

## GREY-BACKED STORM-PETRELS *GARRODIA NEREIS* AND OTHER SEABIRDS ASSOCIATING WITH FREE-FLOATING KELP

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Gillon K.W., White R.W. & Black A.D. 2001. Grey-backed Storm-petrels *Garrodia nereis* and other seabirds associating with free-floating kelp. *Atlantic Seabirds* 3(2): 75-84. During systematic surveys of seabirds and marine mammals at sea around the Falkland Islands, 22 species of seabird were recorded associating with free-floating patches of kelp. Of these, Grey-backed Storm-petrel was the only species where a significant proportion of the total number of birds recorded appeared to utilise free-floating kelp patches as a source of food. At no time was it possible to identify the food being taken but evidence from the literature would suggest that the prey items were the barnacle *Lepas australis*. A significant correlation between the density of free-floating kelp patches and the density of Grey-backed Storm-petrels indicates that Grey-backed Storm-petrels specialise in exploiting a food source largely neglected by other seabirds in Falkland Islands waters.

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### INTRODUCTION

At-sea surveys of seabirds and marine mammals around the Falkland Islands have been conducted since February 1998. These have produced regular records of seabirds associating with free-floating patches of kelp (mostly Giant Kelp *Macrocystis pyrifera* and Tree Kelp *Lessonia flavicans*). A total of 22 species of seabirds has been recorded associating with kelp patches but for most species only a very small proportion of the total number of birds counted were involved. Grey-backed Storm-petrels *Garrodia nereis* were recorded most frequently over kelp patches. In this paper, we present data on the association of seabirds with free-floating kelp around the Falkland Islands and discuss the potential attractions for seabirds based on our own field observations.

### METHODS

All birds and mammals within a 300 m transect on one side of moving vessels of known positions, speeds and headings were counted during at-sea surveys. In addition to this continuous strip transect, all flying birds were sampled using 'snapshot' counts, the frequencies of which were determined by the speed of the



*Grey-backed Stormpetrels Grijpsrugstormvogeltjes (Frits-Jan Maas)*

vessel and the maximum distance ahead of the vessel at which all flying birds could be reliably detected (see Webb & Durinck (1992) for full details of the survey method). In the two year period from February 1998 to January 2000, over 18 000 km<sup>2</sup> of survey effort was achieved within Falkland Islands waters. In addition to the number of birds, other information including behaviour of the birds was also recorded. Any bird resting on or beside, or feeding over, a kelp patch was recorded as associating with kelp. All records of seabirds associating with free-floating kelp patches in the period February 1998 to January 2000 inclusive were examined. The density of Grey-backed Storm-petrels in *ICES* rectangles (cells measuring 15' latitude by 30' longitude) was compared with the density of free-floating kelp patches using a Pearson product-moment correlation.

Table 1 Seabird species recorded associating with free-floating kelp patches in Falkland Islands waters. The total number of birds recorded (*n*), and the numbers and proportions (%) associated with free-floating kelp are shown.

Tabel 1. Geregistreeerde zeevogelsoorten geassocieerd met vrij drijvende zeewiervelden in wateren rond de Falklands. Weergegeven zijn het totaal aantal waargenomen exemplaren (*n*), en het aantal en aandeel (%) geassocieerd met vrij drijvend zeewier.

Species	All birds ( <i>n</i> )	<i>n</i> with kelp	% with kelp
Rockhopper Penguin <i>Eudyptes chrysocome</i>	2002	4	0.2
Magellanic Penguin <i>Spheniscus magellanicus</i>	9526	9	0.1
Southern Royal Albatross <i>Diomedea epomophora</i>	2394	6	0.3
Black-browed Albatross <i>Thalassarche melanophris</i>	61 757	210	0.3
Grey-headed Albatross <i>T. chrysostoma</i>	1048	1	0.1
Northern Giant Petrel <i>Macronectes halli</i>	566	2	0.4
Southern Giant Petrel <i>M. giganteus</i>	2664	20	0.8
Unidentified Giant Petrel <i>Macronectes</i> spp.	2094	28	1.3
Cape Petrel <i>Daption capense</i>	12 993	187	1.4
Antarctic Fulmar <i>Fulmarus glacialisoides</i>	14 290	54	0.4
Unidentified Prion <i>Pachyptila</i> spp.	91 037	746	0.8
Great Shearwater <i>Puffinus gravis</i>	5594	44	0.8
Sooty Shearwater <i>P. griseus</i>	30 261	1	<0.01
Wilson's Storm-petrel <i>Oceanites oceanicus</i>	15 678	416	3.1
Black-bellied Storm-petrel <i>Fregatta grallaria</i>	194	2	1.0
Grey-backed Storm-petrel <i>Garrodia nereis</i>	1933	699	37.3
Imperial Shag <i>Phalacrocorax atriceps</i>	33 682	2	<0.01
Grey Phalarope <i>Phalaropus fulicarius</i>	2	1	50.0
Antarctic Skua <i>Catharacta antarctica</i>	388	16	4.1
Arctic Skua <i>Stercorarius parasiticus</i>	33	7	21.2
Long-tailed Skua <i>S. longicaudus</i>	190	19	10.0
Kelp Gull <i>Larus dominicanus</i>	1730	48	2.8
South American Tern <i>Sterna hirundinacea</i>	1788	45	2.5

## RESULTS

A total of 2567 seabirds of 22 species was recorded associating with kelp patches but for most species only a small number of individuals and a small proportion of the total number of birds counted were involved (Table 1). Grey-backed Storm-petrel, Grey Phalarope *Phalaropus fulicarius*, Arctic Skua

Table 2 Seabird species recorded feeding on or from free-floating kelp patches in Falkland Islands waters.

Tabel 2. Geregistreeerde zeevogelsoorten foeragerend op of van vrij drijvende zeewiervelden in wateren rond de Falklands.

Species	No. birds feeding on/from kelp	% of total no. of associates	% of total number of birds recorded
Black-browed Albatross	65	30.9	0.1
Southern Giant Petrel	7	35.0	0.3
Cape Petrel	9	4.8	0.1
Unidentified Prions	123	16.5	0.1
Wilson's Storm-petrel	403	96.9	2.6
Black-bellied Storm-petrel	2	100	1.0
Grey-backed Storm-petrel	683	97.7	35.3
Grey Phalarope	1	100	50.0
Antarctic Skua	1	6.2	0.3
Long-tailed Skua	1	5.3	0.5
Kelp Gull	1	2.1	0.1
South American Tern	3	6.7	0.2

*Stercorarius parasiticus* and Long-tailed Skua *S. longicaudus* were the only species of which 10% or more of all birds recorded were associated with kelp. Approximately half of all birds recorded associating with kelp were observed sitting on, or beside it. A number of records however were of birds feeding either on the kelp or on food associated with it (Table 2). Birds recorded as feeding were observed either dipping over the kelp (picking at the surface while airborne) or surface seizing (picking at the surface while sitting on the sea) either from the kelp or from the water in its immediate vicinity. Black-bellied Storm-petrels *Fregatta tropica*, Wilson's Storm-petrels *Oceanites oceanicus* and Grey-backed Storm-petrels were the only species of which the majority of birds involved appeared to be utilizing the kelp as a source of food. However, with the exception of Grey Phalarope where only one bird was involved, Grey-backed Storm-petrel was the only species where more than 30% of the total number of birds recorded during surveys appeared to utilise free-floating kelp patches as a feeding location. Of the species of which more than 1000 individuals were recorded in Falkland Islands waters during the study period, only White-chinned Petrels *Procellaria aequinoctialis* unidentified diving-petrels *Pelecanoides* spp. and Gentoo Penguins *Pygoscelis papua* were never recorded associating with kelp during surveys.

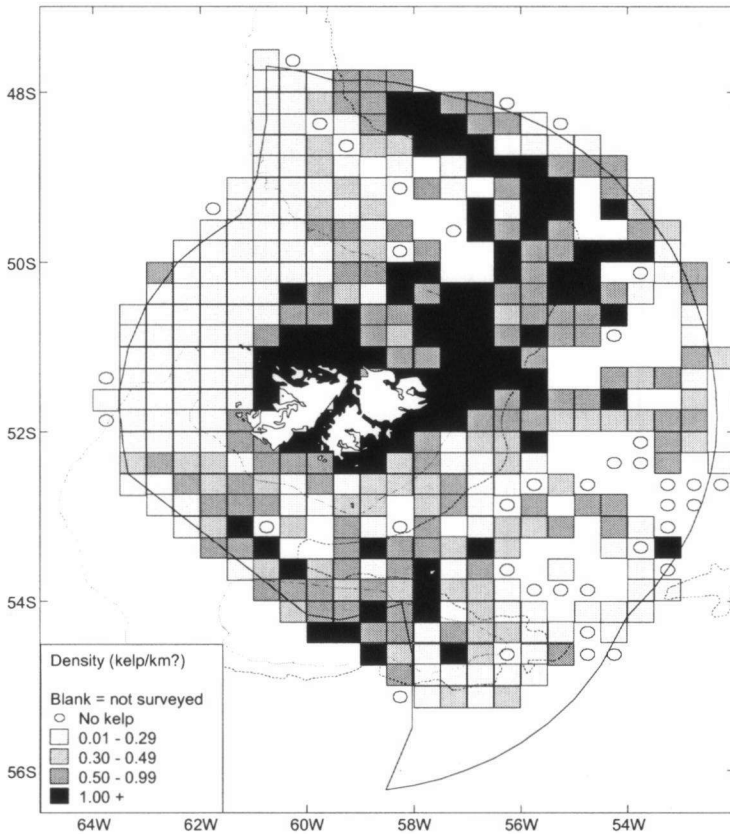
The distribution of free-floating kelp suggests patches drift to the north-east of the islands then along the 1000 m isobath probably carried by the Falkland Current (Fig. 1). Most records and highest densities of kelp-Grey-backed Storm-petrel associations occurred to the north-east of East Falkland, near the 200 m and 1000 m isobaths (Fig. 2). Despite the high densities of kelp in inshore waters around the islands, notably around the north-west and south-east coasts, kelp-Grey-backed Storm-petrel associations were never strong there, nor indeed in any inshore waters. There was a significant correlation between the density of Grey-backed Storm-petrels and the density of kelp patches in ICES rectangles (data from both years combined,  $r = 0.34$ ,  $n = 500$ ,  $P < 0.01$ ). Grey-backed Storm-petrels were recorded during surveys in all months, though rarely in large numbers. Highest numbers were encountered from November to January. The number of kelp-Grey-backed Storm-petrel associations also peaked during this period, as did the number of kelp patches recorded per km travelled; the lowest numbers of both were recorded from March to May (Table 3). The proportion of Grey-backed Storm-petrels associating with kelp showed less seasonal variation although fewest associations were observed from March to May (Table 3).

## DISCUSSION

Free-floating kelp patches appear to serve a number of purposes for seabirds. For some species, e.g. gulls and skuas, they offer alternative rest sites to the open sea. For other species they represent a source of food.

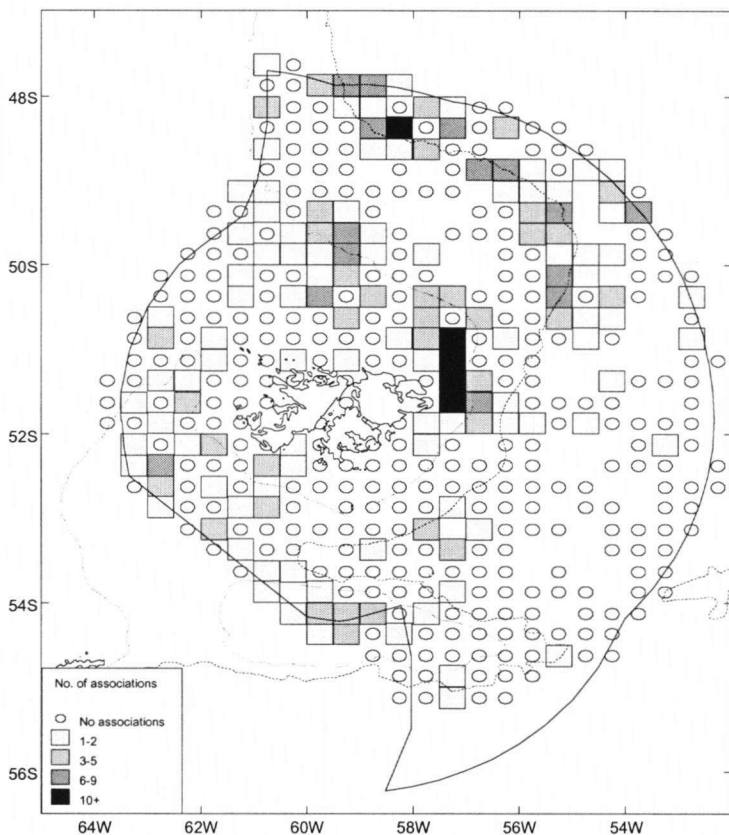
In contrast with other storm-petrels of the southern oceans, the distribution of the Grey-backed Storm-petrel is restricted to the waters south of 35° S (Enticott & Tipling 1997). Studies of Grey-backed Storm-petrel diet have shown that a large proportion of food items taken comprises young of the stalked barnacle *Lepas australis* (Imber 1981; Jouventin *et al.* 1988; Plant 1989). As immature barnacles are considered to be scarce in the surface zooplankton (Grindley & Lane 1979), Imber (1981) suggested that the Grey-backed Storm-petrel is a dietary specialist and proposed that birds pick up young barnacles from mats of floating debris. Its reliance on *L. australis*, whose distribution lies between the Subtropical Convergence and the Antarctic Convergence (Foster 1979), might account for the restricted distribution of the Grey-backed Storm-petrel.

Eades (in Marchant & Higgins 1990), recorded Grey-backed Storm-petrels off Tasmania as feeding by 'pattering' during 75% of observations and 'aerial dipping' in the remainder. Unfortunately, no mention is made of whether the observations were made over kelp or other free-floating debris. Observations in Falkland Islands waters indicate that Grey-backed Storm-petrels



**Figure 1.** Distribution of free floating kelp in %ICES rectangles (15' latitude by 30' longitude) around the Falkland Islands, February 1998-January 2000.

**Figuur 1.** Verspreiding van vrij drijvend zeewier in %ICES-hokken (15' breedte bij 30' lengte) rond de Falklands, februari 1998-januari 2000.



**Figure 2.** Distribution of kelp-Grey-backed Storm-petrel associations in ¼ ICES rectangles (15' latitude by 30' longitude), February 1998-January 2000.

**Figuur 2.** Verspreiding van associaties van zeewier en Grijsrugstormvogeltjes in ¼ ICES-hokken (15' breedte bij 30' lengte) rond de Falklands, februari 1998-januari 2000.

Table 3. Density of kelp patches (kelp km<sup>-2</sup>), number of kelp-Grey-backed Storm-petrel associations (n petrel associations) and the proportion of Grey-backed Storm-petrels that were associating with kelp (% assoc. of all) in each month around the Falkland Islands, February 1998-January 2000.

Tabel 3. Dichtheid van zeewiervelden (kelp km<sup>-2</sup>), aantal associaties van zeewier-Grijsrugstormvogeltjes (n petrel associations) en het aandeel Grijsrugstormvogeltjes dat geassocieerd was met zeewier (% assoc. of all) per maand rond de Falklands, februari 1998-januari 2000.

	kelp km <sup>-2</sup>	n petrel associations	% assoc. of all
Jan	0.111	107	38.62
Feb	0.066	29	22.93
Mar	0.033	19	13.46
Apr	0.015	2	17.65
May	0.006	0	0
Jun	0.042	14	37.21
Jul	0.046	22	39.66
Aug	0.054	14	48.57
Sep	0.066	58	52.78
Oct	0.071	45	46.11
Nov	0.089	146	40.0
Dec	0.109	76	32.43

actively search for free-floating kelp patches as potential sources of food. No studies of Grey-backed Storm-petrel diet have been carried out in the Falkland Islands, and our survey methodology rendered it impossible to identify any prey items taken by storm-petrels feeding over kelp. Imber (1981) stated that the cyprids of pelagic barnacles other than *L. australis* are small and are therefore unlikely to be taken by Grey-backed Storm-petrels, and Foster (1978) suggested that *L. australis* is the only pelagic barnacle in sub-Antarctic seas. It seems likely, therefore, that *L. australis* is the target of Grey-backed Storm-petrels feeding in waters of the Falkland Islands. *Lepas* barnacles have also been found to be a significant component of the diets of Sooty Shearwaters *Puffinus griseus* and Fulmar Prions *Pachyptila crassirostris* (Warham 1996), although our evidence indicates that in Falkland Islands waters the Grey-backed Storm-petrel is the only species to be significantly associated with these crustaceans.

Within Falkland Islands waters the distribution of kelp mirrors well the course of the Falkland Current (Glorioso & Flather 1995). Kelp-Grey-backed Storm-petrel associations have been shown to occur most regularly in areas of high kelp density. The exception to this is in inshore waters where there is no association. If the targeted food source settles only on free-floating kelp patches



that have dislodged for a significant time this may explain the lack of association in inshore waters. Another explanation may be that Grey-backed Storm-petrels are more prone to predation from Kelp Gulls *Larus dominicanus* and/or Antarctic Skuas *Catharacta antarctica* in inshore waters.

Kelp-Grey-backed Storm-petrel associations were recorded in every month except May. May was also the month when least kelp was encountered during surveys. Therefore, it would appear that the fewer kelp-Grey-backed Storm-petrel associations recorded from March to May is at least partly a consequence of fewer kelp patches being present at this time, at least in those waters surveyed. *Lepas australis* is thought to be available as a food source to Grey-backed Storm-petrels year round (Imber 1981) so the observed decline in kelp-Grey-backed Storm-petrels associations is unlikely to be a result of a decline in the availability of *L. australis*.

By targeting free-floating kelp patches, Grey-backed Storm-petrels would appear to specialise in exploiting a food source largely neglected by other seabirds in Falkland Islands waters.

#### ACKNOWLEDGEMENTS

This project was sponsored by Falklands Conservation with funding from the Falklands Operators Sharing Agreement (Shell Exploration and Production South West Atlantic B.V., Amerada Hess (Falkland Islands) Limited, LASMO International Limited and IPC Falklands Limited) in the first year and the Falkland Islands Government (FIG) in the second (and subsequent) years. John Barton of the FIG Fisheries Department provided crucial support in allowing us access to Fishery Patrol Vessels for use as survey bases. Comments from Kees Camphuysen and Jim Reid improved an earlier draft of the paper.

#### GRIJSRUGSTORMVOGELTJES *GARRODIA NEREIS* EN ANDERE ZEEVOGELS GEASSOCIEERD MET VRIJ DRIJVEND ZEEWIER

*Van februari 1998 t/m januari 2000 werden systematische inventarisaties van zeevogels en zeezoogdieren in de zeewateren rond de Falklands uitgevoerd. Tijdens deze tellingen werden o.a. 22 soorten zeevogels (2567 exemplaren) geregistreerd die geassocieerd waren met vrij drijvende zeeviervelden. Grijsrugstormvogeltje *Garrodia nereis*, Kleine Jager *Stercorarius parasiticus*, Kleinste Jager *S. longicaudus* en Rosse Franjepoot *Phalaropus fulicarius* waren de enige soorten waarvan meer dan 10% van alle exemplaren met zeeviervelden was geassocieerd (tabel 1). Ongeveer de helft van deze vogels zat op of naast het zeewier. Van alle soorten was het Grijsrugstormvogeltje de enige soort waarvan een belangrijk deel van het totaal aantal vogels (ca 35%) vrij drijvend zeewier als voedselbron leek te gebruiken (tabel 2). Het was echter niet mogelijk het bemachtigde voedsel te determineren, maar literatuuronderzoek suggereert dat het voedsel bestond uit de eendenmossel *Lepas australis*. De significante correlatie tussen de dichtheid Grijsrugstormvogeltjes en de dichtheid vrij drijvende zeeviervelden wijst er op dat*

*Grijsrugstormvogeltje in de wateren rond de Falklands gespecialiseerd is in het benutten van een voedselbron die grotendeels door andere soorten genegeerd wordt.*

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