Biological Conservation 201 (2016) 169–183

Contents lists available at ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/bioc

Review

The conservation status and priorities for albatrosses and large petrels

R.A. Phillips [a,*], R. Gales [b], G.B. Baker [c], M.C. Double [d], M. Favero [e], F. Quintana [f], M.L. Tasker [g], H. Weimerskirch [h], M. Uhart [i], A. Wolfaardt [j]

[a] British Antarctic Survey, Natural Environment Research Council, High Cross, Madingley Road, Cambridge CB3 0ET, UK
[b] 259 Howden Road, Howden, Tasmania, Australia
[c] Institute for Marine and Antarctic Studies (IMAS-Hobart), Private Bag 129, Hobart, TAS 7001, Australia
[d] Australian Antarctic Division, 203 Channel Highway, Kingston, Tasmania 7050, Australia
[e] Instituto de Investigaciones Marinas y Costeras (IIMyC, CONICET-UNMDP), Mar del Plata, Argentina
[f] Instituto de Biologia de Organismos Marinos (IBIOMAR), CONICET, Puerto Madryn U9120ACD, Chubut, Argentina
[g] Joint Nature Conservation Committee, Inverdee House, Baxter Street, Aberdeen AB11 9QA, UK
[h] Centre d'Etudes Biologiques de Chizé, CNRS, 79360, Villiers en Bois, France
[i] One Health Institute, School of Veterinary Medicine, University of California, Davis, CA 95616, USA
[j] P.O. Box 64, The Crags, 6602, South Africa

ARTICLE INFO

Article history:
Received 25 October 2015
Received in revised form 16 June 2016
Accepted 20 June 2016
Available online xxxx

Keywords:
Anthropogenic impacts
Conservation management
Invasive species
Non-target species
Population trends
Regional fisheries management organisations

ABSTRACT

Seabirds are amongst the most globally-threatened of all groups of birds, and conservation issues specific to albatrosses (Diomedeidae) and large petrels (*Procellaria* spp. and giant petrels *Macronectes* spp.) led to drafting of the multi-lateral Agreement on the Conservation of Albatrosses and Petrels (ACAP). Here we review the taxonomy, breeding and foraging distributions, population status and trends, threats and priorities for the 29 species covered by ACAP. Nineteen (66%) are listed as threatened by IUCN, and 11 (38%) are declining. Most have extensive at-sea distributions, and the greatest threat is incidental mortality (bycatch) in industrial pelagic or demersal longline, trawl or artisanal fisheries, often in both national and international waters. Mitigation measures are available that reduce bycatch in most types of fisheries, but some management bodies are yet to make these mandatory, levels of implementation and monitoring of compliance are often inadequate, and there are insufficient observer programmes collecting robust data on bycatch rates. Intentional take, pollution (including plastic ingestion), and threats at colonies affect fewer species than bycatch; however, the impacts of disease (mainly avian cholera) and of predation by introduced species, including feral cats (*Felis catus*), rats (*Rattus* spp.) and house mice (*Mus musculus*), are severe for some breeding populations. Although major progress has been made in recent years in reducing bycatch rates and in controlling or eradicating pests at breeding sites, unless conservation efforts are intensified, the future prospects of many species of albatrosses and large petrels will remain bleak.

Contents

* Corresponding author.
E-mail address: raphil@bas.ac.uk (R.A. Phillips).

http://dx.doi.org/10.1016/j.biocon.2016.06.017
0006-3207/

1. Introduction

According to the IUCN Red List criteria, which relate to population size, trends, and the extent and fragmentation of breeding distributions, seabirds are amongst the most threatened of all groups of birds (Croxall et al., 2012). Albatrosses and petrels are long-lived, have high adult survival rates, delayed sexual maturity and low fecundity; all lay single-egg clutches, and nine species (all of which are albatrosses) breed biennially if successful in raising a chick (Warham, 1990). Given these extreme life-history attributes, changes in adult mortality have a much greater impact on population trajectories than variation in other demographic parameters, including breeding success, proportion of deferring breeders, juvenile survival and recruitment (Arnold et al., 2006; Croxall and Rothery, 1991; Moloney et al., 1994; Véran et al., 2007). All species have wide at-sea distribution during the breeding and non-breeding seasons; these extensive foraging ranges overlap with, and so put them at potential risk from multiple fisheries in national and international waters (Baker et al., 2007; Delord et al., 2010; Phillips et al., 2006).

Incidental mortality of seabirds in fisheries (hereafter "bycatch"), particularly of albatrosses and petrels, became a major conservation concern in the late 1980s (Brothers, 1991; Murray et al., 1993; Weimerskirch and Jouventin, 1987). Initial evidence came from numerous recoveries in longline fisheries of wandering albatrosses (*Diomedea exulans*) ringed at South Georgia (Islas Georgias del Sur) (Croxall and Prince, 1990), and estimates of very high bycatch from the Japanese tuna fishery off Australia (Brothers, 1991). Although based on very small samples, the inferred mortality coincided with declines in albatross populations in the sub-Antarctic, and so it was strongly suspected that fisheries bycatch was a critical factor (Croxall and Prince, 1990; Prince et al., 1994b; Weimerskirch and Jouventin, 1987). High rates of seabird bycatch were subsequently confirmed in a wide range of longline fisheries (Brothers et al., 1999b; Gales, 1998; Tasker et al., 2000). Although attention focused initially on industrial longlining, bycatch by trawl and artisanal fleets have also been identified as major sources of mortality for many albatrosses and petrels (Croxall et al., 2012; Favero et al., 2010; Maree et al., 2014; Sullivan et al., 2006b).

Solving a conservation problem as pervasive as bycatch for species as wide-ranging as albatrosses and large petrels requires concerted management actions that cover both national and international waters. This motivated the development of the Agreement on the Conservation of Albatrosses and Petrels (ACAP) as a daughter agreement of the Convention on Migratory Species (Bonn Convention), and its ratification in 2004 (Cooper et al., 2006). Although bycatch remains the main threat to many species and hence the contributing factors and demographic consequences are principal foci in this review, albatrosses and petrels also face a range of other threats on land and at sea, including impacts of invasive species, degradation or loss of nesting habitat, disease, pollution and climate change (see below). Consequently, the Action Plan of ACAP addresses topics that include habitat conservation and restoration, management of human activities, research and monitoring, education and public awareness, collation of information and implementation (Agreement on the Conservation of Albatrosses and Petrels, 2001; Cooper et al., 2006). The purpose of this paper is to review the taxonomy, breeding and at-sea distributions, population status and trends, and marine and terrestrial threats to the 22 albatrosses and seven large petrels (*Macronectes* and *Procellaria* spp.) listed under ACAP, and report recent progress in addressing those threats and the priority conservation actions for the future. In order to maintain taxonomic and geographic coherence, the review does not cover the two species of shearwater added to the ACAP list since 2009 (Balearic shearwater *Puffinus mauretanicus* and pink-footed shearwater *Puffinus creatopus*). Unless indicated otherwise by a supporting citation, data in tables and figures reflect published and unpublished data submitted to the ACAP database, available at www.acap.aq.

2. Taxonomy

Although >80 albatross taxa have been formally described since the mid 1700s (Robertson and Nunn, 1998), many were based on specimens collected at sea from unknown breeding locations and later revealed to be age-related plumage morphs of previously-described species. Taxonomic confusion was compounded by a scarcity of information on breeding behaviour and distribution, strong natal philopatry which precluded recognition of genuine physiological or behavioural barriers to gene flow (because contact between individuals from disparate populations is rare), and unusually low levels of genetic divergence even between what appear to be very different species (Nunn et al., 1996; Nunn and Stanley, 1998). This reduces the power of genetic studies to delineate species boundaries (Burg and Croxall, 2001, 2004; Double et al., 2003).

The taxonomic debate surrounding albatrosses was revisited when a new taxonomy was proposed by Robertson and Nunn (1998). This largely applied the Phylogenetic Species Concept and recognised 24 albatross species; however, some decisions were controversial (Penhallurick, 2012; Penhallurick and Wink, 2004; Rheindt and Austin, 2005). Although the recommendation to re-establish four genera (resurrecting *Phoebastria* and *Thalassarche*) has been universally accepted, there is no current consensus at the species level; subsequent taxonomic treatises, field guides and reviews recognised between 13 and 24 albatross species (e.g. Brooke, 2004; Chambers et al., 2009; Christidis and Boles, 2008; Onley and Scofield, 2007; Penhallurick and Wink, 2004; Shirihai, 2002). Acknowledging that taxonomic confusion could hamper conservation, ACAP established a Taxonomy Working Group with a remit to develop a defendable species list based upon peer-reviewed literature and a transparent decision-making process. This group largely follows guidelines in Helbig et al. (2002) which apply a relaxed version of the General Lineage Species Concept, focusing on diagnostic characteristics and evidence for distinct evolutionary trajectories. After assessing the splits advocated by Robertson and Nunn (1998), the conclusion was that two (Pacific albatross *Thalassarche bulleri platei* and Gibson's albatross *Diomedea antipodensis gibsoni*) of the 24 terminal albatross taxa could not be justified as separate species based on available data. The recognition of 22 albatross species by ACAP was later endorsed by Birdlife International (2015), the official IUCN Red List Authority.

Most regional or global taxonomic authorities now recognise 21 or 22 albatross species, depending on whether shy (*Thalassarche cauta*)