

Schaanning (1933) lists wing- and bill-length of skins and weight of eight breeding Brunnich's Guillemots shot at Jan Mayen. Wing- and bill-length were much smaller than in our data, perhaps as a result of post-mortem shrinkage (wing-length 216.6 ± 3.4 mm, range 211-220, $n=8$, bill-length 33.9 ± 1.9 , 32-37). Remarkably, the weights (mean 1365 ± 61.6 g, range 1300-1470, $n=8$), were on average nearly 20 percent more than our heaviest specimen (see Table 2). Dimensions and weight of 15 eggs measured freshly were quite similar to ours (average 80.7×50.7 mm, weight 99.9 ± 13.6 g, range 77-115).

Measurements of Puffins shot at Jan Mayen have been published previously (Holgersen 1953, Salomonsen 1944, Schaanning 1933). Most authors place the Jan Mayen birds between *F.a. arctica* and *F.a. naumanni*. The average wing-length of 15 skins measured by Salomonsen and nine by Schaanning was 175.1 ± 3.5 mm (range 168-180 mm), and 173.4 ± 3.2 (range 168-177) respectively. Salomonsen also found two dwarf specimens (156 and 162 mm respectively). Holgersen mentions one adult with 177 mm. We have found considerably longer wings (Table 3), and it is doubtful whether post-mortem shrinkage is to blame for a 10 mm difference. Bill-length (method 1, from feathers) was 51.3 ± 2.9 mm (range 45.3-54.2), and 51.2 ± 4.0 mm (range 43-55) respectively. Included are two dwarf specimens (49 and 43 for bill-length, 38 and 35 for bill-depth respectively). Holgersen recorded a bill-length of 51 and depth of 40 mm. In the present study bills were longer, but bill-depth was about the same (54.8 and 41.5 mm respectively). Schaannings weights of Puffins are slightly below our findings (mean 560 ± 41 g, range 490-600). The measurements in this study indicate the presence of *naumanni* rather than of *arctica* on Jan Mayen (cf. Cramp 1985).

Measurements of Little Auks are published by the same three authors from adult birds shot at Jan Mayen earlier this century, and these are similar to the present study.

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SUMMARY

Breeding individuals of Common Guillemot, Brunnich's Guillemot, Puffin and Little Auk were caught and measured at Jan Mayen in summer 1983. Dimensions and weights of 185 eggs of Brunnich's Guillemots were also measured. Compared with previous studies, we found considerably larger Puffins, larger but much less heavy Brunnich's Guillemots and very similar Little Auks. It is concluded that the Common Guillemots belong to the sub-species *Uria aalge hyperborea* and that the Puffins belong to *Fratercula arctica naumanni*.

REFERENCES

- ANKER-NILSEN, T., HOPE JONES, P. and RØSTAD, O.W. 1988. Age, sex and origins of auks (Alcidae) killed in the Skagerrak oiling incident of January 1981. *Seabird* 11: 28-46.
- BIRKHEAD, T.R. 1986. Counts of bridled Guillemots *Uria aalge* from Jan Mayen and southwest Greenland. *Ornis Scandinavica* 17: 363.
- CRAMP, S. 1985. *The Birds of the Western Palearctic, Vol 4*. Oxford Univ. Press, Oxford.
- FRANEKER, J.A. VAN, CAMPHUIJSEN, C.J. and MEHLUM, F. 1986. Status over Jan Mayens fugler. *Vår Fuglefauna* 9(3): 145-158.
- HARRIS, M.P. 1980. Post-mortem Shrinkage of Wing and Bill of Puffins. *Ring and Migration* 3: 60-61.
- HOLGERSEN, H. 1953. On a collection of birds from Jan Mayen. *Astarte* 5: 1-9.
- HOPE JONES, P. 1988. The European cline in wing length of Guillemots *Uria aalge*. *Seabird* 11: 19-21.
- SALOMONSEN, F. 1944. The Atlantic Alcidae. *Göteborgs Kungl. Vitterhets Samhälles Handlingar*, 6, vol. 3(5): 1-138.
- SCHAANNING, H.T.L. 1933. Zoological Results of the Norwegian Scientific expedition to East-Greenland, I.2., A contribution to the Bird Fauna of Jan Mayen. *Skrifter om Svalbard og Ishavet* 49: 25-39.

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A note on the diet of Razorbills *Alca torda* wintering off Portugal

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INTRODUCTION

The diet of the Razorbill *Alca torda* is fairly well known over much of its breeding range, but far fewer data are available on the winter food (Bradstreet & Brown 1985). Pilchard *Sardina pilchardus* and anchovy *Engraulis encrasicolus* are the only prey species that have been reported from the southern wintering grounds (Witherby *et al.* 1941, Teixeira 1986).

The Razorbill is a common winter visitor to Portugal, and most birds are probably from British and Irish breeding colonies (Mead, 1974, Hope Jones 1984, Teixeira 1986). Each year large numbers drown while diving near floating nylon gill-nets set off the coast for scar *Trachurus trachurus*, mackerel *Scomber* spp., grey mullet (Mugilidae), sea bream (Sparidae), etc. (Bourne 1984, Teixeira 1986). This mortality was studied between 1983 and 1987 at Fonte da Telha, a small fishing settlement 15 km south of Lisbon, where several hundred corpses were found each year from November to March (Teixeira 1986). Here I report on the stomach contents of a few freshly killed specimens.

METHODS

From November 1985 to March 1986, and in January and November 1987, freshly drowned Razorbills were collected at Fonte da Telha. Most birds had been dead for less than 24 hours and none for more than three days, and were caught in nets set within 9 km of land. Corpses were deep-frozen after collection and stomachs removed and stored in 70% alcohol a few weeks later. The soft tissues and bones of prey present in the oesophagus/proventriculus and in the gizzard were identified and counted and their wet weight recorded. Particular care was taken to examine the endothelial folds of the gizzard for small otoliths, invertebrate parts, etc. Each prey item was identified to the lowest possible taxon. Fish identification was achieved from whole bodies and from otoliths and characteristic bones, with the help of a reference collection. Where possible fish length was measured from the tip of the snout to the tip of the hypural fan (standard length).

RESULTS

Of the 26 freshly killed Razorbills examined, 19 (73%) contained identifiable fish prey, 3 (12%) had no remains at all and 4 (15%) had only a very small amount of unidentified fish bones in the gizzard. The samples with identifiable remains averaged 10.8 g ($n=18$; s.d. = 13.5 g; range 0.9-47.5 g), and contained an average of 4.3 items ($n=19$; s.d. = 3.9 items; range 1-17 items). The samples were generally in good condition, since the birds were caught while feeding, so prey identification to species level was usually possible.

The frequency of occurrence of prey species in the stomachs with identifiable remains is shown in Table 1. Four fish families were found, each represented by a single species. Pilchard was by far the most important species, occurring in 15 (79%) of the 19 stomachs with identifiable remains, making up 66% of the 82 prey items found, and being present in all months except December 1985, when the single bird examined had no identified remains.

Standard lengths averaged 6.5cm (n=11; s.d.=1.2cm; range 4.0-8.3cm). These pilchards were certainly immatures less than one year old, as the species attains maturity when c. 13.5-15.5cm long, during the first year of life (Figueiredo & Santos 1988).

The other two important species were anchovy and sandeels. Anchovy occurred in November 1985 and 1987 and was only found when pilchard was also present. The 19 sandeels were present in 3 (16%) stomachs collected in January 1987. The only two identified were *Ammodytes tobianus*. Standard lengths were measured in one anchovy (7.0cm) and in both *Ammodytes tobianus* (10.0cm).

TABLE 1. PREY ITEMS FROM 19 RAZORBILL STOMACHS FROM FONTE DA TELHA, PORTUGAL. (NOVEMBER - MARCH).

Prey	Overall frequency of prey item		Stomachs in which prey item occurred	
	(n)	(%)	(n)	(%)
Clupeidae				
Pilchard <i>Sardina pilchardus</i>	54	66	15	79
Engraulidae				
Anchovy <i>Engraulis encrasicolus</i>	6	7	3	16
Atherinidae				
<i>Atherina presbyter</i>	2	2	1	5
Ammodytidae				
<i>Ammodytes tobianus</i>	2	2	1	5
unidentified Ammodytidae	17	21	3	16
Unidentified fish	1	1	1	5

DISCUSSION

For seabird diet studies care must be taken in drawing conclusions from small sample sizes (Harrison *et al.* 1984). However, these results, together with those from Witherby *et al.* (1941) and Teixeira (1986), indicate the importance of pilchard to Razorbill in its southern wintering grounds. In fact, pilchard is likely to be the main available resource in these areas. Although the relative abundances of fishes in the waters off Portugal are not known, pilchard seem to be the commonest small fish and, as far as is known, the only small epipelagic species that occurs in very large shoals.

Seabird populations interact with fisheries in a complex way but the decrease of several seabird populations has been associated with the overexploitation of some fish stocks (Furness 1984). The Iberian pilchard stock supports a large human fishery which, over the years of 1976 to 1987, took an average of about 24-31% of the total stock each year (ICES 1988). The fishery is based mainly on young fish (ages 0-2), so probably competes with seabirds. Knowledge of the dynamics in availability of pilchard might help explain the very variable annual numbers of Razorbills recorded in the southern wintering areas (Mead 1974, Carboneras 1988).

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REFERENCES

- BOURNE, W.R.P. 1984. Wrecked seabirds died in Iberian nets. *Mar. Pollut. Bull.* 15: 277.
 BRADSTREET, M.S.W. and BROWN, R.G.B. 1985. Feeding ecology of the Atlantic Alcidae. In NETTLESHIP, D.N. and BIRKHEAD, T.R. (eds.) *The Atlantic Alcidae*: 263-318. Academic Press, London.
 CARBONERAS, C. 1988. The auks in Western Mediterranean. *Ring and Migration* 9: 18-26.
 FIGUEIREDO, I.M. and SANTOS, A.M. 1988. On sexual maturation condition factor and gonosomatic index of *Sardina pilchardus* Walb., off Portugal (1986/1987). *ICES, Pelagic Fish Committee, Doc. C.M. 1988/H:61*.
 FURNESS, R.W. 1984. Threats to seabird populations presented by commercial fisheries. In CROXALL, J.P., EVANS, P.G.H. and SCHREIBER, R.W. (eds.), *ICBP Technical Publication 2*: 701-708.
 ICES (1988) Report of the Working Group on the assessment of pelagic stocks in Divisions VIII and IX and horse mackerel. *ICES, Doc. C.M. 1988/Assess:22*. 156 pp.
 HARRISON, C.S., HIDA, T.S. and SEKI, M.P. 1984. The diet of the Brown Booby *Sula leucogaster* and Masked Booby *Sula dactylatra* on Rose Atoll, Samoa. *Ibis* 126: 588-590.
 HOPE JONES, P. 1984. Skins of guillemots *Uria aalge* and razorbills *Alca torda* examined at Cascais, Portugal, May 1982. *Mem. Mus. Mar.* 3: 1-10.
 MEAD, C.J. 1974. The results of ringing auks in Britain and Ireland. *Bird Study* 21: 45-86.
 TEIXEIRA, A.M. 1986. Razorbill *Alca torda* losses in Portuguese nets. *Seabird* 9: 11-14.
 WITHERBY, H.F., JOURDAIN, F.C.R., TICEHURST, N.F. and TUCKER, B.W. 1941. *The Handbook of British Birds*, Vol. 5. H.F. and G. Witherby, London.

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