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SEA BENTHOS SURVEY

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ciation of Marine Science and Technology

International Council for the Exploration of the Sea  
Benthos Ecology Working Group

Commission of the European Communities  
Science Programme

31280

## TAXONOMY OF NORTH SEA BENTHOS

PROCEEDINGS OF A WORKSHOP ORGANIZED IN HELGOLAND 8-12 FEBRUARY 1988

EDITORS: CARLO HEIP<sup>(1)</sup> & ULRICH NIERMANN<sup>(2)</sup>

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Delta Institute for Hydrobiological Research  
Vierstraat 28  
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The Netherlands, 1989

Communication nr. 445

THE NORTH SEA BENTHOS SURVEY

Council of Europe  
European Association of Marine Science and Technology

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## PREFACE

Research on subtidal benthos has greatly expanded over the last decade with the increasing realisation of the importance of the sediment and its inhabitants in shallow coastal ecosystems and the applicability of this research in pollution studies. European cooperation in benthic research has also greatly increased through programmes such as COST 647 'Coastal Benthic Ecology' of the CEC and the creation of the Benthos Ecology Working Group within the International Council for the Exploration of the Sea.

Through the efforts of the Benthos Ecology Working Group, the benthos of the Southern North Sea was sampled quasi-synoptically in April-May 1986 with seven ships from five European countries using comparable methods. Ten laboratories from France, Belgium, The Netherlands, Germany and the United Kingdom joined the effort that will take about five years to complete. The North Sea Benthos Survey has been accepted as a network in the oceanography programme of the European Association of Marine Science and Technology in the Council of Europe and receives support from the Science Programme of the CEC.

The North Sea Benthos Survey made clear again that even in this area, which is amongst the best studied in the world, our lack of knowledge is still immense. Around one thousand macrobenthic species have now been inventarised and this number is even exceeded by the much less explored meiofauna. Also for quantitative purposes species determination is a prerequisite. One of the main problems encountered in treating the data is taxonomic: even well established laboratories with long traditions may have different opinions on the taxonomy of species even in well known genera. A workshop in which these differences could be discussed was generally felt to be of great importance. From 8-12 February 1988 the workshop on Taxonomy of North Sea Benthos was organised in Helgoland: 29 scientists participated, amongst which well-established taxonomists as well as graduate students.

It was a great success, not in the least due to the stormy setting. The crossing from Cuxhaven in gales of force 11-12 will remain in memories for a long time. Even hardy North Sea scientists had difficult times aboard the Friedrich Heincke and much organic matter was involuntarily added to the already large North Sea pool, though quickly replaced in a more liquid form once arrived upon the island.

We thank the Council of Europe and the Biologische Anstalt Helgoland who contributed financially to the success of the workshop. We also thank the Biologische Anstalt for lodging and providing us with excellent laboratory facilities.

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| Ockelmann             | Kurt W.    | Marine invertebrates: ecology, reproduction behaviour, especially in bivalves               | Marine Biological Lab<br>DK - 3000 Helsingør<br>0045 22 133 44                                                               |
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|                        |                   |                                                                                               |                                                                                                                                      |
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| Turkay                 | Michael           | Taxonomy, Ecology,<br>distribution of<br>crustacea Decapoda<br>Epibenthos of the<br>North Sea | Forschungsinstitut<br>Senckenberg<br>Senckenberganlage 25<br>D-6000 Frankfurt a.M. 1<br>069 - 7542240<br>Telex: 413129 sng d<br>idem |
| Neumann                | Volker            | Macrozoobenthos<br>North Sea                                                                  |                                                                                                                                      |
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| Kunitzer               | Anita             | Benthos of muddy bottoms<br>in the central and<br>southern North Sea                          | Alfred-Wegener-Institut<br>für Polar- und Meeres-<br>forschung<br>Columbusstrasse<br>2850 Bremerhaven<br>0471 - 4831325<br>idem      |
| Bosselman              | Annette           | Larvae and juveniles of<br>macrobenthos in the<br>German Bight                                | 0471 - 4831 333                                                                                                                      |
| Rumohr                 | Heye              | Benthicecology, Baltic<br>UW-TV/Photo<br>Benthic larvae + juv's<br>in-situ experiments        | Institut für Meereskunde<br>Dusternbrooker Weg 20<br>2300 Kiel<br>0431 - 880 2376<br>0431 - 5971 (from April)<br>idem                |
| Wrage<br>Voß           | Renate<br>Joachim | Macrozoobenthos Baltic<br>Macrozoobenthos of<br>Western Baltic &<br>Waddensea & German Bight  | Landesamt für Wasserhaus<br>halt u. Küsten Schleswig-<br>Holstein<br>Saarbrückenstr. 38<br>2300 Kiel 1<br>0431 - 676097<br>idem      |
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| Kröncke                | Ingrid            | Benthos of the Dogger<br>Bank                                                                 | idem<br>040 - 89693 177                                                                                                              |
| Niermann               | Ulrich            | Benthos of the eastern<br>German Bight                                                        | idem<br>040 - 89693 171                                                                                                              |

## SECTION I. METHODOLOGY

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Biologische Anstalt Helgoland

#### Echinodermata

For fixation good quality, buffered formaldehyd (4-5%) or alcohol (70-75%) can be used. When alcohol is used, washing with tap water is recommended. As formalin may corrode calcareous structures, the echinoderms should be transferred to alcohol (70%) as soon as possible. Live specimens can be relaxed by adding magnesium sulfate or icy salt water (fresh water) prior to fixation. Outlines and details of plates and calcarous appendages are more easily recognized when the specimens surface is dried.

For identification use Mortensen, T., 1927, Handbook of the Echinoderms of the British Isles; for material from Danish seas the Danish edition, Mortensen, T., 1924, Pighude (Echinodermer), Danmarks Fauna, is recommended. Juveniles of *Ophiura albida* and *Ophiura ophiura* can be identified using Webb, C.M. & P.A. Tyler, 1985, Marine Biology 89. A quantitative survey of echinoderms in the Central North Sea is presented in Ursin, E., 1960, Meddr Danm. Fish- Havsunders. N.S. 2.

#### Nemertean

In general, identification of nemerteans requires sectioning; though external and internal structures may help to identify families, genera or even species. Significant external features are general body shape, outline of cephalic region, presence of cephalic slits or grooves, number and arrangement of ocelli, opening of mouth and proboscis pore, presence of ventral sucker and caudal cirrus. Appropriate internal structures (distinguishes in specimens lightly flattened or transferred into glucerine) are cerebral ganglia, rhyncocoel, proboscis armature, intestine. Colour patterns of nemerteans may vary considerably, and is thus usually not sufficient for species identification.

For identification of nemerteans use Gibson, R., 1982, British Nemerteans, Synopsis of the British Fauna (New Series) 24. Nemerteans from Danish waters are described in Brunberg, L., 1964, *Ophelia* 1.

SUGGESTED PROCEDURE FOR FIXATION AND PRESERVATION OF BENTHOS SAMPLES  
(METAZOANS)

31223

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Except for larger macrofauna use:

2% formaldehyde (pure quality) in seawater or demineralized H<sub>2</sub>O, buffer with Borax so pH is at least 7,5 (prepare the fluid before use !); make sure that bulk samples are fixed throughout; if necessary exchange fluid; fixation time 1-2 days; then exchange formaldehyde solution as soon as possible with 70% ethanol (final concentration) after short washing with tap water (to remove salt).

This would be a good general method for most taxa of Metazoa.

Special methods:

1. Early spat of shelled molluscs are best kept in 90% ethanol after short washing with tap water. Store samples in the dark.
2. Larval molluscs: Best kept in Carriker's solution: 1 liter of filtered seawater + 10 ml of 40 or 30% formaldehyde (analytical quality) + 100 g of cane sugar and buffered with Borax to get pH of 8 (or slightly higher). Check pH !! (This medium is, however, not good for e.g. planktonic Crustacea).  
Store in darkness.
3. Really good material of polychaetes requires narcotizing with isotonic mgCl<sub>2</sub> before fixation in 2% formaldehyde.
4. When changing preservation fluids of bulk samples, use sieves with meshsize well below that used earlier during sampling.
5. Use for nomenclature the checklist of marine Molluscs from Hoisaeter, T. (1986) Sarsia 71: 73-145.

## Section II. Literature

A PRELIMINARY LIST OF LITERATURE FOR THE IDENTIFICATION OF JUVENILES AND LARVAE OF MARINE MACROBENTHIC BIVALVES (MOLLUSCA)

31284

A. Bosselman

Alfred Wegener Institut, Bremerhaven

AABEL, J.P. (1983): Morphology and function in postmetamorphal Abra alba (Bivalvia: Tellinacea). Sarsia, 68: 213-219.

ANSELL, A.D. (1962): The functional morphology of the larval and the post-larval development of Venus striatula (Da Costa). J. mar. biol. Ass. U.K., 42 (2): 419-443.

FOSSHAGEN, A. (1965): Bunnetvertebratlarver over et Venus-sam-funn i Oresund. Unpubl. cand. real. thesis, Univ. Bergen, 70 pp.

GAGE, J. (1966): The life-histories of the bivalves Montacuta substriata and M. ferruginosa, commensals with Spatangoids. J. mar. biol. Ass. U.K., 46: 499-511.

JØRGENSEN, C.B. (1946): Lamellibranchia. In: G. THORSON. Reproduction and larval development of Danish marine bottom invertebrates, with special reference to the planktonic larvae in the Sound (Øresund). Meddr. Kommn. Danm. Fisk. - og. Havunders., Ser. Plankton 4: 217-311.

LE PENNEC, M. (1980): The larval and post-larval hinge of some families of bivalve molluscs. J. mar. biol. Ass. U.K., 60: 601-617.

LUTZ, R.A. & H. HIDU (1979): Hinge morphogenesis in the shells of larval and early postlarval mussels (Mytilus edulis L. and Modiolus modiolus (L.)). J. mar. biol. Ass. U.K., 59: 111-121.

LUTZ, R.A., R.A. MANN, J.G. GOODSSELL & M. CASTAGNA (1982): Larval and post-larval development of Acartica islandica. J. mar. biol. Ass. U.K., 62 (4): 745-769.

REES, C.B. (1950): The identification and classification of lamellibranch larvae. Hull. Bull. mar. Ecol., III (19): 73-104.

RUMOHR, H. (1980): Der Benthosgarten in der Kieler Bucht-Experimente zur Bodentierökologie. Rep. Sonderforschungsbereich 95, Univ. Kiel, 55: 1-179.

SCHWEINITZ, E. & R.A. LUTZ (1976): Larval development of the northern horse mussel, Modiolus modiolus (L.), including a comparison with the larvae of Mytilus edulis L. as an aid in planktonic identification. Biol. Bull., 150: 348-360.

- WEBB, C.M. (1986): Post-larval development of the Tellinacean Bivalves Abra alba, Tellina fabula and Donax vittatus (Mollusca: Bivalvia), with reference to the late larva. J. mar. biol. Ass. U.K., 66: 749-762.
- WEBB, C.M. (1987): Post-larval development of the Bivalves Nucula turgida, Venus striatula, Spisula subtruncata and S. ellyptica (Mollusca: Bivalvia), (with reference to the late larva). J. mar. biol. Ass. U.K., 67: 441-459.

A BIBLIOGRAPHY ON COMMON LITERATURE OF IDENTIFICATION OF MACROZOOBENTHOS.

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(1) Alfred Wegener Institut, Bremerhaven

(2) Biologische Anstalt Helgoland

Crustacea

LINCOLN, R.J. (1979): British Marine Amphipoda: Gammaridea. 658 pp. British Museum (Natural History), London.

CHRISTIANSEN, M.E. (1969): Crustacea, Decapoda, Brachyura. 143 pp. Marine Invertebrates of Scandinavia, Universitetsforlaget, Oslo.

SMALDON, G. (1979): British Coastal Shrimps and Prawns. Synopses of the British Fauna (New Series), No. 15, 126 pp. Academic Press, London.

JONES, N.S. (1976): British Cumaceans. Synopses of the British Fauna (New Series), No. 17, 66 pp. Academic Press, London.

MAUCHLINE, J. (1984): Euphausiid, Stomatopod and Leptostracan Crustaceans. Synopses of the British Fauna (New Series), No. 30, 91 pp.

E.J. Brill/ Dr. W. Bachhuys, London - Leiden - Köln - København.

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Echinodermata

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WEBB, C.M. and P.A. TYLER (1985): Post-larval development of the common north-west European brittle stars *Ophiura ophiura*, *O. albida* and *Acrocrida brachiata* (Echinodermata : Ophiuroidea). Marine Biology 89: 281-292

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- THOMPSON, T.E. (1988): Molluscs: Benthic Opisthobranchs (Mollusca: Gastropoda). Synopsis of the British Fauna, No. 8, 368 pp. E.V. Brill, Leiden.
- GRAHAM, A. (1971): British Prosobranchs. Synopsis of the British Fauna (New Series), No. 12, 112 pp. Academic Press, London.
- GRAHAM, A. (1988): Molluscs: Prosobranch and Pyramidellid Gastropods. Synopsis of the British Fauna, No. 2, 680 pp., E.J. Brill, Leiden.
- JONES, A.M. and J.M. BAXTER (1987): Molluscs: Caudofoveata, Solenogastres, Polyplacophora and Scaphopoda. Synopsis of the British Fauna (New Series), No. 37, 123 pp. E.J. Brill/Dr. W. Bachhuys, London - Leiden - Köln - København.
- HOISAETER, T. (1986): An annotated check-list of Marine Molluscs of the norwegian coast and adjacent seawaters. Sarsia 71: 73-145 (with an extensive literature index).

## Polychaeta

- HARTMANN-SCHRODER, G. (1971): Annelida, Borstenwürmer, Polychaeta. Die Tierwelt Deutschlands, 58. Teil, VEB Gustav Fischer Verlag, Jena (out of print).
- HOLTE, T. (1986): Polychaeta, Terebellomorpha. Marina Invertebrates of Scandinavia, No. 7, 194 pp. Norwegian University Press.
- TEBBLE, N. and S. CHAMBERS (1982): Polychaetes from Scottish Waters, Part I: Family Polynoidae, 73 pp. Royal Scottish Museum, Edinburgh.
- CHAMBERS, S. (1985): Polychaetes from Scottish Waters, Part II: Families Aphroditidae, Sigalionidae and Polyodontidae. 38 pp. Royal Scottish Museum, Edinburgh.

- FAUCHALD, K. (1977): The Polychaete Worms. Definitions and Keys to the Orders, Families and General. 188 pp. Natural History Musum of Los Angeles County.
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A PARTIAL BIBLIOGRAPHY ON THE IDENTIFICATION OF THE POLYCHAETA  
FROM THE NORTH WEST ATLANTIC

31289

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- HARTMANN-SCHRÖDER, G. (1971). Annelida, Borstenwurmer, Polychaeta. In: Die Tierwelt Deutschlands, F. Dahl (ed.) 594 pp. Fischer Verlag, Jena.

- MIKKELSEN, P. and R. VIRNSTEIN (1982). An illustrated Glossary of Polychaete terms. Harbor Branch Foundation, technical report no. 46. A useful compendium of polychaete terminology with clear drawings.
- PETTIBONE, M.H. (1963). Marine Polychaete Worms of the New England Region. Aphroditidae through Trochochaetidae. Bulletin of the Natural History Museum, U.S. 227 (1): 1-356. Descriptions are short and some drawings are poor.
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NOTES ON SOME PROBLEMS IN THE DETERMINATION OF PHYLLODOCIDAE (POLYCHAETA)  
FROM THE NORTH SEA

31291

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During the course of the workshop held by the Benthos Ecology Working Group of ICES on Helgoland 8-12 February 1988, several problems in the determination of the phyllodocids have become apparent. Given the present status of the literature, several of these could be anticipated, while others were somewhat unexpected. Here, an attempt will be made to give some simple guidelines on what, in my opinion, are the solutions to these problems.

Eteone:

In most of the relevant literature, the species E. lactea and E. spetsbergensis are reported from North Sea waters. E. lactea seems to be a Mediterranean species that does not occur at our latitudes. Likewise, E. spetsbergensis is an Arctic species, that also does not appear to be present in the North Sea area. What we in fact have is, in my opinion, following the suggestion made by Eliason (1962), E. foliosa, originally described from the Atlantic coast of France. This conclusion is based primarily on details of the proboscis. E. foliosa differs from all other species of Eteone present in the North Sea in the relative length of the tentacular cirri (ventral cirri clearly longest) and in the usual absence of setae on segment 2 (one or two setae may be present on small animals, while other species of Eteone from this area have at least four per parapodium on this segment).

Eteone flava and E. longa are easily confused, as current keys primarily use the relative length of the dorsal cirri and of the prostomium for distinction. In my experience, the prostomium is quite contractile, and the latter character seems to be without importance. Regarding the dorsal cirri, one may encounter specimens in which the length of these organs is equal to the width. I have found that the most reliable character is the size of the dorsal cirrus relative to that of the neuropodium. In E. flava it is much larger than the neuropodium (about four times), while it is only somewhat larger in E. longa (up to about twice as large).

### Eulalia:

The existence of the newly described species E. mustela Pleijel, 1987 is not generally known. It has, however, on several occasions turned up in the North Sea material. This species belong to the E. bilineata-group (reduced median antenna and oval dorsal cirri), but is primarily characteristic in the extremely reduced median antenna, while resembles only a slightly elongated papilla and may easily be overlooked. If this antenna is not perceived, the specimen will probably key out as Pseudeulalia or Protomystides, both of which appear to be extremely rare in the northeast Atlantic area.

### Eumida:

Distinguishing E. sanguinea from E. bahusiensis may be very difficult using the literature presently at our disposal. However, E. bahusiensis appears to be a rather seldom species, which is quite distinct from E. sanguinea (at least when living adults are studied). The key character seems to be the same as that indicated in the Eteone flava/longa controversy. In E. sanguinea the dorsal cirri may, in extreme cases, be slightly broader than long, but they are never more than about twice as large as the neuropodium (while they are at least four times larger in adults of E. bahusiensis).

The largest contemporary problem in this genus (in our area) seems to be the report of Eumida (Pirakia) punctifera from the German Bight (Hartmann-Schröder & Stripp, 1968; Hartmann-Schröder, 1971; Gillandt, 1979). The specimens upon which these reports have been based differ greatly from E. punctifera from, for example, the southern coast of England. As has earlier been pointed out (Eibye-Jacobsen, 1987), the animals from the North Sea lack the characteristic pigmentation of E. punctifera and, most importantly, do not have the distinctively shaped presetal lobes on the neuropodia of this species. The reports from North Sea waters seem to be based on young animals, which, in my opinion, most likely belong to E. sanguinea. To my knowledge, genuine E. punctifera has yet to be found in the North Sea.

### Phyllodoce:

The greatest problem in this genus is the distinction between P. maculata and P. mucosa. Following Gillandt (1979) there has in recent years, especially among German workers, been a tendency to regard these species as synonymous (under the name of P. maculata). Material from the North Sea

clearly confirms my experience with specimens from inner Danish waters: the two species are clearly separate. There are important differences in pigmentation: 1) the prostomium is anteriorly dark brown in P. mucosa, only slightly pigmented in P. maculata; 2) segments 3 and 4 bear obvious, dark brown, transverse dorsal bands in P. maculata, while in P. mucosa they are marked only by the mediodorsal and two laterodorsal spots on each segment typical of the dorsum of both species; and 3) the ventral, anterior border of segment 1 is darkly pigmented in P. mucosa, while it is more or less unpigmented in P. maculata. These differences in pigmentation correlate with the only consistent morphological difference between the two species, which is the shape of the ventral cirri. The ventral cirrus is more or less pointed in P. mucosa, while it is rounded in P. maculata. It is, however, necessary to point out that the ventral cirri are usually longer than the neuropodium in both species. There are other, more subtle differences between the two species in the relative length of the tentacular cirri and the number of papillae in the lateral, longitudinal rows on the proximal part of the proboscis, but in these cases the ranges overlap.

The distinction between P. maculata and P. mucosa made by Hartmann-Schröder (1971), regarding the presence or absence of a ciliated ridge on the dorsal cirrus, seems to be based on preserved material. On live animals it is easily apparent that all species of Phyllodoce possess these ridges, this thus being a diagnostic character for the genus as a whole.

This workshop has brought to light several specimens of Phyllodoce longipes, a species which should be easily recognizable by the prolonged, digitiform supracircular lip of the presetal lobe on the neuropodium. The pigmentation of the anterior end has a superficial resemblance to that of P. maculata, in that two segments have dark, dorsal, transverse bands. However, in P. longipes these bands are on segments 4 and 5, not 3 and 4 as in P. maculata. Phyllodoce longipes is synonymous with P. jeffreysii (McIntosh, 1908) (see Parker, 1987), but is not mentioned in Hartmann-Schröder, 1971 under either name.

Several specimens of Phyllodoce rosea were also seen at this workshop. They were, however, usually labeled as P. subulifera, which has been shown to be synonymous with P. rosea (see O'Connor, 1987).

#### Sige:

Sige fusigera is treated in Hartmann-Schröder, 1971 under the name of Eumida (Sige) fusigera. Her description is confused, and obviously largely

follows that of Bergström, 1914 (under the name of Sige macroceros). As was indicated by Uschakov (1972) and later confirmed by Eibye-Jacobsen (1987), the following characters are, among others, to be found in S. fusigera: proboscis smooth (i.e. provided only with micropapillae), all tentacular cirri cylindrical or somewhat flattened (as in often seen in Eulalia viridis and Eumida sanguinea), segment 1 partially reduced dorsally, and the supraacicular lip of the presetal lobe on the neuropodium prolonged and digitiform.

Some additional points:

In closely related species (for example, Eteone longa/flava, Eumida bahusiensis/sanguinea and Phyllodoce maculata/mucosa), it may be expected that specific differences will not appear until at a later stage in the ontogeny of the animals. It is therefore in most cases meaningless to determine the specific identity of very small juveniles (as a rule smaller than 5 mm in length, and certainly less than 3 mm). This is not to be interpreted as ignorance on our part, but simply a reflection of developmental reality. We must in such cases be satisfied only to indicate the generic name unless exceptional information is available.

It is important, when comparing the parapodia of different species, that they be taken from approximately the same region of the body. As a rule, median parapodia should be used. Animals without a prostomium should not, of course, be determined.

Among the phyllodocids, as in many other polychaetes, pigmentation patterns may greatly facilitate specific determination. In my experience, the following procedure best preserves these patterns: narcotization in  $MgCl_2$  (usually impracticable in ecological work), fixation in 2% neutralized formaldehyde in seawater for 2-3 days, and preservation in 70% alcohol, which should be changed after about a week.

Finally, a list and a key will be given for those species of Phyllodoceidae which are known to occur in Danish and Swedish waters, and which should also be present in the North Sea. Besides these, there are a number of species, known from in or near the English Channel or from along the east coast of Great Britain, which may be expected to appear in material from the ICES sampling stations, especially in the southern and western regions of the North Sea: Eteone picta, Eulalia aurea, E. expusilla, E. ornata, E. tripunctata, Eumida punctifera, Hesionura elongata, Nereiphylla paretii, N. rubiginosa, Phyllodoce laminosa, P. lineata and Pterocirrus macroceros.

List of the Danish Phyllodocidae

*Chaetoparia nilssoni* Malmgren, 1867  
*Eteone barbata* (Malmgren, 1865)  
*E. flava* (Fabricius, 1780)  
*E. foliosa* Quatrefages, 1866  
*E. longa* (Fabricius, 1780)  
*E.suecica* Bergström, 1914  
*Eulalia bilineata* (Johnston, 1840)  
*E. mustela* Pleijel, 1987  
*E. viridis* (Linné, 1767)  
*Eumida bahusiensis* Bergström, 1914  
*E. minuta* (Ditlevsen, 1917)  
*E. ockelmanni* Eibye-Jacobsen, 1987  
*E. sanguinea* (Oersted, 1843)  
*Hesionura augeneri* (Friedrich, 1937)  
*Mystides caeca* Langerhans, 1880  
*Nereiphylla lutea* (Malmgren, 1865)  
*Notophyllum foliosum* (M. Sars, 1835)  
*Paranaitis kosteriensis* (Malmgren, 1867)  
*P. wahlbergi* (Malmgren, 1865)  
*Phyllodoce citrina* Malmgren, 1865  
*P. groenlandica* Oersted, 1843  
*P. longipes* Kinberg, 1866  
*P. maculata* (Linné, 1767)  
*P. mucosa* Oersted, 1843  
*P. rosea* (McIntosh, 1877)  
*Pseudeulalia exigua* Eliason, 1962  
*Pseudomystides limbata* (Saint-Joseph, 1888)  
*P.sp.* (presently being worked on by Mary E. Petersen, Zool. Mus., Copenhagen)  
*Sige fusigera* Malmgren, 1865

Key to the Danish Phyllodocidae

- 1: Two or three pairs of tentacular cirri, arranged on one or two segments...2
- 1: Four pairs of tentacular cirri, arranged on three segments

(ventral cirri of segment 2 may be short)...10

- 2: Two pairs of tentacular cirri, on one segment. Segment 2 without dorsal cirri. Four antennae. Nuchal papilla present...(Eteone)...3
- 2: Two or three pairs of tentacular cirri, arranged on two segments. Segment 3 without dorsal cirri. Four or five antennae. Nuchal papilla absent...7
- 3: One pair of tentacular cirri (the dorsal or the ventral) considerably longer than the other (about  $1\frac{1}{2}$  times). Number of setae on segment 2 variable...4
- 3: Dorsal and ventral pairs of tentacular cirri subequal. At least four setae per parapodium on segment 2...5
- 4: Dorsal pair of tentacular cirri longer than ventral pair. Segment 2 with well developed neuropodia, each with at least 4 setae. Dorsum with three dark, longitudinal bands of pigment...Eteone barbata
- 4: Ventral pair of tentacular cirri longer than dorsal pair. Segment 2 without setae, or with 1-2 setae at the most. Preserved animals without extensive dark markings on the dorsum...Eteone foliosa
- 5: Ventral cirri awl-shaped, acuminate, much longer than neuropodium. Animals stout. (Rare species)...Eteone suecica
- 5: Ventral cirri more or less oval, slightly longer than neuropodium at the most. Animals usually quite thin...6
- 6: Dorsal cirri somewhat longer than broad, only about twice as large as neuropodium. Living animals usually white, light grey or light brown, often with a green tinge...Eteone longa
- 6: Dorsal cirri broader than long, about four times as large as neuropodium. Living animals usually pink, sometimes red or yellowish brown...Eteone flava
- 7: Prostomium broadly rounded. Four filiform antennae present. Tentacular cirri fusiform (bottle-shaped) with long, thin tips. Eyes absent...Mystides caeca
- 7: Prostomium more or less cone-shaped. Tentacular cirri subulate or cirriform. Eyes normally present...8

- 8: Dorsal and ventral cirri cirriform (not flattened). Each neuropodium with four or five setae, their shafts distally bifid or trifold. Four antennae present. Interstitial species...Hesionura augeneri
- 8: Dorsal and ventral cirri flattened, lamelliform. More than five setae on each neuropodium, their shafts distally otherwise. Five antennae present (the median antenna very small, difficult to detect)...(Pseudomystides)...9
- 9: Ventral cirri of segment 2 elongate, tentacular (although flattened). Median dorsal cirri about twice as long as broad. Uniform in colouration...Pseudomystides limbata
- 9: Ventral cirri of segment 2 enlarged (up to three times as large as normal ventral cirri), but not tentacular. Median dorsal cirri only  $1\frac{1}{2}$  times as long as broad. Living animals with dark green spots spread over most of body...Pseudomystides sp.
- 10: Four antennae present (NB: Chaetoparia nilssoni included here). Nuchal papilla may or may not be present...11
- 10: Five antennae present (median antenna may be strongly reduced and very difficult to detect)...21
- 11: Dorsal cirrophores poorly developed. All tentacular segments separate and fully developed...Pseudeulalia exigua
- 11: Dorsal cirrophores well developed. Segment 1 fused to segment 2, at least dorsally...12
- 12: Ventral cirri very large, reniform, posteriorly attached to the neuropodium. Nuchal papilla absent...Nereiphylla lutea
- 12: Ventral cirri of normal size, more or less ventrally attached to the neuropodium. Nuchal papilla present...13
- 13: Dorsal cirri quite small, not imbricate. Prostomium dorsally fused to segment 1. Nuchal papilla antenna-like. Segments 2 to 4 with large, acicular setae...Chaetoparia nilssoni
- 13: Dorsal cirri imbricate. Prostomium separate from segment 1. Nuchal papilla normal. Segments 2 to 4 without acicular setae...14

- 14: Segment 1 dorsally developed as a collar, encompassing posterior portion of prostomium...(Paranaitis)...15
- 14: Segment 1 dorsally completely reduced...(Phyllodoce)...16
- 15: Nuchal papilla visible, on posterior ligula of prostomium ...Paranaitis kosteriensis
- 15: Nuchal papilla not visible. Ligula of prostomium very weakly developed or absent...Paranaitis wahlbergi
- 16: Supraacicular lip of presetal lobe on neuropodium prolonged, digitiform. Distal part of proboscis with large papillae...Phyllodoce longipes
- 16: Lips of presetal lobe on neuropodium subequal. Distal part of proboscis tuberculate or smooth...17
- 17: Ventral cirri awl-shaped, very long and thin, acuminate. Proximal part of proboscis with 12 longitudinal rows of papillae and 4 rows of large, drop-shaped papillae...Phyllodoce rosea
- 17: Ventral cirri oval or lanceolate, blunt or acuminate. Proximal part of proboscis with 8 or 12 longitudinal rows of papillae...18
- 18: Proboscis proximally with 8 rows of papillae. Prostomium usually broader than long. Dorsum irridescent with a mediodorsal, longitudinal band of pigment...Phyllodoce citrina
- 18: Proboscis proximally with 12 rows of papillae. Prostomium variable. Pigmentation on dorsum otherwise...19
- 19: Prostomium usually broader than long. Median dorsal cirri at least twice as high as broad. Acuminate tip of median ventral cirri points downwards. Dorsum without spots of pigment, but with transverse, green or brown bands...Phyllodoce groenlandica
- 19: Prostomium longer than broad. Median dorsal cirri  $1\frac{1}{2}$  times as high as broad. Median ventral cirri, if acuminate, then with tip pointing horizontally. Dorsum with 3 longitudinal rows of brown, red or green spots (lateral rows may coalesce as longitudinal bands)...20
- 20: Longest rows on proximal part of proboscis with 9 or less papillae. Median ventral cirri oval, rounded or bluntly pointed

- (NB: longer than neuropodium). Segments 3 and 4 dorsally darkly pigmented. Longest tentacular cirri extend no further than to segment 9...Phyllodoce maculata
- 20: Longest rows on proximal part of proboscis with 9 or more papillae. Median ventral cirri oval, acuminate, with a horizontally pointing tip, longer than the neuropodium. Anterodorsal portion of prostomium and ventral surface of segment 1 very darkly pigmented. Longest tentacular cirri extend at least as far as segment 9...Phyllodoce mucosa
- 21: Proboscis covered with diffusely arranged papillae. Segment 1 dorsally well developed...(Eulalia)...22
- 21: Proboscis variable. Segment 1 at least partially reduced dorsally...24
- 22: Median antenna not conspicuously smaller than frontal antennae. Dorsal cirri lanceolate, much longer than broad. Anal papilla absent...Eulalia viridis
- 22: Median antenna markedly smaller than frontal antennae. Dorsal cirri oval, less than twice as long as broad. Anal papilla present...23
- 23: Median antenna about half as long as frontal ones. Papillae on proboscis become gradually larger distally. Anal cirri oval, distally rounded. Dorsum with two dark, longitudinal bands of pigment...Eulalia bilineata
- 23: Median antenna very short, only about twice as long as it's own width.
- Proboscis covered with papillae of uniform size. Anal cirri with thin, draw-out tips. More or less uniformly green...Eulalia mustela
- 24: Prostomium more or less rounded, greatest width at middle. Large, paired nuchal epaulettes present. Proboscis diffusely covered with papillae except for lateral, longitudinal rows of papillae. Dorsal cirri large, imbricate. Parapodia biacicular. Ventral cirri large, reniform, attached to posterior surface of neuropodium...Notophyl- lum foliosum
- 24: Prostomium more or less cordiform, greatest width at posterior half (exception: prostomium oval in Eumida minuta). Nuchal

- epaulettes absent. Proboscis more or less smooth (with micro-papillae), at least in adults. Dorsal cirri of normal size, only slightly imbricate. Parapodia uniaicular. Ventral cirri normal, more or less ventrally attached to neuropodium...25
- 25: Neuropodium with a prolonged, digitiform supraacicular lip. Segment 1 partially reduced dorsally...Sige fusigera
- 25: Neuropodium with the supra- and subacicular lips more or less equal. Segment 1 completely reduced dorsally...(Eumida)...26
- 26: Prostomium rounded, more or less oval, not cordiform. Antennae distally very thin. Tentacular cirri more or less fusiform (bottle-shaped). Dorsal cirri thick, oval, blunt. Living animals with three longitudinal rows of dark green pigment spots on dorsum...Eumida minuta
- 26: Prostomium more or less cordiform or triangular. Antennae subulate. Tentacular cirri cirriform (cirri of segment 1 and ventral cirri of segment 2 may be slightly fusiform or somewhat flattened). Dorsal cirri cordiform or almost lanceolate. Pigmentation otherwise...27
- 27: Small species (up to about 8 mm at maturity). Dorsal cirrophores weakly developed. Dorsal cirri almost lanceolate. Anal papilla present. More or less uniformly green coloured...Eumida ockelmanni
- 27: Larger at maturity (at least 20 mm long). Dorsal cirriophores well developed. Median dorsal cirri cordiform, no more than about 1½ times as long as broad. Anal papilla absent. Usually with a dark, transverse band across dorsum of each segment...28
- 28: Median dorsal cirri about as long as broad or longer, more or less symmetrical, evenly narrowed distally, only up to about twice as large as neuropodium. Median ventral cirri longer than broad, distally bluntly pointed...Eumida sanguinea
- 28: Median dorsal cirri conspicuously broader than long, somewhat asymmetrical, with a somewhat drawn-out, blunt point, about four times as large as neuropodium. Median ventral cirri broad, asymmetrical, with a somewhat drawn-out, acuminate point...Eumida bahusiensis

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When analyzing the total macrofauna from sediment samples, the amount of time devoted to individuals of rare species is disproportionately high because these often present problems of identification. Ecologists being concerned with quantitative comparisons might like to disregard this fraction from analysis to save time.

- (2) For rare species to be of interest in ecological considerations we need to find out whether there are ecological processes or environmental factors which primarily affect the rare species, and remain unnoticed once we confine our analysis to the common species.
- (3) There is a conceptual difficulty to define "rare species". What is rare from the human point of view may not be rare for a specialized predator or parasite. Large sized individuals always tend to be rarer than small sized individuals. One may find an index by multiplying abundance with logarithm of size. There may be species which are permanently and everywhere rare. Others exploit patchy and rare resources and thus show up rarely in samples but may be numerous nevertheless.
- (4) Certain trophic groups (predators, parasites, commensals) are disproportionately represented in the fraction of rare species. Some species may be always rare but still have a marked impact on the environment like those who make spacious burrows. Species which are always rare may be most liable to extinction. Excluding all these rare species from analysis will result in a biased perception of benthic ecology.
- (5) Quantitative ecology has dominated the work of benthologists in the past decades. This resulted in a neglect of rare species. We conclude that qualitative approaches to benthic ecology ought to be strengthened, otherwise a rich source of information remains hidden in the "tail" of species lists.

REPORT ON THE RESULTS OF THE POLYCHAETA SUBGROUP, HELGOLAND, 8TH-10TH  
FEBRUARY, 1988.

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### Introduction

During the course of the work on the Polychaeta, a large number of families (31) and species (113) were examined (see Appendix 1). This first section deals with all families except the Phyllodocidae which are covered in section 2 by the third author.

Some families with only one or two species e.g. Pisionidae, Onuphidae, are treated no further than listing the material seen, while others, due to specific points of interest or serious taxonomic difficulties are treated more fully.

This report is accompanied by a partial bibliography compiled by the first author with help from Andy Mackie, Heye Rumhor, Peter Garwood and Susan Howson.

### Systematic section

#### Ariciidae

Orbinia sertulata, specimens were noted to be missing interramal cirri in midthoracic chaetigers.

#### Spionidae

A full review of the genus Spio is needed before accurate identification of the species found during this work shop can be made.

#### Magelonidae

Juvenile M. filiformis can be separated from small M. mirabilis (= M. papillicornis) in that they have a square tip to the prostomium while the latter species have a rounded prostomium.

#### Cirratulidae

A review of the genera Chaetozone, Caulleriella and Tharyx is needed before accurate identification of these taxa can be made.

#### Capitellidae

Many specimens of Mediomastus were seen during the workshop. A description of this can be found in Rassmussen's Ecology of the Isefiord and in Warren (1978).

Peresiella was noted in northern North Sea samples.

#### Maldanidae

Generic diagnoses for some genera e.g. Euclymene and Praxillella are at variance in some texts making identification difficult. Shapes of cephalic and anal plates are frequently distorted due to regeneration.

#### Hesionidae

Gyptis capensis/helgolandica. Separation of these two close species was found to be difficult as eye shape varied between specimens. Specimens of North Sea material have been taken by the first author and are being compared with Atlantic G. capensis.

#### Glyceridae

The difficulties of distinguishing G. alba from G. tridactyla were experienced by a number of participants. All material was shown to be G. alba based on the podial and proboscideal papillar morphology.

#### Amphinomidae

Specimens of Paramphinode jeffreysii were shown to have two pairs of posteriorly pointing hooks on the first chaetiger.

#### Lumbrineridae

Lumbrinerid material attributable to L. latreillii was found to vary from species diagnoses of several authors in that the composite chaetae only reached as far back as the 12th chaetiger in some specimens. As the terminal portion of these chaetae was clearly longer than in L. gracilis, it was identified as L. latreillii. Some L. hibernica material specimens were seen. This taxon is not a synonym of L. tetraura and can be distinguished by its long, pointed prostomium and a type of chaeta which in the first chaetigers look like slightly truncated capillaries but which

gradually change into simple crochets over the first ca. 10 segments.

#### Oweniidae

Observations on the tubes of Myriochele species are helpful in separating the species. Due to cropping by bottom feeding fish, many specimens will have the anterior end regenerating and it is therefore difficult to get an accurate description of the prosomium.

#### Ampharetidae

Certain difficulties were encountered when trying to identify specimens of Ampharete due to differences in the length of the dorsal cirri in abdominal segments. It should be noted that the segment which bears the paleae is the first chaetiger.

#### Terebellidae

Specimens of a Streblosoma species were found in northern North Sea material which have three branchial bearing segments, the first of which has approx. 30 filaments, the second approx 10 and the third 3-4.

#### Sabellidae

This family is presently under review by Dr. Phyllis Knight-Jones, University of Swansea.

### SECTION III. DISCUSSIONS

## Appendix I

### LIST OF SPECIES SEEN DURING THE WORKSHOP

Orbinia sertulata

Scoloplos armiger

Paraonis fulgens

Aricidea minuta

Aricidea catharinae

Aricidea simonae

Polydora sp.

Pseudopolydora pauchibracnhiata

Spiophanes kroyeri

Spio filicornis

Spio martinensis

Spio goniocephela

Scoelelepis bonnierii

Pseudomalacoceros tridentata

Laonice sp.

Aonides sp.

Magelona mirabilis

Magelona filiiformis

Magelona alleni

Chaetozone sp.

Caulleriella sp.

Peresiella clymenoides

Capitella capitata

Mediomastus fragilis

Notomastus latericeus

Heteromastus filiiformis

Arenicola sp.

Praxillura longissima

Clymenura sp.

Praxillella/Euclymene

Ophelia cylindricaudata

Ophelia modesta

Polyophtalmus pictus

Travisia forbesi

Phyllodocidae (see report by D. Eibye-Jacobsen)

Harmothoe frazer-thompsoni  
Harmothoe glabra  
Harmothoe extenuata  
Enipo kinbergii  
Pholoe sp.  
Sigalion mathildae  
Pisione remota  
Kefersteinia cirrata  
Hesiospina similis  
Gyptis sp.  
Nereimyra armata  
Microphthalmus similis  
Autolytus sp.  
Eusyllis blomstrandii  
Exogone sp.  
Nereis coccinea  
Nereis zonata  
Nereis pelagica  
Eunereis longissima  
Glycera alba  
Glycera rouxi  
Glycera celtica  
Glycera "lapidum"  
Goniada maculata  
Glycine nordmanni  
Goniadella bobretzki  
Nephtys hombergii  
Nephtys longosetosa  
Nephtys cirrosa  
Paramphinome jeffreysii  
Onuphis conchilega  
Hyalinoecia tubicola  
Eunice pennata  
Lumbrineris fragilis  
Lumbrineris gracilis  
Lumbrineris latreilli  
Lumbrineris hibernica  
Protodorvillea kefersteinia  
Owenia fusiformis

Myriochele sp.  
Melinna cristata  
Mugga wahlbergi  
Amphaerete sp.  
Sosane sulcata  
Eclysippe vanelli  
Streblosoma intestinale  
Streblosoma sp.  
Thelepus cinncinnatus  
Lysilla loveni  
Polycirrus sp.  
Amaeana trilobata  
Parathelepus collaris  
Pista mirabilis  
Lanice conchilega  
Nicolea zostericola  
Paramphitrite tetrabrachia  
Trichobranthus rosea  
Terebellides stroemi  
Octobranchus floriceps  
Sabella sp.  
Pseudosabella sp.  
Chone filicaudata  
Euchone rubrocincta  
Jasmineira elegans  
Jasmineira caudata  
Serpula vermicularis

REPORT ON THE EXAMINATION OF CRUSTACEA AT THE TAXONOMY WORKSHOP (HELGO-  
LAND, FEBRUARY 1988) AND RELATED PROBLEMS. 31294

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The Crustacea presented for an identification check during the workshop belonged to a number of groups: Decapoda, Mysidacea, Isopoda, Amphipoda, Cumacea.

By far the most specimens belonged to the Amphipoda, which are rather abundant in grab samples. Here again, some genera present particular problems due to the species numbers and/or delicate characters. These are mainly: Corophium, Bathyporeia and Gammarus. The remaining genera could be identified easily using the monograph of Lincoln (1979, British marine Amphipoda: Gammaridea). However, in some cases expert confirmation was necessary to get sure about the identification. The afore mentioned three problematic genera can also be identified by LINCOLN's monograph and this was done successfully for Bathyporeia and Gammarus. Some unclear specimens, however, and some Corophium had to be sent to a specialist (Dr. H.G. Andres, Zoologisches Institut und Museum Hamburg).

In the Isopoda only very few specimens were presented, mainly Munna, all other genera being rare in grab-samples. Generally North Sea Isopoda do not have many problems concerning identification.

The Mysidacea can readily be identified with TATTERSAL's monograph (1951. The British Mysidacea). Most species are unproblematic, only in Schistomysis identification can be complicated and even impossible without comparative material. Thus, some specimens of this genus had to be checked. Probably this genus is in need of revision, so that the present identification can only refer to current knowledge.

The Cumacea are not easy to identify, as the females (often met in samples) do not differ from each other as the males do. Presently I consider the identification of this group a task for specialists, and thus did not try to put definitive names on any specimen.

In the Decapoda a few genera are problematic. In the adults this mainly applies to Processa in which the characters presented in the key of SMALDON (1979, British coastal shrimps and prawns) are not always sufficient. Some specimens of this genus had thus to be checked. Another problem is the identification of juveniles. In Crangon the two North Sea species do not differ in the first bottoms stages, so that identification

of very young specimens is impossible. For the Portunids there is a good publication on the first crab stages reared in the laboratory (INGLE & RICE, 1984, Bull. brit. Mus. nat. Hist., Zool., 46: 345-354). However, the characters of the following juvenile stages are not known until now, so that an identification of such material is impossible to date. An investigation of this question is currently in progress.

