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Unusual Mass Stranding of Atlantic Yellow-nosed Albatross (*Thalassarche chlororhynchos*), Petrels and Shearwaters in Southern Brazil

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Abstract.—Mass strandings of seabirds occur frequently on many beaches worldwide and commonly involve penguins, petrels, shearwaters, and prions, among others. Large numbers of stranded albatrosses are rarely reported. In this paper, an unusual stranding event that involved five species of Procellariiformes, predominantly the Atlantic Yellow-nosed Albatross (*Thalassarche chlororhynchos*), is described in southern Brazil. Carcasses and debilitated specimens of Atlantic Yellow-nosed Albatrosses (n = 125), unidentified petrels/shearwaters (Procellariidae; n = 63), White-chinned Petrels (*Procellaria aequinoctialis*; n = 52), Great Shearwaters (*Puffinus gravis*; n = 11), Manx Shearwaters (*Puffinus puffinus*; n = 4) and Cory's Shearwater (*Calonectris borealis*; n = 1) were found stranded between 15 and 22 March 2013. Atlantic Yellow-nosed Albatrosses (n = 20) and White-chinned Petrel (n = 1) were found alive and remained in the rehabilitation center for a few days before being released. A total of at least 256 birds were affected during the 8 days of the event, but a larger number likely remained undetected. Rescued Atlantic Yellow-nosed Albatrosses were not emaciated, and the causes of their stranding remain unknown. Equal or greater numbers of stranded petrels had been recorded previously in the area, but strandings of a large number of albatrosses are unusual in southern Brazil and elsewhere. *Received 13 May 2014, accepted 25 June 2014.*

Key words.—beached, mortality, *Procellaria aequinoctialis*, *Puffinus gravis*, seabirds.

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Mass strandings of marine and coastal waterbirds are frequently reported worldwide. Such events had been reported for a variety of birds, such as *Puffinus* shearwaters (Ayala *et al.* 2013; Haman *et al.* 2013); *Pachyptila* prions and Blue Petrels (*Halobaena caerulea*) (Kinsky 1968; Ryan *et al.* 1989; Martuscelli *et al.* 1997); *Pterodroma* petrels (Ryan *et al.* 1989; Bugoni *et al.* 2007); *Gavia* loons, *Aechmophorus* grebes and Northern Fulmars (*Fulmarus glacialis*) (Jessup *et al.* 2009); *Spheniscus* penguins (Gandini *et al.* 1994; Mäder *et al.* 2010); *Phalacrocorax* shags (Coulson *et al.* 1968); Common Eiders (*Somateria mollissima*) (Camphuysen *et al.* 2002); Common Murres (*Uria aalge*) (Bailey and Davenport 1972); and *Calidris* shorebirds (Buehler *et al.* 2010). Massive die-offs are attributed to a range of causes, including oil pollution (Gandini *et al.* 1994; Furness and Camphuysen 1997); algal blooms (Coulson *et al.* 1968); storms (Kinsky 1968; Bugoni *et al.* 2007); *El Niño* events (Ryan *et al.* 1989; but see revision in Ayala *et al.* 2013); bycatch in fisheries (Hamel *et al.* 2009); and starvation (Camphuysen *et al.* 2002; Haman *et al.* 2013), among other causes. The causes of some of the strandings are frequently undetermined (e.g., Buehler *et al.* 2010). Although strandings affect most seabird taxa, shorebirds and inland waterbirds, mass-stranding events that involve albatrosses rarely have been reported. We are only aware of a single unusual mass stranding in New Zealand, which affected Northern (*Diomedea sanfordi*) and Southern (*Diomedea epomophora*) royal albatrosses (n = 110), Wandering Albatrosses (*Diomedea exulans*; n = 26) and White-capped Albatrosses (*Thalassarche cauta*; n = 45) (Kinsky 1968). This event was due to a severe storm, with wind bursts of 160 km/hr, which blew birds inland and onto the beach in April

1968 (Kinsky 1968). Additionally, there have been no reports of major outbreaks of infectious diseases among albatrosses and large petrels causing mass strandings.

The Atlantic Yellow-nosed Albatross (*Thalassarche chlororhynchos*) is one of the smallest albatrosses, widely distributed in the waters of the subtropical Atlantic Ocean (Brooke 2004). The annual breeding population on Gough Island is estimated to be approximately 5,300 pairs (Cuthbert *et al.* 2014), and the global population, endemic to Gough Island and the Tristan da Cunha Island Group, is estimated to be between 21,000 and 32,000 mature birds (BirdLife International 2014). It is classified as Endangered, mainly due to downward population trends (International Union for Conservation of Nature 2013) that are being caused by incidental mortality in fisheries (Ryan *et al.* 2002; Bugoni *et al.* 2008). The Atlantic Yellow-nosed Albatross feeds on squid and fish, and less frequently on crustaceans, taken on or just below the sea surface (Carboneras 1992). The White-chinned Petrel (*Procellaria aequinoctialis*) and the Great Shearwater (*Puffinus gravis*) are among the most common Procellariidae seabirds in the southwest Atlantic Ocean (Neves *et al.* 2006). In southern Brazil, all three species attend fishing vessels for discards (Olmos 1997; Bugoni *et al.* 2008, 2010). In this note, we report an unusual stranding event of dead and living Atlantic Yellow-nosed Albatrosses, petrels and shearwaters in southern Brazil.

METHODS

Study Area

The beach along the Rio Grande do Sul state, the southernmost in Brazil, is 620-km long, composed of a fine and compacted sand with a 2° gradient (Calliari 1998), where vehicle traffic is facilitated (Vooren and Chiaradia 1990). Adjacent coastal waters are under the influence of discharge of continental waters of La Plata River and Patos Lagoon (Garcia 1998). Offshore is the Subtropical Convergence where the warm oligotrophic waters of the Brazil Current flowing southward, mainly in summer, meet the rich-cold waters of the Malvinas/Falkland Current flowing northward, mainly in winter (Garcia 1998).

Sampling

From 15 to 22 March 2013, a total of 285 km of beach was surveyed for bird strandings, along an area 153 km long on the Rio Grande do Sul coast, in southern Brazil, within the municipalities of Mostardas, Tavares and São José do Norte (Fig. 1). Most beach monitoring was carried out by wildlife rangers who photographed and counted dead bird specimens, removed carcasses to foredunes, and rescued those that were still alive. This allowed identification of species and estimation of the number of dead birds that reached the beach. Rescued birds were measured; primary, rectrices and body molt checked; and body mass obtained by digital scale. The ages of the rescued Atlantic Yellow-nosed Albatrosses were estimated using the criteria of Bugoni and Furness (2009a). Individuals in good condition were banded and released on Cassino Beach, near the rehabilitation center.

RESULTS

Strandings were noted on 15 March, when 23 birds were found between Mostardense Beach and Capão da Marca de Fora Lighthouse (Fig. 1), including live Atlantic Yellow-nosed Albatrosses (n = 6) and White-chinned Petrels (n = 1) (Table 1). The bulk of birds were found on 18 March (n = 141 dead and n = 6 alive), between the northeastern sampling place (São Simão Beach) and the Lighthouse mentioned above. Additional carcasses were found on 21 and 22 March 2013 (see Table 1 for quantities and sections of beach monitored). A total of 257 km of beaches were covered in five days, and 256 seabirds were recorded. The Atlantic Yellow-nosed Albatross was the

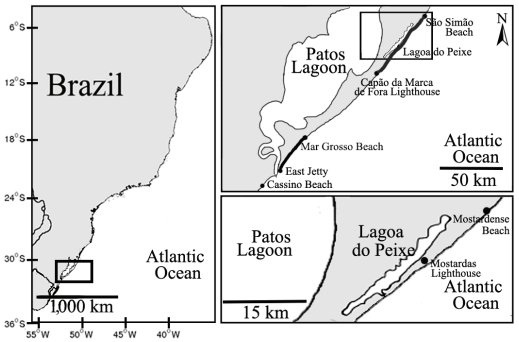

Figure 1. Beach sections along the southern Brazilian coast where seabird strandings were recorded in March 2013. Stretches in bold show monitored areas.

Table 1. Species and number of seabirds found alive and dead during a beach stranding event in March 2013 along the southern Brazilian coast. Sampling effort in each day is given in km, and starting and ending monitoring points are indicated. Beach stretches sampled were 15 March: Mostardense Beach to Capão da Marca de Fora Lighthouse (47 km); 16/17 March: Mostardas Lighthouse to Capão da Marca de Fora Lighthouse (60 km); 18 March: São Simão Beach to Capão da Marca de Fora Lighthouse (80 km); 21 March: East Jetty to Mar Grosso Beach (28 km); 22 March: Solidão Beach to Mostardense Beach (70 km).

	15 March	16/17 March	18 March	21 March	22 March
Species	Alive/ Dead	Alive/ Dead	Alive/ Dead	Alive/ Dead	Alive/ Dead
Atlantic Yellow-nosed Albatross (*Thalassarche chlororhynchos*)	6/16	5/0	6/58	0/8	3/23
Shearwaters (*Puffinus* sp./ *Calonectris borealis*)	0/0	0/0	0/0	0/1	0/0
Manx Shearwater (*Puffinus puffinus*)	0/0	0/0	0/0	0/4	0/0
Great Shearwater (*Puffinus gravis*)	0/0	0/0	0/0	0/11	0/0
White-chinned Petrel (*Procellaria aequinoctialis*)	1/0	0/0	0/31	0/15	0/5
Unidentified petrels (Procellariidae)	0/0	0/0	0/52	0/0	0/11

most affected species, making up 49% of the records, followed by the White-chinned Petrel (20%). There was a smaller number of birds at the southern portion of the monitored area (Mar Grosso), perhaps the result of lower sampling effort in this region, as well an absence of seabird strandings south of the sampling area (F. A. Faria, pers. obs.).

Live Atlantic Yellow-nosed Albatrosses (n = 20) and White-chinned Petrel (n = 1) were found and transported to a rehabilitation center (Centro de Recuperação de Animais Marinhos-CRAM/Universidade Federal do Rio Grande-FURG in Rio Grande, Brazil). Of the live birds, 16 Atlantic Yellow-nosed Albatrosses and the White-chinned Petrel were released after rehabilitation. Among rescued Atlantic Yellow-nosed Albatrosses, there were individuals with adult plumage ≥ 4 years (n = 7), with immature plumage 2-3 years (n = 8), and a first-year juvenile (n = 1). Atlantic Yellow-nosed Albatrosses that were found alive and released (n = 16) had body masses between 1,672 g and 2,720 g. These Atlantic Yellow-nosed Albatrosses were all molting contour feathers. In addition, eight had all primary feathers in full length, while six had one or two primary feathers missing or shorter than full length. A single individual had four primary feathers in molt. Regarding rectrices, eight individuals had all feathers in full length, while the remaining individuals had from one to six feathers still growing or missing.

DISCUSSION

The minimum number of birds affected during the 8-day period of the mass stranding event was 256 seabirds of five species along 153 km of coastline. This is a conservative estimate, as most carcasses remain undetected (e.g., Bibby and Lloyd 1977). A similar or higher number of stranded petrels of all species described in this study have been recorded previously in the area (Petry and Fonseca 2002), but strandings of albatrosses in large numbers are unusual. Petry *et al.* (2012) reported finding 35 live seabirds (resting or debilitated) during a monitoring effort that covered 8,610 km of beaches from 1997 to 1999 and 2007 to 2011 in Rio Grande do Sul state. This produces a rate of 0.004 living birds per km of beach sampled. In the current study, the stranding rate of living birds was 20 times higher (0.08 birds per km), which makes this event unprecedented in terms of species composition and the large number of live birds.

The frequent high water caused by south winds, logistic constraints and the short period of the event precluded planned monitoring of beaches for recovering carcasses for further outbreak analysis. Additionally, only a few birds died during rehabilitation and only gross necropsies were carried out. There was no further analysis of the potential causes of the strandings. The potential causes of the stranding event are therefore difficult to identify. However, rescued Atlan-

tic Yellow-nosed Albatrosses had body mass similar to healthy individuals on their breeding grounds (mean: 2,200 g; Range: 1,780-2,840 g; $n = 26$; Dunning 2008). Individuals had slight molt, as expected for the molt of adult birds finishing the breeding period, as well as immature birds in the area at this time of the year (Bugoni *et al. in press*). Similarly, the age composition of Atlantic Yellow-nosed Albatrosses was similar to the 50:50 proportion of immature:adults found previously of healthy birds of this species captured at sea during the same period of the year (Bugoni and Furness 2009b). All this, coupled with the apparent concentration of birds in the Lagoa do Peixe area, suggest an acute and spatially localized cause. One potential cause that should be investigated is contaminated residuals from fishing vessels causing rapid toxicity, as the species most affected were also the most common species attending fishing vessels in the neritic area at this time of the year (Bugoni *et al.* 2010; Traversi and Vooren 2010).

The species affected in this stranding event were those that we would expect to be attending vessels in this area at this time of the year. Other species, such as the Black-browed Albatross (*T. melanophris*) and the Spectacled Petrel (*Procellaria conspicillata*), are more pelagic (offshore) (Neves *et al.* 2006; Bugoni *et al.* 2009), and the Black-browed Albatross, Giant Petrels (*Macronectes* spp.) and Cape Petrel (*Daption capense*) are more winter species, not fall species in this area (Neves *et al.* 2006). This explains why they were not affected: they were not likely to be in the area during the time of the stranding event.

Seabird mass stranding events, including the one reported here, are particularly deleterious when they affect threatened species that have small population sizes and when they affect individuals that have a high intrinsic value for the population (i.e., adults and subadults), which was the case for the Atlantic Yellow-nosed Albatross. Beach monitoring of mortality events and detailed investigation of causes would contribute significantly to the conservation of many species.

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