

# New record of the non-indigenous species *Microcosmus squamiger* (Ascidiacea: Stolidobranchia) in the harbour of Salerno (Tyrrhenian Sea, Italy)

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The first record of the non-indigenous ascidian *Microcosmus squamiger* in the Salerno harbour (central Tyrrhenian Sea) is reported. Forty-eight specimens of this solitary ascidian were found (September, 2000) on hard bottoms of the internal piers and on the breakwater rocks along the harbour at 2 and 4 m depth respectively.

Recently, records of non-indigenous species have been considerably increased especially in the harbours frequented by trade and pleasure intercontinental ship traffic (Monniot et al., 1985; Galil, 2000; Occhipinti-Ambrogi & Savini, 2002, 2003; Lambert & Lambert, 2003; Mastrototaro et al., 2004). The harbour ecosystem, with its protected and eutrophic waters, is ideal for sessile suspension-feeders such as the ascidians. These tunicates are important indicators of the biological invasions by ships. Both larvae and adults of ascidians can be transported in ballast waters and on boat hulls respectively; in addition the non-feeding planktonic larvae have a rapid settlement, metamorphosis and growth, and the hermaphroditic adults reach sexual maturity in the few weeks (Lambert & Lambert, 2003).

*Microcosmus squamiger* Michaelsen, 1927 is a solitary ascidian, probably Australian in origin (Monniot et al., 2001) dwelling in shallow rocky littoral habitats, particularly bays and harbours.

This species is frequently confused with the very similar species *Microcosmus exasperatus* (Monniot, 1981; Monniot et al., 2001). The two species differ only in some particular internal characters, such as the shape of siphonal spines. In particular *M. squamiger* spines are very short (similar to rounded scales), about 15–25  $\mu\text{m}$  long, with a characteristic fingernail shape with serrated rims (Kott, 1985; Monniot et al., 2001), while *M. exasperatus* present pointed spines about 40–50  $\mu\text{m}$  long with open base posteriorly hooked (Kott, 1985; Monniot et al., 2001).

*Microcosmus squamiger* which seems to have an invasive potential (Turon & Nishikawa, 2005), is actually present in southern California (Lambert & Lambert, 2003), in South Africa (Monniot et al., 2001), in the western Indian Ocean (Monniot, 2002), in the Hawaii Islands (Godwin, 2003). In the Mediterranean Sea specimens of *M. squamiger* have been recorded in several harbours and coastal bays from Bizerte (Tunisia), to Savona, Taranto, Imperia (Italy), Porto Vecchio (Corsica) (Monniot, 1981; as *M. exasperatus*), Magra river estuary (Italy) (Morri et al., 1989 as *M. exasperatus*), Spain (Turon, 1987) and Gibraltar Strait (Algeciras Bay) (Spain) (Naranjo et al., 1996) (Figure 1). This species is often clustered in groups of 6–7 individuals of different sizes, as a result of an epibiotic intraspecific relationship. Its wide but discontinuous distribution is probably due to its diffusion as a fouling species (Lambert & Lambert, 2003; Godwin, 2003).

In this note the first record of *M. squamiger* from the central Tyrrhenian Sea, the harbour of Salerno, is reported (Figure 1). Other non-indigenous species, are previously reported for this area, such as the algae *Caulepa racemosa* var. *occidentalis* (Gambi & Terlizzi, 1998), the mollusc *Bursatella laechei*, the polychaetes *Lumbrineris inflata*, *Branchiomma luctuosum*, *Pileolaria* sp. and *Spirorbis marioni* (Gambi, 2000; Dappiano, 2005), and the isopods *Paracerceis sculpta* and *Mesanthura* sp. (Lorenti et al., in press).

The present study has been carried out within the framework of wider research aimed at checking for the presence of non-indigenous species along the Italian coasts (Gambi, 2000; Dappiano, 2005).

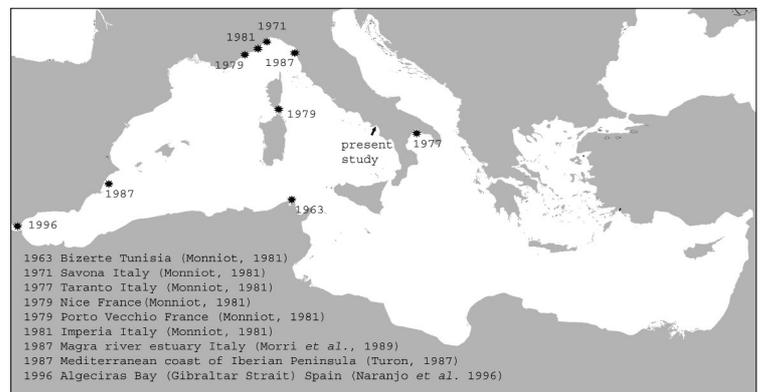


Figure 1. Previous records of *Microcosmus squamiger* in the Mediterranean Sea, and location of the new record reported in this study.

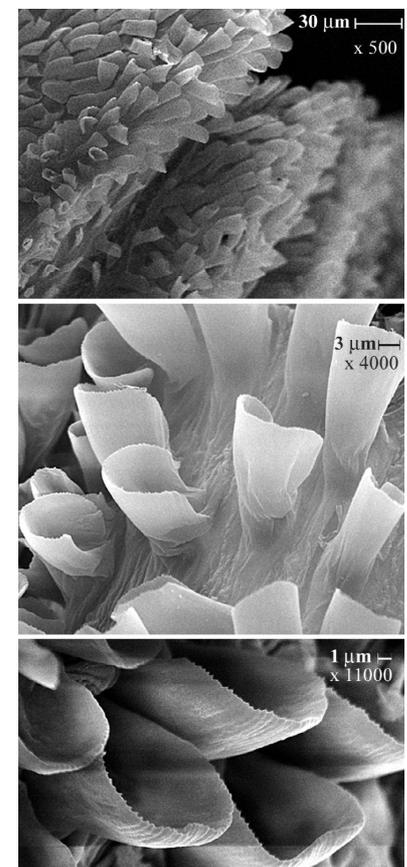


Figure 2. Siphonal spines of *Microcosmus squamiger* collected in Salerno harbour.

Samples were collected in March and September 2000 scraping the substratum over fixed surfaces of 20x30 cm (600 cm<sup>2</sup>) in seven stations located one outside and six inside the harbour. In each station samples were collected along three depth levels at 2, 4 and 6 m. Scraped material, mostly consisting of macroalgae, encrusting calcareous organisms (barnacle tests and bryozoan colonies), and ascidians, was collected directly into a 400- $\mu$ m mesh bag, brought to the surface and then preserved in 10% formalin for subsequent sorting by species.

A total of 48 specimens of *M. squamiger* were collected exclusively in September 2000. In particular, a group of 46 little specimens (total length <1.5–2 cm) was found in the station barely outside the harbour on the breakwater rocks along the mole at 2 m depth, while the other two specimens, one of large size (3.5 cm total length) and the other epibiotic on the former (1 cm of total length), were found at one of the stations located on the internal pier of the harbour at 4 m depth. In both sites *M. squamiger* was associated with the non-indigenous sabellid polychaete *Branchiommata luctuosum*, and with macroalgae such as *Valonia utricularis*, *Corallina elongata*, *Jania rubens* and *Ulothrix flacca* at the station outside the harbour and with the encrusting bryozoa *Schizobrachiella sanguinea* and *Schizoporella errata* at the station inside the harbour.

The morphology of the specimens was in agreement with the last descriptions of the species by Kott (1985) and Monniot et al. (2001). In Figure 2 the scanning electron microscopy (SEM) photographs of the siphonal spines of *M. squamiger* collected in Salerno harbour are reported, in which their fingernail shape scales, with their characteristic serrated rims, is evident.

Finally, the ability of this opportunistic species to form, in a short period, dense and mono-specific aggregations (Lambert & Lambert, 2003; Turon & Nishikawa, 2005), its remarkable tolerance to wide ranges of temperatures and salinity and its high capacity to live also in a degraded environment, indicates that this species is a real competitor to the native species (Lambert & Lambert, 2003). In fact in the harbours of Taranto and Genoa, in which this ascidian was recorded in the 1970s (Monniot, 1981 as *M. exasperatus*) the population of *M. squamiger* has significantly increased (Mastrototaro et al., 2004; personal observation).

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