OVERVIEW OF SEABIRD BYCATCH BY BRAZILIAN FISHERIES IN THE SOUTH ATLANTIC OCEAN

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SUMMARY

*The impact of fisheries bycatch on seabirds around the world is currently the focus of considerable international concern. In Brazilian waters there are eight fisheries that affect seabirds, according to the National Plan of Action for the Conservation of Albatrosses and Petrels (NPOA-Seabirds Brazil). Capture rates obtained by observers during 40 cruises (473 sets and 499,978 hooks) in the pelagic longline fisheries in south and southeastern areas, between November 2000 and December 2005 were 0.102 birds/1000 hooks. The leased fleet (based in northern and northeast ports) that fished along most of the Brazilian coast and in adjacent international waters was sampled by ProBordo observers (Brazilian National Observer Program). Seabird capture in this fishery during 2005 was 68 specimens. The most commonly captured species in both the leased and domestic fleets were the black-browed (*Thalassarche melanophris*) and Atlantic yellow-nosed (*T. chlororhynchos*) albatrosses, white-chinned (*Procellaria aequinoctialis*), spectacled (*P. conspicillata*) petrels and the great shearwater (*Puffinus gravis*). Other fisheries have demonstrated that fishing is an important mortality factor for seabirds and incidental capture rates must be evaluated. The assessment of seabird by-catch by fleets based in Brazilian ports must continue in order to support the implementation of mitigation measures.*

RESUME

L'impact des prises accessoires des pêcheries sur les oiseaux de mer dans le monde entier est actuellement au centre des préoccupations internationales. Selon le Plan d'action national pour la conservation des albatros et des pétrels (NPOA-Oiseaux de mer Brésil), huit pêcheries affectent les oiseaux de mer dans les eaux brésiliennes. Les taux de capture obtenus par les observateurs au cours de 40 campagnes (473 opérations et 499.978 hameçons) dans les pêcheries palangrières pélagiques dans les zones Sud et Sud-Est, entre novembre 2000 et décembre 2005, se sont établis à 0,102 oiseau/1.000 hameçons. La flottille en location (dont les ports d'attache se trouvent au Nord et au Nord-Est) qui opérait le long de pratiquement toute la côte brésilienne et dans les eaux internationales adjacentes a été échantillonnée par des observateurs ProBordo (Programme National Brésilien d'Observateurs). En 2005, cette pêcherie a capturé 68 oiseaux marins. Les espèces les plus communément capturées par les flottilles en location et nationales étaient le Thalassarche melanophris *et le* T. chlororhynchos, *le* Procellaria aequinoctialis, *le* P. conspicillata *et le* Puffinus gravis. *D'autres pêcheries ont démontré que la pêche est un important facteur de mortalité pour les oiseaux marins et que les taux des prises accessoires devaient être évalués. L'évaluation des prises accessoires d'oiseaux de mer par les flottilles basées dans les ports brésiliens doit se poursuivre afin d'appuyer la mise en œuvre des mesures d'atténuation.*

RESUMEN

El impacto de las capturas fortuitas de aves marinas en las pesquerías del mundo está generando una considerable preocupación a nivel internacional. En las aguas brasileñas hay ocho pesquerías que afectan a las aves marinas, según el Plan Nacional de Acción para la conservación de albatros y petreles (NPOA-Seabirds Brasil). Las tasas de capturas registradas por los observadores durante 40 mareas (473 calados y 499.978 anzuelos) en las pesquerías de palangre pelágico en las zonas sur y sureste, entre noviembre de 2000 y diciembre de 2005 se situaron en 0,102 aves/1.000 anzuelos. La flota fletada (con base en los puertos del norte y

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*nordeste) que pesca por casi toda la costa brasileña y en las aguas internacionales adyacentes fue objeto de un muestreo realizado por observadores a bordo (Programa nacional brasileño de observadores). En 2005, la captura de aves marinas en esta pesquería ascendió a 68 ejemplares. Los ejemplares más capturados tanto en la flota nacional como en la fletada fueron: albatros ceja negra (*Thalassarche melanophris*), albatros pico fino (*T. chlororhynchos*), petrel negro (*Procellaria aequinoctialis*), petrel de anteojos (*P. conspicillata*) y pardela capirotada (*Puffinus gravis*). Otras pesquerías han demostrado que la pesca es un factor de mortalidad importante par alas aves marinas y que deben evaluarse las tasas de captura incidental. Debe continuar la evaluación de la captura fortuita de aves marinas pro parte de la flota con base en los puertos brasileños para poder respaldar la implementación de medidas de mitigación.*

KEYWORDS

Seabirds, Procellariiformes, albatross, longline, Brazilian fishery, By-catch, NPOA-Brazil, conservation

1. Introduction

Albatrosses and petrels, more than any other group of birds, are increasingly threatened (BirdLife International 2004). Thirty five percent of the worlds breeding pairs of albatrosses occur in the South Atlantic Ocean. Seven species of albatross breed in the region, including four listed by IUCN as Endangered, and two listed as Vulnerable. In Brazilian waters there are records of 10 albatross and 30 petrel species (Olmos 2002, CBRO 2005, Neves *et al.* 2006a), of which 11 are endangered according to the IUCN Red List (IUCN 2006). There are only three species of Procellariiformes breeding in Brazil, but the southern Atlantic is an important feeding and wintering ground for albatrosses migrating from other regions (Neves, *et al* 2006b). In Brazil, high seabird abundance and diversity is found in southeastern waters, where the northward flowing cold Malvinas/Falklands Current meets the warm waters of the southward flowing Brazilian Current. This Subtropical Convergence region is a high productivity area that holds important fish stocks and considerable numbers of albatrosses and petrels (Seeliger *et al.* 1998).

The main reasons for the decline of albatross and petrel populations currently relate to the interactions with fisheries (BirdLife International 2004). The impact of bycatch on seabirds around the world is the focus of considerable international concern (Gales 1997). Globally, over 300,000 seabirds, of which 100,000 are albatrosses, are estimated be killed every year by longline fishing hooks. The longline fishing effort in the Southern Hemisphere is the main factor accounting for the observed decreases in many albatross populations, especially because they are long-lived species and have slow reproductive rates, making populations highly vulnerable to adult mortality by fisheries (BirdLife International 2006).

Apart from longlining, other fisheries such as live-baiting, gillnetting, trawling and drift netting are a potential cause of mortalities in seabirds. These fisheries are included as potential threats in the National Plan of Action for the Conservation of Albatrosses and Petrels (NPOA-Seabirds Brazil), published in June 2006 (Neves *et al.* 2006b). In Brazil, the Projeto Albatroz (non-government organization) is responsible for contributing to the solution of seabird bycatch, providing information through their Observer Program. This paper presents an overview of available information on seabird interactions, including incidental catches in all fisheries considered a priority and potential ones by the NPOA-Seabirds Brazil, aiming to attend the ICCAT Resolution n^{o} 14 of 2002 on Incidental Mortality of Seabirds.

2. Methods

Data on seabird bycatch were obtained from reports of onboard observers from 34 longline fishing cruises and six scientific trips carried out in southern Brazil. Vessels operated in a large area of the Brazilian Exclusive Economic Zone and international waters, from 20ºS to 40ºS and 26ºW to 52ºW, from 2000 to 2005. Cruises were usually 15-25 days long.

Information from the leased longline fleet during 2005 was collected by the National Observers Program (ProBordo). This fleet is based in northern and northeastern ports, but deployed hooks from 8ºN to 32ºS and 10ºW to 52ºW. These data were obtained through the National Database of Atlantic Tuna.

Sources of seabird bycatch in the bottom longline and other fisheries were obtained from Projeto Albatroz observers, fishermen interviews and literature reviews. Data on fishing effort for the domestic and leased fleets are summarized by season in 2005, and capture rates (birds/1000 hooks) was calculated for seabirds as a whole.

3. Results and discussion

The NPOA-Seabirds Brazil lists four main groups of fisheries that affect seabirds and a further four that may potentially affect them: the pelagic longline fishery by vessels based in the south and southeast regions; the pelagic longline fishery by the leased fleet based at north and northeast ports; the bottom longline fishery; and other more poorly-known fisheries. In the last group, the main concern is with fisheries carried out by vessels from Itaipava, Espírito Santo State, which deploy a variety of fishing gear. In addition, information suggests that the live-bait fishery targeting skipjack tuna, *Katsuwonus pelamis*, gillnetting, trawling and drift-netting may have some impacts on endangered seabird species in Brazil. An overview of the main fisheries and their impacts on seabirds is presented below.

3.1 Pelagic longline fleet based in the ports from the south and southeast region

The fishing effort by the domestic fleet in spring-summer and autumn-winter seasons is shown in **Figure 1**. The geographical distribution of effort is relatively homogeneous through the year, but during winter effort is concentrated in southern Brazil. Seabird capture rates were 0.102 birds/1000 hooks (473 sets and 499,978 hooks), with 51 birds killed. The main species captured were the black-browed (*Thalassarche melanophris*) and Atlantic yellow-nosed (*T. chlororhynchos*) albatrosses, white-chinned (*Procellaria aequinoctialis*) and spectacled (*P. conspicillata*) petrels. Other species not caught during this sampling, but reported by fishermen or in the literature are tristan albatross (*Diomedea dabbenena*), southern royal albatross (*D. epomophora*), northern royal albatross (*D. sanfordi*), wandering albatross (*D. exulans*), great shearwater (*Puffinus gravis)* and southern fulmar (*Fulmarus glacialoides*) (Vaske-Jr 1991, Neves and Olmos 1997, Olmos *et al.* 2001). A maximum of nine birds were caught in a single trip, and captures of spectacled petrel and Atlantic yellow-nosed albatross were recorded in only one trip. During the winter, several southern migrant seabirds reach southern Brazilian waters, as is the case for Black-browed albatross and the White-chinned petrel that are abundant in the area and have high capture rates.
Severe declines in the Black-browed albatross global population could be in part attributed to pelagic logline fisheries in the SW Atlantic. Incidental mortality of seabirds in Atlantic waters was earlier reported by Croxall and Prince (1990) through band recoveries of Wandering albatross breeding in South Georgia and captured by the longline fishery off South America. However, Vaske-Jr (1991) was the first to publish an estimate of seabird mortality by pelagic longliners in Brazil (1.35 birds/1000 hooks), based on 71 seabirds caught in 52 fishing days and 52,593 hooks. These cruises were conducted during autumn-winter and the lower number of hooks must have contributed to the high rates of capture. Neves and Olmos (1997) reported capture rate of 0.12 birds/1000 hooks (effort of 983,333 hooks) in the pelagic fishery based on logbooks and fishermen interviews, which make this bycatch rate probably underestimated.

The distribution of fishing effort of the Brazilian domestic fleet based in south and southeast ports in recent years **(Figure 1)** overlaps closely with seabird distributions. For this reason, this fishery is more damaging to seabird populations than the leased fleet based at north and northeast ports even though it deploys lower number of hooks each year.

3.2 The pelagic longline fishery fleet based in north and northeast ports

The number of leased vessels registered in north and northeast ports has drastically decreased between 2002 and 2004. At Cabedelo Port (Paraíba State), for instance, from 37 vessels operating in 2002, only eight are still operating. In 2005, the tuna longline fleet consisted of 99 vessels of which 61 were national and 38 were leased vessels that had permits issued by the Special Secretariat of Aquiculture and Fisheries of the Presidency of the Republic of Brazil-SEAP/PR (Neves *et al.* 2006b). Leased vessels may deploy other longline gear different to the monofilament gear used by national vessels and this may potentially have different effects on seabird bycatch. Therefore, the Observers National Program (ProBordo) is essential for the description of fishing gear, methods, fishing areas and the influence of fleets on seabird species.

The fishing effort of the leased fleet depends on the period of the year and the target species. Vessels deploy hooks mainly north of 20°S when targeting bigeye tuna (*Thunnus obesus*), usually from October to April. From

May to September, the fleets deploy hooks south of 20°S, targeting albacore (*T. alalunga*). This is achieved by alternating the longline configuration, generally increasing or decreasing the number of branch lines, and searching for depths with large concentrations of each species (Neves *et al.* 2006b).

ProBordo observers provided data on this fleet during 2005 and reported 68 Procellariiformes **(Figure 2)**. The main species caught was the Great shearwater (27 birds), an intertropical migrant that leaves the South Atlantic after breeding in Tristan da Cunha Archipelago (Harrison 1983). Capture of Great shearwaters reported here occurred on Chinese leased vessels and indicates high capture levels for the species. The Atlantic yellow-nosed albatross also occurs frequently over warm waters (Lima *et al.* 2004). Despite the fact that the longline fisheries operated by foreign vessels are based mainly in north and northeast ports, albatrosses and petrels were also captured in high numbers in the south and southeast during winter **(Figure 2)**. Unlike domestic fleets, leased vessels store frozen fish and can stay at sea for several months reaching southern Brazil. Chinese leased vessels usually fish in northern grounds while Spanish leased vessels move south of 20°S. Although no incidental captures have been reported, a concentration of fishing effort around Trindade and Martin Vaz Islands, could be particularly dangerous for the endemic and threatened breeding trindade petrel, *Pterodroma arminjoniana*, and frigatebirds (*Fregata ariel* and *F. minor*) (Sick 1997, IUCN 2006).

3.3 The bottom longline fishery

The bottom longline was established in Brazil after 1994 (Haimovici *et al.* 2004). This fishery targeted mainly namorado sandperch, *Pseudopercis numida*, tilefish, *Lopholatilus villarii*, and groupers, *Epinephelus* spp., with a fleet composed of 42 vessels in 1997 and 1998 and deployment of 17.7 million hooks in 1998 (Olmos *et al.* 2001). At this time, the demersal longline fishery was considered an important threat to albatross and petrels (Neves and Olmos 1997). However, the rapid decline of fish stocks caused a concurrent decline in the number of demersal longliners.

The available data on seabird mortality by bottom longliners were obtained as a part of the Evaluation of the Sustainable Potential of the Living Resources in the Brazilian Exclusive Economic Zone (REVIZEE Program). During 19 cruises carried out between April 1994 and May 1995, 340,777 hooks were deployed in 157 fishing days over the continental shelf and the upper continental slope between 19°30'S and 27°56'S, in depths from 49 to 468 m. The capture of 109 seabirds (0.32 seabirds/1,000 hooks) was reported (Neves and Olmos 1997; Tutui *et al.* 2000). The main species captured were the great shearwater followed by the Atlantic yellow-nosed albatross, white-chinned petrel, spectacled petrel and black-browed albatross. From August 1996 to June 1997, 12 cruises were carried out between Rio de Janeiro and Rio Grande do Sul States (22°-35°S), in depths from 100 to 500 m. A total of 187,908 hooks were deployed in 69 fishing days, capturing 19 seabirds, mainly the same species cited above. The bycatch rate was 0.1 seabirds/1,000 hooks (Olmos *et al.* 2001, Neves *et al.* 2006b).

In south and southeast Brazil, the bottom longline fishery declined sharply. For example, there were 21 demersal longline vessels operating from Itajaí in 2002 (UNIVALI 2003) and only 12 vessels in 2003 (UNIVALI 2004). The number of bottom longline vessels currently operating from Brazilian ports is unknown, but certainly represents a small proportion of the late 1990s fleet. In October 2005, the Normative Instruction N° 37 from Brazilian Environmental Ministry prohibited the fishery for wreckfish, *Polyprion americanus*, due to a 90% population decrease. However, the decline in number of vessels is associated more to the low profitability of the fishery than to legal restrictions. Even so, the bottom longline fishery must be monitored to evaluate the capture of seabirds, and the licensing of new foreign vessels must be rigid, including the compulsory use of paired torilines and other mitigation measures.

3.4 Itaipava fishery fleet

The fleet based at Itaipava, Espírito Santo State, as well as the fleet based at the nearby cities of Piúma, Anchieta and Vila Velha, is composed of 497 vessels of up to 14 m long (Martins *et al.* 2005). Around 70% of the vessels, land at the Itaipava port on a regular basis, production from this fishery account for 50% of total fish landings of the Espírito Santo State (12,300 metric tonnes per year). Frequently, several fishing methods are used simultaneously or at different times. Fisheries include trolling or 'corrico', handlining, surface longlining for dolphinfish (*Coryphaena hippurus*), pelagic longlining for swordfish (*Xiphias gladius*), and bottom droplining.
A description of fishing methods and interactions with seabirds is in progress (Bugoni *et al.* unpubl.). The capture rate was highest for the surface longline fishery for dolphin fish (0.147 birds/1000 hooks). Capture rates in slow trolling for Bigeye tuna was 0.436 birds/day and in the handlining fishery targeting Yellowfin tuna

(*Thunnus albacares)* it was 0.561 birds/day. Spectacled petrel, Atlantic yellow-nosed, black-browed albatrosses and great shearwater were the main seabirds caught.

3.5 Fisheries using pole-and-line with live bait

The use of the pole-and-line and live bait in fisheries is used all over the world as one of the techniques to capture skipjack tuna. This fishery technique, that was adopted in 1979 by Rio de Janeiro fishermen, rapidly spread to other ports, in particular to Itajaí and Rio Grande (Andrade *et al*. 2005).

The incidental capture of seabirds by this fishing methodwas not recorded. However, live baits released to attract shoals of tuna also attract large number of seabirds, such as cory's shearwater (*Calonectris diomedea*), Cape Verde shearwater (*Calonectris edwardsii*) and the great shearwater. Frequently fishermen try to scare birds by hitting them with a metal piece attached to a pole-and-line similar to a whip, killing birds or causing severe injuries. A monitoring program for this fleet is required as well as educational awareness.

3.6 The gillnet fisheries

Gillnets targeting monkfish (*Lophius gastrophysus*) off the Brazilian coast were estimated to kill 802 petrels and albatrosses (Perez and Wahrlich 2005). Birds are captured during settings, because they are attracted to the organisms that adhered to nets during previous setting. Captures of *Procellaria aequinoctialis, P. conspicillata* and *Fulmarus glacialoides* have been registered along the Santa Catarina coast (*F. Peppes, personal observation*). Similar to bottom longlines, this fishery collapsed rapidly. The pelagic driftnet fishery, still occurring in south and southeastern Brazil and targeting hammerhead sharks (*Sphyrna* spp.), also kills seabirds, such as the wandering albatross (Soto and Riva 2000).

3.7 Use of mitigation measures in Brazil

Understanding the factors that affect seabird capture is fundamental in the choice of mitigation measures. There are several methods to reduce seabird bycatch that are being tested and implemented by several regions (Brothers *et al.* 1999). The most applicable measures to the Brazilian longline fleet are also summarized in the NPOA-Seabirds Brazil (Neves *et al.* 2006b).

The Projeto Albatroz, in partnership with IBAMA tested, in 2000 and 2001, mitigation measures (toriline and blue-dyed bait) onboard some Brazilian vessels in order to evaluate their efficiency in reducing seabird incidental capture and also the relationship of these measures to the fisheries production and the acceptability by the crew members (skipper and fishermen). Although the number of hooks for each treatment was small, preliminary results obtained for the fishing production and the incidental capture are encouraging. All four black-browed albatrosses captured were on non-dyed bait and without torilines suggesting the efficacy of these measures. After the trials, for three years at least four vessels used torilines and blue baits routinely. Tests with the mitigation measures are still in progress, but results show that when the information is transmitted in a proper way –taking account of the importance of seabird conservation and the economic impact from the interactions between seabirds and fisheries– it is the most important tool for the voluntary adoption of the suggested measures. Progressively, the skippers can voluntarily adopt mitigation measures, but this needs to be monitored closely.

3.8 Conservation actions and fisheries management

The Brazilian Government, through IBAMA, launched the NPOA-Seabirds Brazil in June 2006. The Plan presents a diagnosis on seabird species, fisheries, seabird bycatch and mitigation measures and also suggests goals for the conservation of breeding areas. However, the incidental captures of albatrosses and petrels by the oceanic fishery, especially by pelagic longline, was the central issue. It was focused on four lines of action: (1) the development of onboard educational activities, especially to fishermen; (2) the mandatory use of mitigation measures onboard vessels based in national territorial waters; (3) the establishment of incentives to adopt such measures, such as the environmental fishery certification; and (4) enforcement of use of mitigation measures through onboard observer programs.

The Plan is already being implemented and one important activity is the development of controlled tests of mitigation measures. With these tests the Brazilian Government expects to create technical background for the elaboration of viable governmental rules for the mandatory use of such measures on the longline fleet. Even

before the publication of NPOA-Seabirds Brazil, many actions addressed towards seabird and sea turtle conservation were adopted by the SEAP/PR. Examples are the inclusion of mitigation mechanisms in the governmental plan for the expansion of fishing fleets, and the adoption of mitigation measures for seabirds as a criterion to the selection of foreign vessel candidates for fishing licenses in Brazil. The recent inclusion of seabird and sea turtle experts in the Scientific Subcommittee for Tuna and Tuna-like Fisheries (SCAA) and in the Brazilian delegations for the RFMOs (Regional Fisheries Management Organizations) consolidate the Brazilian intention to concentrate national effort in solving bycatch in fisheries under Brazilian responsibility.

However, more studies are required particularly on poorly studied fisheries and fleets as the pole-and-line fishery and the Itaipava fleet. Robust bycatch estimates based on data gathered by onboard observers are lacking for all fisheries, as well as an adequate description of some fishing gears and fishing methods. Trials on mitigation measures and their effectiveness are urgently required.

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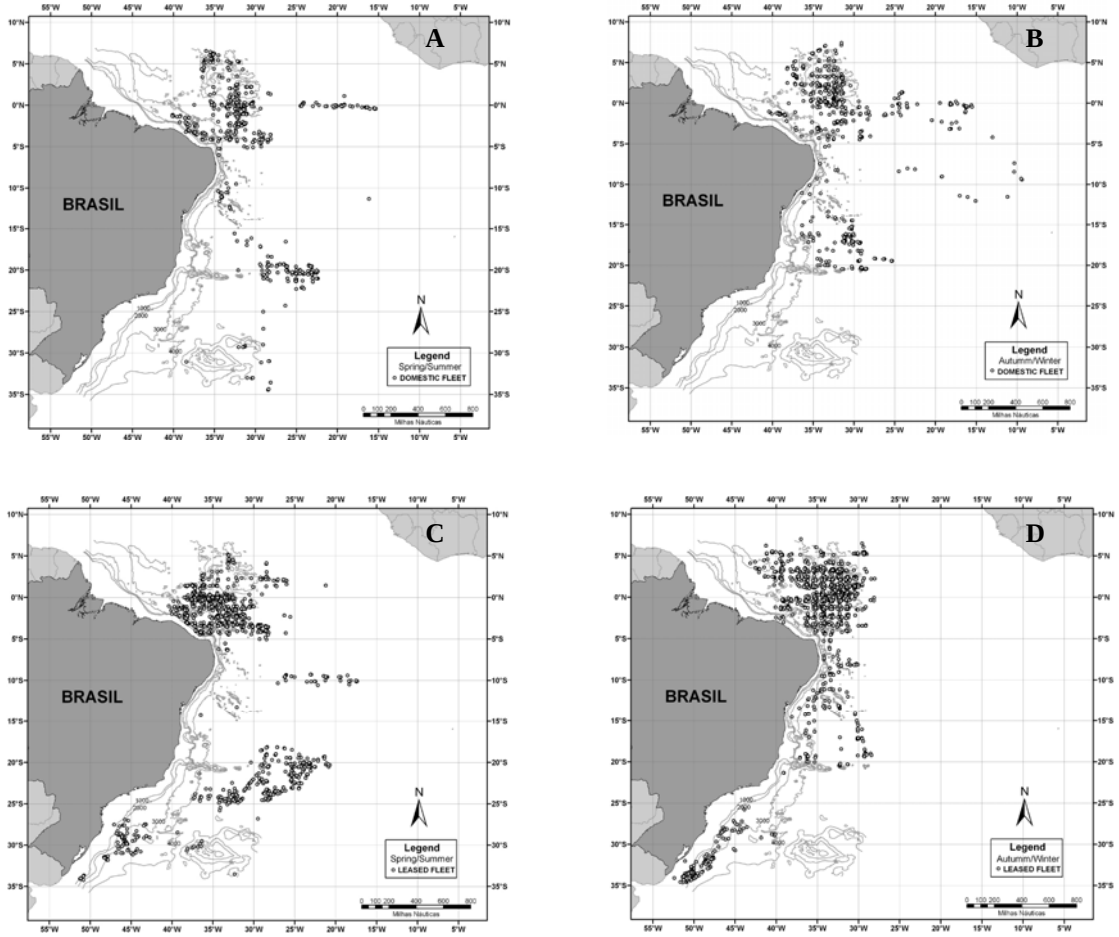

Figure 1. Spatial distribution of fishing effort for the Brazilian domestic pelagic longline fleet in spring-summer (A) and autumn-winter (B) and the leased fleet in spring-summer (C) autumn-winter (D) in 2005.

Figure 2. Incidental capture of seabirds by the pelagic leased longline fleet based in north-northeast Brazil in 2005 (n=68 birds).