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Notes on Norwegian marine Amphipoda. 8. Amphipods found in association with sponges and tunicates

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Nineteen amphipod species in seven different families have been recorded living on or in Porifera and/or Tunicata in Norwegian waters. Of these *Laothoes meinerti*, *Cheirimedon latimanus* and two species of Paramphithoidae are confined to sponges, while *Lysianella petalocera*, *Orchomene* spp., *Andaniella pectinata* and *Stenothoe marina* have been collected from ascidians, but not from sponges. The most common symbiotic amphipods in Norwegian waters are *Leucothoe spinicarpa*, *Aristias* spp. and *Perrierella audouiniana*; these amphipods, and also *Amphithopsis longicaudata*, *Tritaeta gibbosa* and *Phippsiella similis* have been found both in association with sponges and with ascidians.

Little is known about the biology of any of these associations.

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This note compiles published and unpublished records of associations of Norwegian amphipods with sponges and ascidians. This has been done because no such listing exists and many records consequently tend to be overlooked, and also to impress the fact that a considerable number of amphipod species can live both in sponges and in ascidians. This survey is restricted to Norwegian (inclusive Skagerak and Bohuslän) and Spitsbergen waters. I know of no Norwegian amphipods species, however, that have been recorded in association with sponges and ascidians abroad, but not in Norway, with the possible exception of associations from very

shallow water (Frith 1977, Peattie & Hoare 1981).

In the following list only original records are mentioned, not compilations (like Arndt 1933). The correct names of the host sponges and ascidians are in many cases not known, and host identifications therefore will not usually be given here. The amphipods are listed in alphabetic order of families, genera and species. My own unpublished data have been included.

Calliopiidae

Amphithopsis longicaudata Boeck

Porifera. Generally considered to be a sponge

associate in Norway, but very few published records. Vader (1984b) has reported on specimens found on *Geodia* in western Norway. Schiecke (1973) has studied the closely related Mediterranean species *A. depressa* Schiecke. These apparently are ectocommensals, that filter the feeding current of the host sponge.

Tunicata. A single specimen recorded from *Ascidia obliqua* in N. Norway by Aurivillius (1886). I have also found a single specimen in *Ascidia* sp. in the same area.

Laothoes meinerti Boeck

Porifera. A few records from *Geodia* and *Mycale* in western Norway (Vader 1984b). Nothing is known of the biology of any *Laothoes* species.

Dexaminiidae

Dexamine thea Boeck

Porifera. Stephensen (1929) listed this species among 'Amphipoden, die in Schwämmen leben' and Stock (1966) collected a single specimen from *Halichondria* in the Netherlands. As earlier discussed (Vader 1969a) I believe these records to be incidental. *Dexamine thea* is an algal dweller.

Tritaeta gibbosa (Bate)

Porifera. This is one of the best known sponge associates among the amphipods (cf. Fage 1928, Jones et al. 1973). *Tritaeta gibbosa* is not very common in Norway, however, and my observations from the Bergen area seem to be the only published ones from sponges in Scandinavia (Vader 1969).

Tunicata. Also the association of *Tritaeta* with ascidians is well known in the Mediterranean and in western Europe (e.g. Della Valle 1983, Chevreux & Fage 1925, Hamond 1967). I have twice collected the species from ascidians in western Norway, the first such records from this country.

Leucothoidae

Leucothoe spinicarpa (Abildgaard)

Porifera. Many *Leucothoe* spp are well-known sponge associates, but published information in Scandinavia is curiously scarce; the only record I have been able to find is a single specimen from Bohuslän taken from *Mycale lingua* (Oldevig 1959). Nevertheless, *Leucothoe spinicarpa* (but not *L. lilljeborgi* Boeck) is also in Norway

a common associate of many different sponge species; the species is most common in soft-bodied species like *Mycale* spp., but has been collected from *Geodia*, both in western and northern Norway (Vader 1970b, 1984 a,b). It often is found together with *Aristias neglectus* Hansen.

Tunicata. Although *Leucothoe spinicarpa* in Norway is as often found in sponges as in tunicates, the latter association is much better documented (Sars 1890—95, Stephensen 1929, 1945—42, Oldevig 1959). I have found *L. spinicarpa* regularly in many different ascidian species and both in western and northern Norway.

Lysianassidae

Aristias megalops Sars

Porifera. This very rare species was recently rediscovered in northern Norway (Vader 1984a). It lives in an unidentified soft-bodied sponge that grows on the valves of the Iceland scallop *Chlamys islandica* (Müller).

Aristias microps Sars

Tunicata. Found once in an ascidian near Tromsø, together with *Lysianella petalocera* (Schneider 1926).

Aristias neglectus Hansen

Porifera. As with *Leucothoe spinicarpa* there are no Norwegian records of the occurrence of *Aristias neglectus* in sponges, except those recorded by the present author (Vader 1969b, 1970a,b, 1984a). Oldevig (1959) reported *A. neglectus* from several sponge hosts on the Swedish coast.

In fact, *Aristias neglectus* is by far the most numerous amphipod associate of sponges in western and southern Norway, at least in water deeper than 50 m. Many different sponge species may serve as hosts, with a definite preference for voluminous soft-bodied sponges. *Mycale lingua* is the most frequently infested species, while there are usually only a few specimens found on (and never in) *Geodia*. In favourite sponge hosts all *Aristias* species are found distributed all through the host, not concentrated in the more superficial layers of the sponges.

Tunicata. As with *Leucothoe spinicarpa*, the frequent occurrence of *Aristias neglectus* within the branchial cavity of ascidians has been recorded by many Scandinavian authors (Lilljeborg 1868, Sars 1890—95,

Norman 1900, Stephensen 1929, 1935—42, Oldevig 1959). In spite of this and the regular occurrence of *A. neglectus* inside ascidians also in my samples, the number of *A. neglectus* in ascidians in Norway is several orders of magnitude smaller than those in sponge hosts.

Aristias tumidus (Krøyer)

Porifera. No published Norwegian records, but recorded from sponges in Spitsbergen (Goës 1866) and the Russian Arctic (e.g. Brügger 1909). I have found *A. tumidus* several times, occasionally in large numbers, in sponges in the Tromsø area and in Finnmark waters.

Tunicata. Many records from Spitsbergen waters (Goës 1866, Aurivillius 1885, Schellenberg 1925). I have also found single specimens in ascidians in the Tromsø area.

Cheirimedon latimanus (Sars)

Porifera. This rarely collected species, that probably does not rightly belong in the genus *Cheirimedon* Stebbing (cf. Barnard 1969), may be a sponge associate. It has been found a few times on *Geodia* in western Norway (Vader 1984b). Nothing is known on its biology.

Lysianella petalocera Sars

Tunicata. Another rarely collected species. Nothing is known about its biology, but it has been found so often on and in ascidians, both in northern Norway (Schneider 1926, Vader, pers. obs.), western Norway (Vader, pers. obs.) and western Sweden (Oldevig 1959), that this appears to be its regular niche.

Orchomene species

Tunicata. *Orchomene* species are well-known unspecialized demersal scavengers, often taken in baited traps (Oleröd 1975). There are a few isolated records from ascidians. *Orchomene hanseni* Meinert has once been taken in the branchial cavity of an *Ascidia* sp in western Norway by Paavo Tulkki (unpubl. observ.), while Stephensen (1929) mentioned *O. humilis* (Costa) as having been found 'among Ascidians' in the same area. Finally, Schneider (1926) reported to have found a specimen of *O. serrata* Boeck in an Ascidian. The Antarctic *Orchomenella macronyx* Chevreux seems to be a more regular associate of ascidians (Schellenberg 1931, Barnard 1932); for a Mediterranean record of *O. humilis* from an ascidian see Soika (1950).

I have never come across this association myself.

Perrierella audouiniana (Bate)

Porifera. As described by Bonnier (1893) this species is a common associate of European sponges. In contradistinction to *Aristias* spp, *Perrierella* is usually found in the superficial layers of the sponge host only; according to Bonnier (op.cit.) it constructs a shallow burrow similar to that of *Trietaeta gibbosa* (Bate).

The association of *Perrierella* with sponges has in Scandinavia only been reported by Stephensen (1929) and Oldevig (1959). In the Bergen area of western Norway *P. audouiniana* is the most common amphipod associate of sponges at depths of 20—50 m; at greater depths it is usually outnumbered by *Aristias neglectus* and *Leucothoe spinicarpa*, but I have caught single specimens from depths down to 250 m. In northern Norway I have never seen the species.

Tunicata. I have found *P. audouiniana* twice in *Ascidia* sp. in western Norway. Similar associations have been recorded from Britain (Norman 1900).

Melitidae

Maera othonis (M. Edw.)

Porifera. A single record from *Mycale lingua* in western Sweden (Oldevig 1959) is probably incidental.

Paramphithoidae

Epimeria tuberculata Sars

Porifera. Found once 'in the grooves of *Geodia*', together with *Phippsiella similis* (Sars) in the Trondheimsfjord (Stephensen 1935—42).

Paramphithoe hystrix (Ross)

Porifera. I have found this species a few times on unidentified sponges in northern Norway and Spitsbergen. Oshel and Steele (in press) have recently shown that *P. hystrix* feeds on sponges, even ingesting the spiculae.

Stegocephalidae

Andaniella pectinata (Sars)

Tunicata. To my knowledge this is the only stegocephalid amphipod that has been regularly found in the branchial cavity of ascidians; there is also at least one record of *Andaniotes corpulentus* within *Ascidia*

tenera (Schellenberg 1931). *A. pectinata* has been found in the branchial cavity of different ascidian hosts from Greenland (Aurivillius 1885, Hansen 1887), Spitsbergen (Aurivillius 1885, Schellenberg 1925), Northern Norway (Aurivillius 1886, Vader, unpubl. observ.) and Western Norway (Sars 1890–95, Vader, unpubl. observ.), too frequently to be incidental. Nothing is as yet known, however, on the biology of the association.

Phippsiella similis (Sars)

Porifera. This species is often found on sponges, especially *Geodia* spp (Stephensen 1925, 1935–42, Vader 1984b). A similar association has been inferred for the tropical stegocephalid *Andaniexis spongicola* Pirlot (Pirlot 1933a).

Tunicata. I have found a single specimen of *Phippsiella similis* in the branchial cavity of a *Phallusia* sp in western Norway, together with a specimen of *Perrierella audouiniana* (Vader 1984b).

Stegocephalus inflatus Krøyer

Porifera. This is a common species on deep-water hard-bottom. It is also regularly found in *Geodia*-samples, without however showing any preference for them (Vader 1984b). Oldevig (1959) collected a single specimen from *Mycale lingua* in Sweden.

Stenothoidae

Stenothoe marina (Bate)

Tunicata. This common European species that is usually found among hydroids in hard-bottom epifauna communities, also turns up regularly inside ascidians, as first mentioned by Sars (1890–95). This association is not rare in western Norway and recorded both by Tulkki (unpubl. observ.) and by the present author. Other European Stenothoidae that have found in ascidians are *Metopa groenlandica* (Stephensen & Thorsen 1936), *Microstenothoe ascidiae* Pirlot (Pirlot 1933b) and *Stenothoe valida* Dana (Stephensen & Thorson 1936); the latter species is also a well-known associate of sponges (e.g. Chevreux & Fage 1925, Pearse 1934, Krapp-Schickel 1976).

DISCUSSION

If we exclude the most doubtful cases (*Dexamine thea*, *Maera othonis* and *Stegocephalus inflatus*) 19 different amphipod species have been recor-

ded from sponges and/or ascidians; they represent 14 genera and no less than 7 different families. This scattered occurrence, coupled with the lack of obvious gross morphological adaptations, makes it probable that symbiosis with sponges and ascidians is of comparatively recent origin among the Amphipoda and has evolved independently many times. A similar conclusion has earlier been drawn concerning amphipod associations with echinoderms (Vader 1979) and sea anemones (Vader 1983).

Of the 19 species listed, no less than 7 have been recorded both from sponges and ascidians. These include all the most common ones: *Leucothoe*, *Aristias* spp, *Perrierella* and *Tritaeta*, as well as *Amphithopsis* and *Phippsiella*. *Laothoes*, *Cheirimedon* and the two paramphithoid species have hitherto exclusively been found on sponges, while *Lysianella*, *Andaniella* and *Stenothoe marina* appear to be confined to ascidians.

The food ecology of the amphipod species involved and the interactions between amphipods and hosts are in most of these cases almost completely unknown, and only thorough studies of the type carried out on a few foreign sponge- or ascidian-associated amphipods (Fage 1928, Skogsberg & Vansell 1928, Thomas 1979, Thomas & Taylor 1981, Moore & Rainbow 1984, Oshel & Steele in press) will enable us to explain why e.g. *Aristias* species can live in hosts of many different phyla (Vader 1984a), while *Cheirimedon* may be confined to Porifera and *Lysianella* to Tunicata.

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