

Micropogonias undulatus (L.), another exotic arrival in European waters

M. STEVENS*†, G. RAPPÉ‡§, J. MAES*, B. VAN ASTEN* AND F. OLLEVIER*

*Laboratory of Aquatic Ecology, Katholieke Universiteit Leuven, Ch. de Bériotstraat 32, B-3000 Leuven, Belgium and †Vakgroep Biologie, Universiteit Gent, Krijgslaan 281/S8, B-9000 Gent, Belgium

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Two living specimens of the Atlantic croaker *Micropogonias undulatus* have been caught during recent years in Belgian waters (Southern Bight of the North Sea): one in August 1998 as a by-catch of the commercial shrimp fishery in coastal waters, another in October 2001 on a tidal flat in the brackish part of the Scheldt Estuary. These represent the first records of this north-west Atlantic species in European waters, and their occurrence is likely to be due to transportation in ship ballast water.

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In the night of 16–17 August 1998, a 146 mm total length (L_T) specimen of *Micropogonias undulatus* (L.) was captured by a vessel of the Belgian commercial shrimp fishery, working in inshore Belgian coastal waters (51°13' N; 2°55' E). Initially, the specimen was identified mistakenly as *Sciaena umbra* L. and published as such in a local marine natural history magazine (Eneman, 1998), but was recently corrected in the same magazine (Rappé, 2002). In October 2001, a second specimen (132.7 mm L_T , 20.8 g) was caught at night using fyke nets in the Scheldt Estuary at Groot Buitenschoor, a large tidal flat near the Dutch-Belgian border (51°22' N; 4°14' E). Water temperature and salinity measurements at that time were 18.5° C and 6, respectively.

Representatives of the family Sciaenidae (croakers or drums) are widely distributed in shelf waters of the tropical and subtropical Indian, Pacific and Atlantic Oceans and are important components of fisheries in several countries (Nelson, 1994). There are at least seven sciaenid species in the north-east Atlantic, of which five occur in European waters (Chao, 1986). Only the meagre

†Author to whom correspondence should be addressed. Tel.: +32 16 32 45 74; fax: +32 16 32 45 75; email: maarten.stevens@bio.kuleuven.ac.be

§Present address: National Botanic Garden of Belgium, Domein van Bouchout, B-1860 Meise, Belgium.

Argyrosomus regius (Asso) advances north of the Bay of Biscay, reaching Iceland, and rarely penetrates the North Sea. In the north-west Atlantic area Sciaenidae are much more diverse, with some 20 species (Chao, 1978).

The Atlantic croaker has an elongated body, with an elevated dorsal profile and a rather straight ventral profile. It reaches a total length of 55 cm, for a mass of 2.5 kg. The colour is silvery to gold, with some dark, narrow, slightly diagonal streaks. The head is conical, chin with several pores and a row of short, slender barbels on each side, distinguishing it from *A. regius*. The pre-opercular margin has 10–14 spines, with 1–5 spines at its angle. The dorsal fin has X+I spines and 27 rays. The anal fin has II spines + 8 rays. Pectoral fins with 17–18 rays. The main morphometric and meristic data of the two Belgian specimens are reported in Table I. Values agree with descriptions in the literature (Chao, 1978; Robins & Ray, 1986).

The Atlantic croaker can be found along the east coast of the U.S.A. (between Florida and Massachusetts) and northern Gulf of Mexico (Robins & Ray, 1986), where it is one of the most abundant inshore, demersal fish species (Ross, 1988; Lankford *et al.*, 1999). It is an important target species of commercial and recreational fisheries, particularly in the South Atlantic Bight and the Gulf of Mexico (Chittenden, 1977; Barbieri *et al.*, 1997). So far, no reports have been made on an established population outside the known range.

Micropogonias undulatus is considered a euryhaline species that can survive broad salinity and temperature ranges. It prefers muddy bottoms and depths <120 m. In winter, they migrate offshore to spawn in coastal oceanic waters. Post-larval croakers enter estuaries from August to June and remain in estuarine nursery areas during their first year (Forward *et al.*, 1999). Croakers can be defined as opportunistic bottom-feeders. All sizes of croakers are reported to

TABLE I. Measurements and counts of the two specimens of *Micropogonias undulatus*

| Measure (mm) or count | Belgian coast | (% L_S) | Schelde | (% L_S) |
|---------------------------|---------------|------------|------------|------------|
| Total length (L_T) | 146.0 | | 132.7 | |
| Standard length (L_S) | 122.9 | 100 | 114.0 | 100 |
| Body depth | 41.5 | 33.8 | 33.5 | 29.4 |
| Eye diameter | 7.0 | 5.7 | 6.8 | 5.9 |
| Head length | 39.3 | 32.0 | 7.5 | 32.9 |
| Pre-orbital length | 11.45 | 9.3 | 11.3 | 9.9 |
| Pre-dorsal length | 40.5 | 33.0 | 37.0 | 32.5 |
| Pre-anal length | 83.0 | 67.5 | 72.7 | 63.8 |
| Pre-pectoral length | 42.0 | 34.2 | 37.3 | 32.7 |
| Pre-pelvic length | 42.4 | 34.5 | 42.2 | 37.0 |
| Fin rays | | | | |
| dorsal | IX + I, 26 | | IX + I, 29 | |
| caudal | 17 | | 20 | |
| anal | II, 8 | | II, 7 | |
| pelvic | R4; L5 | | 6 | |
| pectoral | 17 | | 17 | |
| Mass (g) | / | | 20.8 | |

ingest benthic invertebrates while adults are capable of taking larger invertebrates and occasionally fishes. The specimen caught in the Scheldt Estuary had a shrimp (*Crangon crangon*) in its stomach, while the North Sea specimen was caught in the Belgian *Crangon* fishery. *Crangon crangon* is one of the most important members of the epibenthic community in inshore waters and in the brackish part of the Scheldt Estuary (Maes *et al.*, 1998).

Since both specimens treated here were still in their first year and not sexually mature (Barbieri *et al.*, 1994), it appears probable that both were recent arrivals and not expatriated *via* oceanic currents. The (post-) larval or young fish may well have been entrained during ballasting in a harbour on the east coast of the U.S.A. and survived the voyage to one of the ports near the West European coast where the cargo was 'deballasted'. There are three major ports in (Vlissingen and Antwerp) or near (Zeebrugge) the Scheldt Estuary all of which receive large amounts of ballast water from foreign, mostly transatlantic, sources. Through the ballast water a dense and diverse collection of organisms such as diatoms, protists, invertebrate larvae and juvenile fishes may be transferred from one harbour to another (Wonham *et al.*, 2000).

To support the assertion, there is a long list of chance introductions of marine organisms in European waters, as well as elsewhere in the world. Many of these are believed to have made the trip in ballast tanks. A spectacular recent case in temperate West European coastal waters is the American jackknife *Ensis directus*, which is well established now from France to Denmark and one of the most common, if not the most common, of bivalves washed ashore on Belgian beaches. Also in the Scheldt Estuary several specimens of other nonindigenous species such as the Chinese mitten crab *Eriocheir sinensis*, and two crabs of the North-American east coast, the Harris mudcrab *Rhitropanopeus harrisii* and the blue swimming crab *Callinectes sapidus*, have been caught and probably they too were transported in ballast water. Two of them (the Chinese mitten crab and the Harris mudcrab) even became established in the estuary (Maes *et al.*, 1998). Poor oxygen concentration further upstream, in the freshwater part of the estuary, may have limited the settlement and expansion of nonindigenous species in the Scheldt. Recent improvement of the water quality may so benefit the survival and settlement of new exotic species. So far no research has been done on the impact of ballast water on the ecosystems of the North Sea shelf coast and adjacent estuaries.

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