mitigation measures (see Chapter 5 above), this is not considered to be feasible in the short term. Therefore, the immediate aim of this NPOA-Seabirds is to reduce seabird mortality in all South African fisheries to an interim target level of less than 0.05 birds/thousand hooks. It is desired that all fisheries attain this target by the process of every individual longline vessel on each of its fishing trips adopting such mitigation methods as will likely result in a mortality of less than 0.05 birds/thousand hooks set.

By way of regular analyses of reported mortality levels for each fishery, the rate of achievement of the interim target will be annually assessed, with the aim that all fishing vessels attain an average mortality rate below the target level by the end of a three-year period, commencing from the adoption of the NPOA-Seabirds. The interim target level of 0.05 birds/thousand hooks should then be reassessed as part of a review and updating of the NPOA-Seabirds.

6.2 Key activities and objectives of South Africa's NPOA-Seabirds

The key activities to be carried out and objectives to be achieved within the three-year period are:

- (i) operate onboard observer programmes at sufficient levels of coverage (both of vessels with observers aboard and percentage of hooks observed during hauling) that allow for reliable estimates of the levels of seabird mortality in all affected South African longline fisheries,
- (ii) collect information on the levels of usage of prescribed mitigation measures in each longline fishery,

- (iii) conduct analyses on returned corpses of seabirds so as to assess species, age classes, gender, population sources, diets, moult, etc.,
- (iv) conduct research on new and existing mitigation measures (e.g. optimum line weighting and setting speeds for individual fisheries),
- (v) institute an education and awareness programme for fishers and for the general public on the reasons for adoption of mitigation measures,
- (vi) run training programmes for observers and fishers on bird identification, treatment of live birds and optimal use of mitigation measures,
- (vii) encourage and support regular surveys and studies of population trends and at-sea distributions of affected seabird species at South Africa's sub-Antarctic Prince Edward Islands and in territorial and EEZ waters,
- (viii) regularly review the conservation status of affected seabirds, especially those breeding at the Prince Edward Islands, and
- (ix) review the efficacy of prescribed mitigation measures in relation to levels of compliance and seabird mortality and recommend changes to procedures and prescriptions by way of amendments to the NPOA-Seabirds.

The activities and objectives listed above are expanded on in the following chapters under the heads: Prescription of mitigation measures, Research and development, Education, training and publicity, and Data collection.

Chapter Seven

Prescription of mitigation measures

7.1 Introduction

The over-riding principle is that each South African longline fishery has in place a set of prescribed mitigation measures aimed at reducing seabird mortality to less than 0.05 birds/thousand hooks. These measures should be reviewed at regular intervals, both in terms of their efficacy and of research and developments in mitigation methods on a global scale.

Prescribed mitigation measures for three of the four existing longline fisheries (hake, Patagonian Toothfish and tuna; along with those of the to-be-halted foreign tuna fishery) are summarized in Table 2. The current levels of compliance with such measures, based on best available knowledge for these fisheries, are summarized in Table 3. Currently no mitigation measures are prescribed for the shark fishery, pending a recommended assessment of whether seabird mortality occurs (see Chapter 10 below).

TABLE 2

MITIGATION MEASURES TO REDUCE SEABIRD BYCATCH CURRENTLY LISTED AS PERMIT REQUIREMENTS IN THREE SOUTH AFRICAN LONGLINE FISHERIES

Regulations	Toothfish	Hake	Tuna	
			SA	Foreign
Setting				
Bird-scaring lines	Yes	Yes	Yes	Yes
Only set lines at night	Yes	Yes ¹	‘Preferred’	Yes ²
Adequate weighting	Yes	Yes ³	Yes ³	Yes ³
Slow setting speed	No	Yes ³	No	No
Thawed bait	Yes	Yes	Yes	Yes ²
Minimum deck lighting	Yes	Yes	Yes	No
No offal dumping while setting	Yes	Yes	Yes	No
Hauling				
Offal dumping opposite haul site	Yes	Yes	Yes	No
No hooks discarded	Yes	Yes	Yes	No
Release birds caught alive	Yes	Yes	No	No

¹For the hake fishery, setting must cease one hour before nautical dawn.

²Although not required in terms of permits to fish in South African waters, these regulations are called for in terms of Japan and Taiwan’s NPOA-Seabirds.

³Regulations do not quantify ‘adequate’ weighting or ‘slow’ setting speed.

TABLE 3

**LEVELS OF COMPLIANCE WITH CURRENT MITIGATION MEASURES IN
THREE SOUTH AFRICAN LONGLINE FISHERIES**

Regulations	Toothfish	Hake	Tuna	
			SA	Foreign
Observer coverage	100%	9%	17%	<1%
Bird-scaring lines	100%	13%	18%	poor ¹
Only set lines at night	99%	100%	94%	poor
Adequate weighting	good	?	?	?
Thawed bait	good	poor	poor	good
Minimum deck lighting	good	poor	poor	poor
No offal dumping while setting	good	good	good	good
Offal dumping opposite haul site	good	poor	poor	poor
No hooks discarded	good	good	good	?
Release birds caught alive	good	?	good	?

7.2 Mitigation measures to be prescribed for each affected fishery

The following mitigation measure are recommended:

- (i) all the prescribed mitigation measures currently in place (Table 2) should continue to be prescribed,
- (ii) following a consultation with the tuna fishery, consideration should be given to making night setting (currently ‘preferred’, page 50, Table 2) a prescribed mitigation measure,
- (iii) the release of birds caught alive should be made a prescribed requirement in the tuna fishery, as it is in the hake and toothfish fisheries, and
- (iv) once research has resulted in recommendations (see Chapter 8 below), line-weighting regimes and setting speeds should be defined in quantitative terms for the hake and tuna fisheries.

7.3 New prescribed mitigation measures

Following research (Chapter 8 below), new mitigation measures may be prescribed for the use of paired streamer lines, integrated weighted lines, underwater-setting devices,

and use of dyed bait in pelagic longlining. Prescription of such (and any other) new measures should only follow after close consultations with the fisheries concerned, and periods of testing under commercial fishing conditions as voluntary measures.

Chapter Eight

Research and Development

8.1 Introduction

Following the FAO's IPOA-Seabirds (Appendix 1), South Africa should undertake research and development on the issue of seabird mortality on longlines to:

- (i) develop practical and effective deterrent devices,
- (ii) improve technologies and practices to reduce incidental capture of seabirds, and
- (iii) evaluate effectiveness of mitigation measures.

To date, South Africa has conducted relatively little research and development on the problem of seabird mortality from longlining, outside assessing the mortality levels in the different fisheries (see Chapter Four above). An exception has been an investigation of the efficacy of an underwater-setting funnel in the Patagonian Toothfish fishery (Section 4.3, page 44). However, this study took place during normal fishing operations, and so South Africa has as yet conducted no trials of mitigation measures as part of a statistically-designed experiment. Such trials, which require the use of a fishing vessel dedicated to the research, are expensive to undertake, because of the high costs of vessel hire. The results of research should be taken into account when revising the NPOA-Seabirds.

Research should also continue into relevant aspects of the biology and conservation management of the affected species of seabirds (Chapter 3). The main research priorities are set out below.

8.2 Research into line weighting

Current mitigation measures in force (Chapter 4, Table 1) for South African hake and tuna longline fisheries require that main and branch lines be “properly weighted to ensure optimal sink rates”. However, this regulation is not quantified. CCAMLR regulations applied in the toothfish fishery require “appropriate line weighting”, defined as 6-kg weights at no more than 20-m intervals, or 8.5-kg weights at no more than 40-m intervals for the Spanish double-line system. There is a need to conduct research (including sea trials) to define a weighting regime for the South African pelagic tuna and demersal hake fisheries, since the CCAMLR regulations may not be optimal for them. Such an investigation should also consider the efficacy, costs and safety implications of using longlines with integrated weights (IW lines). The use of time-depth recorders (TDRs) and the New Zealand “bottle test” will allow for the accurate determination of sink rates.

8.3 Research into setting speeds

Current mitigation measures in force (Chapter 4, Table 1) for the South African hake longline fishery require that “setting speed must be such that sinking rates are maximised”. This measure is not quantified. Research, firstly based on a review of practices and regulations elsewhere in the world, thereafter followed by sea trials if thought desirable, should be undertaken in an attempt to define optimal setting speeds to reduce seabird mortality.

8.4 Research on bird-scaring lines

All South African longline fisheries currently require the use of bird-scaring lines, modelled on the CCAMLR design, which is for a single line bearing streamers (Appendix 2). Recent research in several fisheries world-wide has show that paired streamer lines (“boom and bridle design”) can be more effective at reducing seabird mortality than are single lines. The advantages of using paired lines should be investigated for each South African longline fishery, based on sea trials, which should, at least initially, be carried out as part of normal fishing operations (which will greatly reduce the costs of such research).

8.5 Research on dyeing of bait

Assessing blue-dyed squid bait in the tuna fishery as a mitigation measure is recommended, since this has given promising results elsewhere.

8.6 Research on affected species

Research into the biology of affected species should continue to be undertaken, on aspects of the population dynamics (sizes and trends), foraging ecology, at-sea distribution, genetics and conservation status of seabird populations occurring within South African waters, as well as on the corpses of birds killed on longlines.

To facilitate such research, the Department of Environmental Affairs & Tourism through its Marine & Coastal Management Branch and Directorate: Antarctica and Islands should continue to fund and supply logistics to ongoing and new research activities by both government and academic scientists.

Chapter Nine

Education, training and publicity

9.1 Introduction

The FAO's IPOA-Seabirds lists a comprehensive set of measures for raising awareness among fishers, other relevant groups and the general public on the problem of seabird mortality by longline fishing (see Appendix 1). The recommendation is given that awareness-raising should include both the conservation aspects of the problem and the economic benefits of reducing bait loss to birds. To date, relatively little activity has taken place within South Africa in this regard with fishers, or with other groups, so the scope for action remains large. Known activities include:

- (i) training fishery observers in seabird identification,
- (ii) distribution of CCAMLR and other mitigation and bird identification booklets to observers and some fishing vessels and captains,
- (iii) producing a set of seabird posters by the BirdLife International Seabird Conservation Programme, sponsored by I & J, and
- (iv) writing articles on an *ad hoc* basis for commercial fishing and environmental magazines, giving of media interviews to radio, TV and press, and filming of TV programmes.

Some suggested activities are set out below.

9.2 Education and training of fishers

Consideration should be given to Marine & Coastal Management, or its contractee(s), running annual workshops at which captains and fishing crew of longline vessels, as well as representatives of fishing companies, associations and unions, are given the opportunity to attend and contribute to lectures and presentations (in more than one official language) that will, *inter alia*, cover the following subjects:

- (i) aspects of the biology and conservation requirements of affected species of birds,
- (ii) correct use and the efficacy of prescribed and non-prescribed mitigation measures,
- (iii) identification of seabirds both at-sea and in the hand,
- (iv) procedures for recording, labelling and returning to port any seabirds that come aboard dead during hauling operations,
- (v) correct and safe procedures for handling live birds, removal of ingested and imbedded hooks and entangled lines, and the release of birds caught alive during hauling, and
- (vi) how correct use of mitigation measures may improve fishing efficiency and/or catch size, and therefore profits, by way of reducing bait loss and increasing soak time (by faster line sink-rates) as well as creating opportunities for "green-

labelling” of seabird-friendly products through such mechanisms as assessment and certification by the Marine Stewardship Council.

Every attempt should be made to run such workshops, perhaps initially on a voluntary basis, in a participatory, rather than a “top-down” approach, since fishers themselves are likely to be able to contribute to the improved design and use of mitigation measures by drawing on their own experiences.

9.3 Training of observers

Contracted observer companies should run regular training courses for both existing staff and recruits that, *inter alia*, cover the following subjects:

- (i) standardised procedures for the collection of reliable data on numbers and rates of birds killed and brought aboard alive during setting and hauling operations, respectively,
- (ii) aspects of the biology and conservation requirements of affected species of birds,
- (iii) correct use and the efficacy of prescribed and non-prescribed mitigation measures,
- (iv) identification of seabirds both at-sea and in the hand,
- (v) procedures for recording, labelling and returning to port any seabirds that come aboard dead during hauling operations, and
- (vi) correct and safe procedures for handling live birds, removal of ingested and imbedded hooks and entangled line, and the release of birds caught alive during hauling.

Such training courses should be a mandatory requirement for the appointment of observers, who should be issued with a certificate of having attended and satisfactorily completed the course, which they should take aboard vessels. Expert lecturers should be recruited to give the various modules of the course, by way of lecture(s) and practical(s). The design and contents of the training courses should be approved by Marine & Coastal Management, which should, from time to time, attend such courses so as to see the requisite standards are being met in terms of content and teaching skills, etc.

9.4. Production of mitigation and identification materials

Illustrated booklets, brochures, laminated field sheets, posters and videos should be produced in more than one official language for the use of fishers and observers. Commercial sponsorship and the involvement of interested fishers, observers and environmental NGOs would aid in such production, as would a review of existing materials elsewhere in the world for ideas, etc.

9.5 Awareness raising among interested parties and with the general public

Opportunities should be taken and sought to raise awareness among and educate interested and affected parties (fishers, fishing managers and companies, seafood exporters, processors, suppliers, wholesalers and retailers (including fishmongers and supermarket chains), the catering, hotel and restaurant industries, fishing associations and unions, gear technologists, marine architects, ship builders, legislators, conservation and environmental bodies at non-governmental, governmental and inter-governmental levels, etc.), as well as the general public, on the problem of seabird bycatch by longline fisheries and how it may be addressed by the use of suites of mitigation measures tailored for each particular fishery.

Awareness raising and education activities should include use of the media (press, radio, TV, film), articles in trade, commercial fishing, conservation, environmental and general-interest magazines, and the dissemination of posters, booklets, brochures, videos and other forms of interpretative material to schools, NGOs, etc., as themes for National Marine Weeks, and by way of manned stands and the dissemination of materials at trade and environmental exhibitions and expositions.

Marine & Coastal Management should take advantage of potential synergies by working closely with the fishing industry, non-governmental organizations (such as the Antarctic & Southern Ocean Coalition and the Birdlife International Seabird Conservation Programme), the seabird research programmes of the Avian Demography Unit and Percy FitzPatrick Institute of African Ornithology at the University of Cape Town, and any other interested and affected parties, including the media, in undertaking education, training and publicity activities.

South Africa, via its Departments of Environmental Affairs & Tourism and of Foreign Affairs, and Embassies, should inform intergovernmental bodies, such as the FAO's Committee on Fisheries, the Bonn Convention on Migratory Species, the Agreement on the Conservation of Albatrosses and Petrels (ACAP) and Regional Fisheries Management Organizations (RFMOs, especially CCAMLR, CCSBT, ICCAT and IOTC, see Chapter 2) of its activities in reducing seabird mortality from longline fishing by way of its NPOA-Seabirds.

Lastly, This NPOA-Seabirds should be published and made available, free of charge, by Marine & Coastal Management as a publicly available document, both electronically via web site(s) and by hard copy on request. Copies should be sent to all longline rights holders and made available to all applicants. An adequate knowledge of the prescribed mitigation measures set out in the NPOA-Seabirds by applicants should be used as part of the process of assessing and awarding longline fishing rights.

Chapter Ten

Data Collection

10.1 Introduction

In order to assess regularly the levels of seabird mortality and to ascertain the levels of compliance with prescribed mitigation measures, it is necessary to run an onboard observer scheme on longline fisheries known to cause seabird mortality. Such observers should be properly trained (See Chapter 9). Currently, South Africa operates onboard observer programmes in three of its four longline fisheries: for hake, toothfish and tuna (see Chapter 4). It is intended to increase coverage by observers in hake and tuna fisheries to 20% of fishing trips from 2002. The toothfish fishery currently operated at 100% coverage under CCAMLR regulations. No observer scheme exists or is currently planned for the shark longline fishery. Suggested activities are described below, for which the design and usage of standardised procedures and recording forms are required.

10.2 Collection of data on seabird mortality

The following requirements should be met:

- (i) observer schemes for toothfish, hake and tuna longline fisheries should continue to operate at the 20% minimum (hake and tuna) and 100% (toothfish) levels mentioned above,
- (ii) observers should aim to observe a minimum of 25% of hooks on each set, so as to allow for statistically valid estimates of overall catch rates,
- (iii) all corpses brought aboard should be kept for examination ashore after suitable packaging and deep-freezing, along with information on species' identification, presence of markings such as metal or colour bands, how hooked (e.g. swallowed hook or foul hooked), position and date,
- (iv) information on birds caught alive should be kept including species, age class and sex ideally by photographic record, presence of markings such as metal and colour bands, how hooked or entangled, condition on release (healthy, sick-looking, injured, etc.), position, date, and
- (v) on a voluntary basis information on species and numbers occurring during setting and hauling could be kept, along with information on attack rates of bait, foraging methods and interactions between species.

10.3 Collection of fishing data

The following needs to be collected, *inter alia*, in order to allow for an estimation of seabird catch rates in relation to mitigation measures in place:

- (i) numbers of sets and numbers of hooks per set,
- (ii) fishing positions and dates,
- (iii) times of and vessel speeds during setting and hauling,
- (iv) descriptions and usage of prescribed and any other mitigation measures, including descriptions of streamer lines in use (overall length, height of deployment, number and lengths of streamers etc.), weighting regimes (mass and interval of weights), offal discharge (timing in relation to setting and hauling, position on the vessel), deck-lighting regimes (usage, brightness, direction), and
- (v) assessment by a sampling regime of the numbers of hooks and entangled lines discarded attached to fish heads, etc.

10.4 Assessing for seabird mortality in the shark longline fishery

It is recommended that a number of shark longline vessels has observers aboard as an experiment to assess whether this fishery causes any bird mortality. Vessels fishing offshore (pelagic) and inshore (demersal) and in different coastal regions should be chosen. Information should be collected on the following aspects:

- (i) a description of the fishing methods used (see 10.3 above),
- (ii) presence and activities of seabirds around vessels during setting and hauling, including whether any interest is shown in baited hooks or discarded offal and bycatch, and
- (iii) information on any birds caught alive or dead (see 10.2 above).

This information should then be used to assess whether the shark longline fishery is in need of prescribed mitigation measures to reduce seabird mortality or not. If seabird mortality does occur, then an onboard observer scheme will be required to gather information on the usage of mitigation measures that have been prescribed, as well as the data on affected seabirds as outlined above.

Chapter Eleven

Acknowledgements

Production of South Africa's National Plan of Action – Seabirds was funded by a grant from the Food and Agriculture Organization of the United Nations, via the Marine and Coastal Management Branch of the South African Department of Environmental Affairs & Tourism, to the Avian Demography Unit, Department of Statistical Sciences, University of Cape Town.

The following are thanked for their help in supplying information or in other valued ways: R.J.M. Crawford, R.F. Osborne, M. Kroese, D.C. Nel, A.J. Penney, E. Sabourenkov, C. Smith, L. Upfold, J.W. Valdemarsen and B.P. Watkins. Samantha Petersen designed the front cover and helped in other ways.

Chapter Twelve

Bibliography

- AGNEW, D.J. 2000. The illegal and unregulated fishery in the Southern Ocean and the CCAMLR Catch Documentation Scheme. *Marine Policy* 24: 361-374.
- AGNEW, D.J., BLACK, AD, CROXALL, J.P. & PARKES, G.B. 2000. Experimental evaluation of the effectiveness of weighting regimes in reducing seabird by-catch in the PATAGONIAN Toothfish longline fishery. *CCAMLR Science* 7: 119-132.
- ALEXANDER, K., ROBERTSON, G. & GALES, R. 1997. *The incidental mortality of albatrosses in longline fisheries. A report of the Workshop from the First International Conference and the Biology and Conservation of Albatrosses. Hobart Australia – September 1995.* Hobart: Australian Antarctic Division. 44 pp.
- ANDERSON, S. & McARDLE, B. 2002. Sink rate of baited hooks during deployment of a pelagic longline from a new Zealand fishing vessel. *New Zealand Journal of Marine and Freshwater Research* 36: 185-195.
- ANON. 2000. No foreigners will fish in South Africa! *Fishing Industry News Southern Africa* 1(1): 7.
- ANON. 2000. What is the future of the foreign tuna fleets? *Fishing Industry News Southern Africa* 1 (2?): 7.
- ANON. 2001. Co-operation could benefit SA tuna fishery. *Fishing Industry News Southern Africa* 1(6): 15.
- ANON. 2001. On-board observers get official thumbs-up. *Fishing Industry News Southern Africa* 2(1): 8-9.
- ANON. 2001. Taiwanese boats out by 2002. *Fishing Industry News Southern Africa* 2(2): 5.
- ANON. 2001. SA tuna fleet to grow. *Fishing Industry News Southern Africa* 2(2): 24-26.
- ANON. 2001. Japanese training school gets thumbs up. *Fishing Industry News Southern Africa* 2(4): 14.
- ANON. 2001. Japanese fishing talks flounder. *Fishing Industry News Southern Africa* 2(5): 23.
- ANON. 2002. Japanese fishing in SA waters suspended. *Fishing Industry News Southern Africa* 3(3): 17.
- ANON. 2002. Vessel observer programme kicks off. *Fishing Industry News Southern Africa* 3(3): 18.
- ANON. 2002. *Seabird interactions with fisheries in the Australian Fishing Zone. National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries – Assessment Report. Part I – Review and assessment of bycatch. Part II – Evaluation of mitigation measures [draft].* www.affa.gov.au. 145 pp.
- ASHFORD, J.R. & CROXALL, J.P. 1998. An assessment of CCAMLR measures employed to mitigate seabird mortality in longlining operations for *Dissostichus eleginoides* around South Georgia. *CCAMLR Science* 5: 217-230.
- ATCM 1999. *Final Report of the XXIII Antarctic Treaty Consultative Meeting.* Lima: Peruvian Antarctic Institute,

- BAIRD, S.J. 2001. *Report on the International Fishers' Forum on Solving the Incidental Capture of Seabirds in Longline Fisheries. Auckland, New Zealand, 6-9 September 2000.* Wellington: Department of Conservation. 71 pp.
- BADENHORST, A. 1988. Aspects of the South African longline fishery for Kingklip *Genypterus capensis* and the Cape hakes *Merluccius capensis* and *M. paradoxus*. *South African Journal of marine Science* 6: 33-42.
- BARNES, K.N. (ED.) 2000. *The Eskom Red Data Book of birds of South Africa, Lesotho and Swaziland.* Johannesburg: BirdLife South Africa. 169. pp.
- BARNES, K.N., RYAN, P.G. & BOIX-HINZEN, C. 1997. The impact of the hake *Merluccius* spp. longliner fishery off South Africa on procellariiform seabirds. *Biological Conservation* 82: 227-234.
- BARTLE, J.A. 1990. Sexual segregation of foraging zones in procellariiform birds: implications of accidental capture on commercial fishery longlines of Grey Petrels (*Procellaria cinerea*). *Notornis* 37: 146-150.
- BERGIN, A. 1997. Albatross and longlining – managing seabird bycatch. *Marine Policy* 21: 63-72.
- BERRUTI, A. 1979. The breeding biologies of the sooty albatrosses *Phoebastria fusca* and *P. palpebrata*. *Emu* 89: 161-175.
- BERRUTI, A., ADAMS, N.J. & JACKSON, S. 1989. The Benguela Ecosystem. Part VI: Seabirds. *Oceanography and Marine Biology Review* 27: 273-335.
- BERRUTI, A., COOPER, J. & NEWTON, I.P. 1995. Morphometrics and breeding biology of the Whitechinned Petrel *Procellaria aequinoctialis* at sub-Antarctic Marion island. *Ostrich* 66: 74-80.
- BIRDLIFE INTERNATIONAL 2000. *Threatened birds of the world.* Barcelona and Cambridge: Lynx Edicions and BirdLife International. 852 pp.
- BJORDAL, Å & Løkkeborg, S. 1996. *Longlining.* Oxford: Fishing News books. 156 pp.
- BOGGS, C.H. 2001. In: Melvin, E.F. & Parrish, J.K. (Eds). *Seabird bycatch: trends, roadblocks and solutions.* Fairbanks: University of Alaska Sea Grant. pp. 79-94.
- BOURS, H., GIANNI, M. & MATHER, D. 2001. *Pirate fishing plundering the oceans.* [The Netherlands]: Greenpeace. 28 pp.
- BOUTALL, M. 1991. Longline controversy. “It wasn’t us” say indignant Kingklip ‘six’. *SA Commercial Fisherman* 3(2): 2-4.
- BRANDÃO, A., WATKINS, B.P., BUTTERWORTH, D.S & MILLER, D.G.M. ms. A first attempt at an assessment of the Patagonian Toothfish (*Dissostichus eleginoides*) resource in the Prince Edwards Islands EEZ. Submitted *CCAMLR Science*.
- BROOKE, M. de L. & KLAGES, N.[T.W.] 1986. Squid beaks regurgitated by Greyheaded and Yellownosed Albatrosses, *Diomedea chrysostoma* and *D. chlororhynchos* at the Prince Edward Islands. *Ostrich* 57: 203-206.
- BROTHERS, N. 1991. Albatross mortality and associated bait loss in the Japanese longline fishery in the Southern Ocean. *Biological Conservation* 55: 255-268.
- BROTHERS, N. 1995. *Catching fish not birds.* Australian longline version. Hobart: Parks and Wildlife Service. 70 pp.
- BROTHERS N. 1996. *Longline fishing dollars and sense. Catching fish not birds using bottom set or mid-water sets.* Hobart: Parks and Wildlife Service. 80 pp.

- BROTHERS, N.P., COOPER, J. & LØKKEBORG, S. 1999. The incidental catch of seabirds by longline fisheries: worldwide review and technical guidelines for mitigation. *FAO Fisheries Circular* No. 937. 100 pp.
- BROTHERS, N., FOSTER, A. & ROBERTSON, G. 1995. The influence of bait quality on the sink rate of bait used in the Japanese longline tuna fishing industry: an experimental approach. *CCAMLR Science* 2: 123-129.
- CAMPHUYSEN, C.J. 2001. The distribution of Spectacled Petrels *Procellaria conspicillata* in the south-eastern Atlantic. *Atlantic Seabirds* 3: 113-124.
- CCAMLR 1996. *Fish the sea not the sky*. Hobart: Commission for the Conservation of Antarctic Marine Living Resources. 46 pp.
- CCAMLR 2001. *Report of the Twentieth Meeting of the Scientific Committee*. Hobart, Australia, 22-26 October 2001. Hobart: Commission for the Conservation of Antarctic Marine Living Resources. 577 pp.
- CCAMLR 2001. *Schedule of conservation measures in force 2000/01 season*. Hobart: Commission for the Conservation of Antarctic Marine Living Resources. 113 pp.
- CCSBT 1996. *Basic documents*. Deakin West; Commission for the Conservation of Southern Bluefin Tuna. 60 pp.
- CMS 1997. Proceedings of the Fifth Meeting of the Conference of Parties. Geneva, Switzerland 10-16 April 1997. Bonn: Convention on the Conservation of Migratory Species of Wild Animals. 179 pp.
- CMS [1999] Proceedings of the Sixth Meeting of the Conference of Parties. Vol. 1. Cape Town, South Africa 10-16 November 1999. Bonn: Convention on the Conservation of Migratory Species of Wild Animals. 209 pp.
- COOPER, J. 1994. Seabird mortality from longline fisheries: evidence from Marion and Gough Islands. CCAMLR WG-IMALF-94/18. 7 pp.
- COOPER, J. (ED.) 2000. Conservation of South African albatrosses and petrels at risk from longlining. A BirdLife South Africa and South African National Antarctic Programme Workshop, Cape Town, 7 June 2000. *ADU Research Report* 39. pp. 27.
- COOPER, J. (ED.). Albatross and Petrel Mortality from Longline Fishing International Workshop, Honolulu, Hawaii, USA, 11-12 May 2000. Report and presented papers. *Marine Ornithology* 28: 153-190.
- COOPER, J., BROOKE, M. de L., BURGER, A.E. CRAWFORD, R., J.M. 2001. Aspects of the breeding biology of the Northern Giant Petrel (*Macronectes halli*) and the Southern Giant Petrel (*M. giganteus*) at sub-Antarctic Marion Island. *International Journal of Ornithology* 4: 53-68.
- COOPER, J. & BROWN, C.R. 1990. Ornithological research at the sub-Antarctic Prince Edward Islands: a review of achievements. *South African Journal of Antarctic Research* 20: 40-57.
- COOPER, J., CROXALL, J.P. & RIVERA, K.S. 2001. Off the hook? Initiatives to reduce seabird bycatch in longline fisheries. In: Melvin, E.F. & Parrish, J.K. (Eds). Seabird bycatch: trends, roadblocks and solutions. Fairbanks: University of Alaska Sea Grant. pp. 9-32.
- COOPER, J. & DOWLE, J.E. 1976. Seasonal and spatial distribution of some procellariiform seabirds in southern African waters. *Ardea* 64: 72-79.

- COOPER, J., FOURIE, A. & KLAGES, N.T.W. 1992. The diet of the Whitechinned Petrel *Procellaria aequinoctialis* at sub-Antarctic Marion Island. *Marine Ornithology* 20: 17-24.
- COOPER, J., HENLEY, S.R. & KLAGES, N.T.W. 1992. The diet of the Wandering Albatross *Diomedea exulans* at Subantarctic Marion Island. *Polar Biology* 12: 477-484.
- COOPER, J. & KLAGES, N.T.W. 1995. The diets and dietary segregation of sooty albatrosses (*Phoebetria* spp.) at subantarctic Marion Island. *Antarctic Science* 7: 15-23.
- COOPER, J. & RYAN, P.G. 2001. The Agreement on the Conservation of Albatrosses and Petrels: implications for research and monitoring at the Prince Edward Islands. *South African Journal of Science* 97: 78-79.
- CRAMP, S. & SIMMONS, K.E.L. 1977. *The birds of the western Palearctic, Vol. 1 Ostrich to ducks*. Oxford: Oxford University Press. 722 pp.
- CRAWFORD, R.J.M. 2002. Report on summer survey of Prince Edward Islands conducted from RS *Africana*, December 2001. 21 pp.
- CRAWFORD, R.J.M., SHELTON, P.A., COOPER, J. & BROOKE, R.K. 1983. Distribution, population size and conservation of the Cape Gannet *Morus capensis*. *South African Journal of marine Science* 1: 153-174.
- CROXALL, J.P. & GALES, R. 1998. An assessment of the conservation status of albatrosses. In: Robertson, G. & Gales, R. (Eds). *Albatross biology and conservation*. Chipping Norton: Surrey Beatty & Sons. pp. 46-65.
- CUTHBERT, R., RYAN, P.G. & COOPER, J. ms. Demographic parameters, population modelling and population trends of the Atlantic Yellow-nosed Albatross *Thalassarche chlororhychos*. 24 pp.
- CUTHBERT, R., RYAN, P.G. & COOPER, J. ms. Demographic parameters and conservation status of the Tristan Albatross *Diomedea dabbenena*. 21 pp.
- DE JAGER, B. van D., NEPGEN, C.S de V. & VAN WYK, R.J. 1963. A preliminary report on South African West Coast tuna. *Investigational Report of the Division of Sea Fisheries of South Africa* 47: 1-40
- DIEMONT, M. 2002. Legally speaking. International agreements in fishery management. *Fishing Industry News Southern Africa* 2(6): 21.
- DU TOIT, M., BOERE, G.C, COOPER, J., KEMPER, J., LENTEN, B., SIMMONS, R.E., WHITTINGTON, P.A. & BYERS, O.P. (EDS). in press. *Conservation Assessment and Management Plan for Southern African Coastal Seabirds*. Cape Town & Apple Valley: Avian Demography Unit & IUCN/SSC Conservation Breeding Specialist Group. 194 pp.
- ENVIRONMENT AUSTRALIA [1998]. *Threat abatement plan for the incidental catch (or by-catch) of seabirds during oceanic longline fishing operations*. Canberra: Environment Australia. 61 pp.
- ENVIRONMENT AUSTRALIA 1999. *Draft recovery plan for albatrosses and giant petrels*. [Canberra]: Environment Australia. 98 pp.
- FAO 1995. *Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas*. Rome: Rome: Food and Agriculture Organization of the United Nations. 12 pp.
- FAO 1995. *Code of Conduct for Responsible Fisheries*. Rome: Food and Agriculture Organization of the United Nations. 41 pp.
- FAO 1997. Report of the Twenty-second Session of the Committee on Fisheries. Rome, Italy, 17-20 March 1997. *FAO Fisheries Report No. 562*. 32 pp..

- FAO 1998. Report of the Preparatory Meeting for the Consultation on the Management of Fishing Capacity, Shark Fisheries and Incidental Catch of Seabirds in Longline Fisheries. Rome, Italy, 22-24 June 1998 *FAO Fisheries Report* No. 584. 48 pp.
- FAO 1999. Report of the Consultation on the Management of Fishing Capacity, Shark Fisheries and Incidental Catch of Seabirds in Longline Fisheries. Rome, Italy, 26-30 October 1998 *FAO Fisheries Report* No. 593. 122 pp.
- FAO 1999. Report of the Twenty-third Session of the Committee on Fisheries. Rome, Italy, 15-19 February 1999. *FAO Fisheries Report* No. 595. 70 pp.
- FAO 1999. *The Rome Declaration on the Implementation of the Code of Conduct for Responsible Fisheries*. Rome: Food and Agriculture Organization of the United Nations. 4 pp.
- FAO 1999. *International Plan of Action for reducing incidental catch of seabirds in longline fisheries. International Plan of Action for the conservation and management of sharks. International Plan of Action for the management of fishing capacity*. Rome: Food and Agriculture Organization of the United Nations. 26 pp.
- FAO 2001. *Progress in the implementation of the Code of Conduct for Responsible Fisheries and related International Plans of Action*. COFI/2001/3. Rome: Food and Agriculture Organization of the United Nations. 20 pp.
- FAO 2001. South Africa. In: *Summarized extracts on the status of implementation of the Code of Conduct for Responsible Fisheries*. Rome: Food and Agriculture Organization of the United Nations. pp. 124-126.
- GALES, R. 1993. *Co-operative mechanisms for the conservation of albatross*. [Canberra]: Australian Nature Conservation Agency & Australian Antarctic Foundation. 132 pp.
- GALES, R. 1998. Albatross populations: status and threats. In: Robertson, G. & Gales, R. (Eds). *Albatross biology and conservation*. Chipping Norton: Surrey Beatty & Sons. pp. 20-45.
- GARTSHORE, N.A, COOPER, J. & HUNTER, S. 1988. Bird ringing at Marion and Prince Edward Islands, 1982-1987; with an analysis of movements since 1951. *South African Journal of Antarctic Research* 18: 23-29.
- GLASS, N., LAVARELLO, I., GLASS, J.P. & RYAN, P.G. 2000. Longline fishing at Tristan da Cunha: impacts on seabirds. *Atlantic Seabirds* 2: 49-56.
- GOVERNMENT OF JAPAN 2001. *Japan's National Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries*. [Tokyo]: Government of Japan. 12 pp.
- HALL, H.R. & HAWARD, M. 2000. Enhancing compliance with international legislation and agreements mitigating seabird mortality on longlines. In: Cooper, J. (Ed.). *Albatross and Petrel Mortality from Longline Fishing International Workshop*, Honolulu, Hawaii, USA, 11-12 May 2000. Report and presented papers. *Marine Ornithology* 28: 183-190.
- HAWARD, M., BERGIN, A. & HALL, H.R. 1998. International legal and political bases to the management of the incidental catch of seabirds. . In: Robertson, G. & Gales, R. (Eds). *Albatross biology and conservation*. Chipping Norton: Surrey Beatty & Sons. pp. 255-266.
- HARRISON, J.A, ALLAN, D.G., UNDERHILL, L.G., HERREMANS, M., TREE, A.J., PARKER, V. & BROWN, C.R. 1997. *The atlas of southern African birds*. BirdLife South Africa: Johannesburg. xxx pp.

- HUNTER, S. & BROOKE, M. de L. 1992. The diet of giant petrels *Macronectes* spp. at Marion Island, southern Indian Ocean. *Colonial Waterbirds* 15: 56-65.
- HUNTER, S. & KLAGES, N.T.W.. 1989. The diet of the Grey-headed Albatross *Diomedea chrysostoma* at the Prince Edward Islands. *South African Journal of Antarctic Research* 19: 31-33.
- ICCAT 1985. *Basic texts*. Madrid: International Commission for the Conservation of Atlantic Tunas. 99 pp.
- IUCN 1994. *Resolutions and recommendations. 19th Session of the General Assembly of IUCN – The World Conservation Union, Buenos Aires, Argentina 17-26 January 1994*. Gland: The World Conservation Union. 80 pp.
- IUCN 1997. *Resolutions and recommendations. World Conservation Congress, Montreal, Canada 12-23 October 1996*. Gland: The World Conservation Union. 95 pp.
- IUCN 2001. *Resolutions and recommendations. World Conservation Congress, Amman, Jordan 4-11 October 2000*. Gland: The World Conservation Union. 76 pp.
- JAPP, D.W. 1993. Longlining in South Africa. In: Beckley, L.E. & van der Elst, R.P. (Eds). Fish, fishers and fisheries. Proceedings of the Second South African Marine Linefish Symposium, Durban, 22-23 October 1992. *Special Publication of the Oceanographic Research Institute* 2: 134-139.
- JAPP, D.W. 1995. Report submitted to the Longline Management Committee on the hake-directed Longline Pilot Study conducted from 23 May 1994 to 31 May 1995. Sea Fisheries Research Institute. WG/09/95/D:H:16. 49 pp + 5 appendices.
- KOCK, K-H. 2001. The direct influence of fishing and fishery-related activities on non-target species in the Southern Ocean with particular emphasis on longline fishing and its impact on albatrosses and petrels – a review. *Reviews in Fish Biology and Fisheries* 11: 31-56.
- KROESE, M. & KEITH, D. 2000. Longlining and seabird mortality in South African continental waters. In: Cooper, J. (Ed.). Conservation of South African albatrosses and petrels at risk from longlining. A BirdLife South Africa and South African National Antarctic Programme Workshop, Cape Town, 7 June 2000. *ADU Research Report* 39: 19-20.
- LACK, M. & SANT, G. 2001. Patagonian Toothfish: are conservation and trade measures working? *TRAFFIC Bulletin* 19: 15-32.
- LE MAY, J. 2001. Taiwan tuna fleets to be phased out of SA waters. *Sunday Argus* 24/25 March 2001.
- LESLIE, R.W. & WATKINS, B.P. 2001. Trawl survey of the Patagonian Toothfish (*Dissostichus eleginoides*) resource off the Prince Edward Islands. CCAMLR WG-FSA-01/72. 14 pp.
- LIVERSIDGE, R. & LE GRAS, G.M. 1981. Observations of seabirds off the eastern Cape, South Africa, 1958-1963. In Cooper, J. (Ed.). *Proceedings of the Symposium on Birds of the Sea and Shore, 1979*. Cape Town: African Seabird Group. pp. 149-167.
- LØKKEBORG, S. 19989. Seabird bycatch and bait loss in long-lining using different setting methods. *ICES Journal of Marine Science* 55: 145-149.
- LØKKEBORG, S. 2001. Reducing seabird bycatch in longline fisheries by means of bird-scaring lines and underwater setting. In: Melvin, E.F. & Parrish, J.K. (Eds). Seabird bycatch: trends, roadblocks and solutions. Fairbanks: University of Alaska Sea Grant. pp. 33-41.

- MARCHANT, S. & HIGGINS, P.J. (Eds). 1990. *Handbook of Australian, New Zealand & Antarctic birds. Vol. 1 Part A Ratites to petrels*. Melbourne: Oxford University Press. 735 pp.
- MARINE & COASTAL MANAGEMENT 1992-2001. Research highlights 1991/92-2000/2001. Nos. 1-10. Cape Town: Marine & Coastal Management, Department of Environmental Affairs & Tourism.
- MARINE & COASTAL MANAGEMENT 1993-2002. South African commercial fisheries review 1991-1998. Nos. 1-8. Cape Town: Marine & Coastal Management, Department of Environmental Affairs & Tourism.
- MELVIN, E.F. & PARRISH, J.K. (EDS). Seabird bycatch: trends, roadblocks and solutions. Fairbanks: University of Alaska Sea Grant. 206 pp.
- MELVIN, E.F. & ROBERTSON, G. 2000. Seabird mitigation research in longline fisheries: status and priorities for future research and actions. In: Cooper, J. (Ed.). Albatross and Petrel Mortality from Longline Fishing International Workshop, Honolulu, Hawaii, USA, 11-12 May 2000. Report and presented papers. *Marine Ornithology* 28: 179-182.
- MINISTRY OF FISHERIES & DEPARTMENT OF CONSERVATION 2000. *Draft seabird interaction with fisheries in the New Zealand Exclusive Economic Zone. A review and national Plan of Action*. [Wellington]: Ministry of Fisheries & Department of Conservation. 106 pp.
- NATIONAL MARINE FISHERIES SERVICE 2001. *Final United States National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries*. Silver Spring: National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce. 18 pp + 8 appendices.
- NEL, D.C. 2002. The impact of longline fishing on the seabirds breeding on Marion Island. PhD thesis, University of Cape Town. xxx pp.
- NEL, D.C., LUTJEHARMS, J.R.E, PAKHOMOV, E.A., ANSORGE, I.J., RYAN, P.G. & KLAGES, N.T.W. 2001. Exploitation of mesoscale oceanographic features by Grey-headed Albatross *Thalassarche chrysostoma* in the southern Indian Ocean. *Marine Ecology Progress Series* 217: 15-26.
- NEL, D.C., ++ MS. Population dynamics of Wandering Albatrosses *Diomedea exulans* breeding at sub-Antarctic Marion Island. Submitted xx. yy pp.
- NEL, D.C. & NEL, J.L. 1999. Marine debris and fishing gear associated with seabirds at sub-Antarctic Marion Island, 1996/97 and 1997/98 in relation to long-line fishing activity. *CCAMLR Science* 6: 85-96.
- NEL, D.C., NEL, J.C., RYAN, P.G., KLAGES, N.T.W, WILSON, R.P. & ROBERTSON, G. 2000. Foraging ecology of Grey-headed Mollymawks at Marion Island, southern Indian Ocean, in relation to longline fishing activity. *Biological Conservation* 96: 219-231.
- NEL, D.G., RYAN, P.G., CRAWFORD, R.J.M, COOPER, J. & HUYSER, O.A.W. 2002. Population trends of albatrosses and petrels at sub-Antarctic Marion Island. *Polar Biology* 25: 81-89.
- NEL, D.C., RYAN, P.G., NEL, J.L, KLAGES, N.T.W., WILSON, R.P., ROBERTSON, G. & TUCK, G.N. 2002. Foraging interactions of Wandering Albatrosses *Diomedea exulans* breeding on Marion Island with long-line fisheries in the southern Indian Ocean. *Ibis* 144: E141-E154.

- NEL, D.C, RYAN, P.G. & WATKINS, B.P. 2002. Seabird mortality in the Patagonian Toothfish fishery around the Prince Edward islands, 1996-2000. *Antarctic Science* 14: 151-161.
- NELSON, *The Sulidae. Gannets and boobies.* Oxford: Oxford University Press & University of Aberdeen. 1012 pp.
- NEPGEN, C.C.deV. 1970. Exploratory fishing for tuna off the South African West Coast. *Investigational Report of the Division of Sea Fisheries of South Africa* 87: 1-26.
- NEPGEN, C.C.deV. 1970. The Japanese longline fishery off the South African Coast, 1964-1967. *Investigational Report of the Division of Sea Fisheries of South Africa* 90: 1-13.
- NEWTON, I.P. & FUGLER, S.R. 1989. Notes on the winter-breeding Greatwinged Petrel *Pterodroma macroptera* and Grey Petrel *Procellaria cinerea* at Marion Island. *Cormorant* 17: 27-34.
- OSBORNE, R.F. & MULLINS, P.W. 2002. An analysis of the 2000/2001 South African hake longliner scientific observer programme. Southern African Marine Science Symposium, Swakopmund, Namibia, 1-5 July 2002 Symposium Handbook. p. 77.
- PENNY, A.[J.] 1996. Why bar SA fisherman from longlining tuna and swordfish? *SA Commercial marine Magazine* 5(2): 14-16.
- PENNEY, A.J. 2002. Principal characteristics of tuna fisheries conducted within the South African Exclusive Economic Zone. Pisces Research and Management Consultants. 30 pp.
- [PENNEY. A.[J.]] 2001. SA gains Swordfish quota. *Fishing Industry News Southern Africa* 1(6): 14.
- PENNEY, A.J. & PUNT, A.E. 1993. The South African tuna fishery: past, present and future. In: Beckley, L.E. & van der Elst, R.P. (Eds). Fish, fishers and fisheries. Proceedings of the Second South African Marine Linefish Symposium, Durban, 22-23 October 1992. *Special Publication of the Oceanographic Research Institute* 2: 140-142.
- PRINCE EDWARD ISLANDS MANAGEMENT COMMITTEE 1996. *Prince Edward Islands Management Plan.* Pretoria: Department of Environmental Affairs & Tourism. 64 pp.
- RIVERA, K.S. 2000. The FAO International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries – what are nations doing? In: Cooper, J. (Ed.). Albatross and Petrel Mortality from Longline Fishing International Workshop, Honolulu, Hawaii, USA, 11-12 May 2000. Report and presented papers. *Marine Ornithology* 28: 175-178.
- ROBERTSON, G. 2001. Effect of line sink rate on albatross mortality in the Patagonian Toothfish fishery. In: Melvin, E.F. & Parrish, J.K. (Eds). Seabird bycatch: trends, roadblocks and solutions. Fairbanks: University of Alaska Sea Grant. pp. 43-60.
- ROBERTSON, G., McNEILL, M., KING, B. & KRISTENSEN, R. 2002. Demersal longlines with integrated weight: a preliminary assessment of sink rates, fish catch success and operational effects. CCAMLR WG-FSA-02/22. 17 pp.
- RYAN, P.G. 1998. The taxonomic and conservation status of the Spectacled Petrel *Procellaria conspicillata*. *Bird Conservation International* 8: 2223-235.
- RYAN, P.G. 1999. Sexual dimorphism, moult and body condition of seabirds killed by longline vessels around the Prince Edward Islands, 1996-97. *Ostrich* 70: 187-192.

- RYAN, P.G. & BOIX-HINZEN, C. 1998. Tuna longline fisheries off southern Africa: the need to limit seabird bycatch. *South African Journal of Science* 94: 179-182.
- RYAN, P.G. & BOIX-HINZEN, C. 1999. Consistent male-biased seabird mortality in the Patagonian Toothfish longline fishery. *Auk* 116: 851-854.
- RYAN, P.G., COOPER, J. & GLASS, J.P. 2001. Population status, breeding biology and conservation of the Tristan Albatross *Diomedea [exulans] dabbenena*. *Bird Conservation International* 11: 35-48.
- RYAN, P.G., KEITH, D.G. & KROESE, M. 2002. Seabird bycatch by tuna longline fisheries off southern Africa, 1998-2000. *South African Journal of marine Science* 24: 103-110.
- RYAN, P.G. & MOLONEY, C.L. 2000. The status of Spectacled Petrels *Procellaria conspicillata* and other seabirds at Inaccessible Island. *Marine Ornithology* 28: 93-100.
- RYAN, P.G., NEL, D.C & COOPER, J. in press. Reducing longline mortality of seabirds: a South African perspective. *Acta Zoologica Sinica*.
- RYAN, P.G. & ROSE, B. 1989. Migrant seabirds. In: Payne, A.I.L. & Crawford, R.J.M. (Eds). Oceans of life off southern Africa. Cape Town: Vlaeberg. pp. 274-287.
- RYAN, P.G. & WATKINS, B.P. 2001. Seabird bycatch in the Patagonian Toothfish fishery at the Prince Edward Islands: 2000-2001. CCAMLR WG-FSA-01/61. 7 pp.
- RYAN, P.G. & WATKINS, B.P. 2002. Reducing the incidental mortality of seabirds with an underwater longline setting funnel. *Biological Conservation* 104: 127-131.
- SHANNON, L.V., VAN DER ELST, R.P. & CRAWFORD, R.J.M. 1989. Tunas, bonitos, Sapanish Mackerels and billfish. In: : Payne, A.I.L. & Crawford, R.J.M. (Eds). Oceans of life off southern Africa. Cape Town: Vlaeberg. pp. 188-197.
- SMITH, N.W.McL. 2001. Longline sink rates of an autoline vessel, and notes on seabird interactions. [New Zealand] *Science for Conservation* 183: 1-32.
- [TAIWAN] undated. *Measures taken by Taiwan for reducing incidental catch of seabirds in longline fishery*. 8 pp.
- TASKER, M., CAMPHUYSEN, C.J., COOPER, J., GARTHE, S., MONTEVECCHI, W.A & BLABER, S.J.M. 2000. The impacts of fishing on marine birds. *ICES Journal of Marine Science* 57: 531-547.
- TICKELL, W.L.N. 2000. *Albatrosses*. Mountfield: Pica Press. 448.
- UN 1998. Large-scale pelagic drift net fishing, unauthorized fishing in zones of national jurisdiction and on the high seas, fisheries bycatch and discards, and other developments. Report of the Secretary General. United Nations General Assembly. A/53/743. 29 pp.
- UN 1999. Resolution adopted by the General assembly. 53/33. Large-scale pelagic drift net fishing, unauthorized fishing in zones of national jurisdiction and on the high seas, fisheries bycatch and discards, and other developments. United Nations General Assembly. A/RES/53/33. 5 pp.
- VAN ZINDEREN BAKKER JR, E.M. 1971. Then genus *Diomedea*. In: van Zinderen Bakker, Sr, E.M., Winterbottom, J.M. & Dyer, R.A. (Eds). *Marion and Prince Edward Islands: Report of the South African Biological & Geological Expedition / 1965-1966*. Cape Town: A.A. Balkema. pp. 273-282.
- WALKER, T. 1991. Experiment flattens SA marine resource. Kingklip ravaged. *SA Commercial Fisherman* 3(1): 1,4,6.
- WALSH, J. 1998. The false smile of the toothfish (industry). *SA Commercial Marine* 7(2): 18-20.

- WATKINS, B.P. 1987. Population sizes of King, Rockhopper and Macaroni penguins and Wandering Albatrosses at the Prince Edward Islands, 1951-1986. *South African Journal of Antarctic Research* 17: 150-157.
- WATKINS, B.P. 2002. Seabird by-catch in the Patagonian Toothfish longline fishery at the Prince Edward Islands: 2001-2002. CCAMLR WG-FSA-02/17. 6 pp.
- WELSH, J.G.. 1968. A new approach to research on tuna distribution in South African waters. *Fisheries Bulletin of South Africa* 5: 32-34.
- WILLOCK, A. 2002. *Uncharted waters. Implementation issues and potential benefits of listing toothfish in Appendix II of CITES*. Cambridge & Sydney: TRAFFIC International & TRAFFIC Oceania. 36 pp.
- WOEHLER, E.J. 1996. Concurrent decreases in five species of Southern Ocean seabirds in Prydz Bay. *Polar Biology* 16: 379-382.
- WOEHLER, E.J., COOPER, J., CROXALL, J.P., FRASER, W.R., KOOYMAN, G.L., MILLER, G.D., NEL, D.C., PATTERSON, D.L., PETER, H-U., RIBIC, C.A., SALWICKA, K., TRIVELPIECE, W.Z. & WEIMERSKIRCH, H. 2001. *A statistical assessment of the status and trends of Antarctic and Subantarctic seabirds*. [Cambridge]: Scientific Committee on Antarctic Research. 43 pp.

Appendix One

FAO INTERNATIONAL PLAN OF ACTION FOR REDUCING INCIDENTAL CATCH OF SEABIRDS IN LONGLINE FISHERIES

Introduction

1. Seabirds are being incidentally caught in various commercial longline fisheries in the world, and concerns are arising about the impacts of this incidental catch. Incidental catch of seabirds may also have an adverse impact on fishing productivity and profitability. Governments, non-governmental organizations, and commercial fishery associations are petitioning for measures to reduce the mortality of seabirds in longline fisheries in which seabirds are incidentally taken.
2. Key longline fisheries in which incidental catch of seabirds are known to occur are: tuna, swordfish and billfish in some particular parts of oceans; Patagonian toothfish in the Southern Ocean, and halibut, black cod, Pacific cod, Greenland halibut, cod, haddock, tusk and ling in the northern oceans (Pacific and Atlantic). The species of seabirds most frequently taken are albatrosses and petrels in the Southern Ocean, northern fulmars in the North Atlantic and albatrosses, gulls and fulmars in the North Pacific fisheries.
3. Responding to the need to reduce the incidental catch of seabirds in commercial fisheries in the Southern Ocean, the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) adopted mitigation measures in 1992 for its 23 member countries to reduce incidental catch of seabirds.
4. Under the auspices of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT), Australia, Japan and New Zealand have studied and taken seabird mitigation measures in their southern bluefin tuna longline fishery since 1994, and in 1995 CCSBT adopted a recommendation relating to ecologically related species, including the incidental mortality of seabirds by longline fishing. The recommendation stipulates a policy on data and information collection, mitigation measures, as well as education and information dissemination. All member nations of CCSBT have made the use of bird scaring lines (tori poles) mandatory in their fisheries.
5. The United States of America also adopted, by regulation, measures for reducing incidental catch of seabirds for its groundfish longline fisheries in the Bering Sea/Aleutian Islands and Gulf of Alaska in 1997, and for its halibut fishery in 1998. The United States is currently developing measures to mitigate the incidental catch of seabirds in the Hawaiian pelagic longline fisheries. Several other countries with longline fisheries have likewise adopted similar mitigation measures.

Origin

6. Noting an increased awareness about the incidental catch of seabirds in longline fisheries and its potential negative impacts on seabird populations, a proposal was made at the Twenty-second Session of the Committee on Fisheries (COFI) in March 1997 that FAO organize an expert consultation, using extra-budgetary funds, to develop Guidelines leading to a Plan of Action to be submitted at the next Session of COFI aiming at a reduction in such incidental catch.

7. The International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries (IPOA-SEABIRDS) has been developed through the meeting of a Technical Working Group in Tokyo 25-27 March 1998 and the Consultation on the Management of Fishing Capacity, Shark Fisheries and Incidental Catch of Seabirds in Longline Fisheries held 26-30 October 1998 and its preparatory meeting held in Rome 22-24 July 1998.

Nature and Scope

8. IPOA-Seabirds is voluntary. It has been elaborated within the framework of the Code of Conduct for Responsible Fisheries as envisaged by Article 2 (d). The provisions of Article 3 of the Code of Conduct apply to the interpretation and application of this document and its relationship with other international instruments. All concerned States are encouraged to implement it.

9. The IPOA-SEABIRDS applies to States in the waters of which longline fisheries are being conducted by their own or foreign vessels and to States that conduct longline fisheries on the high seas and in the exclusive economic zones (EEZ) of other States.

Objective

10. Taking into account in particular the objectives of articles 7.6.9 and 8.5 of the Code of Conduct, the objective of the IPOA-SEABIRDS is to reduce the incidental catch of seabirds in longline fisheries where this occurs.

Implementation

11. In implementing the IPOA-SEABIRDS States should carry out a set of activities. This should be done as appropriate in conjunction with relevant international organizations. The exact configuration of this set of activities will be based on an assessment of the incidental catch of seabirds in longline fisheries.

12. States with longline fisheries should conduct an assessment of these fisheries to determine if a problem exists with respect to incidental catch of seabirds. If a problem exists, States should adopt a National Plan of Action for reducing the incidental catch of seabirds in longline fisheries (NPOA-SEABIRDS). (See the attached "Technical note on developing a National Plan of Action for reducing the incidental catch of seabirds in

longline fisheries".) When developing the NPOA-SEABIRDS experience acquired in regional management organizations should be taken into account as appropriate. FAO should provide a list of experts and a mechanism of technical assistance to countries for use in connection with development of NPOA-SEABIRDS.

13. States which determine that an NPOA-SEABIRDS is not necessary should review that decision on a regular basis, particularly taking into account changes in their fisheries, such as the expansion of existing fisheries and/or the development of new longline fisheries. If, based on a subsequent assessment, States determine that a problem exists, they should follow the procedures outlined in paragraph 12, and implement an NPOA-SEABIRDS within two years.

14. The assessment should be included as a part of each relevant State's NPOA-SEABIRDS.

15. Each State is responsible for the design, implementation and monitoring of its NPOA-SEABIRDS.

16. States recognize that each longline fishery is unique and the identification of appropriate mitigation measures can only be achieved through on-the-spot assessment of the concerned fisheries. Technical and operational mitigation measures are presently in use or under development in some longline fisheries where incidental catch of seabirds occurs. Measures developed by different States are listed in a Technical Note attached to this document. This list does not prejudice the right of States to decide to use any of these or other suitable measures that may be developed. A more comprehensive description and discussion of the mitigation measures currently used or under development can be found in FAO Fisheries Circular No. 937.

17. States should start the implementation of the NPOA-SEABIRDS no later than the COFI Session in 2001.

18. In implementing their NPOA-SEABIRDS States should regularly, at least every four years, assess their implementation for the purpose of identifying cost-effective strategies for increasing the effectiveness of the NPOA-SEABIRDS.

19. States, within the framework of their respective competencies and consistent with international law, should strive to cooperate through regional and subregional fisheries organizations or arrangements, and other forms of cooperation, to reduce the incidental catch of seabirds in longline fisheries.

20. In implementing the IPOA-SEABIRDS States recognize that cooperation among States which have important longline fisheries is essential to reduce the incidental catch of seabirds given the global nature of the issue. States should strive to collaborate through FAO and through bilateral and multilateral arrangements in research, training and the production of information and promotional material.

21. States should report on the progress of the assessment, development and implementation of their NPOA-SEABIRDS as part of their biennial reporting to FAO on the Code of Conduct for Responsible Fisheries.

Role of FAO

22. FAO will, as and to the extent directed by its Conference, and as part of its Regular Programme activities support States in the implementation of the IPOA-SEABIRDS.

23. FAO will, as and to the extent directed by its Conference, support development and implementation of NPOA-SEABIRDS through specific, in-country technical assistance projects with Regular Programme funds and by use of extra-budgetary funds made available to the Organization for this purpose.

24. FAO will, through COFI, report biennially on the state of progress in the implementation of the IPOA-SEABIRDS.

Technical note on developing a National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries (NPOA-SEABIRDS)

This is not an exclusive or necessarily all-encompassing list but provides guidance for preparation of the NPOA-SEABIRDS.

The NPOA-SEABIRDS is a plan that a State designs, implements and monitors to reduce the incidental catch of seabirds in longline fisheries.

I. Assessment

1. The purpose of the assessment is to determine the extent and nature of a State's incidental catch of seabirds in longline fisheries where it occurs.
2. The assessment may include, but is not limited to, the collection and analysis of the
 - Criteria used to evaluate the need for an NPOA-SEABIRDS.
 - Fishing fleet data (numbers of vessels by size).
 - Fishing techniques data (demersal, pelagic, methods).
 - Fishing areas.
 - Fishing effort by longline fishery (seasons, species, catch, number of hooks/year/fishery). Status of seabird populations in the fishing areas, if known.
 - Total annual catch of seabirds (numbers per 1000 hooks set/species/longline fishery).
 - Existing mitigation measures in use and their effectiveness in reducing incidental catch of seabirds.
 - Incidental catch of seabirds monitoring (observer programme, etc.).
- Statement of conclusions and decision to develop and implement an NPOA-SEABIRDS.

II. NPOA-SEABIRDS

The NPOA-SEABIRDS may contain the following elements:

1. Prescription of mitigation measures

The NPOA-SEABIRDS should prescribe appropriate mitigation methods. These should have a proven efficiency, and be cost-effective for the fishing industry. If effectiveness of mitigation measures can be improved by combining different mitigation measures or devices, it is likely that each State will find it advantageous to implement a number of different measures that reflect the need and particular circumstances of their specific longline fishery.

2. Research and development

The NPOA-SEABIRDS should contain plans for research and development, including those aiming: (i) to develop the most practical and effective seabird deterrent device; (ii) to improve other technologies and practices which reduce the incidental capture of seabirds; and (iii) undertake specific research to evaluate the effectiveness of mitigation measures used in the longline fisheries, where this problem occurs.

3. Education, training and publicity

The NPOA-SEABIRDS should prescribe means to raise awareness among fishers, fishing associations and other relevant groups about the need to reduce the incidental catch of seabirds in longline fisheries where this occurs; National and International Plans of Action and other information on the incidental catch of seabirds in longline fisheries; and to promote the implementation of the NPOA-SEABIRDS among national industry, research and its own administration.

Provide information about technical or financial assistance for reducing the incidental catch of seabirds.

Preferably design and implementation of outreach programmes for fishers, fisheries managers, gear technologists, maritime architects, shipbuilders, and conservationists and other interested members of the public should be described in the plan. These programmes should aim at improving the understanding of the problem resulting from incidental catch of seabirds and the use of mitigation measures. The outreach programme may include educational curricula, and guidelines disseminated through videos, handbooks, brochures and posters. The programme should focus on both the conservation aspects of this issue and on the economic benefits of expected increased fishing efficiency inter alia by eliminating bait loss to seabirds.

4. Data collection

Data collection programmes should collect reliable data to determine the incidental catch of seabirds in longline fisheries and the effectiveness of mitigation measures. Such programmes may make use of onboard observers.

TECHNICAL NOTE ON SOME OPTIONAL TECHNICAL AND OPERATIONAL MEASURES FOR REDUCING THE INCIDENTAL CATCH OF SEABIRDS

I. INTRODUCTION

To reduce the incidental catch of seabirds, it is essential to reduce the number of encounters between seabirds and baited hooks. It should be noted that, if used in combination, the options could improve mitigation effectiveness.

For each of the measures, the effectiveness and the cost involved for fishers are briefly presented. In this presentation, "effectiveness" is defined as to what extent the measures reduce incidental catch of seabirds; "cost" is defined as the initial cost or investment and any ongoing operational costs.

Other technical options are currently under development and fishers and researchers in the field may develop new mitigation measures, so the list of measures is likely to increase over time.

If effectiveness of mitigation measures can be improved by combining different mitigation measures or devices, each State may find it advantageous to implement different measures that are more suitable for their conditions and reflect the needs of their specific longline fisheries.

The list below should not be considered mandatory or exhaustive and FAO shall maintain a data base of measures that are in use or under development.

II. TECHNICAL MEASURES

1. Increase the sink rate of baits

a) Weighting the longline gear

Concept: Increase the sinking speed of baited hooks and reduce their exposure time to seabirds.

Effectiveness: Studies have shown that appropriate line-weighting can be highly effective in avoiding bait loss to birds.

Cost: The cost is the initial purchase of the weighting material (either heavier gear or weights) and any ongoing replacement of weights lost during fishing.

b) Thawing bait

Concept: Overcome buoyancy problems in bait by thawing and/or puncturing swim bladders.

Effectiveness: Rate of incidental catch of seabirds is reduced when thawed baits are used. It has also been shown that bait fish with deflated swim bladders sink more quickly than those with inflated swim bladders did.

Cost: Possible costs include bait thawing rack, or extra weight to compensate flotation resulting from the air bladder.

c) Line-setting machine

Concept: Increase line sinking rate by removing line tension during gear deployment.

Effectiveness: Although no quantitative assessments have been done, this practice would result in the line sinking more rapidly thereby reducing availability of baited hooks to seabirds.

Cost: For some fisheries, initial costs may include purchase of a line-setting device.

2. Below-the-water setting chute, capsule, or funnel

Concept: Prevent access by seabirds to baited hooks by setting line under water.

Effectiveness: Underwater setting devices are still under development but could have high effectiveness.

Cost: Initial cost would include purchase of the underwater setting device.

3. Bird-scaring line positioned over or in the area where baited hooks enter the water

Concept: Prevent seabirds access to baited hooks where they enter the water. The bird scaring line is designed to discourage birds from taking baited hooks by preventing their access to baited hooks. Design specifications may vary by vessel, fishing operation, and location and are critical to its effectiveness. Streamer lines and towing buoys are examples of these techniques.

Effectiveness: A number of studies and anecdotal observations have demonstrated significant effectiveness of these devices when properly designed and used.

Cost: Low initial cost for the purchase and installation of bird scaring line.

4. Bait casting machine

Concept: Places bait in area protected by a bird scaring line and outside the turbulence caused by the propeller and the ships wake.

Effectiveness: Deployment of bait under the protection zone of the bird-scaring line reduces the availability of baited hooks to seabirds. The extent to which bait loss is reduced by the use of bait casting machines, used either without a bird-scaring line or in such a manner that baits are not protected by a bird-scaring line, is yet to be determined.

Cost: High, initial costs may include purchase of a bait-casting device.

5. Bird scaring curtain

Concept: To deter seabirds from taking baited hooks during the haul by using a bird scaring curtain.

Effectiveness: Anecdotal evidence indicates that the bird-scaring curtain can effectively discourage birds from seizing baits in the hauling area.

Cost: Low, cost for materials.

6. Artificial baits or lures

Concept: Reduce palatability or availability of baits.

Effectiveness: New baits are still under development and effectiveness has yet to be resolved.

Cost: Currently unknown

7. Hook modification

Concept: Utilize hook types that reduce the probability of birds getting caught when they attack a baited hook.

Effectiveness: Hook size might effect the species composition of incidentally caught seabirds. The effect of modification of hooks is, however, poorly understood.

Cost: Unknown.

8. Acoustic deterrent

Concept: Deterring birds from the longline using acoustic signals, such as high frequency, high volume, distress call, etc.

Effectiveness: Low probability of being effective as background noises are loud and habituation to noises is common among seabirds.

Cost: Unknown.

9. Water cannon

Concept: Concealing baited hooks by using high pressure water.

Effectiveness: There is no definite conclusion about the effectiveness of this method.

Cost: Unknown.

10. Magnetic deterrent

Concept: Perturbing the magnetic receptors of the birds by creating magnetic fields.

Effectiveness: No indication of effect in practical experiments.

Cost: Unknown.

III. OPERATIONAL MEASURES

1. Reduce visibility of bait (night setting)

Concept: Set during hours of darkness and reduce illumination of baited hooks in the water.

Effectiveness: This method is generally recognized as being highly effective. However, effectiveness can vary between fishing grounds and also seasonally according to the seabird species. Effectiveness of this measure may be reduced around the full moon.

Cost: A restriction of line setting to the hours of darkness may affect fishing capacity, especially for smaller longliners. Small costs may be incurred to make vessel lighting appropriate. Such restriction can also entail investing in costly technology for maximizing fishing efficiency in a shorter period of time.

2. Reduce the attractiveness of the vessels to seabirds

Concept: Reducing the attractiveness of vessels to seabirds will reduce the potential for seabirds being incidentally caught. Materials (e.g. fish discards, garbage) discharged from vessels should be at a time or in a way that makes them least available to birds or least likely to cause them harm. This includes avoidance of the dumping of discarded fish, offal, fish heads, etc. with embedded hooks. If dumping offal is unavoidable, it should be done on the opposite side of the vessel to where lines are being set or in such a manner that birds are not attracted to the vessel (e.g. at night).

Effectiveness: The issue of offal discharge is a complex one, and there have been conflicting results regarding effects of various procedures in the studies done to date.

Cost: Low; in some situations costs may be associated with providing for offal containment or reconfiguration of offal discharge systems on the vessel.

3. Area and seasonal closures

Concept: Reduce incidental catch of seabirds when concentrations of breeding or foraging seabirds can be avoided.

Effectiveness: Area and seasonal closures could be effective (such as in high density foraging areas or during the period of chick care when parental duties limit the distances adults can fly from breeding sites) although displacement of fishing fleet to other seabird areas needs to be considered.

Cost: Unknown, but a restriction on fishing by area or season may effect fishing capacity.

4. Give preferential licensing to vessels that use mitigation measures that do not require compliance monitoring

Concept: Incentive provided for effective use of mitigation measures that do not require compliance monitoring.

Effectiveness: May be highly effective in stimulating the use of mitigation measures and development of fishing systems that reduce incidental catch of seabirds.

Cost: Unknown.

5. Release live birds

Concept: If despite the precautions, seabirds are incidentally caught, every reasonable effort should be made to ensure that birds brought onboard alive are released alive and that when possible hooks should be removed without jeopardizing the life of the birds.

Effectiveness: Depends on the number of birds brought onboard alive and this is considered small by comparison to the numbers killed in line setting.

Cost: Unknown.

Appendix Two

CCAMLR CONSERVATION MEASURE 29/XIX^{1,2}

Minimisation of the Incidental Mortality of Seabirds in the Course of Longline Fishing or Longline Fishing Research in the Convention Area

The Commission,

Noting the need to reduce the incidental mortality of seabirds during longline fishing by minimising their attraction to fishing vessels and by preventing them from attempting to seize baited hooks, particularly during the period when the lines are set,

Adopts the following measures to reduce the possibility of incidental mortality of seabirds during longline fishing.

1. Fishing operations shall be conducted in such a way that the baited hooks sink as soon as possible after they are put in the water. Only thawed bait shall be used.
2. For vessels using the Spanish method of longline fishing, weights should be released before line tension occurs; weights of at least 8.5 kg mass shall be used, spaced at intervals of no more than 40 m, or 6 kg mass shall be used, spaced at intervals of no more than 20 m.
3. Longlines shall be set at night only (i.e. during the hours of darkness between the times of nautical twilight³)⁴. During longline fishing at night, only the minimum ship's lights necessary for safety shall be used.
4. The dumping of offal is prohibited while longlines are being set. The dumping of offal during the haul shall be avoided. Any such discharge shall take place only on the opposite side of the vessel to that where longlines are hauled.
5. Vessels which are so configured that they lack on-board processing facilities or adequate capacity to retain offal on board, or the ability to discharge offal on the opposite side of the vessel to that where longlines are hauled, shall not be authorised to fish in the Convention Area.
6. A streamer line designed to discourage birds from settling on baits during deployment of longlines shall be towed. Specification of the streamer line and its method of deployment is given in the appendix to this measure. Details of the construction relating to the number and placement of swivels may be varied so long as the effective sea surface covered by the streamers is no less than that covered by the currently specified design. Details of the device dragged in the water in order to create tension in the line may also be varied.
7. Other variations in the design of streamer lines may be tested on vessels carrying two

observers, at least one appointed in accordance with the CCAMLR Scheme of International Scientific Observation, providing that all other elements of this conservation measure are complied with⁵.

8. Every effort should be made to ensure that birds captured alive during longlining are released alive and that wherever possible hooks are removed without jeopardising the life of the bird concerned.

¹ Except for waters adjacent to the Kerguelen and Crozet Islands

² Except for waters adjacent to the Prince Edward Islands

³ The exact times of nautical twilight are set forth in the Nautical Almanac tables for the relevant latitude, local time and date. All times, whether for ship operations or observer reporting, shall be referenced to GMT.

⁴ Wherever possible, setting of lines should be completed at least three hours before sunrise (to reduce loss of bait to/catches of White-chinned Petrels).

⁵ The streamer lines under test should be constructed and operated taking full account of the principles set out in WG-IMALF-94/19 (available from the CCAMLR Secretariat); testing should be carried out independently of actual commercial fishing and in a manner consistent with the spirit of Conservation Measure 65/XII.

APPENDIX TO CONSERVATION MEASURE 29/XIX

1. The streamer line is to be suspended at the stern from a point approximately 4.5 m above the water and such that the line is directly above the point where the baits hit the water.
2. The streamer line is to be approximately 3 mm diameter, have a minimum length of 150 m and have a device at the end to create tension so that the main line streams directly behind the ship even in cross winds.
3. At 5 m intervals commencing from the point of attachment to the ship five branch streamers each comprising two strands of approximately 3 mm diameter cord should be attached. The length of the streamer should range between approximately 3.5 m nearest the ship to approximately 1.25 m for the fifth streamer. When the streamer line is deployed the branch streamers should reach the sea surface and periodically dip into it as the ship heaves. Swivels should be placed in the streamer line at the towing point, before and after the point of attachment of each branch streamer and immediately before any weight placed on the end of the streamer line. Each branch streamer should also have a swivel at its attachment to the streamer line.

