

FISHING GEAR–RELATED INJURIES AND MORTALITY OF SEABIRDS IN COASTAL NORTHERN ARGENTINA

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ABSTRACT

BERÓN, M.P. & SECO PON, J.P. 2021. Fishing gear–related injuries and mortality of seabirds in coastal northern Argentina. *Marine Ornithology* 49: 321–327.

Worldwide, many seabirds are killed annually when they become entangled in gear used in coastal fisheries. This includes seabirds along the coast of Argentina, where recreational fishing occurs year-round and where little attention has been paid to the issue. We report here results for a study conducted in the vicinity of Mar del Plata Harbor and Mar Chiquita Lagoon in Buenos Aires Province, Argentina, during the non-breeding season (March–September 2016). We found and inspected 46 individuals of ten species with moderate (30%), severe (46%), and lethal (24%) lesions from fishing gear entanglement. Coastal birds (83%) dominated the tally, with gulls being the most affected group. The species with the most frequent occurrence in Mar del Plata Harbor and Mar Chiquita Lagoon were Olrog’s Gull *Larus atlanticus* (17.1% and 7.9%, respectively), followed by Kelp Gull *L. dominicanus* (1.3% and 0.3%, respectively). Among Olrog’s Gulls, adults were found most frequently in the Mar del Plata Harbor, whereas sub-adults were more frequent at Mar Chiquita Lagoon. We recommend persistent monitoring to improve understanding of interactions between seabirds and both artisanal and sport-recreational fisheries, as well as campaigns to promote awareness of the issue within the fishing community. The responsible removal of discarded fishing tackle must be encouraged in coastal areas.

Key words: artisanal fishing, ALDFG, bird conservation, coastal Argentina, marine debris, recreational fishing

INTRODUCTION

Seabirds and coastal birds are seriously affected by human activities, chiefly due to their particular life histories (i.e., long-lived, low-fecundity animals with delayed maturity; Burger & Gochfeld 2002). Human disturbances, especially those caused by recreational activities such as tourism, urbanization, and fishing, can affect the distribution, species richness, and abundance of seabirds by disturbing activities such as overwintering, resting, feeding, and reproduction (Huddart 2019). Moreover, the foraging distributions of affected species usually coincide closely with sport-recreational and artisanal fisheries during both the breeding and non-breeding seasons (Stempniewicz 1994, Calado *et al.* 2021). The impacts may be either direct (i.e., provision of food via fisheries discards, incidental mortality by entanglement in fishing gear that is in active use, etc.) or indirect (i.e., removal of competitors; depletion of prey; entanglement in or ingestion of abandoned, lost, or otherwise discarded fishing gear (ALDFG); Furness 2003). ALDFG includes hooks, lines, buoys, and other such gear that enters coastal waters from land- or boat-based fishing activity (Hong *et al.* 2013, Ryan 2018). Most studies on the entanglement issue relate chiefly to industrial fishing in offshore areas (Tasker *et al.* 2000, Phillips *et al.* 2010, Anderson *et al.* 2011, Jiménez *et al.* 2015), while there is little information on the impact of artisanal and the sport-recreational fishing (Eckhardt *et al.* 2012, Chelotti *et al.* 2019, Kolesnikovas *et al.* 2021).

On the coast of Argentina, coastal and marine recreational fishing is widespread. It is performed by people of all ages, occurs throughout the year, and is an activity of great socio-economic importance

(Caille *et al.* 1997, Llompart *et al.* 2012, Dellacasa & Braccini 2016). Despite its prevalence, little attention has been paid to its possible negative effects on coastal fauna, particularly seabirds (see Yorio *et al.* 2014, Seco Pon & Denuncio 2016). From a conservation perspective, this area contains many important resting, foraging, and transit sites that are regularly used by numerous avian species, including seabirds, waterbirds, passerines, and raptors (Martínez 2001, Favero & Silva Rodríguez 2005, Favero *et al.* 2016).

To date, only four studies discuss the effects of ALDFG on coastal and marine vertebrates such as birds along the Argentine coastline. Berón & Favero (2009) showed that the endemic Olrog’s Gull *Larus atlanticus*, which is classified as Near Threatened by the IUCN (2019), is frequently found injured, often lethally, as a result of interaction with sport-recreational fishing activities during its non-breeding season in southeastern Buenos Aires Province. Further south in Buenos Aires Province, other gull species such as Kelp Gull *L. dominicanus* are also impacted by ALDFG, especially in the vicinity of their colonies (Yorio *et al.* 2014). More recently, also in Buenos Aires Province, three Chimango Caracaras *Milvago chimango* and one Chilean Flamingo *Phoenicopterus chilensis* have been reported injured by fishing tackle (Seco Pon *et al.* 2018, Berón 2019).

During ornithological surveys performed in coastal northern Argentina (including southeastern Buenos Aires Province) during the 2016 non-breeding season, we recorded seabirds either entangled in and/or dead from interacting with ALDFG from near-shore coastal fishing activities. This study presents findings from these surveys.

METHODS

Study area

In the southeastern corner of the Buenos Aires Province, Mar del Plata Harbor (MdPH; 38°02'S, 057°32'W) and Mar Chiquita Lagoon (MC; 37°46'S, 057°27'W) are 35 km apart, and both are considered important fishing and angling sites (Lucifora 2001, Pellegrino & Cousseau 2005). MdPH is the most important coastal harbor in Argentina, given the total number of fishing vessels based there and its contribution to the national coastal fishery catch (Lasta *et al.* 2001). It is also an area of urban litter (Seco Pon & Becherucci 2012). In addition, there is a large number of fishing sites along this portion of the coast, including MC and MdPH, where sport-recreational and artisanal fisheries regularly discard baits, fish-processing offal, broken fishing lines, and nylon bags, leaving them near the waterline, at the piers, and/or on the beach (Berón & Favero 2009, Becherucci *et al.* 2017).

Study design

Data was collected from March to September 2016 by means of monthly transects walked along 4–5 km of the coastline at MC and at MdPH in Buenos Aires Province, Argentina (Fig. 1). The timing of samplings was tailored to cover the non-breeding seasons of most

of the seabird species previously reported for the study area (see Favero *et al.* 2016).

Sampling methods and data analysis

At each sampling site, information related to dead or injured birds was collected by both authors. The type of injury was recorded as a) moderate (entanglements that did not seem to hinder the mobility or feeding behavior of birds); b) severe (mutilations, wing lacerations and/or entanglements, hooks embedded in the oral cavity and/or the digestive tract, and hooks embedded in the wings and/or legs); or c) lethal (dead individuals as a result of entanglements and/or ingestion of fishing tackle).

Concomitant to the surveys, we estimated the abundance of seabirds attending the two sites by using point counts of 10 minutes (Bibby *et al.* 1992). Counts by species (and age class, when possible) were analyzed using the maximum abundances observed at each sampling area for each month of study. Observations of individual Olog's and Kelp gulls were tabulated by differences in plumage in the following age categories: juveniles, sub-adults, and adults (Harrison 1983).

The injury occurrence (i.e., the percentage of seabirds observed with entanglements, injuries, and/or deaths) was calculated based

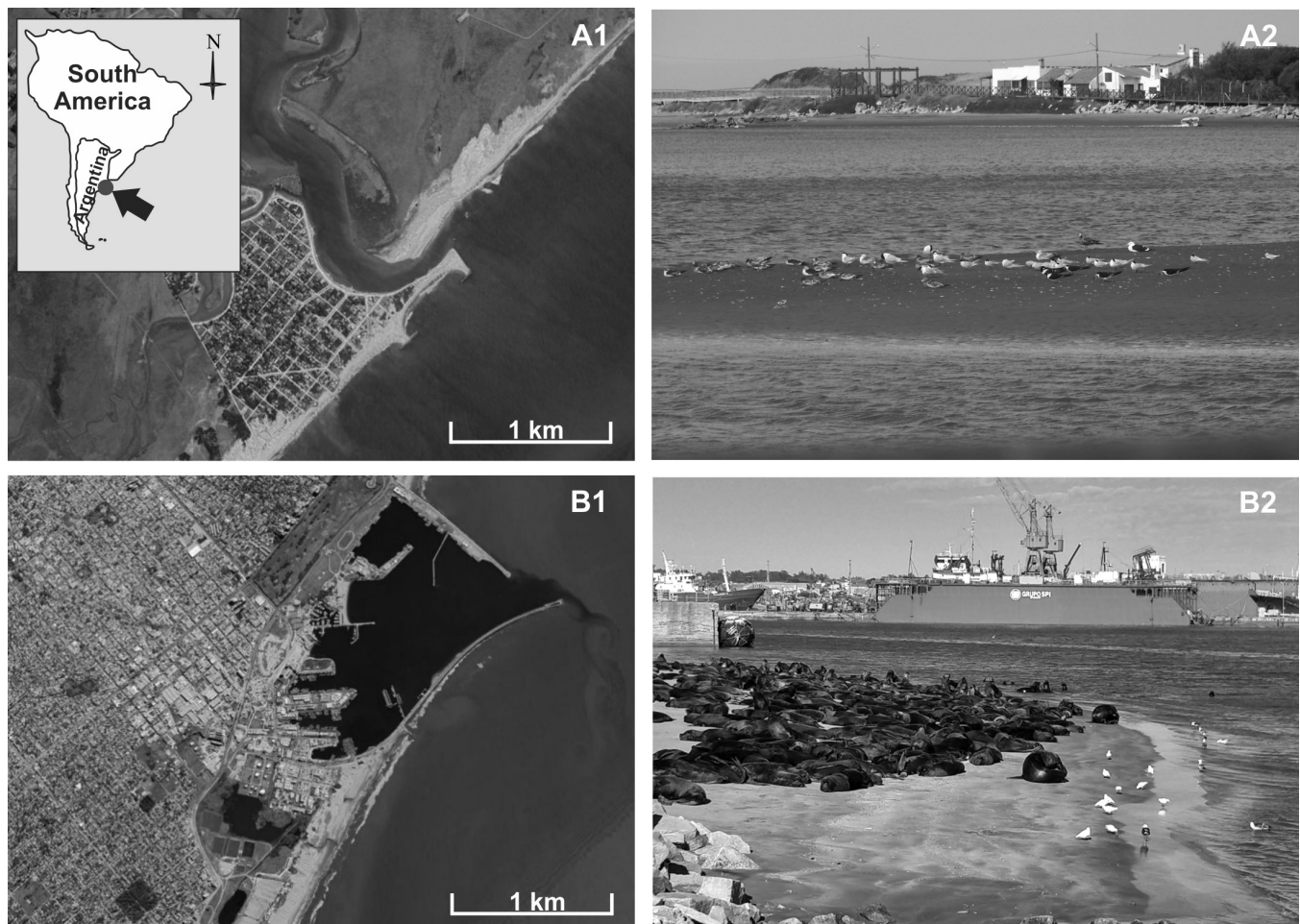


Fig. 1. Map of the study area showing sampling sites in Buenos Aires Province, Argentina: (A) Mar Chiquita Lagoon and (B) Mar del Plata Harbor. Image credits for A1 and B1: ©2021 Google Earth, Image Landsat/Copernicus, Data SIO, NOAA, US Navy, NGA, GEBCO. Image credits for A2 and B2: MPB.

on the total number of individuals recorded in the seabird counts in the sampling areas for the duration of the study period.

RESULTS

A total of 46 seabirds of ten species were found injured or dead as result of potential fishing gear entanglement (Table 1). The tally included larids ($n = 34$), procellariids ($n = 6$), chionids ($n = 4$), and diomedeids ($n = 2$). The majority had severe lesions (46%), followed by moderate (30%) and lethal lesions (24%). The prevalence of fishing gear-related injuries varied by species: most (*ca.* 83%) were suffered by coastal seabirds (*i.e.*, especially gulls but also terns and sheathbills) and the remaining injuries were suffered by pelagic species (*i.e.*, albatrosses, petrels, and shearwaters; Fig. 2). Among dead individuals, six were entangled in monofilament fishing line and four showed injuries from hook intake. A single bird was entangled in monofilament fishing line, sustaining mutilations in both legs. Overall, Olog's and Kelp gulls dominated the count (Table 1) as follows: 41% sub-adults, 33% adults, and 26% juveniles.

Similar tallies occurred at both sampling sites ($n = 25$ at MdPH, $n = 21$ at MC). Of the birds with severe injuries, 75% were found at MdPH and 25% were at MC. For moderate injuries, 60% were found at MC and 40% were at MdPH. A similar proportion of lethal injuries was observed at both sites. At MC, Olog's Gulls showed all types of injuries ($n = 9$ moderate, $n = 4$ severe, and $n = 4$ lethal) and one Kelp Gull exhibited a severe injury. At MdPH, all injured

Olog's Gulls had severe injuries ($n = 7$), while Kelp Gulls exhibited an array of injuries ($n = 2$ moderate, $n = 3$ severe, and $n = 1$ lethal; Table 1).

Gulls, terns, and sheathbills dominated the avifauna counts (Table 2) and the proportion of injury occurrence was similar at both sampling sites (1.7% at MC and 1.4% at MdPH). Among larids at MdPH, Olog's Gulls exhibited the highest injury occurrence (17.1%), followed by the Kelp Gull (1.3%; Fig. 3). At MC, 8% of all Olog's Gull observed were injured, followed by Kelp Gulls and Brown-hooded Gulls *Chroicocephalus maculipennis* at < 0.5% each (Table 2). In the case of Olog's Gull, adults had highest occurrence of injuries at MdPH, but sub-adults exhibited highest frequency of injury at MC (Fig. 4).

DISCUSSION

This study shows the impact of sport-recreational fishing practices on aquatic birds in coastal Buenos Aires Province, Argentina, highlighting a high incidence of injuries caused by ALDFG entanglement. Furthermore, seabirds (especially those exploiting coastal environments) were the most affected group of aquatic birds due to their interaction with derelict sport-recreational fishing tackle. This is in line with previous studies conducted in other coastal environments of southern South America (Yorio *et al.* 2014) and elsewhere around the globe (*e.g.*, Stempniewicz 1994, McPhee *et al.* 2002, Good *et al.* 2009). Moreover, feeding by coastal aquatic birds coincides in space and time with sport-recreational fishing

TABLE 1
Abundance ($n =$ number of individuals) of seabird species sustaining fishing gear-related injuries in coastal areas of the southeastern Buenos Aires Province, Argentina (March–September 2016)

Species	Global IUCN Red List category ^a	Type of injury (n)			Total
		Moderate	Severe	Lethal	
Olog's Gull <i>Larus atlanticus</i>	NT	9	11	4	24
Kelp Gull <i>Larus dominicanus</i>	LC	2	4	1	7
Brown-hooded Gull <i>Chroicocephalus maculipennis</i>	LC	-	1	-	1
South American Tern <i>Sterna hirundinacea</i>	LC	-	-	2	2
Snowy Sheathbill <i>Chionis albus</i>	LC	2	2	-	4
Black-browed Albatross <i>Thalassarche melanophris</i>	LC	-	2	-	2
Atlantic Yellow-nosed Albatross <i>Thalassarche chlororhynchos</i>	EN	-	-	1	1
White-chinned Petrel <i>Procellaria aequinoctialis</i>	VU	-	-	1	1
Sooty Shearwater <i>Ardena grisea</i>	NT	-	-	1	1
Southern Giant Petrel <i>Macronectes giganteus</i>	LC	1	1	1	3
Total		14	21	11	46

^a Global IUCN Red List category (IUCN 2019): LC = Least Concern, NT = Near Threatened, VU = Vulnerable, EN = Endangered

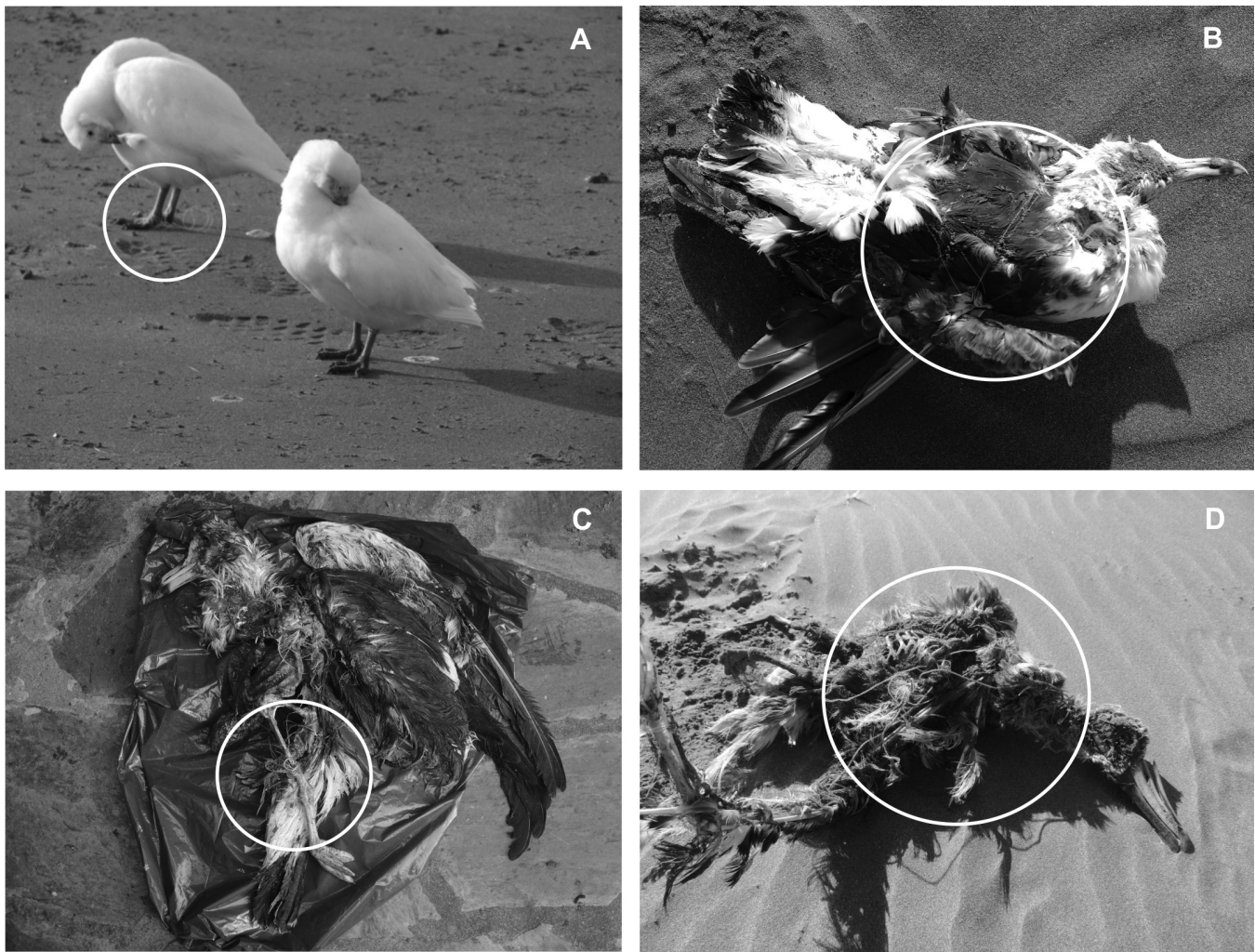


Fig. 2. (A) A live Snowy Sheathbill, (B) a deceased Kelp Gull, (C) a deceased Olrog's Gull, and (D) a deceased Atlantic Yellow-nosed Albatross, all entangled in fishing line. Image credits: JPSP (A–C), Asociación de Naturalistas Geselinos (D).

TABLE 2
Spatial variation in the total number of individuals observed, the number of injured individuals, and the proportion of injury occurrences by species at two coastal sites in southeastern Buenos Aires Province

Species	Mar Chiquita Lagoon			Mar del Plata Harbor		
	Number observed	Number injured	Injury occurrence (%)	Number observed	Number injured	Injury occurrence (%)
Laridae						
Olrog's Gull	213	17	7.9	41	7	17.1
Kelp Gull	335	1	0.3	476	6	1.3
Brown-hooded Gull	265	1	0.4	616	0	0.0
South American Tern	623	0	0.0	0	2	Unknown
Chionididae						
Snowy Sheathbill	0	0	0.0	370	4	1.1
Diomedidae						
Black-browed Albatross	0	1	Unknown	0	1	Unknown
Atlantic Yellow-nosed Albatross	0	1	Unknown	0	0	0.0
Procellariidae						
White-chinned Petrel	0	1	Unknown	0	0	0.0
Sooty Shearwater	0	1	Unknown	0	0	0.0
Southern Giant Petrel	0	1	Unknown	1	2	Unknown

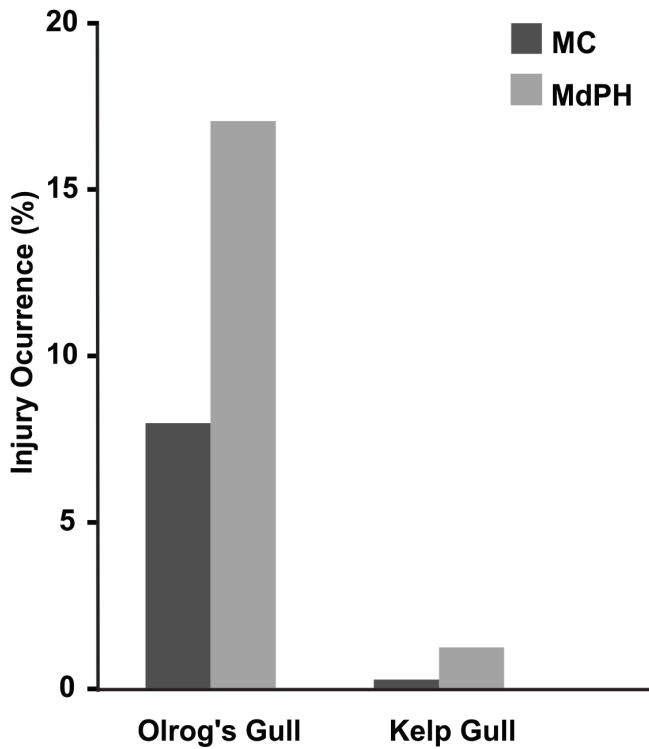


Fig. 3. Spatial variation in injury occurrence (%) estimated for the two most affected seabird species at coastal sites in southeastern Buenos Aires Province. MC = Mar Chiquita Lagoon, MdPH = Mar del Plata Harbor

and/or small-scale fisheries (Abraham *et al.* 2010, Seco Pon *et al.* 2013). These small-scale local fisheries include semi-commercial fleets that target a variety of species within near-shore waters and are operational for 24–72 hours at a time; artisanal fisheries are not included within the term. This means that birds and humans could be exploiting the same trophic resources, and thus some degree of spatial overlap is expected.

While entanglement in commercial fishing gear is problematic, the impact caused by ALDFG entanglement extends to sport-recreational and artisanal fisheries, and therefore the loss of individual birds—especially within shallow inshore waters—may be very high (e.g., Unger & Harrison 2016, Huddart 2019). In turn, this can cause serious issues for associated aquatic birds (Hong *et al.* 2013, Ryan 2018). Our findings are consistent with these studies, though additional studies are limited for our region. When combining our observations with those of Berón & Favero (2009), we see that Olrog’s Gull is the species most affected by debris derived from ALDFG along the Atlantic coast of northern Argentina. This may be due to the foraging behavior of the species, as Olrog’s Gulls feed primarily in crab beds frequented by sport-recreational fishers, in both its breeding and non-breeding grounds (Berón *et al.* 2007, Ravasi *et al.* 2019, Suárez *et al.* 2020).

Here, we also provide the first reports of other coastal species sustaining injuries from sport-recreational and artisanal ALDFG along the northern Argentine coast: Brown-hooded Gull *Chroicocephalus maculipennis*, South American Tern *Sterna hirundinacea*, Snowy Sheathbill *Chionis albus*, and oceanic species like the Black-browed Albatross *Thalassarche melanophris*, Atlantic Yellow-nosed Albatross *T. chlororhynchos*, White-chinned Petrel

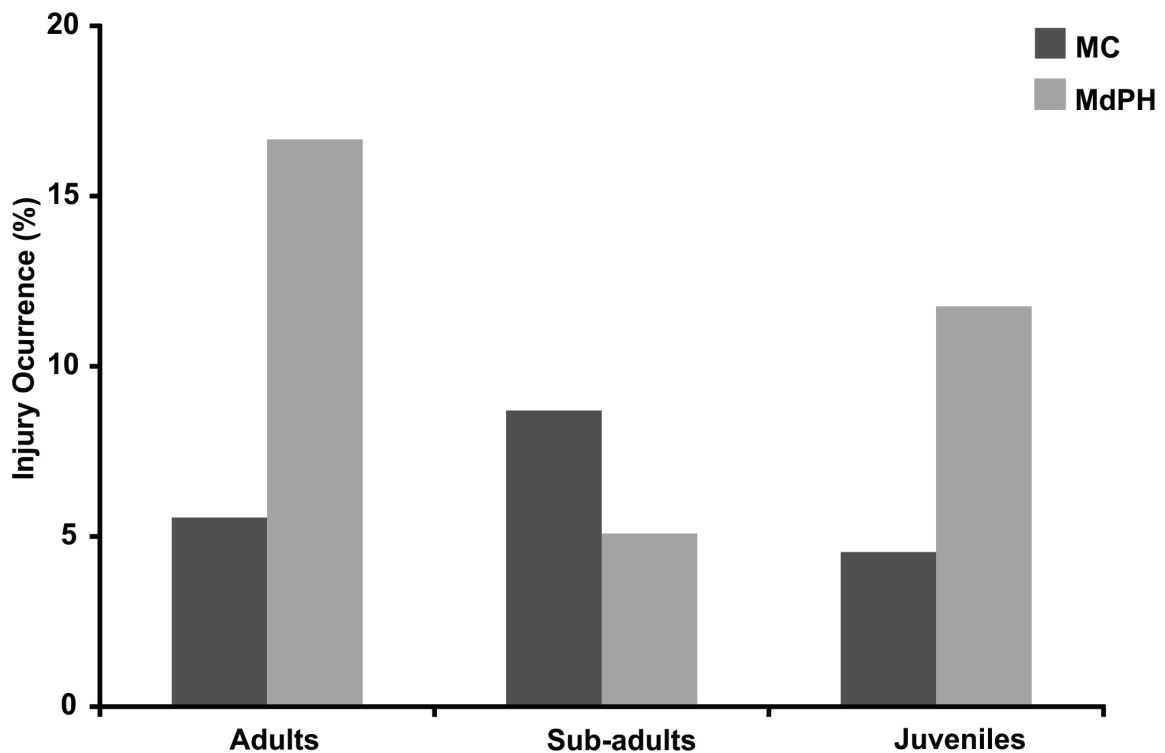


Fig. 4. Injury occurrence (%) according to different age classes of Olrog’s Gull at coastal sites in southeastern Buenos Aires Province. MC = Mar Chiquita Lagoon, MdPH = Mar del Plata Harbor

Procellaria aequinoctialis, Sooty Shearwater *Ardena grisea*, and Southern Giant Petrel *Macronectes giganteus*.

Based on our results, the number of birds sustaining fishing-related injuries was similar regardless of the sampling site. However, the type of lesion varied between sampling sites, with more birds sustaining severe lesions at MdPH and moderate lesions at MC; this will require further research. Additional studies should focus on investigating whether the presence of breakwaters and jetties, which differ in number among the two sites, is a determining factor in the number of injured birds due to the concentration of anglers and/or fishermen on these structures. Furthermore, these structures vary in size and location, occurring at the periphery or far away from areas populated by humans, which could also affect patterns.

CONCLUSIONS

Accounting for the Near Threatened status of Olrog's Gull and that several pelagic seabird species are seriously affected by fisheries, it is paramount to better understand the degree of association of these birds with coastal fishing activities at their wintering grounds in Argentina. This is particularly important for the Olrog's Gull, since it uses the study area mainly during winter and its presence during summer is occasional. Therefore, future studies should focus on the interaction between Olrog's Gull with sport-recreational and artisanal coastal fisheries, as well as the species' association with fishing tournaments in Buenos Aires Province. It is also crucial to include relevant stakeholders within the sport-recreational and artisanal fishing communities to promote more sustainable behaviors from these key social actors.

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