# A COMPARISON OF ARCTIC TERN *STERNA PARADISAEA* AND COMMON TERN *S. HIRUNDO* NEST-SITE CHARACTERISTICS ON COQUET ISLAND, NORTH-EAST ENGLAND

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Robinson J.A., Chivers L.S. & Hamer K.C. 2001. A Comparison of Arctic Tern *Sterna paradisaea* and Common Tern *S. hirundo* nest-site characteristics on Coquet Island, north-east England. Atlantic Seabirds 3(2): 49-58. *The nest-site characteristics of Common Terns* Sterna hirundo *and Arctic Terns* S. paradisaea *were examined at a mixed colony at Coquet Island, north-east England. All Common Terns and the majority of Arctic Terns nested within areas of short grass enclosed by swards of much taller and dense vegetation. The majority of these nesting areas had been artificially managed to attract nesting terns. A fifth of all Arctic Tern pairs nested on sandy and shingle beaches. Within vegetated nesting areas, Arctic Terns nested less densely, in larger open areas and in shorter vegetation than did Common Terns. Neither species showed preferences for the types of plants amongst which to nest.*

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## INTRODUCTION

Common Terns *Sterna hirundo* and Arctic Terns *S. paradisaea* breed syntopically over only a small part of their range in northern Europe (Hagemeijer & Blair 1997). Both species nest in a variety of habitats including grassland, dunes and moorland near the coast, offshore islands and inland lochs and even on arable land yet Arctic Terns tend to be more maritime than Common Terns (Lloyd *et al.* 1991). The two species are colonial and often nest in close proximity to each other (Cramp 1985). However, within a site, the nesting areas of the two species are generally discrete, suggesting that differences in habitat preference and/or interspecific competition prior to egg-laying determine nest-site selection.

Both Common and Arctic Terns nest at high densities at relatively few sites around the UK and are therefore prone to the effects of localised catastrophic events. For these reasons, conservation actions are focused at protecting and managing colonies effectively to maintain or improve the conservation status of these species. Most of the largest colonies of Arctic and

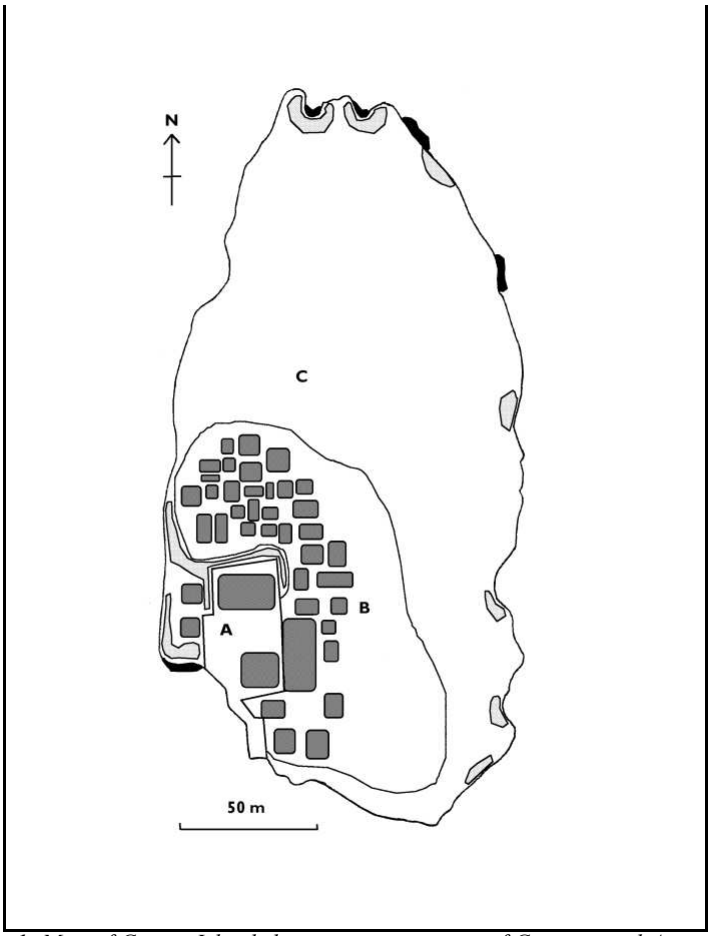


*Figure 1. Map of Coquet Island showing nesting areas of Common and Arctic Terns in 1998. Nesting sites in managed plots are shaded in dark grey, in short vegetation outside of managed plots in light grey polygons, and on beaches in black. The area marked A is a walled lighthouse enclosure, B is a dense nettle bed interspersed with managed plots for nesting terns, and C is a Puffin/large gull colony.*

*Figuur 1. Coquet-eiland met nestplaatsen van Visdief en Noordse Stern in 1998. Donkergrijs = nestplaatsen in beheerde plots; lichtgrijze polygonen = nestplaatsen in korte vegetatie buiten de beheerde plots; zwart = nestplaatsen op stranden. A = ommuurde "vuurtoren-enclosure"; B = dicht begroeide netelvegetatie met verspreid beheerde plots; C = kolonie van Papegaaiduiker en grote meeuwen.*

Common Terns throughout northern Europe are already protected under national legislation and managed specifically for their benefit.

At colonies where the two species nest within vegetation, traditional nesting areas are often managed to provide expanses of short grass, favoured by nesting adults, enclosed by swards of higher and denser vegetation which provide chicks with shelter and protection from predators during the nestling period. Herbicidal sprays are used to assist with this vegetation management and are applied several weeks before the terns return to a site to avoid any potential negative effects to breeding birds. However, due to the varying effectiveness of spraying techniques there is often a high degree of variation in the species-richness and tallness of vegetation in managed areas. Although this method of vegetation management is extremely successful in attracting breeding terns, there are no data to indicate why different species of terns choose some managed areas and not others. Furthermore, although there is some quantitative information on nest-site differentiation between Arctic and Common Terns (Langham 1974; Boecker 1967), very little statistical information has been presented.

In this paper, we compare the characteristics of nest-sites used by Common and Arctic Terns at a large mixed colony in north-east England and provide statistical evidence for differences.

## STUDY SITE

This study was carried out from 24 May to 8 June 1998 at Coquet Island (55 20'N, 1 32'W) which is a small low-lying island 1 km off the coast of Northumberland, north-east England where large colonies of Arctic and Common Terns nest synchronously in close proximity, but in discrete areas using both semi-natural and managed habitats. This island is managed by the Royal Society for the Protection of Birds primarily for the benefit of breeding seabirds. In 1998, approximately 800 pairs of Common Terns and 850 pairs of Arctic Terns nested on the island. Timing of peak laying was similar for both species (modal laying dates for the colony: Arctic Tern 25 May; Common Tern 26 May).

The plateau of the island is approximately 5 ha in area. In 1998, over half of the plateau was covered in thick nettle beds (predominantly *Urtica urens* with smaller areas of *U. dioca*) interspersed with rectangular areas of grass managed specifically for the terns, hereafter referred to as plots (Fig. 1). To maintain the vegetation structure within these plots, conventional herbicides were sprayed in autumn 1997 and in early spring 1998, at least one month prior to the return of the breeding terns. The herbicides chosen do not persist beyond a one-month period and therefore have no effect on the birds breeding on the island. Black-headed Gulls *Larus ridibundus* (2 100 pairs), Roseate Terns *S.*

*dougallii* (29 pairs) and Sandwich Terns *S. sandvicensis* (1 900 pairs) also nested on the island, often within the managed plots or in close proximity, but generally discretely, to the Arctic and Common Terns.

Most of the remaining area of the plateau not covered by nettles or managed plots was honeycombed by the burrows of approximately 11 500 pairs of Puffins *Fratercula arctica* (Fig. 1). Much of this area was covered in bare sandy soil interspersed with small patches of nettles and tall grasses within which Herring Gulls *L. argentatus* (c.25 pairs) and Lesser Black-backed Gulls *L. fuscus* (c.95 pairs) also nested. Shorter vegetation, similar to that found within plots, was present on paths which led up to a lighthouse from the shoreline and on the very edges of the plateau. The island was surrounded by mostly rocky shoreline with several small sandy and shingle beaches.

## METHODS

The gross habitat types used by nesting pairs of both species were recorded on 7 June at the same time as the numbers of breeding pairs were counted. Gross habitat types would not have changed between the time of laying and the date of the survey and, since 7 June was 20 days after the first Common Tern egg had been laid, the timing of the survey allowed the maximum number of clutches to be attributed to gross habitat types prior to the hatching of the first chick. Nest-sites were allocated to one of the following categories: managed plots; vegetated areas outside of managed plots (predominantly paths); shingle beaches; and sandy beaches. The availability of suitable habitat not used by these species was also assessed. The perimeter of each discrete vegetated nesting area was measured to the nearest 1 cm with measuring tape. Boundaries of these areas were defined by dense nettle beds or the edge of the plateau. This information was then used to calculate the area of each discrete vegetated area and nest density within (no. of nests per $m^2$).

Micro-habitat surveys were carried out between 24 and 26 May, the period of peak laying for both species, in managed plots and other discrete vegetated areas. Transects were made throughout the vegetated areas and sampling points were taken at randomly selected distances along each transect (between one and nine metres selected using random number tables). At each sampling point a one metre squared quadrat was held just above the ground to avoid damaging eggs. Within each quadrat the following eight habitat variables were measured: % coverage by vegetation 0-5 cm; % coverage by vegetation 5.5-10 cm; % coverage by vegetation 10.5-30 cm; % coverage by grasses; % coverage by thistles; % coverage by nettles; % coverage by bugloss; % coverage by bare ground. The vegetation on Coquet Island is dominated by very few plant species. Therefore, rare plant species (i.e. those occupying less than 1% coverage of total area sampled) were omitted from statistical analyses.

*Table 1. Habitat coverage of Coquet Island at mean high water mark and use by nesting Common and Arctic Terns in 1998.*

*Tabel 1. Verdeling van habitats op Coquet Eiland bij gemiddeld hoog water en gebruik door Visdiefen Noordse Stern in 1998.*

| Gross habitat type | Estimated coverage of island (%) | % of total no. of breeding pairs | |
|---|---|---|---|
| | | Common Tern ($n$ = 805) | Arctic Tern ($n$ = 843) |
| Managed plots (short grass) | 16 | 91 | 60 |
| Short vegetation outside of managed plots | 10 | 9 | 23 |
| Dense nettle beds | 18 | 0 | 0 |
| Puffin/large gull colony (sandy soil) | 40 | 0 | 0 |
| Shingle shores | 5 | 0 | 16 |
| Sandy shores | 3 | 0 | 1 |
| Rocky shores | 8 | 0 | 0 |

Linear discriminant analysis was used to differentiate between the micro-habitats used by nesting Common and Arctic Terns. This technique compares the between-group variation to the within-group variation and establishes optimal separation of groups based on linear transformation of the independent variables (Green 1971; Gauch 1982). The statistical package SPSS (Norusis 1994) was used to conduct this analysis.

All variables were transformed prior to the discriminant analysis to ensure that all skewed data distributions were normalised. Proportions were arcsine transformed, other continuous variables were logarithmically transformed and counts were square-root transformed (Sokal & Rolhf 1969). The percentage of nests classified correctly was used to indicate the effectiveness of the analysis (Clark *et al.* 1983; Rice *et al.* 1983). Statistically significant differences between groups were based on one-way ANOVAs using the discriminant scores as the dependent variable and the two group variables as the independent variables (Norusis 1994).

## RESULTS

**Gross habitat types used by nesting Arctic and Common Terns** The distribution of Common and Arctic Tern nest-sites on Coquet Island in 1998 is shown in Figure 1. Of the 54 plots managed specifically for the terns 13 (24%) were not occupied by either Arctic or Common Terns on 7 June. These plots were occupied by nesting Black-headed Gulls and Sandwich Terns. A high

proportion of the nests of Common and Arctic Terns were found within the vegetated plots that had been managed specifically for the purpose of attracting terns (Table 1). Common Terns nested exclusively in vegetated areas on the plateau of the island whereas many Arctic Terns also nested on shingle beaches and, to a much lesser extent, on sandy beaches (Table 1). Vegetated areas not sprayed but which held large numbers of nesting Common and predominantly Arctic Terns were situated on paths leading from the shoreline to the lighthouse and on small areas of short vegetation towards the edge of the plateau. Both species avoided dense nettle beds, rocky shorelines and predominantly bare areas of the island with high concentrations of Puffin burrows and nesting large gulls (Table 1).

*Table 2. Habitat variables measured at the nest-sites of Common and Arctic Terns on Coquet Island 1998 and the results of the discriminant analysis. D.A. scores presented in the table are unstandardised canonical coefficients.* * $P < 0.01$; ** $P < 0.001$.

*Tabel 2. Habitatkenmerken gemeten op nestplaatsen van Visdief en Noordse Stern op Coquet Island 1998 en resultaten van discrimant analyse. D.A.-scores in de tabel zijn niet-gestandaardiseerde, kanonieke coëffiënten.* * $P < 0.01$; ** $P < 0.001$.

| Habitat variable | Common Tern | Arctic Tern | D.A. score | %correct | *F* value |
|---|---|---|---|---|---|
| | mean ± S.D. | mean ± S.D. | | | |
| % 0-5 cm | 67.5 ± 22.9 | 68.5 ± 26.8 | -0.34 | 52.4 | 0.2 |
| % 5.5-10 cm | 21.2 ± 20.5 | 30.0 ± 27.3 | -0.08 | 67.7 | 7.3* |
| % 10.5-30 cm | 11.4 ± 16.2 | 2.0 ± 8.1 | -0.09 | 75.8 | 17.7** |
| % grass | 72.2 ± 23.7 | 78.9 ± 19.4 | -0.00 | 54.8 | 2.1 |
| % thistle | 6.8 ± 8.7 | 3.9 ± 10.1 | -2.37 | 58.1 | 1.3 |
| % bugloss | 2.6 ± 5.8 | 1.2 ± 5.5 | 1.21 | 62.9 | 1.0 |
| % nettle | 2.9 ± 4.5 | 2.9 ± 7.6 | 1.26 | 41.9 | 0.0 |
| % bare ground | 13.9 ± 22.1 | 10.0 ± 16.2 | -1.08 | 53.2 | 0.7 |
| Area ($m^2$) | 141.7 ± 122.6 | 628.9 ± 522.9 | 8.42 | 99.9 | 198.7** |
| Nest density ($n\ m^{-2}$) | 0.2 ± 0.2 | 0.1 ± 0.1 | 49.05 | 83.9 | 289.5** |
| All variables | - | - | - | 100 | 177.4 |

**Micro-habitat selection within vegetated areas** The discriminant analysis correctly classified 100% of Arctic and Common Tern nests based on all variables (Table 2). Vegetation height, nest density and plot area were the variables best distinguishing nest-sites of the two species (Table 2). Arctic Terns nested in less densely occupied sites of greater open area than did Common Terns. Both species nested in areas where the vegetation height was predominantly 0-5 cm with much smaller areas of vegetation over 5 cm tall.

However, Arctic Terns nested in areas with a higher proportion of medium height vegetation coverage and a lower proportion of tall vegetation coverage than did Common Terns (Table 2). There was no difference between the two species in the types of vegetation present at the nest-site; both species nested in areas covered predominantly with grasses (Table 2 ) with smaller areas of nettle, bugloss *Lycopsis arvenis* and thistle (*Sonchus* and *Cirsium* spp.).

## DISCUSSION

In this study, the majority of Arctic and Common Terns at Coquet Island nested within vegetated areas managed specifically to provide expanses of short grass enclosed with swards of higher and denser vegetation (Table 1). Other areas of naturally short vegetation were also favoured. Arctic Terns were more cosmopolitan in their choice of nest-site than were Common Terns, the former nesting on small shingle and sandy beaches as well as within vegetated areas on the plateau of the island (Table 1). However, breeding success was low at the beach sites due to tidal inundation during spring series in July (RSPB unpubl. data).

All of the available managed plots (i.e. those without nesting Black-headed Gulls or Sandwich Terns which laid eggs much earlier than the two study species) were occupied by Common and Arctic Terns, together with small numbers of Roseate Terns. Furthermore, very little (< 5%) of the suitable vegetated habitat outside of the managed plots had been left unoccupied by breeding terns. Within-plot nesting density was low compared to that measured at other colonies (Table 2; c.f. Nisbet & Drury 1972; Coulson & Horobin 1976; Bullock & Gomersall 1981; Richards & Morris 1984; Neubauer 1998) which might suggest that the two species could have nested at higher concentrations. However, site-specific characteristics such as nest-site substrate, colony size or predation pressure are important determinants of nesting density at a site (Boecker 1967). Therefore, it is unclear whether these two tern species were nesting at optimal densities at Coquet Island in 1998.

These results suggest that interspecific competition may be of some importance in determining nest-site selection at Coquet Island because the areas available for these two species were confined and very few potentially suitable habitats were left unoccupied in 1998. However, clear differences between the micro-habitats occupied by the two species indicated that there was a certain degree of species-specific choice of nest-site within vegetated areas.

Discriminant analysis has been used in many previous studies to investigate interspecific variations in nest-site selection (e.g. Rice *et al.* 1983; Ramos & Del Nevo 1995; Calladine 1997). The results of our discriminant analysis confirmed much of what has been suggested for Arctic and Common Terns previously (Boecker 1967; Langham 1974; Neubauer 1998). Our analyses

showed that within vegetated areas, Common Terns chose to nest in those which had a slightly higher proportion of tall vegetation than those where Arctic Terns nested (Table 2). Benefits of nesting in well vegetated areas may include enhanced nest site recognition by chicks and adults, protection of chicks and adults against predators, and/or shelter from inclement weather conditions (Bloeckpoel *et al.* 1978; Burger & Lesser 1978). However, extremely dense vegetation may make a site unattractive to nesting Common Terns, possibly because of reduced site recognition (Courtney & Blokpoel 1983). Arctic Terns have longer wings and shorter legs than Common Terns, so it may be more difficult for Arctic Terns to lift from, walk and land in areas of higher vegetation (Cramp 1985). In this study, both species nested in similar types of vegetation, i.e. predominantly grasses with scattered areas of taller plants such as nettle, thistle and bugloss (Table 2).

The results also showed that Common Terns nested in smaller plots and nested at higher density than did Arctic Terns at Coquet Island in 1998 (Table 2). Many previous studies of breeding density at Coquet Island and elsewhere have also shown that, in general, Arctic Terns nest less densely than do Common Terns (Nisbet & Drury 1972; Langham 1974; Cramp 1985). The reasons for this difference remain unclear.

Although the effects of interspecific competition may be important in determining the nest-site locations of these two species when available nest-sites are limited, the results of this study provide some indications as to how Coquet Island could be managed further for the benefit of these two species by increasing suitable habitat types. Experimental manipulation of the vegetation on Coquet should be encouraged in the future to determine whether such management techniques could be successful in attracting target species. Similar work has been successfully undertaken elsewhere (Richards & Morris 1984; Fasola & Canova 1996).

To summarize, the results of this study show that, on Coquet Island, although both species nest predominantly in vegetated areas, Common Terns nest in smaller plots with higher vegetation and more densely than do Arctic Terns and that this can be shown statistically. However, species-specific nest-site preferences can differ markedly between sites (Ramos & Del Nevo 1995). For example, at many sites Common Terns nest in areas with little or no vegetation, in contrast to the results of this study (Burger & Lesser 1978; Richards & Morris 1984; Neubauer 1998; Sudmann 1998). Furthermore, traditional nesting areas may be used annually, irrespective of changes in vegetational succession (Blokpoel *et al.* 1978). We therefore recommend that the nest-site requirements of these two species should be determined on a site-specific basis wherever this is possible.

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EEN VERGELIJKING TUSSEN NESTPLAATSKARAKTERISTIEKEN VAN DE NOORDSE STERN *STERNA PARADISAEA* EN HET VISDIEFJE *S. HIRUNDO* OP COQUET ISLAND, NOORDOOST-ENGELAND

*De karakteristieken van broedplaatsen van Noordse Sterns* Sterna paradisaea *en Visdiefjes* Sterna hirundo *werden in 1998 onderzocht en vergeleken in een gemengde kolonie op Coquet Island, aan de noordoostkust van Engeland. Alle Visdiefjes en de meeste Noordse Sterns nestelden op plekken met kort gras, omgeven door stroken met een veel hogere, dichte vegetatie. De meeste nesten werden gevonden in stukken waar het beheer was afgestemd op het creëren van een aantrekkelijke broedbiotoop voor sterns door de vegetatie kort te houden. Noordse Sterns hadden een bredere biotoopkeus dan Visdiefjes: ongeveer een vijfde van alle Noordse Sterns nestelde op kale zand- en grindstranden (tabel 1). In de begroeide gebiedjes kwamen de Noordse Sterns hoofdzakelijk op de meest kale plekken tot broeden, in veel lagere dichtheden dan Visdieven. Vegetatiehoogte, nestdichtheid en plotgrootte bepaalden het verschil in nestplaats grotendeels (tabel 2). Geen van beide soorten had een duidelijke voorkeur voor de plantensoorten in de nabijheid van het nest.*

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# BREEDING GULLS AND TERNS IN SENEGAL IN 1998, AND PROPOSAL FOR NEW POPULATION ESTIMATES OF GULLS AND TERNS IN NORTH-WEST AFRICA

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Keijl G.O., Brenninkmeijer, A., Schepers, F.J., Stienen, E.W.M., Veen, J. & Ndiaye A. 2001. Breeding gulls and terns in Sengal in 1998, and proposal for new population estimates of gulls and terns in north-west Africa. Atlantic Seabirds 3(2): 59-74. *In May 1998 breeding gulls and terns were surveyed in National Parks Langue de Barbarie and Sine-Saloum Delta, Senegal. This was the first near-complete census of breeding gulls and terns in this part of Senegal. The most numerous breeding species were Grey-headed Gulls* Larus cirrocephalus *(7565 pairs), Slender-billed Gulls* L. genei *(5550 p), Royal Terns* Sterna maxima *(22 693 p) and Caspian Terns* S. caspia *(>8620 p), while Common Terns* Sterna hirundo *(70 p) and Gull-billed Terns* Gelochelidon nilotica *(8 p) occurred in low numbers. The first four species were more numerous than expected from published accounts, the latter two occurred in smaller numbers than expected. Little Tern* Sterna albifrons *(35 p) and Kelp Gull* Larus dominicanus *(1 p) also bred in low numbers. The species are discussed, and a literature review of numbers breeding in the past is presented. Because Senegal, together with the Banc d'Arguin in Mauritania, are the most important areas for breeding gulls and terns in west Africa, and while recent counts are now available from both areas, new population estimates are given and new 1%-levels proposed. There are several threats to breeding birds, among which eggcollecting and overfishing, and the need for proper protection is outlined. Both the islands along the Senegalese coast and the Banc d'Arguin in Mauritania are of major importance for the west African subspecies of Royal Tern, of which almost the entire population breeds in Senegal and Mauretania. Mauritania is of great significance for the east Atlantic population of Bridled Tern* Sterna anaethetus, *a separate subspecies; this population may nowadays comprise as few as 100 pairs, but recent counts are not available.*

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## INTRODUCTION

The north-west coast of Africa supports a prolific seabird community throughout the year. Especially important to seabirds are the shallow areas of the Banc d'Arguin in Mauritania, the Senegal River Delta, Ile de la Madeleine, the Delta of the Sine-Saloum, and the mangrove area in Guinea-Bissau (*e.g.* Cooper *et al*. 1984; Cramp & Simmons 1983; Cramp 1985; Burger & Gochfeld 1996; Gochfeld & Burger 1996). There are areas, such as the mouth of the Gambia river in Gambia, and the Casamance in the south of Senegal, that have not been censused yet, but it is likely that they too support seabird colonies. Even although much attention has been devoted to breeding seabirds in these areas in the past (for Senegal: de Naurois 1964; Latour 1973; Dupuy 1975; 1976; 1983; 1984; Erard 1975; Gowthorpe 1979; Delaporte 1991; for the Banc d'Arguin: Cooper *et al*. 1984; Gowthorpe *et al*. 1996), attention has usually focused on terns, especially Royal Terns *Sterna maxima*, while numbers of non-target species have been estimated, often by obscure methods.

Because of the importance of the Senegalese coast for breeding seabirds, and the lack of recent and detailed data, a census was carried out in May 1998. Colonies of gulls and terns were visited at the Langue de Barbarie and the Sine-Saloum Delta. In this paper we report on the results of the survey.

Since the most important areas for breeding gulls and terns in north-west Africa are located in Mauritania and Senegal (Cramp & Simmons 1983; Croxall *et al*. 1984; Cramp 1985; Nettleship *et al*. 1994; del Hoyo *et al*. 1996) we feel that, after the census in 1998, it is possible to give a reliable population estimate for most species breeding along the entire north-west African coast (Morocco to Liberia, including the Madeiran islands, Selvagen islands, Canary Islands and Cape-Verde Islands). We also propose new 1%-levels for the gulls and terns breeding in this area (*cf.* Rose & Scott 1997).

## METHODS

In 1998 the following areas were visited: Ilot aux Oiseaux at Parc National Langue de Barbarie and Parc National Guembeul (17 May), and the salines at Kaolack (20 May), Ile aux Oiseaux (18-25 May, with an additional visit from 21-28 July), Ile de Sangomar (26 May), Ile Senghor (26 May) and the sandbanks north of Ile aux Oiseaux (26 May; Figure 1) at Parc National du Delta du Sine-Saloum. The survey was carried out in the second half of May because this appeared to be the main breeding period for Royal Terns (*e.g.* Delaporte 1991). Nests of gulls and terns (*i.e.* Grey-headed Gull *Larus cirrocephalus*, Slender-billed Gull *L. genei*, Kelp Gull *L. dominicanus*, Gull-billed Tern *Gelochelidon nilotica*, Caspian Tern *S. caspia*, Common Tern

*Figure 1. National Park Langue de Barbarie and National Parc Sine-Saloum Delta in west Africa. Sites with large colonies of gulls and terns in 1998 are indicated with asterisks.*

*Figuur 1. Ligging van Nationaal Park Langue de Barbarie en Nationaal Park Sine-Saloum Delta in West-Afrika. De grote meeuwen- en sternkolonies in 1998 zijn met sterretjes aangegeven.*

*Table 1. Counted or estimated numbers of breeding gulls and terns at Langue de Barbarie (including National Park Guembeul) and Sine-Saloum Delta (Ile aux Oiseaux, Ile Senghor, salines at Kaolack) in Senegal in May 1998.*
*Tabel 1. Getelde of geschatte aantallen broedende meeuwen en sterns op Langue de Barbarie (inclusief Nationaal Park Guembeul) en Sine-Saloum Delta (Ile aux Oiseaux, Ile Senghor, zoutpannen Kaolack) in Senegal in mei 1998.*

| Species | Langue de Barbarie | Sine-Saloum | Total |
|---|---|---|---|
| Grey-headed Gull *Larus cirrocephalus* | 3000 | 4565 | 7565 |
| Slender-billed Gull *L. genei* | 2100 | 3450 | 5550 |
| Kelp Gull *L. dominicanus* | 0 | 1 | 1 |
| Total gulls | 5100 | 8016 | 13 116 |
| Gull-billed Tern *Gelochelidon nilotica* | 0 | 8 | 8 |
| Caspian Tern *Sterna caspia* | >10* | 8610 | >8620 |
| Common Tern *S. hirundo* | 0 | 70 | 70 |
| Little Tern *S. albifrons* | 35 | 0 | 35 |
| Royal Tern *S. maxima* | 1650 | 21 043 | 22 693 |
| Total terns | >1695 | 29 731 | >31 426 |

* 10 fledglings

*S. hirundo* and Royal Tern) were counted one by one. Gull nests of the previous year were easily recognisable as such and were not included. At Langue de Barbarie, however, Caspian Terns had almost completed their breeding cycle, and the majority of young birds had already fledged. Therefore an estimate of the breeding population was made on basis of the number of adult and young birds present, and by counting the empty nests in the colonies. Royal Terns were still breeding, but there were also pairs with large young. The colony of Grey-headed Gulls at Langue de Barbarie was partly counted, after which numbers were extrapolated. For details on counting methods on Ile aux Oiseaux, which differed according to species, see Keijl *et al*. (2000).

## RESULTS AND LITERATURE REVIEW

A total of 16 waterbird species (including herons, egrets and ibises) was found breeding in coastal Senegal in 1998. Among these were three species of gull and five species of tern (Table 1). In 1998, the Langue de Barbarie supported at least 5100 pairs of gulls and at least 1700 pairs of terns. In the Sine-Saloum Delta (including the salines at Kaolack) 8016 pairs of gulls and 29 731 pairs of terns were counted, giving a grand total of 44 574 pairs. The majority comprised only four species: Grey-headed Gull, Slender-billed Gull, Caspian and Royal Tern.

**Grey-headed Gull *Larus cirrocephalus*** In 1998, 7565 nests were counted along the Senegalese coast. The species also breeds on the Banc d'Arguin, Mauritania, with 50 pairs in 1984; *c*. 25 pairs during 1984-1985 and 10-20 pairs in 1995 (Campredon 1987; Lamarche 1988; Gowthorpe *et al*. 1996). Apart from the colonies in Senegal, there are apparently no breeding sites holding large numbers along the entire south and west African coast (Cooper *et al*. 1984; Nettleship *et al*. 1994; Gatter 1997; Hafner *et al*. 1998; Brooke *et al*. 1999). Our results show that the population estimate for Grey-headed Gull in west Africa given by Cooper *et al*. (1984; Table 3) is much too low. Moreover, even though most of the Grey-headed Gulls breed from mid-May onwards, the species apparently has an extended breeding season, with pairs possibly starting as early as March, while others are still seen with small young as late as July (wardens of Ile aux Oiseaux pers. comm). We estimate that the north-west African population presently holds about 10 000 pairs, corresponding to a 1%-level of 300 individuals.

**Slender-billed Gull *Larus genei*** In 1998, 5550 nests were counted. Interestingly, Cooper *et al*. (1984) mentioned 2850 pairs in west Africa (Table 3; numbers based on Dupuy 1976; Trotignon *et al*. 1976 and Gowthorpe 1979), while in the same year Dupuy (1984) reported the species to be "on the increase" and estimated the population at the Langue de Barbarie, in the Sine-Saloum Delta, and at Kalissaye (S-Senegal) combined at 5000 pairs. In contrast to Grey-headed Gull, the entire population of Slender-billed Gulls appears to breed simultaneously in May-June. In 1998, 1776 were counted on the Banc d'Arguin (Hafner *et al*. 1999). The (derived) estimate of Rose & Scott (1997) is 3333 breeding pairs. The present estimate for the entire north-west African population is 7500 pairs, with a 1%-level of 225 individuals.

**Kelp Gull *Larus dominicanus*** During our visit (18-25 May) there were up to four (sub) adult Kelp Gulls present on Ile aux Oiseaux. A nest was found on 25 May, close to a Caspian Tern subcolony. It contained one chick of one day old, one recently hatched ('wet') chick and one egg (photo on p. 27 in Keijl *et al*. 2000). This is the third breeding record of this species in Senegal. The first nest was found between 26-30 June 1980 on Ile Téréma (a small island close to Ile aux Oiseaux) and probably belonged to a mixed pair of Kelp Gull and Lesser Black-backed Gull *L. [fuscus] graellsii* (Dupuy 1984). A second nest was found on Ile aux Oiseaux between 28-30 May 1983 (Erard *et al*. 1984). This pair of Kelp Gulls is probably the only one breeding in the northern hemisphere, and is the northernmost one in Africa (*cf.* Burger & Gochfeld 1996).

**Gull-billed Tern *Gelochelidon nilotica*** Only eight nests of Gull-billed Terns were found at the salines near Kaolack. It is possible that the number would have increased further in the course of the season, because some tens of adults present in the area could have been birds that had not started breeding yet (*cf.* Browne 1981; Hafner *et al.* 1999). On the other hand, it is also possible that Gull-billed Terns declined considerably since the early 1970s. Outside Senegal, Gull-billed Terns in North-Africa breed only in the Mediterranean, possibly a few pairs every year (Glutz von Blotzheim & Bauer 1982; Meininger *et al.* 1994), and in Mauritania; on the Banc d'Arguin 1600 pairs bred in 1978, on Aftout es Sahéli, Toumbos, an other 1850 pairs bred in September 1987; and 80 kilometres south of Nouakchott there were *c.* eight more pairs (Trotignon 1980 in Browne 1981; Lamarche 1988). More recently, numbers in Mauritania have apparently been lower; after a minimum of 250 pairs in 1994 on the Banc d'Arguin, 660 pairs were counted there in 1995; and in the same year there were 15 pairs near Nouakchott (Gowthorpe *et al.* 1996). In 1972 and 1973 Gull-billed Terns bred with 200 and 300 pairs respectively at the mouth of the Senegal river (Latour 1973), but we have no information on the present situation or on the intervening period. Hafner *et al.* (1999) did not mention Gull-billed Terns as a breeding species during their recent census on the Banc d'Arguin. The colony at Kaolack is the southernmost one in Africa (Cooper *et al.* 1984). Rose & Scott (1997) give 12,000 individuals for west-Europe and north-west Africa together, corresponding to 4000 breeding pairs. In west Europe there are presently about 2000 breeding pairs (Biber 1994; Gochfeld & Burger 1996); this leaves 2000 pairs for the entire African continent (*i.e.* north-west and north Africa). We estimate that the north-west African population presently holds 800 pairs, which corresponds to a 1%-level of 24 individuals.

**Caspian Tern *Sterna caspia*** Caspian Terns seem to have increased markedly during the past decade; in 1991 the number was estimated at 4700 pairs on Ile aux Oiseaux (Delaporte 1991), but in 1998 we counted 8600 pairs. On Langue de Barbarie, it was not possible to make even a rough estimate of the population, as the breeding season was already finished and only some large fledglings with adults were present. The colony numbered at least 10 pairs. Cooper *et al.* (1984) reported 2400 pairs for the entire north-west African coast, and Gochfeld & Burger (1996) estimated the population at 5000 pairs. Although the situation on the Banc d'Arguin is obscure, because breeding takes place continuously from February until June (Hafner *et al.* 1999; this is also the case in Senegal), the Mauritanian population numbers at least 4000 pairs. (Hafner *et al.* 1999 give a total of 10 903 breeding pairs, but this seems a summation of all numbers counted on eight occasions between 23 February and 8 June 1998.) South of Ile aux Oiseaux Caspian Terns bred in the past with about 1500 pairs in

Gambia and the Casamance, and 400-600 pairs in Guinea-Bissau (Britton 1986), although Brenninkmeijer *et al*. (1998) counted only 84 nests there in November 1992. Rose & Scott (1997) give a breeding population of 4000 pairs. We estimate the present north-west African population at 13 500 breeding pairs, and a 1%-level of 405 individuals.

Caspian Tern *Reuzenstem* (photo Frans Schepers).

**Common Tern *Sterna hirundo*** We estimated the population on Ile Senghor at 45 pairs and the one on Ile aux Oiseaux at 25 pairs. Numbers at Ile Senghor were difficult to estimate though, because the entire colony was plundered by fishermen immediately prior to our visit. The number of Common Terns at Ile aux Oiseaux was difficult to estimate as well, because the nests were scattered along the edge of the entire gull colony. Because of predation by gulls, the time spent near the Common Tern nests was kept to a minimum. The hundreds of pairs of Common Tern in the Sine-Saloum Delta, mentioned by de Naurois (1964), have probably largely disappeared. Erard (1975) counted 'some dozens' on Ile aux Oiseaux in June 1974; while Gowthorpe (1979) counted only eleven nests on the same island a few years later. Even though Dupuy (1984) noted that the species increased along the Senegalese coast, Delaporte (1991) found only 28 nests in the Sine-Saloum Delta. The only other location in Senegal where Common Terns are known to breed is the Casamance. Elsewhere along the north-west African coast breeding sites are found on the Banc d'Arguin,

Mauritania, with approximately 200 pairs in 1974 (Trotignon 1976), and (in unknown numbers) in Western Sahara, Guinea-Bissau, Nigeria and Libya (Britton 1986). On the Banc d'Arguin, however, the species was not encountered during the most recent censuses (Hafner *et al*. 1998; 1999, but note that these were conducted by aeroplane). There are no indications for breeding in Libya at present (*cf.* Meininger *et al*. 1994). Rose & Scott (1997) give a breeding population of 400 pairs for the entire Afrotropical region. We estimate the present north-west African population at 200 pairs and the 1%-level for north-west African breeding birds at six individuals.

**Little Tern *Sterna albifrons*** In 1998, adult Little Terns were seen only at Langue de Barbarie and near Pointe de Sangomar, Sine-Saloum Delta, but no nests were found. The species breeds every year in Guembeul with 35-50 pairs, and with *c*. 35 pairs on Langue de Barbarie (Mbaye Diop pers. comm.), but breeding starts somewhat later in the season. On the Banc d'Arguin, the number was estimated at 25-50 pairs in 1974 (Trotignon *et al*. 1976). There are no recent indications of breeding in Mauritania (Hafner *et al*. 1998; 1999, but note that these censuses are done from aeroplanes, and breeding Little Terns are notably difficult to count because they often breed solitarily, and pairs may be spread over a large area). There is no population estimate for this species in Rose & Scott (1997). We propose a population estimate for north-west Africa (excluding the Mediterranean) of 100 pairs and a 1%-level for individuals of three.

**Royal Tern *Sterna maxima*** In 1998 we counted almost 23 000 breeding pairs, of which over 21 000 on Ile aux Oiseaux. Together with Mauritania, where a maximum of 11 041 was counted in May-June 1998 (Hafner *et al*. 1998), at least 34 000 pairs were breeding in west Africa in 1998. (In June 1999, however, there were about 43 000 pairs on Ile aux Oiseaux - pers. obs.) Between 1960 and 1998, Royal Terns have been found breeding at the Banc d'Arguin, Mauritania, at the Langue de Barbarie, Pointe de Sangomar, Ile aux Oiseaux, and in the Casamance (all in Senegal), in Gambia, and in Guinea-Bissau, but apparently did not breed every year on every site. In Western Sahara the species did not breed in the 1950s (Valverde 1957), but there is no information before and after this period. In 1974; Erard (1975) saw three displaying pairs on Ile aux Oiseaux, while in the same year Dupuy (1975) found 10 000 chicks on the south point of Pointe de Sangomar, Sine-Saloum Delta. In Gambia and the Casamance (south Senegal) the species bred in the early 1960s (Morel & Roux 1966), but we have no information from these areas from recent years. De Naurois (1964) and Morel & Roux (1966) named several of the above mentioned locations of breeding in west Africa, but not the Sine-Saloum Delta, so either this site was

not visited by them in the 1960s or, more likely, the species was not breeding there. The Royal Terns regularly shift between breeding sites, resulting in seemingly large fluctuations at any site; in Mauritania for instance, the population fluctuated between 3000 and 16 911 pairs during 1984-1998 (Hafner *et al*. 1999; although this may have been due also to variation in counting dates between years, coverage of the area, or differences in census methods). The reason for shifting of breeding site is unclear. The north-west African population was recently estimated at only 25 000 pairs by Gochfeld & Burger (1996), but this seems very low, as Delaporte (1991) found many more in 1991: 2650 on Langue de Barbarie and 27 500 on Ile aux Oiseaux. Rose & Scott (1997) gave a population estimate of 16 667 pairs. We estimate the population at 43 000 pairs, with a 1%-level of 1290 individuals.

**Other gull and tern species** Apart from the above mentioned species, Black-headed Gull *L. ridibundus*, Laughing Gull *L. atricilla*, Franklin's Gull *L. pipixcan*, Sooty Tern *S. fuscata* and Bridled Tern *S. anaethetus* have (possibly) bred on the Senegalese coast, but were not found breeding in 1998. The breeding of the three gull species is highly erratic (Dupuy 1983; Erard.1984; Mbaye Diop pers. comm.).

A nest of a Sooty Tern was found on 9 July 1954 on Ile Diamanio, Sine-Saloum Delta (de Naurois 1969). Two nests were found between 1977 and 1980 on Langue de Barbarie, and one in May-June 1979 in the Sine-Saloum Delta, after which the species returned for a few more years (Dupuy 1979). On 22 May 1998 one adult was observed on Ile aux Oiseaux, and in July 1998 two were seen on the same site, but there were no indications of breeding.

Until 1999, Bridled Terns unsuccessfully attempted to breed in Senegal (Erard 1975; Britton 1986). The species bred in Mauritania, with 1200-1800 pairs between 1959 and 1965 and only 100 pairs in 1995 (de Naurois 1969; Gowthorpe *et al*. 1996).

## DISCUSSION

Senegal is very important for breeding seabirds in west Africa, especially for Grey-headed Gull, Slender-billed Gull, Royal Tern and Caspian Tern, and the 1%-levels given by Rose & Scott (1997) are greatly exceeded for these species at present (Table 2). For several species however there are no population estimates available. With at least 37 000 pairs of gulls and terns, Ile aux Oiseaux hosts the largest seabird colony along the Senegalese coast. Although it is tempting to compare numbers with those found in the past (de Naurois 1964; Latour 1973; Dupuy 1975; 1976; Erard 1975; Gowthorpe 1979; Delaporte 1991), this is not done because of differences in survey methodology. Also,

*Table 2. 1%-levels for gulls and terns breeding in north-west Africa (Rose & Scott 1997; first column) and the time this number was exceeded in Senegal in 1998 (second column). Also, a proposal for new 1%-levels for breeding populations in north-west Africa is presented. Gulls and terns that have never been found breeding in Senegal, but do breed in north-west Africa (Yellow-legged Gulls* Larus m. michahellis, L. m. atlantis*, Roseate Terns* Sterna dougallii*; Zino & Biscoito 1994) are not included. - = no population estimate available, + = present, but comparison not possible.*

*Tabel 2. 1%-normen voor in Noordwest-Afrika broedende meeuwen en sterns (Rose & Scott 1997; eerste kolom) en het aantal keer dat dit getal werd overtroffen in Senegal in 1998 (tweede kolom). Een voorstel voor een nieuwe 1%-norm staat in de laatste kolom. Meeuwen en sterns die nog nooit in Senegal hebben gebroed, maar dit wel elders in Noordwest-Afrika doen (beide Geelpootmeeuwen* Larus m. michahellis *en* L. m. atlantis *en Dougalls Stern* Sterna dougallii*; Zino & Biscoito 1994) worden hier niet behandeld. - = geen populatieschatting bekend, + = aanwezig, maar vergelijking niet mogelijk.*

| | 1% Rose & Scott 1997 | number x 1% in Senegal 1998 | 1% breeding population NW Africa |
|---|---|---|---|
| Grey-headed Gull *L. cirrocephalus* | - | + | 100 |
| Slender-billed Gull *L. genei* | 33 | 167 | 75 |
| Kelp Gull *L. dominicanus* | - | + | 1 |
| Gull-billed Tern *G. nilotica* | 20 | 0.4 | 8 |
| Caspian Tern *Sterna caspia* | 40 | 216 | 135 |
| Common Tern *S. hirundo* | 4 | 17.5 | 2 |
| Little Tern *S. albifrons* | - | + | 1 |
| Royal Tern *S. maxima* | 167 | 128 | 400 |
| Bridled Tern *S. anaethetus* | 45 | - | 1 |
| Sooty Tern *S. fuscata* | 400 | - | 2 |

there is no information about movement of breeding birds between the various locations along the west African coast; rendering a comparison even more difficult.

**Threats and protection** Cooper *et al*. (1984) concluded that most seabird populations in west Africa have increased since the 1960s. Since their publication, numbers appear to have increased further, although there are large differences, both between locations and between species. One explanation for numerical increase could be the marked growth in commercial fishery and the resulting change in the fish community (*cf.* Furness 1984). There have been many studies emphasizing the close relationship between fish populations, seabird populations and commercial fisheries (*e.g*. Ashmole 1963; Crawford & Shelton 1981; Furness & Cooper 1982; Safina & Burger 1985; Hunt *et al*. 1986;

*Table 3 Comparison of several estimates in the literature of breeding pairs of gulls and terns along the north-west African coast, that breed in Senegal, or have bred there in the past. The numbers given by Cooper et al (1984, first column) are based on census results dating from 1972-1975. Gulls and terns that have been recorded breeding in north-west Africa but not in Senegal (Yellow-legged Gulls* Larus m. michahellis, L. m. atlantis*, Roseate Terns* Sterna dougallii*; Zino & Biscoito 1994) are not considered here. + = present but not counted; - = absent.*

*Tabel 3. Vergelijking van het aantal in Noordwest-Afrika en Senegal broedende paren meeuwen en sterns tussen verschillende literatuurbronnen. De aantallen die door Cooper et al. (1984, eerste kolom) worden gegeven zijn afkomstig uit de jaren 1972-1975. Meeuwen en sterns die nog nooit in Senegal hebben gebroed, maar dit wel elders in Noordwest-Afrika doen (beide Geelpootmeeuwen* Larus m. michahellis *en* L. m. atlantis *en Dougalls Stern* Sterna dougallii*; Zino & Biscoito 1994) worden hier niet behandeld. + = aanwezig maar niet geteld, - afwezig.*

| Species | Cooper *et al.* 1984 | Urban *et al.* 1986 | del Hoyo *et al.* 1996 |
|---|---|---|---|
| Grey-headed Gull *L. cirrocephalus* | 600-700 | - | + |
| Slender-billed Gull *L. genei* | 2850 | 3000 | 6000-7000 |
| Kelp Gull *L. dominicanus* | - | 1 | - |
| Gull-billed Tern *G. nilotica* | 1800 | 1700-2100 | 2000 |
| Caspian Tern *S. caspia* | 2400 | 3500-4300+ | 5000 |
| Common Tern *S. hirundo* | 400 | 200-900+ | + |
| Little Tern *S. albifrons* | 150 | 100s | few 100s |
| Royal Tern *S. maxima* | 10 500 | 15 000-21 000 | 25 000 |
| Bridled Tern *S. anaethetus* | 1500 | 1700+ | + |
| Sooty Tern *S. fuscata* | 2 | - | + |

Schaffner 1986; Cairns 1988; Heubeck 1989; Monaghan *et al*. 1992a, b, Clapp *et al*. 1993; Nettleship *et al*. 1994). If we consider all fish-eating bird populations in west Africa (such as cormorants *Phalacrocorax* spp., Red-billed Tropicbird *Phaeton aethereus*, pelicans *Pelecanus* spp., herons and egrets *Ardeidae*, storks *Ciconiidae*, African Fish-eagle *Haliaeetus vocifer* and kingfishers *Alcedinidae*) there are no indications for increases on the Banc d'Arguin. On the contrary, the numbers of cormorants, herons, egrets, gulls and terns have decreased in the mid-1990s after an increase in the 1980s (Gowthorpe *et al*. 1996; Hafner *et al*. 1999). On Ile de la Madeleine, Senegal, the numbers of Great Cormorants *Phalacrocorax carbo lucidus*, however, have increased greatly (Schepers *et al*. 1998). For the other species or species groups there are no data, either for the Sine-Saloum Delta, for the remainder of Senegal or elsewhere in west Africa.

Other important, more direct threats to seabird colonies in Senegal are tourism, habitat destruction, collecting of eggs, hunting of birds, and (introduction of) ground predators (*e.g*. Stienen *et al*. 1998). Men have collected seabird eggs for hundreds of years (*e.g*. Dragesco 1961). Presently however, at least some of the colonies are over-exploited by egg-collectors. The birds are restricted in their choice of breeding locations, while the human population has increased and continues to do so. In addition transportation has improved, making it possible for people to easily visit every seabird colony.

The north-west African countries have high responsibility for the conservation of several species mentioned in Table 2, especially Royal Tern and Bridled Tern. The African Royal Terns are separated from the North American population as a different subspecies *S. m. albididorsalis*. This means that the world population of this subspecies occurs only in north-west Africa.

The west African Bridled Terns seem to be completely isolated from the other Atlantic populations, and they are sometimes considered to belong to a separate subspecies *S. a. melanoptera*. In the east Atlantic, there is a small population in Mauritania, while other colonies are found only on Ile Virginie, Western Sahara, where 400 pairs were counted in 1960 (Heim de Balsac & Mayaud 1962), and on Pagalu (or Annobon) in the Gulf of Guinea with 200 pairs (Fry 1961; Britton 1986). Rose & Scott (1997) estimated the west African breeding population at 1500 pairs, but this seems too high. It is not known whether Bridled Terns still breed in Western Sahara, while they seem to have disappeared from the Gulf of Guinea (*cf*. Williams 1984; Gochfeld & Burger 1996). The west African Bridled Terns are therefore amongst the most threatened seabirds in the world.

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## *BROEDENDE MEEUWEN EN STERNS IN SENEGAL IN 1998, EN VOORSTEL VOOR NIEUWE POPULATIESCHATTINGEN VAN MEEUWEN EN STERNS IN NOORDWEST-AFRIKA*

*In 1998 zijn broedende meeuwen en sterns geteld langs de Senegalese kust. Het was de eerste volledige telling van alle soorten meeuwen en sterns in Senegal; in het verleden concentreerden onderzoekers zich meestal vrijwel geheel op Koningssterns* Sterna maxima*, of op enkele soorten sterns, en werden in het gunstigste geval schattingen gegeven van andere soorten. Er zijn twee belangrijke gebieden met grote kolonies, namelijk Nationaal Park Langue de Barbarie, in het noorden van het land, en Nationaal Park Sine-Saloum Delta, juist ten noorden van Gambia. In totaal werden 13.116 paar meeuwen en (ten minste) 31.426 paar sterns geteld (tabel 1). De belangrijkste soorten waren Dunbekmeeuw* Larus genei*, Grijskopmeeuw* L. cirrocephalus*, Reuzenstern* S. caspia *en Koningsstern. Kelpmeeuw* L. dominicanus*, Lachstern* Gelochelidon nilotica*, Visdief* S. hirundo *en Dwergstern* S. albifrons *broedden in lage aantallen.*

*Hoewel het verleidelijk is om de in 1998 getelde aantallen te vergelijken met die van eerdere tellingen, wordt een directe vergelijking niet gemaakt omdat van eerdere tellingen vaak onduidelijk is hoe de aantallen tot stand zijn gekomen. Wel worden de oude populatieschattingen gegeven. Tevens wordt een voorstel gedaan voor nieuwe schattingen en voor nieuwe 1%-normen (tabel 2). Dit is mogelijk omdat van alle genoemde soorten vrijwel de gehele West-Afrikaanse populatie uitsluitend in Senegal en op de Banc d'Arguin in Mauretanië broedt.*

*Grijskopmeeuw was met ruim 7500 paar de talrijkste meeuw. De vorige West-Afrikaanse populatieschatting was 600-700 paar (tabel 3). In Mauretanië broeden enkele tientallen paren, ook elders langs de gehele West-Afrikaanse kust komen geen grote kolonies voor. Tot nog toe waren geen tellingen uit West-Afrika beschikbaar. De nieuwe schatting bedraagt 10.000 paar. Van Dunbekmeeuw werden 5550 paar geteld. In Mauretanië werden recent bijna 2000 paar geteld. De oude populatieschatting voor West-Afrika bedroeg 3300 paar, voorstel voor een nieuwe schatting is 7500 paar. Van Kelpmeeuw werd een nest gevonden met twee jongen en een uitkomend ei. Dit is het derde broedgeval van deze soort in Senegal en vermoedelijk het enige op het noordelijk halfrond. Van Lachstern werden slechts acht paar gevonden in zoutpannen bij Kaolack. Mogelijk vestigden zich later in het seizoen nog nieuwe paren. De grootste aantallen broeden in Mauretanië; recent werden daar bijna 700 paar geteld. In het verleden werden in het noorden van Senegal 200-300 paar geteld, maar hier is geen recente informatie over. De oude populatieschatting bedroeg 2000 paar, de nieuwe 800. Van Reuzenstern vonden wij in 1998 ten minste 8600 paar, vrijwel alle op Ile aux Oiseaux. In de Langue de Barbarie was het broedseizoen al voorbij en werden slechts enkele vliegvlugge jongen gezien. Op de Banc d'Arguin broedde recent ten minste 4000 paar, terwijl ten zuiden van het in 1998 bezochte gebied recent ruim 2000 paar zijn geteld. De populatieschatting van 4000 paar voor Noordwest-Afrika is daarom naar 13.500 paar. Van Visdief werden 70 paar geteld, maar een exacte telling was moeilijk, omdat in een kolonie juist voor ons bezoek alle eieren door vissers geraapt waren. In een andere kolonie zaten de Visdieven verspreid langs de rand van de meeuwenkolonie. Om predatie van meeuwen tot een minimum te beperken werd daarom een snelle, globale telling gehouden. In Mauretanië broedden in de jaren 70 nog 200 paar, maar uit de jaren daarna zijn ons geen aantallen bekend. Voorheen werd de totale West-Afrikaanse populatie geschat op 400 paar. Onze schatting bedraagt 200 paar. Van Dwergstern werden geen broedende vogels aangetroffen, maar bewakers in Nationaal Park Langue de Barbarie meldden dat daar jaarlijks 35 paar broeden, zij het iets later in het seizoen. In het naburige park Guembeul broeden jaarlijks 35-50 paar. In Mauretanië broedden in de jaren 70 25-50 paar, maar uit later jaren zijn ons geen getallen bekend. De soort is notoir moeilijk te tellen, omdat zich vaak solitaire paren in afgelegen gebieden vestigen. Wij schatten de Noordwest-Afrikaanse populatie voorzichtig op 100 paar. Van Koningsstern telden wij bijna 23.000 paar, waarvan meer dan 21.000 in een kolonie op Ile aux Oiseaux. Tellingen van de Banc d'Arguin wijzen uit dat de aantallen jaarlijks enorm kunnen*

*fluctueren. De oude schatting voor West-Afrika bedroeg 17.000 paar. Wij schatten de huidige populatie op 43.000 paar.*

*Behalve bovengenoemde soorten zijn in het verleden mogelijke of zekere broedgevallen vastgesteld van Kokmeeuw* L. ridibundus, *Lachmeeuw* L. atricilla, *Franklin's Meeuw* L. pipixcan, *Bonte Stern* S. fuscata *en Brilstern* S. anaethetus. *Deze laatste soort broedde in het verleden in Spaanse Sahara en op Annobon in de Golf van Guinée. Na de jaren 1960 is geen informatie over de eerste broedlocatie, maar de broedvogels op de tweede zijn mogelijk verdwenen. De populatie in Mauretanië is derhalve de laatste in het Oost-Atlantische gebied. De oude schatting voor de populatie bedroeg 1500 paar, maar een recente schatting kwam niet verder dan 100 paar.*

*Het lijkt alsof de aantallen meeuwen en sterns in West-Afrika zijn toegenomen. Een mogelijke verklaring hiervoor zou de sterk toegenomen visserij kunnen zijn. Op de Banc d'Arguin lijken de aantallen echter eerder af- dan toegenomen te zijn. Van Senegal weten we alleen zeker dat de Aalscholvers* Phalacrocorax carbo lucidus *op Ile de la Madeleine zijn toegenomen; van alle overige viseters (aalscholvers, Roodsnavelkeerkringvogel* Phaethon aethereus, *pelikanen, reigers, ooievaars, Afrikaanse Visarend* Haliaeetus vocifer *en ijsvogels) zijn geen populatietrends bekend. Een reeks van andere bedreigingen wordt genoemd, waaronder eierrapers, invoer van grond-predatoren, biotoopvernietiging en jacht. Zowel Mauretanië als Senegal hebben een belangrijke verantwoordelijkheid voor de bescherming van deze vogels en hun biotopen.*

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

Keith W. Gillon, Richard W. White & Andrew D. Black

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* Grijsrugstormvogeltjes *(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 km² 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 ¼ ICES rectangles (cells measuring15' 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. Geregistreerde 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 (*n*) | *n* with kelp | % with kelp |
|---|---|---|---|
| Rockhopper Penguin *Eudyptes chrysocome* | 2002 | 4 | 0.2 |
| Magellanic Penguin *Spheniscus magellanicus* | 9526 | 9 | 0.1 |
| Southern Royal Albatross *Diomedea epomophora* | 2394 | 6 | 0.3 |
| Black-browed Albatross *Thalassarche melanophris* | 61 757 | 210 | 0.3 |
| Grey-headed Albatross *T. chrysostoma* | 1048 | 1 | 0.1 |
| Northern Giant Petrel *Macronectes halli* | 566 | 2 | 0.4 |
| Southern Giant Petrel *M. giganteus* | 2664 | 20 | 0.8 |
| Unidentified Giant Petrel *Macronectes* spp. | 2094 | 28 | 1.3 |
| Cape Petrel *Daption capense* | 12 993 | 187 | 1.4 |
| Antarctic Fulmar *Fulmarus glacialoides* | 14 290 | 54 | 0.4 |
| Unidentified Prion *Pachyptila* spp. | 91 037 | 746 | 0.8 |
| Great Shearwater *Puffinus gravis* | 5594 | 44 | 0.8 |
| Sooty Shearwater *P. griseus* | 30 261 | 1 | <0.01 |
| Wilson's Storm-petrel *Oceanites oceanicus* | 15 678 | 416 | 3.1 |
| Black-bellied Storm-petrel *Fregatta grallaria* | 194 | 2 | 1.0 |
| Grey-backed Storm-petrel *Garrodia nereis* | 1933 | 699 | 37.3 |
| Imperial Shag *Phalacrocorax atriceps* | 33 682 | 2 | <0.01 |
| Grey Phalarope *Phalaropus fulicarius* | 2 | 1 | 50.0 |
| Antarctic Skua *Catharacta antarctica* | 388 | 16 | 4.1 |
| Arctic Skua *Stercorarius parasiticus* | 33 | 7 | 21.2 |
| Long-tailed Skua *S. longicaudus* | 190 | 19 | 10.0 |
| Kelp Gull *Larus dominicanus* | 1730 | 48 | 2.8 |
| South American Tern *Sterna hirundinacea* | 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. Geregistreerde 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 ¼ 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

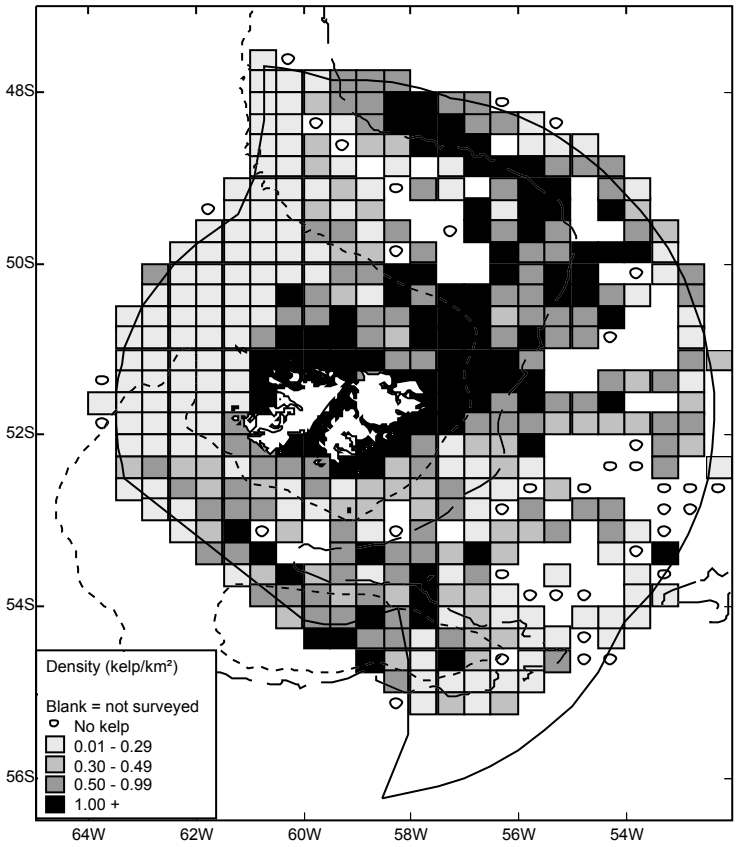


*Figure 1. Distribution of free floating kelp in ¼ ICES rectangles (15' latitude by 30' longitude) around the Falkland Islands, February 1998-January 2000.*

*Figuur 1. Verspreiding van vrij drijvend zeewier in ¼ ICES-hokken (15' breedte bij 30' lengte) rond de Falklands, februari 1998-januari 2000.*

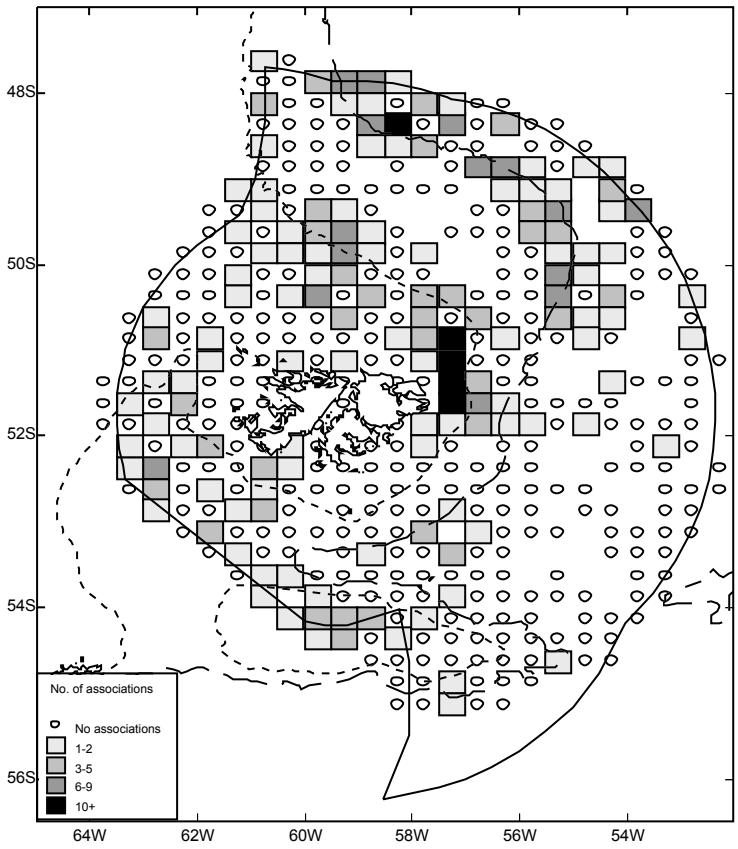


*Figure 2. Distribution of kelp-Grey-backed Storm-petrel associations in ¼ ICES rectangles (15' latitude by 30' longitude), February 1998-January 2000.*

*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$^{-2}$), 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$^{-2}$), 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$^{-2}$ | *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

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## 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 zeewiervelden. 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 zeewiervelden 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 zeewiervelden 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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# A POSSIBLE COMMON GUILLEMOT *URIA AALGE* x RAZORBILL *ALCA TORDA* HYBRID

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Wilhelm S.I., Walsh C.J., Stenhouse I.J. & Storey A.E. 2001. A possible Common Guillemot *Uria aalge* x Razorbill *Alca torda* hybrid. Atlantic Seabirds 3(2): 85-88: *Between 1996 and 2000, a probable Common Guillemot Uria aalge x Razorbill Alca torda hybrid was observed periodically among breeding Common Guillemots on Great Island, Newfoundland, Canada. Although the overall body shape and size of this individual were comparable to those of a Common Guillemot, it possessed traits that appeared intermediate between the Common Guillemot and the Razorbill. We suggest that hybridisation between these two auks may occur, albeit rarely, as a consequence of their extensive overlap in breeding range and close proximity within breeding colonies.*

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Evidence from mitochondrial DNA places the Razorbill *Alca torda* in the same Family (Alcidae) and Tribe (Alcini) as the Common Guillemot *Uria aalge* and Brünnich's Guillemot *U. lomvia* (Friesen *et al*. 1996). This genetic analysis suggests that Razorbills and guillemots evolved from a common ancestor, with the genus *Uria* later diverging into the two sister taxa observed today. Despite similarities in morphological characteristics and breeding biology between Common and Brünnich's Guillemots, only one account of hybridisation exists (Friesen *et al*. 1993). The occurrence of hybridisation between species is likely to occur only where their breeding ranges overlap. In the genus *Uria*, Brünnich's Guillemots occur primarily in the high Arctic, whereas Common Guillemots breed mostly in boreal and low Arctic regions (Nettleship & Evans 1985), with little overlap in breeding ranges.

The Razorbill, however, has a breeding range that overlaps extensively with that of the Common Guillemot (Bédard 1985; Nettleship & Evans 1985). Although Common Guillemots and Razorbills tend to occupy different habitats within their communal breeding grounds (Harris & Birkhead 1985), nest sites are often in close proximity; social interactions between the two species have recently been documented. For example, a male Razorbill, residing on a ledge of breeding Common Guillemots on Great Island, Newfoundland, has been observed in social interactions with Common Guillemots, including attempted copulation (Walsh *et al*. unpubl. data). Given the high likelihood of Common Guillemots and Razorbills encountering each other during the breeding season,

*Figure 1. Between 1996 and 2000, a potential Common Guillemot x Razorbill hybrid has been present in a colony of breeding Common Guillemots on Great Island, Newfoundland, Canada (S.I. Wilhelm)*

*Figuur 1, Een potentiële hybride Zeekoet x Alk was tussen 1996 en 2000 aanwezig in een kolonie van broedende Zeekoeten op Great Island, Newfoundland Canada (S.I. Wilhelm).*

and the observation that, in rare cases, they engage in interspecific courtship behaviour, then hybridisation between these species seems plausible.

Between 1996 and 2000, we observed an unidentifiable auk present sporadically in a colony of breeding Common Guillemots on Great Island, Witless Bay, Newfoundland, Canada (47°11'N, 53°49'W). The specific combination of morphological characteristics suggest that this individual was perhaps a Common Guillemot x Razorbill hybrid. Although its overall shape and size were similar to the Common Guillemot, it had several distinct traits that were more characteristic of the Razorbill. Most noticeably, its bill was shorter and considerably thicker than both the slender, pointed bill of the Common Guillemot and the heavy bill of the Brünnich's Guillemot, although it was not as laterally compressed as that of the Razorbill (Fig. 1). In addition, there were several distinct differences in plumage observed in all years: (1) the upperparts were darker than the dark brown upperparts of the Common Guillemot; (2) the secondaries appeared to be more narrowly tipped with white, characteristic of the Razorbill (Gaston & Jones 1998), whereas the white tips of the inner secondaries of the Common Guillemot form a small area of white on the trailing

edge of the wing; and (3) the individual had a white chin or throat patch immediately below the lower mandible. Also, compared with the Common Guillemot, the neck of this bird appeared shorter and thicker.

In each year this bird was observed, it occupied the same area within the colony. Interestingly, this was adjacent to the territory of a resident Razorbill on the same ledge (Walsh *et al*. unpubl. data). This site tenacity, along with distinct morphological characteristics, strongly suggests that the resightings across years are of the same individual. The bird appeared to be a prospecting male as it was observed attempting to copulate with a Common Guillemot and also fighting with several others.

Attempts to catch this individual have to date been unsuccessful, so in the absence of molecular evidence we cannot confirm that it is a Common Guillemot x Razorbill hybrid. In August 2000, a very similar bird was seen by experienced birders at Cape St. Mary's, a seabird colony approximately 100 km south-west of Great Island (D. Whittaker, pers. comm.). This sighting may have been of the same individual reported here, or a second possible hybrid. As hybridisation and opportunities to observe hybrids are generally rare (Grant & Grant 1992), the true incidence of hybridisation among seabirds may be underestimated.

We thank the numerous assistants who have helped with fieldwork on Great Island over the years of this study. We also thank the Canadian Wildlife Service and Newfoundland Parks and Natural Areas Division for permission to work on the island, and the Reddick family for transportation. This work was funded by the Natural Sciences and Engineering Research Council of Canada (individual operating grant to AES and postgraduate scholarships to SIW and CJW) and Memorial University fellowships to SIW, CJW and IJS.

## EEN VERMOEDELIJKE KRUISING TUSSEN DE ZEEKOET *URIA AALGE* EN DE ALK *ALCA TORDA*

*Op grond van het mitochondriale DNA wordt de Alk* Alca torda *tot de familie van de* Alcidae *gerekend, net als de Zeekoet* Uria aalge *en de Dikbekzeekoet* Uria lomvia. *Genetische analyse suggereert dat Alken en zeekoeten van een gemeenschappelijke voorouder afstammen, waarna de zeekoeten verder differentieerden in twee soorten. Ofschoon beide groepen oppervlakkig bezien zowel wat betreft uiterlijk, als broedbiologie vele overeenkomsten vertonen, bestond er tot dusverre slechts één bekend geval van hybridisatie. Het voorkomen van kruisingen is het meest waarschijnlijk op plaatsen waar twee soorten in hun verspreiding overlappen. In het Noord-Atlantische gebied overlappen Dikbekzeekoet (hoog arctische streken) en Zeekoet (boreaal en laag arctische streken) weinig in hun verspreiding, maar de broedgebieden van Alken en Zeekoeten overlappen grotendeels. In de gemeenschappelijke broedgebieden bezetten beide soorten duidelijk verschillende habitats, maar toch komen op veel plaatsen broedvogels van beide soorten vlakbij elkaar voor. Sociale interacties tussen beide soorten zijn recent gedocumenteerd. Op Great Island (Newfoundland) werd bijvoorbeeld een mannelijke Alk gezien die duidelijk geïnteresseerd was in een Zeekoet, waarmee het zelfs enkele keren probeerde te copuleren. Hybridisatie tussen Alk en Zeekoet lijkt aannemelijk.*

*Tussen 1996 en 2000 werd in Witless Bay (Great Island, 47°11'N, 53°49'W) af en toe een niet te identificeren alkachtige (een daadwerkelijke alk/zeekoet) gezien. De combinatie van uiterlijke kenmerken deed de waarnemers geloven dat het hier om een kruising tussen de Alk en de Zeekoet ging. Vorm en grootte waren die van een normale Zeekoet, maar het dier had een korte en opvallend hoge snavel, dikker en korter nog dan die van een Dikbekzeekoet, maar niet zo smal en hoog als die van een Alk (Fig. 1). De bovendelen waren duidelijk donkerder dan die van de omringende Zeekoeten, de armpennen hadden een smallere witte punt (karakteristiek voor de Alk) en het dier had een witte kin. In vergelijking met 'normale' Zeekoeten leek de nek korter en dikker. De vogel keerde elk jaar op dezelfde plaats terug en verbleef dan vlakbij het territorium van een Alk op dezelfde richel. Het was kennelijk een mannetje, getuige enkele pogingen van het dier om met een Zeekoet te copuleren. Vangpogingen (en daarmee een check van het DNA) zijn tot dusverre mislukt.*

*In augustus 2000 werd een vergelijkbare vogel gezien in de kolonie van Cape St Mary's, ongeveer 100 km verder naar het zuidwesten. Dit betreft misschien dezelfde vogel en anders een tweede geval van (vermoedelijke) hybridisatie.*

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# RAZORBILLS *ALCA TORDA* SUCCESSFULLY REARING YOUNG COMMON GUILLEMOTS *URIA AALGE*

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Harris M.P. & Wanless S. 2001. Razorbills *Alca torda* successfully rearing young Common Guillemots *Uria aalge*. Atlantic Seabirds 3(2): 89-93. *Two cases of Razorbills* Alca torda *successfully raising young Common Guillemots* Uria aalge *to departure from the colony are documented. Both cases apparently resulted from inter-species competition for nest-sites.*

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Attempted matings between a male Razorbill *Alca torda* and female Common Guillemot *Uria aalge*, and a highly probable intergenic hybrid have been observed on Great Island, Newfoundland (Walsh *et al. unpubl. data*.; Wilhelm *et al.* 2001). We have not seen anything similar in 21 seasons of intensive study of these two species in a mixed colony in Scotland, but here we document two instances where pairs of Razorbills raised young Common Guillemots to the stage where they left the colony.

Between 1984 and 2000 we made at least daily checks from before the first egg was laid to after the departure of the latest chick of all Razorbill and Common Guillemot nest-sites in five delimited areas of the auk colonies on the cliffs of the Isle of May (56°11'N, 2°34'W; Firth of Forth, SE Scotland). The positions of all sites used during the period were marked on large-scale photographs (which included areas adjacent to the colony where birds could nest) and checks were made from permanent hides in order to prevent observer disturbance.

Most Razorbills on the Isle of May nest at relatively low density among broken rock at the top, bottom and lateral edges of Common Guillemot colonies. The numbers of Razorbills that laid eggs in the study areas increased from 72 pairs in 1984 to 149 pairs in 2000, mostly by the colonisation of new sites dispersed up to 8-10 m away from the core seabird colony. The numbers of breeding Common Guillemots increased at a rather slower rate over the same period, from 454 pairs to 643 pairs, mainly by a gradual expansion from the core area that brought the species into direct

competition with Razorbills for nest sites. In total, 258 different breeding sites were used by Razorbills and 829 by Common Guillemots. Of these, 31 were used by both species; in 27 (87%) of such cases, the site was originally used by Razorbills and later by Common Guillemots, supporting our impression that Common Guillemots were displacing Razorbills. In only two instances was there an obvious change in the physical characteristics of the site between occupancy by the two species; in both cases movements of stones made the site more open and apparently less suitable for Razorbills (see below).

In 1993 and 1994 we noted frequent fights between the occupants of a Razorbill site that had successfully fledged a chick each season since its first occupation in 1989, and at least two pairs of Common Guillemots that appeared to be attempting to breed at the edge of an established group of five other pairs. None of the birds involved was individually identifiable. This Razorbill site was on a ledge and was much more open (Fig. 1) than is typical of sites on the Isle of May because a large stone, behind which the pair originally nested, had fallen off the ledge in early 1992. In 1993, Razorbills lost their egg during a fight with Common Guillemots. The site was occupied by Razorbills throughout the 1994 season but we did not record an egg.

In 1995, despite very frequent fighting with Common Guillemots, the Razorbills laid an egg on 11 May and commenced incubation. On 16 May, a Common Guillemot laid an egg immediately next to the incubating Razorbill. This resulted in a ferocious fight, between both Razorbills and two Common Guillemots (assumed to be the owners of the egg), during which the Razorbill egg was knocked off the ledge and the guillemot egg rolled a few centimetres to the Razorbill site. The Razorbills retained and incubated the egg until it hatched on 18 June (after the normal incubation period of 33 days). The Razorbills brooded and fed the chick and it left for the sea with one of the adults on the evening of 7 July when aged 19 days old, which is well within the normal range of fledging ages of both Razorbills and Common Guillemots. Razorbills successfully reared a chick at this site in 1996 but Common Guillemots then bred there each season from 1997 to 2000.

Earlier, in 1993, a pair of Razorbills breeding just outwith one of the study plots also fledged a Common Guillemot chick. We have only limited data on this, although Razorbills had bred there in previous years. We had, however, noted repeated fights there between the two species in 1993, and the site was occupied by Common Guillemots in subsequent seasons.

We have a further four records of Common Guillemot eggs being laid at sites occupied by Razorbills but have not recorded the reverse. None

*Figure 1. A Razorbill with a 12-day old young Common Guillemot that it reared from a newly laid egg in 1995. Eight pairs of Guillemots had bred on this ledge; five young were reared but three had fledged before this photograph was taken. (M.P. Harris).*

*Figuur 1. Een Alk met een twaalf dagen oud jong van een Zeekoet dat het had uitgebroed en tot dusverre had groot gebracht van een vers gelegd ei in 1995. In totaal hadden acht paren Zeekoeten op deze richel gebroed en waren vijf jongen uitgebroed. Drie jongen hadden de kolonie inmiddels verlaten, juist voordat deze foto werd gemaakt (M.P. Harris).*

of these eggs were incubated by the Razorbills. At the start of each season there was considerable competition for sites between Razorbills and Black-legged Kittiwakes *Rissa tridactyla,* which laid slightly later than did Razorbills, and we have three records of Razorbills laying in Black-legged Kittiwake nests. In each instance the kittiwakes retained the site; two eggs disappeared but in one case the Razorbill egg was incubated by the kittiwakes for three weeks before being lost.

Razorbills and Common Guillemots breed in close proximity in many places in the North Atlantic. Although the former appears to prefer more enclosed sites such as under boulders, in niches or cracks in cliffs or

even in the entrance to rabbit burrows and the latter prefers more open ledges, there is much potential for competition (Fisher & Lockley 1954). Seabird colonies may appear to be stable with each species having its preferred habitat (Lack 1971); this is rather illusory, however, as long-term studies, such as ours, show considerable inter-specific competition for nest-sites. The ledge shown in Figure 1 was regularly visited by Northern Fulmars *Fulmarus glacialis* and in one season was used by European Shags *Phalacrocorax [Stictocarbo] aristotelis*. Although Northern Fulmars, European Shags and Razorbills regularly win individual aggressive encounters with Common Guillemots (pers. observ.), on the Isle of May during our study the three species tended to compete poorly in the longer term due to the tenacity of Common Guillemots and the competitive advantage afforded by their greater numbers. Over a 21-year period these three species were ousted from this ledge by Common Guillemots.

The imprinting of young birds on foster parents of a different species is well-documented (Heinroth 1910) and experimental studies have shown that, at least in gulls *Larus* spp., this can result from cross-species fostering (Harris 1970). Interspecific matings and/or hybridisation have been documented between Common Guillemot and both Brünnich's Guillemot *U. lomvia* and Razorbill (Tschanz & Wehrlin 1968; Birkhead 1993; Wilhelm *et al.* 2001), species that breed in mixed colonies and have similar breeding strategies. Interspecies fostering such as described in this note, and the erroneous imprinting of chicks, could explain the very few documented case of hybridisation among auks.

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## ALKEN *ALCA TORDA* BRENGEN MET SUCCES KUIKENS VAN ZEEKOETEN *URIA AALGE* GROOT

*Tussen 1984 en 2000 werden op Isle of May (Firth of Forth, ZO-Schotland) in het broedseizoen dagelijks waarnemingen verricht op vijf vaste studieplots in de broedkolonies van Alken* Alca torda *en Zeekoeten* Uria aalge. *De waarnemingen werden verricht vanaf het moment voor het eerste ei werd gelegd tot op het moment dat het laatste jong de kolonie verlaten had. De studiegebieden werden (op foto's) precies afgebakend, regelmatig gefotografeerd en vanuit permanente schuilhutjes bestudeerd om verstoring zoveel mogelijk tegen te gaan. De meeste Alken broeden tussen gevallen rotsen en in rotsspleten aan de randen van dichtbezette Zeekoetenkolonies. Het aantal broedvogels nam toe van 72 paar in 1984 tot 149 paar in 2000, met name door het bezetten van nieuwe broedplaatsen op 8-10 m afstand van de traditionele koloniegedeelten. Het aantal Zeekoeten nam langzamer toe, van 454 paar in 1984 tot 643 paar in 2000, met name door een geleidelijke uitbreiding van de drukst bezette klifrichels. Deze*

*Zeekoeten raakten daardoor geleidelijk aan steeds nadrukkelijker met Alken in conflict over de beschikbare ruimte. In totaal waren 258 broedplaatsen door Alken bezet en 829 door Zeekoeten, daarvan werden 31 locaties door beide soorten gebruikt. In 27 gevallen (87%) ging het daarbij om broedplaatsen die aanvankelijk door Alken, maar later door Zeekoeten werden benut, hetgeen de indruk ondersteunde dat Zeekoeten Alken van geschikte plekken verdreven. Op één zo'n locatie werden in 1993 en 1994 gevechten tussen beide soorten waargenomen om een plek waar Alken sinds 1989 succesvol hadden gebroed. Eenmaal verloren de Alken hun ei, maar behielden zij de broedplaats. Ondanks frequente burenruzies met opdringende Zeekoeten legden de Alken in 1995 op 11 mei een ei, dat ze begonnen te bebroeden. Op 16 mei legde een Zeekoet een ei vlak naast dat van de Alken, waarna felle gevechten uitbraken. In de strijd ging het ei van de Alken verloren, maar rolde het ei van de Zeekoeten dichter naar de broedplaats van de Alken toe. De Alken confisqueerden dat ei, bebroedden het de 'voorgeschreven' periode van 33 dagen en het kwam uit op 18 juni. De Alken brachten het jong met succes groot en vertrokken op 7 juli met het kuiken naar zee. Alken wisten in 1996 met succes op dezelfde locatie te broeden, maar sindsdien is de broedplaats door Zeekoeten bezet.*

*In 1993 werd al vastgesteld dat een paar Alken een Zeekoetenjong had grootgebracht, maar omdat dit buiten de studiegebieden plaatsvond bestaan daarover weinig concrete gegevens. Van vier gevallen waarin eieren van Zeekoeten op de broedplaatsen van Alken terechtkwamen is bekend dat de Alken ze negeerden. Er is geen geval van het omgekeerde bekend (een Alkenei op de Zeekoetenrichel). Aan het begin van elk broedseizoen is er ook intensieve competitie om nestgelegenheid tussen Alken en Drieteenmeeuwen. De auteurs stelden in drie gevallen vast dat Alken een ei in het nest van een Drieteenmeeuw legden, waarna het ei door laatstgenoemde soort werd opgeëist. Twee van die eieren verdwenen spoorloos, maar het derde ei werd eerst gedurende drie weken door de meeuwen bebroed.*

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