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Short paper

Evidence for age-dependent migration strategies in the Short-toed Eagle

The Short-toed Eagle *Circaetus gallicus* is a summer visitor to central Italy, with a breeding population of at least 350 pairs (Baghino *et al.* 2009). Most pairs are concentrated along the Tyrrhenian coast flyway used by birds returning from African wintering grounds (Agostini *et al.* 2002b). Very few breed in southern Italy, despite the availability of suitable habitat, and it has been suggested that this distribution reflects the species' relatively recent colonisation of Italy (Campora & Cattaneo 2006; Agostini & Mellone 2008). On migration, most Italian breeders appear to follow a circuitous route rather than crossing the central Mediterranean, entering and departing Europe via the Strait of Gibraltar, and travelling through northwest Italy, France and Spain (Agostini *et al.* 2002a,b; Premuda 2004). For example, during 2005–07, c. 800 Short-toed Eagles, mostly adults, were observed annually migrating northwards along the Tyrrhenian coast at Mount Colegno during the second half of September (Premuda 2005, 2006, 2007).

Since 2000, however, a regular passage of Short-toed Eagles has been noted each autumn moving south along the Central Mediterranean flyway. Many thousands of raptors follow this route, mostly Honey-buzzards *Pernis apivorus*, Marsh Harriers *Circus aeruginosus* and Black Kites *Milvus migrans*, which takes them south through the Italian Peninsula and Sicily before crossing the Mediterranean to North Africa. Many of these Short-toed Eagles cross the Mediterranean via Marettimo, a small, mountainous island some 30 km off western Sicily and 130 km northeast of Tunisia, at the narrowest point of the central Mediterranean. Passage of Short-toed Eagles at Marettimo occurs mostly during the first half of October (Agostini *et al.* 2002b, 2004b; Gustin & Provenza unpubl.) and most of the birds aged during preliminary observations have proved to be juveniles. Surveys of migrating raptors were carried out on Marettimo in 2002 (3rd–19th October) and 2007 (3rd–15th October).

In 2002, a total of 202 Short-toed Eagles was



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339. Raptor observation point, Marettimo, Italy, October 2007.

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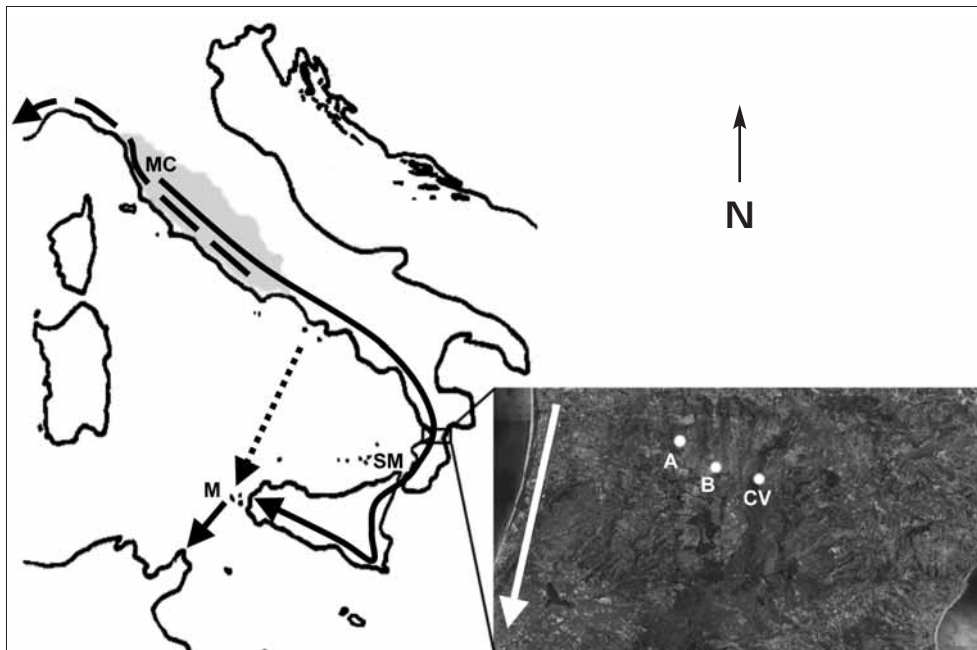


Fig. 1. The study area. **A** and **B**: watchpoints on the Calabrian Apennines used in this study. **CV**: watchpoint on the Calabrian Apennines used during surveys in 1990s. **SM**: Strait of Messina. **M**: Marettimo. **MC**: Mount Colegno. Grey area: approximate breeding range of Short-toed Eagles *Circaetus gallicus* in central Italy. Solid arrow: flyway hypothesised for juveniles in this study. Dashed arrow: flyway of adults en-route to the Strait of Gibraltar. Dotted arrow: alternative pathway of juveniles through the Tyrrhenian Sea, previously suggested by Agostini *et al.* (2004b).

recorded, in 16 flocks (of 2–49 birds, mean 12.2) plus seven single birds. Three flocks, of 2, 42 and 39 birds, left the island heading towards North Africa and one individual was seen to return towards Sicily. For the remaining birds it was not possible to establish the direction of departure. In 2007, 170 Short-toed Eagles were recorded, in 17 flocks (of 2–35 birds, mean 9.1) plus 16 single birds. Of these, flocks of three and 12 continued towards the Tunisian coast; flocks of 24 and four, plus two single birds remained on the island; two flocks, of 19 and 16 birds, flew back towards Sicily; and the direction of departure of the others was not recorded. Of the total of 372 individuals noted in these two years, it was possible to establish the age of 112: 89 (79%) were juveniles, 17 (15%) were immatures, and six (5%) were adults. In addition, during 2nd–15th October 2007, a total of eight migrating Short-toed Eagles, all travelling singly, was counted along the Calabrian Apennines, a migration bottleneck in southern continental Italy (fig. 1). Of these, six were aged: five were juveniles and one was an adult. Previous surveys in the area in the 1990s confirmed that this species is an uncommon migrant (Agostini & Logozzo 1997).

These results suggest that most of the Short-toed Eagles using the Central Mediterranean flyway in autumn are juveniles. Most adults use the Tyrrhenian coast flyway (as above), although some juveniles follow older birds along this route, in late September. However, many juveniles migrate later in the autumn, probably following the coast rather than the inland mountain chain (fig. 1) and migrating singly or in small, loose flocks, thus making monitoring difficult from observation posts along the Calabrian Apennines. It has been suggested that juveniles follow an innate north-east–southwest direction in autumn, leading them directly to western Sicily from breeding areas in north-central Italy, across the Tyrrhenian Sea. The hesitation shown by Short-toed Eagles at Marettimo when facing the open sea suggests that this is unlikely, however. Flocks over Marettimo probably build up as the birds wait for favourable weather conditions in western Sicily. After crossing the Strait of Messina and reaching the south coast of Sicily, juvenile Honey-buzzards make the 400-km sea crossing to Libya via Malta (Agostini *et al.* 2002c, 2004a), but Short-toed Eagles appear more likely to follow the coast to western Sicily,

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340. Short-toed Eagles *Circaetus gallicus* migrating through Marettimo, Italy, October 2007.

where they wait for good weather before departing (fig. 1). On 12th October 2004, a migrating flock of 70 Short-toed Eagles was observed on the southwest coast of Sicily, c. 60 km southeast of Marettimo (Marchese unpubl. data).

We presume that birds returning to Italy in spring follow experienced birds – through northwest Africa, across the Strait of Gibraltar, and to breeding sites in Italy via Spain and France – which prefer the longer, but safer and easier route rather than using the Central Mediterranean flyway.

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