

# Winter microhabitat distribution of coots (*Fulica atra* L.1758) on gravel-pit wetlands in the Garonne river floodplain, Southwest France

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**ABSTRACT.** Human population growth, urbanisation and conversion of land to agriculture have led to loss of natural wetlands throughout the World, making artificial wetlands such as gravel pits, dam lakes or rice fields important for waterbirds. In south-west France, the increasing abundance of gravel pits has allowed several bird species to colonize the region. These "new" wetlands have become substitutes for the natural habitats of waterbirds. Coots (*Fulica atra* L. 1758) colonised the Midi-Pyrénées area when gravel pits were created in the 1970's. Coot populations were censused weekly from October 1996 to February 1997 and from October 1997 to February 1998 on three gravel pits near Toulouse, SW France. Each winter, the number of coots was recorded on each gravel pit, and the microhabitat used by coots identified according to environmental variables (water depth, bank slope, bank vegetation, vegetation between watermarks, macrophytes, human disturbance, zones of open water or near the bank). Open water, which constitutes a secure habitat for this species during the wintering period, abundance of macrophytes (Characea) and presence of lawn on the bank appear as the most important factors influencing coot distribution. This information will be useful for site acquisition for nature conservation and management purposes.

**KEY WORDS :** Coots, *Fulica atra*, gravel pits, Garonne basin, habitat requirement, winter.

## INTRODUCTION

Human activities destroy natural wetlands, but also create artificial wetlands such as rice fields, gravel pits, and dam lakes. These "new" wetlands have become substitutes for wildlife habitat (BELL et al., 1997; FASOLA & RUIZ, 1997; MORI, 2001). The biological value of gravel pits, particularly for waterbirds, is increasingly recognised. Several studies and actions have been undertaken to protect and manage these artificial ecosystems (KEYWOOD & MELLUISH, 1953; OLNEY, 1964; MILNE, 1974; ANDREWS, 1991; PHILIPS, 1992). However, few reports have been published on the ecology of waterbirds in French gravel pits (FROCHOT & GODREAU, 1995; SANTOUL & TOURENQ, 2002). Gravel extractions on the floodplains in France have increased over the last 25 years. Today, 45 gravel pits are active in the Garonne basin near Toulouse, southwest France, representing a water area of 2000 ha. Populations of waterbirds have increased significantly in the region over the last few years, especially during winter. Creation and development of gravel pits have attracted numerous species of birds, of which the coot (*Fulica atra* L., 1758) is the most abundant (SANTOUL & TOURENQ, 2002). In the Garonne floodplain, the number of coots has increased from about ten birds in the 1980s to more than one thousand at the end of the 90s (JOACHIM et al., 1997).

We investigated habitat preferences of wintering coots censused weekly during two winters at three gravel pits located in the Garonne floodplain at Saint Caprais. We attempted to relate habitat characteristic with abundance

of coots within gravel pits. Such information will be useful for site acquisition for conservation and management purposes.

## MATERIAL AND METHODS

The gravel pits of Saint Caprais are located 25 km to the north-west of Toulouse in the Garonne floodplain (43° 46' N and 0° 58' E) (SANTOUL & TOURENQ, 2002).

The total area of the three gravel pits is about 66 ha with a mean depth of 3m (maximum depth : 4m). Mixed-farming of corn and sunflower surrounds the gravel pits. These gravel pits are unmanaged. Waterfowl hunting and fishing are forbidden.

Weekly morning censuses of coots were carried out from October 1996 to February 1997 and from October 1997 to February 1998. The small surface area and open characteristic of the gravel pits studied permitted a total census of the populations (TAMISIER, 1972), using a telescope (20x60) and binoculars (8x30). Coot numbers were recorded on each gravel pit and their position was noted on a map (SANTOUL & TOURENQ, 2002).

To determine habitat used by coot, several parameters were recorded during wintering periods : bank slope : < 5% (1), 5-10% (2), > 10% (3); bank vegetation : absent (1), lawn (2), herbs (3), shrubs (4), trees (5); vegetation between watermarks : absent (1), low (2), high (3); human disturbance : absence of path (0), presence of path (1); macrophytes : absent (0), some (1), abundant (2); water depth : < 1m (1), 1-3m (2), 3-4m (3); zones of open

water or near the bank. The small amounts of vegetation present between watermarks only permitted us to establish classes of density (BOURNAUD et al., 1982). Macrophytes were sampled each year at the end of the spring period (May-June) at several points of each gravel pit. The species-habitat associations were tested with  $\chi^2$  tests (CHESSEL & DOLÉDEC, 1993). The microhabitat profiles were calculated according to MASTRORILLO et al. (1996) as the difference between the frequency of coots in samples representing a particular environmental variable and the frequency of that species in all samples. For significant species-habitat associations ( $\chi^2$  test,  $p < 0.05$ ), negative values indicated avoidance and positive values indicate preference.

## RESULTS

The number of coots reached a maximum during October and November when more than 500 were present. At

the end of the wintering period only a hundred birds were counted; an important decrease was noted in December.

Microhabitat profiles enabled us to highlight the ecological requirements of coots during the wintering period in relation to environmental availability. The three gravel pits studied were heterogeneous in terms of the type of vegetation covering the banks. Coots preferred areas with lawn over those with herbs, shrubs or trees. They occupied deep areas (3-4 m) with macrophytes and preferred areas of open water. However, the vegetation between watermarks and the presence of roads did not influence the distribution of coots during wintering periods. They avoided bank slope more than 10 % (Fig. 1). Six species of submerged macrophytes were present in the gravel pits: *Myriophyllum spicatum*, *Najas major*, *Nitella* sp., *Potamogeton natans*, *Ranunculus trichophyllus* and *Veronica anagallis*. However only the charophyte *Nitella* sp. was abundant.

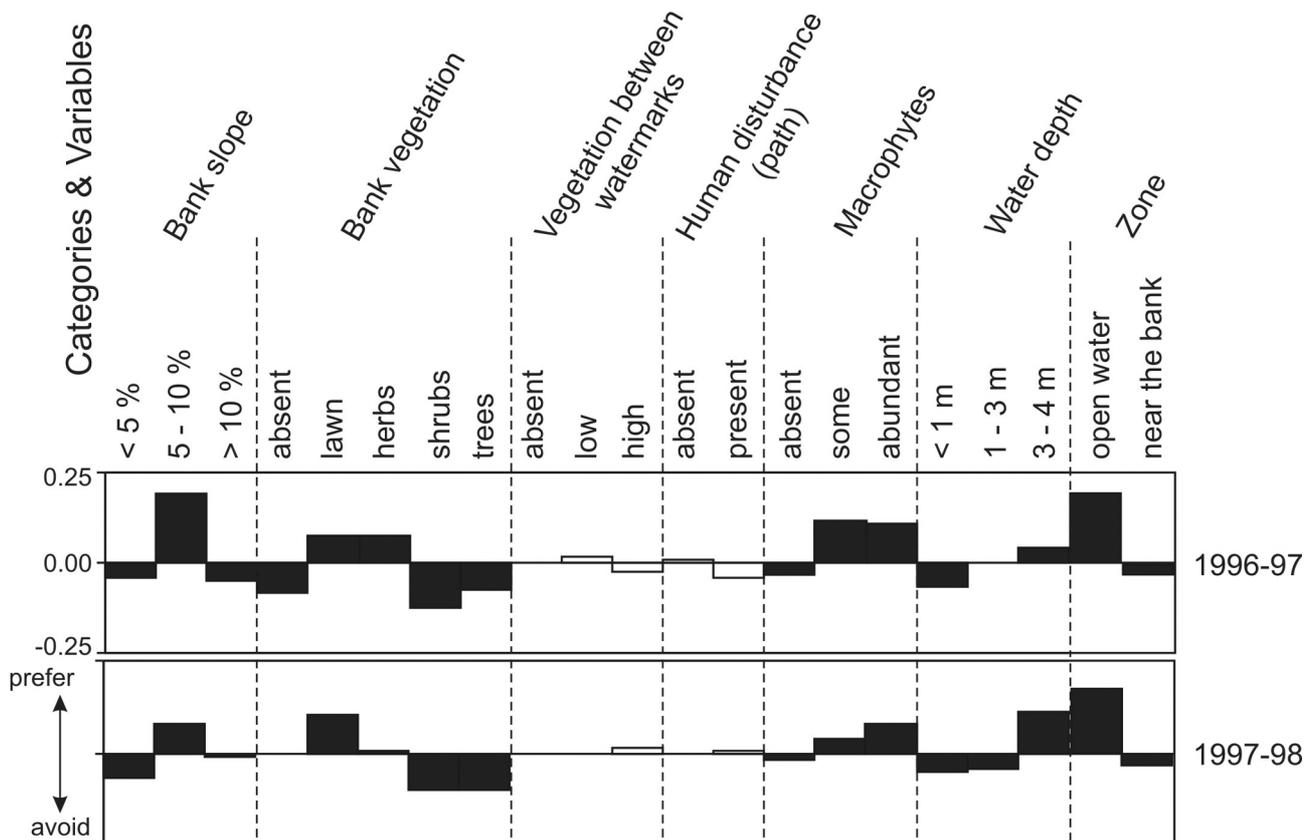


Fig. 1. – Habitat of coot during winter. Each histogram represents the difference between the frequency of coots in a group of samples having that category of environmental variable, and the frequency of that species in all samples. Significant deviations from expected between species and variables are indicated with a black histogram ( $\chi^2$  test,  $p < 0.05$ ).

## DISCUSSION

With a population of coots reaching 600 individuals, the three gravel pits of Saint Caprais constitute an important wintering site in Midi Pyrénées. JOACHIM et al. (1997) have estimated the wintering populations of coots in that region to be between 2500 and 3000 birds.

Our results suggest a strong association between the availability of food and lawn zones with the presence of

coots in winter. Among the factors influencing the wintering distribution of coot, the trophic factor is preponderant. Food resources are more critical in winter than in summer (DUBOWY, 1988). Coots are herbivorous, feeding mainly on macrophytes such as Characeae, etc (BOROWIEC, 1975; DRAULANS & VANHERCK, 1987; IRWIN & O'HALLORAN, 1997). BREDIN & SKINNER (1983) emphasise the importance of aquatic plants near the surface and over large areas to attract coots. Coots remain in these foraging

zones until the complete degeneration of macrophytes (SAUER, 1982). When resources are exhausted, they move towards the lawn zones. The population decrease in December - January is due to the phenology of the species (departure of winter migrants), but is certainly accentuated by the strong depletion of trophic resources. The rare lawn areas constitute the last feeding zones used.

As did BOROWIEC & JAKUBCZYK (1975), we also noted an occupation of the central zone of the water reservoir/pond by coots. These zones, easily accessible (depth : 3-4 m) for coots (CRAMP & SIMMONS, 1977), are rich in aquatic plants. They also constitute a safe habitat (from terrestrial predators) where birds can rest and carry out their comfort activities (e.g. preening) (BOROWIEC & JAKUBCZYK, 1975). By providing opportunities for coots to congregate far from the bank, gravel pits with large open water areas and a deep-water zone in their centre provide suitable foraging areas while reducing the risks of predation (BELL et al., 1997). Coots are not very inclined to escape by flight (CRAMP & SIMMONS, 1977) and this also explains why, whenever possible, they avoid banks covered with shrubs and trees where predators can perch and hide. The results of the study confirm those in other areas (BOROWIEC, 1975; BREDIN & SKINNER, 1983).

Population size of coots wintering in Midi Pyrénées remains small on an international scale (about 2500 coots at the mid-winter waterbird census). However, gravel pits are the major wintering habitat in this region, and those of Saint Caprais have a high carrying capacity (SANTOUL, 2000). The geographical location of the gravel pits near the Pyrenees mountains also makes the Midi-Pyrénées region important as a stop-over for coots (HOYER, 1994). The new extension of gravel pits in the Garonne River basin is of economic and environmental importance. Restoration is generally carried out to transform gravel pits to recreational areas or fishing lakes, and only rarely into habitats primarily designed for waterbird conservation.

Once considered as a simple transition between two breeding periods, the wintering period has been proven to be an essential component of the biological cycle of waterbirds (JORDE et al. 1983; ZORN et al., 1995; TAMISIER & DEHORTER, 1999). Preservation of wintering habitat quality for migratory species is thus necessary. Because of the increasing number of artificial wetlands (reservoirs, rice plantations, gravel pits) compared to the decreasing number of natural wetlands in Europe and worldwide, artificial wetlands have to be taken into account in conservation and management schemes for waterbird communities at both regional and international levels.

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