

The diet of grey-headed albatrosses *Diomedea chrysostoma* at the Prince Edward Islands

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Eighty-eight food samples were collected from grey-headed albatrosses Diomedea chrysostoma at the Prince Edward Islands. Fish and cephalopods were the two main prey components of the diet, the former being predominant. It was not possible to identify most of the fish prey but the most commonly eaten squid were Kondakovia longimana and Histioteuthis eltaninae with the mass of individual squid varying between 13 g and 1 815 g. Whereas the diet was similar to that of grey-headed albatrosses at Iles Crozet it contrasted with that of birds at South Georgia which had a higher proportion of cephalopods and crustaceans in their diet. Differences between the cephalopod beaks recorded in casts and regurgitations are discussed.

Ag en tagtig voedselmonsters is van gryskopmalmokke Diomedea chrysostoma op die Prins Edward-eilande versamel. Vis was die belangrikste komponent van die dieet, gevolg deur koppotige diere. Meeste van die viskos moes ongeïdentifiseerd bly, maar die volopste seekatte in die dieet was Kondakovia longimana en Histioteuthis eltaninae, met massas wat wissel tussen 13 g en 1 815 g. Alhoewel die dieet soortgelyk was aan dié van gryskopmalmokke op Iles Crozet, het dit verskil van dié van voëls op Suid-Georgia deurdat laasgenoemde 'n hoër persentasie koppotiges en skaaldiere in hul dieet gehad het. Verskille tussen koppotiges se bekke wat in mis en opbraaksels gevind is, word verder bespreek.

Introduction

Grey-headed albatrosses *Diomedea chrysostoma* occur throughout the Southern Ocean and breed at a number of sub-Antarctic sites including the Prince Edward Islands in the southern Indian Ocean (Prince 1980). The breeding and feeding ecology of the species has been investigated in detail at South Georgia (Tickell 1964, Tickell & Pinder 1975, Prince 1980). Weimerskirch *et al.* (1986) carried out a comparative ecological study of albatrosses at Iles Crozet, which included some feeding data, and Brooke & Klages (1986) collected some data on the squid prey of grey-headed albatrosses at the Prince Edward Islands. Otherwise, little is known about the species' diet from most of its breeding range.

This paper presents the results of a study into the diet of grey-headed albatrosses at the Prince Edward Islands.

Methods

Food samples were collected at Rook's Bay and Grey-headed Albatross Ridge, Marion Island (46°54'S, 37°45'E) in February - April 1985 (20 samples) and April 1987 (26 samples) during the chick-rearing period. Further samples were collected from birds at the Prince Edward Island (46°38'S, 37°57'E) colony in April 1985 (21 samples) and April 1987 (21 samples).

Adult birds were caught with a hook mounted on a long pole just as they started feeding a meal to their chick. Inverting the bird over a large plastic funnel with a polythene bag attached normally induced regurgitation of the meal (Prince 1980). At South Georgia, Prince (1980) found that there was a significant difference between the mass of a food sample collected and that of the meal fed to a chick. Although this shortfall averaged 15 per cent in grey-headed albatrosses, the food samples were still thought to be representative of the feeds delivered to chicks.

Samples collected were weighed on a pan balance, the liquid portion drained off and the remaining solids weighed. The solid material was then sorted in the laboratory and identifiable material weighed and, where relevant, measured (Prince 1980). Cephalopod beaks were identified by reference to material held in collections at the Port Elizabeth Museum. The lower rostral length of each intact beak was measured and the masses of the cephalopods estimated using the regressions given by Clarke (1985).

Results

Size of samples and liquid proportion

Slightly more than half of the food material consisted of liquid (Table 1) which is a mixture of water and lipids (Clarke & Prince 1980). Fish and cephalopods were the only significant classes of prey in the diet, both in terms of their frequency of occurrence and mass (Table 2).

Fish

Overall, nearly 60 per cent of the diet, in terms of mass, consisted of fish prey (Table 2). However, if the overall totals are broken down by year and by island a different story emerges (Table 3). Samples collected at both islands during 1987 and at Prince Edward Island during 1985 contain similar ratios of fish and cephalopods but samples from Marion Island in 1985 consisted of a much higher proportion of fish (Table 3).

The flesh of fish in the samples was frequently well digested

Table 1
Size of grey-headed albatross food samples and the proportion of liquid they contained (n = 88)

	Mean ± S.D.	Range
Total Mass (g)	343 ± 165	35-850
Liquid (g)	187 ± 119	0-530
Solids (g)	155 ± 123	10-575
Proportion of liquid (%)	55.4 ± 26.4	0-96.1

Table 2
Composition of food samples collected from grey-headed albatrosses at the Prince Edward Islands (n = 88)

	Prey class				
	Fish	Cephalopods	Crustaceans	Penguin	Other
Number of samples containing class	52	56	13	3	5 ¹
Frequency of occurrence (%)	59,1	63,6	14,8	3,4	5,7
Mass of class (g)	7 875	4 640	400	365	295 ²
Proportion of total mass (%)	58,0	34,2	3,0	2,7	2,2

1. Goose barnacles 2; Ctenophore 1; non-cephalopod mollusc 1; seal carrion 1.

2. Seal 285 g; goose barnacles 5 g; non-cephalopod mollusc 5 g.

Table 3
Inter-island and inter-year variation in the composition of grey-headed albatross samples at the Prince Edward Islands

	n	Proportion of total mass (%)		Fish/cephalopod ratio
		Fish	Cephalopods	
1985				
Marion Island	20	77,1	17,2	4,48
Prince Edward Island	21	44,3	39,7	1,12
1987				
Marion Island	26	51,5	39,6	1,30
Prince Edward Island	21	53,7	46,3	1,16

and even in those samples showing little sign of digestion the heads were often missing. Because of this only two fish could be positively identified, using otoliths and skeletal remains. One *Channichthys rhinoceros*, Channichthyidae (total length 350 mm, estimated mass 245 g) and a *Dysalotus alcockii*, Chiasmodontidae (standard length 164 mm, estimated mass 24 g) were found in Prince Edward Island samples. The latter species may be a rather atypical prey, however, since it constitutes a new distributional record for the area (Gon & Klages 1988).

Cephalopods

Although cephalopod flesh was found in over 60 per cent of the food samples it comprised only about one-third of the diet by

mass (Table 2). Cephalopod beaks were found in many samples and the species composition is shown in Table 4. Beaks are only digested very slowly (Ashmole & Ashmole 1967, Furness *et al.* 1984) and persist through a number of meals. Consequently, only samples containing actual flesh were included in the frequency of occurrence and biomass calculations. Two species of squid predominated: *Kondakovia longimana*, Onychoteuthidae, and *Histioteuthis eltaninae*, Histioteuthidae, with other cephalopods only occurring infrequently. The beaks were used to estimate the original masses of the cephalopods eaten and these are also shown in Table 4. The size of squid taken ranged from a 13-g *K. longimana* to a 1 815-g *Moroteuthis knipovitchi*.

Crustaceans

Thirteen samples (14,8 %) contained crustaceans but in nearly all of these only one or two individuals were present, suggesting that most were probably ingested incidentally or were in the stomachs of fish and cephalopods eaten. The amphipod *Themisto gaudichaudii* was found in four samples; remains of large decapod crustaceans occurred in three samples. The remaining samples contained unidentifiable and very digested crustaceans though two probably consisted of euphausiids.

Other prey

Penguin carrion was present in three samples and one contained seal carrion. Goose barnacles *Lepas*, unidentified non-cephalopod molluscs and Ctenophores were occasionally recorded but contributed an insignificant amount to the diet.

Discussion

Diet and foraging range

The data collected during this study show that grey-headed albatrosses at the Prince Edward Islands are predominantly predators on fish, although the proportion can vary (Table 3), probably as a result of localized fluctuations in prey availability. Cephalopods were the only other main source of food. This contrasts with birds at South Georgia where cephalopods were the most important prey (49,0 %) followed by fish (24,1 %) and significant quantities of crustaceans (16,5 %) and lampreys (10,4 %) (Prince 1980). Weimerskirch *et al.* (1986) found the diets of grey-headed albatrosses at Iles Crozet to be similar to those of this study. Fish was the predominant prey with a substantial amount of cephalopods but very little crustaceans and carrion, though they did not carry out an analysis by mass of the different prey types (see Fig. 5 in Weimerskirch *et al.* 1986).

The differences in diet between birds at South Georgia and the

Table 4
Species of cephalopods found in the diet of grey-headed albatrosses at the Prince Edward Islands (total number of beaks = 105)

	Species	%	No. lower beaks measured	Mean estimated mass ¹ (g ± S.D.)
Cranchiidae	<i>Galiteuthis glacialis</i>	6	6	89,7 ± 31,4
	<i>Galiteuthis</i> sp.	1	1	85,4
Onychoteuthidae	Unidentified	1	0	-
	<i>Kondakovia longimana</i>	46	45	186,8 ± 253,6
	<i>Moroteuthis knipovitchi</i>	2	2	982,0; 1 814,6
	<i>Moroteuthis</i> sp.	1	1	1 029
Histioteuthidae	<i>Histioteuthis eltaninae</i>	37	39	78,3 ± 20,7
Gonatidae	<i>Gonatus antarcticus</i>	1	1	151,7
Octopoteuthidae	<i>Taningia danae</i>	1	1	403,6
Chiroteuthidae	<i>Chiroteuthis</i> sp.	2	2	48,4; 123,1
Unidentified squid		3	0	-
Total			98	

¹ Estimated by measuring the lower rostral length and using the regression equations given by Clarke (1985).