

SOME FOOD ITEMS OF THE SOUTH POLAR SKUA *STERCORARIUS MACCORMICKI* AT INLAND SITES IN THE AHLMANNRYGGEN, DRONNING MAUD LAND, ANTARCTICA

W.K. STEELE^{1,2} & JOHN COOPER^{1,3}

¹*Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch 7701, South Africa*

²*Current address: Waterways Group, Melbourne Water, P.O. Box 4342, Melbourne, Victoria 3001, Australia
(william.steele@melbournewater.com.au)*

³*Current address: DST/NRF Centre of Excellence for Invasion Biology, Department of Botany and Zoology, Stellenbosch University, Private Bag XI, Matieland 7602, South Africa*

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Among breeding Antarctic species of birds, the diet of the South Polar Skua *Stercorarius maccormicki* (following Christidis & Boles 2008) is comparatively well studied. Higgins & Davies (1996) have summarised published information on the bird's diet up to 1994, and a number of studies of the diet or notes on the feeding ecology of this species have appeared subsequently (Mund & Miller 1995, Reinhardt 1997, Brooke *et al.* 1999, Norman & Ward 1999, Reinhardt *et al.* 2000, Baker & Barbraud 2001, Hahn *et al.* 2008, Malzof & Quintana 2008, Montalti *et al.* 2009). These studies reveal that South Polar Skuas feed upon almost any animal

prey or waste product available to them, including fishes, marine invertebrates, penguins (including eggs and chicks), petrels, seal carrion and placentae, and waste from research stations.

The majority of detailed studies of the diet of this species have been at near-coastal sites where South Polar Skuas are known to breed and where prey resources in the form of marine animals (primarily fishes but also crustaceans and molluscs), penguin or petrel colonies, or seal-pupping sites are present (Table 1). While there are several published observations of skua diet at inland sites (Table 2), with the

TABLE 1
Published quantitative studies on the diet of the South Polar Skua

| Site | Location | Source |
|--|---------------------|---|
| <i>Coastal sites</i> | | |
| Windmill Islands, Wilkes Land | (66°20'S, 110°30'E) | Eklund 1961 |
| Cape Royds, Ross Island | (77°33'S, 166°09'E) | Young 1963 |
| Balleny Islands | (66°55'S, 163°45'E) | Robertson <i>et al.</i> 1980 |
| Ross Sea | (75°S, 170°W) | Ainley <i>et al.</i> 1984 |
| Signy Island, South Orkney Islands | (60°43'S, 45°36'W) | Hemmings 1984 |
| Anvers Island, Palmer Archipelago | (64°46'S, 64°03'W) | Pietz 1987; and references in Higgins & Davies 1996 |
| Vestfold Hills, Ingrid Christensen Coast | (68°35'S, 77°58'E) | Green 1986 |
| Hop Island, Rauer Group, East Antarctica | (68°49'S, 77°44'E) | Norman & Ward 1990 |
| Ardley Island and Fildes Peninsula, South Shetland Islands | (62°13'S, 58°55'W) | Peter <i>et al.</i> 1990 |
| Eastern Larsemann Hills, Princess Elizabeth Land | (69°21'S, 76°00'E) | Wang & Norman 1993 |
| Cape Bird/ Cape Evans, Ross Island | (77°10'S, 166°41'E) | Mund & Miller 1995 |
| Potter Pen., King George Island, South Shetland Islands | (62°14'S, 58°40'W) | Reinhardt 1997 |
| Hop Island, Rauer Group, East Antarctica | (68°49'S, 77°44'E) | Norman & Ward 1999 |
| Ardery Island, Windmill Islands, Wilkes Land | (66°22'S, 110°27'E) | Baker & Barbraud 2001 |
| Potter Pen., King George Island, South Shetland Islands | (62°14'S, 58°40'W) | Hahn <i>et al.</i> 2008 |
| Cierva Pt, Danco Coast, Antarctic Peninsula | (64°09'S, 60°57'W) | Malzof & Quintana 2008 |
| Half Moon Island, South Shetland Islands | (62°34'S, 59°55'W) | Montalti <i>et al.</i> 2009 |
| <i>Inland sites</i> | | |
| Svarthamaren, Dronning Maud Land | (71°53'S, 05°10'E) | Brooke <i>et al.</i> 1999 |

exception of the study by Brooke *et al.* (1999) these are generally only qualitative descriptions of prey remains. Therefore, during three summer field seasons (1991/92–1993/94) in the Ahlmannryggen mountain range of western Dronning Maud Land (see Steele & Newton 1995) regurgitation pellets produced by skuas were collected opportunistically whenever found to provide information on the food of this species at inland sites in Antarctica. We recognise that there are limitations to the usefulness of regurgitation pellets in determining the diet of any species (e.g. Young 1990) but consider the food items contained in pellets from inland Antarctica worth noting.

The Ahlmannryggen is a mountain range in western Dronning Maud Land comprised of scattered exposed peaks (known as nunataks) and covering an area of approximately 120 × 75 km (Wolmarans & Kent 1982; Fig. 1). Five avian species have been reported from the Ahlmannryggen: Antarctic Petrel *Thalassoica antarctica*, Snow Petrel *Pagodroma nivea*, Southern Fulmar *Fulmarus glacialisoides*, Wilson's Storm Petrel *Oceanites oceanicus* and South Polar Skua (Ryan & Watkins 1988, Ryan *et al.* 1989, Swart 1989, Steele *et al.* 1994, Steele & Newton 1995). Of these species, only Snow Petrel and Wilson's Storm Petrel have been confirmed as breeding in the

TABLE 2
Published information on the diet of the South Polar Skua at inland sites

| Site | Location | Source |
|---|--|-----------------------------|
| Tottanfjella and Heimefrontfjella, Dronning Maud Land | (75°S, 10°W) | Bowra <i>et al.</i> 1066 |
| Rennick Glacier Region, Northern Victoria Land | (71°12'S, 162°24'E 70°45'S, 162°05'E) | Dow & Neall 1968 |
| Theron Mountains, Coats Land | (79°00'S, 28°00'E) | Brook & Beck 1972 |
| Lake Vanda/ Marble Pt, Wright Valley, Ross Dependency | (77°31'S, 161°40'E) | Fowler 1973 |
| Robertskollen, Dronning Maud Land | (71°28'S, 03°15'W) | Ryan & Watkins 1988 |
| Rockefeller Mountains, Edward VII Peninsula | (78°45'S, 154°00'W) | Broady <i>et al.</i> 1989 |
| Northern Prince Charles Mountains, Mac.Robertson Land | (70°14'S, 65°51'E) | Heatwole <i>et al.</i> 1991 |
| Svarthamaren, Dronning Maud Land | (71°53'S, 05°10'E) | Brooke <i>et al.</i> 1999 |

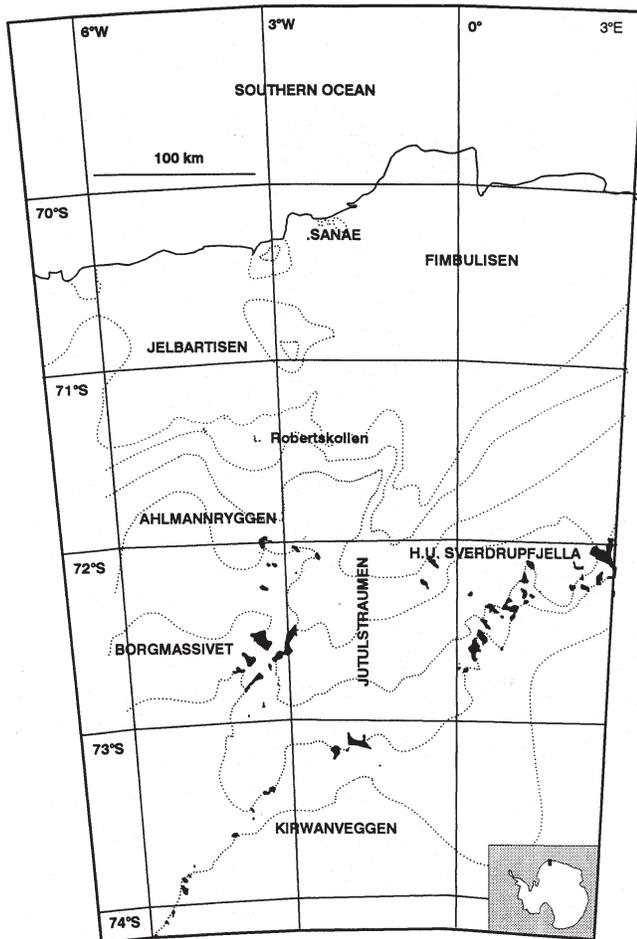


Fig. 1. The mountain ranges of western Dronning Maud Land.

TABLE 3
South Polar Skua pellets collected from sites in the Ahlmannryggen, western Dronning Maud Land, Antarctica, 1991/92–1993/94 (refer to Ryan *et al.* 1989 for details of sites at Robertskollen)

| No. | Location | Date collected | Mass (g) | Dimensions (mm) |
|----------------------------------|----------------|----------------|----------|-----------------|
| Vesleskarvet (71°40'S, 02°51'W) | | | | |
| 1 | Vesleskarvet | 17 Dec 91 | 14.7 | 150 × 35 |
| 2 | Vesleskarvet | 19 Dec 91 | 1.0 | 22 × 19 |
| Robertskollen (71°28'S, 03°15'W) | | | | |
| 3 | Ice Axe Peak | 1 Jan 92 | 2.1 | 50 × 30 |
| 4 | Cairn Peak | 7 Jan 92 | 11.5 | 50 × 35 |
| 5 | Glacier's Edge | 14 Jan 92 | 1.2 | 38 × 30 |
| 6 | Cairn Peak | 15 Jan 92 | 3.5 | 140 × 35 |
| 7 | Cairn Peak | 22 Jan 92 | 3.4 | 45 × 33 |
| 8 | Cairn Peak | 24 Jan 92 | 5.5 | 90 × 35 |
| 9 | Ice Axe Peak | 1 Jan 93 | 2.8 | 85 × 20 |
| 10 | Ice Axe Peak | 1 Jan 93 | 3.2 | 60 × 40 |
| 11 | Johan's Folly | 2 Jan 93 | 1.2 | 75 × 25 |
| 12 | Petrel's Rest | 3 Jan 93 | 1.3 | 83 × – |
| 13 | Petrel's Rest | 3 Jan 93 | 1.4 | 75 × 35 |
| 14 | Johan's Folly | 5 Feb 93 | 2.6 | 80 × 50 |
| 15 | Cairn Peak | 16 Nov 93 | 1.2 | 45 × 25 |
| 16 | Robertskollen | — | 3.7 | 80 × 30 |

Ahlmannryggen (Steele & Newton 1995). The largest number of breeding Snow Petrels, approximately 500 nesting pairs, was found at Robertsollen (71°28'S, 03°15'W) (Croxall *et al.* 1995).

Sixteen South Polar Skua pellets were found and collected at two sites: Robertsollen and Vesleskarvet (71°40'S, 02°51'W), where no petrel species have been recorded breeding (Table 3). These two sites are 30 km apart and some 150 and 180 km, respectively, inland from the open sea during the austral summer breeding season (Wolmarans & Kent 1982; Fig. 1).

Pellets were bottled and kept frozen until analysed during November 1994. Following defrosting, the pellets were air-dried and then measured and weighed, before being moistened and carefully broken apart and their identifiable contents separated. Bird bones, feathers and, in one case, a petrel foot were assigned to species by size and appearance. Eggshell was not identifiable to species. Marine items were identified as being either fish bones or cephalopod beaks, but were not identified further.

As expected, Snow Petrels constituted the most common prey item, occurring in 15 of 16 pellets. Many Snow Petrel carcasses at Robertsollen showed evidence of being preyed upon, presumably by skuas. Antarctic Petrel, the second-most common vertebrate observed in the Ahlmannryggen, was found in a single pellet (Table 4). These results agree with those of other studies at inland mountains of Antarctica, where locally breeding fulmarine petrels apparently formed the bulk of the skuas' diet (Brook & Beck 1972, Brooke *et al.* 1999). However, the presence of fish and cephalopod remains in skua pellets at inland Antarctic mountains was not expected. The average foraging radius of breeding South Polar Skuas at a coastal site has been estimated to be around 23 km, and no farther than 85 km (Hahn *et al.* 2008). While no active nests of South Polar Skuas were found during the course of this study (Steele & Newton 1995) and many of the skuas seen in the Ahlmannryggen may be non-breeding birds, it is unlikely that skuas in these mountains, and more than 150 km from the open sea during summer, were feeding directly on marine animals. Snow Petrels breeding at Robertsollen are known to feed on fish and cephalopods (Steele 2005). Thus, the marine remains found in skua pellets may have originated from the stomachs of Snow Petrels preyed upon, or kleptoparasitised from adult Snow Petrels returning to feed their chicks at the Robertsollen colonies.

TABLE 4
Composition of South Polar Skua pellets from the Ahlmannryggen, western Dronning Maud Land, Antarctica

| Taxa | Occurrence | | Abundance | |
|------------------|------------|------|-----------|------|
| | n | % | n | % |
| Snow Petrel | 15 | 93.8 | 15 | 51.7 |
| Antarctic Petrel | 1 | 6.3 | 1 | 3.5 |
| Bird egg | 2 | 12.5 | 2 | 6.9 |
| Fish remains | 3 | 18.8 | 3 | 10.3 |
| Cephalopod | 5 | 31.3 | 8 | 27.6 |
| Total | 16 | | 29 | |

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