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RESEARCH

Where and when has the rare Fish Species *Regalecus glesne* been Found in the Mediterranean so far?

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Abstract
The finding of two specimens of oarfish, *Regalecus glesne*, in the north-western Ionian Sea (central Mediterranean), in the years 2021 and 2022 and at depths of 525 and 350 m respectively, is reported to update the current information on the distribution of this teleost fish in the Mediterranean waters. In fact, to date, that most of the *R. glesne* findings are distributed in the western part of the Mediterranean basin, between the Ligurian Sea (Italy) and the Gulf of Lion (France), with 22 and 17 findings, respectively. The TL recorded in the Ligurian Sea ranges from 86.5 to 433 cm, and in the Gulf of Lion from 88 to 446 cm. For the two captured specimens during these surveys, the estimated total length were 650 and 2700 mm, respectively. Macroscopic examination of the gonads identified these specimens as an indeterminate and a female in the early stage of gonad maturity.

Keywords *Regalecus glesne* · Oarfish · Distribution · Rare species · Mediterranean

Introduction

The oarfish *Regalecus glesne* Ascanius, 1772 also known as the king of herrings, is a slender, greatly elongated and ribbon-like fish of the family Regalecidae, order Lampriformes. This family has undergone many rearrangements over time that have added or deleted species and genera considered synonyms or sisters (Albano et al. 2022). Currently, the accepted classification attributes two genera to this family, *Agrostichthys* Phillipps, 1924, with *Agrostichthys parkeri* (Benham, 1904) as unique species, and *Regalecus* Ascanius, 1772 with two species *Regalecus russellii* (Cuvier, 1816) and *R. glesne* Ascanius, 1772. Roberts (2012) provides a diagnosis of both *Regalecus* species which can be differentiated mainly by the number of total gill rakers and dorsal-fin rays. The oarfish, known as the longest teleost (maximum recorded length of about 17 m) (Robins et al. 1986), is a mesopelagic fish occurring in most tropical and temperate areas of the planet (Froese and Pauly 2010). It is mainly found at depths from 300 to 1000 m (Roberts 2012), only rarely observed or caught alive in surface waters (Whitehead et al. 1986). Despite having a cosmopolitan distribution (Roberts 2012), reaching great depths, it is rarely caught by common fishing gearsand probably this contributes to its rare reports from fishermen (Schmitter-Soto 2008; Dragičević et al. 2011). In the Mediterranean Sea, *R. glesne* was first recorded in 1826 by Risso under the name *Gymnetrius gladius*. It is considered a very rare species (Quero et al. 2003), despite its presence has been reported throughout the entire basin (Whitehead et al. 1986; Kova et al. 2021). The information on its biology is scarce and based mainly on stranded or dying specimens (Schmitter-Soto 2008; Dulčić et al. 2009). In particular, this teleost has been reported in Liguro-Provençal waters between the Ligurian Sea in Italy (Ariola 1904; Mezzana 1909; Vinciguerra 1918; Guiglia 1950; Tortonese 1970; Psomadakis et al. 2008, 2012) and the Gulf of Lion in France (Risso 1827; Cuvier and Valenciennes 1835; Giglioli 1880; Damiani 1913; Vayssiére 1917; Quero et al. 2003; Psomadakis et al. 2008; Gicqueau et al. 2018), where its strandings are quite frequent (Psomadakis et al. 2008). It has also been reported in Spanish waters of

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the western Mediterranean (Lozano-Cabo 1969) and south of the Balearic Islands in the Algerian basin (Moranta et al. 1998), which currently remain the only two records from the western Mediterranean Sea. It has been recorded off Gennadi (Greece) (Corsini-Foka 2009) and in the Aegean Sea (Ondrias 1971; Papaconstantinou 1988), in the Egypt waters (Haroun et al. 2017), in the Levantine Sea along the Turkish coasts (Bilecenoglu et al. 2014), in the Maltese waters in the central Mediterranean Sea (Jennings 1996; Lanfranco 1993) and in Croatian waters of the central Adriatic Sea (Dulčić et al. 2009; Dragičević et al. 2011). In the Italian seas, apart from the Ligurian Sea mentioned above, the oarfish has been observed in the waters surrounding the island of Elba (Damiani 1913), in the northern Tyrrhenian Sea (near the shore of Castiglioncello) (Vinciguerra 1918), in the Gulf of Naples (Tortonese 1970) and in Terracina (Psomadakis et al. 2012). It was also captured in the southern Tyrrhenian Sea, in the area near the Strait of Messina in Sicily (stranded in Oliveri), where eggs and young individuals at different stages of development were also collected (Berdar et al. 1975; Cavallaro and Cavaliere 1980) and a single juvenile specimen was also reported from Capo Peloro, in Sicily (Cavallaro and Cavaliere 1980). Its presence has also been documented in the northern Adriatic Sea (off the coasts of Rimini) (Padovani 1933), while to date, no findings have been recorded in the Ionian Sea. All mentioned occurrences are shown in Fig. 1.

This work updates the information on the distribution of *R. glesne* in the Mediterranean basin, reporting the finding of two specimens of this rare teleost in the north-western Ionian Sea. Morphometric measurements and information on the sex and gonad maturation stage of the two captured individuals are also reported.

Materials and Methods

Two specimens of *R. glesne* were captured in the north-western Ionian Sea (Fig. 2; Table 1). The first (CODE 1), during an experimental haul carried out in September 2021

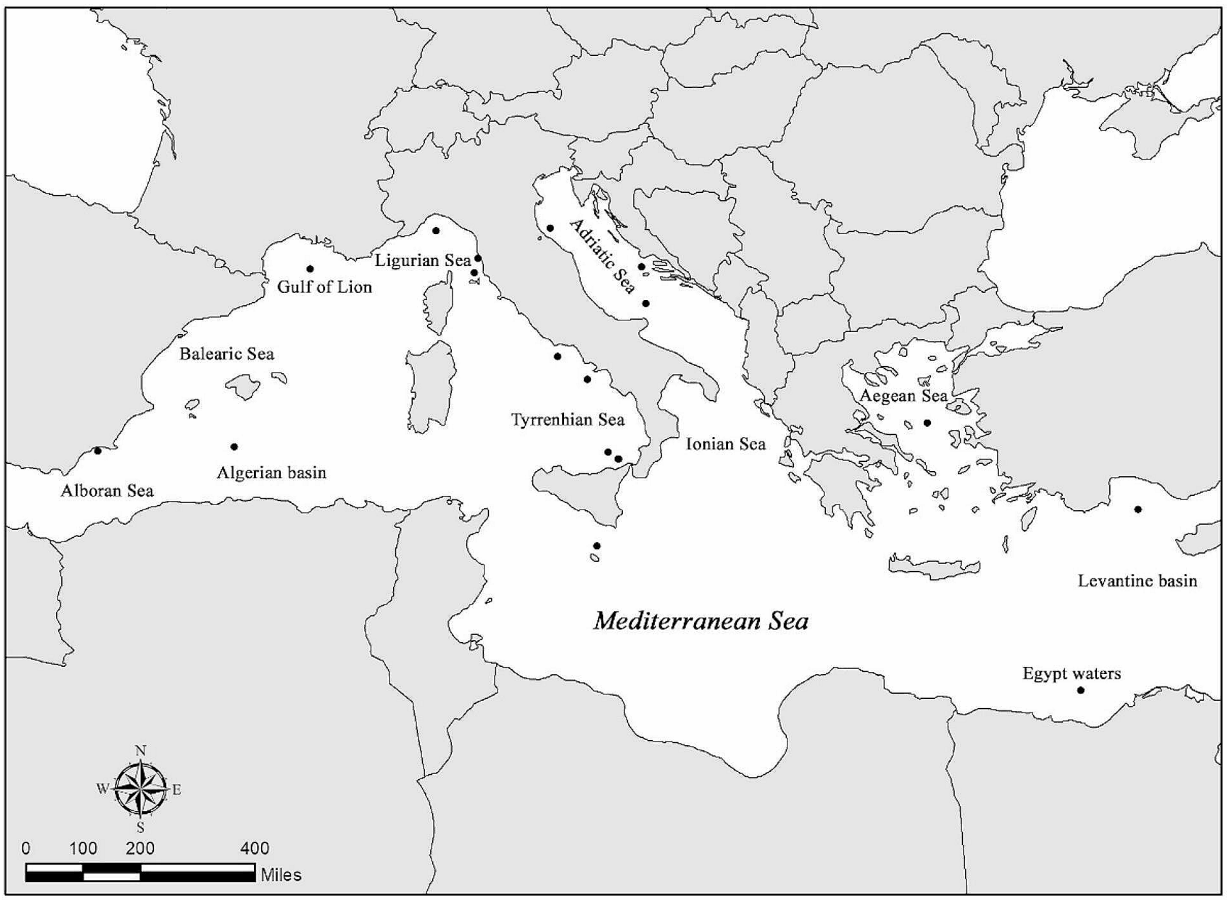

Fig. 1 Previously recorded occurrence of *R. glesne* in the Mediterranean Sea (●)

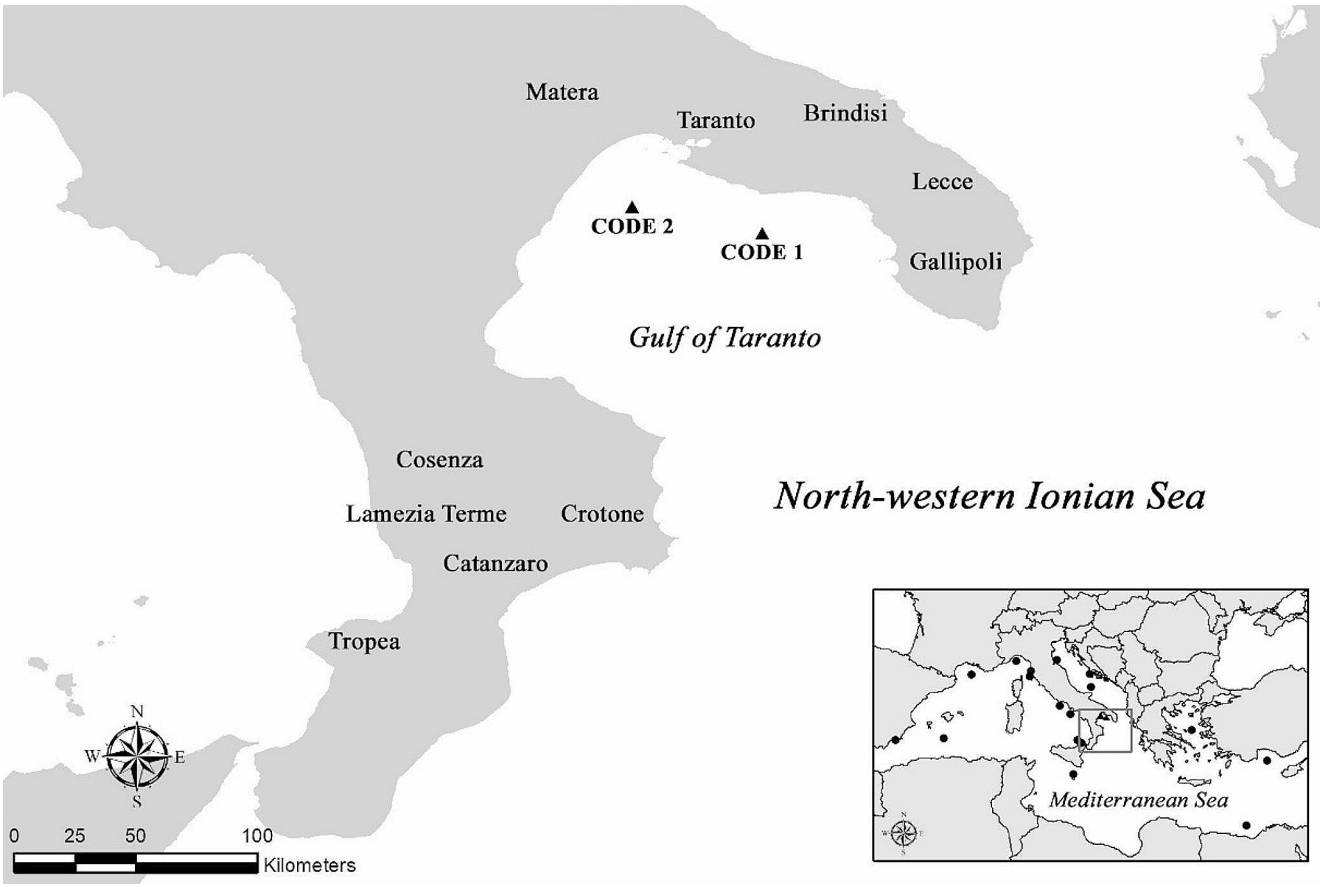

Fig. 2 Records of two specimens of *Regalecus glesne*, CODE 1 and CODE 2 captured in the north-western Ionian Sea (▲)

at a depth of 525 m off the coast of Maruggio in the province of Taranto, Apulia (Italy) (40.15016° N, 17.51416° E) within the MEDITS survey (International Bottom Trawl Survey in the Mediterranean) (Spedicato et al. 2019) The second specimen (CODE 2) was accidentally caught in March 2022 at a depth of 350 m, always in the Gulf of Taranto, Apulia (Italy) (40.40900° N, 17.00066° E), by a professional fishing vessel engaged in commercial trawling. After the capture, both specimens were placed individually in plastic container and kept frozen (-20 °C) until the time of analysis. The main morphometric measurements were taken for both specimens, in particular, the two lengths were measured to the nearest mm, using a millimetric ichthyometric table with an accuracy of 1 mm, while the two body weights were measured using a digital balance with an accuracy of 0.1 g. Furthermore, information on sex and maturity stage of the gonads was also recorded. Since the specimens were captured with the terminal part of the body truncated, the Total Length (TL) was estimated considering that the Pre-Anal Length (PAL) represents approximately 30% of the TL, as reported by Psomadakis et al. (2008).

Results

Historical Records

In Table 1 are shown the geographical area of the records, the year of occurrence, the total length, when observed, and the reference of the records of *R. glesne* reported in the Mediterranean basin. It can be observed that most of the *R. glesne* findings are distributed in the western part of the Mediterranean basin, between the Ligurian Sea (Italy) and the Gulf of Lion (France), with 22 and 17 findings, respectively. The TL recorded in the Ligurian Sea ranges from 86.5 to 433 cm, and in the Gulf of Lion from 88 to 446 cm. Most of the specimens were caught by local fishermen or observed alive swimming near the water surface. Some specimens, instead, were found stranded. Anyway, ancient reports present some problems related to the different nomenclature of the species used in past centuries (Albano et al. 2022). Also, possible errors in the previous morphological identification of specimens are not to be excluded, considering that some reports are attributed to fish observed alive and not caught, especially considering the lack of scientific knowledge and tools available in the past.

Table 1 Historical records of *Regalecus glesne* in the Mediterranean Sea from 1826 and new findings in the north-western Ionian Sea (°)

Geographic Area	Locality	Year	Length (cm)	References
Gulf of Lion (France)	Nice	1826	155 TL	(Risso 1827)
	Nice	1826	155 TL	(Risso 1827)
	Nice	1830	212 TL	(Cuvier and Valenciennes 1835)
	Nice	1830	290 TL	(Cuvier and Valenciennes 1835)
	Nice	1830	not available	(Cuvier and Valenciennes 1835)
	Nice	1871	not available	(Psomadakis et al. 2008)
	Nice	1877	88 TL	(Giglioli 1880)
	Nice	1891	219 TL	(Damiani 1913)
	Nice	1896	99.5 TL	(Psomadakis et al. 2008)
	Beaulieu Saint-Jean	1897	300 TL	(Vayssiére 1917)
	Monaco	1910	300 TL	(Vayssiére 1917)
	Monaco	1934	135 TL	(Psomadakis et al. 2008)
	La Formigue	1994	197 TL	(Psomadakis et al. 2008)
	Marseille	2002	350*	(Quero et al. 2003)
	Marseille	2002	400*	(Quero et al. 2003)
	Cap Ferret	2002	446 TL	(Quero et al. 2003)
	Bay of Port-Cros	2018	160 TL	(Gicqueau et al. 2018)
Ligurian Sea (Italy)	Noli	1903	118 TL	(Psomadakis et al. 2008)
	Noli	1903	125 TL	(Ariola 1904)
	Borghetto Santo Spirito	1906	108 TL	(Vinciguerra 1918)
	Borghetto Santo Spirito	1906	154.9 TL**	(Vinciguerra 1918)
	Arenzano	1908	330 TL	(Vinciguerra 1918)
	Savona	1909	288 TL	(Mezzana 1909)
	Savona	1909	332 TL	(Mezzana 1909)
	Albissola	1915	325 TL	(Vinciguerra 1918)
	Santa Margherita Ligure	1917	236 TL	(Vinciguerra 1918)
	Spotorno	1950	180.4 TL	(Guiglia 1950)
	Spotorno	1950	188 TL	(Guiglia 1950)
	Genova	1950	not available	(Guiglia 1950)
	Genova Prà	1953	258 TL	(Psomadakis et al. 2008)
	Genova Pegli	1959	not available	(Psomadakis et al. 2008)
	not available	before 1970	not available	(Tortonese 1970)
	Santa Margherita Ligure	1980	86.5 TL	(Psomadakis et al. 2008)
	Sanremo	1992	362 TL	(Psomadakis et al. 2008)
	Sanremo	1993	433 TL	(Psomadakis et al. 2008)
	Sanremo	1997	145 TL	Garibaldi (in verbis)
	Sanremo	1998	206 TL	(Psomadakis et al. 2008)
	Arenzano	2003	330 TL	(Psomadakis et al. 2008)
	Arenzano	2012	not available	(Psomadakis et al. 2012)
Spanish waters (western Mediterranean Sea)	Mazarrón	1969	not available	(Lozano-Cabo 1969)
South of the Balearic Islands in Algerian basin (western Mediterranean Sea)	not available	1998	not available	(Moranta et al. 1998; WoRMS 2023)
Aegean Sea	not available	before 1971	not available	(Ondrias 1971)
	not available	before 1988	not available	(Papaconstantinou 1988)
	Gennadi (Greece)	1993	194 TL	(Corsini-Foka 2009)
Egypt waters	not available	not available	not available	(Haroun et al. 2017)
Levantine Sea	along the Turkish coasts	not available	not available	(Bilecenoglu et al. 2014)
Maltese waters (central Mediterranean Sea)	Malta	not available	not available	(Jennings 1996; Lanfranco 1993)
Central Adriatic Sea (Croatia)	Stobreč	2009	194 TL	(Dulčić et al. 2009)
	Palagruža Island	2010	10.34 SL	(Dragičević et al. 2011)

Table 1 (continued)

Geographic Area	Locality	Year	Length (cm)	References
Island of Elba (Italy)	not available	1891	not available	(Damiani 1913)
Northern Tyrrhenian Sea (Italy)	Castiglioncello	1913	110 TL	(Vinciguerra 1918)
Gulf of Naples (Italy)	not available	not available	not available	(Tortonese 1970)
Tyrrhenian Sea (Italy)	Terracina	2012	not available	(Psomadakis et al. 2012)
Near Strait of Messina (Italy)	Oliveri	1974	15 SL 24.9 SL 25.2 SL	(Berdar et al. 1975)
Capo Peloro (Italy)	Sicily	1980	21.5*	(Cavallaro and Cavaliere 1980)
North-western Ionian Sea (Italy) (°)	Maruggio	2021	65.0 TL**	Present paper
	Gulf of Taranto	2022	270 TL**	
Northern Adriatic Sea (Italy)	Rimini	1932	150*	(Padovani 1933)

SL (Standard Length) and TL (Total Length) of specimen is shown

(*) length not specified; (**) TL estimated

Table 2 Morphometric measurements of two specimens of *Regalecus glesne* caught in the north-western Ionian Sea (central Mediterranean Sea)

Measurements	Specimen CODE 1 (mm)	Specimen CODE 2 (mm)
Total Length estimated	650	2700
Truncated body	402	1000
Pre-Anal Length	196	812
Pre-Dorsal Length	13	56
Pre-Pelvic Length	47	175
Head Length to until operculum	41	168
Head height (through centre of eye)	29	116
Body height (at posterior margin of operculum)	31	126
Body height (at anus)	19	88
Pre-orbital Length	10	38
Greatest body height	30	130
Max. eye diameter	9	35
Total weight (g)	27.9	1321

New Findings

The new records of *R. glesne*, captured in the north-western Ionian Sea, extend the distribution range of the species in the Mediterranean Sea. All recorded morphometric measurements are reported in Table 2, where the estimated TLs for two specimens (CODE 1 and CODE 2) were 650 and 2700 mm, respectively. The individual CODE 1, identified as sexually indeterminate, had body damaged mainly along the dorsal and pectoral fin rays and altered body colour, due to poor recovery status. The specimen CODE 2 showed some visible marks probably due to the mesh of the fishing net and some damages on dorsal and pectoral fins (Fig. 3A). Only a few of the long anterior rays of the dorsal fin, which form the characteristic "plume", have been preserved intact (Fig. 3B). The mouth was protruding, probably due to pressure changes, from the bottom to the surface, during the capture. Macroscopic examination of the gonads identified this specimen as a female in the early stage of gonad maturity. The skin, without scales, was covered by typical dermal tubercles with circular bases and the body colouration was silvery bluish grey with visible small scattered dark spots and longitudinal dark bands along the sides. The damaged membrane of the dorsal fin was red/orange in colour, transparent in the basal part and surrounding the white rays, while the rays of the plume were bright red/orange. The anal fin was absent. The large ocular globes were cream-coloured with a dark iris and clear pupils. The features described, for both captured specimens, are in agreement with the species description reported by Whitehead et al. (1986) and Roberts (2012). Other taxonomic features, which could not be observed in our two specimens due to the damage, are the number of the dorsal fin rays (usually 400–450), caudal fin rays (3–4) and the total gill rakers on first gill arch (37–47) (Roberts 2012).

Discussion

The two specimens of *R. glesne* captured in the Gulf of Taranto represent the first occurrence of this rare species in north-western Ionian Sea (central Mediterranean) and they also update its distribution in the Mediterranean Sea, with a total of 60 oarfish observations recorded since 1826. The TL recorded for adult specimen ranges from 86.5 to 446 cm (average TL = 221 cm), while for juvenile specimens the verified SL ranges from 15 to 25.2 cm (average SL = 20 cm). The largest number of observations occurred between the Ligurian Sea and Gulf of Lion, 36.6% and 28.3% respectively, on the total recorded observations.

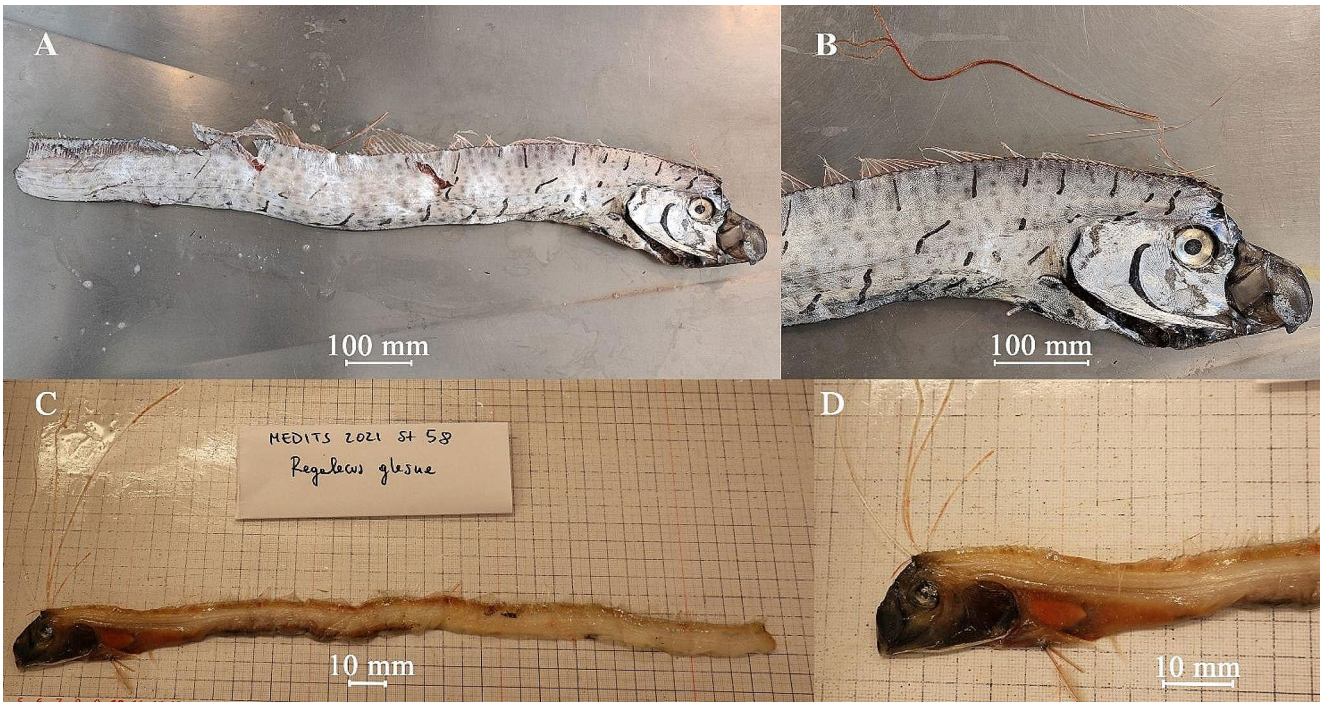

Fig. 3 Specimen CODE 2 of *Regalecus glesne*: visible marks on body **A**; detail of the head region and some of the long anterior dorsal rays of the plume **B**. Specimen CODE 1 **C** and detail of the head region **D**

For both new specimens, the total lengths were estimated as the posterior section of the truncated body, probably due to serial autotomy. This process involves just the posterior part of the body over the anus and caudal fin, without involving any vital organs and it may occur several times during life (Roberts 2012). This mechanism could represent a defence strategy against predators, as reported by Chakrabarty (2013). The reasons for the occasional stranding and death of oarfish are unclear, but according to Schmitter-Soto (2008) and Dulčić et al. (2009) there are several possible causes, such as shark attacks or large bony fish predators, red tide, confluence of sea currents, earthquakes, etc.

The pelagic habit of oarfish regarding a wide depth range could explain its low availability to common fishing gear and its perceived rarity. However, this species could be really rare or uncommon.

Given the supposed rarity of *R. glesne*, the present findings provide a new contribution to the knowledge on the distribution of this teleost fish in the Mediterranean.

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Author Contributions Conceptualization: L.S. and G.G.; Investigation: L.S., G.G., R.C. and C.T.; Contributed analyses/tables/figures: L.S., G.G. and P.M.; Writing – original draft preparation: L.S. and G.G.; Writing – review and editing: R.C., G.D. and P.M.; Corresponding author: G.G. All authors have read and agreed to the published version of the manuscript.

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Data Availability The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical Approval No living animals have been used in this study.

Competing Interests The authors declare no competing interests.

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References

Albano M, D'Iglio C, Spanò N, Fernandes JMO, Savoca S, Capillo G (2022) Distribution of the Order Lampriformes in the Mediterranean Sea with notes on their biology, morphology, and taxonomy. Biology 11(10):1534. https://doi.org/10.3390/biology11101534

Ariola V (1904) Pesci nuovi o rari per Il Golfo Di Genova. Ann Mus Civ Stor Nat Genova 41:153–168

Berdar A, Guglielmo L, Giacobbe S (1975) Ritrovamento Di Tre Giovani Esemplari Di *Regalecus glesne* Ascanius, 1772 spiaggiati ad Oliveri (Messina). Atti Soc Peloritana 21:124–139

Bilecenoglu M, Kaya M, Cihangir B, Çiçek E (2014) An updated checklist of the marine fishes of Turkey. Turk J Zool 38(6):901–929. https://doi.org/10.3906/zoo-1405-60

Cavallaro C, Cavaliere A (1980) Spiaggiamento Di *Regalecus glesne* Ascanius (Pisces: Regalecidae) Nello Stretto Di Messina. Mem Biol Mar Ocean 10(5):135–137

Chakrabarty P (2013) Review work of Systematics, biology and distribution of the species of the oceanic oarfish genus *Regalecus* (Teleostei, Lampridiformes, Regalecidae). Roberts T Copeia 2013(2):356. https://www.jstor.org/stable/24635733

Corsini-Foka M (2009) Uncommon fishes from Rhodes and nearby marine region (SE Aegean Sea, Greece). J Biol Res 12:125–133

Cuvier G, Valenciennes MA (1835) Histoire Naturelle Des Poissons. Levrault, Paris

Damiani G (1913) Di Un *Regalecus Gladius* Walb. All'Isola d'Elba, con note Sui *Regalecus* mediterranei. Boll Della Soc Zool Ital 1(11–12):329–339

Dragičević B, Pallaoro A, Grgičević R, Lipej L, Dulčić J (2011) On the occurrence of early life stage of the king of herrings, *Regalecus glesne* (Actinopterygii: Lampriformes: Regalecidae), in the Adriatic Sea. Acta Ichthyol Piscat 41(3):251–253. https://doi.org/10.3750/AIP2011.41.3.13

Dulčić J, Dragičević B, Tutman P (2009) Record of *Regalecus glesne* (Regalecidae) from the eastern Adriatic Sea. Cybium 33(4):339–340. https://doi.org/10.26028/cybium/2009-334-008

Froese R, Pauly D (2010) Fish Base. http://www.fishbase.org. Accessed 18 January 2023

Gicqueau C, Dubas R, Renoult J (2018) Fish watch forum. http://www.fish-watch.org. Accessed 16 January 2023

Giglioli EH (1880) Elenco Dei Mammiferi, Degli Uccelli E dei rettili ittiofagi appartenenti alla Fauna Italica E Catalogo degli Anfibi E dei Pesci Italiani. Stamperia reale, Firenze, p 55

Guiglia D (1950) Nuova Cattura Di *Regalecus glesne* asc. Nel Golfo Di Genova. Ann Mus Civ Stor Nat G Doria 64:288–290

Haroun ES, Akel K, Karachle PK (2017) The Marine Ichthyofauna of Egypt. Egypt J Aquat Biol Fish 21(3):81–116. https://doi.org/10.21608/ejabf.2017.4130

Jennings G (1996) Maltese fishes - an Identification Guide. Calypso, London, p 236

Kova M, Lipej L, Dul J, Iglesias SP, Goren M (2021) Evidence-based checklist of the Mediterranean Sea fishes. Zootaxa 4998(1):1–115. https://doi.org/10.11646/zootaxa.4998.1.1

Lanfranco G (1993) The fishes around Malta (Central Mediterranean). Progress, Malta, p 132

Lozano-Cabo F (1969) Nota Sobre El hallazgo en Mazarrôn de una especie de pez *Regalecus glesne* (Ascanius), poco comûn en El Méditerranée. Bol Real Soc Esp Hist Nat 67:29–31

Mezzana N (1909) Il Cittadino, Anno XL, n.150, Savona

Moranta J, Stefanescu C, Massutí E, Morales-Nin B, Lloris D (1998) Fish community structure and depth-related trends on the continental slope of the Balearic Islands (Algerian basin, Western Mediterranean). Mar Ecol Prog Ser 171:247–259. https://doi.org/10.3354/meps171247

Ondrias J (1971) A list of the fresh and sea water fishes of Greece. Hellenic Oceanol Limnol 10:23–96

Padovani C (1933) Prima Cattura Di *Regalecus Gladius* (Walb.) Nel mare adriatico. Boll Pesca Piscic Idrobiol 11(1):102–107

Papaconstantinou C (1988) Fauna Graeciae: check - list of Marine fishes of Greece. National Centre for Marine Research, Athens, p 257

Psomadakis PN, Bottaro M, Doria G, Garibaldi F, Giustino S, Vacchi M (2008) Notes on the Regalecidae (Pisces, Lampridiformes) occurring in the Gulf of Genova and in Liguro-Provençal waters (NW Mediterranean). Ann Mus Civ Stor Nat G Doria 99:549–571

Psomadakis PN, Giustino S, Vacchi M (2012) Mediterranean fish biodiversity: an updated inventory with focus on the Ligurian and Tyrrhenian seas. Zootaxa 3263(1):1–46. https://doi.org/10.5281/zenodo.280724

Quero JC, Spitz J, Vayne JJ (2003) Observations ichtyologiques effectuées en 2002. Ann Soc Sci Nat Charente-Marit 9(3):275–279

Risso A (1827) Histoire Naturelle Des principales productions de l'Europe méridionale et particulièrement de celles des environs de Nice et des alpes maritimes. Levrault, Paris, p 480

Roberts T (2012) Systematics, biology and distribution of the species of the oceanic oarfish genus *Regalecus* (Teleostei Lampridiformes, Regalecidae). French National Museum Natural History. Publications Scientifiques du Muséum, Paris, p 268

Robins CR, Ray GC, Douglas J, Freund R (1986) A field guide to Atlantic coast fishes of North America. The Peterson field guide series. Houghton Mifflin Harcourt, Boston, p 354

Schmitter-Soto JJ (2008) The Oarfish, *Regalecus glesne* (Teleostei: Regalecidae), in the Western Caribbean. Caribb J Sci 44(1):125–128. https://doi.org/10.18475/cjos.v44i1.a13

Spedicato MT, Massutí E, Mérigot B, Tserpes G, Jadaud A, Relini G (2019) The MEDITS Trawl Survey specifications in an ecosystem approach to fishery management. Sci Mar 83(S1):9–20. https://doi.org/10.3989/scimar.04915.11X

Tortonese E (1970) Osteichthyes (Pesci Ossei), Parte Seconda. Fauna d'Italia. Edizioni Calderini, Bologna, p 565

Vayssiére MA (1917) Note Zoologique et anatomique sur un *Regalecus* (*Gymnetrus*) *Gladius* Cuv. Et valenc. Pris dans le golfe de Marseille. Bull Mus Natl Hist Nat 23:15–25

Vinciguerra D (1918) Intorno Ai *Regalecus* Del Golfo Di Genova E Di altre località italiane. Ann Mus Civ Sto Nat Genova 48:76–92

Whitehead PJP, Bauchot ML, Hureau JC, Nielsen J, Tortonese E (1986) Fishes of the North-eastern Atlantic and the Mediterranean. UNESCO, Paris, p 491

WoRMS Editorial Board (2023) World Register of Marine Species. https://www.marinespecies.org at VLIZ. Accessed 16 May 2023. https://doi.org/10.14284/170

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