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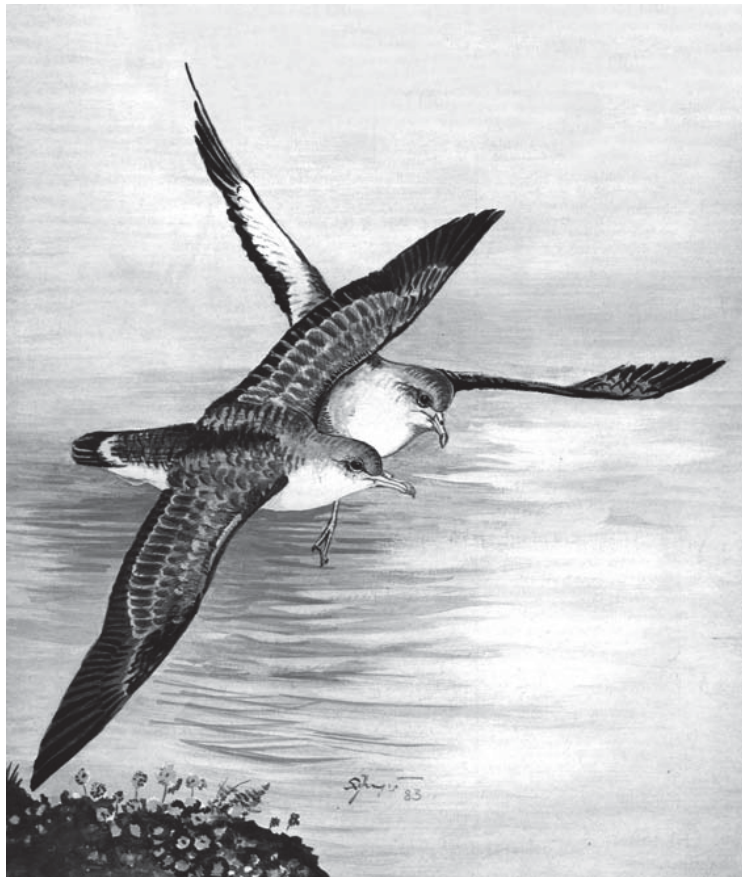


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Data on spring migration of immature Short-toed Eagles *Circaetus gallicus* through the Central Mediterranean route (Italy, Tunisia)

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Riassunto – Dati sulla migrazione primaverile degli immaturi di *Biancone* *Circaetus gallicus* attraverso la rotta del Mediterraneo Centrale (Italia, Tunisia). Osservazioni sulla fenologia migratoria primaverile di immaturi di *Biancone* sono state svolte nella primavera 2007 in nove stazioni di osservazione dislocate nell'Italia peninsulare ($n = 3$), in quella insulare ($n = 5$) e in Tunisia ($n = 1$). Nel complesso, la ricerca ha richiesto $n = 231$ giornate di campo (in media $n = 25.7 \pm 3.9$ SE gg/stazione; estremi: Cap Bon $n = 8$; M.te Conero $n = 48$) concentrate in larga percentuale ($n = 82.3\%$, $n = 190$) tra il 20 aprile e il 20 maggio (estremi: 9 marzo – 31 maggio), per un totale di $n = 2002$ ore di osservazione (in media $n = 222.4 \pm 39.9$ SE ore/stazione; estremi: Cap Bon $n = 33$; M.te Conero $n = 480$). Nel complesso, sono stati identificati $n = 112$ individui immaturi in transito, di cui $n = 57$ (50.9%) ad Arenzano, $n = 28$ (25.0%) a Cap Bon, $n = 19$ (17.0%) sulle Alpi Apuane e $n = 4$ (3.6%) sia sul M.te Conero che in Sicilia e isole minori. Le osservazioni di Arenzano e delle Alpi Apuane (con direzioni di volo prevalenti: ENE e SE rispettivamente), così come gli avvistamenti in Sicilia (direzione di volo prevalente: NE), suggeriscono che la maggior parte dei bianconi immaturi effettui in primavera una migrazione “a circuito” come gli adulti. Il comportamento riscontrato nei bianconi immaturi, in migrazione tardiva rispetto agli adulti, è in accordo con quanto noto e con le osservazioni relative allo Stretto di Gibilterra. La mancata corrispondenza delle osservazioni tra Cap Bon e Sicilia suggerisce due possibili ipotesi: a) i bianconi immaturi osservati sul capo tunisino non hanno attraversato il mare e hanno estivato in Africa. Questa prima ipotesi è supportata dal rilevamento tramite trasmettitore satellitare di due bianconi rimasti in Africa durante il loro secondo anno di vita; b) si trattava di soggetti che hanno attraversato il Canale di Sicilia e hanno estivato in Sicilia. Questa seconda ipotesi potrebbe giustificare l'osservazione di immaturi in transito a Marettimo in autunno.

Short-toed Eagle migration has been studied in depth in Italy and its specific “circuitous” migration involving most of the Italian population has been documented, both in spring (Premuda 2004a, 2007, Baghino and Premuda 2005, 2007) and in autumn (Agostini *et al.* 2002a, 2004,

Premuda 2002, 2004b, 2007, Ruggieri *et al.* 2006, Baghino *et al.* *in press*), probably as a result of a conservative strategy (Agostini *et al.* 2002b) and very likely involving a population of western origin (Agostini and Mellone 2008). The autumn migration of juvenile Short-toed Eagles originated from the population breeding in Central Italy has been investigated (Agostini *et al.* 2004, 2005, 2009). Results showed that part of the juveniles follow the adults in their “circuitous” northward migration (passing along the Apuane Alps in Tuscany and then along the Ligurian Coast at Arenzano), while other birds head southward, concentrating at Marettimo island (Trapani, Egadi, Sicily) in the first half of October (Agostini *et al.* 2004, 2005, 2009). The immature birds perform a ‘circuitous’ autumn migration as do juveniles when migrating in flocks of adults during the second half of September, even if some have also been recorded later (October) at Marettimo (Agostini *et al.* 2004, 2005, 2009).

Conversely, the spring migration of immatures through Italy is not as well known as the autumn one. The aim of this study is to contribute to the knowledge of spring migration of immature Short-toed Eagles, on the basis of field observations performed during spring 2007 (March-May) over 2002 hours of observation, at eight Italian and one Tunisian watching-sites (Table 1).

At all the sites, the observations were performed daily from about 09:00 to 17:00 (legal time); for each observation, time (hh:mm), species, number of individuals, sex and age (whenever possible), flight direction of birds (incoming and outgoing) were recorded. The observations were made with binoculars and telescopes.

The Ligurian observation post is part of the Beigua Regional Nature Park and of the “Beigua-Turchino” Special Protection Area. All the Sicilian sites were monitored for the Project “Rapaci Migratori”, organised by LIPU-Birdlife Italy.

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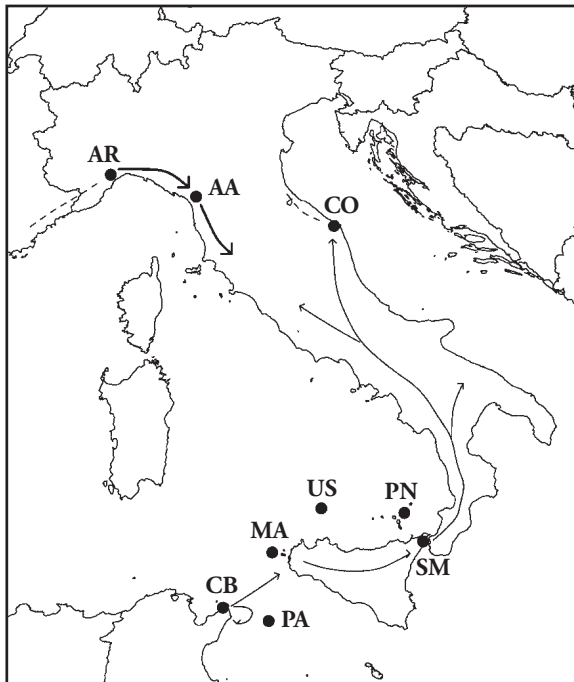


Figure 1. Possible major routes (arrows) used by immature Short-toed Eagles *Circaetus gallicus* during spring migration through Italy and Tunisia and geographical localization of observation sites: AR = Arenzano; AA = Apuane Alps; CO = Conero; CB = Cap Bon; PA = Pantelleria; MA = Marettimo; US = Ustica; PN = Panarea; SM = Stretto di Messina – *Possibili principali rotte migratorie usate da bianconi Circaetus gallicus immaturi durante la migrazione primaverile in Italia e Tunisia e localizzazione dei siti di osservazione*: AR = Arenzano; AA = Alpi Apuane; CO = Conero; CB = Cap Bon; PA = Pantelleria; MA = Marettimo; US = Ustica; PN = Panarea; SM = Stretto di Messina.

It is worthwhile to note that the risk of double counts is high at Cap Bon, where birds were often observed stopping their migration flight in front of the water barrier and then flying back inland (Agostini and Duchi 1994, Agostini *et al.* 1994a, 1994b, Agostini 2002, 2005). Moreover, during our study, frequent clouds over the promontory and fog over the sea made not possible to detect the raptors starting the sea crossing; therefore, an observation post located on the slopes of a hill close to El Haouaria was used to detect raptors coming from inland before reaching the promontory; hopefully, this approach limited double counts.

Specific identification and ageing characters used are those provided by Clark (1999), Forsman (1999), Premuda (2004c) and, partially, Campora (2002, 2009), Campora and Cattaneo (2005). In agreement with Forsman (1999), second and third calendar year birds were considered immatures while older birds, including those in their fourth calendar year, were considered adults. In particular, meth-

ods for ageing immatures were the following: 1) second calendar year spring (March): juvenile plumage with rufous tones (often bleached), no signs of moult on remiges, lack of dark terminal wing band, “S” curve line of wing border, narrow “hand”; 2) second calendar year spring (April): like 1) (more abraded) but with few inner primaries (1-3) moulted, poorly-defined breast band; 3) third calendar year spring: very pale or white head and body plumage, poorly-defined or absent breast band, outermost primaries still juvenile (abraded, bleached), presence of both juvenile and second-generation (with darker terminal band) secondaries.

During the sample periods 112 immature Short-toed Eagles were observed (Table 2). The four short-toed eagles observed at Strait of Messina and Ustica were not aged, but, considering the late migration periods, we assume that they were immature. At Cap Bon, of the immature birds that were precisely aged ($n=12$, 43%), five (42%) were in their second calendar year, and seven (58%) in their third calendar year.

The observations at Arenzano and at the Apuane Alps, as well as the low number of records in Sicily, suggest that most immatures perform a “circuitous” migration in spring, as do adults (Premuda 2004a, 2007, Baghino and Premuda 2005, 2007).

The phenology of immature Short-toed Eagles migrating later than adults is in accordance with Cramp and Simmons (1980), Campora (2009) and with the observations at the Strait of Gibraltar (Finlayson 1992).

Despite the risk of double counts of birds coming back inland at Cap Bon (Agostini and Duchi 1994, Agostini *et al.* 1994a, 1994b, Agostini 2002, 2005), the “movements” of immature Short-toed Eagles were evident at the site.

Apparently, the birds counted at Cap Bon were not detected at any Sicilian watching-site.

A first possibility is that Short-toed Eagles did not cross the sea, and instead spent the summer in North-Africa, where the species is known to be present (Cramp and Simmons 1980, Isenmann *et al.* 2005).

In agreement with this hypothesis, a second calendar year Short-toed Eagle tracked by satellite in 2008-9 didn’t cross the Mediterranean Sea and spent his second summer in Morocco (Pavón *et al.* 2010). Another second calendar year Short-toed Eagle tracked by satellite in 2007-8, lingered in its wintering area in Mali (inland Niger delta), suggesting that immatures do not necessarily need to set out on a return migration (Cavallin *et al.* 2008).

In addition, based on the examination of museum specimens of “pale” plumages ($n=77$), some of which were collected in Africa, Campora and Cattaneo (2005) stated that not all immatures return to Europe in spring - with

Table 1. Details of the observation sites used during spring 2007 – *Dettaglio dei siti di osservazione utilizzati durante la primavera 2007.*

Area	Site	Coordinates	Altitude (m a.s.l.)	Distance from the seacoast (km)	Census period	Sampling effort (hours)
Ligurian Apennines (W Liguria)	Arenzano	44°24' N-8°40' E	350	1,5	9-18 May	78
Apuane Alps (NW Tuscany)	Capriglia	43°58' N-10°14' E	400	5	9 March/1 April	196
Adriatic coast (Marche)	M. Conero (Gradina)	43°32' N-13°26' E	200	2	14 April/31 May	480
Island of Ustica	Punta Falconiera	38°70' N-13°20' E	50	0,5	20 April/20 May	230
Aeolian Archipelago	Panarea (M. dei Corvi)	38°38' N-14°04' E	585	0,5	20 April/20 May	255
Strait of Messina	M. Peloritani	38°11' N-15°33' E	500	5	20 April/20 May	280
Egadi Islands	Marettimo (Semaforo)	37°57' N-40°02' E	500	1	20 April/20 May	240
Sicilian Channel	Pantelleria (Airport)	36°48' N-11°57' E	100	2	22 April/18 May	210
Cap Bon (NE Tunisia)	El Haouaria	37°10' N-11°00' E	100	4	22-29 April	33

Table 2. Details of the observations of migrating Short-toed Eagles performed at the nine study sites during spring 2007 – *Dettaglio delle osservazioni di bianconi in migrazione svolte nei nove siti di studio durante la primavera 2007.*

Site	Indd. Total	Immatures	Peak	Direction
Arenzano	57	57 (100%)	38 on 13 May	E-NE
Apuane	838	19 (2.3%)	7 on 31 March	SE
Conero	4	4 (100%)	–	N-NW
Ustica	1	1 (100%)	–	NE
Panarea	0	0	–	–
Strait of Messina	3	3 (100%)	–	NE
Marettimo	0	0	–	–
Pantelleria	0	0	–	–
Cap Bon	32	28 (87.5%)	10 on 26 April	NE

some instead remaining throughout the year in their wintering areas - because the proportion of pale individuals increases in Africa in March and April, when breeding adults have already occupied their nesting territories in Europe. However, a delayed (May) migration of immatures to Europe cannot be excluded.

A second possibility is that eagles seen reaching the Cap Bon Promontory crossed the Sicilian Channel and spent the summer in Sicily. This hypothesis could explain the passage of immatures over Marettimo during the autumn migration (Agostini *et al.* 2004, 2009).

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