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STOMACH CONTENTS OF SPERM WHALES STRANDED IN THE NORTH SEA

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ABSTRACT

On the morning of 28 January 1996, a group of 6 sperm whales stranded on Cruden Bay beach, twenty miles north of Aberdeen (Scotland). All were males, ranging from 12 to 13 m in length.

Stomach samples were collected from 5 whales. Blubber and liver samples were collected for analysis of contaminant levels, skin samples collected for genetic studies and teeth removed for ageing. The whales were 20-25 years old.

Food remains recovered consisted entirely of cephalopod beaks (apart from a skate egg capsule in the stomach of one whale). However, it was not possible to examined the whole gastric contents in any of the cases. One whale had a piece of net of around 1 m. length in the stomach. The oceanic squid *Gonatus* sp. (probably *Gonatus fabricii*) was the main prey species, but remains of other oceanic squids (*Histioteuthis bonnellii*, *Teuthowenia megalops*, *Todarodes sagittatus*) were also found together with the octopus *Haliphron atlanticus*.

Results are compared with stomach contents of sperm whales stranded in 1994 in Scotland, and also whales stranded in Holland and Germany in that year.

INTRODUCTION

The Sperm whale (*Physeter macrocephalus* L.) is the largest of the Odontoceti (toothed whales): males can reach 18-21 m in length while females do not exceed 12 m (Berzin, 1972). It is a cosmopolitan species found in deep waters in all oceans (Rice, 1989). While females and calves remain in low latitudes all year round, males migrate into high latitudes in spring/summer. Young males are often found travelling in groups. Groups of animals from 11.9 to 13.7 m long and aged from 15 to 29 years (Best, 1979 called them "medium size bachelor" groups) can consist of 3 to 15 whales.

Strandings of sperm whales in the North Sea have been documented since the 16th century but numbers appear to have increased in the last decade (Smeenk, In Press). The stranded animals are typically sub-adult or adult males and most strandings occur in the winter

months, presumably animals returning southwards from their feeding grounds to breeding areas in lower latitudes.

Diets of sperm whales stranded in the North Sea and adjacent areas have previously been described by Lick *et al.* (1995), Santos *et al.* (1995) and Clarke (In Press) but all these studies have been based on a few animals and more information is still needed on the feeding habits of this species.

On the early morning of the 28 January 1996 a group of 6 sperm whales stranded at Cruden Bay (twenty miles north of Aberdeen, Scotland). The present paper describes the findings from dietary analysis and related studies on these animals.

MATERIAL & METHODS

The group of 6 sperm whales stranded alive at Cruden Bay but died soon afterwards. The bodies were spread along 1 mile of the beach. All of the whales were measured and samples of blubber, skin and teeth were collected the next day.

Whales were numbered 1 to 6 starting from the south. Whale number 6 was cut open and examined more thoroughly as it appeared thin. Part of the stomach contents was collected. The next day (48 hours after the stranding) the whales had filled with gas from decomposition of the internal organs. Three animals burst open and two more were opened with the help of diggers to prevent further explosions. Food remains, consisting mainly of cephalopod beaks, and liver samples were collected from the open whales. It was not possible to examine the whole gut. All the stomach contents collected were returned to the laboratory, washed clean and stored in 70% alcohol.

Cephalopods beaks were identified using reference material and published guides (Clarke, 1980, 1986). Standard measurements (rostral length for squid species and hood length for the octopus species; Clarke, 1986) were taken on both upper and lower beaks using a binocular microscope fitted with an eyepiece graticule. Mantle length and body weight of the animals were estimated using regressions from Clarke (1986), Pierce *et al.* (1993) and unpublished data.

The relative importance in the diet for each prey type was estimated as proportion of total prey weight.

RESULTS

All the whales were males and ranging from 12.1-13.75 m of length, with blubber thickness ranging from 120-140 mm., and estimated age of 20-25 years. Levels of pollutants e.g. chlorinated biphenyls and organochlorine pesticides were analysed by the Scottish Office Agriculture, Environment and Fisheries Department (SOAEFD) and results are reported in McKenzie *et al.* (1996). Liver samples showed high mercury and cadmium levels, consistent with an animal feeding mainly on cephalopods.

The squid *Gonatus* sp. (probably *Gonatus fabricii*) was the most important prey item (Table 1, Fig. 1). The size distribution of the *Gonatus* (Fig. 2) indicates that the animals eaten were large, probably mature. Other oceanic squid species (*Histioteuthis bonnellii*, *Teuthowenia megalops*, *Todarodes sagittatus*) were also found together with the deep-water octopus *Haliphron atlanticus*. In one case (whale number 5), a skate egg capsule was found together with a lower beak of the coastal squid *Loligo forbesi* and an upper beak of the octopus *Eledone cirrhosa*.

DISCUSSION

It is still not clear what could drive what seem to be perfectly healthy animals to shallow waters and the beach, where they strand and die. Several explanations have been proposed in the literature, such as increased pollutant levels (Bouquegneau *et al.*, 1995), underwater explosions related to gas and oil prospecting (van Bree, 1977; Clarke, pers. comm.), increase in traffic and noise levels (Vandewalle, 1992), electric storms together with sudden meteorological changes (Robson & van Bree, 1971; Kompanje & Reumer, 1995) and disturbances in the geomagnetic field (Klinowska, 1988). However, there is little evidence available to test any of these hypotheses.

Stomach contents analysed from male sperm whales stranded in the area in the last few years have shown a predominance of *Gonatus* sp. remains and very little else (Table 2). *Gonatus fabricii* (Lichtenstein) is an oceanic species considered to be the most abundant squid in the Arctic and Subarctic area of the North Atlantic (Kristensen, 1983). Clarke & MacLeod (1976) found *Histioteuthis bonnellii* and *Taningia danae* to be the most important prey from the stomach contents of 6 sperm whales caught off Iceland. If these results are representative, it may indicate that sperm whales concentrate on *Gonatus* only in the eastern northeast Atlantic, e.g. around the coast of Norway, or that diets have changed since the 1970s.

Juvenile squid (dorsal mantle length up to 50 mm) are caught in the surface layers. At a length of 50-70 mm *Gonatus* disappears from the surface, probably moving to deeper waters (Bjørke, 1995). Squids between 80 mm and 250 mm have been caught at depths of 200-550 m with deep pelagic and bottom trawls (Wiborg, 1982; Wiborg *et al.*, 1984). In West Greenland, at a length of about 200 mm, and aged 2 years, the males are probably mature. Females mature at about 2-3 years and pen length larger than 200 mm. Females probably die after spawning while males possibly breed twice (Kristensen, 1984). The size (mantle length) estimated for the majority of *Gonatus* in the stomachs of the whales stranded at Cruden Bay (Fig.2) corresponds to mature squids (205-235 mm.).

Very few mature specimens and no spawned eggs have been found, probably because spawning takes place at depths greater than 200 m (Kristensen, 1984). Areas of spawning have not been identified. The main spawning period is from December to April (Bjørke, 1995 for the Norwegian Sea), which coincides with the months with more strandings of sperm whales in the North Sea (Smeenk, In Press). Concentrations of spawning *Gonatus* probably represent an important resource for sperm whales in the North Atlantic.

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Figure 1. Percentage by weight of main prey

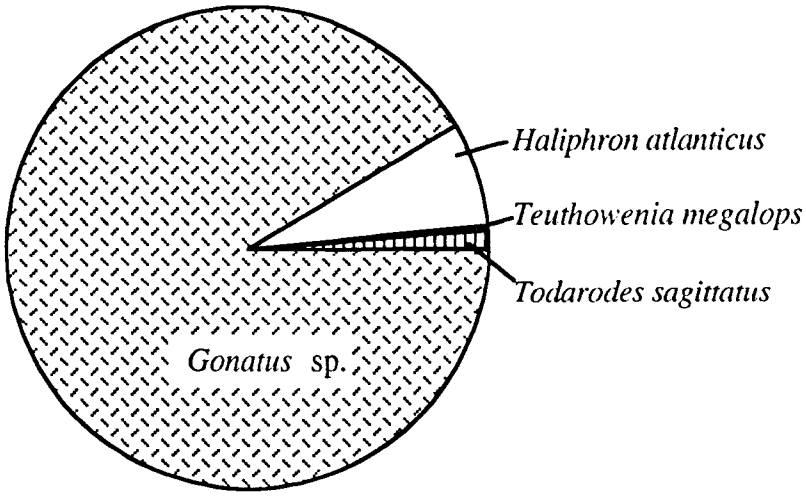

Figure 2. Size distribution of *Gonatus* sp.