USE OF FEEDING HABITAT BY BREEDING NIGHT HERON AND LITTLE EGRET

MAURO FASOLA
Dipartimento Biologia Animale,
Pz. Botta 9 – 27100 Pavia
MAURO GHIDINI
Via Scuole 16 – 25100 Brescia

Information on the impact of wading birds on their prey is still limited (Kushlan 1978), and all the studies on habitat use by populations of wading birds have been concerned with natural wetlands. We seek to redress this balance and we present here quantitative data on habitat use, prey availability and consumption by a population of Night Herons *Nycticorax nycticorax* and Little Egrets *Egretta garzetta* feeding in rice fields, the most important feeding habitats for the herons during the nestling period in North–Western Italy (Fasola *et al.* 1981 a). The data are discussed in relation to information obtained on the feeding dispersion, activity rhythm and breeding behaviour of these two herons in the same study area (Fasola 1982 and in press, Galeotti 1982).

STUDY AREA AND METHODS

The observations were carried out in 1979 and 1980 at two heronries 9.8 km apart, near Lardirago and Vaccarizza, Northern Italy (described by Fasola *et al.* 1981 a), and along a 1.5 km wide study area on the feeding grounds between them. In this study area (15 km^2) the herons fed mostly in the rice field which covered 5 km^2, except for a few birds occasionally feeding in the irrigation canals. In all the North Western Italian breeding range, where rice cultivation is widespread, we estimated that about 69% of the Night Herons and 95% of the Egrets are supported by the rice fields. This estimate was obtained from the density of feeding herons and the total extension of the fields, from the proportion of the prey captured in the fields, and from a comparison of the population levels in the zone of rice cultivation and in other parts of the plain.

The rice fields were flooded at the beginning of May. From 4 May to 3 July 1979 and 1980 we surveyed this study area 55 times during daytime, recording the location of all individuals of each species on a 1 : 10 000 scale map. Night Herons during the nestling period are equally active at night and in daytime (Fasola in press). The surveys were stopped in July because the rice had grown so tall that some birds were hidden from view and not recorded. The data from the two years were pooled. The average density of the herons was calculated for each 5 days' period.

During the period 18 May to 29 June 1980 we took 156 prey samples in a number of different rice fields. Each sample was obtained by taking 10 sweeps (2 m long) with a net of 25 cm width. The prey items in each sample were counted and the average density (kg dry weight/ha) was estimated assuming that the area sampled was 5 m^2 and taking the weight of each prey from Fasola *et al.* (1981 b).

DENSITY OF SEEDING HERONS

Bird density of both Night Heron and Little Egret on the feeding grounds increased slowly from the beginning of the observations (Fig. 1). The first egg hatchings occurred in the colonies at the end of April. Galeotti (1982) observed that the adult Night Herons guard the chicks continuously until about 10 days old. At this point both parents start to spend more time on the feeding grounds and leave the chicks by themselves. The increase in density of birds on the feeding grounds from 10 May coincided with this period, 10 days after the first hatchings, when parental surveillance of the nests decreased. However the increase in density was spread over one and a half months (Fig. 1) because nesting was not synchronized between pairs, and a few nests had chicks until the first half of July. The density of herons on the feeding grounds decreased sharply in the second half of June, when most chicks in the colonies had fledged. This decrease occurred because adult birds abandoned the colonies (they were not observed on the feeding grounds and they did not roost in the colonies during daytime). The adults probably began the pre–migratory dispersive movements (Cramp & Simmons 1977).

The first juvenile Night Herons appeared on the feeding grounds on the firsts days of June (Fig. 1) about 40 days after the first hatchings in the colonies. This is in accordance with the fledging period of 35-40 days recorded by Galeotti (1982). However the density of recently fledged Night Herons remained low in relation to the density of the adults, and ranged from 3.7% to 21.1% of the number of the adults. Despite this the average number of young birds fledged per pair in the heronry near Vaccarizza was 2.7 (Galeotti 1982). The low density is due to the fact

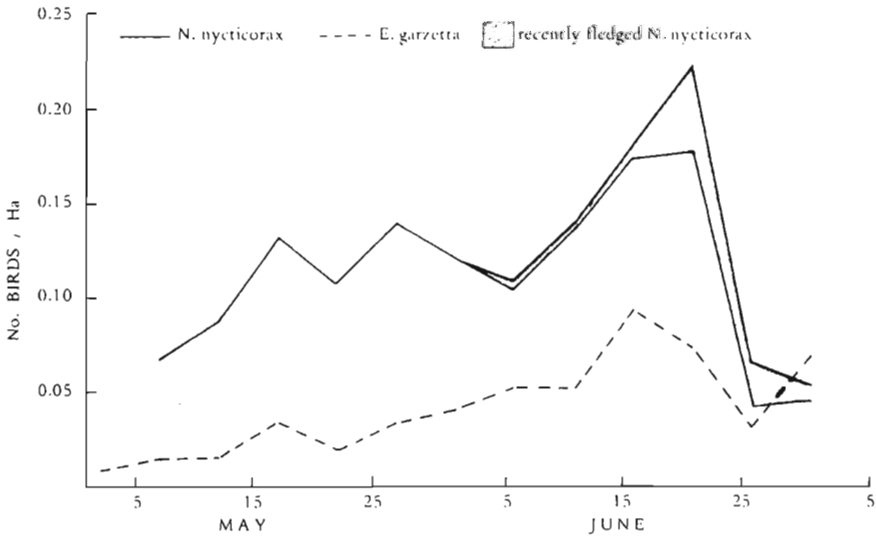

FIGURE 1. Density of herons on the feeding grounds during the nestling period.

that juveniles disperse far from the colonies soon after fledging. Only 1.7% of the Night Herons were still immature by their second year. The scarcity of these latter in the breeding zones of the Western Palearctic (Cramp & Simmos 1977) suggests that most of them do not migrate from the wintering ranges.

PREY AVAILABILITY

The densities of the prey varied widely (Fig. 2). In the second half of May the prey levels were low. Frogs *Rana esculenta* which laid their eggs in the rice fields and soon moved to the nearby canals, and crustaceans *Triops cancriformis* were decreasing. The increase in prey density at the beginning of June was due to the growth of large numbers of tadpoles. From mid June onwards, temporary draining of the fields for reasons of agricultural management resulted in the death of many tadpoles. The survivors metamorphosed and moved from the fields to the canals. Hence prey density decreased sharply at that time.

Although prey abundance in the rice fields fluctuated considerably during the study, the use by herons did not. Rather, numbers of herons increased gradually from 10 days after the first hatchings, when the adults began to leave the chicks

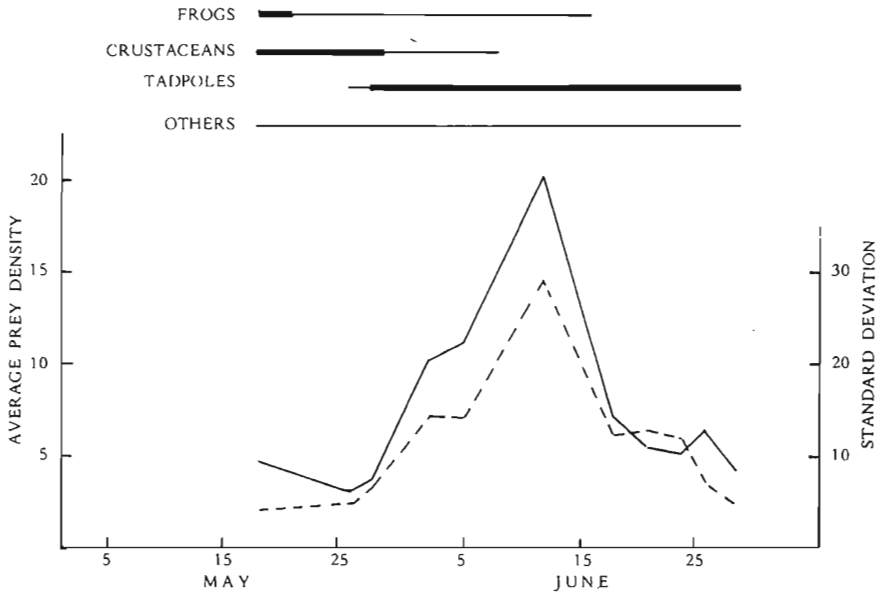

FIGURE 2. Prey density in the rice fields. Below: average density in g dry weght/ha (——) and variation between fields as Standard Deviation of the weights (- - - -). Above: abundant (▬) and scarce (—) presence of each prey type. "Others" were a number of species of insects and worms.

unattended and the energy demands of the chicks approached their peak. These data suggest that prey density in rice field does not limit bird use and that there is little switching from rice field to other habitats as prey density decreases. Rice fields are exploited by herons in other countries (France, Voisin 1978; Japan, Yamagishi 1980), but there the herons make more use of alternative habitats.

PREY CONSUMPTION

The maximum prey densities found in rice fields were similar to those found in marshes, pastures and mangrove swamps used by the White Ibis *Eudocimus albus* during breeding period (14 to 17 kg/ha, recalculated from Kushlan 1979). The impact of the herons on the amount of their prey is low. One adult Night Heron in our study area captures on average 147 g dry weight of prey per day during the nestling period (Fasola in press). The Little Egret is smaller (455 g versus 636 g of the Night Heron, Moltoni 1936), and should require less prey. Assuming a daily food consumption of 147 g for both species, we estimate that on the day of lowest prey density (26 May) the herons took 1.4% of the prey present in the rice fields. During the rest of the study period the daily consumption was under 1%. Prey density varied independently from the herons' density, and was thus regulated by other factors; we observed movements of the frogs between fields and canals, and the deaths of many tadpoles (the latter caused by the draining of the fields). On the other hand, in patchy habitats the effect of predation may be stronger. Kushlan (1976) found that species of herons reduced the biomass of fish by 76% in one drying pond; however when predation did not occur a reduction by 93% was caused by crowding. We know of no other estimate of the impact on prey by wading birds.

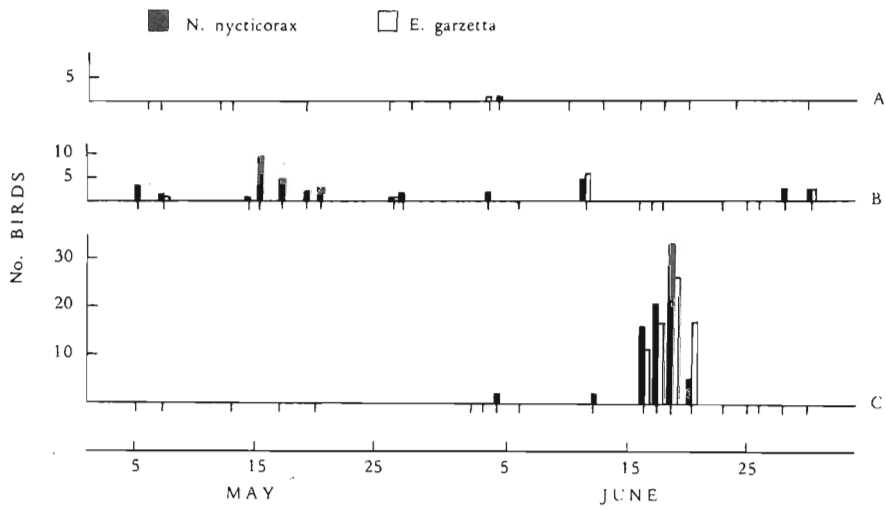

FIGURE 3. Examples of exploiation of three zones of rice fields (each about 7 ha) in 1980. The days of the visits are marked below the lines.

DISPERSION OF THE HERONS

The density of herons varied greatly from one field to the next, and in each field from one day to the next. Some fields were scarcely exploited (Fig. 3a) while in others the exploitation was low and relatively regular (Fig. 3b). Some fields were occupied by groups of herons only over short spells in June (Fig. 3c). These different patterns of exploitation resulted in a scatterd foraging dispersion through May and an aggregated dispersion through June, wen the variation in prey density between field was highest (Fig. 2). The aggregation of the herons in our study area is related to the increased prey clumping, the clumps being located by the herons through social interactions (Fasola 1982).

ACKNOWLEDGEMENTS. We wish to thank Patrick J. Dugan for critical comments on the manuscript.

RIASSUNTO

USO DELL'AMBIENTE DI ALIMENTAZIONE IN NITTICORA E GARZETTA NEL PERIODO RIPRODUTTIVO

– La densità di Nitticora *N. nycticorax* e di Garzetta *Egretta garzetta* nelle zone di alimentazione, la disponibilità di prede e il loro consumo sono stati stimati quantitativamente, in tutto il periodo di allevamento dei pulcini (maggio e giugno 1979 e 1980).
– La zona di studio è stata una fascia di terreno coltivato tra due garzaie distanti 9.8 km, nella quale gli aironi si alimentavano quasi solo in risaia.
– Il periodo dell'allevamento e dell'emancipazione dei giovani è risultato centrato attorno al momento di maggiore disponibilità di prede.
– La densità di aironi nelle zone di alimentazione è aumentata gradualmente, ed è poi calata in relazione allo stadio della nidificazione e al comportamento riproduttivo, e non ha risentito delle variazioni di abbondanza delle prede.
– Il consumo giornaliero delle prede da parte degli aironi è stato quasi sempre inferiore all'1% della biomassa disponibile; le variazioni di abbondanza delle prede non dipendono dalla predazione degli aironi.

FIG. 1. Densità di Nitticora e Garzetta nelle zone di alimentazione.

FIG. 2. Densità delle prede nelle risaie. Sotto: densità media in g peso secco/ha (———) e Deviazione Standard (- - - -). Sopra : presenza abbondante (▬) e scarsa (———) di rane, crostacei, girini, altre prede.

FIG. 3. Esempi di presenze in tre zone di risaia. I giorni di osservazione sono segnati sotto alla linea.

RESUME'

UTILISATION DES LIEUX D'ALIMENTATION PAR L'HERON BIHOREAU ET L'AIGRETTE GARZETTE

– La densité de Heron bihoreaux *N. nycticorax* et de Aigrette garzettes *Egretta garzetta* dans les zônes d'alimentation, la disponibilité des proies et leur consomation ont été estimés quantitativement pendant toute la période d'élevage des poussins (Mai et Juin 1979 et 1980).
– La zône étudiée était un morceau de terrain cultivé entre deux heronniéres distantes 9,8 km, dans laquelle les hérons s'alimentaient principalement dans la rizière.
– La période d'élevage et d'emancipation des jeunes ont résulté d'être centrés au moment de la plus grande disponibilité de proies.
– La densité des hêrons dans les zônes d'alimentation a augmenté graduellement et ensuite a diminué en relation avec le stade de la nidification et le comportement reproductif; elle n'a pas ressenti des variations des abondances des proies.
– La consomation journalière des proies des hêrons est restée en général en dessous de 1% de la biomasse disponible. La variation d'aboundance des proies ne dépend pas de la capture des hêrons.

FIG. 1. Densité de Heron bihoreau et Aigrette garzette dans la zône d'alimentation.

FIG. 2. Densité des proies dans les riziéres. Présence abondante (▬) et limitée (—) de grenouilles, crustaces, tetards et autres proies. Densité moyenne en g pois sec/ha (—) et Deviation (- - - -).

FIG. 3. Exemples de présence de hêrons en trois zône de la rizière. Les jours d'observation son marqués sous la ligne.

REFERENCES

CRAMP, S. & SIMMONS, K.E.L. (eds.) 1977. The birds of the Western Palearctic. Vol. I. Oxford University Press.

FASOLA, M. 1982. Feeding dispersion in the Night Heron *Nycticorax nycticorax* and Little Egret *Egretta garzetta* and the information centre hypothesis. Boll. Zool. 49 : 19-28.

FASOLA, M. (in press). Activity rhythm and feeding success of nesting Night Herons *Nycticorax nycticorax*. Ardea.

FASOLA, M., BARBIERI, F., PRIGIONI, C. & BOGLIANI, G. 1981 a. Le garzaie in Italia, 1981. Avocetta 5: 107-131.

FASOLA, M., GALEOTTI, P., BOGLIANI, G. & NARDI, P. 1981 b. Food of Night Heron and Little Egret feeding in rice fields. Riv. ital. Orn. 51: 97-112.

GALEOTTI, P. 1982. L'allevamento della prole nella Nitticora *Nycticorax nycticorax*. Avocetta 6: 11-22.

KUSHLAN, J. A. 1976. Wading bird predation in a seasonally fluctuating pond. Auk 93: 464-476.

KUSHLAN, J. A. 1978. Feeding ecology of wading birds. National Audubon Society Res. Rep.. 7: 249-297.

KUSHLAN, J. A. 1979. Feeding ecology and prey selection in the White Ibis. Condor 81 : 376-389.

MOLTONI, E. 1936. Le garzaie in Italia. Riv. ital. Orn. 6 : 109-148, 211-269.

VOISIN, C. 1978. Utilisation des zones humides du delta Rhodanien par les ardeidés. Oiseau 48: 217-261, 329-380.

YAMAGISHI, S., INOUE, Y. & KOMEDA, S. 1980. Distribution of colonies and roosts and feeding dispersal of the Little and Cattle Egrets (*Egretta garzetta* and *Bibulcus ibis*) in Nara Basin, Japan. Tori 29: 69-85.

Ricevuto gennaio 1983