INTER-AMERICAN TROPICAL TUNA COMMISSION

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DEL MAR, CALIFORNIA, 11 MAY 2009

Conservation status and at-sea threats for the Waved Albatross (*Phoebastria irrorata*)

Agreement for the Conservation of Albatrosses and Petrels (ACAP)

ABSTRACT

This paper presents an updated picture of the information available on the biology of the Waved albatross *Phoebastria irrorata* and the threats the species is currently facing with particular emphasis on mortality associated with fisheries. The Waved Albatross breeds almost exclusively on Isla Española in the Galapagos Archipelago, and its at-sea distribution is restricted to the eastern Pacific Ocean mostly between the Galapagos and the adjacent mainland of South America from central Ecuador to central Peru, but occasionally ranging farther. A decrease in adult survival and a likely reduction in population size have been recently associated with increased mortality from incidental and intentional catch in fisheries. These, together with other potential threats in breeding sites, led to a recent upgrading of the species under the IUCN Red List as Critically Endangered as it is considered to be facing an extremely high risk of extinction in the wild. ACAP has developed, in conjunction with the Governments of Peru and Ecuador (who are Parties to the Agreement), a Plan of Action to provide managers, scientists and stakeholders with a set of recommended actions required to improve the conservation status of the species. The final goal of the Plan of Action is to increase public awareness of the urgent conservation needs of Waved Albatrosses and to promote specific management, research, and education actions that will minimize human impacts, prevent further population declines and secure the future of this species.

INTRODUCTION

The waved albatross (Albatros de Galápagos in Spanish) *Phoebastria irrorata* is a tropical seabird that breeds almost exclusively on Isla Española in the Galapagos archipelago (Tickell 2000, Anderson et al. 2002). Its distribution is restricted to the eastern Pacific Ocean between the Galápagos archipelago and the adjacent mainland of South America from Ecuador to Peru (Anderson *et al*. 1998, 2003, Tickell 2000, Fernández *et al*. 2001). A reduction in adult survival and a likely reduction in population size have been associated with increased mortality from incidental catch in fisheries and intentional catch for human consumption (Anderson *et al*. 2002, Awkerman *et al*. 2006, Ayala *et al*. 2008). This evidence indicates a high risk of extinction and has led to its re-categorisation from Vulnerable to Critically Endangered by the IUCN Red List (Birdlife 2007).

Due to concern about the urgent conservation needs of this species during 2007 and 2008 the Agreement on the Conservation of Albatrosses and Petrels (ACAP) developed an Action Plan for Waved Albatrosses in order to provide managers, scientists and stakeholders with a summary of the biology, status, and threats facing the species, together with a list of actions needed to improve its conservation status (ACAP 2008a). The geographical scope of this plan included breeding sites in the Galápagos archipelago, the main feeding grounds in waters off Ecuador and Peru, and the eastern Pacific Ocean including waters off Panama, Colombia and the north of Chile where birds may occasionally be found.

BIOLOGY OF THE SPECIES

The waved albatross breeds almost exclusively on Isla Española (1°22'S, 89°40'W) in the Galápagos archipelago, but a few birds breed on Isla de La Plata (1°17'S, 81°3'W) off the central coast of Ecuador (Tickell 2000, Anderson et al. 2002). Waved albatrosses are restricted to the eastern Pacific Ocean; birds range mostly over a relatively small area delimited by the Galápagos Islands, the central Ecuadorian coast and the central Peruvian coast (Pitman 1986, Tickell 1996, 2000, Anderson et al. 1998, 2003, Fernández et al. 2001, Awkerman et al. 2005a) (Fig. 1). Waved albatrosses are rarely seen north of the Equator, although a few birds have been recorded off the coasts of Colombia and Panama (Tickell 2000). There have been sightings of birds west of Islas Fernandina and Isabela (Merlen 1996). Birds may disperse into southern Peru and northern Chile (Goya unpub. data). Censuses conducted by IMARPE show a strong seasonal and annual variability in the use of areas by the waved albatrosses during normal years compared with El Niño and La Niña events (Goya, unpubl. data).

In Española Island, the first complete censuses conducted by Harris provided a figure of 10,600 breeding pairs in 1970 and at least 12,000 breeding pairs in 1971 (Harris 1973). The second census conducted by Douglas in 1994 indicated at least 18,254 breeding pairs (Douglas 1998). The third census, carried out by Anderson using a different methodology, indicated 19,214 breeding adults (i.e. 9,607 breeding pairs) on the island in 2001 (Anderson et al. 2002). The 1970 and 2001 counts were thought to provide the best indication of long-term population trends, which indicated numerical stability and no overall decline over a

31 year period (Anderson et al. 2002). In spite of some controversy about the accuracy of different censuses and the effect of ENSO events on the population, the whole picture indicates that a substantial change in population size may have occurred between 1994 and 2001 (Awkerman et al. 2006). The most recent count in 2007, using the same methods as in Anderson et al. (2002), indicates a further decline in the population (Anderson et al. 2008). Very small breeding numbers can be found at Isla La Plata and also small aggregation of individuals at Isla Genovesa.

Figure 1. Approximate range of the Waved Albatross inferred from satellite tracking.The boundaries of selected Regional Fisheries Management Organisations (RFMOs) are also shown (ACAP 2008b).

An estimated population of 12,000 land tortoises *Geochelone hoodensis* once inhabited Isla Española. It was the native dominant herbivore on the island, probably creating a significant amount of breeding habitat for albatrosses as they grazed and moved through the vegetation. Galápagos tortoises were depleted by human consumption during the 17th to 19th centuries and the population was nearly extinct by the 1960s. The few remaining tortoises were relocated to establish a captive breeding programme while introduced goats were eradicated. About 1600 young Galápagos tortoises have been reintroduced to Española and wild breeding was confirmed in 1994 (W. Tapia pers. comm.). Feral goats *Capra hircus* inhabited the island for about 80 years and may have created additional clearings, benefiting the albatross population. Birds also colonised a landing strip which was cleared at the US radar site in the eastern part of the island during World War II and later abandoned. Goats were eradicated by the Galápagos National Park Service by 1978, and the vegetation across the island closed in thereafter. Two hillside inland colonies disappeared entirely by 1994 (Douglas 1998). Overall declines in population at other inland areas might be related with habitat loss due to regrowth of vegetation (Anderson *et al.*

2002). Recently, new surveys were conducted in the central part of Española to improve the estimates of total population numbers, but also to establish plots and controls of nesting albatrosses in order to measure future responses to possible experimental vegetation manipulations (Gibbs & Woltz 2008).

Waved albatrosses on Isla Española breed from April to December (Harris 1973). Most of the population breeds annually, though some pairs defer breeding (Rechten 1986). Early breeders arrive in late March and begin laying eggs between mid-April and late June. Males arrive earlier than females (Huyvaert *et al*. 2006), and older more experienced birds arrive earlier than younger birds. Incubation of a single egg takes two months and both adults share incubation shifts that may span 20 days in recently laid eggs to four days as hatching time approaches. Chick-rearing takes 5.5 months and both adults share duties as chicks need to be brooded and guarded for several weeks. Most birds leave the island between January and March. The majority of birds breed for the first time when aged five or six (Harris 1969, 1973).

Estimation of annual adult survival conducted during the 60's and 70's averaged 95% (Harris 1973). Annual survival of adults marked in 1970 and resighted in 1971 was 96.9%. Survival of young from banding averaged 93.4% (Harris 1973). Preliminary ranking of models used to estimate survival (Anderson *et al*. 2004) initially produced a model yielding survival parameter estimates that were generally similar to that of Harris (1973). In a subsequent insight, a new model that specified constant survival except during the 2002/03 ENSO event fit the survival data markedly better (Awkerman *et al*. 2006) than did any of the models in the original set (Anderson *et al*. 2004).

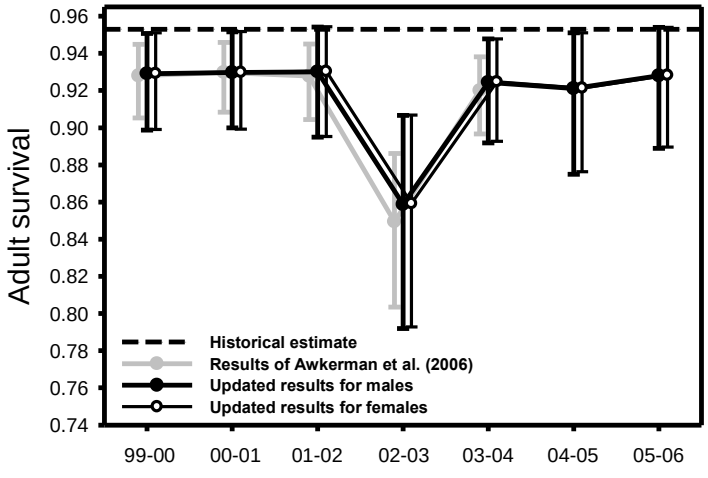

Figure 2. Parameter estimates and 95% confidence limits of annual adult survival for adult waved albatrosses based on band-resight histories (Awkerman et al. 2006, Anderson et al. 2008).

Awkerman *et al*. (2006) estimated adult survival as 92.5% for most years from 1999 to 2005. Their survival estimates were 2-3% lower than Harris' (1973) during non-ENSO years and about 10% lower in the 2002/03 warm ENSO (Fig 2). Elasticities indicated that changes in adult survival had the largest effect on population growth rate; the minimum 1% estimated adult mortality attributed to incidental and intentional capture of birds in artisanal fisheries off Peru is a significant impact on the population. There are no estimates of effects due to

longline (tuna) and trawl fisheries, which overlap with waved albatross distribution and may further affect the population (IATTC 2006). The expansion of the vegetation in breeding sites and the consequent occurrence of collisions when birds return to nests might also affect survival.

Deterministic matrix models employed to analyse population viability indicate decreasing population growth when recent estimates of vital rates representative of years 1999-2001 and 2003-2005 (lambda = 0.97) are used, and a rapidly decreasing population growth when vital rates from the 2002/03 warm ENSO (lambda = 0.88) are applied. These results indicate that the overall lifespan, and especially the reproductive lifespan, are influenced dramatically by these reductions in adult survival (Fig. 3). Preliminary estimations conducted during the Second Workshop for the Waved Albatross Plan of Action (Guayaquil 2008) show that on the basis of estimated survival rates, the additional mortality of 50 albatrosses per year could drive the species to extinction in less than 400 years in the best scenario and less than 100 years in the worst (Awkermann *et al*. pers. comm.). Reduction of adult mortality in fisheries appears to be the most effective means of stabilizing this threatened species (Huyvaert et al. 2008).

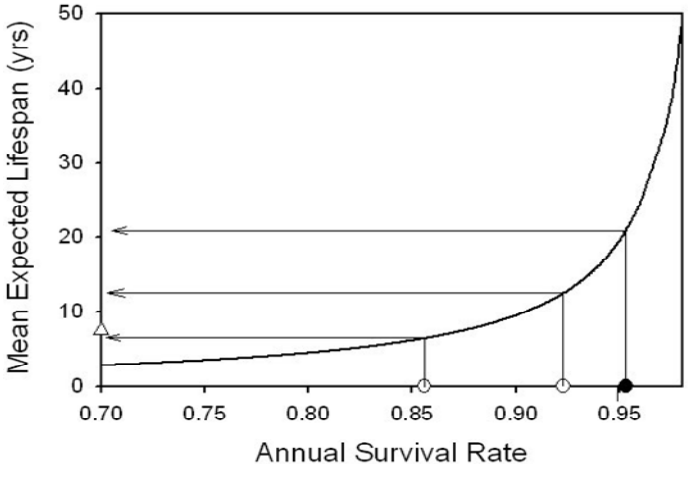

Figure 3. Mathematical relationship between annual adult survival and mean lifespan. Dark circle shows the value from the 60s, as estimated from the data in Harris (1973); open circles show estimations for recent non-ENSO(larger value) and 2002 ENSO (smaller value) years (Awkerman et al. 2006). The triangle shows the mean age at first breeding (Harris 1973). Reproductive lifespan under current non-ENSO annual survival is less than half that under annual survival in the 60s.

The bulk of the food fed to chicks of waved albatross on Isla Española was composed of squid (53% by occurrence), fish (41%), and pelagic crustaceans (46%) (Harris 1973). Most of the squid (80%) was from two families, Histioteuthidae and Octopodoteuthidae, with individuals ranging in mass from five grams to 450 grams. The most common fish identified included flying fish Exocoetidae, Mexican scad *Decapterus scombrinus* and round herring *Etrumeus teres*, ranging in length from 30 mm (20 fish in a single regurgitation) to 340 mm. The euphausiids *Benthopausia* sp. and *Thysanopoda monocantha* were the most common crustaceans in chick diets. The scavenging behaviour of waved albatrosses was originally disregarded as a source of food due to scarcity of documented events and the impression that birds do not follow ships (Harris 1973). However, more recent information

coming from Peruvian fisheries shows that this association can be stronger than thought (Ayala et al. 2008a, b, J. Mangel & J Sigheto unpubl. data,).

Recent studies using satellite telemetry have shown that waved albatrosses forage in the Peruvian upwelling region most of the year, except during the brooding period (Anderson *et al*. 1998, 2003, Fernández *et al*. 2001, Awkerman *et al*. 2005a). Albatrosses travel from their nesting grounds on Isla Española to the continental shelf off Peru to forage during the incubation and chick-rearing periods, and are thought to spend the non-breeding season in the same area (Anderson *et al*. 1998, 2003). Albatrosses remain within the Galápagos Islands, foraging in the central part of the archipelago, during the brooding period (Fernández *et al*. 2001, Anderson *et al*. 2003, Awkerman *et al*. 2005a). Non-breeding birds prospecting for mates and sites on Isla Española remain within the Galápagos Islands during at least part of the breeding season (Anderson *et al*. 1998, Awkerman *et al*. 2005a). All the information available is consistent in showing a high overlap of the Waved albatross with IATTC area through the year (BirdLife 2006 [SAR-7-05b], IATTC 2006b [SAR-7-10], ACAP 2008d [SARM-9-11b]).

CONSERVATION STATUS OF THE WAVED ALBATROSS

The waved albatross has been recently reclassified from Vulnerable to Critically Endangered on the IUCN Red List of Threatened Species, prepared by Birdlife International (IUCN 2007). The uplisting was considered after a major reduction in population size and adult survival due to human induced mortality that could lead to extinction within a few decades (Anderson *et al*. 2002, Awkerman *et al*. 2006). The Waved albatross is also listed on Appendix II of the Convention on the Conservation of Migratory Species of Wild Animals, among migratory species of "unfavourable" conservation status that need or would significantly benefit from international cooperation on their conservation and management. The Agreement on the Conservation of Albatrosses and Petrels (ACAP), drawn up in 2001, includes the Waved albatross in its Annex 1. Ecuador and Peru have both signed and ratified ACAP. Ecuador considers the Waved albatross as Endangered (Garnizo 2002) and provides complete protection to the species. In Peru, the Waved albatross is listed as Vulnerable in the Categorization of Threatened Wildlife Species. Due to the substantial spatio-temporal overlap with the IATTC convention area, the species was considered of particular concern by the IATTC (IATTC 2007 [SAR 8-14]).

FISHERIES AND INTERACTIONS WITH FISHERIES

The use of longline gear in Peru was encouraged in the late 1980s and 1990s as a way to reduce dolphin mortality in artisanal gillnets (Reyes 1993, Jahncke *et al*. 2001). However, these vessels have become the primary factor in seabird mortality since the 1990s (Crowder and Myers 2001). In the past, fishing activities were not considered a risk to waved albatrosses because birds apparently lacked the ship-following behaviour of other albatrosses that leads to bycatch in longline and other fishing gear. However, waved albatrosses are now known to scavenge dead fish when available and this behaviour

represents a threat in the presence of longline fisheries (Merlen 1996). Net and longline fisheries for blue shark *Prionace glauca*, mako shark *Isurus oxyrinchus*, and mahi mahi *Coryphaena hippurus* have been reported taking waved albatrosses off Peru (Jahncke *et al*. 2001, Mangel *et al*. 2005). The Inter-American Tropical Tuna Commission (IATTC) recognized that artisanal vessels could be a problem for waved albatrosses in a recent report (IATTC 2006).

Although waved albatrosses are distributed within the area delimited by Galápagos and the coasts off Ecuador and Peru, most of their foraging activity occurs over the continental shelf off northern Peru and southern mainland Ecuador (Anderson *et al*. 1998, 2003, Fernández *et al*. 2001, Awkerman *et al*. 2005a). Longline and driftnet fishing are currently banned within the Galápagos Marine Reserve where chick-brooding and prospecting albatrosses are known to forage (Anderson *et al*. 1998, Awkerman *et al*. 2005a). Longline and driftnet fishing are common practices off Peru and Southern Ecuador, and may represent a potential threat to waved albatrosses.

An onboard observer program carried out by Pro Delphinus from May 2005 to April 2006 surveyed 51 artisanal longline fishing trips (a total of 354,222 hooks) in six fishing villages. They documented a single capture of a black-browed albatross *Thalassache melanophrys* caught by the beak after the longline was deployed while fishing for sharks from the port of Ilo (Mangel *et al*. 2006). This represents a bycatch rate of 0.003 birds/1000 hooks. Mangel *et al*. (2006) made an effort to estimate bycatch for the artisanal longline fleet. For this purpose they assumed information regarding average fishing practices collected at seven villages during a total of 173 fishing trips from 2003 to 2006 (6.5 sets/trip × 860 hooks/set) and combined this with IMARPE's estimate of 11,316 artisanal longline fishing trips off the coast in 2002. Further research is needed to come up with more precise estimates of seabird mortality associated with longlining in this region.

IATTC has data on albatross abundance of the waved albatross in IATTC waters for the period 1997/2007 (M. Hall pers. comm.). This information, together with a recent analysis conducted by ACAP, shows that the waved albatross is entirely distributed within the IATTC area at all times of the year (ACAP 2008c). The IATTC regional observers programme (Peru and Ecuador) for marine turtles has observed 540 longline trips (c. 600,000 hooks set). In addition to this 420,000 hooks were observed by APECO (Peru) and 350,000 hooks observed by British Petroleum. None of these observations showed cases of incidental mortality of seabirds in the fishery (M. Hall pers. comm.). This lack of interaction might be attributed to the characteristics of the fishing operation as this fleet uses very small boats, performs side setting and night setting. However, there are important gaps in information from certain areas and portions of the fleet such as demersal longliners, trammel nets and Asian longliners (M. Hall pers. comm.). Recent reports from the Taiwanese fleet show capture rates of between 0.05 and 0.20 birds /1000 hooks for waters in the vicinity of Galápagos (Huang *et al*. 2008). However, sample sizes are reduced for the area of interest and no information on the species affected is included.

Through surveys of fishermen, Mangel *et al*. (2006) documented intentional capture of waved albatrosses in Salaverry, Peru. Fishermen reportedly captured 12 albatrosses and one unidentified petrel with baited hooks ? one of the albatrosses was released after its band was removed, while all of the other birds were eaten by the crew. Nine of the

albatrosses eaten were captured in a single fishing trip out of 21 onboard surveys. More recently, intentional captures associated with the gillnet fishery were documented in Salaverry, Chimbote and San José (Ayala *et al*. 2008a, b). At least one isolated intentional capture was reported in Islas Española, presumably for consumption (D. Anderson pers. comm.). Recovered bands provided further evidence suggesting that catch of albatrosses in Salaverry may be occurring on an unusually large scale (Jimenez-Uzcategui *et al*. 2006b).

ACTIONS TO IMPROVE THE CONSERVATION STATUS OF THE SPECIES

During the development of the ACAP Plan of Action and the workshops held in Lima (2007) and Guayaquil (2008), a set of recommended actions were discussed. The Plan recommends actions to address threats at sea and on land, plus monitoring of the population, education and outreach. In this document, only actions concerning fisheries are addressed.

It is apparent that fisheries are affecting waved albatrosses adversely. Our knowledge of interactions at sea is not perfect, so the main actions listed are designed to improve this situation while attempting to tackle those issues where some evidence of adverse effect already exists. In general terms, it is recommended that: (a) given the lack of detailed knowledge, actions to manage potential threats should be conducted under the precautionary principle, and (b) where possible, all actions relating to fisheries should be implemented with the support and coordination of artisanal and industrial fishery managers, unions and fishermen.

The following key actions have been identified:

(1) To complete collection of information on fisheries through the development and improvement of observer programmes, including incidental and intentional capture;

(2) To analyze the cumulative levels of incidental and intentional capture, investigating those areas and times of the year where gaps in information exist;

(3) To develop and implement mitigation measures;

(4) To develop education and training programmes; and

(5) To promote inter-institutional management.

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