



ASSESSMENT OF SEABIRD BYCATCH IN PERUVIAN ARTISANAL FISHERIES

Final Report to the British Petroleum Conservation Programme



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1. INTRODUCTION

This report summarizes the results of the Pro Delphinus research project funded by the British Petroleum Conservation Programme, the National Oceanic and Atmospheric Administration and the International Association of Antarctica Tour Operators. Broadly speaking, this project seeks to better understand the threats to seabirds posed by artisanal fisheries in Peru, and to work collectively toward minimizing these threats. This project represents the continuation of research begun in 2004. This current phase of the project focused on implementing and expanding an onboard observer program in the ports of Salaverry, Callao, and Ilo. During this phase of the project we also continued to hold educational workshops with fishermen and local officials, to expand the network of fishermen and biologists willing to work with us on the project, and to collect and report seabird bands recovered throughout the country.

1.1 Project Justification

The Peruvian small scale (artisanal) fishery is large and diverse. It contains about 6,250 vessels and 28,000 fishermen (Escudero 1997). Artisanal fisheries are defined here and according to Peruvian fisheries regulations as containing boats with a maximum of 32.6m³ of storage capacity, 15m of length, and principally based on the use of manual work during fishing operations (Ley General de Pesca 2001).

Efforts in seabird research and conservation in Peru continue to be limited. Previous research indicates that vulnerable and critically endangered species, including waved albatross (*Phoebastria irrorata*) and Chatham Island albatross (*Thalassarche eremita*), are being taken as bycatch in these fisheries (Majluf et al. 2001, Jahncke et al. 2001, Anderson et al. 2003, Alfaro-Shigueto & Mangel 2003, Mangel & Alfaro-Shigueto 2004). Jahncke et al. (2001) estimated that 2,370 to 5,610 albatrosses were taken annually as bycatch in the artisanal longline fleet in Peru. However, no systematic monitoring of seabird bycatch had been conducted along the Peruvian coast.

Our initial work on this subject consisted of fisherman interviews, recovery of seabird bands and educational workshops. The goal of this work was to update and improve the level of information available regarding seabird bycatch in Peru's artisanal longline and gillnet fisheries. This first year of assessment indicated that seabird bycatch does indeed continue to occur in artisanal longline and gillnets fisheries. Interviews carried out in 38 ports with 723 fishermen indicate that many species of albatrosses and petrels interacted with the fisheries. A preliminary analysis from this study suggested a seabird bycatch rate of 0.15 to 0.42 seabirds/1000 hooks (Mangel & Alfaro-Shigueto 2004).

Evidence of seabird bycatch was also confirmed through the continuing recovery of seabird bands from a number of ports. These returns indicated that waved albatrosses, Chatham Island albatrosses, northern giant petrels (*Macronectes halli*), Humboldt penguins (*Spheniscus humboldti*), and other species are taken in artisanal longline and gillnet fisheries.

This preliminary research was designed as a precursor to an onboard observer program. The present study awarded by the British Petroleum Conservation Programme helped to implement that observer program. Presence of onboard observers could serve several functions. They could clarify the results of fisherman interviews and could provide an

accurate assessment of seabird bycatch, at-risk species, and causes of and possible solutions to the problem.

Lack of resources in the Peruvian government has slowed progress toward developing a National Plan of Action (NPOA) for seabirds as proposed by the Food and Agriculture Organization's (FAO) International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries (IPOA-Seabirds). Results from this proposal will be presented to and discussed with government officials at the Ministry of Fisheries (MIPE) and the Instituto del Mar del Peru (IMARPE), and will be used to encourage the adoption of an NPOA for seabirds in Peru.

2. PROJECT OBJECTIVES

This project had two principal aims. First we sought to quantify seabird bycatch per unit effort (CPUE) in this poorly studied fishery and geographic area. Second, we wanted to increase awareness of seabird conservation and biology, and promote the use of bycatch mitigation measures through an educational program targeting fishermen, local officials and local researchers. These aims will assist in decision making for seabird conservation measures in Peru and will increase awareness at a local, national and regional level.

The specific objectives of the project included:

1. To assess seabird bycatch per unit of effort (CPUE) in ports where artisanal longlines and gillnets are the gear commonly used during fishing activities.
2. To increase seabird conservation awareness in fishing communities through lectures and workshops.
3. To encourage local researchers, through training and support, to develop conservation studies of endangered marine fauna.
4. To provide technical information to government agencies that can be used as a baseline study for a NPOA for seabirds.

3. METHODS

3.1 Fleet Characteristics

Peru's artisanal fleet is very large and diverse. A 1997 study of the fishery indicated that there were more than 28,000 fishermen and 6,200 vessels operating out of 109 ports (Escudero 1997). Two of the main fishing methods employed are longlines and gillnets. Statistics from IMARPE, indicate that 1,968 longline trips were recorded for the second half of the year 1999 (Estrella et al. 2000). For all of the year 1999, 63,083 gillnet trips were conducted (Estrella et al. 1999 and 2000). More recent information on artisanal longlines indicates that in 2002, 11,316 trips were conducted (IMARPE unpublished data). This suggests substantial growth in the longline fishery since 1999.

While there is much variation in longline and gillnet fishing methods throughout the country, some general characterizations can be made. Longline vessels typically set their gear in the morning and recover it in the early evening. Gear is set at the surface. Mainline length varies by boat and number of hooks but is typically about 2-3km. in

length. The main target species include sharks and mahi mahi. Sharks are fished from approximately March – November and mahi mahi are fished from December – February. Trip length varies by season with mahi mahi trips typically lasting 5-7 days and shark trips lasting 15-20 days. Vessels may travel up to 250 miles from shore. Hook size and type varies but almost all vessels use J hooks. Northern ports tend to use smaller hooks than in the south. Species used for bait include giant squid, mackerel, and flying fish. Bait may be fresh, frozen or salted. Weighted branchlines are used in some ports, and are used more often in the south of the country. Steel leaders are often used during shark season to reduce gear loss.

Figure 1. A typical longline boat from the port of Ilo.



The artisanal gillnet fleet is more variable than the longline fleet. Gillnets are set nets but may be on the surface or at depth. Our research in the port of Salaverry indicates that nets are typically set at a depth of 5 to 7 fathoms (1 fathom = 1.8 meters). Nets may also vary in length. Data from several ports indicate that net length ranged from 0.4 to 2.6 km (Alfaro-Shigueto unpublished data). Nets may be tended either during the day or at night. Bait is sometimes used. Many boats use gillnets year-round while others switch to longlines to capture mahi mahi during the austral summer. Gillnet trips are typically shorter than longline trips and occur closer to shore. Gillnet target species include sharks, rays, croaker, weakfish, mullet, grunt and others. Mesh size used varies according to the target species.

Figure 2. The view aboard a gillnet vessel from the port of Salaverry



3.2 At-sea observers

Pro Delphinus has an onboard observer program operating in the ports of Ilo (boats and observers do, however, sometimes move to other fishing areas such as Pucusana, Ancon and Chimbote). We have also initiated observer programs in two other ports where high levels of seabird interactions were identified. These ports are Callao and Salaverry in central and northern Peru, respectively (See Figure 3). In addition, Pro Delphinus observers in our other ports were also trained in seabird bycatch monitoring. Training included lessons in data collection methods and seabird identification. Data sheets, GPS units and all other necessary equipment were provided. Datasheets were designed to gather information on fishing operation, the vessel specific gear used and the bycatch obtained during the fishing trip (see Appendix V). Observers worked throughout the entire year in order to cover both the shark and mahi mahi seasons. The observers in Salaverry monitored both longlines and gillnets due to the known interaction of seabirds with both fisheries.

3.3 Seabird band collection

Seabird bands recovered by fishermen were collected by our shore based observers and submitted to banding agencies (i.e. the Bird Banding Laboratory and the British Trust for Ornithology). Banding agencies were often able to provide information on each animal captured, including species, sex, date of banding, age class of animal at time of banding, and location banded. This information supplemented the results of the on-board observers and provided another level of detail regarding seabird species at risk from bycatch.

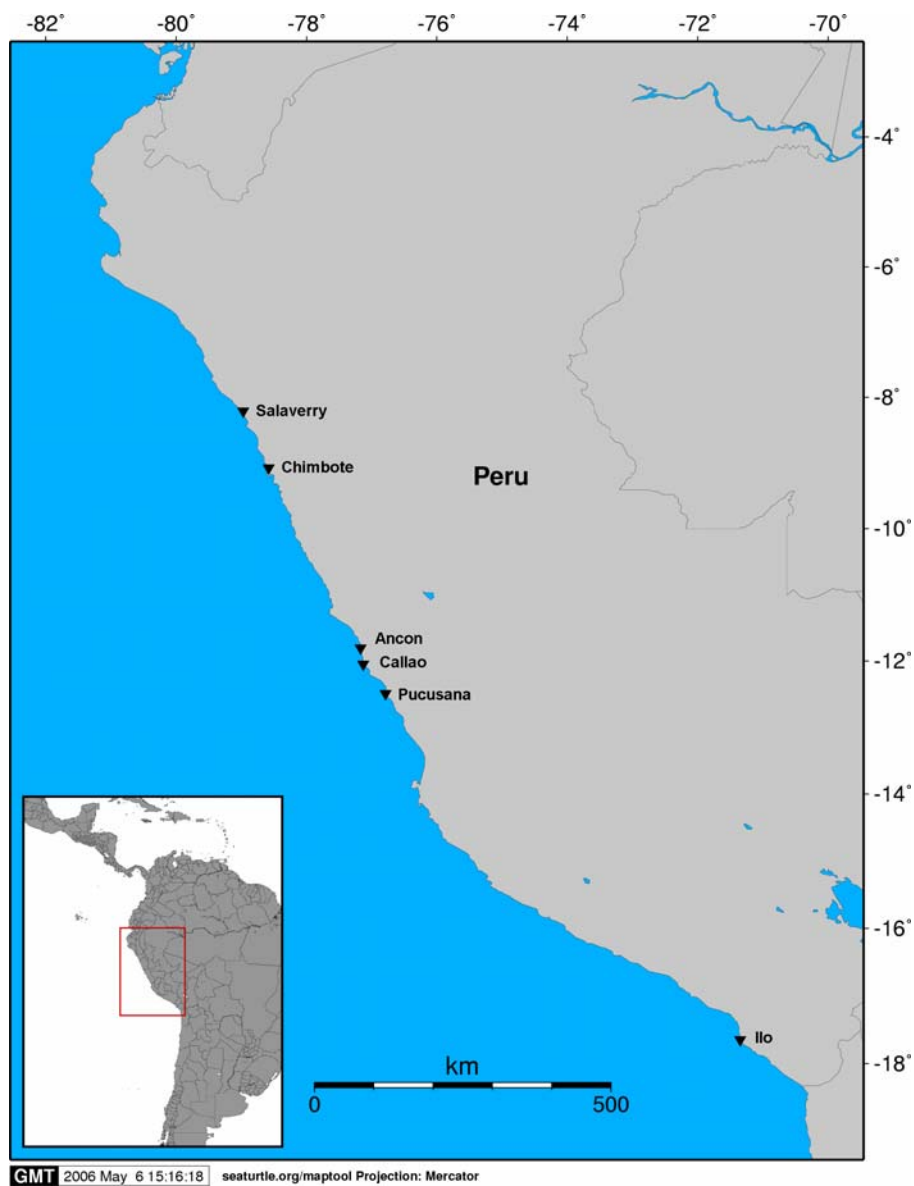
3.4 Outreach and education

3.4.1 Training of local researchers: Local researchers were trained in seabird biology and monitoring. Seabird workshops were conducted at local universities and other institutions such as CEP-Paita (a technical school for fishermen), the Direccion de Capitanias y Puertos de la Marina (DICAPI – the maritime authorities), and the coastal laboratory of IMARPE in Ilo. Numbers of attendees at every workshop were noted. An 11 question pre- and post- workshop survey was conducted during most workshops to assess the knowledge acquired during the talk (see Appendix VI). Workshop attendees were also added to a list of contacts. All participants were provided with materials on general marine conservation and on seabird conservation and biology.

3.4.2 Conservation workshops with fishermen: Workshops were conducted in the ports of Paita, San Jose, Santa Rosa, Salaverry, Callao, Mollendo, San Juan de Marcona, Ilo, Morro Sama and Vila Vila, as well as in other ports, and stressed the importance of seabird conservation and the use of mitigation measures. Workshops were coordinated through DICAPI, and local fishermen associations. Fishermen and local researchers were provided with educational materials to promote seabird conservation (i.e. seabird identification guides, bycatch mitigation guides, stickers, etc.). A list of attendees to the workshops was also recorded. A short pre- and post- workshop survey was conducted to assess the impact of the talk.

A network of people interested in seabird conservation was compiled into a directory. This was based upon the contacts made during workshops with fishermen, meetings at

Figure 3. Locations of ports from which onboard observers operated (SEATURTLE.ORG Maptool, 2002).



the government agencies, and meetings with local researchers and will serve to more efficiently coordinate future workshops and effectively implement conservation efforts.

3.4.3 Reports to government agencies: A final report, with a 2 page executive summary, based largely on this document, will be distributed to government agencies such as IMARPE, MIPE and INRENA (Instituto Nacional de Recursos Naturales). This report will contain all the information generated from the onboard observer program, a list of activities conducted during the study (such as workshops, talks and seminars) and the list of contacts with local researchers, observers and fishermen that participated in the study.

Aside from this final report it is also important to note that throughout the project Pro Delphinus coordinated its activities with government agencies and provided them with information on our project's progress.

4. RESULTS

4.1 At-sea observers

From May 2005 to April 2006 we surveyed a total of 72 artisanal fishing trips. Sampled ports were Ilo, Salaverry, Pucusana, Ancon, Chimbote, and Callao. Table 1 and figure 5 provide a summary of observer trips by port.

The take of seabirds observed can be separated into three categories: (1) bycatch from longline operations, (2) bycatch from gillnet operations, and (3) targeted take of seabirds by crew members. We will address each of these sources of mortality separately and also attempt to aggregate them to provide a more general overview of conservation implications to seabird populations in Peru.

4.1.1 Longline bycatch: One seabird was reported as bycatch from longline fishing operations. This animal was a black-browed albatross that was hooked in the beak after the line was deployed (Figure 4). The fishing boat, which was targeting sharks, originated in the port of Ilo in October 2005. The longline was deployed at 8:00 AM and fully recovered by 6:30 PM. Condition of the carcass is consistent with being consumed by giant squid (*Dosidiscus gigas*) after being hooked.

Figure 4. Black-browed albatross hooked in the port of Ilo.



Figure 5. Location of observed longline and gillnet sets, May 2005 – April 2006 (SEATURTLE.ORG Maptool, 2002).

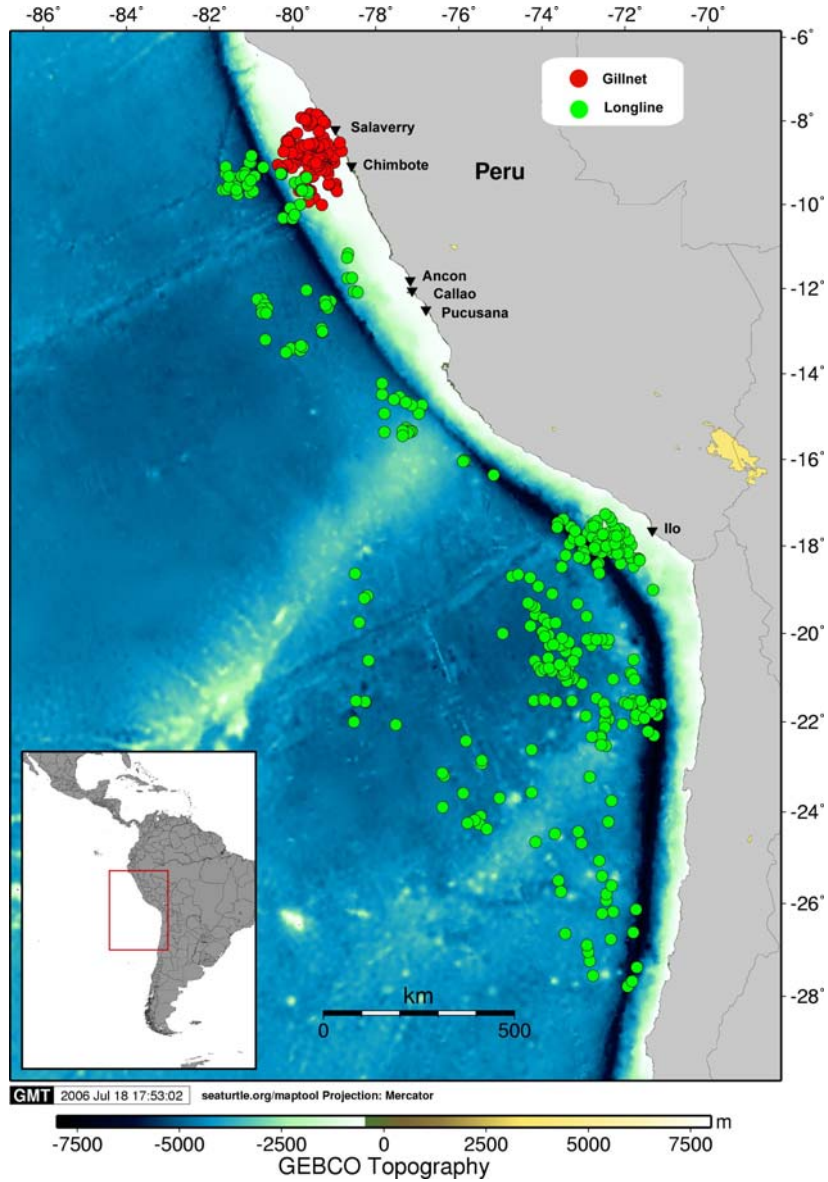


Table 2 summarizes the fishing effort monitored by our on-board observers. Based on the total fishing effort and bycatch observed one can calculate a standardized 'Catch Per Unit Effort' (CPUE).

The standard metric used for longline vessels is catch per 1000 hooks. Below is the calculated CPUE values based on observer data of one bird bycatch in 354,222 hooks set:

Overall CPUE: 0.0028 / 1000 hooks

Using information from IMARPE and the Pro Delphinus onboard observer database we are able to arrive at an estimate of longline CPUE for the country. For the year 2002 IMARPE estimated that 11,316 artisanal longline fishing trips were conducted (IMARPE unpublished data). Using our database, which contains details on 173 artisanal longline fishing trips from 7 ports from 2003 to 2006, we determined that an average of 6.5 sets was conducted per trip. Our data also indicate that an average of 860 hooks/set was deployed. Combining this information, and assuming that fishing practices in 2002 were similar to 2003-2005, we estimate that 63.25 million hooks were set in the year 2002 (11,316 trips x 6.5 sets/trip x 860 hooks/set). A bycatch rate of 0.003 seabirds / 1000 hooks yields an estimated bycatch of 189.7 animals in the year 2002.

4.1.2 Gillnet bycatch: Onboard observer effort on gillnet vessels was limited to the port of Salaverry in central Peru. A total of 21 trips with 175 sets were monitored. Bycatch recorded during these trips consisted of 13 guanay cormorants (*Phalacrocorax bougainvillii*), 2 Humboldt penguins, 1 sooty shearwater (*Puffinus griseus*) and 2 unidentified petrels. The cormorants, petrels, shearwater, and one of the penguins were reported as drowned after becoming entangled. The remaining penguin was entangled but alive. The animal was retained by the crew and brought to shore (the fate of this animal is unknown). Twelve of 13 cormorants drowned during the same set. The remaining cormorant drowned on another trip. All the cormorants were defeathered and brought to shore for consumption. The two petrels drowned in the same set while the remaining 3 animals (2 penguins, 1 shearwater) entangled in separate sets. Depth of the nets ranged from 5 to 8 fathoms, or 9.1 to 14.6 meters. No bait was used in five of six sets. The remaining set was baited with dolphin fat/meat. All nets were set in the mid-morning to mid-afternoon, left overnight and recovered the following morning.

One standardized CPUE metric used for gillnets is 'bycatch per set'. This measure allows one to control for differing numbers of sets conducted per trip. Using this measure we calculated a bycatch CPUE of 0.103 animals/set (18 seabirds caught in 175 sets). The CPUE for cormorants, Humboldt penguins, petrels, and shearwaters were estimated to be 0.074, 0.011, 0.011, and 0.005 animals/set, respectively.

Our onboard observers also record the approximate length of the nets deployed. As a result we can also calculate a bycatch estimate in terms of kilometers of net deployed. Because nets were made up of individual panes of varying sizes the result is a range of estimates for total amount of net laid. For this study approximately 300.9 to 422.5 km of net were monitored for seabird bycatch. The bycatch of 18 seabirds in this length of net results in a bycatch rate of from 0.060 to 0.043 birds/km of net.

Using data collected by Pro Delphinus on fishing effort in Salaverry we are able to make a preliminary estimate of seabird bycatch by gillnets for this port. Based on our onboard observer program we estimated that an average of 8.33 sets were conducted during

Table 1. Observer trips by port.

Port	# Longline Trips	# Gillnet Trips
Salaverry	6	21
Chimbote	2	0
Ancon	2	0
Callao	1	0
Pucusana	3	0
Ilo	37	0
TOTAL	51	21

Table 2. Longline fishing effort observed by port and bycatch recorded.

Port	# Trips	# hooks	Bycatch
Salaverry	6	58,150	0
Chimbote	2	30,600	0
Ancon	2	20,400	0
Callao	1	18,000	0
Pucusana	3	23,500	0
Ilo	37	203,572	1
TOTAL	47	354,222	1

Table 3. Number of gillnet trips and estimated seabird bycatch for the port of Salaverry 2002-2005.

Year	# Trips	# Sets	Total	Estimated Bycatch			
				Cormorants	Penguins	Petrels	Shearwaters
2002	411	3425.0	352.3	254.4	39.1	39.1	19.6
2003	620	5166.7	531.4	383.8	59.0	59.0	29.5
2004	421	3508.3	360.9	260.6	40.1	40.1	20.0
2005	572	4766.7	490.3	354.1	54.5	54.5	27.2

each gillnet fishing trip (21 trips monitored with 175 sets). We also calculated the number of gillnet trips that occurred in Salaverry for the past four years (Table 3; Alfaro Shigueto unpublished data). Knowing the estimated number of sets per year and CPUE we were then able to estimate the actual annual bycatch of seabirds from 2002 to 2005 (Table 3).

For longlines we were able to extrapolate to the country level and provide an estimate of seabird bycatch. The same is not possible with gillnets. Sufficient data is not available to estimate the number of gillnet sets which occur in Peru on an annual basis. We can, however, calculate a minimum estimate of gillnet bycatch. For the year 1999 (the last year for which data are available) there were 63,083 gillnet trips in Peru (Estrella et al. 1999 and 2000). If one were to assume conservatively that only one set occurred per trip than the result would be a minimum estimate of gillnet sets and bycatch for the year. A bycatch CPUE of 0.103 animals/set for 63,083 sets yields a minimum estimate of seabird bycatch for the year 1999 of 6497.5 animals (This assumes that the national bycatch rate is equal to the rate calculated for Salaverry of 0.103 animals/set).

4.1.3 Targeted take: The targeted take of albatrosses at sea is a recently recognized phenomenon that to date has only been documented in the port of Salaverry (see section 4.2 for more information). Onboard observers documented the capture of 12 waved albatrosses and 1 unknown petrel. All animals were captured by setting a baited hook (sometimes with shark liver or dolphin fat). One waved albatross was captured by the crew of a gillnet vessel and released after removing its metal identification band. The remaining 11 waved albatrosses and 1 petrel were killed and eaten by the boat crew. Nine of 11 albatrosses were taken on one gillnet trip, the remaining 2 were taken on another gillnet trip.

Targeted take of seabirds is not directly associated with a particular gillnet set. That is, an increase in number of sets may not necessarily increase the targeted take of seabirds. As a result we have instead attempted to estimate seabird take in terms of take/trip. The targeted take of 13 seabirds during 21 trips results in a take rate of 0.619 seabirds/trip. The take rate for waved albatrosses and petrels are 0.571 and 0.048, respectively. Similar to section 4.1.2, using information on fishing effort in Salaverry, we were then able to estimate the actual annual take of seabirds for that port for the years 2002 to 2005 (Table 4).

Table 4. Estimated seabird targeted take for gillnet vessel in the port of Salaverry 2002-2005.

Year	# Trips	Estimated Catch		
		Total	Waved Alb.	Petrels
2002	411	254.4	234.9	19.6
2003	620	383.8	354.3	29.5
2004	421	260.6	240.6	20.0
2005	572	354.1	326.9	27.2

Because we have estimates of both bycatch and targeted take of seabirds from gillnet vessels in Salaverry we can estimate the total annual seabird catch for the port. A total of 31 seabirds were taken during 21 trips (18 bycatch and 13 targeted take). These consisted of 13 cormorants, 12 waved albatrosses, 3 petrels, 2 penguins, and 1 sooty

shearwater. This level of take yields an overall catch rate of 1.476 seabirds/trip. Table 5 Combines the results displayed in tables 3 and 4 and presents an estimate of total annual catch rate for Salaverry from 2002 to 2005.

Table 5. Number of gillnet trips and estimated total seabird catch for the port of Salaverry 2002-2005.

Year	# Trips	# Sets	Total	Estimated total catch				
				Waved Alb.	Cormorants	Petrels	Penguins	Shearwaters
2002	411	3425.0	606.7	234.9	254.4	58.7	39.1	19.6
2003	620	5166.7	915.2	354.3	383.8	88.6	59.0	29.5
2004	421	3508.3	621.5	240.6	260.6	60.1	40.1	20.0
2005	572	4766.7	844.4	326.9	354.1	81.7	54.5	27.2

As with the previous section, data deficiencies regarding the annual number of gillnet sets in Peru do not allow for an estimation of a seabird catch rate for the entire country. Moreover, due to the fact that the targeted take of seabirds may be a phenomenon exclusive to a particular port or region we have not extrapolated these values to the country level. Furthermore, the at-sea distribution of waved albatrosses is centered more in central and northern Peru so interactions with fishing vessels in southern Peru would be expected to be less frequent (Anderson et al. 2003).

4.2 Seabird band collection

Since beginning seabird band collection in 1998 we have collected 107 bands (see Table 6). Bands were collected from 9 locations. Species identified include waved albatrosses, Chatham Island albatrosses, northern giant petrels, Humboldt penguins, royal terns (*Sterna maxima*) and laughing gulls (*Larus atricilla*). One petrel species is still unidentified and one is known only by its local common name, "perica negra". The majority of the band returns are associated with captures in fisheries, although for many bands, details on the animals capture or fate are minimal. Thus, while a band may be associated with a longline or gillnet boat that does not necessarily mean that it was taken as bycatch.

As discussed in section 4.1.3 some seabirds are purposely captured. Information from band returns suggests several reasons. First, animals were captured because they were carrying visible metal bands or other types of transmitters which fishermen believed may have some monetary or reward value. Second, waved albatrosses were captured for the purpose of consumption by fishermen from Salaverry. Twenty-six of the 28 waved albatrosses captured with hook and line from the port of Salaverry were consumed. The remaining two were released after their metal bands were removed. Limits in the amount of information available to us regarding these banded animals is however, often minimal and does not allow us to make determinations of capture method.

In total, waved albatrosses comprise 87% of all band returns. Eighty-two percent of band returns are of waved albatrosses from the port of Salaverry.

It is also important to highlight a possible increase in band returns during the austral winter months. For that past two years we have received large numbers of bands from fishermen in Salaverry from approximately the months of June to October. In 2004 we

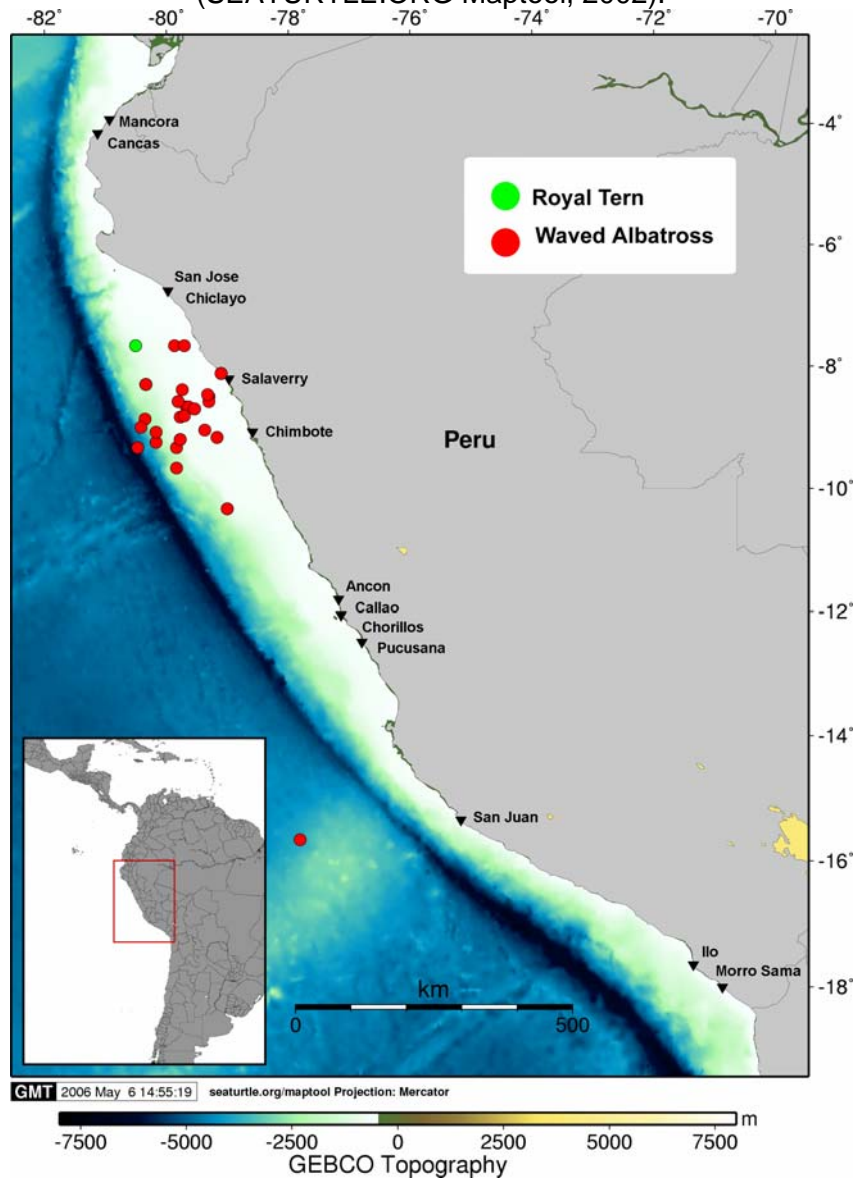
received 26 bands during this period compared with four for the remainder of the year. In 2005 we received 16 bands from June to September and 11 returns for the remainder of the year.

Information on capture location is available for a subset of band returns. In most cases we were provided information on capture location to the nearest minute of latitude and longitude. These captures were plotted in Figure 6. This plot indicates that all but one captures occurred within approximately 150 miles (241 km.) of shore. The fact that all but one of these captures occurred over the continental shelf is reflective of where seabird distributions overlapped with fishing effort and does not necessarily reflect the full range of the population.

Table 6. Summary of all seabird band returns by port, species and fishery (1998-2006).

Port	# Bands	Species	Vessel Type (#)
Mancora	1	Waved Albatross	Unknown
Chiclayo	1	Royal Tern	Unknown
San Jose	2	Waved Albatross	Gillnet
	1	Royal Tern	Unknown
Salaverry	88	Waved Albatross	Longline (16)
			Gillnet (34)
			Unknown (38)
	1	Laughing Gull	Unknown
	1	Royal Tern	Gillnet
Chimbote	1	Chatham Is. Albatross	Longline
	1	Unknown	Unknown
Callao	2	Waved Albatross	Longline
Chorillos	1	Humboldt Penguin	Gillnet
San Juan	3	Humboldt Penguin	Gillnet (2)
			Unknown (1)
	1	Unknown	Unknown
	1	Chatham Is. Albatross	Unknown
	1	'Perica negra'	Beach cast
Morro Sama	1	N. Giant Petrel	Longline
TOTAL	107		

Figure 6. Map of seabird band returns overlaid on bathymetry (SEATURTLE.ORG Maptool, 2002).



4.3 Outreach and education

Outreach and education activities during this project were diverse and occurred at many fishing ports throughout the country.

4.3.1 Training of local researchers: A total of 9 workshops were held between August 2005 and May 2006. A total of 195 students and local officials participated. Educational packets were distributed to many participants. Workshops held at local universities were particularly well received with many students later contacting Pro Delphinus requesting further information on projects and how they may be able to participate.

We also provided a seabird information kit to local researchers from Universities at Trujillo, Chiclayo and Piura, to network with them in the future regarding seabird bycatch information in that area.

Table 7. Training workshops held with students and local officials.

Location	Date	# Attendees
Universidad San Marcos	August 2005	34
Paita	August 2005	16
Universidad Ricardo Palma	September 2005	17
Ilo DICAPI	November 2005	18
Universidad Cayetano Heredia	November 2005	15
Universidad Pedro Ruiz Gallo, Chiclayo	November 2005	25
Pimentel	November 2005	30
Chimbote	April 2006	12
Ilo	May 2006	28

4.3.2 Conservation workshops with fishermen: A total of 12 workshops were held between August 2005 and May 2006. Approximately 210 fishermen participated. Workshops were useful in raising awareness among fishermen regarding marine conservation and the conservation of seabirds. Workshops also served to open dialogue with fishermen regarding the types of seabirds they see and catch. Workshops were conducted in locations such as fishermen association buildings, boats and pool halls. With pool halls being the most popular and more attended.

Table 8. Locations and dates of training workshops for fishermen.

Location	Date	# Attendees
Salaverry	August 2005	14
San Jose	September 2005	Na
Ilo	November 2005	13
Santa Rosa	November 2005	5+
Pimentel	November 2005	19
San Jose	November 2005	20
Paita	February 2006	16
Salaverry	April 2006	22
Salaverry	April 2006	19
San Juan de Marcona	May 2006	32
Mollendo	May 2006	7
Ilo	May 2006	43

4.3.3. Workshops evaluation: A total of 251 pre- and post- workshop survey were completed (43% to fishermen). Results showed that respondents, both fishermen and authorities, had an increase in awareness about seabirds and the concepts of “threatened species” and “migratory species” as a result of the discussion. In general, the state of knowledge regarding seabirds was lower than that for sea turtles (91% of authorities knew sea turtles were protected species vs. 86% for seabirds, numbers for

fishermen were similar with 68% and 53%, respectively). Before the talks only 52% of fishermen and 39% of local authorities knew that the local common name of 'pajarotes' ('big birds') referred to albatrosses and petrels. Local authorities were, however, in most cases better informed than fishermen in their survey responses. Also, 92% of fishermen also indicated their willingness to try new fishing techniques including mitigation measures to help avoid interacting with threatened species. Furthermore, 95% of fishermen indicated they would attempt to release seabirds alive if they became entangled in fishing gear.

4.3.4 Technical reports to government: Throughout the course of this project Pro Delphinus has kept Peru's conservation agencies informed as to our activities and progress. We have had meetings with both Elisa Goya of IMARPE and Rosario Acero of INRENA to discuss this research and have provided both with progress reports. At the conclusion of the project both agencies will be given a copy of our final report and recommendations for future work and collaboration.

4.3.5 Other activities:

4.3.5.1 Dave Kellian Visit: In February 2006, Dave Kellian - a member of the nonprofit group Southern Seabird Solutions which deals with seabird interactions and fisheries in New Zealand - came to Peru as part of an interchange agreement with the IMARPE. Dave has been a commercial fisherman his entire life and has been active in promoting seabird conservation and mitigation in New Zealand. Dave's main intention was to share his experience as a fisherman who has successfully avoided seabird bycatch in New Zealand and to learn more about Peru's artisanal fisheries and their interactions with seabirds. Some species of albatrosses that nest in New Zealand use the waters of Peru and Chile as feeding grounds. Therefore, the need for collaboration between these countries to work in seabird conservation is crucial.

Dave visited several ports during his visit. Pro Delphinus in coordination with IMARPE arranged for him a trip aboard a fishing boat to show him first hand the fishing techniques employed by Peruvian fishermen. The trip ended in Ilo, where Dave gave several talks on seabird conservation to fishermen and local officials. We then traveled north to the port of Paita where we conducted another talk at the fishermen training school CEP-Paita. The talk was attended by 26 students from 6 countries. This talk focused on seabird conservation and the important role of fishers on this subject. Following his visit Dave developed a list of recommendations to advance seabird conservation in Peru.

4.3.5.2 Educational materials: Educational materials have also been produced for this project. These include a seabird identification guide that we have distributed to fishermen, local officials and students throughout the country (Appendix II). We also produced a sticker and a poster for distribution to fishermen and local officials which contain brief conservation messages and information on how to contact us regarding seabird issues (Appendix III and IV).

4.3.5.3 Pro Delphinus-IMARPE MoU: Pro Delphinus is in discussions with the government agency IMARPE regarding the possibility of establishing a Memorandum of Understanding (MoU) between our two organizations. The focus of the MoU would be in establishing an official relationship between our two organizations, to help expand marine fauna bycatch monitoring throughout the country, to minimize research

redundancy, to standardize data collection, and to work in close collaboration with the government on various aspects of marine conservation efforts.

4.3.5.4 Information dissemination: Throughout the course of this research Pro Delphinus has actively sought to disseminate project findings in order to raise international awareness of seabird/fishery interactions in Peru. To that end we have participated in or collaborated with fellow researchers on the production of the following documents and presentations:

1. Awkerman, J., K. Huyvaert, J. Mangel, J. Alfaro-Shigueto, and D. Anderson. 2006. Incidental and intentional catch threatens waved albatross population. Oral presentation at the 33rd Annual Pacific Seabird Group Meeting, Girwood, Alaska, February.
2. Awkerman, J., K. Huyvaert, J. Mangel, J. Alfaro-Shigueto, and D. Anderson. Incidental and intentional catch threatens Galápagos waved albatross. *In review*. Biological Conservation.
3. Jimenez Uzategui, G., J. Mangel, J. Alfaro-Shigueto, and D. Anderson. 2006. Fishery bycatch of the waved albatross *Phoebastria irrorata* in the Pacific Ocean. Report prepared by the Charles Darwin Foundation.
4. Mangel J., and J. Alfaro-Shigueto. Addressing seabird interactions with artisanal fisheries through grassroots conservation: Longline and coastal gillnets in Peru. 2006. Oral presentation to be given at the 4th North American Ornithological Conference. Veracruz, Mexico, October.

We also continue to closely coordinate our research with the Charles Darwin Research Station and Wake Forest University (WFU). These partnerships are essential for information exchange regarding the waved albatross and possible threats to the population. We also continue to work with WFU in order to better understanding possible reasons for the apparent seasonality and male bias in band returns.

5. DISCUSSION

The objectives for this project were to: (1) assess seabird bycatch per unit effort through an onboard observer program, (2) continue to gather seabird band returns using our network of land-based observers, (3) cultivate and expand our contacts in ports along the coast, (4) promote local interest in seabird conservation, and (5) discuss project results with the Peru government.

5.1 Bycatch

5.1.1 Longlines: Our research provides the first onboard observer based estimate of seabird bycatch in Peruvian artisanal fisheries. One year of observer data from longline vessels produced a seabird CPUE of 0.003 animals / 1000 hooks. This CPUE is low in comparison with other published values of longline CPUE (reviewed in Nell & Taylor 2003 and Bergin 1997). When this CPUE is extrapolated to the country level we estimate that approximately 190 seabirds may be taken annually in Peru's artisanal longline fleet. Given that this rate is based on the bycatch of one animal, it is difficult to generalize about the factors leading to bycatch (i.e. day vs. night setting, bait type, etc.). To develop a better understanding of seabird interactions with longline fisheries the continuation of an onboard observer program is recommended.

Reasons why this value may be relatively low remain uncertain and in need of further study. It may be that seabird densities in this region are not as high as other areas (D. Kellian, personal communication, February 2006). As a result, longline boats may not be attended by the large numbers of seabirds seen in other longline fisheries. However, discussions with fishermen in northern Peru do indicate that seabirds are present as lines are set and are sometimes observed diving for baited hooks and bringing branchlines to the surface. These are conditions under which seabird bycatch would be expected to occur even though it has only been documented on one occasion through our onboard observer program. Furthermore, while this study has not yet been impacted by an El Niño Southern Oscillation (ENSO), Jahnke et al. (2001) note that during an ENSO, when prey is scarce, seabirds may more aggressively go after baited hooks thus increasing bycatch rates. Given that the majority of our observer effort aboard longline vessels occurred in the southern port of Ilo one must also consider that there may be regional differences in seabird interactions and bycatch rates that have not as yet been captured by the observer program.

Peru's artisanal longline fishery has grown considerably since the mid-1990s. A review of government documents indicates that in the second half of 1999 a total of 1,968 longline trips occurred (Estrella et al. 2000). By 2001 this had risen to 11,316 trips for the entire year (IMARPE unpublished data). This fleet does not actively employ seabird capture mitigation or avoidance measures. For example, the majority of the fleet sets around dawn using surface lines with no weighting. It is feasible therefore, that seabird bycatch could be further reduced with the introduction of one or more cost effective mitigation measures, like line weighting and use of only fresh or salted bait. Sea trials with different mitigation measures are recommended.

5.1.2 Gillnets: During this study seabird bycatch in gillnets was monitored in the port of Salaverry. A total of 18 seabirds were observed captured (13 cormorants, 2 penguins, 2 petrels, and one shearwater) all but one of which drowned in the nets. These 18 captures resulted in a bycatch rate of 0.103 animals per set. Given the smaller number of gillnet trips observed in comparison to longline trips, this catch rate is considerable higher than that for Peru's artisanal longlines.

Using information on annual numbers of gillnet trips (63,000 trips in 1999) we then provided a minimum estimate of gillnet bycatch for Peru. This estimate was 6,498 animals. This high bycatch estimate may be due in part to the fact that gillnets are often set at or near the ocean surface where petrel species can locate them and also because nets are left to soak overnight during which time entangled animals tire and drown. As with longlines, no seabird entanglement mitigation measures are currently employed by the fishery. This is an area in need of further research.

This estimate should also be viewed with caution. Peru's artisanal gillnet fleet is very diverse and seabird populations may not be at equal risk throughout the country. We have, however, attempted to develop a reasonable and conservative first estimate of gillnet bycatch. Moreover, given the size of the gillnet fleet and the number of trips and sets conducted annually, it is reasonable to expect that a significant bycatch of seabirds is occurring. To develop more accurate assessments onboard observer effort should be expanded into other ports to better evaluate other regions of the country and other gillnet fisheries (with different target species, set times, mesh sizes, etc.). Understanding of

this fishery could be further augmented through increased availability of government statistics on Peru's artisanal fleet.

Bycatch in gillnet fisheries also targeted different species of seabirds than longline fisheries. During our study one albatross was caught in longlines while gillnets entangled cormorants, penguins, petrels and shearwaters. Both the guanay cormorant and the sooty shearwater are listed as Near Threatened by the IUCN Red List. The Humboldt penguin is listed as Vulnerable. The Humboldt penguin and the guanay cormorant are also listed as endangered under Peruvian law (Ley de Agricultura 2004). This listing prohibits, among other things, the hunting, capture, possession, or trade of these species.

The fact that the 13 cormorants drowned in gillnets were brought to shore for later human consumption makes clear that these animals may be more precisely thought of as incidental catch and not as bycatch. The dynamics of the interaction of this species with the gillnet fishery also warrant further attention given the high but sporadic nature of the interaction. If this species is drowning in gillnets at a similar rate in other ports than this could be expected to be negatively effecting the population.

The capture of Humboldt penguins is also of particular concern given their protected status in Peru and their listing as a vulnerable species according to the IUCN Red List. In Peru, the situation of Humboldt penguins is considered critical, with only about 5000 animals distributed primarily between 5 locations (Paredes et al. 2003). Capture in gillnets also represents an addition threat to these already stressed populations. The bycatch of penguins in surface drift gillnets has also been reported (Majluf et al. 2002) and penguins are a known food source in some communities (C. Zavalaga, personal communication, February 2006).

5.2 Targeted take/band returns

The targeted capture and consumption of waved albatrosses and petrels is a previously unreported phenomenon that adds a new dimension to the issue of seabird/fishery interactions. This practice was documented both through our onboard observer program and through band returns. This practice is of concern for several reasons. First, in the port of Salaverry, as evidenced from band returns and our observer data, the practice appears to occur fairly regularly. In fact, the targeted capture rate documented by our observer program was comparable in magnitude to the bycatch rate. More research is needed to assess the frequency of this practice both in Salaverry and throughout the region.

A possible reason for the practice, which came about in discussions with fishermen in the area, is that the port of Salaverry is known as a community that regularly hunts and consumes seabirds. This situation was further confirmed by the preparation of the guanay cormorants for human consumption. Their use differed from that of the waved albatross, however, in that the cormorants were brought to port while the albatrosses were consumed at sea.

Also, there remains a perception that there is a reward or value associated with the recovery of metal or plastic seabird identification bands. The targeted take of seabirds for their bands has also been documented in Chile (Moore & Battam 2000). These are

both issues which can be addressed in part through enhanced education and awareness efforts.

A second cause for concern is that, in general, targeted catch appears to be selective for waved albatrosses which are classified as vulnerable by CITES. Furthermore, research shows recent population declines which may in part be attributable to captures in Peruvian fisheries (Awkerman et al. in review).

Third, this practice is independent of fishing method. That is, animals can be targeted by any boat at sea which overlaps with the distribution of waved albatrosses. As Peru's artisanal fleet continues to grow, the number of fishery/seabird interactions and mortalities could be expected to increase without the implementation of mitigating measures. Efforts to reduce the take of seabirds must therefore be broadly targeted to artisanal fishers in central and northern Peru generally. The expansion of onboard observer effort throughout the region and on both gillnet and longline vessels is recommended because it could help determine if the fleets fish in separate areas and, as a result, interact at different rates or with different species of seabirds.

Band return data also suggests a peak in returns during the austral winter months. It is still unclear what may be causing this increase in band returns. Possible explanations include:

1. Shifts in fishing areas to regions with higher densities of waved albatrosses
2. Changes in waved albatross foraging patterns that bring them into greater contact with Peruvian fisheries
3. Changes in fishermen behavior during the summer months (i.e. capture more birds as a food source related to low fish capture)

It is worth noting that this apparent peak in band returns coincides with the period in which waved albatrosses are attending to their chicks at their breeding colonies in the Galapagos Islands. The loss, therefore, of any of these animals due to fishery interactions would also result in death of the chick and a reduction in the population's fecundity while the surviving adult searches for a new mate in subsequent years. If adults attending to their chicks are more aggressive in seeking out food sources during this period (to include being more likely to dive for baited lines or show increased interest in fishing vessels) this could help explain the increase in band returns or capture rates during these months.

It remains unclear whether waved albatrosses with identification bands are targeted selectively. Onboard observer effort shows that of 12 albatrosses captured, 4 were carrying bands (33%). If this ratio were consistent it would suggest that the 88 band returns recovered in Salaverry were representative of the capture of 267 animals. In order to better understand this dynamic more information is needed on the frequency and reasons for targeted seabird take.

Band returns also indicate that other species of seabirds interact with artisanal fisheries throughout Peru. A total of 6 species were identified from bands. These were reported from 9 separate ports. The species identified include several listed by CITES as vulnerable or endangered. Also, these represent species that nest both locally and as far away as New Zealand and North America. Band returns also reinforce observer data

which indicates that Humboldt penguins entangle and drown in gillnets and that this occurs at various ports throughout the country.

Future efforts in northern Peru should therefore focus on continued monitoring of the fishery, identifying potential mitigation measures and more intensive outreach and educational campaigns to sensitize the community to seabird conservation issues and to better understand the dynamics of incidental and targeted take.

These results make clear that seabird conservation is a theme of importance along the entire coast of Peru. They also demonstrate the need to work regionally to understand potential impacts of fishery interactions with species migrating through the waters governed by many nations.

5.3 Outreach and education

Education and outreach efforts were a core part of this project and are vital to the success and longevity of this program and of future conservation efforts in Peru.

Workshops with students, local officials and fishermen proved an effective means of raising awareness, distributing educational materials, and developing relationships with residents in port communities throughout the country. Workshops and training with students revealed a latent, untapped interest in marine conservation at the university level. We hope to be able to take advantage of this interest and provide students opportunities to work in on-the-ground research and conservation projects. The benefits of this are twofold. First, it is a source of motivated, skilled workers. Second, by involving students in existing marine research projects we seek to lay the groundwork toward developing the next generation of marine researchers and conservationists in Peru.

Workshops with fishermen were also well received. Fishermen often commented that the workshops were the first time they had ever received information of the kind and they appreciated the opportunity. Workshops also created the opportunity to hold further discussions with fishermen on an individual basis. From these interactions we often learned more about fishing methods and interactions with marine fauna. It was also an opportunity to identify fishermen who may be interested or willing to serve as community contacts in the future.

Pre- and post-workshop questionnaires also proved to be a useful tool in assessing the level of awareness of participants and an effective means of evaluating the success of the workshops. Future workshops will also make use of these questionnaires. Results suggested that the majority of fishermen and local officials were aware of the protected status of species like sea turtles and seabirds. However, respondents appeared to be less familiar with seabirds than sea turtles. This may be due to the higher profile of sea turtle conservation in general and in Peru specifically. It also points to the need to further stress seabird biology and conservation at future workshops. Furthermore, we were encouraged by the willingness expressed by fishermen regarding the use of mitigation measures and the release of seabirds from fishing gear.

We recommend the continuation of workshops with fishermen, local officials and students in communities along the Peru coast. These workshops should continue to address topics of marine biology and conservation generally and with a specific focus on

seabirds (particularly albatrosses, petrels, shearwaters, penguins). Appropriate technique for handling animals and procedures when encountering a banded bird should also be addressed. Given the relatively high targeted take and bycatch of seabirds in central Peru future workshops should also emphasize work in this region. Future workshops should also address the apparent differences in seabird interactions between longline and gillnet vessels. Workshops could also be used as a forum for learning more about the reasons for and dynamics of the targeted take of waved albatrosses.

The presence of observers onboard fishing vessels also proved to be another excellent educational opportunity. Observers were often looked to as 'experts' regarding marine species and could use the opportunity to further inform crewmembers about species biology and conservation issues. This situation reinforces the need to provide observers with the best available information and training regarding marine fauna and conservation.

Aside from the various videos and materials compiled and used during the workshops, Pro Delphinus also produced three seabird conservation educational pieces (a brochure, a sticker and a poster). These materials were used at most of the workshops conducted and have been distributed to many other ports along the Peru coast. Fishermen in particular showed much interest in the materials, often immediately starting by trying to identify the species they see at sea. These materials also proved useful not only as a means of disseminating a conservation measure, but also as a sign of appreciation for people's participation. We recommend the continued production and distribution of these and other educational materials at ports along the Peru coast. Materials distributed in central and northern Peru should place particular emphasis on the potential for interactions with the waved albatross.

In general, it must be recognized that environmental education is a long process that targets different publics often using different means and with different end goals. This suggests that one should not expect results overnight and that it is through repeated visits and the development of relationships with individuals in these communities that greater awareness, sensitivity to marine fauna and conservation topics, and potential behavioral change will be realized. Pro Delphinus is dedicated to maintaining the long term presence and commitment necessary to make these advances possible.

6.0 RECOMMENDATIONS

Below is a summary of recommendations for advancing seabird conservation in Peru.

1. Continue with and expand the use of onboard observers on artisanal longline and gillnet vessels. Future observer work should be maintained in existing ports and also expanded, particularly in the center and north of the country. Observers should be placed on both longline and gillnet vessels. This work is necessary in order to quantify and better understand seabird interactions with the artisanal fleet and to identify potential regional differences and differences between longline and gillnet vessels.
2. Conduct sea trials of potential mitigation measures for longline vessels such as line weighting, use of fish oil and variations of tori lines.
3. Quantify the sink rates of baited hooks.
4. Research the mitigation measures available to reduce seabird bycatch in gillnets.

5. Coordinate and standardize protocols between onboard observers operating throughout the country.
6. Increase access to government fishery statistics.
7. Continue with and expand the education and outreach program to include repeated follow-up visits to ports along the entire Peru coast. Workshops in central and northern Peru should take priority and should emphasize the potential for interactions with waved albatrosses. Materials should also be developed to address gillnet bycatch.
8. Continue researching the dynamics of targeted take of seabirds. Identify the scale and geographic extent of this practice and identify possible solutions.
9. Promote regional cooperation and information dissemination regarding seabird/fishery interactions in Peru in order to better understand the conservation and management implications to the species affected.
10. Identify boat captains, boat owners or fishermen leaders who could act as community leaders with regard to seabird conservation, and who would be willing to experiment with mitigation measures or gear modifications.

LITERATURE CITED

Alfaro-Shigueto, J., and J. Mangel. 2003. Seabird band returns from Peruvian fisheries. Poster presented at the 13th Annual Meeting of the Pacific Seabird Group, Parksville, British Columbia, Canada, February.

Anderson, D., K. Huyvaert, D. Wood, C. Gillikin, B. Frost, H. Mouritsen. 2003. At-sea distribution of waved albatrosses and the Galapagos Marine Reserve. *Biological Conservation* 110: 367-373.

Awkerman, J., K. Huyvaert, J. Mangel, J. Alfaro-Shigueto, and D. Anderson. Incidental and intentional catch threatens Galápagos waved albatross. *In review*. *Biological Conservation*.

Bergin, A. 1997. Albatross and longlining – managing seabird bycatch. *Marine Policy* 21(1): 63-72.

Escudero, L. 1997. Encuesta estructural de la pesquería artesanal del litoral peruano. *Informe Progresivo del Instituto del Mar del Peru* 59: 1-87.

Estrella, C., R. Guevara-Carrasco, J. Palacios, W. Avila, and A. Medina. 1999. Informe estadístico de los recursos hidrobiológicos de la pesca artesanal por especies, artes, meses y caletas durante el primer semestre de 1999. Instituto del Mar del Perú. Informe no.148, Agosto 1999. La Punta, Callao. 214pp.

Estrella, C., R. Guevara-Carrasco, J. Palacios, W. Avila, and A. Medina. 2000. Informe estadístico de los recursos hidrobiológicos de la pesca artesanal por especies, artes, meses y caletas durante el segundo semestre de 1999. Instituto del Mar del Perú. Informe no. 151, Enero 2000. La Punta, Callao. 194pp.

Jahncke, J., E. Goya and A. Guillan. 2001. Seabird bycatch in small-scale longline fisheries in Northern Peru. *Waterbirds* 24(1): 137-141.

Ley de Agricultura. 2004. Aprueban categorización de especies amenazadas de fauna silvestre y prohíben su taza, captura, tenencia, transporte o exportación con fines comerciales. Decreto Supremo #034-2004-AG.

Ley General de Pesca. 2001. Reglamento de la ley general de pesca. Decreto Supremo #012-2001-PE. Título 3, Capítulo 2, Artículo 30.

Majluf, P., E. Babcock, J. Riveros, M. Schreiber and W. Alderete. 2002. Catch and bycatch of seabirds and marine mammals in the small scale fishery of Punta San Juan, Peru. *Conservation Biology* 16(5): 1333-1343.

Mangel, J. and J. Alfaro-Shigueto. 2004. Seabird bycatch in Peruvian artisanal fisheries: Results from fisherman surveys. Presented at the 3rd International Albatross and Petrel Conference, Montevideo, Uruguay, August.

Moore, P. and H. Battam. 2000. Procellariiforms killed by fishers in Chile to obtain bands. *Notornis* 47: 168-169.

Nel, D. and F. Taylor. 2003. Globally threatened seabirds at risk from longline fishing: International conservation responsibilities. Report presented to the Meeting of the UN Food and Agriculture Organization Committee on Fisheries. Rome, Italy. February. 15pp.

Paredes, R., C. Zavalaga, G. Battistini, P. Majluf, and P. McGill. 2003. Status of the Humboldt penguin in Peru, 1999-2000. *Waterbirds* 26(2):129-138.

SEATURTLE.ORG Maptool. 2002. SEATURTLE.ORG, Inc.
[Http://www.seaturtle.org/maptool/](http://www.seaturtle.org/maptool/)(May 2006).

APPENDIX 1: PICTURES FROM THE PROJECT



Workshop with navy officials at the port of Ilo.



Workshop with fishermen at the port of Salaverry.



Workshop with navy officials in Salaverry.



Fishermen sharing band information after a workshop in Salaverry.



Dave Kellian and Joanna Alfaro Shigueto talking with fishermen in the port of Paita.



Fisherman from Chiclayo with seabird sticker.



Giant petrel captured off Ilo.
(animal captured and released for photo)



Guanay cormorants drowned in a gillnet
off Salaverry.



A sooty shearwater recovered drowned
from a gillnet in Salaverry.



A group of waved albatrosses feeding on
discards from a boat in Salaverry.



Typical artisanal boats from Paíta. They
are often reconfigured during the year
between longlines and gillnet.



The bustling port of Ilo in southern Peru.

APPENDIX 2: SEABIRD CONSERVATION BROCHURE

Para cualquier información sobre pajarotes, contáctanos a:

prodelphinias@yahoo.com
 joseana@peruaviacion.com
 Llámamos a los teléfonos:
 01-463-5105, 01-2413081o al 01-9668-1041

Recuerda que no hay recompensa monetaria por las bandas pues eso podría estimular la captura de aves para el cobro de dinero. Si nos indicas como contactarte (dirección de correo) te enviaremos material sobre esta campaña y la información disponible sobre el ave que reportaste.

Pajarotes
Tus Compañeros de Viaje

Evitemos más muertes. Salvémoslos...

Logos: PERU, Peregrine The Spirit of Adventure, NOAA

Los Pajarotes Tus Compañeros de Viaje

Los albatros y petreles, también conocidos como "pajarotes", son aves marinas de gran tamaño. Anidan formando colonias en islas remotas, es decir se agrupan para poner huevos y criar polluelos. Los albatros son aves muy especiales: forman una pareja estable y ambos padres se turnan el cuidado del único huevo y del polluelo una vez que nace. Los padres pueden realizar viajes de hasta 5 semanas para alimentar a su única cría. Si los padres son cazados en el mar, la cría generalmente muere. Los jóvenes albatros tardan mucho en alcanzar la madurez sexual para aparearse, algunas especies reproducen por primera vez a los 10 años y pueden alcanzar hasta los 60 años de edad. Muchas especies ponen un único huevo cada dos años.

Los albatros y petreles son especies migratorias, es decir viajan grandes distancias desde su lugar de anidación hacia los lugares que utilizan para alimentarse. Por ejemplo, muchas de las especies que vemos en nuestro mar han llegado de islas de Nueva Zelanda, Australia y de Ecuador (Islas Galápagos) para alimentarse en aguas Peruanas. Algunas especies de albatros y petreles están en serio peligro. Se ha registrado una alta mortalidad de estas aves en la pesca con palangre (espineles) y con redes.

En la pesca de espineles en otros países como Estados Unidos, Nueva Zelanda y Australia, se han creado medidas mitigadoras para reducir la muerte de pajarotes. Estas medidas son fáciles de implementar e incluyen:

- Uso de líneas espantapajaros
- Uso de carnada descongelada
- Lance de aparejos de pesca durante la noche

En nuestro país hay gente trabajando para reducir la muerte de pajarotes. El gobierno también esta colaborando y ha dictado normas ministeriales para su protección como el DS 034-2004AG. El Perú además a firmado convenios internacionales para la protección de los albatros y petreles, los mismos que no se podrán cumplir sin la valiosa ayuda de los señores pescadores.

RECOMENDACIONES SI UN PAJAROTE SE AMALLA O ENGANCHÁ EN TU APAREJO:

1. Coloca cuidadosamente al ave en cubierta
2. Cúbrele los ojos con una tela para que se calme, pero ten cuidado de no obstruir los agujeros para respirar
3. Agarra firmemente la cabeza del ave, mientras otra persona desenreda o desengancha cuidadosamente el aparejo de pesca
4. Si el ave se trago el anzuelo profundamente, corta la línea lo más cerca posible al anzuelo
5. Mantén al ave en tu embarcación hasta que se seque y pueda volar. Esto lo notarás cuando el ave se mantenga sobre sus patas y su cabeza este firme
6. Anota el lugar, fecha y la especie de ave. Si el ave tiene banda metálica o plástica, **NO LA QUITES**. Anota la información completa y envíalo a las direcciones que figuran al reverso.
7. Tu estas haciendo la diferencia y colaborando en proteger estas aves, nosotros responderemos tu carta con información del sitio de origen del ave, el año en que fue banderado y su edad estimada.

Albatros y Petreles Gigantes del Perú

Albatros de Salvin, Albatros de Chatham, Albatros de Cabeza Gris, Albatros de Buller, Petreles Gigantes, Nariz Tubular, Albatros de las Galápagos, Albatros Ceja Negra, Albatros Real, Albatros Errante

Brochure produced for this project and distributed to fishermen, local officials and students.

APPENDIX 3: SEABIRD CONSERVATION STICKER



Amigo pescador...!

Cuida tus pajarotes!!!

Están de paso por nuestros mar y quedan muy pocos!!!
Nosotros podemos evitar que desaparezcan!!!

Los albatros o pajarotes, vienen desde las Islas Galápagos en Ecuador, de Australia y Nueva Zelanda donde se reproducen. Viajan grandes distancias para alimentarse en nuestro país.

Si tienes información sobre estas aves, favor escríbenos a:
prodelphinus@yahoo.com o llamar al tlf.: **01-2413081**

Sticker distributed at ports during educational workshops.

APPENDIX 4: SEABIRD CONSERVATION POSTER

A poster with a dark blue background. At the top, the text 'Amigo pescador...!' is written in white. Below it, 'Cuida tus pajarotes!!!' is written in large white and yellow letters. A large, detailed illustration of a brown and white albatross is the central focus. A red lightning bolt graphic strikes the bird's head. In the background, another albatross is shown flying over a rocky coastline. Text on the right explains that albatrosses are migratory and their populations are declining. It advises to be careful if they are caught and to report leg bands. A call to action states that participation in conservation is important and provides contact information for 'prodelphinus.org'. At the bottom, there are logos for NOAA, bp, Wildlife Conservation Society, Peregrine, BirdLife International, and Conservation International, along with a small logo for 'Puntos de Puntos'.

Poster distributed at ports during educational workshops.

APPENDIX 5: ONBOARD OBSERVER SEABIRD DATA SHEETS



4. FICHA PARA AVES MARINAS

Código de viaje: _____

Nombre de embarcación: _____

Lugar de zarpe: _____

Codigo de animal	No. Lance	Carnada	Latitud	Longitud	Especie	N° individuos	Condicion	Estado	Enganche	Uso	N° fotos	Muestra	Codigo de Bandas

Comentarios: (anotar toda información relevante como si fue cebada, si se engancho de día o de noche, numero de pajarotes que se acercaron al bote durante operacion y si fue durante lance o recojo de aparejo):

INSTRUCCIONES DE LLENADO DE FORMATO

<p><u>Carnada:</u> Anotar si era pota, caballa, etc. y su condición: fresca, congelada, etc.</p>	<p><u>Especie:</u> Ver guía de identificación</p>	<p><u>Condición:</u> 1. Muerta 2. Moribunda 3. Viva en buenas condiciones</p>	<p><u>Estado:</u> 1. Enganchada en tendida 2. Engancha en recojo 3. Avistada (volando, alimentándose, etc) 4. Cuando el aparejo esta en el aqua 5. Desconocido</p>
<p><u>Enganche:</u> 1. Pico 2. Garganta 3. Pecho 4. Ala 5. Otro lado</p>	<p><u>Uso:</u> 1. Soltada Viva 2. Desechada Muerta 3. Se comió 4. Desplumada para uso de plumas 5. Otro</p>	<p><u>Muestra colectada:</u> 1. Cabeza 2. Plumas 3. Marcas</p>	<p><u>Código de bandas:</u> Anotar todo lo que dice. Si el ave estuviera, soltarla. Si el ave está muerta, coleccionar las bandas.</p>

APPENDIX 6: PRE- AND POST- WORKSHOP SURVEYS

ENCUESTA (antes del taller)

Contesta marcando con una **X** la opción que más te parezca

1. Sabías que Pajarotes es el nombre común de los albatros y petreles?
SI _____ NO _____
2. Sabías que los pajarotes vienen de otros países?
SI _____ NO _____
3. Sabías que los pajarotes o albatros y petreles son **especies amenazadas**?
SI _____ NO _____
4. Qué es para ti "**Especie Amenazada**"?
____ Que son peligrosas
____ Que quedan muy pocos
____ Que desaparecieron ya del planeta
____ No se
5. Sabías que están protegidos por ley? Que es prohibida su captura, consumo y comercio?
SI _____ NO _____
6. Sabías que tomando o usando ciertas medidas se puede reducir la captura de aves en altamar?
SI _____ NO _____

ENCUESTA (después del taller)

Contesta marcando con una **X** la opción que más te parezca

1. Sabes que significa "**Especie amenazada**"?
____ Que son peligrosas
____ Que quedan pocas
____ Que desaparecieron ya del planeta
____ No sé
2. De la Charla, qué crees que significa **especie migratoria**?
____ Que comen algas
____ Que viajan constantemente durante su vida
____ Que están en peligro
____ No sé
3. Si cae un pajarote en tu aparejo, **tratarías de desengancharlo** y luego devolverlo al mar?
____ SI ____ No, porque me quita tiempo ____ No, cortaría la línea nomás
4. De las medidas para reducir la captura de aves, usaría estas medidas en tu aparejo?
____ SI ____ No
5. Si marcaste **SI** en la pregunta anterior, cuáles de estas medidas usarías?
____ Línea espantapájaros
____ Carnada descongelada
____ Carnada de teñida