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Scientific note

Sea spider as mussel substrate – a light and scanning electron microscopic view on a Northern Adriatic fouling community

(Chelicerata: Pycnogonida and Mollusca: Bivalvia)

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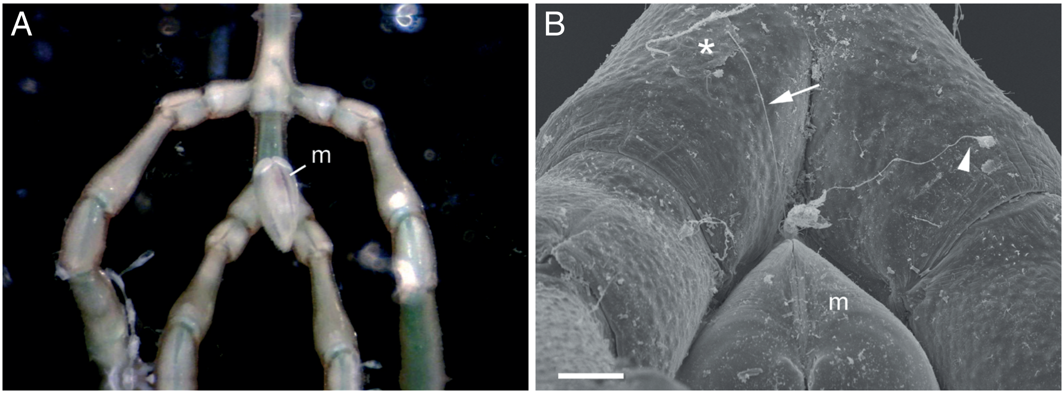

Fig. 1. *Musculus* sp. on *Endeis charybdaea*, viewed from ventral. **A.** Macrophoto, not to scale. **B.** SEM picture: **asterisk**, attachment zone of byssus; **arrow**, silk filament still attached to attachment zone after SEM preparation; **arrowhead**, another filament with „end button"; **m**, mussel; bar: 100 µm.

When studying sea spiders (Chelicerata: Pycnogonida), one can observe specimens covered with a mix of detritus and both unicellular and small multicellular epibionts, e. g. diatoms, sessile flagellates, bryozoans, but also quite „clean" ones. In their review on pycnogonid epibiosis, Arnaud & Bamber (1987) report that the degree of coverage may be related to moult cycles. It is near at hand to assume the coverage of sea spiders may provide camouflage. Contrary to actively induced camouflage, as is known, e. g., for decorator crabs (Brachyura), in sea spiders camouflage seems to be a side-effect rather than a phenomenon the animals bring to pass actively.

While identifying pycnogonid specimens (*Endeis charybdaea* (Dohrn, 1881) and *Endeis spinosa* (Montagu, 1808)) sampled from a mussel dominated fouling community (Mytilidae) growing on the anchor chain of a sensing probe off Rovinj (Croatia, Istria; courtesy by M. Pfannkuchen, Center for Marine Research; Coordinates: 45.08337 N, 13.6046 E, 1.5 m depth, collected on the 8th of June 2023), we found a specimen of *E. charybdaea* that had a juvenile bivalve firmly attached with byssus under its body between leg pair four (Fig. 1A). The juvenile mussel with some probability could be attributed to *Musculus* Röding, 1798 sp. (Mytilidae; Alf et al. 2020). The firm attachment of the mussel to the sea spider indicated that we had found a long-term rather than a short-term association between the two species.

Hence, after critical-point drying and gold-sputtering of the specimen, we used a Leica 1430 VP scanning electron microscope (SEM) to have a closer look. Though a big part of the byssus had been detached during SEM preparation, a roundish plaque of mussel secretion became visible on the sea spider's body, plus a few remaining silk strands connecting the two animals (Fig. 1B). This specimen informs two aspects that are of interest: (i) the type of at-

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tachment of byssus to arthropod cuticle and (ii) the rare association between bivalve and sea spider, in which the mussel must have settled on the sea spider the same way as on its usual immovable and solid substrate. Young post-larval mytilids are known to do byssus drifting to find new attachment sites (Lane et al. 1985). Considering the fact that sea spiders are very slow animals with phases of immobility, our observation seems not totally deviant; a probable explanation might be that the pycnogonid has become the settlement site of a drifting mytilid. Furthermore, the position of the mussel on the body indicates that the sea spider might not just tolerate the mussel; instead, it might be unable to remove it because the attachment site seems out of reach of its legs. In addition to the case reported here, one consistent mollusc–pycnogonid association is known, i. e. that of the gastropod *Dickdellia labioflecta* (Dell, 1990) parasitizing colossendeids (Lehmann et al. 2007).

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