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Status of the Golden Eagle *Aquila chrysaetos* in Abruzzo

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The knowledge about the presence and the distribution of the Golden Eagle *Aquila chrysaetos* in the Abruzzo Region up to the end of '900 is probably partial and not exhaustive. In the paper "*Birds of Abruzzo and Molise*" by the ornithologist Nicola De Leone, with observations from 1908 up to 1932, this species is frequently reported as present in several municipalities (De Leone 1933). In more recent papers the number of known pairs is between 8 and 14. Presence and distribution data have been further analyzed in "*Central Apennines*" (Chiavetta 1978, Zocchi 1992, Allavena *et al.* 1997, Spinetti 1997, Borlenghi & Corsetti 2002).

In 2003, the Abruzzo ornithological station promoted a full survey over all of its territory, revealing the presence of 16 territorial pairs, confirmed through nests in the administrative boundaries of the region (Magrini *et al*. 2007). Other breeding pairs were present in Abruzzo but they were found nesting just outside the administrative borders (Artese *pers. obs*.). Since 2003, monitoring continued uninterruptedly for the entire population, although some pairs were not studied.

The Abruzzo region covers 10795 km^2, 7029 of which are classified as mountain. Excluding the urbanized areas of Aquilana, Peligna and Fucino planes, the remaining territory foothills and mountain is suitable for this species.

The study area incorporates about 6.750 km^2 including three National Parks (Gran Sasso and Monti della Laga National Park, Maiella National Park, Abruzzo, Lazio and Molise National Park) the Sirente-Velino Regional Park and four Regional Nature Reserves (San Venanzio canyon, Sagittario canyon, Genziana and Zompo lo Schioppo mountains). In addition, also SPAs (Special Protection Areas under the 2009-147-EC Directive "Birds" areas) are listed within the protected areas. All the monitored pairs live within protected areas (national parks, regional or state or regional reserves) or SPAs.

The known territorial pairs were followed for several years through direct observations and monitoring. The operative protocol required at least four annual surveys: one between February and March to observe the presence of pairs in the nesting area; a second one in April to check the egg laying, another one in May and June to check for the presence of chicks, and a final survey between July and August to check fledging. Each survey took at least four consecutive hours (Pellegrini 2003). The observations were made with optical magnification telescope and binoculars from vantage points at distances that did not involve any alteration of the reproductive activity in progress. Each observer always covered the same assigned pairs. The survey included the collection of both morphological (nest type, exposure, cliff height), biological parameters (estimated age of the pair, feeding, behaviour) and environment characteristics. All known nests were georeferenced with coordinates UTM -WGS 84 -33N and mapped at 1: 25,000 scale using the GIS program Arcmap 9.2. The DB contained also all the information related to each single pair provided by the field collaborators.

This paper uses the following definitions:

- observed population consistency: the number of territorial pairs censused in the breeding season;
- probable population consistency: the number of terri-

torial pairs whose presence was detected in at least one breeding season in the past;
- population consistency: the number of territorial pairs whose presence was observed but not yet ascertained;
- estimated population size: the number of territorial pairs which are estimated to be currently present in the study area, including those that are considered to likely live in areas recently surveyed or not.
- average productivity: the ratio between fledged young and monitored pairs.
- fledging rate: the ratio between fledged young and pairs that bred.
- reproductive success: the ratio between fledged young and pairs that laid eggs (Fig. 1).

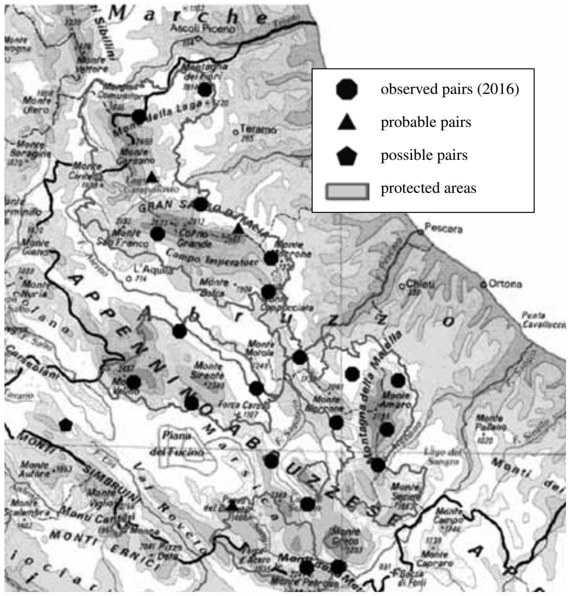

Figure 1. Distribution of *Aquila chrysaetos*' pairs in 2016.

In 2016 a total of 24 pairs were counted in Abruzzo, 17 of which were observed by our working group, while other 6, present in the P.N.M., were monitored by the park`s staff. Although they occupied a stable territory, 3 out of 17 pairs never bred. Of the remaining 14 pairs, only 10 laid and from 7 nests only one chick hatched.

The reproductive parameters for the 2016 season (excluding pairs of the Maiella National Park) were: average productivity: 0.50 (+0.20 compared to the 2015 average productivity); fledging rate: 1 (stationary if compared to the 2015 rate fledging).

In the 2003-2016 period, the following reproductive parameters were measured:

ascertained pairs	**212**
breeding pairs	**135** (63.68%)
fledged young	**121**
fledging rate	**1.04**
average productivity per pair	**0.57**
reproductive success	**0.90**
average number of nests per pair	**3.13** (range 1-8)
known nests on trees	**0**
average share of the nests	**977.5 m** (n = 46; range 480-1475 m)
average minimum distance among nests	**14.269 km** (S.D.: 4.011; n = 20)

In order to define the home range in Abruzzo, as no specimens were tracked by satellite loggers nor observed by multiple groups of contemporaneous observers within the study area for the determination of territorial boundaries, a cartographic analysis was performed. It was performed by attributing to each pair a circular buffer. The radius of the buffer, from the most used nesting site of each pair in the last years, was equal to half the average minimum distance between contiguous pairs nests, i.e. 7.135 km. The average area occupied was about 160 km^2. As shown in Fig. 2, in several areas the distribution areas were partially overlapping, while other large areas remained unoccupied.

The densities detected in 2016 (number of individuals present every 100 km^2) were calculated with the exclusion of the presence of floaters and considering only those of the pairs present in the area and the fledged young. Considering an area of 6,750 km^2 with 24 pairs present and 7 fledged young, it resulted to be 0.81 units per 100 km^2 and 3.55 pairs per 1,000 km^2. This is a very low density compared to that found in the Alps (Fasce *et al.* 2011, Bassi this volume). However, it must be taken into consideration that non territorial or floating birds were excluded from the count (further six pairs were present), thus density in Abruzzo is among the highest in the Apennines.

The trend of the Abruzzo population, however, is slowly increasing thanks to a rediscovered natural balance through food availability and suitable protection. The positive effect of the institution of protected areas could be negatively counterbalanced by negative legislative changes. The turn-over of pairs is still little known but it is very frequent in several areas (Pellegrini *pers. obs.*). This leads to the issue of the most usual causes in mortality; i.e. collisions with electricity pylons and wind turbines, hunting and the widespread use of helicopters.

Reproductive success is affected instead by the non-regulated sports activities such as hang-gliding, rock climbing, mushroom hunters, photographers and hikers near the breeding sites. The quantification of these prob-

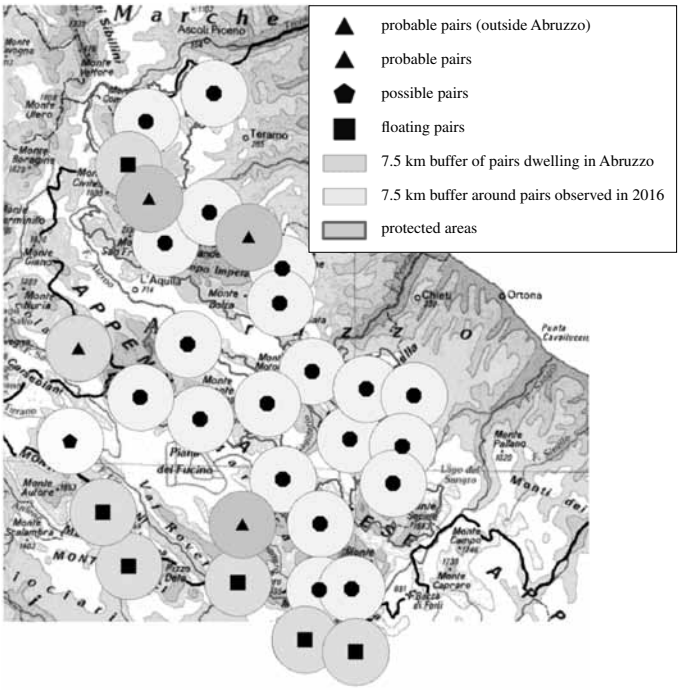

Figure 2. Hypothesized distribution areas.

lems cannot be easily determined in absence of specific studies, and in the Abruzzo region it has been computed only for a few areas (Antonucci *pers. comm.*).

Even the presence of floaters and the dispersion of young birds is poorly investigated. The positive trend in the areas neighboring Abruzzo, with many cases of re-colonization of old sites and occupation of new areas in recent decades, suggests a satisfactory survival trend. The increase of wind farms remains one of the major risk factors (De Sanctis & Allavena 2009). All the listed issues may find a proper solution in the careful management of the areas, with greater exchange of the data collected by the local contexts through a single national database and greater attention by the public office Abruzzo Region.

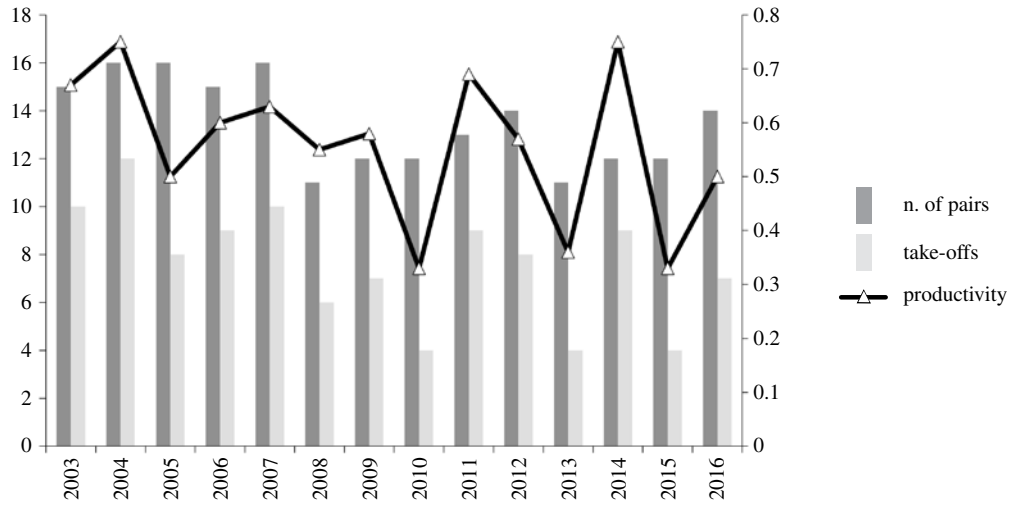

Figure 2. Trends of No. of pairs and productivity of the Golden Eagle in Abruzzo region.

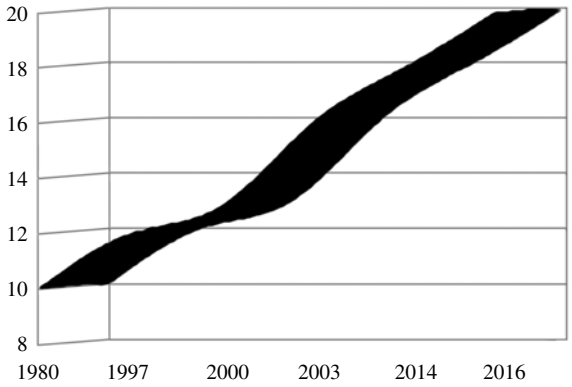

Figure 4. Trend of the number of pairs from 1980 to 2016 in Abruzzo region.

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