INCIDENTAL CAPTURE OF SEABIRDS SURVEY IN COASTAL FISHERIES

BRITISH PETROLEUM CONSERVATION PROGRAMME 2003

FINAL REPORT

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1. INTRODUCTION

1.1. THE PROBLEM WORLDWIDE

Incidental mortality associated to fishing gears is the main problem for the conservation of nearly all albatross, many petrel species and other seabirds like shearwaters and penguins. The situation is so serious that 20 of the 24 albatross species are currently threatened with extinction (BirdLife International, 2000).

The incidental capture during longline fishing occurs when seabirds are attracted to fishing vessels by discards and bait and ingest baited hooks during the setting or, to a lesser extent, the hauling of the longline. Hooked birds are subsequently pulled under the water by the weight of the line and finally drowned (Environment Australia, Biodiversity Group 1998). On the other hand, seabirds mortality caused by trawlers generally fits into two broad categories: 1) cable mortality, including warp cable, netsonde (third wire) and paravane cables, and (2) net entanglements; including all mortality caused by direct interaction and entanglement with nets. In the Falklands Islands-Malvinas, it is conservatively estimated that approximately 1,500 seabirds, predominantly Black-browed Albatross, are killed annually by the local demersal trawling fleet (Sullivan and Red, 2004)

Albatrosses and petrels are vulnerable to other fishing operations, especially to the trawling and driftnets (Alexander *et al.* 1997). Several cases of seabird's mortality were recorded in coastal fisheries (Melvin *et al.* 1999, Yorio and Caille 1999, Tamini *et al.* 2002). Melvin *et al.* (1999) recorded the incidental capture of rhino auk (*Cerorhinca monocerata*) and guillemot (*Uria aalge*) in coastal gillnets in Washington state, United States of America.

In the Argentine Sea, single bottom trawl with 25 m footropes were used by coastal vessels. Codend mesh size was 38 mm (stretched) and trawling speeds were from two to three knots (Tamini 2001). During the hoisting process of this net, the mesh that is stilling in the water forms a fence in which different seabirds are trapped (Tamini, pers. obs.). It has been determined that 81 % of the coastal Argentine fleet operates in Buenos Aires province and the fishermen can use several types of trawl nets (Lasta *et al.* 2001).

The pelagic trawling net is another kind of fishing gear used along the coast of Buenos Aires Province. In 1998 it was estimated that 100 Magellanic penguins (*Spheniscus magellanicus*) might have been killed annually by the coastal fishery of Puerto Quequén (Tamini *et al.* 2002). Additionally, observations of the interaction between seabirds and trawl vessels were conducted in five Patagonian coastal fisheries and the incidental capture recorded was very low due to the relatively small size of the net's horizontal opening. However, if new fishing strategies are developed, such as the use of mid-water nets close to the shore aimed at pelagic species like the anchovy (*Engraulis anchoita*), seabird mortality might rise (Yorio and Caille 1999). Along the Buenos Aires Province coast, the fishing of anchovy and chub mackerel (*Scomber japonicum*) with mid-water nets is very common (Errazti and Bertolotti 1998). The development of research and conservation projects about incidental capture of albatrosses and petrels in the coastal fisheries of Argentina is necessary, due to the scarce available information (I Taller Sudamericano de Conservación de Albatros y Petreles 2001).

Commercial fisheries operations may affect seabirds in a number of ways including mortality in fishing gear, competition for food resources (Burger and Cooper 1984) or the provision of new food sources in the form of fisheries waste (Furness, et al, 1988). Most seabirds are considered to be top predators in marine ecosystems, which make them potential competitors with commercial fisheries (Furness 1984). This competition can introduce changes in abundance or community structure. Likewise, any changes in abundance of seabirds may also have profound effect on the ecology of their breeding islands. For example, Sooty and Short-tailed Shearwaters are 'keystone species' because of their impact on soil aeration, nutrition and plant regeneration (Moller et al. 2000).

1.2. SEABIRDS

1.2.1. SHORTH SYNOPSIS OF SPECIES

Threatened species due to incidental capture by fisheries all around the world belong mostly to the Orders Sphenisciformes (penguins) and Procellariiformes (Albatrosses, Petrels, Shearwaters, Storm Petrels and Diving Petrels).

Order SPHENISCIFORMES:

Family SPHENISCIDAE (Penguins): Comprises five genera, and 17 species. Penguins are restricted to the Southern Hemisphere. They are pelagic, great swimmers and divers. They are notable for their upright posture and stiff wings that cannot be folded against the body. Penguins are medium to large birds with a thick layer of fat beneath the skin. Penguins are considered monogamous and individuals often nest at the same nest site, with the same partner from the previous year. Most penguins breed in large colonies.

Order PROCELLARIIFORMES

Family DIOMEDEIDAE (Albatrosses): Two genera that comprise 24 species. Albatrosses, the biggest of all seabirds, are huge long-winged birds that visit land only to reproduce, sometimes in large colonies, mainly on remote oceanic islands. They have large longevity and form life couples. They feed fishes, squids and leftovers of ships cooking. Most of them are stubborn ship- followers. Picture: Black-browed Albatross *Thalassarche melanophris*.

Family PROCELLARIIDAE (Fulmars, Prions, Petrels and Shearwaters): This is the most diverse group in the Procellariiformes Order; it is composed by 12 genera with 55 species, going from huge petrels to tiny prions. Oppositely to albatrosses, which have single nostrils placed on each side of their hook-tipped bills, all Procellariidae have their nostrils joined in a simple tube placed on the upper part of the bill (sometimes the

term "tubenosed" is used to describe their nose). They are highly pelagic, displacing over the ocean with rushes of quick wing movement followed by rigid-wing glides. They return to land only to reproduce. Picture: White-chinned Petrel *Procellaria aequinoctialis.*

Family HYDROBATIDAE (Storm Petrels): These are the smallest of all Procellariiformes; composed by 7 genera with 20 species arranged in two main groups, one at each hemisphere. Picture: Wilson's Storm-Petrel *Oceanites oceanicus*.

Family PELECANOIDEDAE (Diving Petrels): This family represents 4 species, restricted to southern oceans. Diving Petrels are small, fatty short-winged seabirds with a white dorsal and black ventral pattern. Their flight is extremely low and fast, over the waves with a wing buzzing, occasionally flying over the crests without much more than a short pause.

1.2.2. THREATENED SPECIES

The use of longline as a fishing gear has been a cause of quick decline of various seabird populations. In Argentina alone, six species are regarded as vulnerable due to their use: White-chinned Petrel (*Procellaria aequinoctialis*), Common Giant Petrel (*Macronectes giganteus*), Grey-headed Albatross (*Thalassarche chrysostoma*), Royal Albatross (*Diomedea epomophora*), Wandering Albatross (*Diomedea exulans*) and Sooty Albatross (*Phoebetria fusca*). Also, the Spectacled Petrel (*Procellaria conspicillata*) which qualifies under the global critically endangered status and has been recently recorded in Argentine waters (Savigny 2002).

Other two species, which could appear in Argentine waters, and would qualify under the "endangered" status, are the Northern Royal Albatross (*Diomedea sanfordi*) and Tristan Albatross (*Diomedea dabbenena*). It is considered likely that both species would have problems with fisheries in the near future, and for that reason we are taking them into account. Currently there is a big discussion related to the systematic of the albatrosses and petrels, based on the species concept depending on islands, territories and migrations. Therefore the number of species considered varies between 24 and 30 approximately.

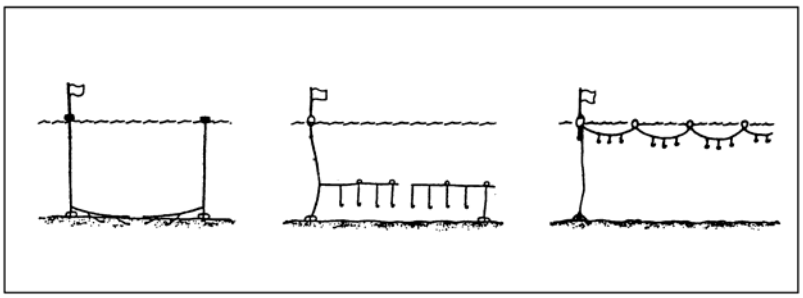
The seabird species recorded with more frequency in captures with long-lining fishing art in the Patagonia region are the Black-browed Albatross and White-chinned Petrel (Favero *et al.* 2001). Other species captured in this region are the Wandering Albatross, Grey-headed Albatross, Royal Albatross, Sooty Albatross and Common Giant Petrel (Alexander *et al.* 1997, Favero *et al.* 2001) although with less frequency.

1.3. IMPLICATED FISHING GEARS

Fishing gears, defined as fishing systems or skills prepared for the capture of hydro-biological resources, conformed principally by net panels (Elissetche, 1992), are classified in a great variety of alternatives according to the capture modality and the associates devices (Nédelec and Prado, 1990).

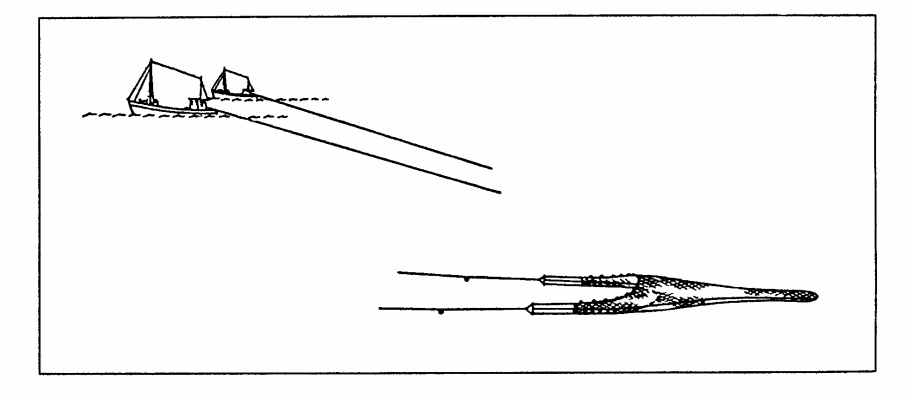
1.3.1. LONGLINE

Natural or artificial baits are placed on hooks to attract preys in hand lines and longlines. Simple or multiple hooks without baits may be used too to capture individuals from target species when they pass by.



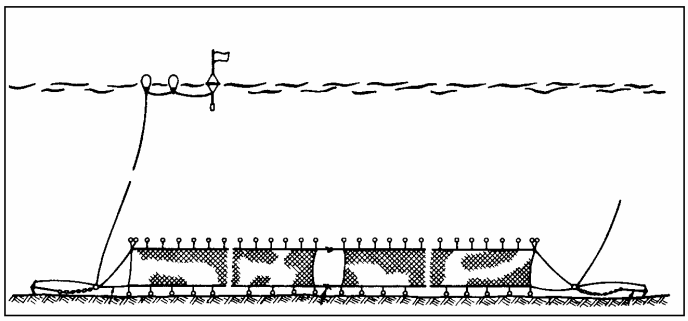
1.3.2. TRAWL NET

Trawling nets comprise a cone shaped body closed by a codend that gets wider on the opening by wings. They can be pulled by one or two ships and are classified as **bottom trawl** (with footrope and weight) and **middle water trawl** (with footrope with weight attached to the uppers floats to keep all the element floating).



1.3.3. GILLNET

On gillnets fishes get trapped on the net, that can be just one (**tangle net**) or three (**trammel net**). Depending on their design, ballast and floatability, it can be used to fish on the water surface, intermediate deeps or the bottom.



1.4. COASTAL FISHERIES IN ARGENTINA

Fishing activities in Argentina started last century with the costal fleet operations and with the income of immigrants currents, mainly from Europe, at the beginning of the century, which brought the fundamental elements for the conformation of the argentine marine fisheries. The development process was consolidated with the improvement of the preservation techniques, the transportation and the setting of fishermen colonies in adjacent areas to Mar del Plata (Bertolotti *et al.*, 1986).

Until the year 1961 the argentine fishing fleet was composed almost exclusively by coastal vessels. While the coastal fleet kept the number of vessels mostly constant the pelagic fleet grew in a sustainable way raising its capture capacity. In the last 20 years data it can be observed that in 1984 the coastal fleet contributed with 46.000 metric tons (mt) to the marine fishery of our country while in 1996 coastal fishery captured 167.300 mt of maritime products. This rise in the capture capacity was related to an increase in the fishing effort and a technological improvement in some fleets of the coastal areas of Buenos Aires Province (Chiaramonte, 1998)

Up to now, differences on the impact produced on the ecosystem by different fisheries has been poorly tested in Argentina. Since the sustainable growth of the pelagic fishing and the freezing fleets that operate on waters of the Argentine Sea, a change of behavior on the fishing activity was noticeable on some of the coastal fisheries.

Our study was made in Buenos Aires Province where the main ports of the country are situated. The cities where the coastal ports are located are General Lavalle, San Clemente del Tuyú, Mar del Plata, Puerto Quequén, Ingeniero White and Puerto Rosales, from which Mar del Plata and Puerto Quequén are the most important ones.

1.4.1. MAR DEL PLATA HAURBOR

The city of Mar del Plata has a population of 553000 habitants from which 200000 incomes come directly or indirectly from fishing. The port concentrates 189 vessels of 10 to 19 meters length (74 % of the fleet) and a crew of 1362 workers. This is the only port in Buenos Aires with pelagic fishing vessels. The gears used in this haurbor are: bottom trawl, surface trawl, purse seine, line, lampara, longline, gillnet and traps (Errazti and Bertolotti, 1998).

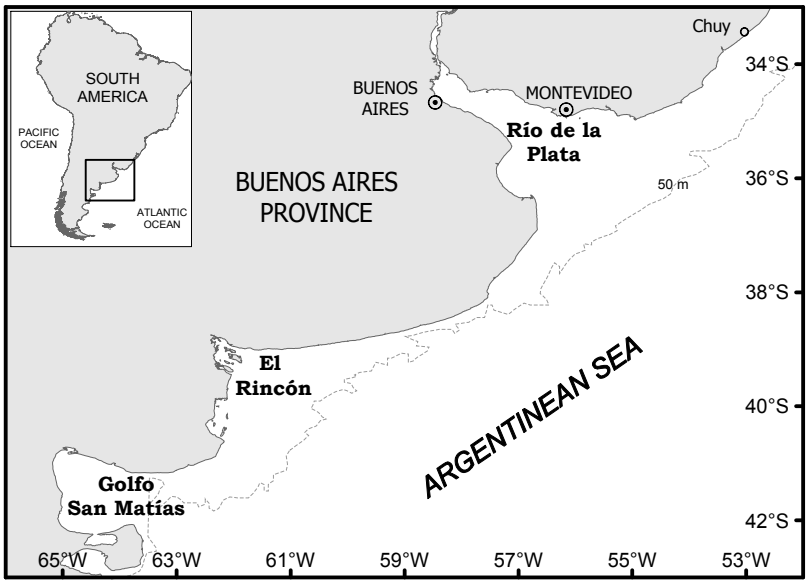
1.4.2. PUERTO QUEQUÉN HAURBOR

On the other hand, Puerto Quequén and its neighboring city, Necochea, have an 85000 people population from which only 8000 depend on fishing. The coastal fleets operating at Puerto Quequén consist of 26 vessels (about 9,4 % of the province's coastal fleet) and a crew of 144 fishermen.

The fishing gears used in these ports are: bottom trawl, surface trawl, purse seine, line, lampara, gillnet and traps (Errazti and Bertolotti, 1998).

1.5. STUDY AREA

The marine ecosystem of Buenos Aires coast is defined in the North by the coastal line up to Chuy (R.O. of Uruguay) in the North (33° 30 S), El Rincón in the South (41°S) and the West by the 50 meters isobate. It contains three areas with different oceanographic characteristics: the estuarial area of the Common Argentina – Uruguay Fishing Zone with the typical two-layer structure: the superficial one dissolved by continental contributions and the other one deeper with levels of salt raised in the media platform (Guerrero *et al.* 1997a, Guerrero *et al.* 1997b, Lasta 1998). The central coastal area of the Buenos Aires Province is defined by a 30 km narrow strip with waters caused in platform (Guerrero, 1998) and El Rincón area defined by two patterns. The first one formed by platform waters that through advection are shifted from the south region by the media flow of the platform (same pattern of the central area). The second one is a coastal area with dissolved water due to continental contributions of the Negro River, and in a smaller amount, the Colorado River (Guerrero 1998). The complete region contributes with an average of 84, 4 % of the fishing landing in the country and 61,7 % of the metric tonnage of fished products exported in different forms. The different fisheries exploit more than 57 species of fish of commercial importance and shellfish that are traded both in the local and foreign market.



2. PROJECT AIMS AND OBJECTIVES

2.1. AIMS

1. To evaluate the impact produced by coastal fishery activities on seabird species, particularly on the endangered albatrosses and petrels.
2. To generate base information about albatross and petrel species which interact with the coastal fishery fleet
3. To promote, through training of university students, the conformation of a research group specially focused on the conservation of seabirds.
4. To spread the conservation problem of the seabirds through National, International and Neotropical Scientific Meetings and to the general public.

2.2. OBJECTIVES

1. **a.** To obtain detailed information about endangered albatrosses and petrels mortality in trawling and other coastal fishing arts through personal inquiries to fishermen.

   b. To obtain capture events data of the species already mentioned through on board watchers work in fisheries previously selected based on inquiries.
2. **a.** To obtain distribution and relative abundance data of the species already mentioned.

   b. To obtain interspecific and intraspecific interaction data and other behavioral data of these species.
3. **a.** To train university students in terms of methodologies and work dynamics of the coastal fishery industry.

   b. To train students in the use of different field methodologies associated to the estimation of population densities and the featuring of local stratum of sampling and geo-referenced techniques.

   c. To train students in the use of several software packages for the management of data, statistics and density estimations.
4. **a.** To submit the results to National and International Neotropical Scientific Meetings.

   b. To collaborate with the Argentine BirdLife International Partner, Aves Argentinas-Asociación Ornitológica del Plata in their institutional seabird's conservation project.

   c. To promote local and regional awareness of conservation requirements of the endangered albatrosses and petrels populations through graphic materials.

   d. To elaborate technical reports that reach Governmental and Non Governmental Organizations

   e. To carry out work reunions with societies, associations and fishing cooperatives thus sharing the corrective measures to be used.

3. SCIENCE ACTIVITIES

Data collection has been divided in two parts. Inquires to fishermen have been made in order to obtain certain information to determine which of the ports and/or small fishing camps should be selected and the season of the year according to the level of impact over the endangered albatrosses and petrels species. On board observations were made when this first stage was finished and suitable ports and/or small fishing camps were selected.

3.1. FIRST STEP: MAKING THE SKILLS

Surveys at ports and small fishing camps have been made in order to carry out some of the activities involved in the project about interactions between seabirds and fisheries from Buenos Aires Province, Argentina. Because of that, three journeys were made to different points of the coast (Figure 1):

- **8-11 of May:** Puerto Quequén.
- **22 -31 of May – South of Buenos Aires:** Claromecó, Dunamar, Monte Hermoso, Pehuencó, Punta Alta, Puerto Rosales and Ing. White.
- **9-13 of July - North of Buenos Aires:** Gral. Lavalle, San Clemente del Tuyú, Las Toninas, Santa Teresita, Mar del Tuyú, La Lucila del Mar, San Bernardo, Mar de Ajó, Pinamar, Ostende, Valeria del Mar, Villa Gessel and Mar del Plata.

Twenty-one sites have been visited (6 ports and 15 small fishing camps), 71 interviews with fishermen were done (about the 32,9 % of the total fleets) from the three types of coastal fleets: coastal vessels, small vessels and boats. Bahía San Blas was discarded due to the lack of fisheries in that area. That information was provided by Ing. White informers.

Our staying in each place was related to the number of vessels in different ports. Some places visited like San Clemente del Tuyú or Dunamar have a few ships (only 3 or 4 boats) due to that our visits were shorter and we needed 4 hours to record those sites. Big ports like Mar del Plata, Puerto Quequén, and Ing. White have an average fleet of 20–60 vessels and we needed 3–4 days for these localities.

Enquires were made to fishermen of each port. The most frequent questions were about interaction events in the last year. Requested information was about incidental captures in relation to the seasons, fishing gears and its characteristics, target species, seabirds species attending the vessels, ages and abundances. All this information was recorded. Moreover, information from each fisherman (personal data) and the ship to which he belongs like boat data (length, engine power, etc), days per month of fishing activity and other relevant characteristics were recorded. A pre-established model (see Appendix 1) was followed at the surveys. With all this information the appropriate analysis were made and the sites for the next step of the project were selected.

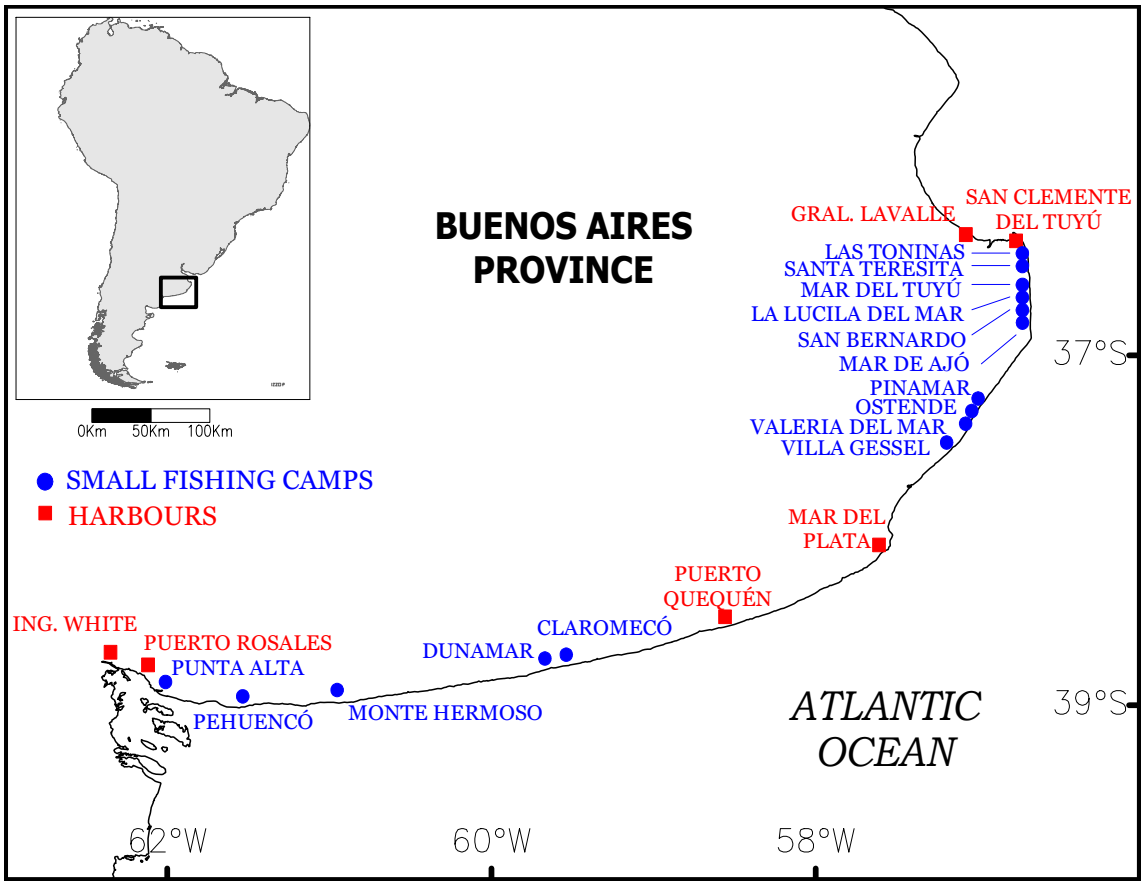


Figure 1: Ports and small fishing camps recorded with skills to the fishermen.

3.2. ONBOARD OBSERVERS PROGRAMME

With the skills data we determined three localities to carry out our on-board observations: Mar del Plata (MP), Puerto Quequén (PQ) and Claromecó (CL). We worked with different fleets at each locality: small vessels in MP, coastal vessels in PQ and boats in CL. Although MP fishery works with small and coastal vessels, we chose the second one because the coastal vessel was the selected float for our study in PQ making them comparative. Onboard observations have been carried out in eight surveys from Buenos Aires city to MDP, PQ and CL (Table 1) every 45 days.

	Puerto Quequén	Mar del Plata	Claromecó
19th –27th July	8	-	Interviews
7th –14th September	3	2	-
1st –9th November	7	4	2
2nd –10th January	2	4	-
7th –15th February	3	4	-
6th –14th March	6	-	Interviews
22nd April - 2nd May	6	-	Interviews
5th –13th June	-	-	Interviews

Table 1: Dates of each survey, the ports surveyed and the number of observation days are presented.

The meeting point for each survey was the Museo Argentino de Ciencias Naturales. We left early in the morning because we had between nine to ten hours of traveling head us. The final destinations of each member of the team could vary because we covered different stations along the Buenos Aires coast; a part of the team went to Mar del Plata and others to Puerto Quequén where the center of research Estación Hidrobiológica de Puerto Quequén is. During the first day we visited the port of the locality to which we were assigned.

There we made contact with the fishermen and talked to them about the incidental capture of seabirds. The fishermen were always well disposed to answer, and were very kind to us. In these chats we had the possibility to ask them if we could go on board with them. This was not easy to do because the vessels had little space available onboard, but due to the very good relationship of the leader with some fishermen from when he did his graduate work, we could get onboard of between 2 and 3 ships for each survey.

Once on board, we watched the birds that were close to the vessel with the help of binoculars. We identified the species and the number of individuals of each species during the haul. In this moment more than five hundred birds of approximately ten different species of albatrosses, petrels, penguins, shearwaters and gulls may gather around the vessel.

Once we made the counting we took notes of the observations in a filling form. We also took note of some variables like time, temperature, speed of the vessel, time of the haul and position. We stayed in the vessel for 60 hours.

Fishermen made us questions related to seabirds, gave us accurate information about the incidental captures and brought us some captured seabirds for identification. After almost a year of monthly visits to the ports, we consolidated very good relationships with the local fishermen and organizations involved in conservation.

3.3. METHODOLOGY

Observers filled worksheets with specific information about each vessel. Recorded data were initial and final position of each haul, depth, hour, haul duration, distance from coast, climatic data (water temperature and wind speed) boat trip and average speed. These data were recorded in worksheets (Appendix 2). Specific worksheets for seabirds observations were filled recording the following data: species, number and age class (immature or adult) identified by plumage molt and other characteristics (Olmos 1997), sex and measures, activity (flying, eating, resting), distance to the ship (Appendix 3). All this type of information was associated with the possibilities that the observer had at each opportunity due to the sea dynamics and fishermen's work.

3.4. FLOCKS COUNTING

The methodology followed by the observers for size estimation of mixed flocks of seabirds eating during the boat fishing activity periods was the counting methodology of bird's flocks (modified from Howes 1987). This method is based on the total counting of the individuals divided in mental blocks of variable size (10, 20, 50, 100, etc) depending of the number of seabirds present during the sampling. The position of the observer was bellow the sun making easier the counting and identification. Repetitions were made as long as possible. The countings were expressed in terms of the species that form the flock (that could be mixed), the total number of birds and an estimation of the number of several species if the flock is mixed or a proportion of each species. We established four strata for calculating the distance of the flocks to the fishing vessels (Figure 2).

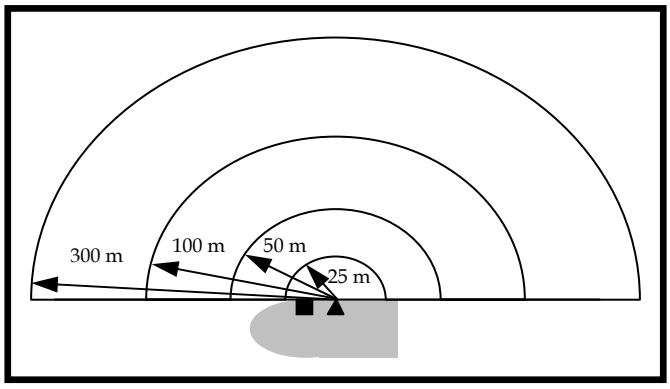


Figure 2: Stratification method utilized for the mixed flocks counted. Grey form: vessel. Triangle: net ascent. Square: observer's position.

Mixed flock of seabirds species that were counting during a period of time after the haul

Each observer spent between 48-60 hours onboard and had the suitable gear (seabirds field guide, pencil, rubber, GPS, tape recorder, photo camera, raincoat, binoculars and thermometer) to do the observations an record all these data. We used worksheets specially achieved (Appendices 2 & 3) to record the haul and flocks characteristics.

3.5. TRANSECTS

Seabirds counting by transects took place while the ship was in movement, using a scan method: all birds ahead the ship within 90° or 180° were counted. Information derived from the count produces an index of abundance of birds seen during each 10 minutes observation period. Results were converted, according to the ship's speed, to birds recorded per kilometer traveled (Tasker *et al.* 1984).

3.6. PROBLEMS AND COURSE CHANGE

During the project we had some problems with the onboard programme: the synchronization between the team at each trip, the climatic conditions of the region and the commercial nature of the fisheries. For example: the duration of the trip of the coastal vessels of PQ were 60 hours then few captains were disposed to support one observer during this time. Moreover several fishermen do not have means of communication (telephone, radio, etc.) then it was difficult to arrange an encounter to share some fishing trips. The boats of CL leave from the beach and due to weather conditions they go fishing only around 10 days a month, therefore it is hardly possible to join them to observe their activities. These problems gave as consequently a low quantity of days onboard in spite of a lot of days spent in the ports.

To obtain abundance of seabirds data, transects method was not used due to the fact that all seabirds recorded were "ship followers"; and the use of this method would have created an overestimated value of abundance for the local seabirds populations.

In the case of the fishing camp of CL the data record was different. We made only two onboard trips. The results of the observations showed very few sights and null feeding interactions between seabirds and boats. In this case we tried to keep periodic talk with the fishermen related to the date of the apparition of penguins. Fishermen accepted to collect the penguins killed by gillnets and conserve them on a refrigeration chamber where the owner is one of the fishermen that we know at CL.

4. RESULTS

4.1. SKILLS

With regards to the interaction between seabirds and fisheries, three sites of potential capture were identified: **Mar del Plata (MP)** and **Puerto Quequén (PQ)** ports, and the small fishing camp from **Claromecó (CL)**.

In **MP** area the results indicate the occurrence of interaction with small vessels (using bottom gillnets, bottom and surface trawl nets and lampara (FAO, 1972)) and the coastal vessels (which use only bottom trawl nets) (Table 2). All the skills agree that the Magellanic Penguin (*Spheniscus magellanicus*) was captured by the first type of vessel and the fishermen could not estimate a number of individuals. The Great Shearwater (*Puffinus gravis*) and the Sooty Shearwater (*P. griseus*) were captured by both fleets (50% and 100% of the skills).

In **PQ** area the main interactions were with species like shearwaters (*P. gravis* and *P. griseus*, 100%) and in a lesser extent with Black-browed Albatross (*Thalassarche melanophris,* 53,8%), Magellanic Penguin (*S. magellanicus*, 15,4%) and Giant Petrel (*Macronectes sp*., 7,7%) (Table 2).

	MAR DEL PLATA		**PUERTO QUEQUÉN**				**CLAROMECÓ**
SPECIES	**Shearwaters** *(Puffinus gravis* and *P. griseus)*	**Magellanic Penguin** *(Spheniscus magellanicus)*	**Shearwaters** *(Puffinus gravis* and *P. griseus)*	**Block-browed Albatross** *(Thalassarche melanoprhis)*	**Giant Petrel** (*Macronectes sp.*)	**Magellanic Penguin** *(S. magellanicus)*	**Magellanic Penguin** *(S. magellanicus)*
FLEET	Coastal vessels Small vessels	Small vessels	Coastal vessels				Boats
FISHING GEAR	Bottom trawl net	Gillnet, surface trawl net and lampara	Bottom trawl net			Surface trawl	Bottom gillnet
SEASONS	Spring and Summer	-	Spring and Summer	During the whole year		Auttumn	Auttumn
SUCESOS	Days before storms	-	Days before storms	Impacts with wires and hulls	-	-	-
% OF SKILLS	50 and 100 %	100%	100 %	53,8 %	7,7 %	15,4 %	70 %
SPECIMENS	720 x vessels/year	-	2-50	1-3 per vessel/year	-	-	28-350 x boat/year

Table 2: Results obtained from 71 skills made to fishermen in Mar del Plata, Puerto Quequén and Claromecó. The fleets with cases of incidental capture of seabirds have seat in these localities

The fishing gears involved were bottom and surface trawl nets used by the coastal vessels. Skills results indicated that: when *P. gravis* was captured, the number of birds was highly variable (2-50 individuals/haul) and associated with the incoming of storms; and between 1 and 3 individuals of *Thalassarche melanophris* collide with each vessel per year. Also for Giant Petrel and Magellanic Penguin the fishermen could not estimate a number of birds captured by year because these species were trapped in the nets very sporadically.

In **CL** area the interaction occurred specially with bottom gillnets. The Magellanic Penguin (70 %) was the only species captured (Table 2). The fishermen there use small boats because this village does not have a port.

The Appendix 4 shows all the results of this first stage of the project, including the number of vessels and fishing gears utilized in every locality.

4.2. SPECIES RECORDED IN PUERTO QUEQUÉN

Seabirds species composition and the relative abundance of seabirds associated to fishing operations were recorded for 33 fishing days. The checklist of birds for this area indicates a total of 44 species recorded in the region. From this checklist (based on Mazar Barnett and Pearman, 2001) we recorded 18 species (41 % from total): 11 species of the Procellariiformes order, 6 Charadriiformes and 1 species of Sphenisciformes.

Two of the 18 species recorded breed exclusively at Tristan da Cunha Archipelago. A total of 12 species (11 Procellariiformes and 1 Sphenisciformes), 70.59% of the total observed, breed only at Patagonia and/or Antarctic Islands. Only one species (*Stercorarius antarticus*) reproduces at both sites. Another 2 species (11.76%) breed in the Northeast Atlantic Area and one (5.88%) reproduces at New Zealand (Table 3 and Figure 3).

Although *T. melanophris* breeds at Falklands/Malvinas Islands and South Georgia Islands, radio-tracking studies showed that the population from S. Georgia migrates exclusively to South African Coasts and then the individuals observed in our study area came from Falkland Islands /Malvinas (BirdLife 2004b).

The Great Shearwater (*Puffinus gravis)* makes trans-equatorial migrations beginning in April and returning to the colonies in September (Harrison, 1983). This species was the most frequent recorded in spring (Figure 4). This is evidence that this species use the study area during the breeding season. The records from winter possibly are juveniles that stay in the study area while adults come back to northern hemisphere at the end of the breeding season (from Neves 2000).

Species	TCG	PAI	ANT	NZ	NH
Thalassarche chlororhynchos	X				
Puffinus gravis	X				
Stercorarius antarticus	X	X	X		
Macronectes giganteus		X	X		
Oceanites oceanicus		X	X		
Procellaria aequinoctialis			X		
Fulmarus glacialoides		X			
Larus maculipennis		X			
Larus cirrocephalus		X			
Puffinus griseus		X	X		
Spheniscus magellanicus		X	X		
Sterna hirundinacea		X	X		
Thalassarche melanophris		X	X		
Larus dominicanus		X	X		
Daption capense			X		
Diomedea epomophora				X	
Puffinus puffinus					X
Stercorarius parasiticus					X
Total	**3**	**11**	**10**	**1**	**2**

Table 3: Abbreviations: TCG, Tristan da Cunha and Gough Islands, PAI, Patagonia and Antartic Islands, ANT, Antarctica, NZ, New Zealand, NH, Northern Hemisphere.

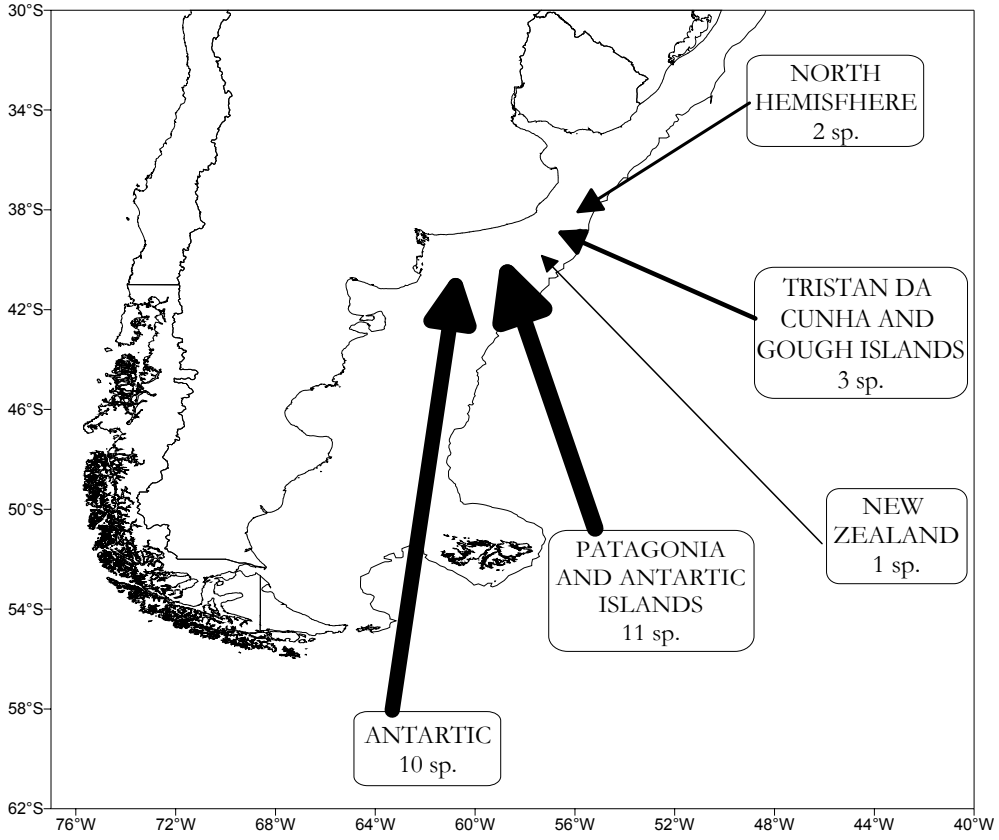


Figure 3: Map of breeding sites distribution of the species recorded

4.3. SEASONAL VARIATION OF SPECIES IN PUERTO QUEQUÉN

Of the 17 species identified onboard during the study between 8 and 11 were recorded depending on the period. The daily maximum media of seabirds in the flocks fluctuated between 102 ± 60,1 and 503,3 ± 343 individuals/haul. The daily maximum media of the most abundant species fluctuated considerably among periods: Black-browed Albatross *Thalassarche melanophris* (4,67 – 103,17 ind./haul), White-chinned Petrel *Procellaria aequinoctialis* (5,67 – 49,21 ind./haul), Great Shearwater *Puffinus gravis* (1,67 – 113,57 ind./haul) and Kelp Gull *Larus dominicanus* (0 - 540,33 ind./haul). *T. melanophris* was the dominant species in July, September and January (proportions: 0,56; 0,62; and 0,46) while *L. dominicanus* was the dominant species in February, March and April (proportions: 0,89, 0,95 and 0,37) (Table 4 and Figure 4).

SPECIES	JUL	SEP	NOV	JAN	FEB	MAR	APR
Royal Albatross (*Diomedea epomophora*)	1,3	–	–	–	–	–	–
Black-browed Albatross (*Thalassarche melanophris* *EN)	103,2	64,0	102,7	64,0	4,7	16,8	16,8
Yellow-nosed Albatross (*Thalassarche chlororhynchos* * EN)	–	–	0,1	2,0	14,0	1,3	1,2
White-chinned Petrel (*Procellaria aequinoctialis* * VU)	49,2	34,0	47,7	38,7	23,3	5,7	17,8
Common Giant-Petrel (*Macronectes giganteus* * VU)	0,2	0,3	2,0	0,7	0,7	–	–
Great Shearwater (*Puffinus gravis*)	–	1,7	113,6	2,7	11,0	2,0	33,7
Sooty Shearwater (*Puffinus griseus*)	19,8	0,7	2,9	–	–	1,7	2,5
Manx Shearwater (*Puffinus puffinus*)	–	–	0,3	0,3	0,3	0,2	0,3
Wilson's Storn-Petrel (*Oceanites oceanicus*)	1,7	1,3	0,3	–	–	–	–
Pintado Petrel (*Daption capense*)	0,2	0,3	–	–	–	–	–
Magellanic Penguin (*Spheniscus magellanicus* * NT)	5,5	0,3	–	0,7	–	0,3	1,0
South American Tern (*Sterna hirundinacea*)	0,8	0,3	0,1	–	–	0,7	–
Kelp Gull (*Larus dominicanus*)	1,7	–	6,4	24,0	457,7	540,3	38,0
Grey-hooded Gull (*Chroicocephalus cirrocephalus*)	–	–	–	0,3	–	–	–
Brown-hooded Gull (*Chroicocephalus maculipennis*)	–	–	4,3	2,0	–	–	10,8
Arctic Skua (*Stercorarius parasiticus*)	–	–	–	1,3	0,3	–	–
Brown Skua (*Stercorarius antarticus*)	–	–	–	–	–	–	0,7
Total number of species	10	9	11	11	8	9	10

Table 4: Species recorded onboard based on the preliminary list of seabirds in the region and its global threaten category (BirdLife 2004a). Global threaten categories (*): NT Near Threatened, VU, Vulnerable, EN, Endangered, CR, Critically Endangered.

Others species appeared several times in small numbers, peaking in a particular period (Yellow-nosed Albatross *Thalassarche chlororhynchos*, 14 ± 14,42 ind./haul in February and Sooty Shearwater *Puffinus griseus* 19,79 ± 22,29 ind/haul in July) (Figure 5). Only *T. melanophris* and *P. aequinoctialis* were recorded in more than 90 % of the days. *Puffinus gravis* abundance peaked in November and April (Table 4).

The records of *Diomedea epomophora* were restricted to one survey only (July 2003) and due to bad climatic conditions in the winter 2004 we could not repeat onboard surveys to compare data of this species. But due to the non breeding dispersal range it was expected the record during winter 2003 (Table 4)

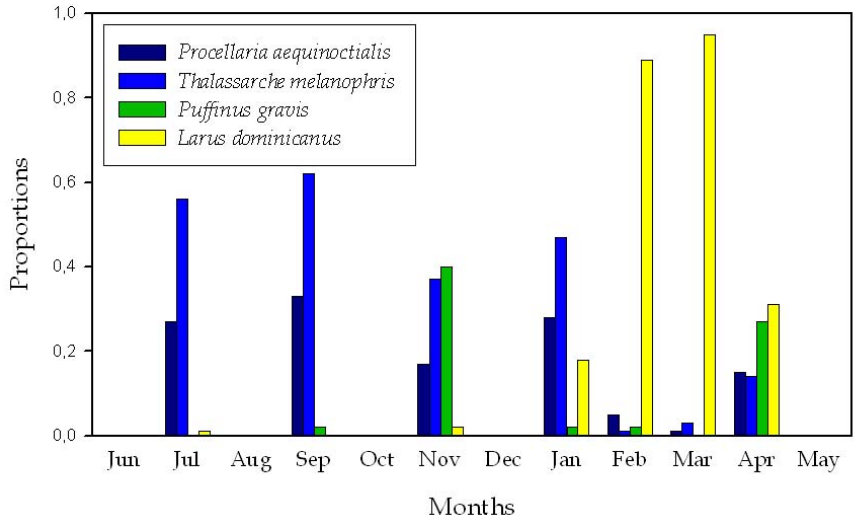


Figure 4: Abundance proportions of the four main species recorded at Puerto Quequén.

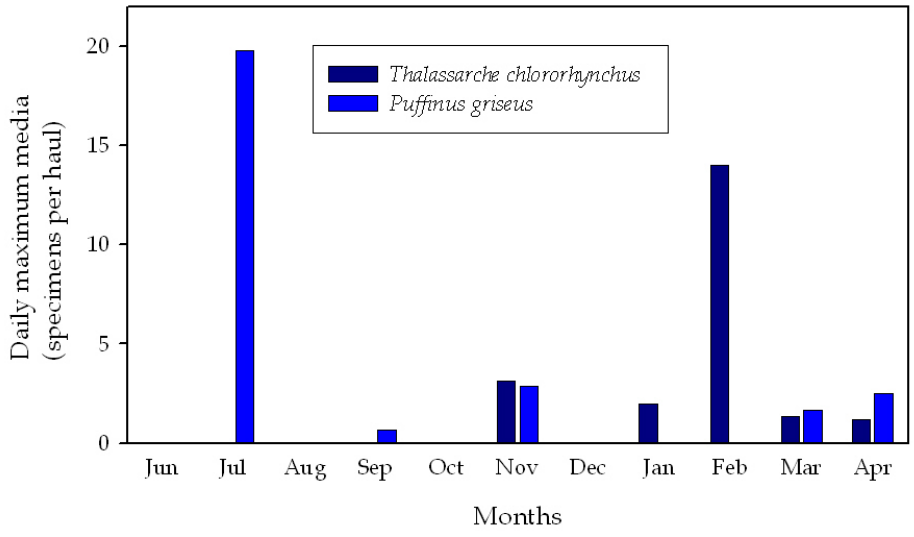


Figure 5: Daily maximum media of *Thalassarche chlororhynchos* and *Puffinus griseus*.

4.4. SPECIES RECORDED IN MAR DEL PLATA AND CLAROMECÓ

During the on-board surveys made at Mar del Plata Port we recorded three species of gulls: Kelp Gull (*Larus dominicanus*) Grey-hooded Gull (*Chroicocephalus cirrocephalus*) and Brown-hooded Gull (*Chroicocephalus maculipennis*). We also recorded Neotropical Cormorants (*Phalacrocorax brasilianus*) attending the trawlers. Great Shearwater (*Puffinus gravis*), Sooty Shearwater (*Puffinus griseus*), Magellanic Penguin (*Spheniscus magellanicus*), Arctic Skua (*Stercorarius parasiticus*) were also observed. In this case the fishery target species was the shrimp, the fishing gear were bottom trawl net and lampara, and the vessels went up to 4 miles from the coast.

We had the opportunity to get on-board when the fishermen used a different fishing gear and went up to 6 miles from the coast, and in this case we saw the White-chinned Petrel (*Procellaria aequinoctialis*) and the Southern Giant-petrel (*Macronectes giganteus*). This difference on the species seen may be a consequence of shorter distance from the coast these vessels go fishing (Table 5).

Scientific name	**MAR DEL PLATA**		**CLAROMECÓ**
	< 4 miles	*4 – 6 miles*	*without interaction with*
Spheniscus magellanicus	X	-	-
Phalacrocorax brasilianus	X	-	-
*Procellaria aequinoctialis*VU*	-	X	X
*Macronectes giganteus*VU*	-	X	-
*Thalassarche melanophris*EN*	-	X	-
Puffinus gravis	X	-	-
Puffinus griseus	X	-	-
Stercorarius parasiticus	X	-	-
Oceanites oceanicus	-	-	X
Sterna hirundinacea	X	X	-
Larus dominicanus	X	X	X
Chroicocephalus maculipennis	X	-	X
Chroicocephalus cirrocephalus	X	X	-

Table 5: Species recorded onboard in Mar del Plata and Claromecó based on the preliminary list of seabirds in the region and its global threaten category (BirdLife 2004). Global threaten categories: NT Near Threatened, VU, Vulnerable, EN, Endangered, CR, Critically Endangered, OS: Occurrence State: X: recorded in this study, -: not recorded in this study.

We visited Claromecó during the spring (November 2003) since fishermen indicated it was the season with more incidental captures of Magellanic Penguins. We got on-board of some boats to survey their fishing activity, but we did not see any individual of this species. We identified Kelp Gull (*Larus dominicanus*) and Brown-hooded Gull (*Chroicocephalus maculipennis*), Neotropical Cormorant (*Phalacrocorax brasilianus*), White-Chinned Petrel (*Procellaria aequinoctialis*) and the Wilson's Storm-Petrel (*Oceanites oceanicus*) but none of them interacted with the fishing operations which occur mostly underwater. On later visits, fishermen told us that they have not been seeing penguins or having any interaction with other species (Table 5).

4.5. SPECIES NOT RECORDED

There were some species registered in the area according to bibliography that we have not record. In the next paragraphs we discuss several reasons this could have happened.

Calonectris diomedea (a warm water species and occasional in our study area, Cooke and Mills, 1972, Narosky and Di Giacomo 1993), *Procellaria cinerea* (it is not a shelf waters species in none season, just one individual was recorded in winter by Jehl, 1974), and *Thalassarche chrysostoma* (uncommon and a cold water species, more common south from Subtropical Convergence, Rumboll and Jehl, 1977).

Pterodroma species (*P.macroptera*, *P.lessonii*, *P.incerta*, *P.mollis* and *P. brevirostris*) seem to be more pelagic species (Rumboll and Jehl, 1977), *Halobaena caerulea* and *Pachyptila* species (*P. desolata* and *P. belcheri*) are also cold water species with exceptionally rare records in the study area (Rumboll and Jehl, 1977).

The Shy Albatross (*Thalassarche cauta salvini*) disperses in the non breeding season throughout Southern Oceans, with preferences for South America although this subspecies is rare and still was not recorded in our study area.

In relation to Sooty Albatrosses (*P. fusca* and *P. palpebrata*) although *palpebrata* is a cold water species whereas *fusca* preferes warmer waters, but both are pelagic species then they are out of range for the study area.

The Wandering Albatross (*Diomedea exulans*) is an outside platform species and Tristan and Northern Royal Albatrosses (*D. sanfordi* and *D. dabbenena*) are species still not founded in our country but they have some records in South Brazil so in future surveys we will continue looking forward these species.

The Spectacled Petrel (*P. conspicillata*) is a newly discovered species in Argentinean waters with only a few records, but all records were inside the study area, so we need more onboard effort for make a record of this species. The northern Giant Petrel (*Macronectes halli*) is a partial austral migrant in Argentina but we did not record the species during the study. The Cape Verde Shearwater (*Calonectris edwardsii)* is a very rare species, its non breeding distribution in the South Atlantic Ocean is poorly known (BirdLife International 2004) and also we did not record it in our study.

The Rockhopper Penguin *(Eudyptes chrysocome)* is another partial austral migratory species in Argentina generally recorded in winter but rare and not recorded in our study (Narosky and Di Giacomo 1993), the Black-bellied Storm Petrel (*Fregetta tropica)* and White-bellied Storm Petrel (*Fregetta grallaria)* are occasional

in Buenos Aires province, these species are summer visitors and its pelagic dispersal is poorly understood in southern Atlantic ranges West to Brazil and Argentina.

A precise wintering area is unknown for the Pomarine Skua *(Stercorarius pomarinus)* and the Long-tailed Skua (*Stercorarius longicaudus)*. Available evidence suggests wide pelagic dispersal in both Pacific and Atlantic Oceans to about 50ºS with main wintering areas probably off Atlantic coast of South America (*longicaudus*). In the case of *S. pomarinus* non breeders may remain in winter quarters throughout year. These species had few observations in the Buenos Aires province region (Narosky and Di Giacomo 1993) and they were not recorded in our study.

4.6. INTERACTION 1: INCIDENTAL CAPTURE

Incidental capture rates of *Puffinus gravis* (Figure 6) and *Spheniscus magellanicus* in Puerto Quequén were 0,04 and 0,01 individuals/haul respectively. Considering 14.000 hauls per year, an estimated of 560 Great Shearwaters and 140 Magellanic Penguins may be trapped annually by this fishery.

Figure 6: Great Shearwater (*Puffinus gravis*) incidentally captured when the fishermen extracted the capture from the last part of the net. The front part of the net (of green color) stays in the water and the shearwaters are caught when they dive.

MONTH	HAULS OBSERVED	SEABIRDS CAPTURED	MOMENT OF THE HAUL
July '03	18	1 (*Spheniscus magellanicus*)	Trawl
September '03	7	—	—
November '03	21	4 (*Puffinus gravis*)	Raising the net
January '04	8	—	—
February '04	8	—	—
March '04	19	—	—
April '04	16	—	—

Table 6: Details of the onboard observers programme organized in Puerto Quequén, Buenos Aires Province.

The fact that incidental capture was only registered in *P. gravis* and *S. magellanicus* suggest that the fishing gears used by coastal fisheries in the Buenos Aires province are a source of mortality mostly for diving species, since they get caught by the net underwater and drown latter. *P. gravis* is a shearwater that submerges up to 10 meters to capture its preys and can also fly while the Magellanic Penguin goes deeper underwater and is incapable of flying. These characteristics make them vulnerable to incidental capture on different moments of the haul, being the Great Shearwater more likely to be captured during the net rising (Table 6), whereas *S. magellanicus* gets generally trapped when the net is undersea. Besides, *P. gravis* is capable of following the ship, since it can fly, what makes this species a more frequent target of incidental capture for coastal bottom trawlers.

Both of these species migrate during the year, what can cause a local seasonality in the occurrence of incidental capture. Besides, the Magellanic Penguin is a prey specialist, since its diet is mostly composed of anchovy and hake (Gandini *et al*., 1999), characteristic that can make fluctuate the presence of this species in the area even more, making the incidental capture events highly unpredictable.

Incidental capture of *S. magellanicus* and *P. gravis* was registered in coastal fisheries of the Patagonia (Gandini *et al*., 1999, Gonzalez Zeballos and Yorio 2003). Therefore, although the extent of the mortality caused by a single fleet could be considered low, the whole situation can be much larger when we take into account the whole region fishing activities.

No albatross was captured during our study but this group was identified as captured before by fishermen during the skills. Albatrosses are killed by longline fisheries mainly when they hit the lines or bite the hooks. Although it is likely for them to collide with the net cables of trawlers, if it happens fishermen are unable to see it, since it occurs at the stern, and they work at the opposite side of the ship. The collision with cables would cause the fracture of the albatross wings, which would lately fall to the water and die. On the other hand, it is improbable that they get trapped on the net since they do not generally chase preys by diving.

Even though we did not register albatross mortalities events related to coastal fishing operations during our on-board surveys its occurrence was confirmed by the skills results, therefore we do not discard the potentiality of the coastal fishery of the Buenos Aires province to act as a mortality source for albatrosses.

4.7. INTERACTION 2: TROPHIC INTERACTION

We saw an instantaneous picture of the discard produced by a bottom trawl fishing vessel after each haul. Though we could observe more of four seabirds species around, these ones did not feed on some fish species (e.g. *Prioniotus nudigula*, Family Triglidae) Occasional observations demonstrated that these species of seabirds eat several fishes discarded (*Cheilodactylus bergi*, *Raneya fluminensis*

and *Trachurus lathami*) whereas others are despised. In future works we will extend our observations and methodologies to have more data about this kind of trophic interaction.

4.8. SEASONAL VARIATION OF *BLACK-BROWED ALBATROSS* AGE CLASSES

In different surveys we could estimate total numbers of two different age classes (adults and immatures) of the Black-browed Albatross and make a first descriptive analysis of its seasonal variation.

We could observe an estimated low proportion of immatures (15-30%) during July, January, March and April with a shift in November (80%) (Figure 7). During September and February we did not have data of this relation due to the work conditions that sometimes do not permit as to take data in a systematic way, and in the other months we did not make onboard trips.

The high levels of juvenile mortality recorded in Brazilian waters where adult breeding birds do not occur, suggests that dispersing juveniles generally travel greater distances than adult breeding males and females (Olmos et al. 2000). In others studies realized in Patagonia, during the austral summer-auttumn (january-may), the proportion of immatures varied between 20 and 29% of total (Gonzalez Zevallos, *et al*., 2003).

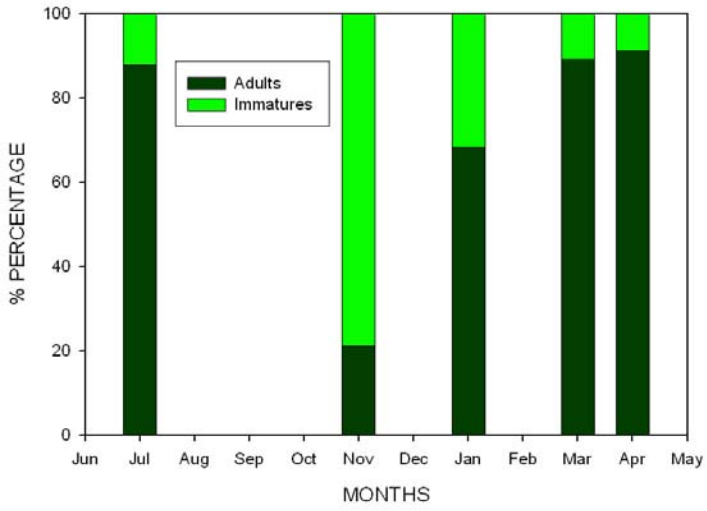


Figure 7: Percentage of adults and immatures classes of *Thalassarche melanophris*.

5. EDUCATE FOR CONSERVATION

In order to accomplish with the educational objectives, we organized this part of the project in two different ways: formal and informal education.

For the first one we invited the Environmental Educators Group (GEA) to work with us. This group, conformed by professionals from areas of biology, education and anthropology, has been working for several years on environmental education and nature interpretation in natural protected areas jointly with institutions such as Fundación Vida Silvestre Argentina (WWF partner) and Aves Argentinas (BirdLife International partner). Their aims are to teach and translate, in a friendly and significant way, the functioning and problems of natural ecosystems through environmental interpretation techniques and to provide tools and bases to understand the nature and to generate values and interests to promote social participation in conservation issues.

5.1. EDUCATION GOALS

- To support one of UNESCO and PNUMA principal lines, working with public educational institutions as a mean to reach every social sector (UNESCO-PNUMA, 1996: page 15).
- To provide local leaders, through educational activities, information and tools that allow them to improve their life quality and to participate actively on the conservation of the seabirds populations of the area.
- To generate local and regional consciousness about the requirements for the conservation of albatrosses, petrels and other seabirds present at the argentine coast.
- To facilitate the accomplishment of specific objectives about the strategies to follow for the conservation of albatrosses and petrels determined by BirdLife International and to follow the guidelines that emerged as a result of the I Taller Sudamericano de Conservación de Albatros y Petreles (Aves Uruguay and SEO/BirdLife International, 2001), one of which is to develop research and conservation projects in Argentina.

5.2. TARGETS OF THE EDUCATIONAL WORK

Environmental education activities were addressed to Necochea and neighboring zones community members, more specifically to fishermen, educators and community leaders. Three different kinds of audience will be distinguished in order to make the educational activities:

- Community leaders: to bring up local leaders that will be able to continue with the educational activities about the environmental in a long term.
- Teachers and indirectly girls and boys, who attend schools of the project area: to work on subjects about environmental care, putting specials emphasis in topic related with this project.
- Fishermen: to develop and work with topics referred to the suitable use of fishing arts that are used in order to decrease the impact on sea birds populations.

5.3. WORKSHOP FOR TEACHERS AND COMMUNITY LEADERS

5.3.1. PREVIOUS DIAGNOSIS AND PURPOSE SUSTAINTABILITY

On February 13th 2004, we made a trip to Necochea to explore and present the educational team to different actors of the community. Our objective was to make a diagnostic evaluation to detect their appreciation about the sea community of the area and to begin designing the educative plan for activities with teachers and community leaders. To accomplish this, we organized several meetings and interviews with the above mentioned actors, where we analyzed the possibility of developing activities together.

Some people we met were:

- Cristina Morales, Headmaster of the CIE (Centro de Investigaciones Educativas).
- Ricardo Luzarreta, Director of the Unidad de Enseñanza Universitaria Quequén, Universidad Nacional del Centro de la Provincia de Buenos Aires.
- Eduardo Catalisano, teacher of Puerto Quequén.
- Luis Nogueira, Technician of the CONICET (Consejo de Investigaciones Científicas y Técnicas), who works at the Museo de Fauna Regional of Puerto Quequén (which belongs to the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia").

As a result of the interviews, we distinguished the major themes to include in the educative program. Some of them are:

1) Educators and community leaders were interested on the occurrence of the course.
2) Most of the teachers did not use the coast as a teaching tool.
3) Historically, Necochea and Puerto Quequén communities (with 2 km of distance between each other) did not have a good relationship.

Moreover, the visit to the area and some education and information centers allowed us to get a first impression of this place which helped us to planificate our educative program. We could also know about the frequency of visits to the sea and their appreciation about this ecosystem.

5.3.2. SPECIFIC OBJECTIVES

- To provide participants with new educational tools for they teaching-learning work. Teachers and local leaders should have achieved knowledge about the local environment that allows them to promote actions tending to increase environment valuation.

- To enrich the diffusion of environmental issues by the participants trough the provision of non formal educational techniques and increase their awareness function and their role as a link between the environment and local communities.

5.3.3. EDUCATIVE METHODOLOGY

We used environmental interpretation as the methodological axis for these activities. Interpretation is a way of communication, which emphasizes the transference of ideas and the relationships between them. The information used clarifies concepts and relevant processes for the generation of a significant knowledge.

This is a methodology developed to work in natural areas with groups with a good disposition for learning, no time limitations and that do not expect to be evaluated (in the traditional sense of this word). It is thanks to these characteristics that it functions as a method that contributes with formal education. The activities carried out use resources provided by recreation, art and theatre, among others, to develop direct experience actions and to put in practice all the senses. We used the model of thematic interpretation (Ham 1992) for the planning of the activities and the proposals of Cornell (1979) as a basis for the structure, with four groups of activities tending to focalize the attention, generate enthusiasm, direct experience and share the inspiration.

5.3.4. DIDACTIC MATERIAL

We made specific material which summarizes the principal components and methodologies treated during the workshop, in order to facilitate comprehension during it and to provide material for future consulting. Each participant was provided with this material for further searches. It included the following themes:

1) Environmental education bases

2) Environmental interpretation bases and examples

3) Interpretative planning

4) Interpretative evaluation

5) Coastal ecosystems and seabirds characteristics (biology, status and conservation)

Each participant also received a guide (*Guía del escritorio al campo No. 3: Lo que deja el mar. Costa Atlántica de Buenos Aires y Uruguay. Revista Vida Silvestre No. 81. 2002)* which constitutes didactic material for groups work, as well as a certificate of their participation

5.3.5. PROGRAMME OF ACTIVITIES

The training program was diagrammed and developed by members of GEA and our team. Planning of the workshop was based on the following pre-established characteristics. The workshop was developing on April 23rd and 24th 2004 at three different places:

Day 1 (04/23/04): Classes were dictated at the *Centro de Investigaciones Educativas* (CIE) at Necochea during 3 and half hours.

Day 2 (04/24/04): During the morning classes were dictated at the Universidad Nacional del Centro de la Pcia. de Buenos Aires *Unidad de Enseñanza Universitaria Quequén* at Puerto Quequén and a field trip to the beach was done during the afternoon. These activities lasted a total of 9 hours.

The workshop was addressed to two different kinds of public: institutional representatives (municipality members, tourism personal, etc) and teachers. This allowed us to make them exchange their experiences and knowledge and to enrich our work, with the opportunity to reevaluate each others work and increase the possibility of occurrence of coordinated actions. It counted with 39 participants among which were teachers from Necochea and Puerto Quequén schools, teaching students, tourism agents and employees of the municipality of Necochea.

The workshop consisted in a series of interpretative and demonstrative activities, recreation and participation at different environments (the classroom and the beach). Different sources of interpretation were used in order to practice the options that this mode of communication provides. Different combined techniques were used:

- To ask
- To answer
- To construct
- Direct experience
- Use of senses
- By game

5.3.6. WORKSHOP THEMATIC PLANNING

Presentation and introduction of the workshop:

Shows how useful can the environmental interpretation and education by daily elements is.

Topic: valuation and use the beach as the classroom near from the institutions

Subject: the beach as a good place for developing the curricular contents by the environmental education and interpretation.

Facts and Ideas which support the subject:

a. What and how useful is the environmental education and the environmental interpretation?

I. Definition of the environmental education (EE).

II. Objectives of the EE.

III. Insertion in the formal education.

IV. Definition of the environmental interpretation (EI).

V. EI principles: the Freeman Tilden principles.

b. Characterization of the EI.

I. Three characteristics of the EI.

II. Four qualities of the EI.

III. Three useful strategies: to question, to ask and to structured.

IV. The ductility.

c. Educates sources in EE and EI used in the area. Activity in the scholar reserve.

I. Differentiation and definition of the sources.

II. The use of senses like a source.

III. The game like a source.

IV. Sources of coast environmental.

d. Planning and Evaluation of the EI

I. Topic and subject.

II. Ideas, facts and rule 7±2.

III. Activities of presentation and diagnostic evaluation.

IV. Final activities and adding evaluation.

V. Types and characteristics of the EE and EI evaluation.

e. The roll of the multiplying agents in conservation and the valuation of the coastal ecosystems.

I. Valuation of the coastal environmental.

II. The roll of the different multiplying agents from the local formal education.

5.4. EVALUATION

The evaluation was made on a sequential way at the end of each section. The final activity worked as an integration of all themes treated and allowed us to evaluate the reach of the workshop. Moreover, a distance consultancy was offered to people interested on intensifying this proposal.

5.5. RESULTS

- Attendants discovered tools for the work at open spaces.
- The workshop was a space for the discussion and exchange of ideas about the problems, alternatives to develop and the role of each one on the local environmental situation.
- Valuation of local resources, since a lot of people was interested on this kind of problem.

- The relationship between the participant actors was strengthened and a reflection about their main role and the possibilities of action with the available resources was done.
- An open link between the project leaders and the different participants of the workshop and the institutions to which they belong to was established.

5.6. BALANCE AND PROJECTION

We consider that the workshop achievements in the long term were:

1- To strength the work of the community referents.

2- To reinforce the bonds between them, setting the possibilities and likelihood of a coordinated work.

3- To favor groups visits to natural coastal areas, since the beach is a "classroom" close to the institutions which the belong to and a proper place to develop the curricular contents through de environmental education and interpretation.

5.7. INFORMAL ACTIVITIES

On every trip we made, we talked to fishermen and local community. In these opportunities we explained them the characteristics of seabirds tagging and informed them about the incidental capture of albatross by the longline fisheries, among other themes. This way, information about seabird's situation, particularly on what is related to fishing operations, was provided to fishermen and the local community in a non-formal way.

As part of this project we plan to give a copy of this final report to the fishermen associations and societies of Puerto Quequén, Mar del Plata and Claromecó.

One of our goals for the future is to formalize this activity trough the organization of education programs oriented to fishermen with the objective of working on themes related to the possibility of reducing the impact on seabirds populations through the sustainable use of fishing gears.

6. DIFFUSION ACTIVITIES

6.1. PUBLIC DIFFUSION

Site	Media	Details of feature	Circulation
Monte Hermoso	Monte Vision S.A.	Interview with Leandro Tamini and Maria Laura Habegger	4.000
Necochea	Ecosdiarios	On front page. Interview with Leandro Tamini and Eugenio Coconier	3.000
Necochea	www.ecosdiarios.con/ediciones/14042004.htm	Paper Interview posted on internet web site during two months.	10.000 per month
Necochea	Cablevision S. A.	5 minute-Interview with Leandro Tamini in Saturday at the morning a local TV show (Sábado a la mañana)	10.000
Buenos Aires	Nuestras Aves 45	Article about the conformation of the project	1500
Buenos Aires _ MACN	www.macn.secyt.gov.ar/boletin/ago03.pdf	Article about the winning of the BP award	2500 hits per months
Buenos Aires _ MACN	www.macn.secyt.gov.ar/boletin/mar04.pdf	Article about workshop	2500 hits per months
Buenos Aires _ MACN	Carnotaurus Año IV – Número 8	For the MACN personnel	100
Buenos Aires _ MACN	Carnotaurus Año V – Número 48	For the MACN personnel	100

MACN: Museo Argentino de Ciencias Naturales "Bernardino Rivadavia"

6.2. SCIENTIFIC SPREADING

1° TALLER SOBRE LA INTERACCIÓN ENTRE AVES MARINAS Y PESQUERÍAS EN EL MAR ARGENTINO

In the city of Mar del Plata, between April 23 and 25, 2003 the **1° Taller sobre la interacción entre aves marinas y pesquerías en el Mar Argentino** (1st Workshop about interactions between seabirds and fisheries at the Argentine Sea) was presented. This event counted with the participation of about 30 representatives of Governmental Organisms, ONGs, specialists on seabirds and fisheries and other interested people, with the intention to obtain a diagnostic of the situation and to elaborate recommendations on high-priority actions to improve the state of conservation of the populations of seabirds that are distributed over the Argentine sea.

Throughout the first day oral presentations about the present of knowledge at national level, projects developing, international agree, politic, etc were given. During the second day, the participants worked in multidisciplinary tables of discussion where conservation and investigation were developed as priority subjects. Finally, during the third day we made a document with the recommendations and conclusions of the workshop. We had the opportunity to present this project to the main specialist of Argentina.

V JORNADAS NACIONALES DE CIENCIAS DEL MAR

Results of the inquiries made to fishermen were presented to the scientist community at the V Jornadas Nacionales de Ciencias del Mar; which took place last December at Mar del Plata, Argentina. This event is the most important Congress of Sea Sciences in Argentina, and counted with the presence of students from this country as well as from Uruguay, Chile and Brazil. In that occasion we were able to exchange opinions with other researchers who are also concerned about seabird's conservation issues.

III INTERNATIONAL ALBATROSS AND PETRELS CONFERENCE

We prepared two resumes and posters to present the last results about seabirds interaction with coastal fishing vessels at the Third International Albatross and Petrels Conference next August 2004 at Montevideo, Uruguay. In this opportunity we were able to talk with the most experienced researchers on bird's incidental capture around the world.

6.3. PRESENTATIONS AND PUBLICATIONS OF THE PROJECT

Tamini L. L., Barreira A. S., Sidders M., Habegger M. L, Perez J. E and E. G. Coconier. 2004. Incidental capture of seabirds in coastal fishing vessels at Buenos Aires Province, Argentina. Third International Albatross and Petrel Conference, IAPC. 23-27 August, 2004. Montevideo, Uruguay.

Coconier E. G., Tamini L. L., Barreira A. S., Sidders M. and J.E. Perez. 2004. Seabirds attending coastal bottom trawlers at Buenos Aires Province, Argentina. Third International Albatross and Petrel Conference, IAPC. 23-27 August, 2004. Montevideo, Uruguay.

Tamini, L. L.; Coconier, E. G. y J. E. Perez. Captura incidental de aves marinas por la flota costera, de rada o ría y artesanal en la Pcia. de Buenos Aires. Res. V Jornadas Nacionales de Ciencias del Mar. Mar del Plata 8-12 de diciembre. 2003.

Tamini, L. L. 2003. Estudio sobre la captura incidental de aves marinas en pesquerías costeras. I Taller sobre la interacción entre aves marinas y pesquerías en el Mar Argentino. Mar del Plata, Argentina. 23-25 de abril. 2003.

7. CONCLUSIONS

- The differences between skills data and observer's data could be explained by the lack of precision of the interviewing method and/or the insufficient effort of the observations.
- *Thalassarche melanophris* was the most abundant Procellariiforms species recorded. Have also been reported around the commercial vessels in nearby regions (Olmos, 1997, Yorio and Caille, 1999)
- The presence model of marine birds, abundance and seasonality observed also could be the result of the distance of coast of the fishing operations. More studies on these fisheries would prove this effect.
- Incidental capture of two species threatened (*Spheniscus magellanicus* and *Puffinus gravis*) even though their populations are numerous (Gandini *et al.*,1999, Marchant and Higgins, 1990), was registered like in other studies which detected incidental capture of seabirds in Puerto Quequén (*S. magellanicus* in pair surface trawl nets, Tamini, *et al*., 2002). Incidental capture of albatrosses is not dismissed.
- The bottom trawl net emerged like a strong risk for seabirds due to the great effort in the Buenos Aires Province's fleets.
- The south of Buenos Aires province emerges like an important feeding area for some seabirds populations due to the quantities of seabirds implicated and the large number of fishing vessels in the zone.

8. IDENTIFICATION OF CONSERVATION PROBLEMS

- The most important problem of seabird's conservation was the lack of information that the local people of many coastal localities of the south of Buenos Aires Province had.
- The rapid change between fishing gears by the coastal fisheries, i.e. form bottom trawl to pelagic trawl, increasing the risk of capture for population of Magellanic Penguin *Spheniscus magellanicus* (Tamini *et al*., 2002)
- Occurrence of incidental capture of two species threatened (*Spheniscus magellanicus* and *Puffinus gravis*).
- The relationship between the discard of fishes used by seabirds as a feeding resources and the likelihood of changes on seabird's communities should be studied.

9. RECONMMENDATIONS

- To implement an observer on board program with a higher experimental effort to identify other species involved on incidental capture.
- To give continuity to the educational work at the south of Buenos Aires Province and generate a local consciousness about the importance of these populations on marine communities and ecosystems
- To study the use of the fish discard as a food resource by seabird species involved on incidental capture, and its relationship with individual characteristics, such as sex, age, and health condition.

10. ACKNOWLEDGMENTS

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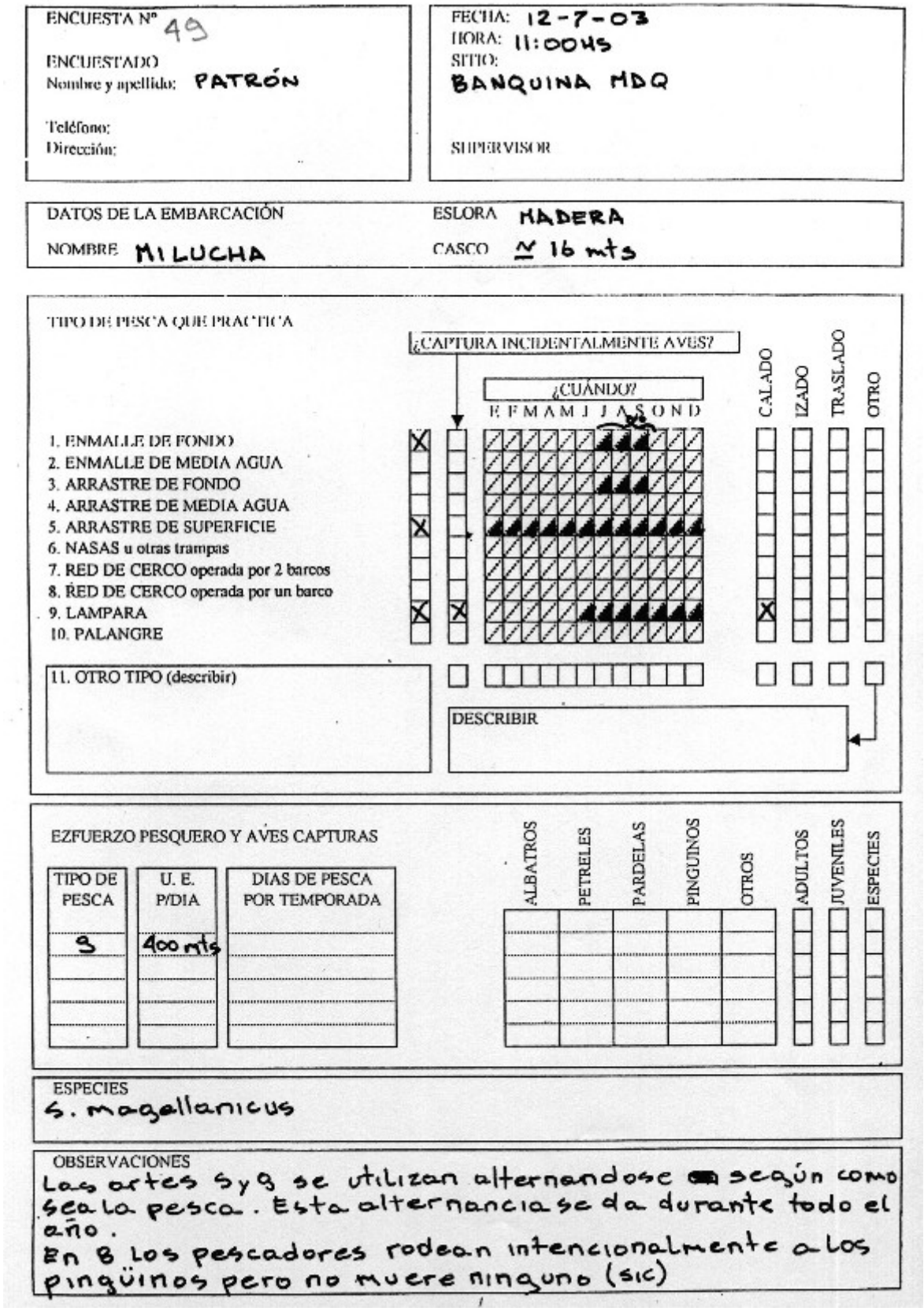
12. APPENDICES

12.1. APPENDIX 1: MODEL OF SKILL



ENCUESTA Nº 49

ENCUESTADO
Nombre y apellido: PATRÓN

Teléfono:
Dirección:

FECHA: 12-7-03
HORA: 11:00HS
SITIO:
BANQUINA MDQ

SUPERVISOR

DATOS DE LA EMBARCACIÓN
NOMBRE MILUCHA

ESLORA MADERA
CASCO ≃ 16 mts

TIPO DE PESCA QUE PRACTICA

¿CAPTURA INCIDENTALMENTE AVES?

¿CUÁNDO?
E F M A M J J A S O N D

CALADO
IZADO
TRASLADO
OTRO

1. ENMALLE DE FONDO
2. ENMALLE DE MEDIA AGUA
3. ARRASTRE DE FONDO
4. ARRASTRE DE MEDIA AGUA
5. ARRASTRE DE SUPERFICIE
6. NASAS u otras trampas
7. RED DE CERCO operada por 2 barcos
8. RED DE CERCO operada por un barco
9. LAMPARA
10. PALANGRE

11. OTRO TIPO (describir)

DESCRIBIR

EZFUERZO PESQUERO Y AVES CAPTURAS

TIPO DE PESCA	U. E. P/DIA	DIAS DE PESCA POR TEMPORADA
9	400 mts	

ALBATROS	PETRELES	PARDELAS	PINGÜINOS	OTROS	ADULTOS	JUVENILES	ESPECIES

ESPECIES
S. magellanicus

OBSERVACIONES
Las artes 5 y 9 se utilizan alternandose según como sea la pesca. Esta alternancia se da durante todo el año.
En 8 los pescadores rodean intencionalmente a los pingüinos pero no muere ninguno (sic)

12.2. APPENDIX 2: WORKSHEET FOR INFORMATION OF VESSELS AND HAULS

BP PROJECT *SEABIRDS '03*

Observadores	LLT			
Arte de pesca	Arrastre de fondo	U. E.		
Lancha	Volador	Tripulación	4	Motor
Lancha de apoyo	———	Tripulación	—	Motor

Lance N° 1	Comienzo	Final	Fecha 5/11/03
QF1103-01 Hora	5:30 Hs	9:30 Hs	Velocidad (nd.)= 2,5/3 nudos
Situación	38° 36' .542 S	38° 32' .776 S	Temperatura(°C)= —
	58° 33' .991 W	58° 22' .085 W	Vel. Viento=
Distancia a la costa	3 millas	3 millas	Dir. Viento=
Profundidad	29 m.	29 m	Rumbo 500

Lance N° 2	Comienzo	Final	Fecha 5/11/03
QF1103-02 Hora	10:15 Hs	13:55 Hs	Velocidad (nd.)= 3 n
Situación	38° 32'.776 S	38° 36.548 S	Temperatura(°C)=
	58° 22'.085 W	58° 33.719 W	Vel. Viento= —
Distancia a la costa	3 millas	3 mill	Dir. Viento= —
Profundidad	29 m	28 m	Rumbo 240°

Lance N° 3	Comienzo	Final	Fecha 5/11/03
QF1103-03 Hora	15.00 Hs	17:50 Hs	Velocidad (nd.)= 3 n
Situación	38° 39' 105 S	38° 36'654 S	Temperatura(°C)=
	58° 32' 633 W	58° 24'092 W	Vel. Viento=
Distancia a la costa	6 millas	6 millas	Dir. Viento=
Profundidad	43 m	43 m	Rumbo 66°

Lance N° 4	Comienzo	Final	Fecha 5/11/03
Hora	18:10	20:00	Velocidad (nd.)= 2,7 n
Situación	38° 36' 776 S	38° 38' .120 S	Temperatura(°C)=
	58° 24' 758 W	58° 30' .179 W	Vel. Viento=
Distancia a la costa	6 millas	6 millas	Dir. Viento=
Profundidad	43 m	41	Rumbo 290°

Lance N° 5	Comienzo	Final	Fecha 6/11
QF1103-04 Hora	5:00 Hs	7.30 Hs	Velocidad (nd.)= 3 n
Situación	38° 36' 300 S	38° 33' 900 S	Temperatura(°C)=
	58° 12' 800 W	58° 03' 000 W	Vel. Viento=
Distancia a la costa	9 m	9 m	Dir. Viento=
Profundidad	48 m	48 m	Rumbo 500

Lance N° 6	Comienzo	Final	Fecha 6/11
QF1103-05 Hora	9:30	11:40	Velocidad (nd.)= 3,4 n.
Situación	38° 25' 916 S	38° 28 208 S	Temperatura(°C)=
	57° 56' 564 W	58° 03 250 W	Vel. Viento=
Distancia a la costa	5 mill	5 mill	Dir. Viento=
Profundidad	34 m	32 m	Rumbo 270°

12.3. APPENDIX 3: WORKSHEET FOR SEABIRDS RECORDS

Planilla de registro de especies de aves marinas
BP Seabirds 03

Barco: Volador Observador: LLT

Fecha: 26/4/4 27 y 28 Página: 1

Lance	Hora	Especie	Plumaje	Cantidad 0-25	25-50	50-100	100-300	300-#	Dir	En Vuelo	Posado	Comiendo	MM N	SP	Notas
1	14:30	LDOM	A	35						✓					9F0404-09
		LMAC	I	40						✓					
		LDOM	J	15						✓					
		TCLO	J	1							✓				
		TCLO	A	1							✓				
2	18:00	TMEL	A	1							✓				9F0404-10
		LDOM		2							✓				
3	9:00	TMEL		3 ✓									30	DDEL	9F0404-11
		PGRA	A	1 ✓											
		CANT		1 ✓						✓					
		PGRI		2 ✓											
		TMEL			15 ✓					✓	✓				
		PAEQ			|—50—|	✓					✓				
		PGRA	A		20 ✓						✓				
		PGRA	A			20 ✓					✓				
		SMAG			6 ✓						✓				
4	13:00	PGRA	A	8 ✓						✓					9F0404-12
		TMEL		3 ✓							✓				
		PAEQ		1 ✓							✓				
		PPUF				1 ✓				✓					
		PGRA	A	7 ✓							✓				
5	17:00	PGRA	A	|—40—| ✓							✓				9F0404-13
		TMEL		15 ✓							✓				
		PAEQ		5 ✓							✓				
		LMAC		2 ✓						✓					
6	9:00	CANT		3 ✓						✓					9F0404-14
		TMEL	A				20 ✓				✓				
		TMEL	A	1 ✓							✓				
		PGRA	A	10 ✓							✓				

12.4. APPENDIX 4: DETAILS OF INFORMATION OF SKILLS

	FLEETS					SKILLS					
PORTS AND SMALL FISHING CAMPS	COASTAL	SMALL	BOATS	TOTAL	FISHING GEARS	COASTAL	SMALL	BOATS	TOTAL	%	INVOLVED SPECIES
General Lavalle	24			24	Pair bottom trawl	6			6	25	no
San Clemente del Tuyú		4		4	Bottom gillnet, bottom trawl net		2		2	50	no
Las Toninas			4	4	Bottom gillnet			2	2	50	no
Sta. Teresita -Mar del Tuyú			8	8	Bottom gillnet, bottom trawl net for shrimp, line			2	2	25	no
San Bernardo - Mar de Ajó – La Lucila del Mar			4	4	Bottom gillnet			2	2	50	no
Pinamar – Ostende – Valeria del Mar			4	4	Bottom gillnet			1	1	25	no
Villa Gesell			3	3	Bottom gillnet, small longline			1	1	33.3	no
Mar del Plata	20	40		60	Bottom gillnet, bottom trawl net,, lampara, traps	2	8		10	16.7	*Puffinus gravis, P. griseus, Spheniscus magellanicus*
Puerto Quequén	16			16	Bottom trawl net, surface trawl net, bottom gillnet	13			13	81.3	*P. gravis, P. griseus, S. magellanicus, Macronectes sp. Thallasarche melanophiys*
Claromecó – Dunamar		7	12	19	Bottom gillnet, dredge, pots		3	7	10	52.6	*S. magellanicus*
Monte Hermoso			10	10	Bottom gillnet, line			8	8	80	no
Pehuencó			4	4	Line, bottom gillnet, line			3	3	75	no
Puerto Rosales – Punta Alta – Ingeniero White		17	39	56	Bottom gillnet		11		11	19.6	no
	60	64	92	216		21	22	28	71	32.9	