Agreement on the Conservation of Albatrosses and Petrels

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Gillnet Bycatch of ACAP Species and Ongoing Mitigation Development

Rory Crawford (BirdLife International), Jeff Mangel (ProDelphinus) and Ken Morgan (Environment and Climate Change Canada)

SUMMARY

Based on foraging ecology and recorded bycatch events, 12 of 31 ACAP species are considered susceptible to capture in gillnets. Entanglements have largely been recorded in driftnets, particularly on the high seas in salmon and squid nets, prior to an international ban on this gear in areas beyond national jurisdiction. Broadly, bycatch in gillnet fisheries is not presently considered to be a major threat to ACAP species; though fisheries operating in the north Pacific, along the Humboldt Current and in the western Mediterranean and eastern Atlantic - especially those utilising driftnets - merit closer monitoring to assess whether this is truly the case. Recent advances have been made in the testing of gillnet mitigation measures, with both net lighting and high contrast net panels showing some promise in reducing bycatch with minimal effects on target catch.

Captura secundaria con red de enmalle de las especies del ACAP y labor permanente en materia de mitigación

RESUMEN

A partir de la ecología alimentaria y de registros de captura secundaria, se considera que 12 de las 31 especies del ACAP son susceptibles de ser capturadas en redes de enmalle. Se han registrado muchos casos de captura por enredo en redes de superficie, sobre todo en las redes de alta mar utilizadas para la pesca de salmón y calamar, antes de que entrara en vigor una prohibición internacional del uso de este arte de pesca en zonas situadas fuera de la jurisdicción nacional. En términos generales, actualmente no se considera que la captura secundaria en pesquerías con red de enmalle constituya una amenaza grave para las especies del ACAP. No obstante ello, las pesquerías que operan en el Pacífico norte, por la corriente de Humbold, en el Mediterráneo occidental y en el Atlántico oriental, especialmente aquellas donde se utilizan las redes de superficie, ameritan ser controladas de cerca a fin de corroborar que ello sea así. Recientemente se ha avanzado en la evaluación de las medidas de mitigación de captura secundaria con red de enmalle gracias tanto a la iluminación de las redes como al uso de paneles de alto contraste en dichos artes de pesca. Estos avances son prometedores a los efectos de reducir la captura secundaria con consecuencias mínimas para la pesca de las especies objetivo.

Capture accessoire des espèces de l'ACAP dans les filets maillants et élaboration permanente de mesures d'atténuation

RÉSUMÉ

D'après les études d'écologie alimentaire et les captures accessoires enregistrées, 12 des 31 espèces de l'ACAP sont menacées par la capture accessoire dans les filets maillants. De nombreux cas d'enchevêtrement ont été constatés dans les filets dérivants, en particulier dans les filets de pêche au saumon et au calamar en haute mer, avant que cet équipement fasse l'objet d'une interdiction internationale dans les zones ne relevant d'aucune juridiction nationale. De manière générale, la capture accessoire dans les filets maillants n'est pas considérée actuellement comme une menace majeure pour les espèces de l'ACAP, bien que les activités de pêche dans le Pacifique Nord, le long du courant de Humboldt, ainsi qu'en Méditerranée occidentale et dans l'Atlantique Est, en particulier celles utilisant ces filets dérivants, devraient faire l'objet d'une surveillance plus étroite pour évaluer si cela est réellement le cas. De récents progrès ont été réalisés concernant les essais de mesures d'atténuation des captures accessoires dans les filets maillants. Aussi bien le système d'éclairage des filets que les filets à fort contraste se sont révélés prometteurs pour la réduction des captures accessoires, tout en minimisant les effets sur la prise des espèces cibles.

Introduction

Seabird bycatch in gillnet fisheries has been subject to increasing interest in recent years, including the publication of a global review in 2013 (Zydelis *et al*., 2013) and efforts to develop mitigation measures (Wiedenfeld *et al.*, 2015; Martin and Crawford, 2015; Northridge *et al.*, submitted). Gillnets (used as a catch-all term that includes drift and bottom-set nets, layered entangling trammel nets and others) most frequently capture pursuit-diving and benthic-feeding species, with alcids, seaducks and cormorants among the most susceptible groups (Zydelis *et al.*, 2013). However, albatrosses, petrels and shearwaters have been recorded as bycatch in gillnets. The purpose of this document is to summarise the ACAP-listed species that have been captured in gillnets and identify whether there are any species where this may be of significant concern. Additionally, there is a summary of recent developments with regard to gillnet mitigation measures for seabirds.

<u>ACAP species susceptibility</u>

Adapted from Zydelis *et al*. (2013), Table 1 below is a summary of whether ACAP Annex 1 listed species are considered susceptible (based on their foraging behaviour or high recorded mortalities in gillnet fisheries) and if they have been recorded as bycatch, with relevant references. Where possible, these references were checked to examine the scale of bycatch recorded.

Species	**Susceptible (Y/N)?**	**Recorded as bycatch (Y/N)?**	**References**
Northern Royal Albatross *Diomedea sanfordi*	**N**	**N**	
Southern Royal Albatross *Diomedea epomophora*	**N**	**N**	
Wandering Albatross *Diomedea exulans*	**N**	**N**	
Antipodean Albatross *Diomedea antipodensis*	**N**	**N**	
Amsterdam Albatross *Diomedea amsterdamensis*	**N**	**N**	
Tristan Albatross *Diomedea dabbenena*	**N**	**N**	
Sooty Albatross *Phoebetria fusca*	**N**	**N**	
Light-mantled Albatross *Phoebetria palpebrata*	**N**	**N**	
Waved Albatross *Phoebastria irrorata*	**Y**	**Y**	Awkerman *et al.*, 2006; Mangel *et al*., 2011
Black-footed Albatross *Phoebastria nigripes*	**Y**	**Y**	DeGange *et al*., 1993; Johnson *et al*., 1993; Gould *et al*., 1997; Ogi, 2008
Laysan Albatross *Phoebastria immutabilis*	**Y**	**Y**	Ainley *et al*., 1981; DeGange and Day, 1991; DeGange *et al*., 1993; Gould *et al*. 1997; Ogi, 2008; Artukhin *et al*., 2010
Short-tailed Albatross *Phoebastria albatrus*	**Y**	**Y**	Artukhin *et al*., 2010
Atlantic Yellow-nosed Albatross *Thalassarche chlororhynchos*	**N**	**N**	

Indian Yellow-nosed Albatross *Thalassarche carteri*	**N**	**N**	
Grey-headed Albatross *Thalassarche chrysostoma*	**N**	**Y**	Mangel *et al*., 2011
Black-browed Albatross *Thalassarche melanophris*	**Y**	**Y**	Ogi, 2008; Mangel *et al*., 2011
Campbell Albatross *Thalassarche impavida*	**N**	**N**	
Buller's Albatross *Thalassarche bulleri*	**N**	**Y**	Ramm, 2010; DeGange *et al*., 1993
Shy Albatross *Thalassarche cauta*	**N**	**N**	
White-capped Albatross *Thalassarche steadi*	**N**	**Y**	Ramm, 2010
Chatham Albatross *Thalassarche eremita*	**N**	**N**	
Salvin's Albatross *Thalassarche salvini*	**N**	**N**	
Southern Giant Petrel* *Macronectes giganteus*	**N**	**Y**	Ramm, 2010
Northern Giant Petrel* *Macronectes halli*	**N**	**Y**	Ramm, 2010
White-chinned Petrel *Procellaria aequinoctialis*	**Y**	**Y**	Perez and Warhlich, 2005; Neves *et al*., 2006; Ramm, 2010, 2012; Rowe, 2010; Mangel *et al*., 2011
Spectacled Petrel *Procellaria conspicillata*	**Y**	**Y**	Neves et al, 2006
Black Petrel *Procellaria parkinsoni*	**Y**	**N**	
Westland Petrel *Procellaria westlandica*	**Y**	**Y**	Ramm, 2010, 2012; Rowe, 2010
Grey Petrel *Procellaria cinerea*	**Y**	**N**	
Pink-footed Shearwater *Ardenna creatopus*	**Y**	**Y**	Mangel *et al*., 2011
Balearic Shearwater *Puffinus mauretanicus*	**Y**	**Y**	ICES, 2013

**Note that this was actually a single record of Giant Petrel bycatch, but the individual was not identified to species level*

It is notable that most (19/31 species) are not considered susceptible to gillnet bycatch – this is primarily because they are predominantly surface-foraging species with low recorded bycatch in gillnets. The species considered to be susceptible either use pursuit diving as one of a number of foraging options (the majority of the shearwaters and petrels) or have been regularly recorded as gillnet bycatch. Note that two species not considered susceptible by Zydelis *et al*. (2013) have been added to the susceptible list by the authors of this paper - one is Short-tailed albatross, the other is Black-browed albatross. Rationale is provided below.

Albatrosses

Among the species recorded as gillnet bycatch are the three north Pacific albatross species (Black-footed, Laysan and Short-tailed). While the former two species have been recorded in much higher numbers, the lack of records of Short-tailed albatross bycatch is potentially a function of their small population (Artukhin *et al*., 2010). Much of this bycatch was recorded in the high seas squid driftnet fisheries previously prosecuted by Japan and Korea (DeGange *et al*., 1993), or in salmon driftnet fisheries operating historically in US waters, but most recently in the Russian Exclusive Economic Zone (EEZ) (Artukhin *et al*., 2010). Salmon driftnets in the Russian EEZ were estimated to kill 5,226 albatrosses (comprising the three species listed above) between 1993 and 1998 (Artukhin *et al*., 2004). High Seas driftnets were banned in 1991 (United Nations General Assembly, 1991), and while the gear remains legal and active within many EEZs, in 2015 the Russian Government banned the large-scale salmon driftnet fishery in their EEZ. Although this means that several of the known fisheries of concern for these species are inactive or banned (and the main victims were alcids and non-ACAP listed shearwaters) (DeGange *et al*., 1993; Gould *et al*., 1997; Ogi, 2008; Artukhin *et al*., 2010), ACAP should remain cognisant that impacts are likely still occurring resulting from Illegal, Unreported and Unregulated (IUU) fishing (e.g. 33 vessels were suspected of illegal high seas driftnet fishing in the north Pacific from 2008-2014 (National Marine Fisheries Service, 2015)). The impacts of smaller-scale, within-EEZ fisheries clearly merit closer monitoring given the potential risks, particularly for north Pacific species.

The other albatross species recorded as gillnet bycatch include Buller's, White-capped, Black-browed, Grey-headed and Waved. Of these, only the Waved Albatross is assessed as being susceptible by Zydelis *et al*. (2013), though Black-browed albatrosses are also considered susceptible in this review. The Buller's and White-capped albatross incidents do seem to be isolated: two White-capped and one Buller's albatross came from the 2008/09 season in New Zealand when they were captured on the haul after moving close to the net to feed – both were released alive (Ramm, 2010). Two Black-browed albatrosses and a single Grey-headed albatross were recorded as bycatch across 133 observed driftnet trips in Peru from 2005-2011 (Mangel *et al*., 2011). Both Black-browed albatrosses were recovered alive, though only one of these was released - the other was killed, while the Grey-headed albatross was caught on the soak and released alive (Mangel, pers comm.).

Although Waved albatrosses are considered susceptible to gillnet bycatch (Zydelis *et al*., 2013), there are a similarly small number of bycatch records for this species. Awkerman *et al*. (2006) recorded 12 mortalities for this species across a year in 30 observed trips in Peru starting in October 2004. While all of these mortalities did occur on gillnet vessels, they were the result of active targeting of birds by crew using baited hooks. The only mortality that has been documented was in Peruvian driftnets, where aggregations of birds occur when vessels are processing catch (Mangel *et al*., 2011). Other entanglements resulting in live release of birds have occurred (Mangel, pers comm.). Although the mortality rates of both Waved and Black-browed albatrosses (see above) are low, the huge number of small-scale driftnet vessels operating in the key foraging grounds of these species on the Humboldt Current in particular (Goya *et al*., 2011) does mark them as potentially susceptible.

Petrels and shearwaters

Foraging ecology has not been comprehensively studied for all the ACAP listed petrels and shearwaters. Thus while many utilise surface foraging, Zydelis *et al*. (2013) list all these species (with the exception of the predominantly scavenging giant petrels) as susceptible to gillnet bycatch, because pursuit diving as a foraging strategy is either suspected (Spectacled, Grey, Westland and Black petrels) or known (White-chinned petrel, Balearic and Pink-footed shearwaters) (ACAP Species Assessments, 2016).

In terms of recorded events, White-chinned petrels and Pink-footed shearwaters have been noted as bycatch most frequently. White-chinned petrel bycatch has been recorded from Brazil (Perez and Wahrlich, 2005; Neves *et al*., 2006), New Zealand (Ramm, 2010) and Peru, where 12 individuals were recorded from over 100 observed trips between 2005 and 2011 (Mangel *et al*., 2011). Pink-footed shearwaters have been recorded in lower numbers (four birds over the same observation period in Peru (Mangel *et al*., 2011), plus two more in 2015 (Mangel, unpublished)). The attraction of Pink-footed shearwaters to mixed feeding flocks (including e.g. Sooty shearwaters *Puffinus griseus*, which have been captured in salmon gillnets (Morgan, pers comm.)) around fishing vessels infers that they may be at greater risk than is suggested by the limited available data.

Although the foraging behaviour of Balearic shearwaters would appear to put them at risk from gillnets, there are no recorded events. However, the gregarious behaviour of this species around fishing boats (resulting in irregular but large bycatch events in longlines) (Arcos *et al*., 2008) may mean bycatch has gone unrecorded in poorly monitored small-scale gillnet fisheries.

The single record of giant petrel (not identified to species level) bycatch was recorded in New Zealand in 2008/09, and was thought to have been the result of a bird foraging close to a net during hauling (Ramm, 2010). The single incident of Westland petrel bycatch was recorded in the same season (Ramm, 2010), though seven birds collided with a setnet vessel the following year and were released alive (Ramm, 2012).

Summary of impacts

Overall, gillnet bycatch does not presently appear to represent a substantial risk to ACAP-listed seabirds, with more concern for alcids, penguins and seaducks (Zydelis *et al*., 2013). However, the potential for mortalities, particularly in surface-set gillnets, is clear (DeGange *et al*., 1993; Artukhin *et al*., 2010; Mangel *et al*., 2011), and fleet-wide impact estimates can be large when effort is high – for example, over 5,000 albatrosses (a mix of Laysan, Black-footed and Short-tailed) were estimated killed in the salmon driftnet fishery in Russian waters between 1993 and 1998 (Artukhin *et al*., 2004). Although this particular fishery was recently closed, driftnets remain in use within the EEZs of several countries, and the potential impact of this gear on a variety of non-target species, including non-ACAP seabirds, cetaceans and pinnipeds, merits closer monitoring attention from national authorities, particularly – from an albatross and petrel perspective – in the North Pacific, Humboldt Current (to cover potential impacts to threatened Waved albatrosses and Pink-footed shearwaters), and in the Western Mediterranean/Eastern Atlantic (for Balearic shearwaters). While the impacts of individual vessels may be small, the massive scale of some of the small-scale fleets utilising gillnets could make bycatch in this gear significant at the fleet-wide level.

<u>Emerging gillnet bycatch mitigation research</u>

Very little research has explored technical means of reducing avian bycatch in gillnets (Lokkeborg, 2011; Zydelis *et al*., 2013), especially when compared to cetaceans (Northridge et *al*., *submitted*). This has been the subject of previous reviews submitted to the Seabird Bycatch Working Group of ACAP (Childerhouse and Steptoe, 2013), which concluded that there is no single measure suitable for all fisheries, that fisheries-specific solutions need to be explored and that visual and acoustic deterrents have shown some promise (Melvin *et al*., 1999).

However, since 2013, some progress has been made. Martin and Crawford (2015) published a review examining gillnet bycatch from a sensory ecology perspective, and based on this, proposed the testing of black and white panels attached at regular intervals along gillnets to alert birds (and potentially other non-target taxa) to their presence. These are presently undergoing preliminary testing in Chile and Lithuania (see Figure 1 and www.seabirdbycatch.com). Early results require full analysis, but suggest this measure shows promise. This review also highlighted that adjustments to net colour for nets deployed at depth were unlikely to significantly change their visibility, though this may have some utility for surface-set nets, particularly in clear waters. For example, recent work with captive Little penguins *Eudyptula minor* suggests that orange-coloured mesh may result in fewer interactions (Shet *et al*., 2016).

Figure 1. Net panel, comprised of synthetic material strips to reduce drag, attached to gillnet in Lithuania (Pic: © Julius Morkunas, Seabird Task Force)

Figure 2. Longline lights attached to the headline of a gillnet in Peru (Pic: © Jeff Mangel)

While Martin and Crawford (2015) raised concerns about the effects of lights on the vision of dark-adapted foraging birds, net lighting (using longline fishing LED lights clipped along the headline at regular intervals) shows promise as a multi-taxa gillnet mitigation measure (see Figure 2 above). Originally developed for sea turtles (Wang *et al*., 2013), testing in Peruvian demersal-set nets suggests that lighting may also reduce the bycatch of seabirds (Mangel *et al*., 2014; Mangel *et al*., unpubl. data). Forthcoming trials in gillnet fisheries in Newfoundland (Montevecchi, pers. comm.) and Poland (Crawford, pers comm.) will conduct further testing of LED lights.

Several of these results and proposals were discussed at a joint BirdLife-American Bird Conservancy gillnet mitigation workshop in January 2015, the results of which are available online (Wiedenfeld *et al*., 2015). Outstanding follow-ups from this workshop include building a better understanding of the underwater auditory capacities of gillnet bycatch-susceptible birds and further testing of high-visibility sections of netting (as tested by Melvin *et al*., 1999) in other, similar fisheries. Additionally, there was a proposal, discussed further at the Pacific Seabird Group meeting in 2015, to map gillnet fisheries overlapping with susceptible species - which ought to include ACAP species. It is recommended that this is pursued by relevant Pacific seabird data holders and national authorities.

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