



## Notes on the feeding ecology of two common eiders, *Somateria mollissima*, in central Italy

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### ABSTRACT

Two common eiders *Somateria mollissima* were observed in Tuscany, Italy, during the late winter. The activity rhythms (expressed as the percentage of time feeding, the dives per minute and the percentage of time underwater) were characterized by a morning feeding peak and a decline during the day. The possible reasons for this pattern are discussed. The eiders did not appear to select areas in which the feeding effort was less, and since neither human disturbance nor kleptoparasitism can explain this phenomenon, the food availability and quality is tentatively proposed as the most probable explanation.

**KEY WORDS:** Eider; *Somateria mollissima*; Habitat use; Activity rhythms; Italy.

### ACKNOWLEDGEMENTS

Special thanks are due to A. Frate for her enthusiastic help in the field work and to Prof. I. Patterson (University of Aberdeen, U.K.), who kindly reviewed the manuscript and made very useful comments. I also thank G. Anselmi (W.W.F. Grosseto) for his collaboration, G. Rallo for provision of facilities during the field work, and the Delegazione di Spiaggia di Castiglione della Pescaia for giving permission to stay in the port.

(Accepted 12 June 1988)

### INTRODUCTION

While the food and the feeding habits of common eiders are rather well-known over a wide geographic range (see Milne & Dau (1976) for a review), there is a lack of information on the feeding ecology of this species at the southern limits of its distribution.

In Italy eiders have been recorded several times during this century. In particular, during the 1986-1987 winter six individuals were reported in Tuscany (Arcamone, 1987). Nevertheless, only incidental data on their feeding ecology have been published.

The aim for this study was to provide quantitative data on the winter feeding ecology of eiders, so that comparisons could be made with other areas and, ultimately, to help in understanding the major ecological factors that are relevant to the present distribution of eiders.

### STUDY AREA

Castiglione della Pescaia, near Grosseto (Tuscany, central Italy) is a small port; it is a tourist resort during summer and a fishing port in winter. The tidal range is very small (generally less than 0.3 m). The eiders frequented six different but contiguous areas at this port: 1. interior of the port (P): muddy bottom, depth 1.8 to 3 m; 2. entrance of the port (E): muddy bottom, depth about 2.5 m; 3. head of the right dock (R): mixed rocky-muddy bottom, depth about 2 m; 4. head of the left dock (L): rocky bottom, depth 4 to 6 m; 5. near the shore (S): rocky bottom, depth about 50 cm; 6. open sea (more than 200 m from the shore) (D): various bottoms, depth > 6 m. In habitats 1, 2, 3 and 4 there is a constant flow of freshwater, while habitats 1 and 2 were subject to disturbance caused by boats. The depths were taken from the map of Hydrographic Institute of the Italian Navy and checked with a bathometer.

### MATERIALS AND METHODS

This study is based upon two eiders (*Somateria mollissima* L.), 1 subadult male and 1 female that arrived in the study area in November, 1986 and remained there until February 10th, 1987. They did not return in following winter, which was an exceptionally mild one. The eiders were observed for 102 hours, from January 22th to February 8th, 1987, with the aid of a pair of 7 × 50 binoculars and a 15 × - 60 × 60 telescope. Photographs were also taken. For the two animals, we recorded the duration of 3252 dives and the zones frequented during time intervals of 1 h up to 10 h 30 min. For the analysis of activity rhythms only periods lasting at least 5 h of continuous observation were utilized. In six cases we watched the animals continuously from dawn, when they arrived flying from the open sea, to dusk, when they swam back to the open sea. The number of cases of kleptoparasitism (by *Larus ridibundus* and *L. cachinnans*) was also recorded. Statistical analyses were performed using a Stats-Plus program for Apple II-e computers. Spearman rank correlation and Wilcoxon matched-pairs signed-rank tests were used.

### Definitions

*Time feeding:* the time of dives plus the time between dives (excluding interruptions lasting more than 10 min, an arbitrary value clearly longer than «recovery time», see Nilson, 1972). These eiders never caught prey other than by diving.

*Percentage of kleptoparasitism:* the number of prey items stolen by gulls divided by the total number of prey brought to the surface by eiders (× 100).

*Percentage of time feeding per habitat:* the time used for feeding in each habitat divided by total time feeding (× 100).

RESULTS

The activity rhythms, expressed as percent of time spent feeding, percent of observation time underwater and number of dives per minute of observation are shown in Figure 1. There was a good correlation between the three parameters both for the male ( $0.864 > r_s > 0.827, p < 0.002$ ) and for the female ( $0.882 > r_s > 0.728, p < 0.004$ ). There was also a good correlation between male and female in the three parameters considered ( $0.891 > r_s > 0.855, p < 0.001$ ), though the male dived more frequently ( $z = 2.58, p = 0.009$ ). There was no statistical difference between the two individuals in the percent of time spent feeding ( $z = 1.60, p = 0.106$ ), in the percent of time underwater ( $z = 1.33, p = 0.179$ ) and in the mean duration of dives ( $z = 1.24, p = 0.211$ ).

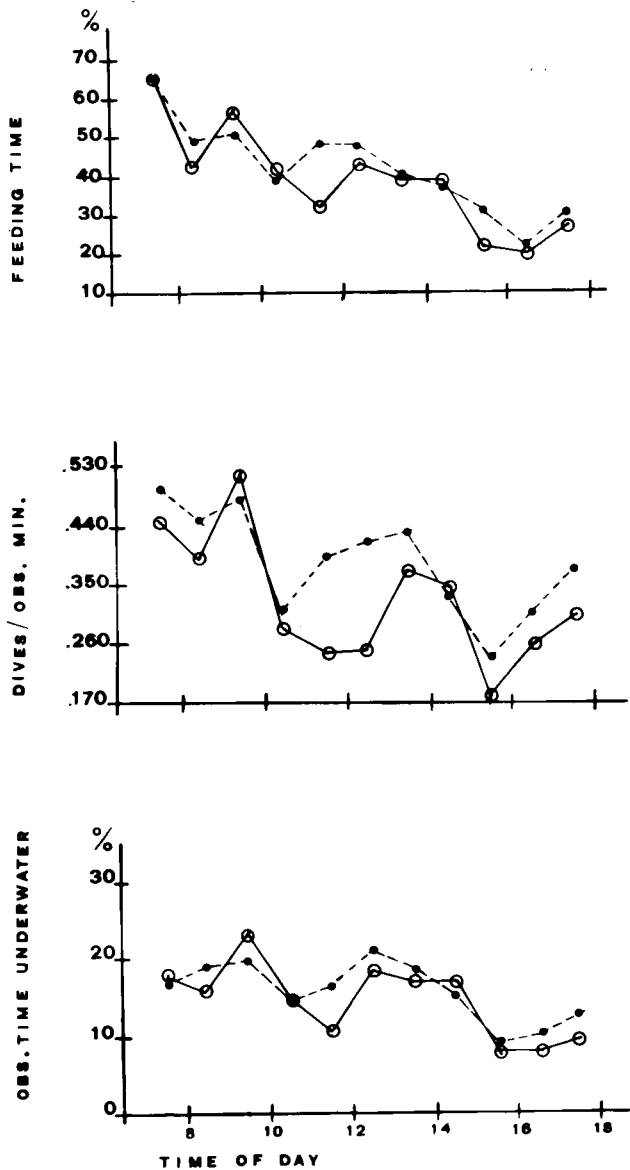


Fig. 1 - Activity rhythms of the two eiders: Solid line = female; broken line = male.

The data on habitat use are shown in Figure 2. The patterns of use of the male and the female were all strictly correlated ( $1 \geq r_s \geq 0.886, p < 0.02$ ), except for kleptoparasitism ( $r_s = -0.014, p = 0.418$ ); however, the latter was rather infrequent (total number of occurrences = 24).

The mean depth was positively correlated with the mean duration of dives ( $r_s = 0.886, p = 0.0198$  for both the male and the female) and with the percent of feeding time underwater ( $r_s = 0.886, p = 0.0198$  for the male,  $r_s = 0.829, p = 0.0419$  for the female), while depth was negatively correlated, although not significantly, with the number of dives per minute feeding.

The percent of time feeding per habitat was neither correlated with the mean depth nor with the mean duration of dives, the number of dives per minute feeding and the percent of feeding time underwater ( $0.143 \geq r_s \geq -0.543, 0.69 > p > 0.26$ ). The most frequented area (P; Fig. 2) had the highest level of human disturbance.

The eiders brought to the surface a variety of prey items (mainly crabs, 59.6%, and fishing offal, and fishing offal, 18.4% of identified prey items). The fishing offal was taken only in the habitats P, E, and especially in R. The crabs appeared to belong to at least two different species (possibly *Carcinus mediterraneus* and *Eriphia spinifrons*), the first often taken in the muddy habitats, the second in the rocky ones.

DISCUSSION

In areas where the tidal range is large the activity rhythms of eiders have been reported to be strongly

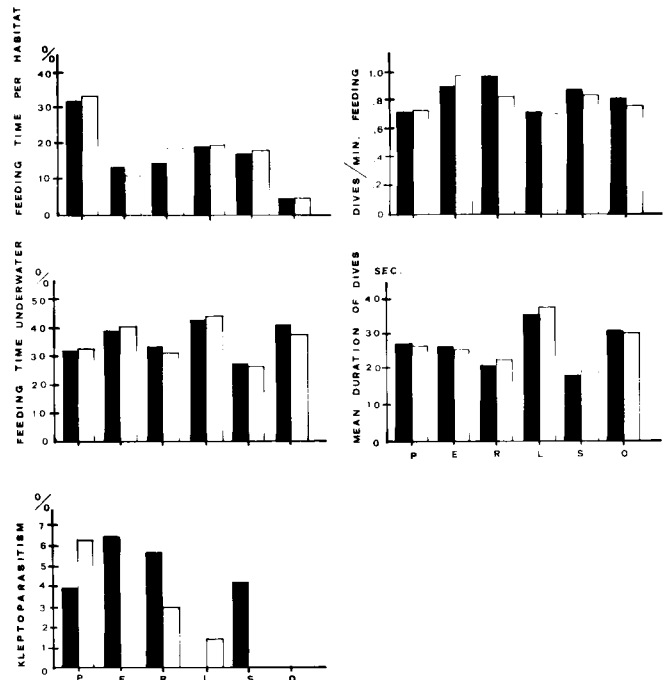


Fig. 2 - Parameters of habitat use by the two eiders (for the abbreviations, see «Study Area»): Open bars = female; solid bars = male.

tide-dependent (e.g. Bent, 1925; Marriott, 1966; Player, 1971; Cantin *et. al.*, 1974; Campbell, 1978; Minot, 1980; I. Pattersons personal communication). Where the tidal range is small, as was the case in the present study, the eiders have a feeding activity peak in the morning and one in the evening (e.g. Pethon, 1967; Dunthorn, 1971). The studies cited above are not strictly comparable with mine, because they involved different methods of data collection (i.e. counting the number of birds feeding, rather than following single animals). In fact, individuals of a population can have activity rhythms different from those of the population on the whole. Nevertheless, the pattern found in the present study was essentially the same, the major difference being the absence of the evening peak; this was probably due to the shorter day length in winter (cf. Pethon, 1967). The morning feeding peak may be due to the high physiological need to feed after a night-long fast (cf. Minot, 1980). It should be noted that the high levels of correlation between the activity rhythms of the male and those of the female are probably due to the fact that the two birds very often stayed together and synchronised their activities.

In a suboptimal habitat, as the central Italian coastline may be for eiders, one can expect an increased feeding effort; unfortunately, however, the lack of comparable data from another area prevents such an interesting comparison.

The positive correlations between the mean depth and both the mean duration of dives and the percentage of feeding time underwater, a pattern also reported for the golden-eye (*Bucephala clangula*) and the long-tailed duck (*Clangula hyemalis*) (Nilson, 1972), indicate that the diving effort increases with depth.

The lack of a negative correlation between the time

feeding per habitat and the various parameters of feeding effort is interpreted as an indication that the eiders did not choose the habitat in order to minimize their feeding effort. Neither could human disturbance nor kleptoparasitism have caused the observed pattern of habitat utilization (see «Results»). It is therefore suggested that the factor underlying the observed habitat use by eiders might be the different food availability and quality, probably caused by the differences in the kind of bottom and in salinity, rather than feeding effort.

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