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NOTES ON *HYDROIDES ELEGANS* (HASWELL, 1883) AND *MERCIERELLA ENIGMATICA* FAUVEL, 1923, ALIEN SERPULID POLYCHAETES INTRODUCED INTO THE NETHERLANDS

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ABSTRACT

The occurrence of *Hydroides elegans* in Dutch waters is observed for the first time. Differences with *H. norvegica* are discussed. Possible ways of introduction of *H. elegans* and *Mercierella enigmatica* are discussed.

INTRODUCTION

In 1972 a visit was paid to the Kanaal door Walcheren, a brackish canal in the province of Zeeland, south-western part of the Netherlands, near the harbour of Vlissingen (Flushing). The water of this canal is warmed by the cooling system of electricity works to a level 3-5°C higher than comparable natural waters. The quay-walls were covered by a belt of tube-worms (*Mercierella enigmatica* Fauvel, 1923), at least 15 cm thick, for the first time observed in these waters by Wolff (1969). Although the worm occurs up to the waterlevel, it thrives mainly at a depth of about ½ meters. A thorough survey of the collected material revealed no other serpulids.
In 1973 another visit was paid, mainly to obtain live *Mercierella*. When the material had been placed in an aquarium, a different type of tube-worm appeared to be present as well, *Hydroides elegans* (Haswell, 1883), a typical fouling species.

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MATERIAL STUDIED

Hydroides elegans (Haswell, 1883)

Netherlands, Vlissingen, Keersluisbrug, near power station, on piling, about 1 m deep, Ten Hove leg., 25.IX.1973 (about 100 specimens, collection Ten Hove (tHU) 192, ZMA V Pol. 2613).

Localities outside the Netherlands, mainly from harbours, together about 600 specimens; England, Sussex; France, Marseille; Italy, Savona, Genoa, La Spezia, Naples, Taranto; Malta, Valetta; Tunisia, Lake of Tunis; Ghana; Moçambique, Morrumbene estuary; Ceylan, Colombo; Argentina, Buenos Aires; Curaçao, Schottegat. Material in collection tHU nrs. 82/84, 91/92, 98/100, 105/109, 151, 160, 205; ZMA V Pol. 2614; BMNH 1937.11.9, 1953. 3.1. 980-1030, 1955.4.1. 59-79, 1955.11.1, 1959. 12.16.14-18; RMNH 932.

Hydroides norvegica Gunnerus, 1768

Netherlands, Den Helder, aquarium of Netherlands Institute of Sea Research (NIOZ), from *Cancer pagurus* from North Sea, Ten Hove leg., X.1966 (3 specimens, tHU 76); Den Helder, harbour, from boulder aboard m.s. HD 75, somewhere from North Sea, Ten Hove leg., 13.I.1967 (2 spec., tHU 77); IJmuiden, on cinder cast ashore, Stock leg., 9.XII.1950 (10 spec., ZMA V Pol. 464/1); Noordwijkerhout, beach, Lucas leg., 24.X.1948 (1 spec., ZMA V Pol. 462); Noordwijk, on bunch of cork, cast ashore, Lacourt leg., 20.I.1951 (2 spec., ZMA V Pol. 464/2).

Localities outside the Netherlands, mainly from 30-60 m depth, together about 150 specimens: Norway, Finnmark, Bodö, Fosenheia; England, Scarborough, Liverpool Bay; France, Bay of Concarneau, Nice. Material in collection tHU 80, 90, 93, 104, 200; RMNH; ZMA V Pol. 460, 461, 463; NRS 6878.

Mercierella enigmatica Fauvel, 1923

Netherlands, Vlissingen, inner harbour, L. de Wolf leg., W.J. Wolff det. (empty tubes, tHU 78); Vlissingen, Keersluisbrug, near power station, on piling, about 1 m deep, Ten Hove leg., 6.IV. 1972, 25.IX.1973, 2.IX.1974 (1000 or more specimens, tHU 169, 191; ZMA V Pol. 2615).

Localities outside the Netherlands, all brackish, together about 100 specimens: Tunisia, Lake of Tunis; Argentina, Buenos Aires; Hawaiian Islands, Oahu. Material in collection tHU 85, 150, 163.

TAXONOMICAL REMARKS

For a long time *Hydroides elegans* has been confused with *Hydroides norvegica*, as for instance in Hartmann-Schröder (1971b). However, Zibrowius (1971, 1972, 1973a) clearly demonstrates that the binomen *H. norvegica* as used by many authors should be split into several species. In the Mediterranean *H. norvegica* s. str. is a typical circalitoral (sublitoral) species of non-polluted waters, and *H. elegans* a typical harbour fouling species.

Outside the Mediterranean *H. norvegica* s. str. occurs in North Atlantic waters (from N. Norway down to Morocco; Zibrowius, 1973b: 40), *H. elegans* is found around the world in tropical and subtropical seas. *H. elegans* has also been reported from the artificially heated water of Shoreham Harbour Canal (English Channel) and Swansea (Bristol Channel), both under the name of *H. incrustans* Monro (Monro, 1938; Gee, 1963).

The main difference between *H. elegans* and *H. norvegica* may be found in the collar setae, with a subapical denticulate zone in the first species, and without it in the second species (Zibrowius, 1971: 720). Although in general this is correct, the setae should be examined critically. This has been done by Mr. W. van Leeuwaarden (unpublished), whose work is thankfully acknowledged. He analyzed the taxonomic importance of the collar setae in the genus *Hydroides*, mainly from the Caribbean. His conclusion, based on 200 slides of 13 species, is that the collar setae can be used for distinction on species-level only exceptionally.

Using Van Leeuwaarden's material and report as a

basis, the author restudied his slides, and also examined some additional material. Alltogether 70 specimens of *H. elegans* and 25 of *H. norvegica* have been studied for the collar setae.
All seventy slides of *H. elegans* show a markedly constant form of collar setae, as illustrated in figs. 1-3. The collar setae of *H. norvegica* (figs. 4-9) show a great variation in form, with one to three, usually two teeth, and sometimes with a slight indication of a subapical denticulate zone.
Further differences between the species may be found in the operculum and tube. Moreover, experimental research points in the direction of a specific difference. Gee (1963: 710-712) finds "a significant lowering in viability of the hybrids" of *H. norvegica* x *H. elegans* (under the name *H. incrustans*), and concludes "Inter-fertility, however, is greatly reduced, suggesting speciation is occurring" assuming that the latter is a physiological warm-water race of the former. Wolsky (1952: 346, 1955: 76) and Issekutz-Wolsky & Wolsky (1958: 611) signalize differences in the way of cleavage rate of eggs of *H. norvegica* from Kristineberg (Sweden) and Naples (Italy); the latter material most probably belongs to *H. elegans*. The tube of *H. norvegica* contains no aragonite, tubes of *H. elegans* have 18-21% aragonite (Bornhold & Milliman, 1973: 370).

ECOLOGICAL REMARKS

Interesting questions such as: from where *Mercierella* and *Hydroides elegans* have been imported, and by which means, can never be solved with certainty. Transport in the larval stage, either by sea currents or in the ballast tanks of ships may be possible, since both species have planktonic larvae. The length of the planktonic life is not exactly known, but it lasts at least one week. Estimations for *Mercierella* vary from at least one month under laboratory conditions (Mathias & Izac, 1963: 831), to about one week (Vuillemin, 1965: 160) or not more than one month (Fischer-Piette, 1937: 200). The difference between the estimations might be explained by a partial development of the larvae inside the parent tube (Fischer-Piette, 1937: 203), however, this is not recorded again in the remaining extensive literature concerning this species. Hill's (1967: 311) record for *Mercierella* from Lagos of 4-5 weeks is based on the related species *Neopomatus ushakovi* (Hartmann-Schröder, 1971b: 20).
For *H. elegans* the following data are given: 6-7 days (Wisely, 1958: 357), 15 days (Vuillemin, 1965: 215), and 21 days or more (Sentz-Braconnot, 1964: 386), in all instances as *H. norvegica*. Eleven days after cleaning the aquarium, an operation which will have provoked shedding of sexual products, young *H. elegans* already had a tube-length of 3 mm, giving an estimation of duration of planktonic life at about 21°C of 7-9 days (unpublished record, Ten Hove, July 1974).
Hydroides dianthus has a planktonic stage of at least 10 days (as *hexagonis*, Grave, 1933: 381); *Pomatoceros triqueter* has one of 3 weeks (Segrove, 1941: 472) or of 10-15 days (Føyn & Gjøen, 1953: 75).
Both species are "well known foulers" on ships' bottoms, upon which they settle in spite of relatively high velocities (Wood, 1955: 37, 2.0-2.8 km/h; Vuillemin, 1965: 221, 1.6-2.2 km/h). Actual presence on ships' bottoms of *H. elegans* has been observed for instance by Anonymous (1952: 193) and Allen (1953: 310) as *H. norvegica* and by Zibrowius (1971: 722, 1973b: 42), of *Mercierella* by Anonymous (1952: 139), Dumitrescu (1962: 66), Bogoroditsky (1963: 28), Rullier (1964: 96-98) and Wolff (1969: 90), few selected references only.
Although many authors explain the distribution of some marine invertebrates through transport by ships, only few of them give facts (e.g. Allen, 1953, Bertelsen & Ussing, 1936, perhaps also Wesenberg-Lund, 1941: 43).
There are not many data on the age at which serpulids become mature . Hill (1967: 313) gives four weeks or more for *Neopomatus ushakovi* (as *M. enigmatica*). Fischer-Piette (1937: 200). supposes maturation within a few weeks, though spawning generally does not happen until next season, while Vuillemin (1965: 179) gives 4 months for *M. enigmatica*. *Hydroides dianthus* is sexually mature in 59 days (Grave, 1933: 381), but might be so more early, since 38 days after artificial fertilization it has 21 abdominal segments (as *H. uncinatus*, Vuillemin, 1965: 210), a stage at which *H. elegans* is mature (as *H. norvegica*, Vuillemin, 1965: 221; Ranzoli, 1957: 209).

Orton (1913: 316) and Føyn & Gjøen (1953: 77) state that *Pomatoceros triqueter* is mature at 4 months. It is evident that artificial spawning by breaking of tubes (during the cleaning of ships' bottoms) already may occur within a few weeks after settling took place.

Based upon this partly circumstancial evidence (not meant to be complete) the most probable conclusion is that *Mercierella enigmatica* as well as *Hydroides elegans* have been introduced on ships' bottoms, the former species in 1967 (Wolff, 1969: 90), the latter species maybe between April 1972 and September 1973.

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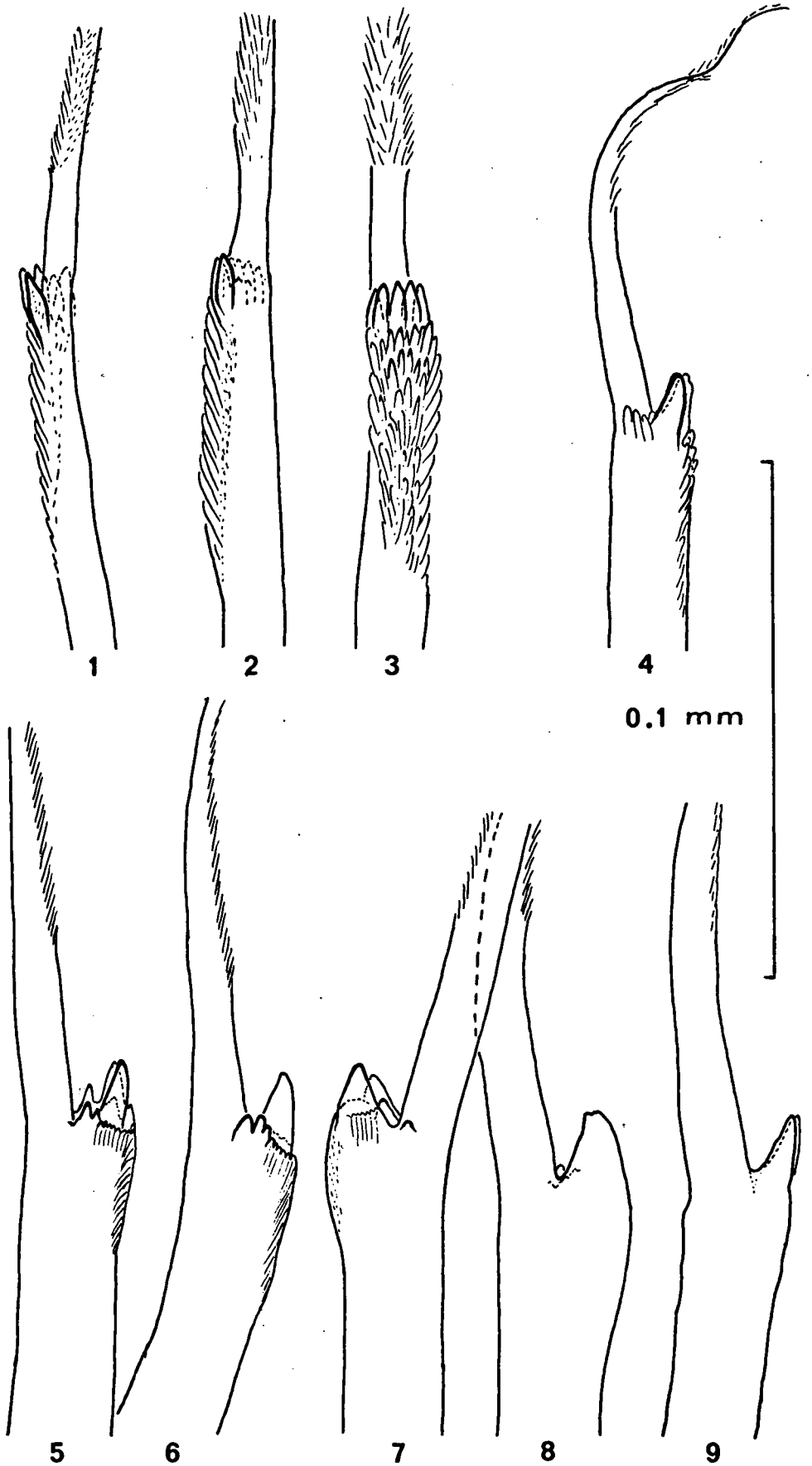
Legend to the figures on the opposite page

Figs. 1-3. Collar-setae of *Hydroides elegans*, various views: large subapical denticulate zone, six or seven small teeth, well defined apical hairy zone. Fig. 1 from Marseille (collection Ten Hove Utrecht 83). Figs. 2-3 after a specimen from Lake of Tunis (tHU 82).

Figs. 4-9. Variation in the collar-setae of *Hydroides norvegica*: the series shows a gradual change from subapical denticulate zone to smooth subapical zone. Fig. 4, two large teeth, small subapical denticulate zone, well defined apical hairy zone; Fig. 5, two large teeth, four small teeth, coarsely striated subapical zone, well defined apical hairy zone; Fig. 6, two large teeth (one broken), three small teeth, striated subapical zone, well defined apical hairy zone; Fig. 7, two large teeth, two small teeth, faintly striated subapical zone, well defined apical hairy zone; Fig. 8, one large tooth, no subapical denticulate zone, well defined apical hairy zone; Fig. 9, two large teeth, no subapical denticulate zone, poorly expressed apical hairy zone. Fig. 4 from 63°N, 09°E (Norway; tHU 90). Figs. 5-8 from one specimen off Scarborough (North Sea; tHU 80). Fig. 9 from North Sea (tHU 77).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