

Short Communication

First record of the naked goby *Gobiosoma bosc* (Lacepède, 1800) in European watersRalf Thiel^{1*}, Jörg Scholle² and Sandra Schulze²¹ Biocenter Grindel and Zoological Museum, University of Hamburg, Martin-Luther-King-Platz 3, 20146 Hamburg, Germany² BIOCONSULT Schuchardt & Scholle GbR, Reeder-Bischoff-Str. 54, 28757 Bremen, GermanyE-mail: ralf.thiel@uni-hamburg.de (RT), scholle@bioconsult.de (JS), schulze@bioconsult.de (SS)

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Abstract

The naked goby *Gobiosoma bosc* (Lacepède, 1800), a western Atlantic gobiid species, has been recorded for the first time in European waters in October 2009. Seven specimens were caught by a stow net vessel at river km 45 in the Weser estuary (Germany) close to Sandstedt.

Key words: *Gobiosoma bosc*; naked goby; Gobiidae; Weser estuary; Germany; non-indigenous species

Introduction

The naked goby *Gobiosoma bosc* (Lacepède, 1800) is a western Atlantic species, its natural range is along the Atlantic coast from Massachusetts to Florida, except for southeastern Florida and Florida Keys (Robins et al. 1986; van Tassell 2011). It also occurs in coastal areas of the Gulf of Mexico, from Everglade City (USA) to Campeche (Mexico) (Hubbs et al. 1991). *G. bosc* has been observed over a wide range of salinities, e.g. from 0 to 45 psu in estuaries along the Gulf of Mexico (Dawson 1969), but is common in low to moderate salinities (Dahlberg and Conyers 1973). It inhabits a variety of shallow estuarine habitats like sandy or muddy substrates, saltmarshes, oyster reefs, and is most abundant in tidal pools and subtidal areas with oyster shell (Dahlberg and Conyers 1973; Crabtree and Dean 1982; Breitburg 1999; Harding and Mann 2000; Lehnert and Allen 2002). In its native range, the naked goby reaches 64 mm in total length (Fritzsche 1978) and feeds mainly on annelids and small crustaceans (Breder 1948; Breitburg 1999).

Material and methods

On October 13th 2009, seven individuals of *Gobiosoma bosc* were caught in the Weser estuary, Germany (Figure 1), using a stow net (opening area 135 m², mesh size 10 mm in the cod end) by the commercial fishery vessel 'Ostetal'. The specimens were caught at one sampling station (53°22.3'N, 8°29.8'E) in two successive hauls during flood end ebb tides between 0530 and 1320 hrs. Water depth at the sampling station ranged between 11 and 14.3 m. At the surface, salinity varied between 0.8 and 3.5 psu, water temperature from 14.2–14.8°C, and dissolved oxygen levels of 9.6–10.5 mg/l. Three of the collected specimens were preserved in 70% ethanol and transferred to the fish collection of the Zoological Museum Hamburg (ZMH) for accurate species identification. At ZMH the specimens were photographed (Figure 2) and deposited under catalogue number ZMH 25884. Their morphometric measurements were done following Hubbs and Lagler's (1958) method. Their meristic characters were counted and they were identified according to Boschung and Maiden (2004), Hoese and Moore (1977), Hubbs et al. (1991) and Murdy and Hoese (2003).



Figure 1. Map with the record of *Gobiosoma bosc* (red spot) in the Weser estuary.
Map base: © Federal Maritime and Hydrographic Agency.

Occurrence of sensory pores was checked after Akihito (1986). Vertebrae, dorsal-fin spines and rays as well as anal-fin rays of all specimens were counted from radiographs using an X-ray imaging system (Faxitron LX-60). The separation of sexes was performed according to Ginsburg (1933) and Dahlberg and Conyers (1971) based on the structure of the genital papilla.

Results and discussion

Brief description of the specimens

No scales present. Ground color brown, with about nine vertical light bars separating broad brownish interfaces (Figure 2). Cephalic head pores B', C(s), D(s), E, F, H', preopercle pores M', N, O' and posterior oculoscapular pores K' and L' present. Body short and stout, body depth 17.9-21.5% SL (Table 1). Interorbital width contained 0.9-1.3 times in orbit diameter. Pelvic fins not reaching to anus, pelvic-fin length contained 2-2.8 times in distance from pelvic-fin

insertion to anal-fin origin. Meristic counts are: D1 VII; D2 I, 12-13; Anal 10-11; Pectoral 18; Pelvic I, 5; Vertebrae 27-28 (Table 1). The preserved specimens of *G. bosc* were represented by two males and one female.

Identification

Our specimens agree well with the coloration, body shape, counts and measurements presented by Boschung and Mayden (2004), Hoese and Moore (1977), Hubbs et al. (1991) and Murdy and Hoese (2003). *Gobiosoma bosc* is generally confused with *G. ginsburgi* Hildebrand & Schroeder, 1928, *G. longipila* Ginsburg, 1933, and *G. robustum* Ginsburg, 1933. However, all of our individuals of *G. bosc* differ from the relatively similar *G. ginsburgi* and *G. longipila* by lacking two modified basicaudal scales. Furthermore, the pelvic fins of the latter two species are longer reaching almost to the anus. In *G. robustum* the posterior oculoscapular canal with pores K' and L' is generally absent. Additionally, *G. robustum* has dots and dashes along the midline which are not to be found in *G. bosc*.

Figure 2. Naked goby, *Gobiosoma bosc*, captured from the Weser estuary, Germany, on October 13th 2009 (specimen 1 (above), 2 (middle) and 3 (below) of seven captured individuals are shown). Photograph by R. Thiel.



Table 1. Morphometric measurements and meristic counts for the new records of three specimens of *Gobiosoma bosc* (ZMH 25884). Total weight is given in grams. Total and standard lengths are in millimetres, other measurements are expressed as a percentage of standard length.

Characters	<i>Gobiosoma bosc</i> ZMH 25884		
	Specimen 1	Specimen 2	Specimen 3
Total weight (TW)	0.517	0.928	1.171
Total length (TL)	37.8	42.7	50.2
Standard length (SL)	31.3	35.3	41.6
% SL			
Body depth (BD)	17.9	21.5	19.5
Orbit diameter (OD)	5.6	7.2	4.6
Interorbital width (IW)	5.0	5.5	4.9
Orbit diameter/head length (OD/IW)	1.1	1.3	0.9
Pelvic-fin length (VL)	15.6	12.7	16.0
Pelvic-fin insertion to anal-fin origin (VI-AO)	30.5	35.7	31.5
Pelvic-fin insertion to anal-fin origin/pelvic-fin length (VI-AO/VL)	2.0	2.8	2.0
First dorsal-fin spines (D1)	VII	VII	VII
Second dorsal-fin spines & rays (D2)	I, 13	I, 13	I, 12
Anal-fin rays (Anal)	10	11	10
Pectoral-fin rays (Pectoral)	18	18	18
Pelvic-fin spines and rays (Pelvic)	I, 5	I, 5	I, 5
Total vertebrae (Vertebrae)	28	27	27
Sex	female	male	male

Distribution

The specimens of *Gobiosoma bosc* from the Weser estuary represent the first record of this species from European waters. The record of both adult male and female individuals could be a sign for a possible future establishment in German waters.

Oyster reefs which are preferred habitats in the native range of *G. bosc* in North America, are not present in that muddy-sandy habitat of the Weser estuary, where the naked goby was caught. However, although the species prefers oyster reefs in their native range, it occurs also in other habitat types, e.g. sandy or muddy substrates, saltmarshes and tide pools (e.g. Dahlberg and Conyers 1973; Crabtree and Dean 1982; Breitburg 1999; Harding and Mann 2000; Lehnert and Allen 2002).

The first record of *G. bosc* outside of North America was reported in 2002 from the north side of the Orinoco Delta, Venezuela, South America (Lasso-Alcalá et al. 2005). Non-native populations of naked goby exist also in several waters in Texas, e.g. in the Victor Braunig and Calaveras reservoirs (San Antonio River drainage), Bexar County (Fuller et al. 1999). Into these reservoirs the species was introduced accidentally when marine game fishes were released. However, it is more likely that the specimens of naked goby found in the Weser estuary have been transported via ballast water. The Weser estuary is an important shipping route where even several deepening measures were performed for shipping purposes (e.g. Schirmer and Schuchardt 2001).

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