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REVIEW OF SEABIRD STATUS AND INCIDENTAL CATCH IN EASTERN PACIFIC OCEAN FISHERIES

IATTC Resolution C-05-01 on incidental mortality of seabirds recommends the implementation of the FAO's International Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries (IPOA-Seabirds; FAO 1999); the collection of all available information on interactions with seabirds, including incidental catches in all fisheries under the purview of IATTC; and for the Working Group on Stock Assessment to assess the impact of incidental catch of seabirds resulting from the activities of all the vessels fishing for tunas and tuna-like species, in the eastern Pacific Ocean, including an identification of the geographic areas where there could be interactions between longline fisheries and seabirds. This report is based on Documents SAR-7-05c, SAR-7-05b, and SAR-7-10 presented at the meeting of the Stock Assessment Review Working Group in May 2006. In its report, the Working Group noted that it did not review these documents at the same level as it did the documents on stock assessments of tunas.

Albatrosses and petrels have been identified as some of the most vulnerable species to bycatch in fisheries (Wooller *et al*. 1992; Brothers *et al*. 1999). Albatrosses, in particular, scavenge for food, and are attracted to the baited hooks during longline setting operations. The interaction of seabirds with fisheries (particularly those using longline gear) has become an international issue as demonstrated by the adoption of the IPOA-Seabirds, resolutions by regional fishery management organizations (CCAMLR, IATTC, ICCAT, IOTC, WCPFC), and mandatory mitigation requirements by CCAMLR and CCSBT. In 2004, the Agreement on the Conservation of Albatrosses and Petrels (ACAP) entered into force; it identified fishery interactions as a key threat facing these seabirds, and recommended that collaborations with regional fishery management organizations be pursued to reduce fisheries interactions (ACAP 2004).

This report reviews the status and distribution of albatrosses and petrels that breed or forage in the IATTC Area defined under the Antigua Convention (an area extending to 50°N and 50°S, bounded to the west by 150°W), and that are of known conservation concern or known to be vulnerable to bycatch, particularly in longline fisheries. Population sizes and status of albatrosses and petrels breeding or foraging in the IATTC Area are given in Table 1.

1. SEABIRD SPECIES OF CONCERN

1.1. Waved albatross

The waved albatross breeds almost exclusively on Isla Española, Galápagos, Ecuador (Anderson *et al*. 2002). The species is listed as 'vulnerable' under the International Union for the Conservation of Nature (IUCN) criteria, based on its very small breeding range (IUCN 2004). A 2001 assessment estimated a population size of 31,000 to 35,000 adults, indicating a marked decline in breeding population size between 1994 and 2001 (Anderson *et al*. 2002).

Tracking data[1] during the April-December breeding season (Figure 1) reveal that foraging is focused in the Peruvian upwelling area between the Galapagos Islands and the coast of Peru (Anderson *et al*. 1998;

[1] Tracking data presented in this report are from the Global *Procellariiform* Tracking Database and the tracking plots extracted from SAR-7-05b. Contributors to this database are acknowledged in SAR-7-05b.

2003). IATTC observer data from the purse-seine fleet, overlaid on longline effort distribution, showed a similar distribution pattern (SAR-7-10). Few observations of waved albatross have been made outside the Peruvian upwelling area (Tickell, 2000; SAR-7-10), and sightings indicate that the highest aggregations of waved albatross on the Peruvian continental shelf occur during the non-breeding season (Goya and Cardenas, 2003), suggesting that this area is highly important for this species.

TABLE 1. Albatrosses and petrels breeding or foraging in the IATTC Area

Common	Scientific	Global annual breeding pairs[1]	Status[2]
Antipodean albatross[3]	*Diomedea antipodensis*	5,154	Vulnerable
Black-browed albatross	*Thalassarche melanophrys*	609,395	Endangered
Black-footed albatross	*Phoebastria nigripes*	64,617	Endangered
Buller's albatross	*Thalassarche bulleri*	31,435	Vulnerable
Chatham albatross	*Thalassarche eremita*	4,000	Critically endangered
Grey-headed albatross	*Thalassarche chrysostoma*	106,036	Vulnerable
Laysan albatross	*Phoebastria immutabilis*	554,699	Vulnerable
Light-mantled albatross	*Phoebetria palpebrata*	22,031	Near threatened
Northern royal albatross	*Diomedea sanfordi*	2,078	Endangered
Salvin's albatross	*Thalassarche salvini*	76,943	Vulnerable
Short-tailed albatross	*Phoebastria albatrus*	362	Vulnerable
Southern royal albatross	*Diomedea epomophora*	7,872	Vulnerable
Wandering albatross	*Diomedea exulans*	7,874	Vulnerable
Waved albatross	*Phoebastria irrorata*	18,210	Vulnerable
Black petrel	*Procellaria parkinsoni*	2,500	Vulnerable
Grey petrel	*Procellaria cineria*	?	Near threatened
White-chinned petrel	*Procellaria aequinoctialis*	2,350,000?	Vulnerable
Southern giant petrel	*Macronectes giganteus*	29,774	Vulnerable

[1] Number of nesting pairs is the standard unit for reporting seabird abundance, based on colony monitoring. Total population estimates are not available for all species. (Sources: SAR-7-05b, BirdLife International 2004).
[2] Source: IUCN 2004.
[3] Including Gibson's albatross (*D. antipodensis gibsoni*).

1.2. Laysan albatross

The IUCN lists the Laysan albatross as vulnerable, based on a > 30% decline over 84 years (IUCN 2004). Virtually all (~99.9%) of the world's Laysan albatross breed in the Northwestern Hawaiian Islands, with other small breeding sites are in Japan and Mexico. The current world population is estimated at 3.4 million individuals (NMFS 2005a).

Tracked Laysan albatross from the small breeding population on Isla de Guadalupe, Mexico (350 breeding pairs, BirdLife International 2004), remained almost entirely within the IATTC Area (Figure 2). Laysan albatross tracked from Tern Island (Hawaii) and the Aleutian Islands did not forage in the IATTC Area, but data from the Tagging of Pacific Pelagics (TOPP) Program indicate that Laysan albatross do disperse into the IATTC Area during the non-breeding season (S. Shaffer, cited in SAR-7-05c).

1.3. Black-footed albatross

The IUCN lists the black-footed albatross as endangered, on the basis of a projected future decline of more than 60% over the next 56 years (IUCN 2004). Most of the world's black-footed albatross (96%) breed in the Northwestern Hawaiian Islands, with other breeding sites in Japan and Mexico. At Midway Atoll, the December 2005 count marked the fifth consecutive year of increased numbers of black-footed albatross nests, after fairly steep declines in the 1990s (J. Klavitter, cited in SAR-07-05c). The current world population of black-footed albatross is approximately 300,000 individuals (NMFS 2005a).

Tracking data show that 36% of the black-footed albatross distribution during the breeding season was within the IATTC Area (Figure 3).

1.4. Black-browed albatross

The Chilean black-browed albatross population comprises 18% of the world's population (Birdlife International 2004). This population forages along the edge of the continental shelf, spending 19% of its time within the IATTC Area during the breeding season (October until March) and 65% during the non-breeding season, when its range extended northwards into areas of longline fishing effort (Figure 4).

1.5. Chatham albatross

The Chatham albatross is listed by IUCN as critically endangered, because it is a single, small breeding population. Tracking data for the non-breeding distribution of Chatham albatross indicate that over 50% of its at-sea time is within the IATTC Area. The Chatham albatross migrates across the Pacific at or below 40°S between January to April and then moves north along the Humboldt Current into Peruvian coastal waters, wintering in a area north of 20°S, in areas which also overlaps with longline fishing effort in the IATTC Area (Figure 5). Birds then return to their breeding colony between July and September, following a more northerly route (Robertson *et al*. 2000).

1.6. Buller's albatross and Salvin's albatross

Buller's and Salvin's albatrosses are both listed as vulnerable under IUCN criteria. Both species breed in New Zealand, yet commonly forage off the South American coast (Jehl 1973; Stahl *et al*. 1998; Robertson *et al*. 2003; Spear *et al*. 2003; Goya and Cardenas 2003). Most albatrosses observed from ship surveys were within 200 km of shore (Spear *et al*. 2003). Salvin's albatross are abundant between 10 and 40°S, and Buller's albatross are most abundant below 30-40°S (Jehl 1973; Stahl *et al*. 1998, Spear *et al*. 2003). These observations indicate some likely spatial overlap with longline fisheries.

2. OTHER SEABIRDS OF POTENTIAL CONCERN

2.1. Short-tailed albatross

The short-tailed albatross breeds exclusively in Japan. As of 2005, 80-85% of the known breeding population uses a single colony on Torishima, an active volcanic island. The IUCN lists the species as vulnerable because it has a very small population (approximately 2,000 individuals) and a limited breeding range (IUCN 2004; USFWS 2005; P. Sievert, cited in SAR-7-05c). Conservation efforts have resulted in a steady population increase (7.3% per annum) and an improvement in its conservation status (IUCN 2004). It is listed here because of the species' vulnerable status and because it is uncertain how extensively its range overlaps with the IATTC Area.

2.2. Black (or Parkinson's) petrel

The black petrel breeds exclusively on two islands off New Zealand (BirdLife International 2006). The species is listed as vulnerable under the IUCN criteria, because of its limited breeding range and the potential threat of introduced predators at the colonies (IUCN 2004). The world population numbers about 10,000 individuals and is believed to be stable (IUCN 2004). It is listed here because black petrels migrate from breeding sites off New Zealand to the eastern Pacific Ocean between the Galapagos Islands, southern Mexico, and northern Peru (Pitman and Ballance 1992) and have been documented as bycatch by New Zealand longliners (Brothers *et al*. 1999).

2.3. Antipodean, southern royal, and northern royal albatrosses

These species also migrate across the Pacific from their breeding grounds in New Zealand to the coast of South America, where they remain largely south of 40°S, and generally forage south of longline fishing areas.

3. SEABIRD BYCATCH IN TUNA AND SWORDFISH FISHERIES

3.1. EPO tuna purse-seine fishery

IATTC observers are not required to record seabird mortalities during purse-seine sets because staff and observer experience indicates that they occur exceedingly rarely, if at all.

3.2. Industrial longline fisheries

Seabirds can comprise significant bycatches in longline fisheries (Melvin and Parrish 2001; Brothers *et al*. 1999). However, there may be a large variability in bycatch depending on the vessel size and setting technique and fishing area. Techniques that result in rapid line sinkage close to the hull, for example, limit the exposure of the baited hooks to seabirds and reduce bycatch.

Information on longline bycatch in the North-central and Northeast Pacific comes from the US pelagic longline fishery (SAR-7-05c). The observed fishing effort in the Hawaii deep-set tuna fishery ranged from 40°N to 0° and 180° to 135°W, and the shallow-set swordfish fishery ranged from 40°N to 15°N and 180° to 135°W, overlapping with the IATTC Area. Historically, higher levels of seabird bycatch occur in the swordfish fishery than the tuna fishery. The predominant seabird species taken in these fisheries are the black-footed and Laysan albatrosses. The estimated level of albatross bycatch has decreased since 1999 and 2000, reflecting increased use of bycatch mitigation measures, and seabird mitigation measures have been required in these fisheries since 2002.

The Hawaii-based pelagic tuna longline fleet was estimated to have taken approximately 0.004 albatross per 1,000 hooks in 2005, while the shallow-set swordfish fishery, which has 100% observer coverage, took approximately 0.04 albatross per 1,000 hooks. The total estimated 2005 take for both Hawaii fisheries was 89 black-footed and 105 Laysan albatrosses.

During 2001-2004, NMFS observers monitored the US West Coast pelagic longline swordfish fleet in an area that overlapped with the IATTC Area (SAR-7-05c), and reported 65 black-footed and 7 Laysan albatross mortalities, and 7 black-footed albatross released injured (a take rate of 0.23 birds per 1,000 hooks) (Petersen *et al*. 2003; L. Enriquez, cited in SAR-7-05c). Seabird mitigation measures were not required during this time period.

Using known bycatch rates from the US pelagic fishery based in Hawaii (1994-2000 data) and the spatial distribution of fishing effort by Japanese and Chinese Taipei fleets operating in the central North Pacific, it was estimated that 5,000 to 14,000 black-footed albatross could be taken annually in the Northeast Pacific (Lewison and Crowder 2003). However, the assumption that the Hawaii fleet and the Japanese and Chinese Taipei fleets have similar bycatch rates may not be valid (NMFS 2005c), a view shared by the IATTC staff.

Interviews with experts in the regional fisheries and seabirds suggested that there are generally low levels of bycatch of seabirds in pelagic longline fisheries in the tropical Pacific (Watling 2002).

SAR-7-05e, the report of an observer on a Chinese longline vessel that deployed 300,000 hooks, reported mortality of fewer than six birds (storm petrels and blue-footed boobies).

Integrated population modeling is being developed for black-footed and Laysan albatross populations to assess whether past and present levels of bycatch are likely to significantly affect populations. One project will attempt to estimate a threshold level of bycatch that would, at a specified level of certainty, allow a sustainable growth rate for the albatross populations (Goodman and Lebreton, 2005). Another project will apply integrated modeling techniques to black-footed albatross populations (Maunder and Hoyle 2005).

3.3. Artisanal longline fisheries

Reports to IATTC staff from observers placed aboard artisanal longliners in the EPO by regional sea-turtle programs have not confirmed any albatross mortalities and indicate that seabird mortalities were minimal (less than a dozen seabird mortalities per ~1 million hooks set). Setting techniques will likely determine the extent of the seabird bycatch. Small coastal boats that use side-setting techniques which result in rapid line sinkage close to the hull are likely to have lower bycatches because the seabirds have limited exposure to the bait.

However, evidence exists of bycatch of albatrosses off South America (Goya and Cardenas 2003; G. Merlen, cited in Anderson *et al*. 2003; J. Awkerman *et al*., cited in SAR-7-05b,c). A study based on 29 fisherman interviews estimated that the Peruvian artisanal longline fleet may take 2,370 to 5,610 albatrosses annually, most likely waved or Chatham albatrosses (Jahncke *et al*. 2001). In conjunction with a mark-recapture study of waved albatross, a survey of 37 major fishing communities in Perú was initiated and a minimum fishery mortality rate of 0.0093 was estimated from the tag returns (J. Awkerman *et al*., cited in SAR-7-05b,c).

4. INDIRECT FISHERY EFFECTS ON SEABIRDS

Fisheries that target particular species can impact other components of the ecosystem, particularly those species that depend on associations with the harvested target species. Distinct seabird species assemblages form feeding flocks in association with tunas and dolphins (Au and Pitman 1986). Tropical seabirds depend upon these predators to drive prey closer to the surface (Ballance *et al*. 1997); this constitutes the most important foraging strategy for many tropical seabirds. This degree of dependence has not been found in non-tropical seabirds (Ballance and Pitman 1999). Activities that directly impact tunas can also indirectly affect the seabirds that closely associate with, and depend upon, the tunas (SAR-7-05c).

5. SEABIRD BYCATCH REDUCTION

5.1. Gear and operational changes

In the past 10 years, effective bycatch mitigation measures have been developed and used in longline fisheries (reviewed in SAR-7-05c). Gear research has addressed an array of measures and methods; recent tests (Boggs 2001; Minami and Kiyota 2002; Gilman *et al*. 2003; 2006) of gear to reduce seabird bycatch (underwater setting chute, blue-dyed bait, side-setting) have resulted in regulatory changes for the Hawaii-based pelagic longline fleet and a technical assistance program to convert vessels to side-setting operations (Brothers and Gilman 2006). When setting north of 23°N (tuna and swordfish) or shallow-setting south of 23°N, vessels must either side-set or, if the lines are set over the stern, use other methods to keep seabirds away from the baited hooks and thus avoid catching them. Vessels engaged in deep-setting using a monofilament main longline north of 23°N that do not side-set must also employ a line shooter and attach a weight of at least 45 g to each branch line within 1 m of the hook. In addition to the above requirements, shallow-setting vessels that do not side-set must also deploy gear at least 1 hour after local sunset and complete the deployment no later than local sunrise.

In the US, 44 out of 124 Hawaii longline vessels are currently side-setting, and no albatrosses were caught in 2005 by these vessels. It is not known how many vessels in non-US fleets have converted to side-setting as a means to reduce the bycatch of seabirds. Japan indicated plans for side-setting experiments on larger pelagic vessels (ISC 2006).

5.2. Area closures

The US West Coast pelagic longline fishery is prohibited in the US EEZ. Shallow sets are essentially prohibited west of 150°W. Deep sets for tuna may occur north of 23°N, provided that required seabird avoidance measures are used. Although instituted as sea turtle protective measures, these closures have also served to reduce seabird bycatch.

5.3. Pelagic gear mitigation studies

Several promising gear devices and operational methods have been identified by fishermen and mitigation scientists that may be very effective at reducing seabird bycatch on pelagic longline gear. Studies are underway to better define an effective and practicable suite of seabird mitigation measures that can be widely applied on pelagic longline vessels. Results from these studies are anticipated within the next one to three years. International studies to test gear designed to sink baited hooks quickly such that it is inaccessible to seabirds include methods to set the line underwater or that scare the birds away from the baited hooks (SAR-7-05c). Further tests have been identified to explore methods that would make side-setting more practicable (Brothers and Gilman, 2006).

In summary:

1. Information indicates that longline fisheries in the IATTC Area may have both direct and indirect impacts on some seabird populations. The level of the impact is currently not known.
2. Remote-tracking data and at-sea observations highlight the importance of the IATTC Area for foraging and breeding of waved and Laysan albatrosses, foraging of black-footed and black-browed albatrosses, and several other albatross species from New Zealand which migrate across the Pacific to forage in the Humboldt Current.
3. Observer data from US pelagic longline fisheries indicate bycatch of Laysan and black-footed albatrosses in the Northeast Pacific. No comparable data exist from industrial longline fleets in the central and southeast Pacific.
4. Plots of seabird distributions overlaid on pelagic longline effort revealed several areas of potential vulnerability to bycatch: 1) the area between the Galápagos Islands and mainland Ecuador and Perú where waved albatross breed and forage; 2) the area north of 20°N latitude where Laysan and black-footed albatross breed and forage, particularly near the small breeding colonies off Baja California; 3) the coastal zone along South America where several species are known to forage.
5. Seabird bycatch mitigation measures have been developed which have effectively reduced seabird bycatch in longline fisheries, and more gear research is ongoing.

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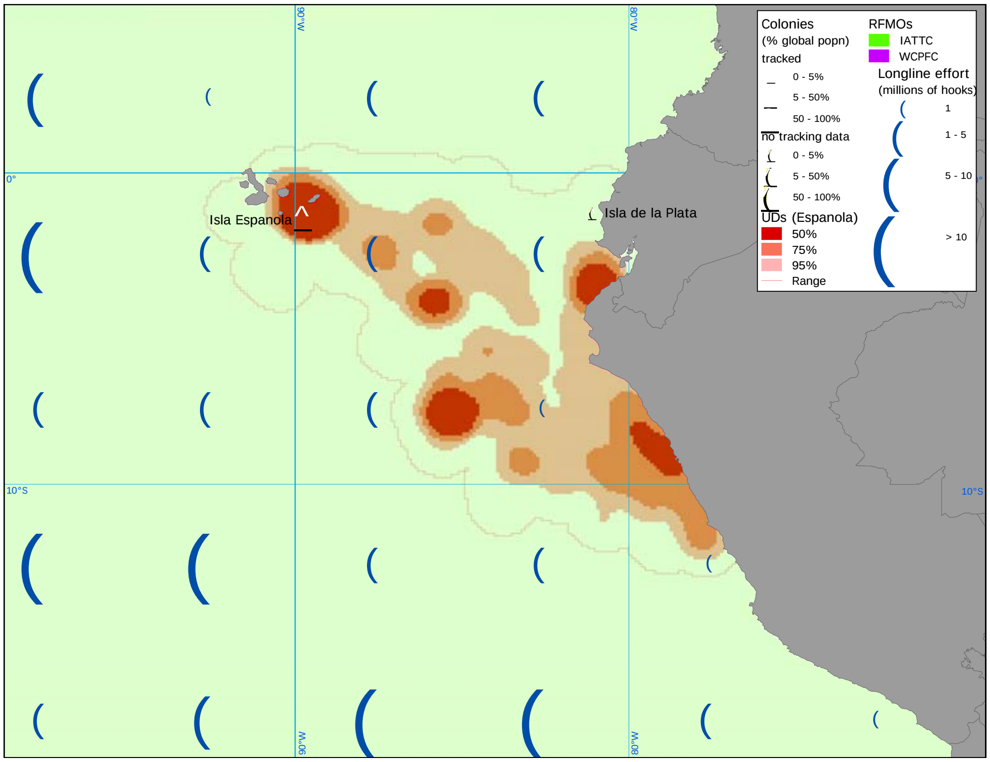

FIGURE 1. Distributions of waved albatrosses during the breeding season, tracked from Isla Española (>99% population), and longline fishing effort in the IATTC Area, 1997-2004 (hooks set per 5° square). Data from D. Anderson and J. Awkerman, Wake Forest University; Source: SAR-7-05b.

FIGURA 1. Distribuciones de albatros de las Galápagos durante la temporada de cría, rastreados desde Isla Española (>99% de la población), y esfuerzo de pesca palangrero en el Área de la CIAT, 1997-2004 (anzuelos calados por cuadrícula de 5°). Datos de D. Anderson y J. Awkerman, Wake Forest University; Fuente: SAR-7-05b.

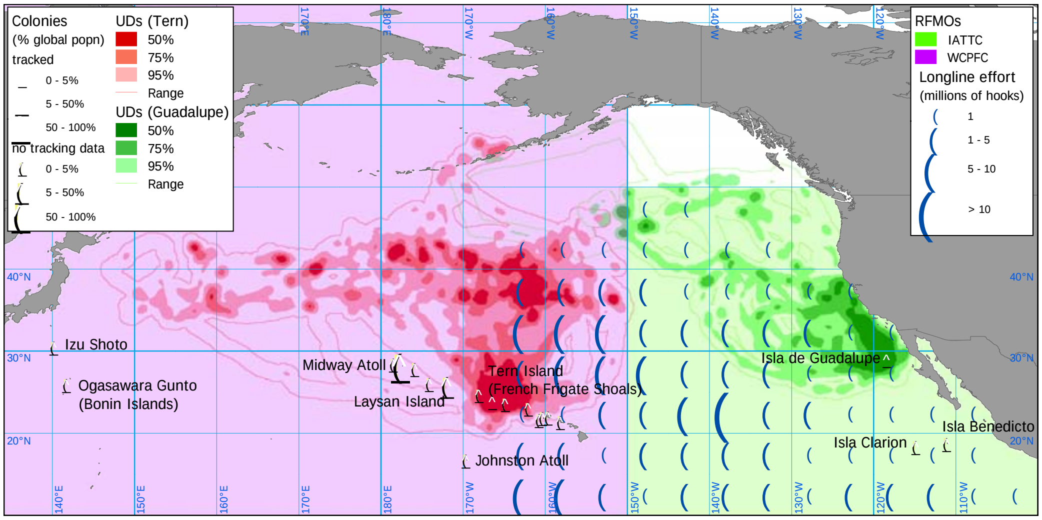

FIGURE 2. Distribution of Laysan albatrosses, tracked during the breeding season from Tern Island in Hawaii, and Isla de Guadalupe in Mexico, and overlap with the IATTC Area and longline fishing effort in the IATTC Area, 1997-2004 (hooks set per 5° square). Data from R. Suryan, Hatfield Marine Science Center, Oregon State University; Source: SAR-7-05b.

FIGURA 2. Distribución de albatros de Laysan, rastreados durante la temporada de cría desde Tern Island (Hawai) e Isla de Guadalupe (México), y superposición con el Área de la CIAT y el esfuerzo de pesca palangrero en el Área de la CIAT, 1997-2004 (anzuelos calados por cuadrícula de 5°). Datos de R. Suryan, Hatfield Marine Science Center, Oregon State University; Fuente: SAR-7-05b.

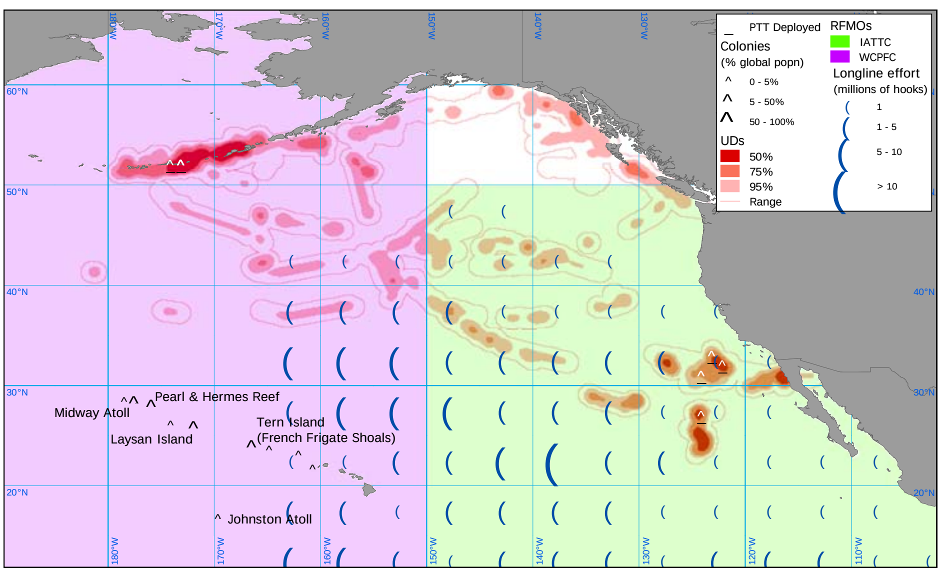

FIGURE 3. Distribution of black-footed albatrosses during the non-breeding season, tracked after capture at sea, and overlap with the IATTC Area and longline fishing effort in the IATTC Area, 1997-2004 (hooks set per 5° square). Data from R. Suryan, Hatfield Marine Science Center; D. Hyrenbach, Scripps Institute of Oceanography; R. Dotson, NMFS; Source: SAR-7-05b.

FIGURA 3. Distribución del albatros patinegro fuera de la temporada de cría, rastreados después de su captura en el mar, y superposición con el Área de la CIAT y el esfuerzo de pesca palangrero en el Área de la CIAT, 1997-2004 (anzuelos calados por cuadrícula de 5°). Datos de R. Suryan, Hatfield Marine Science Center; D. Hyrenbach, Scripps Institute of Oceanography; R. Dotson, NMFS; Fuente: SAR-7-05b.

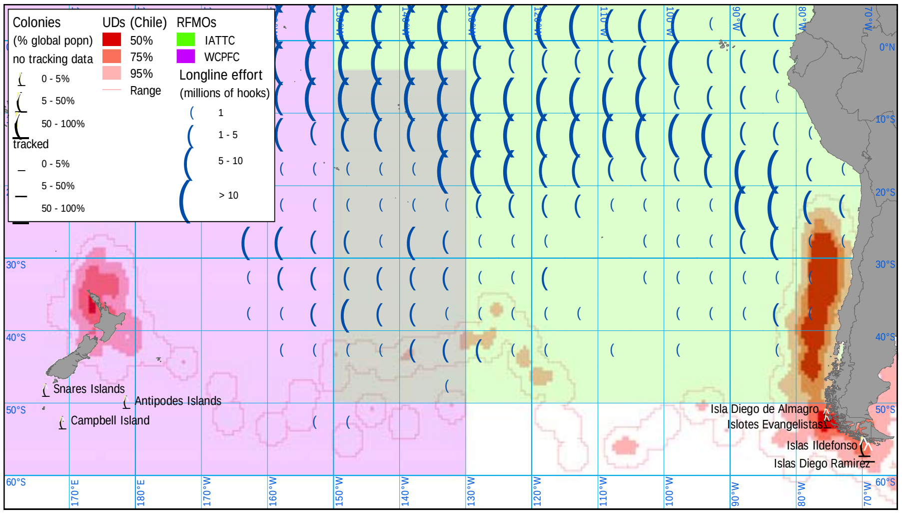

FIGURE 4. Distribution of black-browed albatrosses during the non-breeding season, tracked from Islas Diego Ramirez, Chile, and overlap with the IATTC Area and longline fishing effort in the IATTC Area, 1997-2004 (hooks set per 5° square). Data from C. Robertson, Department of Conservation New Zealand, D. Nicholls, and M. Murray; Source: SAR-7-05b.

FIGURA 4. Distribución del albatros ojeroso fuera de la temporada de cría, rastreados desde las Islas Diego Ramírez (Chile), y superposición con el Área de la CIAT y el esfuerzo de pesca palangrero en el Área de la CIAT, 1997-2004 (anzuelos calados por cuadrícula de 5°). Datos de C. Robertson, Departamento de Conservación de Nueva Zelanda, D. Nicholls, y M. Murray; Fuente: SAR-7-05b.

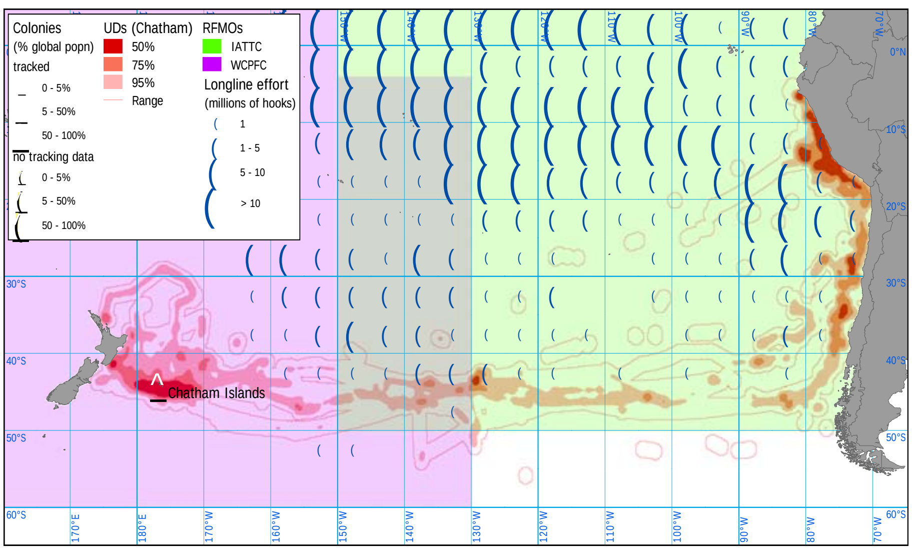

FIGURE 5. Distribution of Chatham albatrosses during the non-breeding season, and overlap with IATTC Area and longline fishing effort in the IATTC Area, 1997-2004 (hooks set per 5° square). Data from C. Robertson, Department of Conservation New Zealand, D. Nicholls,and M. Murray; Source: SAR-7-05b.

FIGURA 5. Distribución del albatros de Chatcham fuera de la temporada de cría, rastreados desde las Islas Diego Ramírez (Chile), y superposición con el Área de la CIAT y el esfuerzo de pesca palangrero en el Área de la CIAT, 1997-2004 (anzuelos calados por cuadrícula de 5°). Datos de C. Robertson, Departamento de Conservación de Nueva Zelanda, D. Nicholls, y M. Murray; Fuente: SAR-7-05b.