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The Marine Strategy in Campania region (Southern Italy): monitoring of Audouin's Gull (*Ichthyaetus audouinii*) breeding colonies over the period 2018 - 2023

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Abstract

The first nesting of Audouin's Gull (*Ichthyaetus audouinii*) in Campania was observed in 1993 along the southern coasts of Cilento. After an irregular beginning, with a reduced number of pairs, the situation has become more stable, also due to the colonization of Phlegrean and Sorrento-Amalfi coasts, starting from 2006, whereas in the first years of 2000s, the species resulted extinct in Cilento. Since 2006, nesting has been regular over the years, although the number of pairs, colonies, and sites changed over time. The number of breeding pairs has decreased, while the adult population seems stable. In some cases, this phenomenon could be due to the high disturbance of colonies by natural predators and human activities.

Keywords: Audouin's Gull, breeding, Campania Region, Marine Strategy

Riassunto

La prima nidificazione di Gabbiano corso (*Ichthyaetus audouinii*) in Campania è stata osservata nel 1993 sulle coste del Cilento meridionale. Da allora, dopo un inizio caratterizzato da una certa irregolarità e da un numero molto ridotto di coppie, la situazione si è stabilizzata, anche a seguito della colonizzazione delle coste flegree e sorrentino-amalfitane a partire dal 2006, mentre a partire dai primi anni del 2000, la specie risulta estinta in Cilento. Dal 2006 la nidificazione è stata regolare negli anni, sebbene il numero di coppie, di colonie e di siti è variato nel tempo. Si registra un calo del numero di coppie riproduttrici a fronte di una popolazione di adulti che sembra invece stabile. Un fenomeno che potrebbe essere dovuto sia ai predatori naturali che ad attività

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antropiche: nautica da diporto, frequentazione dei siti in periodo riproduttivo.

Parole chiave: Gabbiano corso, riproduzione, Campania, Marine Strategy

Introduction

The Audouin's Gull (*Ichthyæetus audouinii*) is a monotypic and Holomediterranean species, with a European population estimated at 15,700-21,000 pairs (Burfield et al. 2023), with the highest concentration in Spain. Other consistent colonies are located in Algeria, Italy, Greece and France. The number of breeding pairs has been declining from the 25,000 estimated pairs in 2007 to the current above-mentioned estimates, a phenomenon related to the collapse of the main and most numerous colonies of this species, located at the Ebro Delta in Spain. The rapid decline of the Ebro colony, however, coincided with the colonization of new areas throughout the Western Mediterranean and Southern coasts of Portugal, and with the increase in breeding pairs of pre-existing colonies (Brichetti & Fracasso 2018; Keller et al., 2020; BirdLife International 2020).

BirdLife International recently re-evaluated the European Red List category for this species, transferring it from "Least Concern - LC" status, assessed in 2015, to "Vulnerable - VU" status in the 2021 review (BirdLife International 2021). In the fourth assessment of the SPEC (Species of European Conservation Concern) status, BirdLife International classified the species as SPEC1. This category is attributed

to species whose status is critical at global level and concerns the species throughout its planetary range (Burfield et al. 2023). The recent Italian Red List, on the other hand, shows a better situation for our country with a change from the category "Near Threatened - NT", assessed in 2012, to the category "Least Concern - LC" in 2019 (Gustin et al. 2019). In the Campania Red List, the species is considered as "Endangered - EN" (Fraissinet & Russo 2013).

In Italy the Audouin's Gull is a regular migrant, partially sedentary and regular breeder (Brichetti & Fracasso 2018; Baccetti et al. 2021). ISPRA estimated a breeding population of 1330 pairs for 2014, distributed in 15 colonies (Nardelli et al. 2015; Brichetti & Fracasso 2018).

In Campania it is a resident breeder, a migrant and a winterer (Fraissinet & Usai 2021). It began nesting in 1993 with a few breeding pairs on the Cilento coasts of Capo Palinuro and Infreschi (Milone 1999; Serra et al. 2001). The breeding activity continued irregularly in the second half of the 1990s, still in Cilento, gradually becoming more regular. In 1994, 1995 and 2001 a pair nested on Infreschi Coast, while in Capo Palinuro 3 pairs nested in 1997, none in 1998, 1-2 pairs in 1999 and 8 in 2000 (Serra et al. 2001; Milone and Finamore 2002 and 2003). In 2006 nesting was ascertained on Ischia Island with the observation of 8 pairs, at least 4 of which reached the eggs hatching with a minimum of 6 fledged juveniles, and the presence of 17-39 individuals (Usai pers. Obs.). On the other hand, there are no more nesting records in Cilento and it is believed that the species does not breed there since the first half of the 2000s decade (Fraissinet and Russo 2013; Usai in Fraissinet, 2015). In 2007, were counted 14 active nests on Ischia island, with at least 18 fledged juveniles and up to 50 adults and sub-adults individuals (Usai 2007). In 2008, 20 pairs were documented with 25 fledged juveniles (Cavaliere 2009). In 2010, 85 individuals were surveyed at two sites in a

monitoring session on July 21, with 28 juveniles (A. Usai and E. Esse pers. comm.). Since 2007, the nesting has also been detected on Isca and Vetara islets off Punta Campanella. The first documented nesting occurred in 2007, with at least one pair and two juveniles, one of which fledged (Russo and Fulgione 2010). In 2008, 4 pairs and 6 fledged juveniles were detected, while in 2010 there were 9 active nests, doubling those of previous years, and up to 21 individuals at the same time in June 17, while the fledged juveniles were 11-13 (Corbi et al. 2008; Cavaliere et al. 2011). In 2014 a small colony also established on the island of Vivara (Usai in Fraissinet 2015).

The ARPA Campania, in implementation of the Marine Strategy and the consequent task of marine monitoring, signed an agreement with A.S.O.I.M. to monitor the breeding colonies of the Audouin's Gull starting from 2018. The agreement provides for the sampling activities and the compilation of the relative methodological sheets. This has allowed for constant monitoring along the Campania coasts during the breeding season. This paper reports data collected during the 6 years of monitoring.

Materials and Methods

The monitoring protocol of the Marine Strategy, during the breeding season involves a survey by boat along all regional coasts potentially suitable for hosting the species. All rocky coasts of Campania are covered: the Cilento coasts, the Phlegrean archipelago and the continental Phlegrean coasts, the Sorrento-Amalfi coastline with its islets, and the island of Capri. The censuses were carried out from the sea, aboard boats provided by ARPA Campania, and from the land. Surveys by boat involved the circumnavigation of the islands and the inspection of rocky coastlines suitable for nesting, keeping the boat about 50 meters from the shore, or 100-150 meters

along high coastlines and cliffs. The censuses were scheduled according to the reproductive and phenological knowledge about the species (Brichetti & Fracasso 2018; Usai in Fraissinet 2015). Surveys were carried out in May and June, when the activity in the colony is at its highest and includes the incubation and hatching of eggs, before the fledging of chicks; generally, each colony was monitored twice within the same breeding season. No counts of chicks were made at the nest to avoid disturbance to the broods of a species experiencing a critical state of conservation.

Results

Despite considerable variation in the number of pairs and colonies location, the Audouin's Gull reproduced in Campania regularly during 2018-2023 (Fig. 1). The colony on Vivara Island has been the only breeding site of this species in Campania from 2018 to 2020. Since 2021, a gradual colonial abandonment of this site and the recolonization of two historical sites on the nearby Ischia island and on the Isca islet have been observed. In 2022 the Audouin's Gull successfully reproduced in Ischia and probably in Vivara with a single pair, while the Isca colonial site was abandoned as a result of strong anthropogenic disturbance during the establishment of the colony. In 2023 Vivara and Isca have not been occupied and the Ischian colony has decreased, but a fair number of adults - 117 - and 4 ascertained pairs (probably 6), were found on the islet of San Martino, located in the Phlegraean Fields, not far from the coast once connected to this islet by a bridge. The colony used both natural ledges on the tuffaceous ridge and some abandoned buildings (Tab.1).

The percentage of breeding adults out of the total number of adults in the colony ranged from 46 to 59%, with a sharp decrease in 2023, when only 8% of adults have bred.

All breeding sites found over the 2018 -

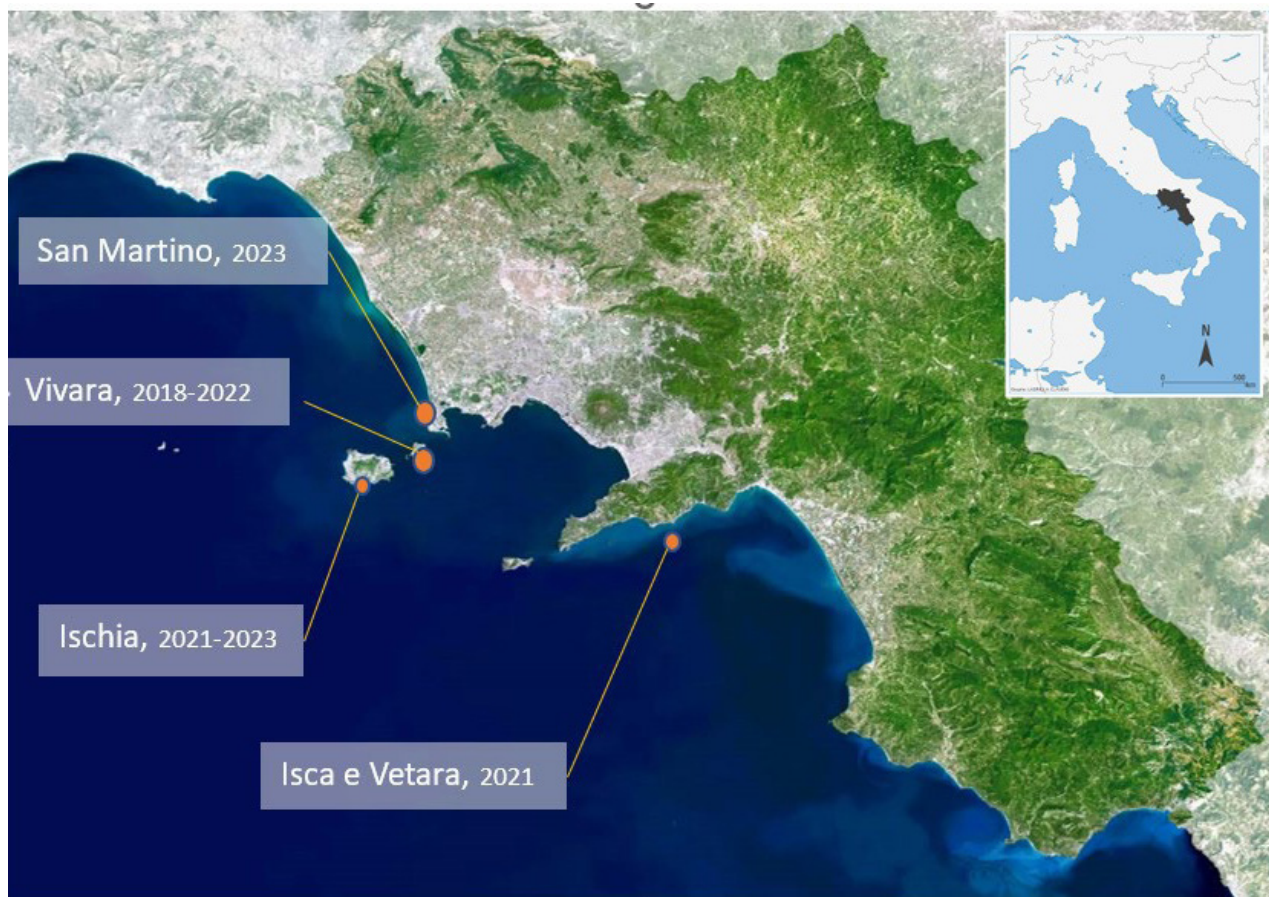


Fig. 1: Localization of breeding colonies on the Campania coasts in the period 2018 - 2023

Table 1: Population and reproduction trends during 2018-2023 at the colonial sites (AC: adults present in the colony; BP: breeding pairs).

	2018		2019		2020		2021		2022		2023	
	AC	BP	AC	BP	AC	BP	AC	BP	AC	BP	AC	BP
Vivara	180	57	121	33	126	135	8	2	14	1	0	0
Isca	0	0	0	0	0	0	32	12	0	0	0	0
Ischia – Punta della Signora	0	0	0	0	0	0	45	18	53	9	85	4
San Martino	0	0	0	0	0	0	0	0	0	0	117	4
Tot	180	57	121	33	126	135	85	32	67	10	202	8

2023 period are located along the coasts of Naples province. Some adults were observed along the coasts of southern Cilento during this period, but no nesting has ever been detected.

Discussion

Despite heavy urbanization and anthropogenic disturbance, the coasts of the

Campania region offer some stretches suitable for nesting. All colonial sites are located in Special Areas of Conservation (SAC) of Natura 2000 protected areas net; furthermore, all of them fall within the boundaries of protected areas of the national and regional system of parks and reserves, as shown in Table 2.

Despite fidelity to breeding area, (Lambertini 1993, Serra et al. 2001; Martínez-Abraín 2003), in Campania the Audouin's Gull has shown a defined turnover among different colonial

Table 2: The table shows the different protection systems of the territories in which the Audouin's gull colonies in Campania fall.

<i>Colonial site</i>	<i>SAC code and Italian denomination</i>	<i>Other protected areas of Italian system of parks and reserves</i>
San Martino	IT80330013 Isolotto di San Martino e dintorni	Parco Regionale dei Campi Flegrei
Vivara	IT80330013 Isola di Vivara	Area Marina Protetta "Regno di Nettuno"
Ischia – Punta della Signora	IT80330026 Rupi costiere dell'isola di Ischia	Area Marina Protetta "Regno di Nettuno"
Isca	IT80330006 Costiera amalfitana tra Nerano e Positano	Area Marina Protetta "Punta Campanella"

sites over the years;

The Vivara colony abandonment in 2021 coincided with the general collapse of the regional population and the recolonization of Ischia and Isca historical sites, after 8 and 11 years, respectively. The abandonment and recolonization of colonial sites is possibly due to the increase of predators and parasites caused by the growth of the colony itself over the years (Serra et al. 2001), or by dispersal movements (Martínez-Abraín 2003), or, as in the case of Isca in 2022, to a persistent human disturbance due to construction work on the other side of the islet and fishing and water sport activity during the colony establishment. The recent colonization of the San Martino islet could mark the beginning of an increasing occupation of synanthropic habitats, a phenomenon already observed in other Italian locations, for example the Apulian sites (Authors' personal obs.).

The conservation over the years of a fair number of adults in colonies, although only half breeding, leads to the conclusion that the coasts of Campania are trophically suitable, The conservation over the years of a fair number of adults in the colonies, although only half are engaged in reproductive activities, leads us to consider the Campania coastal area suitable from a trophic point of view. The phenomenon of frequent changes of location should be explored further, checking whether there may also be an anthropic cause.

Once the work was completed, the new monitoring for the 2024 breeding season recorded the return of the colony to the island of Vivara and the movement of the Ischia colony to another location on the island, as

well as the absence of nesting on the islet of San Martino. Confirming the species' well-known capacity for turnover in the choice of reproductive sites.

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The Marine Strategy Directive (2018/56/EC) established a framework for community action in the field of marine environmental

policy. Enforced by Legislative Decree no. 190/10, it has entrusted to the Ministry of the Environment the task of implementing marine monitoring, in agreement with the Italian network of environmental agencies: ARPA - ISPRA. In order to fully implement the Monitoring Programmes, referred to the Ministry Decree of 11 February 2015, were introduced activities for the monitoring of marine species and habitats listed under Annexes I, II, IV, V of the Habitats Directive (92/43/EEC) and seabirds species under the Birds Directive (2009/147/EC). Among planned activities for the Campania Region there are the monitoring plans of the Audouin's Gull (*Ichthyaeus audouinii*). Since 2018 ARPA Campania has been supported by the collaboration with A.S.O.I.M. - Associazione Studi Ornitologici Italia Meridionale (Southern Italy Ornithological Studies Association) through a special agreement, which provides sampling activities and methodological sheets. The Marine Strategy monitoring programs entrusted to ARPA Campania funded this research, whose technical staff collaborated with ASOIM researchers, using ARPA's nautical means.

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