See published paper 2013.

Identification keys for Terebellomorpha (Polychaeta) of the Eastern Atlantic and the North Polar Basin. I. Pectinariidae and Terebellidae

M.K. Leontovich[1], I.A. Jirkov[2]

Department of Hydrobiology, Moscow Lomonosov State University, 119899, Moscow, Russia.
e-mail: [1]axionice@mail.ru; [2]ampharete@yandex.ru

ABSTRACT: the new user-friendly identification keys for Pectinariidae and Terebellidae of the Eastern Atlantic and the North Polar Basin is proposed.

KEY WORDS: identification key, Polychaeta, Pectinariidae, Terebellidae, Eastern Atlantic, the North Polar Basin.

The keys cover the shelf of the Eastern Atlantic (to the north, from the Bay of Biscay) and the North Polar Basin (shelf and deep water) and includes more than 100 species. Additional general faunistic works treating Terebellomorpha in the North East Atlantic and the Arctic include Fauvel (1927), Hartmann-Schröder (1971, 1996), Holthe (1976) and our book (Jirkov, 2001).

Introduction

The terebellomorph polychaeta are bristle worms of small to medium, seldom large, size. The largest species in British waters may reach a length of about 20 cm, but most species are 2–10 cm in length. Three families are known from the area: Pectinariidae, Ampharetidae and Terebellidae. Several authors accept Trichobranchinae as family, but in our opinion it is not correct, and now an increasing number of polychaetologists accept the same opinion. Some authors include Sabellariidae in Terebellomorpha, but usually sabellariids are included in Serpulomorpha.

Terebellomorph polychaetes can be found from the intertidal to depths more than 9 km, in all sediments, but especially in soft sediments and among stones and kelps. All of them are deposit feeders, usually surface, sometimes, subsurface, and some (*Lanice conchilega* at least) can feed by filtaring water. Almost all Terebellomorpha build tubes, which are very characteristic for pectinariids, and in other families tube structure is often a species-specific character.

External morphology

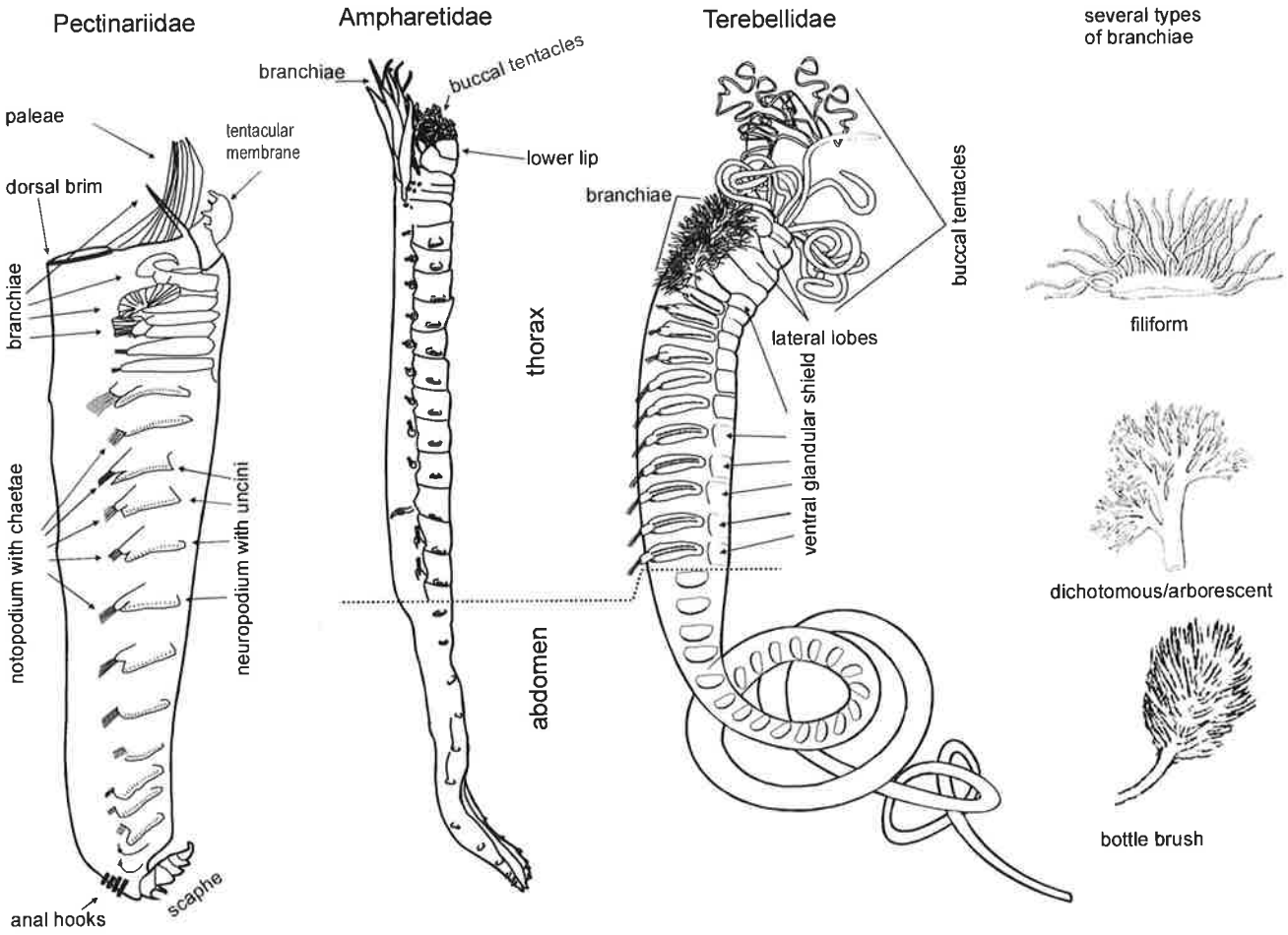
The body of Terebellomorpha can be subdivided into thorax and abdomen. Thorax is the anterior part of the body with notopodia. The abdomen is the posterior part of the body that has no notopodial with chaetae (rudimental notopodia without chaetae can be present). Usually neuropodia are present in the abdomen, but Pectinariidae and some Polycirrinae have no abdominal neuropodia. Some Terebellinae have notopodia in all or almost all segments, in these cases there is no distinct thorax/abdomen subdivision.

Terebellomorpha is an order of Polychaeta which is characterised by the presence of notopodia with buccal tentacles, simple bristles and neuropodia with uncini. Segmentation of the anterior end slightly differs between publications and can be a source of confusion. However, for the proposed keys, it does not matter.

Generic definition and the number of genera is a matter for discussion. We prefer large clearly defined genera, some prefer to split these genera into several small ones, often monotipic. Thus in Ampharetidae for ca. 300 species now, there are up to almost 100 genera that are sometimes accepted.

Identification

All characters mentioned in the first sentence are obligate. Characters mentioned in the second sentence are not obligate but often can help in identification. To shorten and simplify the keys, not all steps have only two



alternatives, so take care. It is strongly recommended to identify several specimens together rather than a single individual. Use of methyl blue often makes morphological characters more visible.

The most important characters for different families differ considerably, but usually during identification it is necessary to count segments with different types of parapodia. For most characters mentioned in the key it is not necessary to prepare slides and use a compound microscope. Even double rows of uncini can usually be seen under a stereomicroscope with some experience, though initially it is better to check under a compound. Only in a few cases use of a compound is necessary (steps 7, 8, 19 and 40 in Terebellidae key) as we did not have enough material for investigation of external morphology, usually slight magnification will be enough (100–200^{x}). In small specimens, chaetae can be viewed directly from specimens placed upside-down under a cover-glass. In larger specimens it is necessary to tear off a neuropodium for examination. Some additional remarks for identification are given in appropriate places in the keys.

The species range is given for each species. Also, scientific names used for species by Holthe (1986) are given. For complete synonymy see Jirkov (2001) and Jirkov *et al.* (2001). Taxonomical system follows Jirkov (2001) and Jirkov *et al.* (2001), except generic diagnosis of Trichobranchinae, which follows Muir (2010).

Explanation of terms, used in keys

Avicular uncini — a flattened uncini with a short or long shaft and a large rostrum (also called a beak or a fang) surmounted by one or more rows of secondary teeth.

Branchiae — notopodial cirri of anterior segments, they can have different shape.

Buccal tentacles — tentacles attached in or near mouth.

Nephridial papilla — a papilla with the external opening of one of the excretory organs.

Paleae (single — palea) — a simple, often enlarged, forward-pointing notochaeta of the first chaetiger in Pectinariidae and some Ampharetidae.

Pectinate uncini — a small flattened chaetae (in terebellomorphs always neurochaetae) with a short shaft and one or more vertical rows of large teeth giving it a comb-like appearance.

Ventral glandular shield — the delimited ventral surface of a thoracic segment, usually covering glandular

tissue, more thick and usually more whitish than neighbouring parts.
Uncini (single — uncinus) — plates with teeth. The structure of uncini (number and arrangement of teeth) is one of the most important taxonomic characters.

Abbreviations

AU — abdominal unciniger.
S — segment.
C — chaetiger.
TC — thoracic chaetiger.
TU — thoracic unciniger.
Abbreviation with number means this very segment, i. e. S2 means the second segment

No one key is complete and perfect. If you have any difficulties or troubles, do not hesitate to contact us by e-mail or by any other means.

Pectinariidae

1. Tips of paleal chaetae blunt 2

— Tips of paleal chaetae tapering ..... ***Pectinaria*** (partim)...3

2. Tentacular membrane serrated ..... ***Pectinaria granulata***
Shallow water, high boreal.

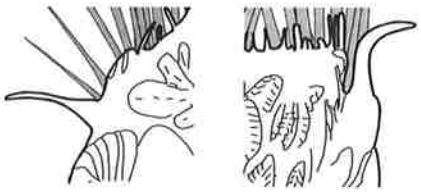
— Tentacular membrane smooth ..... ***Petta pusilla***
Shallow water, boreal-lusitanian.

3. Dorsal brim with cirri ..... ***Pectinaria auricoma***
Low sublittoral – bathyal, widely boreal.

— Dorsal brim smooth..... 4

4. 12 TU 5

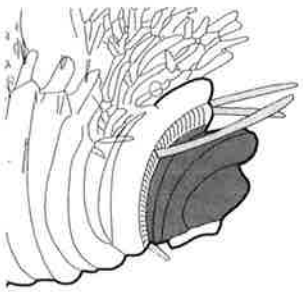
— 13 TU ..... ***Pectinaria belgica***
Shallow water, boreal-lusitanian.



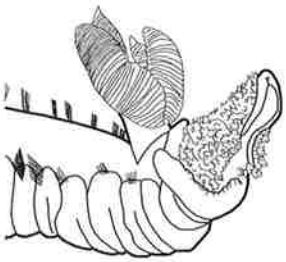
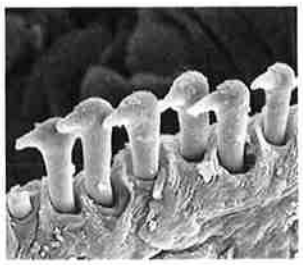
5. Tentacular membrane joined with the base of first pair of branchiae..
..... ***Pectinaria koreni***
Shallow water, widely boreal.

— Tentacular membrane free, does not join with base of first pair of branchiae..... ***Pectinaria hyperborea***
Low sublittoral, arctic

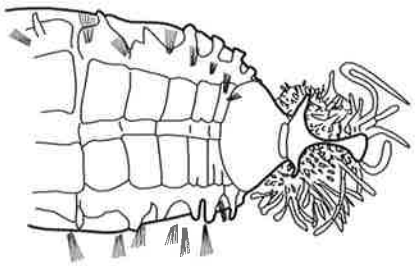
Terebellidae




1. Upper lip (dark grey) usually small, buccal tentacles (light grey) attached ***behind*** (***above***) it, if lost places of attachment are visible. Branchiae of different shape, often branched (if absent uncini always in double rows); c, if present, usually one per segment; uncini avicular or pectinate, often in double rows in posterior thorax .....***Terebellinae***...2

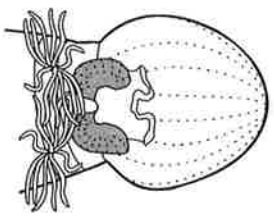
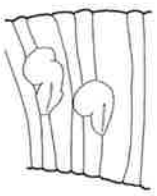



— Upper lip large, buccal tentacles attached ***to*** (***on***) it; thoracal uncini with long shafts, abdominal without, never in double rows. Branchiae always present, different shape, but never branched; ventral glandular shields absent .....
.....***Trichobranchinae***...28



— Upper lip large, buccal tentacles attached ***to*** (***on***) it (can cover the whole surface or limited to margins or to bases) or more rarely ***behind*** it. Branchiae always absent; ventral glandular shields three per segment, split by two longitudinal furrows, often medial shield much smaller (sometimes reduced) than lateral shields, sometimes lateral poorly developed and only small medial one visible; thoracic uncini never in double rows, often absent totally .....***Polycirrinae***...32

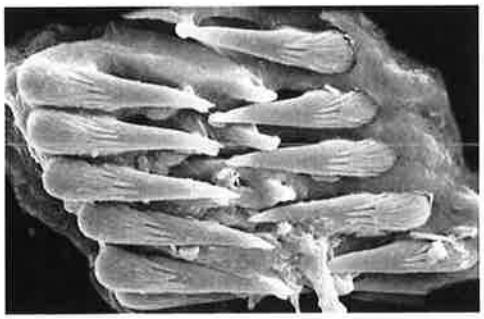
Reduced of parapodia is characteristic for the subfamily. Noto- and neuropodia are hardly often visible. We recommend using methyl blue even if everything seems clear.

2. Peristomium ventrally forms a big proboscis; buccal tentacles attached to two fields (grey); abdominal neuropodia with large cirri .....
.....***Artacamini...Artacama proboscidea***

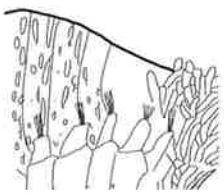
Holthe (1986) — *Artacama proboscidea*. Shelf arcto-boreal.

— Peristomium without proboscis; buccal tentacles attached to single field; abdominal neuropodia without cirri.....3

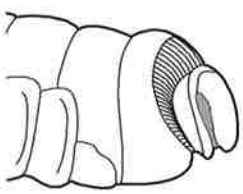


3. Uncini in posterior thorax in double rows, like a zipper (very seldomly two rows can be zipped and hardly distinguishable under the stereomicroscope, but still clear under a compound). Branchiae present or absent, often arborescent .....***Terebellini***...4

Abdominal neuropodia with double rows of uncini are followed by neuropodia of a different shape with single row of uncini. So if you find a shape change it also means that number of rows changed as well.

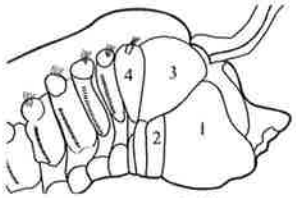



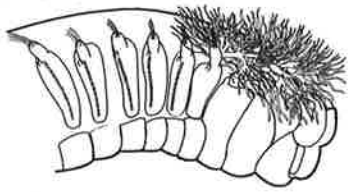
— Uncini never in double rows. Branchiae always present and never arborescent; dorsal surface often looks porous .....***Thelepini***...24

4. Branchiae present (if lost, places of attachment can be seen) 5

— Branchiae absent (nephridial papillae sometimes look like damaged branchiae!).....21



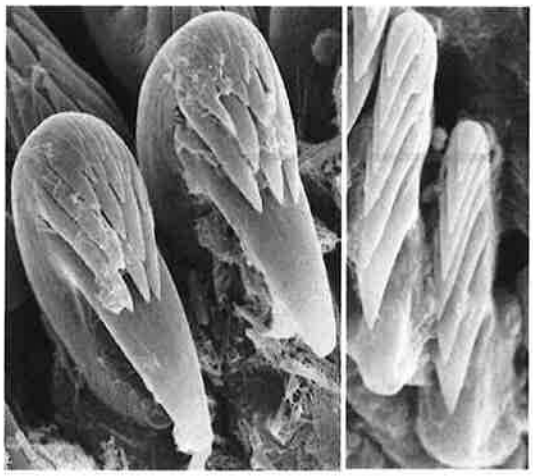


5. Anterior segment(s) with lateral lobes (projections on anterior edge) much longer than segment 6

— Lateral lobes, if present, shorter than segment 13

6. 1 or 2 pairs of branchiae 9

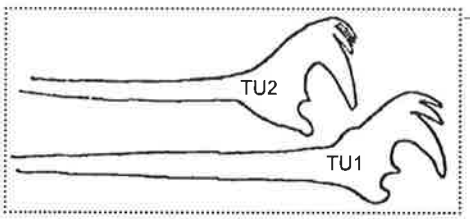
— 3 pairs of branchiae 7



7*. Uncini avicular (main tooth + numerous smaller teeth above). 8

— Uncini pectiniform (teeth almost equal)..... ***Loimia medusa***[1]
Shallow water lusitanian-tropic

8. All uncini without elongated base ..... ***Lanice conchilega***
Holthe (1986) — *Lanice conchilega*
Shallow water low boreal-tropic

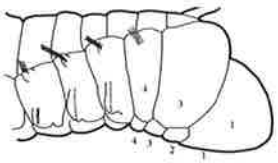


— Uncini of TU1 and TU2 with elongated base..... ***Pista cretacea***
Species was found very close to UK waters (Biscay Bay)

9. Branchiae dichotomous 10

— Branchiae like a bottle brush 11

* To go through steps 7 and 8 it will be enough to prepare one slide from TU1 (for both), but for step 7 uncini from any chaetiger are suitable.



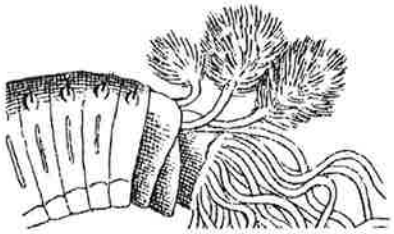
10. 15 TÑ (=14 TU), sandy tube flattened and regularly sinuous.....***Pista flexuosa***
Holthe (1986) — *Axionice flexuosa*.
Shelf arctic arctic.

— 16 TC (=15 TU), tube covered with sand, small stones, shell fragments etc. .....
.....***Pista maculata***
Holthe (1986) — *Axionice maculata*.
Shelf and upper slope arcto-boreal.

— 17 TC (=16 TU), tube muddy, usually with slim muddy projections..***Pista mirabilis***
Widely in bathyal and abyssal, known from deep parts of the North Sea.

11. 1 pair of branchiae.....12

— 2 pairs of branchiae, often has one undeveloped branchiae and there are 3 branchiae in total .....***Pista malmgreni***
Holthe (1986) — *Pista cristata* (partim).
Shallow water low boreal.



12. Thoracic uncini with long manubrium (manubrium absent in young worms, width < 1 mm).....***Pista bansei***
Holthe (1986) — *Pista cristata* (partim).
Mainly lower shelf boreal-lusitanian.

— All uncini with short manubrium even in very large worms .....***Pista cristata***
Holthe (1986) — *Pista lornensis*.
Shallow water low boreal.
Scionella lornensi Pearson, 1969 is undoubtedly the junior synonym.

13. 2 pairs of branchiae.....14

— 3 pairs of branchiae.....16

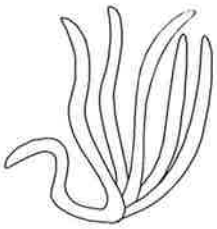
14. All abdominal uncini in single row. 15–19 TC.....***Nicolea***...15

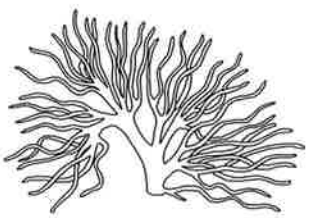
— Uncini in double rows in less than eight anterior AU. 13 (rarely 14–15) TC.....
.....***Paramphitrite birulai***
Holthe (1986) — *Paramphitrite birulai* & *P. tetrabranchia*.
Shelf.

— Uncini in double rows in some tens of anterior AU. 17–18 TC.....***Amphitritides gracilis***
Holthe (1986) — *Amphitritides gracilis*.
Shallow water low boreal-lusitanian

15. 15 TC.....***Nicolea zostericola***
Holthe (1986) — *Nicolea zostericola*.
Shallow water low boreal.

— 17 (rarely 18 or 19) TC.....***Nicolea venustula***
Holthe (1986) — *Nicolea venustula*.
Probably shelf arcto-boreal.





16. Branchiae filiform. 17 TC ..... ***Amphitrite cirrata***
Holthe (1986) — *Amphitrite cirrata*.
Shallow water widely boreal-arctic.

— Branchiae dichotomous. 17–27 TC 17

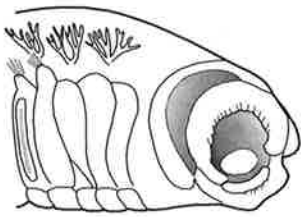
17. 17 TC 18

— 19 TC ..... ***Amphitrite groenlandica***
Holthe (1986) — *Neoamphitrite groenlandica*.
Shallow water high boreal.

— 21 TC ..... ***Amphitrite grayi***
Holthe (1986) — *Neoamphitrite grayi*.
Shallow water high boreal.

— 23–27 TC 20

— Notochaetae almost to the end of body ..... ***Terebella lapidaria***
Shallow water low boreal.



18. Anterior end with ventro-lateral collar ..... ***Eupolymnia nesidensis***
Holthe (1986) — *Eupolymnia nesidensis*.
Shallow water widely boreal.

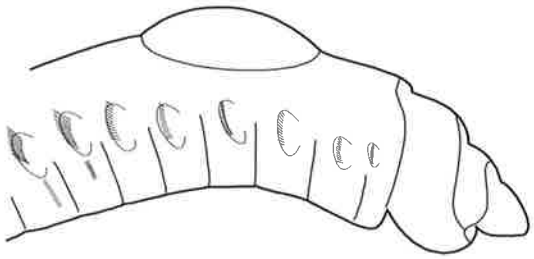
— Anterior end without ventro-lateral collar 19

19. Uncini with numerous teeth above main tooth; eyes absent ..... ***Amphitrite edwardsii***[2]
Holthe (1986) — *Neoamphitrite affinis*.
Shallow water boreal–lusitanian.

— Uncini with 1 or 2 teeth above main tooth; eyes present .. ***Eupolymnia nebulosa***
Holthe (1986) — *Eupolymnia nebulosa*.
Shallow water widely boreal.

20. Uncini in double rows up to C24–C28 ..... ***Amphitrite figulus***
Holthe (1986) — *Neoamphitrite figulus*.
Shallow water widely boreal.

— Uncini in double rows almost to the end of body ..... ***Amphitrite rubra***
Shallow water lusitanian.



21. S2 with circular collar; uncini start from C7 or C8 (neuropodia without uncini can start earlier!). 17 TC ..... ***Laphania boecki***
Holthe (1986) — *Laphania boecki*.
Shelf arcto-boreal.

— Anterior segments can have dorsal folds, lateral lobes, but never circular collar; uncini start from C2 or C3 22

— Anterior segments have neither dorsal folds nor lateral lobes or circular collar; neuropodia start near the end of thorax or present on abdomen only, upper lip enlarged and folded 32

22. Uncini starting from C2 23

— Uncini starting from C3. Usually 16 TC (14–16 TC), uncini in double rows up to C16 ..... ***Proclea graffi***
Holthe (1986) — *Proclea graffi & P. malmgreni*.
Shallow water boreal.

— Uncini starting from C3. Usually 20–23 TC, uncini in double rows up to C24–C27 ..... ***Proclea emmi***
Shallow water boreal Pacific (in the North Polar Basin in the Chuckchee Sea only).

23. 10 TC, uncini in double rows up to C17 (i.e. on 7 anterior abdominal segments) ..... ***Leaena ebranchiata***
Holthe (1986) — *Leaena ebranchiata*.
Shallow water arctic-high boreal.

— Usually 11 TC (11–12 TC), uncini in double rows up to C15 (i.e. on 4 anterior abdominal segments)..... ***Lanassa venusta***
Holthe (1986) — *Lanassa venusta*
= ?*Lanassa praecox*[3]
Shelf high boreal and arctic.

— 13–14 TC, uncini in double rows up to C16..... ***Phisidia aurea***
Holthe (1986) — *Phisidia aurea*
Shelf boreal.

— 15 TC, uncini in double rows up to C15..... ***Lanassa nordenskjoldi***
Holthe (1986) — *Lanassa nordenskjoldi*
Shelf high boreal and arctic.

— Notochaetae almost to the end of body..... ***Baffinia hesslei***
Holthe (1986) — *Baffinia hesslei*
Shallow water high boreal.

24. Upper lip wall-shaped; uncini start from S5..... 25

— Upper lip prolonged plate; uncini start from S9..... ***Parathelepus collaris***
Holthe (1986) — *Parathelepus collaris*
Lusitanian.

25. Notochaetae from 1st branchiferous segment..... ***Streblosoma***...26

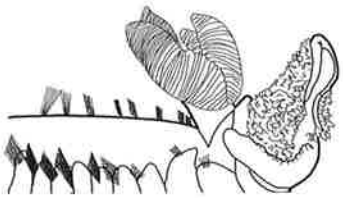
— Notochaetae from 2nd branchiferous segment..... ***Thelepus***...27

26. No more than 30 segments with notochaetae..... ***Streblosoma intestinalis***
Holthe (1986) — *Streblosoma intestinalis*
Shelf boreal.

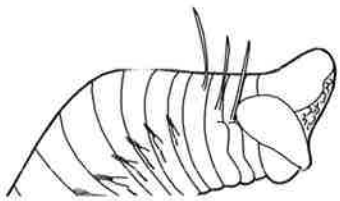
— Up to 90 segments with notochaetae..... ***Streblosoma bairdi***
Holthe (1986) — *Streblosoma bairdi*
Shelf boreal.

27. 2 pairs of branchiae..... ***Thelepus cincinnatus***
Holthe (1986) — *Thelepus cincinnatus*
Extremely widely distributed.

— 3 pairs of branchiae..... ***Thelepus setosus***
Holthe (1986) — *Thelepus stosus*.
Lusitanian.

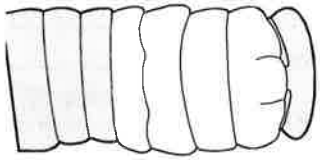


28. Branchiae: four branches with large transverse lamellae on smooth stem..... ***Terebellides***...29

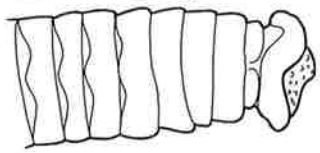


— All (2–4 pairs) branchiae cirriform..... 30

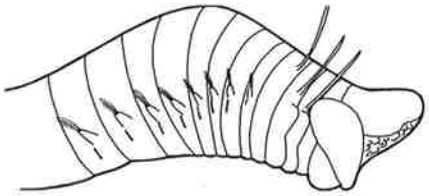
— First pair of branchiae cirriform, other foliaceous..... ***Octobranchus floriceps***
Holthe (1986) — *Octobranchus floriceps*
Distribution unknown, probably boreal shelf.



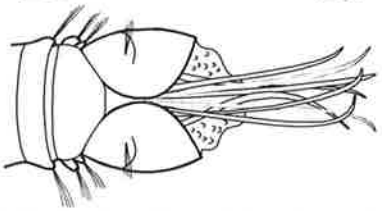
29. C1–C4 ventrally much lighter than the rest of ventrum..... ***Terebellides williamsae***
Holthe (1986) — *Terebellides stroemi* (partim)
Low shelf and slope arctic.



— Ventral surface of all segments similar..... ***Terebellides stroemi***
Holthe (1986) — *Terebellides stroemi* (partim)
Extremely widely distributed.



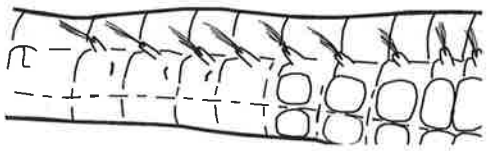
30. Places of branchial attachment clear; 2–3 pairs of branchiae, 15 TC.....31



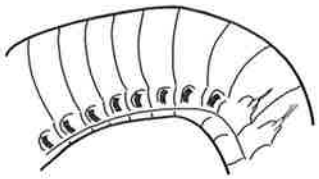
— Places of branchial attachment covered by lateral lobes; 4 pairs of branchiae, 16 TC .....***Octobranchus sikorskii***
Unknown, probably low boreal shelf.

31*. 2 pairs of branchiae (branchiae are hard to see as they are covered by tentacles and upper lip).....
.....***Trichobranchus roseus***
Holthe (1986) — *Trichobranchus roseus*.
Shelf boreal.

— 3 (in juveniles 2) pairs of branchiae.....***Trichobranchus glacialis***
Holthe (1986) — *Trichobranchus glacialis*.
Shelf arcto-boreal.



32. Neuropodia from TC7–TC14, both noto- and neuropodia present at least on 2 segments, usually neuropodia are clearly visible. Ten to many TC.....***Polycirrus*** (partim)...34

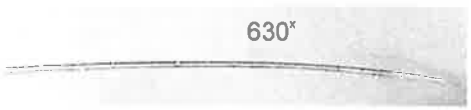


— Thorax with notopodia with notochaetae only, neuropodia from 1st abdominal segment, i.e. no segments with both noto- and neuropodia, usually neuropodia are clearly visible. Ten to several tens TC.....
.....***Polycirrus*** (partim)...40

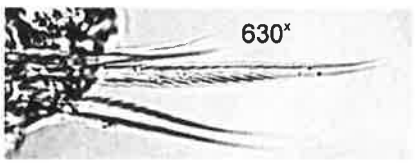
— Thorax with notopodia with notochaetae only, neuropodia start from 5th–6th abdominal segment, i.e. no segments with both noto- and neuropodia, usually neuropodia are hard to see. Ten TC, body surface finely sculptured.....***Amaeana trilobata***
Holthe (1986) — *Amaeana trilobata*.
Shelf and slope boreal.

— Neuropodia totally absent, less than ten TC .....***Lysilla***...33

— Chaetae totally absent (nephridial papillae can imitate notopodia perfectly, but they have no chaetae); body surface roughly sculptured.
.....***Hauchiella tribullata***
Holthe (1986) — *Hauchiella tribullata*.
Shelf boreal.

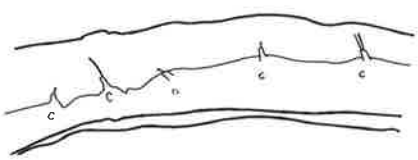


33. Body white or grey, notochaetae under compaund microscope seem to be smooth, almost completely inside notopodia.....***Lysilla loveni***
Holthe (1986) — *Lysilla loveni*.
Shelf boreal.

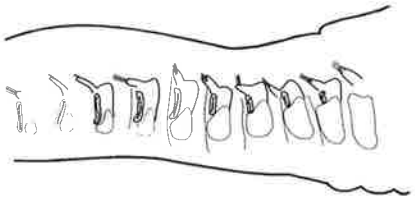


— Body reddish, notochaetae under compaund microscope seem to be ciliated, large part of them is outside notopodia.....***Lysilla nivea***
?Lusitanian.

34. Neuropodia and neurochaetae clearly visible, neuropodia usually wider than notopodia.....35



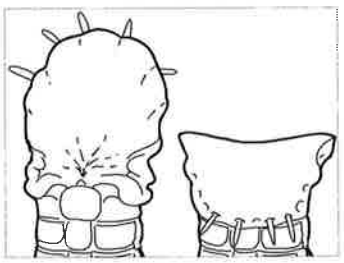
— Neuropodia and neurochaetae very small and hardly visible (use methyl blue!); neuropodia not wider than notopodia 39



35. First neuropodia 3 times shorter than 5th ..... ***Polycirrus denticulatus***
Holthe (1986) — *Polycirrus denticulatus*.
Lusitanian.

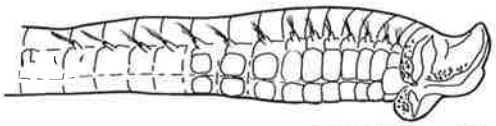
— All neuropodia of the same size 36

36. Upper lip tri- or four-lobed 37

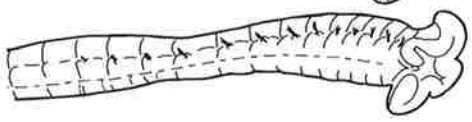


— Upper lip convex, not lobed. More than 30 segments with notochaetae ..... ***Polycirrus aurantiacus***
Holthe (1986) — *Polycirrus aurantiacus*.
Shelf low boreal.

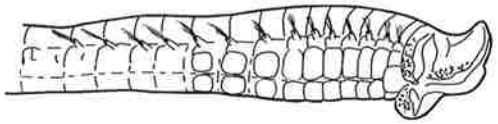
— Upper lip oval. 14–16 segments with notochaetae ..... ***Polycirrus haematodes***
Holthe (1986) — *Polycirrus haematodes*.
Shelf low boreal. According to Holthe (1986) up to 22 segments with notochaetae.



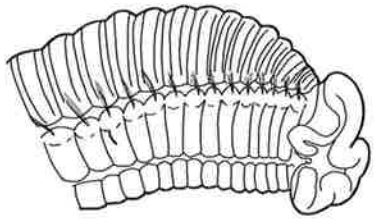
37. Ventral shields distinct 38



— Ventral shields indistinct, notochaetae short, smooth, upper lip four-lobed, secondary annulation absent ..... ***Polycirrus arcticus***
Holthe (1986) — *Polycirrus arcticus* (partim).
Shelf boreal.



38. Upper lip trilobed, secondary annulation absent; notochaetae long, ciliated. 13–20 TC ..... ***Polycirrus norvegicus***
Holthe (1986) — *Polycirrus norvegicus*.
Shelf boreal.



— Upper lip four-lobed, secondary annulation present; notochaetae long, smooth. 18–25 TC ..... ***Polycirrus fedorovi***
Holthe (1986) — *Polycirrus arcticus* (partim).
Deep water arctic.

— Upper lip trilobed; secondary annulation distinct at least on abdomen. 12–19 TC ..... ***Polycirrus tenuisetis***
Lusitanian.

39[1]. Upper lip trilobed ..... ***Polycirrus arenivorus***
Lusitanian.

— Upper lip four-lobed ..... ***Polycirrus caliendrum***
Holthe (1986) — *Polycirrus caliendrum*.
Lusitanian.

40. Lateral glandular shields distinct, smooth; 10–13 TC 41

— Lateral glandular shields indistinct, ventral surface rugose; 17–19 TC ..... ***Polycirrus plumosus***
Holthe (1986) — *Polycirrus plumosus*.
Shelf low boreal.

41. Uncini with several teeth of the same size... .....***Polycirrus latidens***
Holthe (1986) — *Polycirrus latidens*.
Shelf boreal.

— Uncini avicular (one tooth is much larger than other).....***Polycirrus medusa***
Holthe (1986) — *Polycirrus medusa*.
Mainly shallow water arcto-boreal.

Remarks

[1] Probably different species.

[2] According to information available we cannot state any difference between *Amphitrite edwardsi* and *A. affinis*. We have checked numerous specimens from the British waters to the Sea of Japan and have found only one species, so have treated them as a single species. Further investigation is needed to reach a final decision.

[3] *Lanassa praecox* according to Fauvel's (1927) description does not differ from *Lanassa venusta*.

[4] The difference between *Polycirrus arenivorus* and *P. caliendrum* needs to be verified, it is possible that in reality it is a single species, but investigated material contrary to *Amphitrite edwardsi–A. affinis* case is small and does not provide a well-grounded conclusion.

Acknowledgement

Authors wish to thank MES Ltd. team for very fruitful discussions of these keys. Also we thank all people who tested these keys and made remarks, which allows to do them much better: David Hall and Tim Worsfold (Thomson Unicomarine Ltd.) and all participants of Workshop in Newcastle in 2008.

References

Will be given in the second paper.