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New data about breeding success of the Eurasian Eagle Owl, *Bubo bubo* in the Oasis "Gravina di Laterza" (Apulia, Italy)

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Abstract

The Eurasian Eagle Owl, *Bubo bubo* is considered a globally declining species. Except for the Alps regions, the Eurasian Eagle Owl is irregularly distributed throughout Italy. Knowledge in Apulia and Basilicata is lacking, particularly in the Gravine Area, where sporadic sightings have been documented in recent decades. The aim of this work is to update information about the status of the Eurasian Eagle Owl in the area of the Lipu Oasis "Gravina di Laterza" and try to estimate the minimum number of reproductive pairs.
The study was developed over the years 2020 to 2023 by multiple methods, such as playback, camera trapping, and listening to spontaneous singing. Five monitoring stations were located in relation to various factors considered in the literature to be of primary importance for the owl. The first year a response was obtained from a male individual. In the same spot, in the following years, calls from a female and subsequently from two young individuals were recorded. A male individual was repeatedly filmed by camera trap. It is therefore believed that a stable reproductive pair of the species is present in the study area.

Keywords: *Bubo bubo*, Gravina di Laterza Oasis, nesting.

Riassunto

Il gufo reale, *Bubo bubo* è considerato una specie globalmente in declino. Fatta eccezione per le regioni alpine, il Gufo reale è irregolarmente distribuito in tutta Italia. Le conoscenze sulla distribuzione della specie in Apulia e Basilicata sono abbastanza lacunose, in particolare nell'Area delle Gravine, dove negli ultimi

decenni sono stati documentati solo sporadici avvistamenti. Lo scopo di questo lavoro è quello di aggiornare le informazioni relative allo status del Gufo reale nell'area dell'Oasi Lipu "Gravina di Laterza" cercando di stimare il numero minimo di coppie riproduttive. Questo studio è stato sviluppato nel corso degli anni dal 2020 al 2023, applicando una combinazione di più metodi tra cui l'emissione del playback, il fototrappolaggio e l'ascolto del canto spontaneo. Le 5 stazioni di monitoraggio sono state selezionate in relazione a diversi fattori considerati in letteratura di primaria importanza per la specie. Il primo anno è stata ottenuta una risposta da un individuo di sesso maschile. Nello stesso punto, negli anni successivi, sono stati ascoltati prima un individuo di sesso femminile e poi una coppia di giovani. Nel punto in cui era posizionata la fototrappola, invece, è stato ripreso più volte un individuo di sesso maschile. Si ritiene quindi che nell'area di studio sia presente una coppia riproduttiva stabile.

Parole chiave: *Bubo bubo*, Oasi Gravina di Laterza, nidificazione

Introduction

The Eurasian Eagle Owl, *Bubo bubo* is considered a globally declining species (IUCN, 2017). The species is considered No-SPEC according to Burfield et al. (2023), is included in Annex I of the Birds Directive, in Annex II of the Bern Convention and is present in the Red List of Italian Birds (Gustin et al., 2021).

The Eurasian Eagle Owl is a species irregularly distributed throughout Italy (Lardelli et al., 2022) except for Sicily, where it was recently declared extinct (Sarà et al., 1987) and Sardinia, where it has never been reported (Fasce, 1993).

In Apulia, knowledge about its status is incomplete: in particular, in the Terra delle Gravine Regional Natural Park, sporadic sightings have been documented in recent decades (Sigismondi, 1987, 2005; Scorrano, 2008), plus a nesting with the fledging of two young (Sigismondi et al., 1987) and the discovery of a deceased individual in the municipal area of Massafra (Chiatante, pers. com.). The latest research in 2019 confirmed its presence only in the area of "Gravina di Laterza" (Luce et al, 2021)

The aim of this work is to update the status of the Eurasian Eagle Owl in the area of the Lipu Oasis "Gravina di Laterza" by estimating the minimum number of reproductive pairs and describing the areas of greatest conservation value for the species.

Materials and methods

The study area is the Oasis "Gravina di Laterza", covering approximately 870 hectares, was established in 1999 thanks to a collaboration agreement between the Province of Taranto, the Municipality of Laterza and the Lipu (Italian League for Bird Protection). It is included in the SAC/SPA IT9130007 called "Area delle Gravine", which falls within the Regional System for the Conservation of Nature in Apulia (L.R. 19/97) in line with the Community directives of the Natura 2000 Network (Habitat Directive 92/43 EEC; Bird Directive 79/409, updated 2009/147/EC). It is also included in the Natural Regional Park "Terra delle Gravine", about 25000 ha wide, established by the Apulia Region by Regional Law 18/05 in December 2005 (modified with Regional Law 6/2011).

In the present study we used a combination of some methods like playback, collection of presence signals (feathers, bird pellets and remains of prey), camera trapping and listening to spontaneous song, to confirm the presence of the eagle owl in the site and to

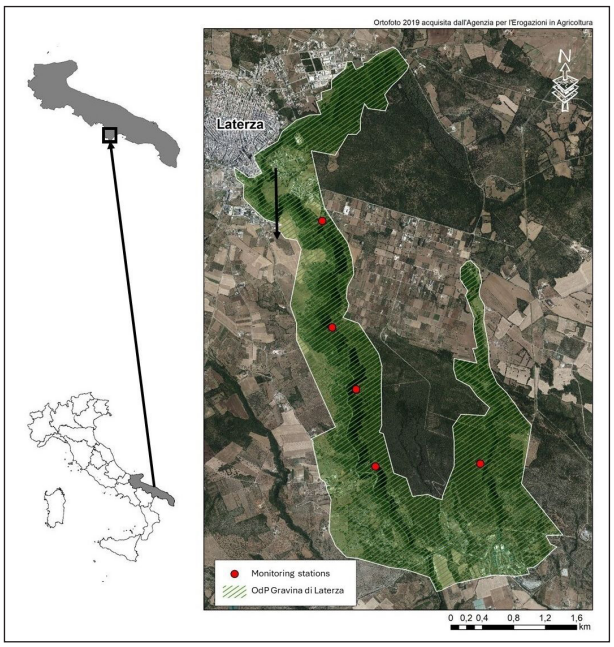

Figure 1. Study area with the five monitoring stations

assess nesting and reproductive success.
The research activity was carried out during the period 2020-2023, for a total of 56 field trips. Each sampling year was further divided into two sessions: winter (from November to January) and summer (from April to July) (Tab. 1).

Table 1. Field trips of research activity during the period 2020-2023

Year	Invernal session	Spring session	Total
2020	From 16/11/19 to 29/01/20	From 20/05/20 to 16/07/20	9
2021	From 19/11/20 to 20/01/21	From 12/04/21 to 21/07/21	17
2022	From 28/12/21 to 27/02/22	From 03/04/22 to 02/07/22	14
2023	From 23/12/22 to 16/01/23	From 27/04/23 to 15/07/23	16

The following methods were used throughout the monitoring period, except for camera trapping, used only in 2022:

- The playback method; is used to certify the presence in a territory of some species that are particularly difficult to observe and register and consists of imitating the song of the male individual with a recorded call or by voice to induce him to emit a response (Bergerhausen & Willelms, 1988; Pedrini, 1989). The aim of the stimulation is to obtain a response from at least one individual, who defends his territory through sound communication and reacts aggressively to the invasion of the territory by the presumed intruder, simulated by the emission of the recorded call (Bibby et al., 1992) and, possibly, try to identify the daytime resting site or the nesting site through triangulation (Bux, 2008).
- Bird pellets; they are discards containing undigested food remains. It is possible to find pellets near the perches assiduously frequented by a species.
- Camera trap technique; it allows to photograph wildlife through an instrument (camera trap) operated by infrared sensors and does not require permanent presence of an operator. This method, used for the first time in 1890 and then refined over the years, is due to the naturalist photographer George Shiraz, who developed a technique which, through the use of a long cable, allowed the animals themselves to take a self-portrait, simultaneously triggering a flash (Kucera & Barrett, 2011);
- Listening to spontaneous songs; it involves exclusively listening to the vocalizations that the Eurasian Eagle Owl emits from its perch, and is useful for counting territorial males in the period from November to March (Mikkola, 1983; Cramp, 1985; Pedrini, 1989), applying the listening stations method (Bibby et al., 1992) and in the March – April period when the contact of individuals occurs through listening to the songs that precede mating (Penteriani, 2003; Muscianese, 2006);

Using open-source software such as Qgis and Google Earth, emission and listening points were selected using information about the ecology of the eagle owl and previous data on the presence of the species. Thus, five sampling stations were chosen close to the edge of the ravine, thus exploiting its particular geomorphology for better sound diffusion of the playback (Fig.1).
Sessions and number of surveys carried out from 2020 to 2023.
The territorial vocalization of the male individual used in this study was obtained from the xeno-canto website, dedicated to recording and sharing the calls and sounds of different bird species from all over of the world.
At the selected emission points, sessions were carried out with the playback method, while spontaneous listening sessions were carried out exclusively in the points where at least one response was obtained during playback and the presence of the species was recorded previously (Luce et al., 2021).

Figure 2. Feather of Eurasian Eagle Owl found in one of the sampling stations.

Results

Stimulation with the playback method allowed to hear the territorial response of a male individual only in one of the monitoring stations. The individual was contacted in the 2020 winter session (December 19, 2020). At this station, therefore, only spontaneous listening sessions were carried out not to disturb the species.
During these sessions the male's territorial emission was heard several times (12 April 2021, 28 December 2021, 19 January 2022).
During the surveys, a perch usually frequented by the species was identified, confirmed by the presence of numerous wads and feathers (Figs. 2,3). The camera trap placed on 19 January 2022 therefore confirmed the assiduous attendance of the roost by a male individual (Fig.4). In the spring session of 2022 (April 12, 2022), the spontaneous singing of a female individual was heard for the first time, and subsequently both sexes were heard interacting with each other (June 4, 2022). In July several targeted spontaneous listening sessions were carried out to assess a possible nesting. During these sessions, both the male and female individuals were heard again, but no vocalizations were attributable to young individuals.
In the spring session of 2023 (18 April 2023), the male and then the female individual were heard again. In this monitoring year, several listening sessions of spontaneous singing were carried out to verify effective reproduction. In July (July 6, 2023), two juvenile vocalizations were heard for the first time, attributed to at least two individuals. A second session was also carried out (15 July 2023) aimed at confirming reproduction, during which the presence of at least two young individuals was therefore confirmed.

Figure 3. Pellet of Eurasian Eagle Owl found in one of the sampling stations.

Discussion

The "Gravina di Laterza" is confirmed as an important site of presence of the eagle owl, as previously reported (Sigismondi, 1987, 2005; Scorrano, 2008; Luce et al., 2021). For the first time, this paper confirms a breeding pair. However, it is appropriate to remember that the low densities that characterize some populations led us to avoid territorial manifestations such as singing ones. A similar condition would also be confirmed by the studies of Penteriani & Pinchera (1989). It is probable that in a densely populated area such as that of this study, the species chooses the less anthropized and more difficult to reach areas. For this reason, it is necessary to enforce and expand conservation measures, in order to preserve this and other species present in the area (Penteriani & Pinchera, 1989).

The "Gravina di Laterza", in fact, is one of the best-preserved sites in the arc of the Ionian ravines, thanks also to the Lipu Oasis, instituted about twenty years ago, which contributes to the conservation of biodiversity. Infact, Among the species of conservation interest there are the Black Stork, *Ciconia nigra*, the Lanner, *Falco biarmicus*, the Lesser Kestrel, *Falco naumanni*, the Short-toed snake eagle, *Circaetus gallicus,* the Black Kite, *Milvus migrans* (Bellini et al., 2008), the Leopard Snake, *Zamenis situla*, the Apennine yellow-bellied toad, *Bombina variegata pachypus,* and the Otter, *Lutra lutra* (Marra et al., 2023).

Studies on top predators are essential in managing and conservation strategies for species and habitats (Newton, 1979). From a methodological point of view, the method presents a simple applicability, despite some limitations represented by some logistical and accessibility aspects of the sites. The particular geomorphology of the geological form known as "Gravina" plays an important role in the sound diffusion of the playback, in fact, based on the context of each individual station it is necessary to adapt the monitoring method to the specific characteristics of each one, such as the positioning of the acoustic emitter in a specific point located high up or at the edges of the ravines to attenuate the echo. An important limiting factor is wind which could alter the operators' ability to listen

Figure 4. Male Eurasian Eagle Owl photo-trapped near the Gravina di Laterza.

or simply alter the transmission of sound.
In the near future, it is hoped that studies like this will continue in order to further investigate the distribution and trend of the Eurasian Eagle owl in in the Ionian ravines in its entirety in order to apply targeted conservation measures and, at the same time, to adapt management policies aimed at preserving the habitats that characterize these peculiar ecosystems.

Author contributions

Conceptualization: G.L., M.M.
Field research: G.L., M.M., E.D.A., M.N.
Writing of the original draft, review and editing: G.L., M.M.
Project administration: M.M.

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