



Figure 1. Northern Fulmars *Fulmarus glacialis* feeding on offal/discards at a small long-liner, just north of the Faroe Islands, January 2004. © Jan van Franeker.

Letter: Seabirds and trawlers

In a discussion of the diet of the Northern Fulmar *Fulmarus glacialis* Danielsen *et al.* (2010) speculate about the reason for the occurrence of a high proportion of the mesopelagic Glacier Lanternfish *Benthoosema glaciale*. When examining the stomach contents of seabirds taken around Britain and Ireland in the early 1970s we were surprised by the occurrence of not only mesopelagic species which might come to the surface at night as originally suggested by Macgillivray (1846), but also bottom-living species such as flatfish unlikely to do so. We came to the conclusion that they came from the copious vomited stomach-contents of fish brought up from deep water by trawlers, which appear to form a major part of the food

taken by the smaller accompanying seabirds (Bourne 1982, 1997).

References

- Bourne, W. R. P. 1982.** Concentrations of Scottish seabirds vulnerable to oil pollution. *Marine Pollution Bulletin* 13: 270–273.
- Bourne, W. R. P. 1997.** Fulmars, squid and annelids. *Sula* 11: 217–222.
- Danielsen, J., van Franeker, J. A., Olsen, B., & Bengtson, S. A. 2010.** Preponderance of mesopelagic fish in the diet of the Northern Fulmar *Fulmarus glacialis* around the Faroe Islands. *Seabird* 23: 66–75.
- MacGillivray, J. 1846.** The food of the petrel family. *Zoologist* [1846]: 1490.

W. R. P. Bourne, Ardgath, Station Road, Dufftown, Keith AB55 4AX, UK.

Table 1. Fish species caught by research trawling around the Faroe Islands and the percentage with empty stomachs, 2007–11.

Fish species	Total	Empty (%)
Haddock <i>Melanogrammus aeglefinus</i>	9,432	6.4
Cod <i>Gadus morhua</i>	9,675	7.7
Saithe <i>Pollachius virens</i>	7,116	10.8

Reply

In his note to Danielsen *et al.* (2010), of course Dr. Bourne is right that fisheries or fish vomit could have played a role regarding the high proportion of the mesopelagic Glacier Lanternfish *Benthoosema glaciale* found in Northern Fulmar *Fulmarus glacialis* stomachs. However, in our paper Fulmar stomachs were considered to contain fisheries offal when remains of bivalves (Bivalvia) and gastropods (Gastropoda), sea urchins (Echinoidea), and/or crabs (Brachyura) were found. This was done since we assumed that if stomachs contained remains of benthic organisms, they would have originated from the consumption of discarded guts of larger bottom-dwelling fish thrown overboard from a fishing vessel. Analysis for co-occurrence of lanternfish and offal indicators in the Faroese Fulmar stomachs showed that while 107 stomachs contained traces of offal and 135 stomachs contained Glacier Lanternfish, only 14 contained both. Thus we have no reason to suspect that many of the lanternfish had been consumed indirectly, as part of offal or fish vomit. Studies in other regions, where offal and bycatch can be excluded as a source of diet components, have also shown that myctophids can be seized directly by surface-feeding fulmarines (e.g. Coria *et al.* 1997; Gould *et al.* 1997; Ferretti *et al.* 2001).

In addition, survey data from the Faroese Marine Research Institute indicate that only a small percentage of the fish stomachs collected onboard the research vessel were empty (Table 1). Furthermore it seems unlikely that any emptying of fish stomachs, caused by pressure differences, would only occur at the surface, where Fulmars can feed.

References

- Coria, N. R., Soave, G. E., & Montalti, D. 1997. Diet of Cape Petrel *Daption capense* during the post-hatching period at Laurie Island, South Orkney Islands, Antarctica. *Polar Biology* 18: 236–239.
- Danielsen, J., van Franeker, J. A., Olsen, B., & Bengtson, S. A. 2010. Preponderance of mesopelagic fish in the diet of the Northern Fulmar *Fulmarus glacialis* around the Faroe Islands. *Seabird* 23: 66–75.
- Ferretti, V., Soave, G. E., Casaux, R., & Coria, N. R. 2001. Diet of the Snow Petrel *Pagodroma nivea* at Laurie Island, Antarctica, during the 1997/98 breeding season. *Marine Ornithology* 29: 71–73.
- Gould, P., Walker, W. & Ostrom, P. 1997. Foods of northern fulmars associated with high-seas drift nets in the transitional region of the North Pacific. *Northwestern Naturalist* 78: 57–61.
- Johannis Danielsen, *Faroese Marine Research Institute, Nóatún, F-O 100, Tórshavn, Faroe Islands;*
 Jan A. van Franeker, *IMARES, P.O. Box 167, 1790 AB Den Burg, Texel, The Netherlands.*