

Fulmar feeding on Gonatus steenstrupi (F.J. Maas) Noordse stormvogel met Gonatus steenstrupi (F.J. Maas)

FULMARS, SQUID AND ANNELIDS NOORDSE STORMVOGELS, INKTVIS EN BORSTELWORMEN

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ABSTRACT

Over two thirds of a sample of Northern Fulmars Fulmarus glacialis around Scotland and west of Ireland had mouthparts of adult deep water squid, mainly Gonatus sp., in their stomachs, and others those of polychaete annelids Nereis sp. not found in food regurgitated for their chicks. It is suggested these prey may either be caught when they come to the surface at night, and digested before the birds return to land, or left over from the period when other food is scarce early in the year. It seems possible that it is an adaptation for this method of feeding which enabled Fulmars to exploit the wastes from whaling and then fishing so successfully.

INTRODUCTION

The important place of cephalopods in the diet of the petrels, and the possibility that they may catch them at night, first appears to have been reported by John MacGillivray (1846) following a visit to St Kilda off the Outer Hebrides (W Scotland) in June-July 1840, and subsequent voyage around the world in HMS Fly in 1842-46 (Ralph 1993), as follows (bird nomenclature revised):

"Food of the Petrel Family. In the stomachs of individuals of the Fulmar Petrel (*Fulmarus glacialis*), dissected by me at St Kilda several years ago, I invariably found numbers of the horny mandibles of the Lepiadae. Since then I have examined others of the family, and generally with the same result. I allude particularly to the Cape Petrel (*Daption capense*), two species of Albatross (*Diomedea exulans* and *D. melanophris*), and a Puffinus from the NE coast of Australia. From this, it is probable that the Cuttle fish family, which swarm in the Southern Seas, approach the surface chiefly at night, when the various oceanic birds above alluded to, are no less active than during the day, for marked individuals have been known to follow a ship for thousands of miles in her course across the trackless ocean."

Similarly, in September 1924 Hagerup (1926) also found that 50 Fulmars killed at 64°N in the Davis Strait all contained squid beaks, possibly from *Gonatus fabricii*,

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the food of Bottle-nosed Whales *Hyperoodon ampullatus* (Gray 1942). It has since been confirmed by Grieg (1933) and Lydersen *et al.* (1989) that Fulmars feed upon this squid around Svalbard. During surveys of seabird diet around Scotland and Ireland in 1970-75, the stomachs of 26 out of 36 Fulmars examined (72%) held cephalopod beaks, identified as mainly *Gonatus fabricii* (Bourne 1982, 1986). Since recent surveys of regurgitations fed by Fulmars to their chicks have seldom detected squid (Furness & Todd 1984, Camphuysen & Van Franeker 1996), possibly because only the durable mouthparts are found in the stomach (Camphuysen & Van Franeker 1997), and past reports of Fulmars feeding on these squid have been overlooked (Furness 1994, Croxall & Prince 1996), it may be useful to give details of our records of Fulmars taking squid and annelids.

OBSERVATIONS

A total of 127 seabirds usually shot at sea around north Britain, Ireland, the Faroes and in the Davis Strait were frozen until they could be processed when their digestive tract was preserved in alcohol. When the contents were examined by Tim Dixon and John Benzie the durable invertebrate mouthparts were separated. The best prey specimens from 23 birds, mainly Fulmars, collected off Scotland and Ireland from January to August, were referred to M. Clarke at the Marine Biological Association Laboratory, Plymouth, for identification (Table 1, Fig. 1).

Month	Jan	Feb	Apr	May	Jul	Aug	Oct	Total
number of birds	3	2	1	8	5	1	1	21
Gonatus spp.	-	1	-	5	3	1	-	10
possible Gonatus spp.	1	1	1	5	2	-	-	10
Octopo-/Histioteuthis	-	1	-	1	-	-	-	2
Oegopsids	3	-	-	1	-	1	-	5
Octopod Eladone cirrosa	1	-	-	1	1-2	-	-	3-4
Nereis (virens ?)	-	1	-	7	2	-	-	9

 Table 1. Invertebrate mouthparts from the stomachs of Fulmars.

 Tabel 1. Harde monddelen van ongewervelden in de magen van Noordse Stormvogels.

RESULTS

In general the main squid found in British and Irish waters were mature *Gonatus*, identified as *G. fabricii* before the description of the similar, more southerly species *G. steenstrupii* (Kristensen 1981a), of an estimated average weight of 226g and a maximum of 308g, the size also taken by Bottle-nosed Whales (Clarke & Kristensen 1980), with at least one other Oegopsid squid present. A Sooty



- Figure 1. Localities of collection of seabirds containing invertebrate mouthparts. The dotted line indicates the 200m depth contour. Those squid that were identified were normally Gonatus everywhere except for single Octopoteuthis or Histioteuthis in the central North Sea and outer NW Shelf.
- Figuur 1. Plaatsen waar zeevogels werden verzameld die inktviskaken of monddelen van borstelwormen in de maag hadden. De meeste inktvissen die konden worden herkend, verspreid over het gehele gebied, behoorden tot het geslacht Gonatus. In de centrale Noordzee en op de rand van het Continentale plat in het NW werden enkele Octopoteuthis en Histioteuthis gevonden.

Shearwater *Puffinus griseus* taken at 60.4°N 4.3°W on 7 September 1973 also contained *Gonatus* and another squid species, and a Great Shearwater *P. gravis* taken at 53.1°N 12.6°W off south west Ireland on 11 August 42 small Oegopsid squids, though *Gonatus*, found in a Fulmar taken with it, was not identified. In addition 3-4 Fulmars and a Black Guillemot *Cepphus grylle* contained beaks of small Octopods (probably Eladone cirrhosa), with an estimated weight of 21-25g.

Some other Fulmars also contained the jaws of polychaete worms *Nereis* (which P. Gibbs thought might be *N. virens*), though these were not found together with cephalopods.

DISCUSSION

It is well known that the shearwaters catch squid (Brown et al. 1981), but the fact that Northern Fulmars also do this has attracted less attention. It seems debatable where, how and when they obtain them. While Fisher (1952: 428-430) lists other species, he does not pursue the subject. Gonatus are seldom brought up by trawls (P. Boyle pers. comm.), and Hagerup (1926) thought their beaks might be scavenged from whale faeces, Clarke et al. (1981) from whale vomit, and Rodhouse et al. (1987) following post-spawning mortality. Gonatus spawn on the sea floor (Kristensen 1981b). Imber (1973) has followed MacGillivray (1846) in suggesting they might be caught coming to the surface at night. While I have not seen a Fulmar secure a souid. I have seen fairly closely related flying gadfly petrels Pterodroma sp., including Great-winged Petrel P. macroptera, discussed by Imber (1973), pick apparently inert squid from the surface far out at sea, and several gather together on the water to peck at larger squid, by day. One reason why these birds have developed such strong skulls and formidable bills, capable of tearing fish open and lacerating a human hand, might be to seize and dismember squid too large to be swallowed whole. Presumably the *Nereis* were caught in the swarming reproductive epitoke phase, as in the Barents Sea (Lydersen et al. 1989, Camphuysen & Van Francker 1997), where when it remains light all night in June I once saw seabirds catching annelids at the sea surface around midnight.

Although it is usually assumed that Fulmars feed, and must therefore have caught their food, at the sea surface, Fisher (1952: 418, footnote) reports that they are efficient divers. To quote another example, some off-duty crew were fishing from a high oil platform in the North Sea on the fine, calm afternoon of 18 August 1978, which they still did commercially at that time, although it was later banned because the lost lines proved a hazard to divers. When they threw an unwanted fish overboard it attracted two Fulmars, an adult Great Black backed Gull *Larus marinus*, and ten migrant Common Gulls *L. canus*. As it sank one Fulmar followed it down right out of sight, presumably since the water was clear for well over ten metres, for a period of the order of minutes, brought it up, tore it open, and extracted the guts. The other Fulmar also dived, but the gulls merely flew ineffectually around overhead. Possibly Fulmar diving ability has been underestimated because it only occurs in the middle of a 'feeding frenzy', or at night. *Gonatus* are shoaling squid up to 30cm long in which the immatures live

near the sea surface. The adults stay much deeper by day, though they might ascend at night (Kristensen 1983). Fulmars may catch them then, especially where they may gather to spawn early in the year in the Davis Strait, between Iceland and Jan Mayen (Greenland Sea) and off Vesterålen and Møre in Norway (Bjørke 1995), where there were formerly also Fulmars (Montevecchi & Hufthammer 1990). This may also explain the occurrence of a Fulmar colony in lower latitudes on St Kilda. If the Fulmars catch squid at night, they may digest them before they come to land by day. This would explain why only beaks were found in birds all collected after 10:30 hrs, and the scarcity of recognisable squid in the regurgitations fed to chicks. Alternatively, the durable beaks found with other indigestible matter in Fulmar stomachs may be left over from other times of year.

There has been much debate over the reason for the recent increase of the Fulmar in the temperate North Atlantic, which Fisher (1952) attributed to the extra food in the form of offal provided by first whaling and then fishing. I have already suggested (Bourne 1966, 1984) that the critical period may not be the summer, when there appears to be ample food, but the winter, when in the past Fulmars may have caught squid in a way that has also proved suitable for scavenging around first whalers and then trawlers.

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