

**ON THE OCCURRENCE OF EARLY LIFE STAGE OF THE KING OF HERRINGS,
REGALECUS GLESNE (ACTINOPTERYGII: LAMPRIFORMES: REGALECIDAE),
IN THE ADRIATIC SEA**

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Abstract. The occurrence of an early life stage of the king of herrings, *Regalecus glesne* Ascanius, 1772, is reported for the first time from the Adriatic waters. A single larva (SL = 103.4 mm) was found alive in the waters of open Adriatic near a remote Island Palagruža. Findings of early life stages of this species are very rare in the Mediterranean and have previously been reported only from the waters of the Strait of Sicily and Elba Island.

Keywords: *Regalecus glesne*, king of herrings, oarfish, Adriatic Sea, larva, early life stage, record

The king of herrings also known as the oarfish, *Regalecus glesne* Ascanius, 1772, is an open water mesopelagic species occurring in most tropical and temperate areas of the World Ocean (Froese and Pauly 2010), but is quite rare in the whole area of its wide distribution. King of herrings can be found at depths down to 1000 m, but can also be encountered near the surface (Bauchot 1987). Its global distribution and movements in the water column reveal an extensive migratory pattern both at vertical and horizontal axis. However, most records of this fish are based on stranded or moribund specimens found near the coasts and sightings of live fish in its natural habitat are very rare (Schmitter-Soto 2008). The fact that this fish inhabits greater depths and is therefore unavailable to most fishing gears probably adds to the perceived rarity of the species.

King of herrings has a band-like body, laterally compressed and extremely elongated. It is considered as the longest known teleost, being able to reach lengths of up to 11 m (Eschmeyer et al. 1983). It's enormous occipital crest, long pelvic fins, vivid coloration of fins, unusually shaped head and it's greatly elongated body leave a little space for the misidentification of the adult specimens of this species.

This species is also present in the Mediterranean where it is considered very rare (Tortonese 1970). However, it is more common in certain areas such as the Liguro-Provencal basin where the findings of adults specimens are more frequent (Psomadakis et al. 2008). Adults,

based more or less on single specimens, were also recorded in the Aegean Sea (Bilecenoglu et al. 2002, Corsini Foka 2009) and Adriatic Sea (see Dulčić et al. 2009). However, considering the only few documented records, it seems that the occurrences of the early life history stages of *R. glesne* are exceptionally rare and as such present a valuable material for investigation.

Although a lot of ichthyological surveys have been carried out in the Adriatic Sea, particularly those which involve larvae sampling, early life stages of this species have never been reported. The aim of this paper is to present a record of an early life history stage of *Regalecus glesne* based on a specimen found in the Adriatic Sea.

On 30 September 2010, during the night hours, one larvae of *Regalecus glesne* (Figs. 1–2) was caught with a hand net. It was caught south of the Island Palagruža in the open central Adriatic (lat 42°23.374'N, long 16°15.764'E). The specimen was preserved in 4% formalin and deposited in the Ichthyological Collection of the Institute of Oceanography and Fisheries, Split, Croatia (IOR-Rgles 2). Standard length (SL) and biometric measurements of the specimen were performed to the nearest mm, while the fish was weighed to the nearest 0.01 g.

Morphometric and meristic measurements of the specimen are presented in Table 1. The specimen was 103.4 mm long (SL) and weighed 0.712 g. Biometric measurements and meristic counts are in agreement with those provided by Berdar et al. (1975). The fish was observed swimming at the surface near the anchored research vessel during

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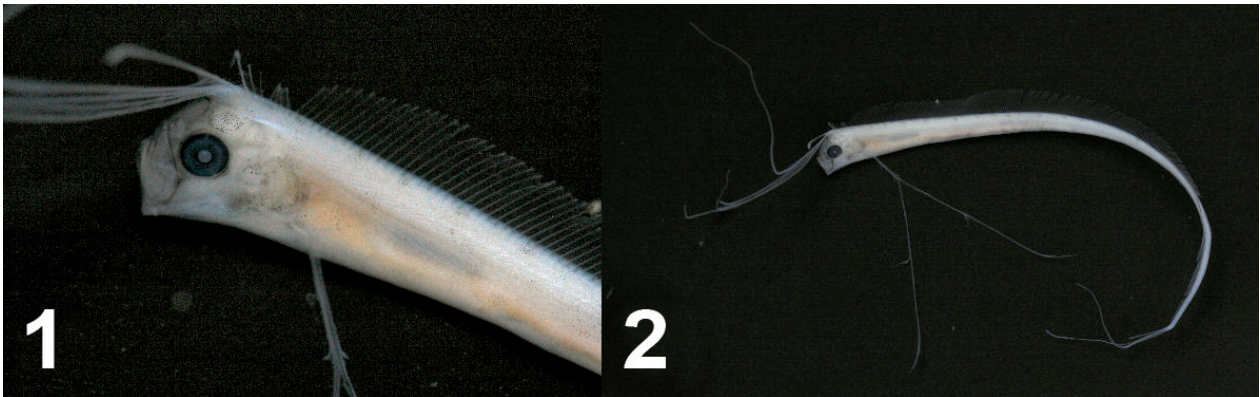
the night and was probably attracted by the lights of the ship. Before the fish was caught, it was merely swimming under the lighted part, but was not particularly active and it seemed as if it was just passively drifting. The fish was positioned horizontally in the water and when the hand net was deployed, the fish did not become particularly active in the intention to escape.

The body of the specimen was elongated as in the adult specimen and it displayed almost all of the morphological peculiarities of the adult including elongated rays in the occipital crest and elongated pelvic fin with fleshy appendages. The body of the fresh specimen was almost completely white and transparent, so it was possible to see the internal organs when the fish was illuminated. Almost regular 1 mm wide patches of darker pigments, separated from each other by 4–5 mm, were visible under the dorsal fin throughout the body. The anterior part of the head including mouth was covered in black pigment. Several clusters of melanophores were visible along dorsum of gut and series of melanophores in thoracic region. Furthermore, the specimen possessed a typical caudal fin

with four elongated fin rays, a characteristic lost in adults.

Since this specimen exhibited no resemblance in coloration to adult or juvenile oarfish and according to proposed gradual transformation from larvae to juvenile rather than by abrupt metamorphosis (Fahey 2007), we might characterize our specimen as a transitional larva rather than juvenile. However, it is difficult to establish a proper classification of early life history stages of this species due to lack of some characteristic stages upon which terminology definitions rely such as squamation due to lack of scales and settlement due to pelagic life cycle.

Little is known about the biology and ecology of *Regalecus glesne* in general, and even less about its early life stages and early development. Eggs and larvae were described by Sanzo (1925) and description of three juvenile specimens from the Mediterranean Sea found washed up on the beach near the Strait of Messina were given by Berdar et al. (1975) (Table 1). Additionally, Cavallaro and Cavaliere (1980) reported a finding of a single juvenile specimen (TL = 215 mm) (Table 1) from Cape Faro near the island of Sicily. It seems that



Figs. 1–2. A transitional larva of *Regalecus glesne* caught in the Adriatic Sea; **Fig. 1.** Head close-up; **Fig. 2.** The whole specimen

Biometrical measurements [mm] and meristic data of the specimen of *Regalecus glesne* from the Adriatic Sea and from previous studies in the Strait of Messina

Table 1

Biometric parameter	This study	Cavallaro et al. (1980)	Berdar et al. (1975)		
Standard length (excluding caudal fins)	103.4	181	252	249	150
Preanal length	45.8	—	89	90	60
Head length	9.1	—	16	17	11
Eye diameter	2.9	—	4.5	5	3
Maxillary length	4.1	—	8	7.5	5
Pectoral fin length	2.8	—	6	4	4
Ventral fin length	51.5	—	68	86	61
Caudal fin length	16.9	—	23	29	15
Body height at ventral fin base	7.0	—	12	12	8
Smallest body height	0.5	1.0	—	—	—
Body height at ventral fin base	7.0	10.0	—	—	—
Occipital crest height	52.8	40	80	74	40
Dorsal fin rays (excluding occipital crest)	389	—	418	391	390
Occipital crest rays	6	—	7	6	6
Pectoral fin rays	12	—	13	12	12
Caudal fin rays	4	—	4	4	4
Ventral fin rays	1	—	1	1	1

previous findings of eggs, larvae, and juvenile stages of this species in the Mediterranean were limited to its central part, especially the Strait of Messina, probably due to the particular oceanographic properties of the area which facilitate stranding of various life stages of mesopelagic and bathypelagic fishes. All juvenile specimens described in the aforementioned papers considered larger juvenile specimens which had body coloration similar to that of the adult fish, i.e., silvery flanks and reddish fins while our specimen showed no signs of such coloration. The only similarity in pigmentation between our specimen and those described elsewhere is the darkly pigmented anterior head region. Dark head pigmentation is probably an adaptation developed for the countershading during the characteristic vertical positioning of the adult fish in the water column. Yet, whether juvenile oarfishes resemble adults in this type of behaviour is still not known.

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REFERENCES

- Bauchot M.L.** 1987. Poissons osseux. Pp. 891–1421. *In*: Fischer W., Bauchot M.-L., Schneider M. (eds.). Fiches FAO d'Identification pour les Besoins de la Pêche. (rev. 1). Méditerranée et Mer Noire. Zone de Pêche 37. Vol. II. Commission des Communautés Européennes and FAO, Rome.
- Berdar A., Guglielmo L., Giacobbe S.** 1975. Ritrovamento di tre giovani esemplari di *Regalecus glesne* Ascanius, 1772 spiaggiati ad Oliveri (Messina). [Discovery of three young specimens of *Regalecus glesne* Ascanius, 1772 stranded at Oliveri (Messina).] *Atti della Società Peloritana di Scienze Fisiche, Matematiche e Naturali* **21**: 124–139.
- Bilecenoglu M., Taskavak E., Mater S., Kaya M.** 2002. Checklist of the marine fishes of Turkey. *Zootaxa* **202** (113): 1–194.
- Cavallaro C., Cavaliere A.** 1980. Spiaggiamento di *Regalecus glesne* Ascanius (Pisces: Regalecidae) nello stretto di Messina. [Stranding of *Regalecus glesne* Ascanius (Pisces: Regalecidae) in the Strait of Messina.] *Memorie di Biologia Marina e di Oceanografia* **10**: 135–137.
- Corsini-Foka M.** 2009. Uncommon fishes from Rhodes and nearby marine region (SE Aegean Sea, Greece). *Journal of Biological Research* **12**: 125–133.
- Dulčić J., Dragičević B., Tutman P.** 2009. Record of *Regalecus glesne* from the eastern Adriatic Sea. *Cybium* **33** (4): 339–340.
- Eschmeyer W.N., Herald E.S., Hammann H.** 1983. A field guide to Pacific coast fishes of North America. Houghton Mifflin Company, Boston MA.
- Fahey M.P.** 2007. Early stages of fishes of the Western North Atlantic Ocean. Vol. I. Northwest Atlantic Fisheries Organization, Dartmouth, Nova Scotia, Canada.
- Froese R., Pauly D.** (eds.) 2010. FishBase. [version 11/2010]. <http://www.fishbase.org>
- Psomadakis P.N., Bottaro M., Doria G., Garibaldi F., Giustino S., Vacchi M.** 2008. Notes on the *Regalecus glesne* occurring in the Gulf of Genova and in Liguro-Provencal waters (NW Mediterranean) (Pisces, Lampridiformes, Regalecidae). *Annali del Museo civico di Storia naturale „G. Doria“* **99**: 549–571.
- Sanzo L.** 1925. Uova e larvi di *Regalecus glesne* Asc. [Eggs and larvae of *Regalecus glesne* Asc.] *Memorie Reale Comitato Talassografico Italiano* **118**: 1–7.
- Schmitter-Soto J.J.** 2008. The oarfish, *Regalecus glesne* (Teleostei: Regalecidae), in the Western Caribbean. *Caribbean Journal of Science* **44** (1): 125–128.
- Tortonese E.** 1970. Osteichthyes (Pesci Ossei), Parte Prima. *Fauna d'Italia*, Vol. X. Edizioni Calderini, Bologna.

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