

First record of sea lice (*Caligus belones*) on garfish (*Belone belone*) in the Iberian Peninsula

Primer registro del piojo de mar (*Caligus belones*) parasitando la aguja de mar (*Belone belone*) en la península ibérica

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Abstract

A novel observation of sea lice (*Caligus belones*) on garfish (*Belone belone*) is described from the Galician coast (NW Spain), being the first time for southern Europe. This finding is important as there are few worldwide records of sea lice (*C. belones*) parasitizing garfish.

Keywords: ectoparasites, fish hosts, parasitic copepod

Resumen

Se describe una nueva observación del piojo de mar (*Caligus belones*) parasitando la aguja de mar (*Belone belone*) en la costa de Galicia (noroeste de España), siendo la primera vez para el sur de Europa. Este hallazgo es importante, ya que hay pocos registros en todo el mundo del piojo de mar (*C. belones*) parasitando la aguja de mar.

Palabras clave: ectoparásitos, hospedadores marinos, copépodo parásito

Garfish *Belone belone* Linnaeus 1761 is a pelagic marine fish species distributed in waters surrounding Europe and North Africa, including the Atlantic Ocean, the Mediterranean Sea and the Black Sea. The species can be a commercially important pelagic fish in some areas of Europe, as the Black Sea (SAMSUN *et al.*, 2016). In the Iberian Peninsula, it is not usually a target for professional and recreational fishing, but the amount of captures is not contemptible; in the northwest of Spain (Galicia) about 76.7 tonnes

were captured and sold in 2015 (data from the Xunta de Galicia–Consellería do mar; <http://www.pescadegalicia.gal/>). Over the last decades, there has been a notable increasing in the knowledge of the biology of garfish (e.g., SAMSUN *et al.*, 2006 and references therein). Despite this research progress, their parasite composition remains unknown and may be far from complete. In this regard, previous works have aimed to describe the parasitic fauna of garfish in detail (e.g., GRABDA, 1981; DORMAN & HOLMES, 1991; ÖZER & YURAKHNO 2013; CHÄARI

et al., 2015), but few have reported the observation of sea lice on the species (e.g., DORMAN, 1991; DORMAN & HOLMES, 1991; KOCH *et al.*, 2014). Sea lice species are external parasitic copepods of the family Caligidae characterised by the presence of a flattened cephalothorax, typical of this group, which is used as attachment organ (KABATA, 1992). Sea lice are often found parasitizing anadromous salmonid populations during their marine growth phase (e.g., TORRISSEN *et al.*, 2013; THORSTAD *et al.*, 2015), and marine fish species (e.g., NAWASAGA, 2011). Of the entire recognised genera of Caligidae, only the *Caligus* genus has been found on garfish so far. In this regard, four species of the *Caligus* genus have been identified on garfish: *Caligus belones* Krøyer, 1863, *Caligus elongatus* von Nordmann, 1832, *Caligus diaphanus* von Nordmann, 1982 and *Caligus pelamydis* Krøyer, 1863 (CRESSEY & COLLETTE, 1970; DORMAN, 1991; DORMAN & HOLMES, 1991; KABATA, 1992; HOLMES, 1998; KOCH *et al.*, 2014). It should be noted that the specimens assigned to *C. belones* from *Coryphaena equiselis* Linnaeus, 1758 by WILSON (1905) were described as a new species, *Caligus wilsoni* Delamare Deboutteville & Nunes-Ruivo, 1958; species collected and re-described, years later, from *Lutjanus griseus* (Linnaeus, 1758) by CRESSEY (1991). Overall, sea lice (especially *Lepeophtheirus salmonis* Krøyer, 1837) are well known to cause serious deleterious effects and severe economic losses in some fish species like Atlantic salmon (*Salmo salar* Linnaeus, 1758) and sea trout (*Salmo trutta* Linnaeus, 1758) (e.g., TORRISSEN *et al.*, 2013 and references therein). However, more information about sea lice infestation patterns on marine fish species is required to understand sea lice epidemiology in the wild.

On 15 May 2016, a local fisherman captured a garfish specimen using a spinning lure in the Gabeiras islands (NW Spain, 43.5108°N 008.3386°W). The specimen was brought to the laboratory for visual inspection. Parasites were detected and counted. Intensity (number of parasites per infected host) was determined recording the presence of sea lice in seven body parts (operculum, pectoral fin, dorsal fin, pelvic fin, anal fin, caudal fin and body) (Table I).

	Operculum	Pectoral fin	Dorsal fin	Pelvic fin	Anal fin	Caudal fin	Body
Right	16	5	0	0	0	0	11
Left	9	3	0	0	0	0	7

Table I. Number of parasites (*Caligus belones*) distributed on the body surface of garfish (*Belone belone*).

Tabla I. Número de parásitos (*Caligus belones*) en cada una de las partes corporales de la aguja de mar (*Belone belone*).

Collected parasites were morphologically identified as *C. belones* based on DORMAN & HOLMES (1991) and KABATA (1992). We paid attention to the diagnosis characters to identify this species, i.e., the shape and proportion of the genital segment, the shape and the proximity of the caudal rami, the armature of the second exopod segment of the first leg, the armature of the fourth leg, and the shape of the external furca (see DORMAN & HOLMES, 1991 for illustrations of the diagnosis characters). The specimen was dissected to determine sex and diet composition. The specimen was a male of 880 mm length (total length) and no food remains were found in the stomach. A total of 51 parasites were found. No parasites on dorsal, pelvic, anal and caudal fins were found. By contrast, the other body parts showed parasite intensities between three (left pectoral fin) and sixteen (right operculum). The remaining intensities are given in Table I. Skin lesions were evident in the parasitized fish (Figure 1), suggesting that the specimen might be more susceptible to secondary infections (BOXASPEN, 2006). In fact, heavy infections of sea lice can reduce growth, fecundity, and survival of their hosts (BOXASPEN, 2006; THORSTAD *et al.*, 2015).

This confirmation of sea lice (here *C. belones*) parasitizing garfish is, to the best of our knowledge, the first record in the Iberian Peninsula and increases the number of known territories to five. In this sense, *C. belones* has been reported from garfish in German (CRESSEY & COLLETTE, 1970), Irish (DORMAN & HOLMES, 1991), Swedish (DORMAN, 1991), Dutch (KOCH *et al.*, 2014) and Spanish (present study) waters. This finding is important as there are few worldwide records of *Caligus* spp. parasitizing garfish (see above literature) as well as other belonid fish species (e.g., CRESSEY & COLLETTE, 1970; TAVARES *et al.*, 2004; CHÂARI & NEIFAR, 2015). From fishery management and

conservation perspectives, future monitoring programmes should take into account parasites like sea lice on wild marine fish species in order to improve the knowledge about their epidemiology and spatiotemporal variation in infestations levels in nature.

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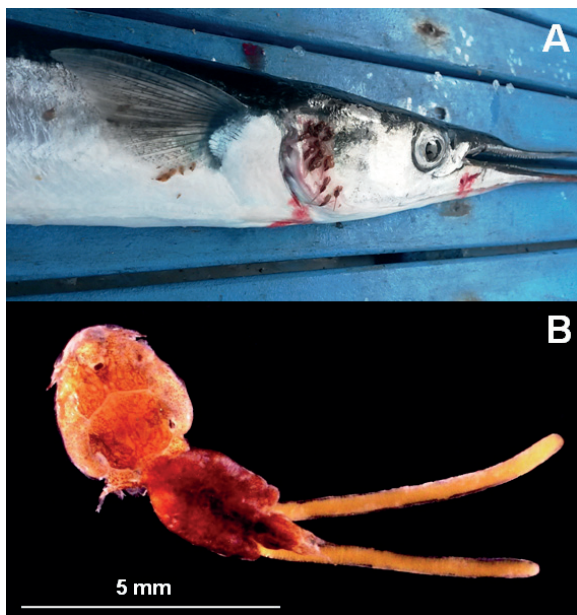


Figure 1. Photograph of the captured specimen of garfish (*Belone belone*) showing the sea lice infection *in situ* on the right operculum and pectoral fin (A). Detail of a gravid female *Caligus belones* found parasitizing the specimen of garfish (B).

Figura 1. Fotografía del ejemplar capturado de aguja de mar (*Belone belone*) mostrando la infección por piojos de mar *in situ* en el opérculo derecho y aleta pectoral (A). Detalle de una hembra grávida de *Caligus belones* encontrada parasitando el espécimen de pez aguja (B).

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