Exceptional wintering and spring migration of the booted eagle Hieraaetus pennatus in Italy in 2004 and 2005

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Abstract - After the exceptional influx of Booted eagles Hieraaetus pennatus from Western Europe in October 2004, we reviewed the species’ presence in Italy over the period December 2004 - February 2005 and during spring 2005. We documented the size of the species’ wintering population by gathering the sightings from various regions of Italy. We surveyed the spring migration of the species through simultaneous raptor counts at several sites (mostly in Sicily and Sicilian islands). The remarkable wintering population of 2004-2005 (estimated range: 173 - 202 individuals) was related to the unusual migratory influx that took place in the previous autumn and it agrees with an apparent trend towards an increasing number of birds wintering in southern Italy, particularly in Sicily (estimated range: 132 – 157 individuals). The northward spring migration observed from the southern regions of Italy along the Tyrrhenian coast (towards France), validates the hypothesis of a West European origin of the individuals migrating in the spring of 2005 and can be regarded as a case of circuitous migration in the Booted Eagle.


The Booted Eagle Hieraaetus pennatus is considered “rare” in Europe, where it breeds both in Western Europe (France, Portugal and Spain) with several thousand pairs and in Eastern Europe (most in Russia, Turkey and Ukraine), with a few thousand pairs (BirdLife International 2004). Although the species is mainly a trans-Saharan migrant, some individuals overwinter in Southern Europe and North Africa (Cramp and Simmons 1980, Zalles and Bildstein 2000, Corso 2001, Agostini 2002).

During the migration across the Mediterranean basin, most booted eagles of the western and the eastern European populations concentrate at the Straits of Gibraltar and Bosphorus, respectively (Finlayson 1992). Until now the Central Mediterranean and the Italian Peninsula were only partially interested by the migration of this species (Cramp and Simmons 1980, Bijleveld 1986, Zalles and Bildstein 2000, Corso 2001, Agostini 2002).

In Italy the Booted Eagle is considered a regular migrant and irregular wintering species (though it is regular in Sicily) (Brichetti and Fracasso 2003). Premuda and Baghino (2004) investigated the autumn migration of Booted Eagle through the Italian Peninsula, analysing existing information from 1985 to 2003 and suggesting a western European origin for some of the booted eagles migrating in Italy during autumn (Premuda 2003).

The influx migration of more than 500 booted eagles from Spain and France through Italy that took place in October 2004 was a well-documented phenomenon (Baghino and Premuda 2005, Baghino 2005, Guillosson et al. 2006). This work presents new data collected in Italy from winter
2004 to spring 2005, aiming at quantifying the winter pres-
ences of the species and at analysing its spring movements.

METHODS

The study area covers the Italian Peninsula as a whole, with
a particular focus on some selected sites interested by a con-
centrated passage of migrant raptors (Figure 1).

Wintering

Winter records were collected from December 2004 to Janu-
ary 2005. In Eastern Sicily counts were performed only in
January 2005, because the eagles appeared to be still involved
in migration movements during December 2004. Moreover,
only for Sicily, we also analysed data collected during winter
2005-2006. During the study period, the main areas investi-
gated were: Po Delta (Emilia-Romagna), Tuscany, Latium,
Campania, Salento peninsula, Sardinia and Sicily.

In these areas the authors and some field observers car-
ried out 1-3 visits per area. The visits included all sites in
which the species was observed in the previous autumn.
The remaining Italian regions were also surveyed by many
birdwatchers but without results (data mainly obtained from
www.ebnitalia.it), although it cannot be excluded that
some undetected individuals may have wintered in southern
Italy (mainly in Calabria and Basilicata), where cover-
age was poor.

In order to reduce the likelihood of double counts, both
moult pattern and colour morphs with individual plumage
characters were recorded whenever possible. Birds were aged
on the basis of moult patterns and silhouette (Conzemius
1996, Clark 1999, Forsman 1999). With regards to morphs,
the rufous morph reported by Clark (1999), was not taken
into consideration and any birds appearing intermediate
and/or rufous were recorded as dark morph individuals.

Spring migration

The survey was carried out in springs 2004 and 2005. At the
Apuane Alps (Lucca, Tuscany) and at Arenzano (Genoa,
Liguria; Fig. 1, Tab. 2) visual counts were made simultane-
ously from 6 to 21 March. At Arenzano, another 16-day rap-
tor migration count took place from 5 to 20 May. In addi-
tion, from 20 April to 20 May, the following sites were mon-
tored for the Project “Rapaci Migratori”, organised by
LIPU-Birdlife Italy: Pantelleria, Marettimo, Panarea, Strait
of Messina (Sicily) and Mount Conero (Marche); the Erice
site was surveyed only in 2005 (Fig. 1, Tab. 2).

Observations were carried out during daylight time (8-10
hours/day at each site) and were interrupted only in case
of rain and poor visibility.

RESULTS

Wintering

During winter 2004-2005, we estimated that 173-202 boot-
ed eagles wintered in Italy, among which 41-45 individuals
in continental regions and Sardinia, and 132-157 individu-
als in Sicily (Tab. 1, Fig.1). Many booted eagles were
observed in wetlands: Po Delta, Circeo National park, Diac-
cia Botrona, Ombrone mouth, Cixerri and Colostrai lake,
Saline of Siracusa, Cozzo Pantano, Vendicari, Simeto
marshes, Pontebarca, Lentini lake, Biviere of Gela (Tab. 1).

We established the morph of 44 birds: 31 were in light
morph and 13 in dark morph. Out of the 48 birds that were
aged with certainty in Sicily, only 1 adult was detected, the
other being juveniles. During the following winter
(2005/2006), about 93-112 booted eagles wintered in Sici-
ly: 17 in Siracusa province, 4-6 in Ragusa province, 3-5 in
Messina province, 14-17 in Catania province, 10-12 in Cal-
tanissetta province, 40-50 in Agrigento province, 5 in Tra-
pani province (1 at Favignana island, 4 at Pantelleria
island). In January 2006, we aged 35 individuals of which 7
were juveniles, 5-6 adults and the other 22-23 individuals
were in their 3rd calendar year.
Spring migration

At all study sites, an increase in the number of booted eagles was recorded in spring 2005 as compared to spring 2004 (Tab. 2; Wilcoxon test, $Z = 2.52$, $P = 0.012$). This was evident in the Sicilian sites, particularly at the Strait of Messina, where the maximum counts were achieved (2004: 8 individuals, 2005: 87 individuals; Tab. 2), but also in Northern Italy (e.g. the Arenzano site in May; 2004: 2 individuals, 2005: 20 individuals; Tab. 2).

During April-May 2004, at Sicilian sites, the birds were all juveniles, except one adult observed in Pantelleria. In April-May 2005, at the Strait of Messina 62 birds were carefully observed at close range: they resulted all juveniles. In May 2005 at Arenzano site, the age was established for nine individuals and they were all juveniles. However, in this site in March 2005 and in the Apuane Alps in March 2004 and 2005 only adults were observed (6, 2 and 7 individuals, respectively).

In April-May 2004, the morph of eagles was recorded only in the Strait of Messina: 7 individuals were in pale and 1 in dark morph. In spring 2005, pale morph individuals were predominant among the eagles observed in the study sites (pale vs. dark morph: Wilcoxon test, $Z = 2.20$, $P = 0.028$; Tab. 3).

The flight direction of the migrant eagles was N-NE at the Sicilian channel and Conero promontory, N-NW at the Strait of Messina, NW at the Arenzano site (Fig.1).

DISCUSSION

Wintering

The high number of booted eagles recorded in Italy during winter 2004-2005 (estimated range: 173 - 202 individuals; 132 – 157 in Sicily), compared to the lower numbers in previous years, appears to be strongly related to the exceptional influx from Western Europe that occurred during autumn 2004 (Baghino and Premuda 2005). At the same time, it strengthens the trend towards an increasing number of birds wintering in Italy, mainly in Sicily.

Over the last twenty years, there has been an increase in the number of booted eagles wintering in areas of the Central Mediterranean (Corso and Iapichino 1998, Corso 2005).

In Italy, prior to 1980, there were only two winter records of Booted Eagle: one adult at Torviscosa, NE Italy, 20 December 1948 (Fantin 1974), one individual near Rivoltella-Sirmione, N Italy, in December 1979 (Brichetti and Cambi 1981). The number of records increased after 1980: one individual in NW Italy in January 1981 (Brichtetti and Cambi 1981). The number of records increased after 1980: one individual in NW Italy in January 1981 (Brichtetti and Cambi 1981). The number of records increased after 1980: one individual in NW Italy in January 1981 (Brichtetti and Cambi 1981).

In January 2003, a minimum of 12 individuals was recorded in Sic Muscusa and Agrigento provinces (Ruggieri 2004) with 20-24 individuals in 2004 (Corso 2005). The main wintering areas have always been Siracusa and Agrigento provinces.

Table 2. Geographical coordinates, altitude, census period and number of observations of migrating booted eagles during the springs 2004 and 2005, for each study site. – Coordinate, altitudine, periodo di censimento e numero di individui di aquila minore osservati durante le primavera 2004 e 2005 per ciascun sito di osservazione.

<table>
<thead>
<tr>
<th>Area</th>
<th>Site</th>
<th>Coordinates</th>
<th>Altitude (m a.s.l.)</th>
<th>Census period</th>
<th>Number of individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2004</td>
</tr>
<tr>
<td>Apuan Alps (NW Tuscany)</td>
<td>Capriglia</td>
<td>43° 58' N - 10° 14' E</td>
<td>378</td>
<td>6-21 March</td>
<td>2</td>
</tr>
<tr>
<td>Beigua Regional Nature Park – Western Liguria</td>
<td>Arenzano</td>
<td>44° 24' N - 8°40' E</td>
<td>350</td>
<td>6-21 March</td>
<td>1</td>
</tr>
<tr>
<td>Sicilian Channel</td>
<td>Pantelleria</td>
<td>36°48’N – 11° 57’E</td>
<td>100</td>
<td>20 April</td>
<td>20 May</td>
</tr>
<tr>
<td>Egadi Islands</td>
<td>Marettimo</td>
<td>37°57’N – 40°02’E</td>
<td>500</td>
<td>20 April</td>
<td>20 May</td>
</tr>
<tr>
<td>Inner Sicily</td>
<td>Erice</td>
<td>38°02’ N – 12°35’E</td>
<td>750</td>
<td>20 April</td>
<td>20 May</td>
</tr>
<tr>
<td>Aeolian Archipelago</td>
<td>Panarea</td>
<td>38°38’N – 14°04’E</td>
<td>421</td>
<td>20 April</td>
<td>20 May</td>
</tr>
<tr>
<td>Strait of Messina</td>
<td>M. Peloritani</td>
<td>38°11’N – 15°33’E</td>
<td>500</td>
<td>20 April</td>
<td>20 May</td>
</tr>
<tr>
<td>Marche (Adriatic coast)</td>
<td>Conero</td>
<td>43°32’N – 13°26’E</td>
<td>200</td>
<td>20 April</td>
<td>20 May</td>
</tr>
<tr>
<td>Beigua Regional Nature Park – Western Liguria</td>
<td>Arenzano</td>
<td>44° 24' N - 8°40' E</td>
<td>350</td>
<td>5-20 May</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 3. Pale, dark, and not valuated morph of booted eagles observed in migration at the Strait of Messina, Pantelleria, Marettimo, Erice, Panarea island, Apuan Alps and Arenzano (see Tab. 2 for census periods). – Frequenze dei diversi morfi di aquila minore osservati durante la migrazione nei diversi siti di osservazione.

<table>
<thead>
<tr>
<th>Area</th>
<th>Pale morph</th>
<th>Dark morph</th>
<th>Not evaluated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strait of Messina</td>
<td>53</td>
<td>14</td>
<td>18</td>
</tr>
<tr>
<td>Pantelleria</td>
<td>5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Marettimo</td>
<td>8</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Erice</td>
<td>0</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Panarea</td>
<td>29</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Apuan Alps</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Arenzano, March</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Arenzano, May</td>
<td>14</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>115</td>
<td>25</td>
<td>45</td>
</tr>
</tbody>
</table>

Sicily hosts the greatest number of booted eagles wintering in Italy, and observations indicate a possible increase. This trend began to be noticed in the late 1980s (Iapichino and Massa 1989, Iapichino 1993, Ciaccio and Priolo 1997). Winter records became increasingly frequent in the early 1990s (Lo Valvo et al. 1993). Later, 5 individuals on average were estimated to be wintering in eastern Sicily each year (Grussu and Corso 1997, Corso and Iapichino 1998).
The age-ratio of the birds wintering in Sicily in 2004-05 compared to 2005-06 is very interesting: most birds aged in 2004-05 were juveniles (97.9%), while in 2005-06 most 
birds were immature (>62%) with a few adults as well. This 
finding suggests that these birds might well be the same 
individuals returning to the wintering grounds where they 
spent the previous winter.

Spring migration

While the data collected during the project “Rapaci Migra-
tori” in spring 2004 are in agreement with those reported in 
the previous years at the Strait of Messina (Corso 2001), the 
unusually high number of booted eagles observed in spring 
2005 seems to be strongly related with the anomalous 
movements observed the previous autumn. The exceptional 
volume of the Booted Eagle autumn migration that occurred 
during 2004 (> 500 individuals; Baghino and Premuda 
2005) is also evident by a simple comparison with the over-
all number of records (N =192) collected in Italy from 1985 
to 2003 (Premuda and Baghino 2004).

It’s particularly interesting to note that a case of mass 
migration took place during autumn 1985 (Premuda and 
Baghino 2004), suggesting that such a phenomenon may 
occur recurrently under particular circumstances, and that in 
spring 1986, just after the first “influx” recorded in the 
autumn of 1985, many individuals of this species (35) were 
observed at the Strait of Messina (iapichino and Massa 1989).

According to the known phenology of the booted eagle 
(Forsman 1999), the majority of birds migrating in late 
April and early May in both study seasons were immature 
(mainly 2y juveniles). On the contrary, individuals migrat-
ing in March would mostly concern adult birds, as it was 
partially shown by the raptor counts made at the Tuscan and 
Ligurian sites (Apuane Alps and Arenzano).

The predominance of pale morph among the booted 
eagles migrating through Italy is in agreement with the 
morph ratio existing in Spain and in the Western Europe, 
rather than in the Eastern European distribution range (Fors-
man 1999). The northward route taken by booted eagles 
crossing Southern Italy, then heading NW along the upper 
Tyrrhenian coast and finally SW along the Ligurian coast, 
with almost no birds along the Adriatic coast, validates the 
hyothesis of their West European origin, in agreement with 
the autumn observations made at Arenzano (Premuda and 
Baghino 2004). This suggests the occurrence of a case of 
spring circuitous migration: such a pattern has been docu-
mented in the short-toed eagle Circaetus gallicus across 
Italy, with the exactly opposite migration direction (SE in 

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REFERENCES

Agostini N 2002. La migrazione dei rapaci in Italia. In: Brichetti P, 
Gariboldi A (eds). Manuale di Ornitologia Vol. 3. Edagricole - 
Il Sole 24 Ore, Bologna, pp. 157-182.

Agostini N, Baghino L, Colele L, Corbi F. Premuda G 2002a. Cir-
cuitous autumn migration in the Short-toed Eagle (Circaetus 

Agostini N, Baghino L, Panuccio M. Premuda G 2002b. A conser-
vative strategy in migrating Short-toed Eagles (Circaetus gallicus). 

The autumn migration strategy of adult and juvenile short-toed 
eagles Circaetus gallicus in the central Mediterranean. Avocet-


Baghino L 2005. Un caso di migrazione di massa dell’Aquila mini-
ore Hieraaetus pennatus in Liguria. Il Biancone s.n.: 19-22.

Baghino L, Premuda G 2005. Autumno 2004: eccezionale invasio-
de di aquile minori. Quaderni di birdwatching 13, CD-ROM.

Edizioni EBN Italia, Verona.

BirdLife International 2004. Birds in Europe: populations esti-
mates, trends and conservation status. Conservations Series 

Bijleveld M. 1986. Sur la migration de l’Aigle bôtté, Hieraaetus 

Bresciana 17: 211-234.


di Lentini e delle zone umide adiacenti (Sicilia, Italia). Natu-
ralista siciliano 21: 309-413.


