

# THE WINTERING BEHAVIOUR OF COOT *FULICA ATRA* L. AT CORK LOUGH, SOUTH-WEST IRELAND

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## ABSTRACT

The activity pattern of a flock of coot *Fulica atra* at Cork Lough was studied during daylight hours over the winter of 1993/4 using instantaneous scan sampling. As an unknown proportion of the flock was out of sight at any time, the data are based only on visible birds. Swimming was the most important activity of visible birds, representing 38% of daylight hours, followed by feeding (36%). Surface feeding was the main foraging strategy, accounting for about 34% of time spent feeding during daylight hours. There was significant variation in activities both over the day and over the winter. Visible coot spent most of their daylight hours ( $94.2 \pm 0.7\%$ ) on water with a temporal variation in the mean percentage numbers being observed. Air temperature had no significant effect on behaviour. Increased precipitation resulted in an increase in resting and a corresponding decrease in the time devoted to preening. An increase in wind speeds was seen to result in an increase in grazing intensity.

## INTRODUCTION

The European coot *Fulica atra* L. is a resident and winter visitor on freshwater lakes throughout Ireland (Hutchinson 1989). It has been ranked as the sixth most common riparian species at altitudes less than 50m in Britain by Marchant and Hyde (1980). The estimated wintering coot population in north-west Europe, including some winter influx from continental Europe, is 1.5 million (Monval and Pirot 1989) with an estimated Irish wintering population of 30,000 birds (Sheppard 1993).

Coots are omnivorous, feeding mainly on the vegetative parts and seeds of aquatic and sometimes terrestrial plants (Cramp and Simmons 1980). As well as feeding on aquatic vegetation, coots also graze in flocks on grasslands in winter (Hurter 1972; Sharrock 1976). They are one of the most aquatic and least retiring of the rail family, tolerating almost continuous human presence up to fairly close ranges, and will, in some town parks, take food from the hand (Cramp and Simmons 1980). Many features of coot behaviour (including activity patterns or winter behaviour) are poorly understood (Cramp and Simmons 1980) and such baseline behavioural data are very important in furthering our understanding of the ecology of the species. Because they frequent urban ponds, it is possible that bread feeding, as seen in mute swan *Cygnus olor* (Keane and O'Halloran 1992; Sears 1989), is an important part of their winter diet and

hence may influence over-winter survival. In the absence of such behavioural data, this study set out to determine (a) daily and over winter activity patterns; (b) foraging behaviour and importance of bread feeding; (c) the relative use of the water and land; (d) the influence of weather conditions. This study was undertaken on a coot population at Cork Lough, where about 50 birds wintered during 1993/4.

## MATERIALS AND METHODS

### STUDY AREA

The study was undertaken at Cork Lough, a shallow, freshwater lake in the western suburbs of Cork city (see Pollock and O'Halloran 1995 for description). The lake is elliptical in shape and covers an area of approximately fifteen acres, of which eleven acres are open water (Kelly 1985). As the lake is situated in a built-up area, the birds are subjected to human disturbance, although many people give them food. Cork Lough is home to many species of bird, including mute swan and Canada goose *Branta canadensis*.

### DATA COLLECTION

Instantaneous scan sampling of the flock was carried out at intervals of fifteen minutes for a minimum observation period of one hour from 22 October 1993 to 21 January 1994 on 40 different days, resulting in 370 scan samples collected be-

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tween dawn and dusk (see Figs 3 and 4). As the birds spent most of their time in the water, the observer effect on subject behaviour during data collection was minimal. All activities recorded were mutually exclusive and during each scan a bird was only recorded once. Weather data were obtained from the Irish Meteorological Service. It was not possible to monitor the behaviour of birds that were out of sight on the island, so there may have been a tendency to underestimate certain activities, for example, resting. The activity patterns therefore refer to observed birds only and do not include individuals on the island.

#### DATA CATEGORIES

Activity categories were defined as feeding, resting on water, loafing on artificial trestles, preening, swimming, treading (a bird travelling across the water surface aided by flapping wings) and aggression. For analysis of feeding strategies the category was further sub-divided into surface feeding, bread feeding, diving, upending, grazing, head submerged and foraging. For each scan sample, the date and time relative to the dawn time were noted. The proportion of visible birds in and out of the water was calculated for each scan.

#### ANALYSIS

The number of birds involved in each activity was recorded and converted into the proportion of the total number of birds observed in the scan (Altmann 1974). Where more than one scan was undertaken in any hour, data for that hour were pooled to minimise the effect of serial correlation and to ensure independence of samples. These hourly data were then analysed in three ways. Firstly, the entire data set was examined to determine the mean percentage time that observed coots spent in each activity for all time periods. Secondly, the data were re-analysed to determine the mean percentage time spent in different activities during the day, which was divided into hourly periods after dawn. Thirdly, the data were pooled into weekly periods and re-analysed to examine activity patterns over the winter. Finally, the influence of weather was analysed by correlating activity levels with mean weekly rainfall, average temperatures on the preceding night and mean wind speed in each of four categories: low (1.5–9.05 knots), medium (9.06–16.6 knots), high (16.61–24.15 knots) and very high (24.16–31.17 knots). One-way ANOVA and correlation analysis were carried out on the data using Minitab (Ryan *et al.* 1985), following Arcsine transformation.

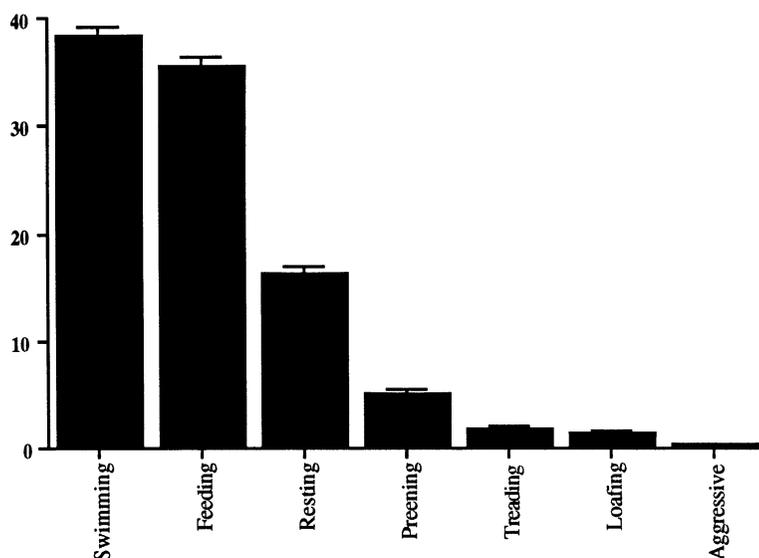


Fig. 1—Percentage time spent in various activities by visible coots at Cork Lough (mean ± s.e., 116 scans) during daylight hours.

#### RESULTS

Data were collected over a thirteen-week period from 22 October 1993 to 21 January 1994, on 40 days. The number of birds recorded in a scan ranged from seventeen to 57, with most in December.

#### ACTIVITY PATTERNS

The main activities of observed birds were feeding and swimming, which together represented almost 80% of the time; resting and preening were also frequently recorded (Fig. 1). The mean percentage time spent feeding peaked at one hour after dawn and thereafter decreased with time to nine hours after dawn ( $r = -0.955$ ,  $P < 0.01$ , d.f. = 7) (Fig. 2). The mean percentage time spent resting by observed birds increased slightly but significantly during daylight hours ( $r = 0.732$ ,  $P < 0.05$ , d.f. = 8) (Fig. 2).

The mean percentage time spent swimming, feeding and resting per week during daylight by the observable birds showed significant variation over the entire study period (swimming  $F_{12,103} = 2.05$ ,  $P < 0.05$ ; feeding  $F_{12,103} = 1.85$ ,  $P < 0.05$ ; resting  $F_{12,103} = 2.30$ ,  $P < 0.05$ ) but with no significant trend (Fig. 3). Significant variation was also observed in the time per week spent preening and resting on the trestles in the observable birds over the thirteen weeks of the study ( $F_{12,103} = 2.58$ ,  $P < 0.01$  and  $F_{12,103} = 2.30$ ,  $P < 0.01$ , respectively), but again no obvious pattern emerged.

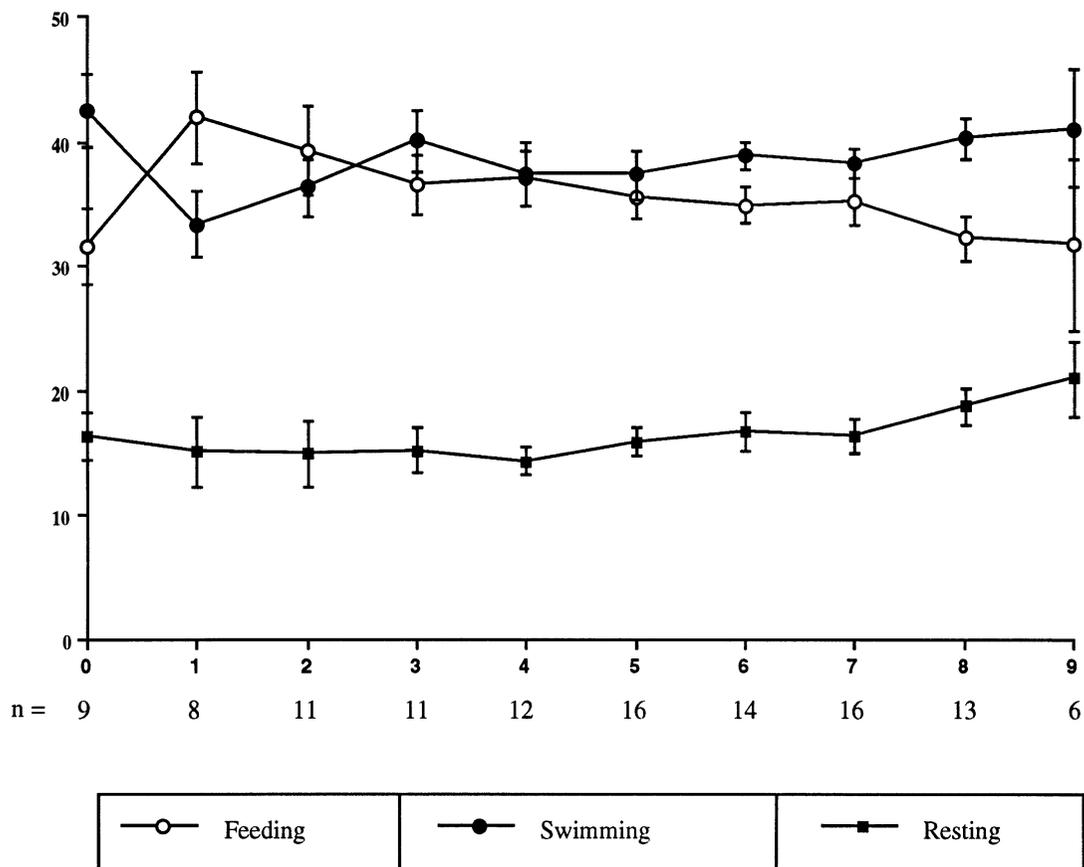


Fig. 2—Mean ( $\pm$ s.e.) percentage time spent feeding, swimming and resting throughout daylight hours by coots at Cork Lough (a total of 116 scans; the number for each hour (n) is also indicated).

#### FEEDING STRATEGIES AND SPATIAL UTILISATION

The most important feeding strategy of visible birds was surface feeding, representing  $35.8\% \pm 1.6\%$  of the observation time (Fig. 4). The mean percentage time devoted to this strategy increased significantly during daylight hours ( $r = 0.664$ ,  $P < 0.05$ , d.f. = 8) (Fig. 5). Grazing was the only feeding strategy that showed significant variation over daylight hours ( $F_{9,106} = 3.91$ ,  $P < 0.01$ ) and decreased significantly with time ( $r = -0.862$ ,  $P < 0.01$ , d.f. = 8) (Fig. 5). Surface feeding, the dominant feeding strategy of the observed birds in the flock, showed significant variation on a weekly basis over the study period ( $F_{12,103} = 13.42$ ,  $P < 0.01$ ) (Fig. 6) and decreased significantly from week 1 to week 13 ( $r = -0.877$ ,  $P < 0.01$ , d.f. = 12) (Fig. 6). The other feeding strategies also showed significant variation over the study period (feeding on bread  $F_{12,103} = 2.13$ ,  $P < 0.05$ ; diving  $F_{12,103} = 3.53$ ,  $P < 0.01$ ; grazing  $F_{12,103} = 2.76$ ,  $P < 0.01$ ; and feeding with head submerged  $F_{12,103} = 5.5$ ,  $P < 0.01$ ).

The observed birds spent most time during daylight hours ( $94.2 \pm 0.7\%$ ) on water, although the mean percentage numbers on the water varied

over time ( $F_{9,106} = 3.71$ ,  $P < 0.01$ ). A significant decreasing trend ( $r = -0.806$ ,  $P < 0.01$ , d.f. = 8) in time spent out of the water for the visible birds was seen over daylight hours.

#### WEATHER CONDITIONS

The mean percentage time that observed birds spent resting increased significantly ( $r = 0.651$ ,  $P < 0.05$ , d.f. = 11) with precipitation, whilst preening decreased significantly ( $r = -0.611$ ,  $P < 0.05$ , d.f. = 11). Increased levels of precipitation also caused a significant decrease in surface feeding ( $r = -0.704$ ,  $P < 0.01$ , d.f. = 11). There was a significant increase in grazing with mean wind speed ( $r = 0.871$ ,  $P < 0.01$ , d.f. = 3), but air temperature had no significant effect on behaviour.

#### DISCUSSION

Because this is the first study known to us on coot behavioural activity patterns over winter, we have few comparisons to make with other such data, but we do compare the time devoted to different activities to that of other species and provide a baseline for future studies on coot.

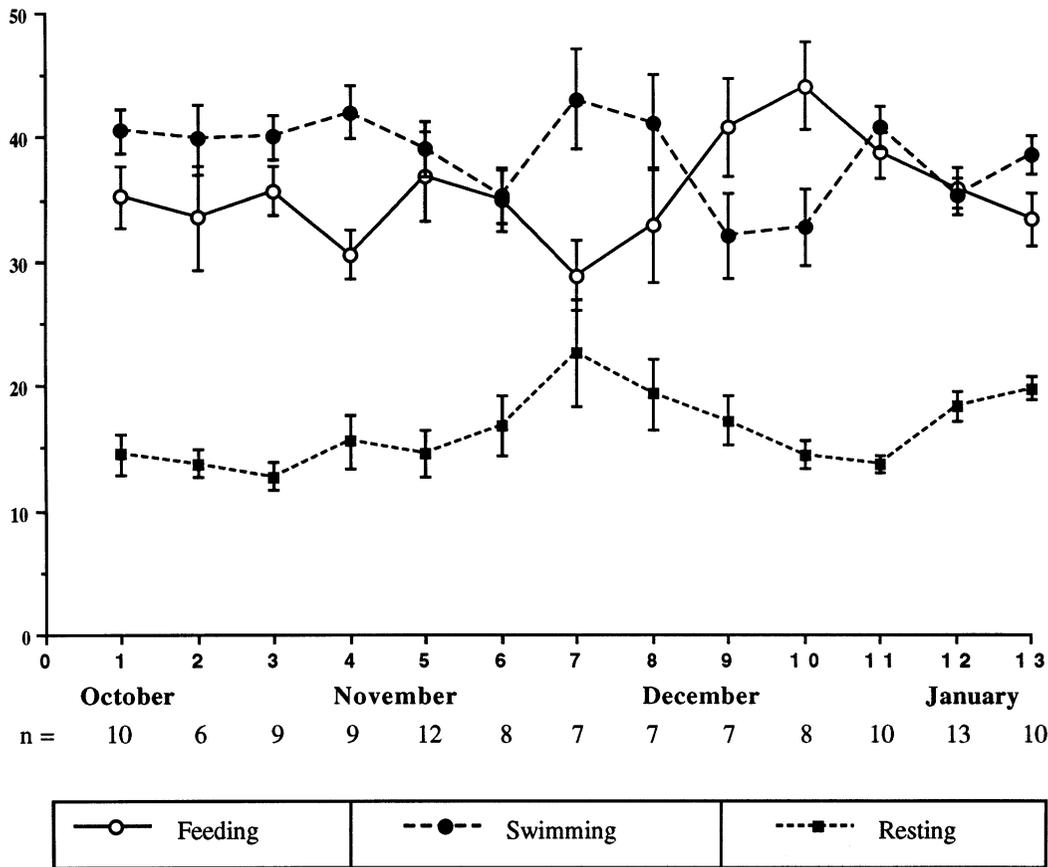


Fig. 3—Mean ( $\pm$ s.e.) percentage time spent feeding, resting and swimming during daylight hours throughout the winter by visible coots at Cork Lough (total of 116 scans; the number of scans for each week (1–13) is also indicated).

ACTIVITY PATTERNS

The dominant behaviour observed for visible coots over the winter was swimming and feeding, representing 38% and 36% of the daylight hours, respectively. This level of feeding is very similar to that observed (using similar methodology) for moorhen at this site (39%) by Pollock and O’Halloran (1995) and by Fordham (1978). The mean percentage time during daylight hours devoted to resting by visible birds increases from two hours after dawn when feeding and swimming together decrease. In the morning, shortly after dawn, they embarked on an intense period of feeding (Fig. 3). This dropped off as the day progresses leaving a greater percentage of their time to swimming and resting.

The percentage time that visible birds spent swimming, feeding and resting during daylight hours over the study period varied. A decrease in feeding in week 7 is reflected by an increase in the percentage time devoted to resting. A decrease in feeding towards the end of the study is expected given the approach of the breeding season and the increased energetic requirements of the birds dur-

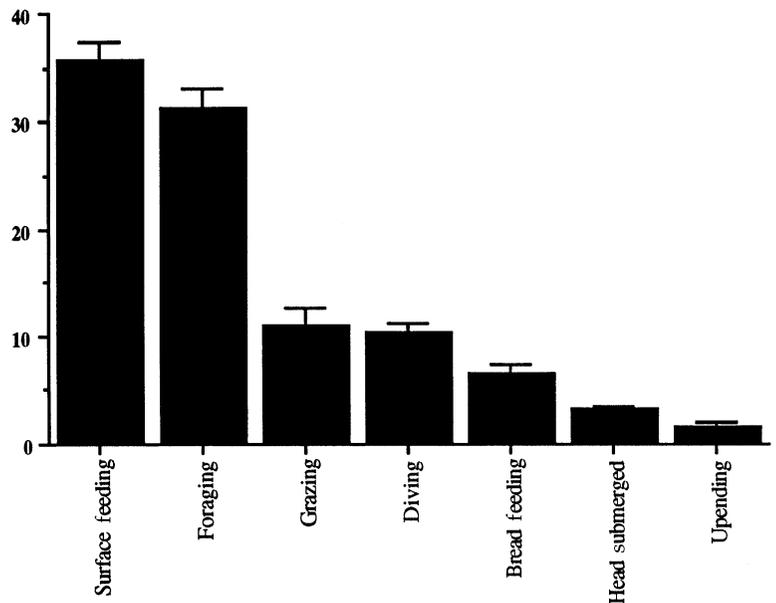


Fig. 4—Mean ( $\pm$ s.e.) percentage of total time spent feeding during daylight hours using different foraging strategies by coots at Cork Lough over the winter (116 scans).

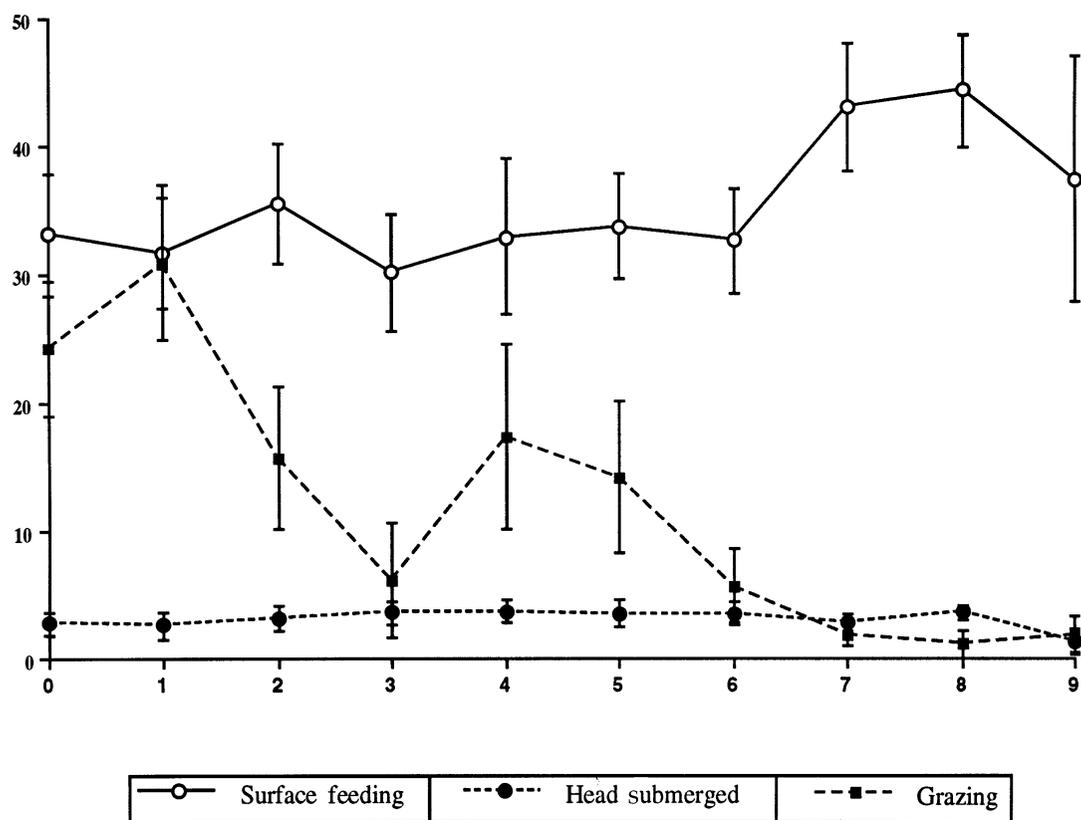


Fig. 5—Mean ( $\pm$ s.e.) percentage time spent grazing and feeding with head submerged during daylight hours by coots at Cork Lough (116 scans).

ing this time. Generally, during spring, birds need to build up their reserves in preparation for the breeding season. Thus it is possible that the decrease is a result of low food availability in the water or on the surrounding land. However, this requires further investigation. The low percentage time devoted to aggression by observed birds is typical of coots in winter when they form large gregarious flocks in contrast to their behaviour during the breeding season (Gibbons *et al.* 1993).

#### FEEDING STRATEGIES AND SPATIAL UTILISATION

The most common feeding strategy of the observed coots at Cork Lough over the winter was surface feeding. Observed food consumed in this way included pieces of provisioned food, insects and in some cases bird faeces, illustrating the opportunistic nature of their feeding. Surface feeding is a characteristic strategy of coot (Horsfall 1986) and they often bring their food to the surface before consumption. As there is very little natural aquatic vegetation available at Cork Lough (Kelly 1985), the birds are probably exploiting provisioned food. Cramp and Simmons (1980) have also reported this opportunistic aspect of the coot foraging. Although their feet are adapted to both walking and swimming, coot are still awkward on

land. The observed coots at the study site spent only 15% of daylight hours grazing, compared to moorhens, which devoted over 40% (Pollock and O'Halloran 1995). This can be explained by the more aquatic nature of the coot. Coots did not 'beg' as actively as mute swans at Cork Lough, where this was found by Keane and O'Halloran (1992) to be the most common foraging feeding strategy.

Visible coots spent the majority of their daylight hours on the water. Time spent out of the water was considerably lower, representing less than 6% and at this time the birds were grazing. This is in sharp contrast to the pattern seen for moorhen, which spend almost 70% of their time out of the water (Pollock and O'Halloran 1995). In both cases, grazing is the main use of land and the large difference in their spatial distribution can be explained by the difference in the relative importance of grazing in the diets of these closely related species.

#### WEATHER CONDITIONS AND ACTIVITY PATTERNS

Coot movements over long distances between sites during cold spells have been described by many authors (e.g. Sheppard 1993). There was no evidence of any increase in the number of birds at Cork Lough

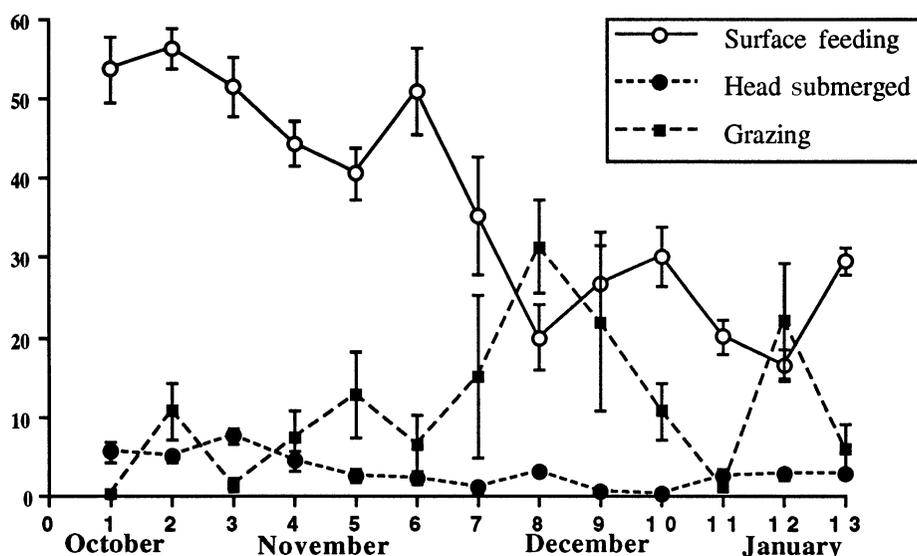


Fig. 6—Mean ( $\pm$  s.e.) percentage time spent surface feeding by coots throughout the winter at Cork Lough (370 scans).

during this study and the activity of the visible birds was not influenced by temperature. Grazing intensity increased with increased wind speed. Although this may be related, in part, to decreased numbers of people at the Cork Lough during bad weather and hence potentially less disturbance, grazing does not show a corresponding significant increase with rainfall, which is much more likely to influence the presence of human disturbance than high winds. The likely reasons for coots emerging from the water to graze have been debated in the past. Cramp and Simmons (1980) state that the coot 'feeds in flocks, on land (normally near water)—particularly late autumn to spring when wind causes high waves'. This point has been disputed by Odin (1988), who argues that coot sighted at Llanisheen Reservoir, south Glamorgan, graze the grass banks when 'aquatic vegetation is in short supply and revert to feeding on the water when winds cause high waves and aquatic vegetation disturbed from the reservoir floor floats on the surface'. At Cork Lough coot feed on land when wind causes high waves, though this is probably because of the absence of food provisioning during bad weather rather than the disturbance of aquatic food sources.

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