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THE ORIENTATION/NAVIGATION HYPOTHESIS: AN INDIRECT
EVIDENCE IN MIGRATING HONEY BUZZARDS, *PERNIS APIVORUS*

Riassunto. — *L'ipotesi orientamento/navigazione: una prova indiretta nei Falchi pecchiaioli, Pernis apivorus, migranti.*

Sono state effettuate osservazioni sulla migrazione autunnale del Falco pecchiaiolo sull'Appennino calabrese tra il 24 agosto ed il 5 ottobre 1995 e sull'isola di Malta tra il 6 settembre ed il 5 ottobre 1993 e 1995. Sull'Appennino calabrese sono stati contati 1095 individui, con il picco il 7 settembre. Dal 24 agosto al 12 settembre si verificò il passaggio di quasi tutti i rapaci, con una notevole sovrapposizione della migrazione degli adulti e dei giovani, prevalentemente tra il 7 ed il 10 settembre. Sull'isola di Malta furono contati 483 individui nel 1993 ed 88 nel 1995, quasi tutti dopo la metà di settembre. Questi risultati, comparati con quelli di un precedente studio effettuato sull'Appennino calabrese nel 1993, suggeriscono che i giovani Falchi pecchiaioli sono in grado di apprendere la rotta più breve per attraversare il Mediterraneo centrale (tra la Sicilia e la Tunisia) soltanto quando migrano insieme agli adulti.

Abstract. — Observations of Honey Buzzards, *Pernis apivorus*, migrating across the central Mediterranean were made in the Calabrian Apennines (southern Italy) from 24th August to 5th October 1995, and in Malta from 6th September to 5th October 1993 and 1995. In the Calabrian Apennines 1095 individuals were observed, with a peak of 237 birds on 7 September. From 24 August to 12 September the passage of nearly all raptors was observed and a notable overlap in the migration periods of adults and juveniles occurred. In Malta, where a concentration of juvenile Honey Buzzards occurs, 483 and 88 individuals were counted, in 1993 and 1995, respectively, nearly all after mid September. These results, compared with those of a previous study made in the Calabrian Apennines in 1993, suggest that juveniles learn the shortest route to cross the Central Mediterranean (between Sicily and Tunisia) during their first series of seasonal migrations only when migrating in flocks of adults.

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Introduction

The Honey Buzzard, *Pernis apivorus*, frequently migrates in flocks, and uses soaring and gliding flight over land concentrating in narrow straits (CRAMP & SIMMONS 1980, KERLINGER 1989). During migration over the central Mediterranean, they use mainly two routes: one foresees the crossing from Sicily to Tunisia (150 km), the second from Sicily to Libya via Malta and involves a larger stretch of sea (>400 km) (MOREAU 1953, BEAMAN & GALEA 1974, BROWN *et al.* 1982, AGOSTINI *et al.* 1994a, AGOSTINI & LOGOZZO 1998). In autumn, the major concentration of individuals occurs in the Calabrian Apennines (southern continental Italy), where the distance between the Tyrrhenian and the Jonian coasts is narrowest (AGOSTINI & LOGOZZO 1995a,b,c, 1997). As at the Straits of Gibraltar and the Bosphorus (PORTER & WILLIS 1968, BERNIS 1973), the peak occurs between the end of August and the beginning of September. The adults migrate in this period and use the same spring route, crossing the central Mediterranean between Sicily and Tunisia via the island of Marethimo (AGOSTINI & LOGOZZO 1997, 1998). Juveniles and few adults cross the sea between Sicily and Libya via Malta (AGOSTINI & LOGOZZO 1995b), where nearly all birds are observed after mid September (Beaman & Galea 1974). In this island most part of raptors are recorded during weak contrary winds, while very few are observed during following winds (BEAMAN & GALEA 1974). It agrees with the observations made at Cap Bon (Tunisia) and at the Straits of Messina during spring migration of this species that, rarely, undertakes water-crossing with following winds (AGOSTINI 1992, AGOSTINI *et al.* 1994b). This flight strategy is in contrast with the hypothesis that raptors converge on the island of Malta during adverse weather (BEAMAN & GALEA 1974).

Study area and methods

Observations on the Calabrian Apennines were made from 24th August to 5th October 1995 from a post on the slopes of Mount Covello at an altitude of approximately 700 m (Fig.1). We divided the 43 days of observations into two periods, from 24th August to 12th September (Early) and from 13th September to 5th October (Late). It was possible to determine the age of some birds, generally when they were very close (<150 m) overhead (AGOSTINI & LOGOZZO 1995b). The total of adults and juveniles in each period, was estimated according to their proportion in the sample of identified individuals. A total of 334 hr of observation

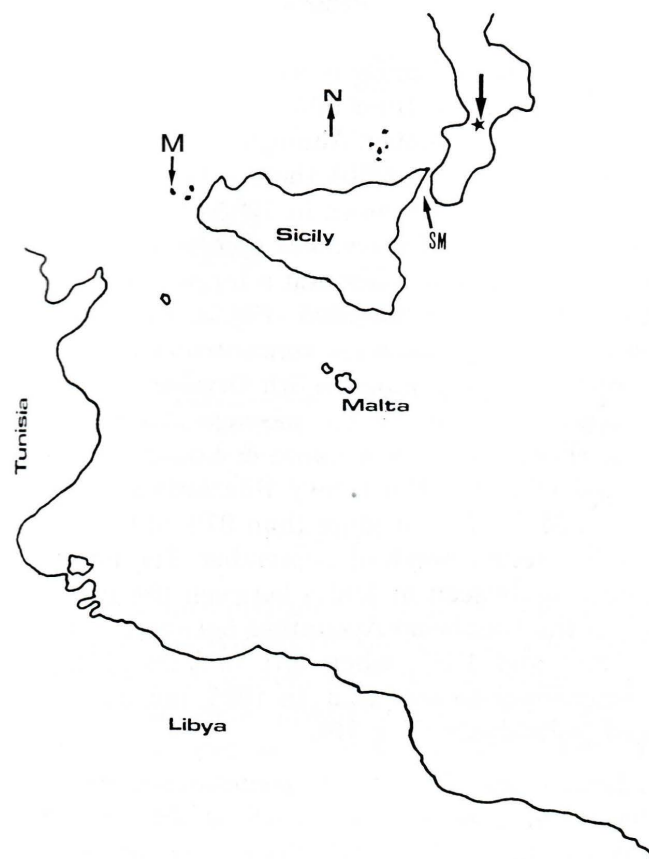


Figure 1. — The study area location (M = island of Marettimo; SM = Straits of Messina).

were tallied, using 10X50 binoculars. Our observations have been compared with the results of a previous study made on the Calabrian Apennines in 1993, when 895 individuals were counted from 24 August to 5 October (AGOSTINI & LOGOZZO 1995b), estimating the total of adults and juveniles using the same methods.

The Maltese Islands are situated nearly in the centre of the Mediterranean 90 km south of Sicily and 335 km north of Libya. Birds concentrate along the cliffs on the western side of the Island of Malta where, presumably, they can take advantage of the best thermals (BEAMAN & GALEA 1974). A total of 188 and 177 hr of observation were tallied from a post situated on the highest point of the island (approx. 250 m a.s.l.), from 6 September to 5 October 1993 and 1995 using 10X40 binoculars.

Results

A total of 1095 Honey Buzzards were counted in 1995 on the Calabrian Apennines and more than 90% of birds were observed between 24th August and 12th September. Analogously to the observations made in 1993 (AGOSTINI & LOGOZZO 1995b), there was a bimodal distribution in the migratory flow (Fig.2). However, in 1995, differently from the previous study, the two periods of movement occurred both from late August and the first 10-days of September and a large overlap in the migration of adults and juveniles was recorded (Fig.3), mostly between 7th and 10th September. In 1993, juveniles concentrated their migration later than adults, from 13th September to 5th October, and thus the bimodal distribution occurred because of the passage of birds belonging to the two age classes (Fig.3, see also AGOSTINI & LOGOZZO 1995b).

On the island of Malta 483 Honey Buzzards were counted in 1993 and only 88 in 1995. Each year more than 97% of the raptors have been observed after the second week of September. The notable difference in numbers of individuals seen in Malta between the two years, is similar to that found on the Calabrian Apennines between 13th September and 5th October 1993 and 1995, when 351 and 99 birds were recorded. Finally, it is interesting to note that, in 1995, not one adult was recorded among aged individuals ($N = 10$).

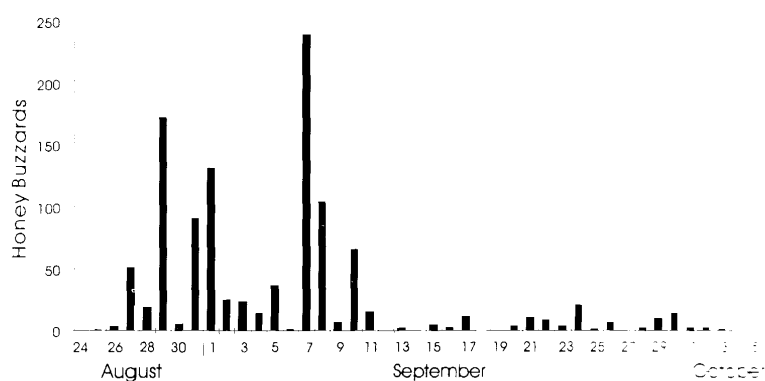


Figure 2. — Seasonal occurrence of migrating Honey Buzzards on the Calabrian Apennines in summer and autumn 1995.

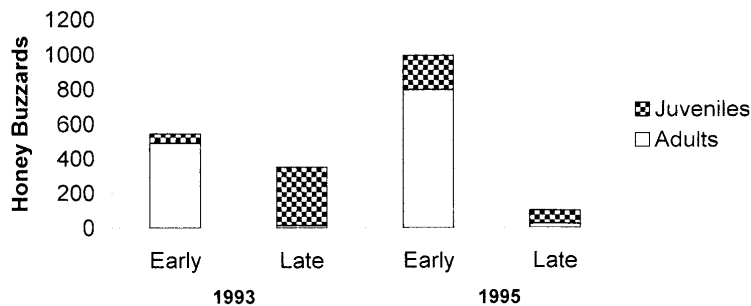


Figure 3. — Total of adult and juvenile Honey Buzzards estimated on the Calabrian Apennines into the two observation periods (Early = 24 August-12 September; Late = 13 September-5 October) in 1993 and 1995, according to their proportions among the aged individuals (1993: early $N = 164$, late $N = 54$; 1995: early $N = 238$, late $N = 26$).

Discussion

Some authors have demonstrated that better orientation is possible by a group than by an individual (RABOL & NOER 1973, WALLRAFF 1978, HELBIG & LASKE 1986). A problem with this hypothesis is that adults (expert individuals) can show juveniles which way to fly only when migrating in the same period (KERLINGER 1989). Our observations, according to the orientation/navigation hypothesis, suggest that juvenile Honey Buzzards are able to learn the shortest route to cross the central Mediterranean (between Sicily and Tunisia) only when migrating in flocks of adults; in fact, over Malta, the biggest concentration of individuals occurred in 1993, when juveniles concentrated their migration in a successive period in respect to the adults; in this case, juveniles passing over the Calabrian Apennines, after the crossing of the Straits of Messina, move along a northeast to southwest axis genetically defined (AGOSTINI & LOGOZZO 1995b). If there were not information transmission when overlapping in the migration periods of the two age groups occurs, in the Straits of Messina the routes of adults and juveniles in the same flock should diverge. Nevertheless, on the island of Malta in 1995, remarkable concentrations of individuals between the end of the first and the second week of September have not been recorded. Even the previous study carried out on the island between 1969 and 1973, does not report concentrations of birds during the first half of September; moreover it shows, in correspondence of our observations, a marked difference in the seasonal counts with a minimum of 455 individuals in 1972 and a maximum of 824 in 1973 (BEAMAN & GALEA 1974).

In Malta, the flocking behaviour might have another function. Studies carried out on the Cap Bon promontory (Tunisia) during the spring migration of Honey Buzzards and Black Kites, *Milvus migrans*, have shown that these raptors undertake the crossing of the Channel of Sicily more frequently when migrating in numerous flocks (AGOSTINI & DUCHI 1994, AGOSTINI *et al.* 1994a). Moreover they showed a tendency to remain together, since the first individuals taking a decision (crossing or not) were followed by the others. These behaviours, the low percentage of individuals crossing and the difference in the migration periods of the two age groups during spring, suggested that flocking is important for water-crossing because an increase in flock size increases the probability that the flock will contain one or more individuals with a pronounced tendency to continue migrating (AGOSTINI & DUCHI 1994, AGOSTINI *et al.* 1994a). The strong tendency to remain in flock in front to a water barrier, could explain because some adult can be observed in Malta after mid September (AGOSTINI & LOGOZZO 1995b); in fact, at the Straits of Messina, when in minority, they could follow the juveniles taking the southern route. Unfortunately, the geographical characteristics of the island of Malta, do not permit the carrying out of the observations along the coast to verify if such behaviour is manifested among juvenile Honey Buzzards during their first migration. Moreover the presence of a strong activity of poaching carried out on the island (BEAMAN & GALEA 1974) constitutes a variable rendering even more difficult the migration study.

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Errata Corrige. — Nel lavoro di AGOSTINI & LOGOZZO, 1998 - Primi dati sulla migrazione primaverile dei rapaci Accipitriformi sull'Isola di **Marettimo** - *Riv. ital. ornit.*, 68 (2), a pag. 154, riga 5 dal basso, leggere: maggio 1998 in luogo di: maggio 1997.