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Marine mammals in the Gulf of Gaeta: an updated checklist with historical data

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Abstract

This work contains historical and modern records of marine mammals observed in the Gulf of Gaeta (Italy, Central Tyrrhenian). Eleven species of cetaceans were sighted, representing about 58% of the Italian and about 46% of the Mediterranean cetofauna. Four species are regularly sighted: *Balaenoptera physalus*, *Physeter macrocephalus*, *Stenella coeruleoalba*, and *Tursiops truncatus*. *Ziphius cavirostris*, *Orcinus orca*, and *Grampus griseus* are rare. Two species - *Eschrichtius robustus* and *Megaptera novaeangliae* - are occasional, while sightings of *Globicephala melas* and *Delphinus delphis* seem to have decreased dramatically based on recent surveys. The *Monachus monachus* presence, recorded with certainty in the past, is now to be ruled out. Recent sightings without photos that confirm the correct identification are to be considered doubtful.

Keywords: marine mammals, cetaceans, Mediterranean monk seal, gulf, checklist.

Riassunto

Nel presente lavoro sono riportate le segnalazioni, storiche e moderne, dei mammiferi marini osservati nel Golfo di Gaeta (Lazio). È stata documentata la presenza di undici specie di cetacei che rappresentano circa il 58% della cetofauna italiana e circa il 46% di quella mediterranea. Quattro specie sono avvistate regolarmente: *Balaenoptera physalus*, *Physeter macrocephalus*, *Stenella coeruleoalba* e *Tursiops truncatus*; *Ziphius cavirostris*, *Orcinus orca* e *Grampus griseus* sono specie rare. Due specie, invece, sono occasionali ovvero *Eschrichtius*

robustus e *Megaptera novaeangliae*, mentre gli avvistamenti di *Globicephala melas* e *Delphinus delphis* pare siano diminuiti drasticamente sulla base di recenti survey. La presenza attuale di *Monachus monachus*, documentata con certezza in tempi storici, è ormai da escludere. Avvistamenti recenti, privi di documentazione fotografica che ne confermino la corretta determinazione, sono da considerarsi dubbi.

Parole chiave: mammiferi marini, cetacei, foca monaca, golfo, checklist.

Introduction

The Gulf of Gaeta is located in the central part of the Tyrrhenian Sea (Italy), the deepest basin of the western Mediterranean Sea (Astraldi and Gasparini, 1994). The gulf takes its name by the city of Gaeta (Lazio region). The waters of the gulf are affected by various threats such as urbanization, agriculture, animal husbandry, mussel and fish farming, shipyards, and tourist facilities (Aguzzi et al., 2012, Orlandi et al., 2014). This water body has always been interested by the presence of cetaceans, as evidenced by many documents, sightings, and beachings. In the past, there was also the *Monachus monachus* that has currently disappeared in Italy, except for a few sporadic sightings (Fioravanti et al., 2020). As reported in Manfrini et al. (2022), in Italy, the first attempts to systematically collect data on cetacean mortality and beachings were made by the World Wildlife Fund through the "Cetacean Project" at the end of the 1970s, followed by the efforts of the Centro Studi Cetacei (CSC), the first Italian national stranding network, which was established in 1985 and started its nationwide activities in 1986 (Cagnolaro, 1985; Borri, 1995; Borri, 1997). To date, the activities of CSC are concentrated in central Adriatic Sea.

Since 2006, the Interdisciplinary Center for Bioacoustics and Environmental Research (Centro Interdisciplinare di Bioacustica e Ricerche Ambientali, CIBRA) of the University of Pavia and the Museum of Natural History of Milan have added to the fundamental role played by the CSC. They were appointed by the Italian Ministry of the Environment and the Protection of the Territory and the Sea (Ministero dell'Ambiente e della Tutela del Territorio e del Mare) to collect cetacean stranding data. As part of this assignment, the Italian stranding network database (Banca Dati Spiaggiamenti, 2025) was created. In 2014, the National Center For Diagnostic Investigations Of Stranded Marine Mammals (Centro di referenza nazionale per le indagini diagnostiche sui mammiferi marini spiaggiati, C.Re.Di.Ma.) was established. This institute cooperates with other entities of the national strandings network that includes the Cetacean stranding emergency response team (CERT), the Mediterranean marine mammals tissue bank of the University of Padua, and the BDS.

Currently, in the Gulf of Gaeta, the International Association Ulysses Projects (Associazione Internazionale Progetti Ulisse, AIPU) contributes to the conservation and dissemination of the good practices for cetaceans and marine life in general. These efforts follow those by the Italian Naval League, Sperlonga Section (Latina).

Nowadays, researchers who want to study the fauna or flora in a specific area have to look for photos and videos posted on social networks by citizens. Indeed, the massive presence of citizens/tourists in almost every geographical region around the world represents a workforce that researchers cannot match. With their posts, they contribute significantly to the knowledge of the species present in a specific area, and this is particularly true with cetaceans, which have always attracted the attention of the general public. However, all data posted on social media must be carefully

screened and validated by researchers and experts (Pace et al., 2019).

The work aims to provide a review of marine mammals data in the Gulf of Gaeta (Middle Age to present), from beachings, social media, and museums, to contribute to the knowledge of local species and prepare potential conservation programs.

Materials and Methods

The checklist we propose includes marine mammal species that, based on historical and modern data collected up to 2023, are observed regularly, rarely, and occasionally in the Gulf of Gaeta. Regular cetaceans are the species regularly present in the Italian seas - according to the biogeographical sectors adopted by the Italian Society of Marine Biology (Società Italiana di Biologia Marina, SIBM) - and in the Mediterranean Sea (Cagnolaro et al., 2015). Occasional (vagrant) is a species represented by individuals found outside their native range, appearing in a given region with high or extreme rarity (Notarbartolo di Sciara and Tonay, 2021).

For taxonomy, we have referred to the List of Marine Mammal Species and Subspecies of the Society for Marine Mammalogy (last updated June 2024; List of Marine Mammal Species and Subspecies, 2025). For the taxonomic names discussed, we adopted the most conservative option provided by Loy et al. (2019). Regarding the English common names and conservation status of each species, we referred to the IUCN Red List (IUCN Red List, 2025). For Italian names, we referred to Loy et al. (2019).

We collected data from three sources: 1) photos/videos uploaded on the Web by citizens 2) national databases of past and recent cetacean strandings 3) historical archives of all national museums of natural history and zoology. For the first source, we

identified photos and videos of cetacean sightings in the Gulf of Gaeta uploaded to social networks. Then, we contacted the authors to obtain more information and verify the reliability of the data. For the second source, we relied on the two national databases, BDS and GeoCetus database of the Centro Studi Cetacei (Di Lorenzo et al., 2013; GeoCetus, 2025).

Finally, we consulted the archives of all Italian museums of natural history and zoology, in particular the Municipal Museum of Zoology and Museum of Comparative Anatomy "Battista Grassi" in Rome, and Zoological Museum in Naples (Podestà et al., 2008; Cagnolaro et al., 2012, 2014, 2015; Maio et al., 2014; Manfrini et al., 2022).

Study area

The borders of the Gulf of Gaeta are the Cape Circeo, Aurunci Mountains, and Roccamonfina Volcano in the northern sector; the Apennine fold and thrust belt in the eastern sector; the Neapolitan volcanic complex (Ischia and Procida Islands and the Gulf of Naples) in the southern sector; the Pontine Islands to the west (Figure 1). The geomorphological and geophysical features of the Gulf are related to the Volturno River and its flow rate. The last sector of the Volturno River crosses the Campanian plain, flowing into the town of Castel Volturno, where its mouth is. The bottom of the Gulf of Gaeta is a typical continental shelf. Quaternary clastic and volcanic deposits gradually slope westward, deepening abruptly to a depth of 120 m. In the Gulf of Gaeta, water circulation, similar to that of the Tyrrhenian Sea, is characterized by two seasonal currents that influence coastal circulation, such as coastal morphology and submerged morphostructures (Cavaliere et al., 2023). Within the Gulf is the Canyon of Cuma, a deep and wide underwater valley that starts from areas near the Campi Flegrei and

reaches a maximum depth of 800 m between the islands of Ischia and Ventotene. This canyon represents a big sedimentary basin for the materials transported along the coast by the Volturno and Garigliano Rivers, and most importantly, it increases the upwelling

velocity. Also, it acts as a conveyance channel to the sea. Sedimentation and hydrodynamic phenomena characteristic of canyons create a peculiar habitat characterized by a high local density and diversity of benthic and pelagic fauna (De Pippo et al., 2000).



Figure 1. Study area.

(Basic cartographic layer ESRI Ocean URL https://services.arcgisonline.com/ArcGIS/rest/services/Ocean/World_Ocean_Base/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D; Map by S. Viglietti).

Results

Historical Data

Archaeological findings dating back to the Middle Age and linked to the maritime culture of the cities in the Gulf of Gaeta showed the presence of large cetaceans in the study area. In the churches and cathedrals of Gaeta (Figures 2a-b) and Minturno (Latina), and those of

Sessa Aurunca (Caserta), bas-reliefs on white marble slabs outside and inside, dating back to the 12th-13th centuries, are still preserved, depicting episodes from the biblical book of the prophet Jonah being swallowed and spat out by the "Pistrice-Leviathan" identified with the "Whale" whose tradition derives from the classical Greco-Roman Age. Fin whales (*Balaenoptera physalus*) and sperm whales (*Physeter macrocephalus*) have inhabited the

Gulf since the 19th century. Oronzio [= Oronzo] Gabriele Costa (1787-1867), Professor of Zoology at the University of Naples, was the first zoologist to provide a preliminary description of cetofauna of the Southern Italy seas in a monograph on the Mammals of the

Kingdom of Naples. In particular, Costa (1839) described the presence, as mementos and relics, of "bones religiously preserved in the Church of Gaeta (ossami che religiosamente conservasi nella Chiesa di Gaeta)" (Maio & De Stasio, 2014; Maio et al., 2023a, 2024).



Figure 2. Bas-reliefs on the exterior of the Cathedral of Saints Erasmo and Marciano and St. Maria Assunta in Cielo in Gaeta, dating back to 12th-13th centuries, depicting the "Pistrice/Leviathan"; a) Left side of the entrance b) Right side of the entrance. Photo by N. Maio.

Two lower jaw fragments of *Balaenoptera* spp. (Figures 3a-b) are in the Cathedral of Saints Erasmo and Marciano and St. Maria Assunta in Cielo in Gaeta. Since the 1940s, the presence of *Balaenoptera*

spp. has been recorded. These findings could be the same as Costa's citation or recent. In any case, they represent historical documentation of the presence of cetaceans in the Gulf.



Figure 3. Two lower jaw fragments of *Balaenoptera* spp. preserved in the Cathedral of Saints Erasmo and Marciano and St. Maria Assunta in Cielo in Gaeta. Photo by A. Madonna.

Current cetofauna

Cetartiodactyla Montgelard, Catzeflis &
Douzery, 1997

Cetacea Brisson, 1762

Mysticeti Flower, 1864

Family Balaenopteridae Gray, 1864

Balaenoptera physalus (Linnaeus, 1758) -
Balenottera comune - Fin whale

Endangered Global and Mediterranean (Last assessment 2021)

Common species. Sightings are concentrated mainly north of Ischia Island, in the Cuma Canyon, a feeding site during summer (Mussi & Miragliuolo, 2003; Maio et al., 2019). Single individuals and pairs are observed, while larger aggregations are rare (Mussi et al., 1997, 1998; Mussi & Miragliuolo, 2003). Several beachings with even large individuals have been recorded since 1996 (Maio et al., 2001; Maio & Quercia, 2006; Manfrini et al., 2022). No breeding events, sightings, or beachings of calves or juveniles are known (Maio et al., 2024).

Megaptera novaeangliae (Borowski, 1781) -
Megattera - Humpback whale

Least concern Global (Last assessment 2018)

Occasional species. A humpback whale juvenile was photographed on 20 July 2016, north of Procida Island (Naples) (Maio et al., 2019a, 2019b; Maio et al., 2024).

Family Eschrichtiidae Ellerman & Morrison-Scott, 1951

Eschrichtius robustus (Lilljeborg, 1861) -
Balena grigia - Gray whale

Least concern Global (Last assessment 2017)

Occasional species. On 14 April 2021, a Gray whale juvenile was sighted near Ponza Island (Lazio). It was the first sighting in the Italian seas (Manfrini et al., 2023).

Then, it reached Baia (Bacoli) and Sorrento in the Gulf of Naples and then ascended toward Gaeta on April 19 of the same year (Figures 4). Considering its peculiar feeding behavior, it is presumable that the animal traveled the stretch between the Gulf of Naples and Gaeta under the coast to feed. Also, the same individual was observed in Fiumicino (Lazio), Viareggio (Tuscany), the Ligurian Sea, the Provençal coast (France), and the Valencian coast (Spain). The last documented sightings were in May 2021 near the Balearic Islands (Spain) (Maio et al.,



Figure 4. Close-up of the gray whale. Source: https://napoli.repubblica.it/cronaca/2021/04/18/news/balena_di_sorrento_ancora_un_avvistamento_stavolta_nelle_acque_del_porto_di_baia-296941399/

2023b; Maio et al., 2024).

Odontoceti Flower, 1867

Family Physeteridae Gray, 1821

Physeter macrocephalus Linnaeus, 1758 -
Capodoglio - Sperm whale

Endangered Mediterranean (Last assessment 2006)

It is a common species, although difficult to observe. Sightings mainly concern single individuals, while larger aggregations (e.g., three individuals) are rare. Most reports are concentrated in summer and autumn, especially in the Canyon of Cuma, between Ventotene and Ischia Islands (Mussi et al., 1997, 1998; Pace et al., 2014; Figures 5a-d).

The first record of the species dates back to 1821, concerning the sighting of an individual in the Gulf mentioned by Giuseppe Sanchez (1827). In 1979, a sperm whale (about 9 m long) was captured in Gaeta (L. Cagnolaro, pers. comm.). In 1980, the beaching of a 5.50

m calf near Terracina and the capture in a net of a second calf (6.5 m long) in Gaeta in 1982 indicated a possible nursing area for the species (L. Cagnolaro, pers. comm.; figures 6a-b). The last beaching in the study area dates back to 2021 (Maio et al., 2024).



Figure 5. Sperm whale observed in the Cuma Canyon, between Ventotene and Ischia Islands. Photos by R. Gabriele.



Figure 6. Sperm whale captured in July 1982 near Gaeta. Photos by G. Soccorso, C. Di Nitto, pers. comm.

Family Delphinidae Gray, 1821

Stenella coeruleoalba (Meyen, 1833) -*Stenella striata* - Striped dolphin

Vulnerable Mediterranean (Last assessment 2010)

It is the most common species in the study area, sighted most frequently in late summer (August - September), often with *Delphinus delphis* and *B. physalus* with groups of up to 200 individuals (Mussi et al., 1997; Mussi & Miragliuolo, 2003). Both sightings and beachings confirm that the species use the Cuma Canyon as a breeding site during the summer, although a second breeding period in late winter or early spring is likely (Mussi & Miragliuolo, 2003). One beached individual

was a newborn less than a year old, ranging in size from 100 to 140 cm, suggesting that this species probably uses the study area as a nursery in addition to giving birth (Maio et al. 2012, BDS, Guarino et al., 2021). There were at least five reports of beached animals still alive. Of three individuals it was possible to recover the skull for musealisation (Maio & De Stasio, 2014). In recent years, following diagnostic investigations conducted by the "Istituto Zooprofilattico Sperimentale del Mezzogiorno" (IZSM, public health control institution) in collaboration with other Italian "Istituti Zooprofilattici Sperimentali", three beached individuals tested positive for Dolphin Morbillivirus (DMV) (a male from Giugliano, Campania, in 2013, a female



Figure 7. Common bottlenose dolphins in the Gulf of Gaeta. a) Photo by N. Maio b) Photo by R. Gabriele c) Photo by L. Valerio.

and a male in Bacoli in 2021). The latter two individuals tested positive for *Herpesvirus*, and the male also for *Toxoplasma gondii* (Casalone et al., 2014; Fernández-Escobar et al., 2022; Giorda et al., 2022; Grattarola et al., 2023; Vargas-Castro et al., 2023; F. Di Nocera, pers. comm.; W. Mignone, pers. comm.). The male from Giugliano died of infectious diseases and was 19 years old, as determined by skeleton-chronological survey. It supports the hypothesis that the longevity of the individuals examined is much lower, probably due to the diseases they suffered from (Guarino et al., 2021; Maio et al., 2024).

Tursiops truncatus (Montagu, 1821) –
Tursiope – Common bottlenose dolphin
Vulnerable Mediterranean (Last assessment 2009)

Common species. Sightings are concentrated along the lower sandy coast of the Gulf of Gaeta, including the mouths of the Garigliano and Volturno Rivers, as far as Monte di Procida (Figures 7a-c). The species is sighted all year round with a greater frequency in summer,



with groups of up to 200 individuals (Mussi et al., 1997; Mussi & Miragliuolo, 2003). Data from Mussi & Miragliuolo (2003) confirm that common bottlenose dolphins also choose the area for breeding: newborns have been observed in summer with a peak in August (Mussi et al., 1997, 1998). Diagnostic surveys conducted by the IZSM found two beached individuals positive for DMV: a male in 2017 and a female in 2019 both from Mondragone (Caserta); the latter individual also tested positive for *T. gondii* (Giorda et al., 2022; F. Di Nocera, com. pers.; W. Mignone, com. pers.; Maio et al., 2024).

Delphinus delphis Linnaeus, 1758 – Delfino comune – Short-beaked common dolphin
Endangered Mediterranean (Last assessment 2003)

Rare species. Since 1997, its presence has been documented in the Cuma Canyon (Mussi et al., 1998). The presence of newborns and juveniles suggests that the Gulf is a breeding area during the summer (Pace et al., 2015; Maio et al., 2024; figures 8a-b); however, this species is difficult to observe.



Figure 8. a) Adult Short-beaked Common dolphin. b) Female with calf. (Photos by R. Gabriele).

Globicephala melas (Traill, 1809) –
Globicefalo – Long-finned pilot whale
Endangered Global and Mediterranean (Last assessment 2021)

Rare species. In the 1990s, was observed in

the waters of the Pontine Islands with pods composed of 6 to 35 individuals, even with juveniles (Mussi et al., 1997, 1998). It has subsequently become rare. In recent years, no sightings in the Gulf have been reported (Maio et al., 2024).

Grampus griseus (G. Cuvier, 1812) –
Grampo – Risso's dolphin

Endangered Global and Mediterranean (Last
assessment 2020)

Rare species. In the 1990s, pods of about 7-10 individuals, both adults and females with young, were observed in the area Northwest of Ischia: the largest aggregations were 40 individuals, usually a few kilometers from the coast in September, sometimes in association with striped dolphins *Stenella coeruleoalba* (Figure 9). The presence of newborns has been observed in spring and summer (Mussi et al., 1997; Mussi & Miragliuolo, 2003). Only two documented beachings are known: in 1987 in Formia and in 1991 in Gaeta, whose skeletons were preserved in the Museo Civico di Zoologia in Roma (Cagnolaro et al. 2012, 2014; Maio et al., 2024).



Figure 9. Risso's Dolphin in association with Striped Dolphin (Photo by R. Gabriele).

Orcinus orca (Linnaeus, 1758) –
Orca – Orca/Killer whale

Critically endangered Global and Strait of Gibraltar
subp. (Last assessment 2019)

Rare species. Bompar (2000) reports the sighting of a pod of about 12 specimens in July 1987 between Ponza and Ventotene Islands (Cagnolaro et al., 2015).

Family Ziphiidae Gray, 1865

Ziphius cavirostris G. Cuvier, 1823 – Zifio –
Cuvier's beaked whale

Data deficient Mediterranean (Last assessment 2006)

Rare species. There is only one report of an individual found off Ponza Island in 1989 in an advanced state of decomposition (BDS). For the central Tyrrhenian Sea, there is only one report for the Gulf of Naples in 1989, one month before the Ponza report, and a further six reports for the Lazio Region between 1988 and 1999 (Podestà et al., 2006).

Carnivora Bowdich, 1821

Caniformia Kretzoi, 1938

Pinnipedia Illiger, 1811

Family Phocidae Gray, 1821

Subfamily Monachinae E. L. Trouessart, 1897

Monachus monachus (Hermann, 1799) –

Foca monaca mediterranea –

Mediterranean monk seal

Critically endangered Mediterranean

(Last assessment 2008)

Regionally extinct species. The oldest traces of its presence date back to 1836, when Oronzio Gabriele Costa (1787-1867), professor of zoology at the University of Naples, states in "Statistica Zoologica" (Costa, 1836): «la Foca monaca e vitellina appariscono a quando a quando sulle coste del regno provenienti dall'Arcipelago» [the Monk (*M. monachus*) and Common (cfr. *Phoca vitulina*) seals appear from time to time on the coasts of the Kingdom (of Naples) from the Archipelago (presumably referring to the Pontine Neapolitan or Campanian Archipelago)]. Cornalia (1870) in "Fauna d'Italia" states: «Nel 1863, ne fu preso un individuo all'Isola di Ponza» [In 1863, an individual was captured on the Ponza Island]. Furthermore, a juvenile was caught and photographed on Ponza



Figure 10. Capture of a Monk seal, Ponza Island, 1872-1921. Unidentified author, slide on glass plate, hand staining of Giorgio Roster (© Collezione Archivi Alinari-archivio Roster, Florence).

between 1872 and 1921 (Figure 10). There are also several recent testimonies by fishermen from 1975 until 2009, such as the sighting of a specimen in late summer-early autumn in the "Grotta dei Siluri" (Gaeta) (D'Amante, pers. comm.) (De Luca A., 2025; Anonymous, 2009; Lambertucci, 2024). However, without photos, these records cannot be confirmed.

Discussion

To date, four cetacean species are sighted regularly in the Gulf of Gaeta: *Balaenoptera physalus*, *Physeter macrocephalus*, *Stenella*

coeruleoalba, and *Tursiops truncatus*, and (Maio et al., 2001, 2006, 2012, 2019a, 2023a; 2023b). *Eschritius robustus* and *Megaptera novaeangliae* are occasional, as in the Mediterranean basin, while sightings of *Globicephala melas* and *Delphinus delphis* seem to have drastically decreased. Finally, *Ziphius cavirostris*, *Orcinus orca*, and *Grampus griseus* are rare despite the presence of the Canyon of Cuma in the Gulf, a potential foraging area for these species. However, for these species with elusive behavior, much depends on the research effort in the field. So, eleven cetacean species have been recorded

in the gulf, representing about 58% of the Italian cetofauna (19 species) and about 46% of the Mediterranean cetofauna (24) (Maio, 2015; Loy et al., 2019; Cozzi et al., 2021).

The presence of *Monachus monachus*, recorded in the past, is to be excluded. Recent sightings without photos are doubtful and, in any case, would only demonstrate a casual passage of individuals, not their settlement or attempted reproduction as occurred in Apulia (Southern Italy) (Fioravanti et al., 2020).

Overall, local data confirm regional and national ones, with the relative abundance of *S. coeruleoalba* and *T. truncatus*, the most common species in the Mediterranean Sea (Maio, 2015; Loy et al., 2019). The high frequency of calves suggests that females of these species use the gulf to deliver and as a nursery site (Mussi et al., 1997; Mussi & Miragliuolo, 2003; Guarino et al., 2021; Maio et al., 2019a, 2023a, 2023b). The most interesting data is the sighting of the *E. robustus*, which has never been observed in Italian seas before (Manfrini et al., 2023). In the Mediterranean, the species was present in the 4th-6th century AD (Rodrigues et al., 2018). Recently, there have only been two reports dating back to May 2010, off the coast of Israel and the Catalan coast in Spain (Scheinin et al., 2011).

Note the detection of DMV, *Toxoplasma gondii*, and Herpesvirus in a *S. coeruleoalba* and DMV and *T. gondii* in a *T. truncatus*. These reports are essential for public health safety because these pathogens are zoonotic agents (Casalone et al., 2014; Fernández-Escobar et al., 2022; Giorda et al., 2022; Grattarola et al., 2023; Vargas-Castro et al., 2023; F. Di Nocera, personal communication; W. Mignone, personal communication). At the "Dipartimento di Biologia" of the "Università di Napoli Federico II", in cooperation with the "Università Politecnica delle Marche", molecular analyses are currently underway to identify the geographical origin of beached individuals and specimens preserved in

museum collections (Fioravanti et al., 2022; Maio et al., 2022; Fioravanti et al., 2024a, 2024b, Latini et al., 2024) and studies on the determination of their age and growth rates to understand the population structure of the various species in their natural environment (Guarino et al., 2021).

Finally, the results obtained are useful for assessing the health status of these species and contribute to the development of effective management and conservation plans for the species in the study area and central Tyrrhenian Sea.

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