

PHYLUM NEMERTEA (RHYNCHOCOELA)

Nemertean worms are almost always easily recognized as such by their soft, elongated, narrow, highly contractile, unsegmented bodies, lacking setae and covered by cilia. A few species are common in the Woods Hole region, but about 30 may occur. The group is excellently discussed in Coe's "Biology of the Nemerteans of the Atlantic Coast of North America" (1943), which anyone making a serious study of the group must have at hand. However, identification by the beginner attempting to use the extensive keys in Coe's work is made difficult by the fact that the division of nemerteans into orders is based in part upon such internal features as the arrangement of muscle layers in the body wall. The general descriptive features below may be useful in deciding the probable order in which to place an unknown specimen. Figure references on nemerteans are to Plate 5.

Class ANOPLA: Mouth posterior to brain; proboscis not armed with stylets.

Order Paleonemertea. In general, paleonemerteans are slender, soft, and extensible, heads somewhat blunt, bodies not much flattened; ocelli and longitudinal cephalic slits are lacking.

Order Heteronemertea. Heads characteristically rather snakelike, with marked lateral slits (figs. 7, 12), but Parapolia and Zygeupolia are exceptions. A small caudal cirrus (fig. 12) is found in Cerebratulus, Micrura, and Zygeupolia.

Class ENOPLA: Mouth anterior to brain; proboscis armed with one or more stylets (figs. 8-10) except in Bdellonemertea.

Order Hoplonemertea. The stylets are diagnostic (flatten animals cautiously beneath cover slip or between microscope slides and examine by transmitted light).

Order Bdellonemertea. One species, commensal in mantle cavities of bivalve molluscs. Does not much resemble a nemertean, but has a leech-like form with posterior sucker (fig. 11).

KEY TO THE MORE COMMON NEMERTEANS OF THE WOODS HOLE REGION

1. Free-living 3
1. In mantle cavity of bivalves or in egg mass or gills of crabs 2
2. In mantle cavity of bivalves; intestine convoluted and without diverticula; stylet apparatus absent; mouth and proboscis opening united; posterior sucking disk present (fig. 11); uncommon: Order BDELLONEMERTEA Malacobdella grossa
2. Among eggs or gills of crabs; proboscis rudimentary, with no accessory stylets Carcinonemertes carcinophila
3. In marine or brackish waters 4
3. In fresh water; with 4 or 6 ocelli; color reddish or pinkish; length up to 20 mm Prostoma rubrum
4. Generally small worms, with blunt, flattened heads; usually oblique cephalic grooves mark rear corners of head; ocelli usually obvious (4 or numerous); presence of proboscis stylets diagnostic Order HOPLONEMERTEA 5
(Note: Prostoma and Carcinonemertes, keyed out above, are also in this order)
4. Not referable to Hoplonemertea 15

5. Ocelli 4, set as corners of a square; small worm, often colorful 6
5. Ocelli otherwise 11
6. Body of slender cylindrical form; of firmer consistency than other nemerteans of similar small size (10-20 mm); color varies; head not demarcated from body; 4 ocelli in a square Oerstedia dorsalis
6. Body of short, flattened form; head demarcated by inconspicuous transverse grooves; 4 large, occasionally fragmented, ocelli; worms small and variously colored. Tetrastemma 7
7. Body usually with more or less conspicuous longitudinal stripes 8
7. Body lacking well defined longitudinal stripes 9
8. Body rather slender, yellow, with 2 broad longitudinal brown stripes Tetrastemma elegans
8. Body short and broad; usually green, with one or 2 longitudinal yellow stripes and 6 green stripes near tip of head Tetrastemma vittatum
9. White or translucent with superficial flecks of white Tetrastemma wilsoni
9. Yellow, rosy, red, or green 10
10. Pale green or yellowish, head white or cream colored Tetrastemma candidum
10. Yellow or rosy, often spotted with brown; with band of dark pigment connecting the 2 ocelli on the same side of the head Tetrastemma vermiculus
11. Ocelli extend posteriorly along lateral nerve cords beyond brain; basis of central stylet cylindrical and sharply truncated or concave at posterior end (fig. 9) Zygonemertes virescens
11. Ocelli do not extend posteriorly beyond brain; basis of central stylet truncate-conical or pear shaped and usually rounded at posterior end 12
12. Only one pair of ocelli, situated near tip of head; color of body orange-red Amphiporus bioculatus
12. Ocelli 6 to 12 on each side of head 13
13. Ocelli in a single row along each side of head (fig. 10); blood vessels bright red, and conspicuous in life; color of body usually pale yellow or rosy Amphiporus cruentatus
13. Ocelli in an irregular double row on each side or scattered 14
14. Epidermis very thick and soft, secreting much viscid mucus when stimulated; movements of body often leech-like Amphiporus griseus
14. Epidermis thin and firm, secreting but little mucus when stimulated; moves by creeping Amphiporus ochraceus
- Note: The following dichotomy involves separating the orders PALEONEMERTEA and HETERONEMERTEA. The mouth in both is posterior to brain; proboscis stylets are absent.
15. Not possessing ocelli, or longitudinal cephalic grooves, or caudal cirrus; worms slender and not over 150 mm long probably Order PALEONEMERTEA 16
15. Any large local nemerteans; any nemerteans with deep longitudinal cephalic slits, or with a caudal cirrus (but this is often broken off), or with ocelli but without stylets probably Order HETERONEMERTEA 18

16. Bodies filiform (lengths up to 150 mm, diameter up to one mm 17
 16. Body much flattened in posterior region (width 2-5 mm);
 head changeable in shape, broader than adjacent body, flat,
 rounded or emarginate anteriorly; color pale reddish or yel-
 lowish Carinoma tremephoros
17. Very slender, filiform body; head broad; mature worms up
 to 25 mm long; color whitish; forms delicate mucoid tubes
 Tubulanus pellucidus
17. Very slender, filiform body; head long, pointed; mouth far
 back of brain; length up to 100 mm; characteristically coils
 body into a close spiral Procephalothrix spiralis
- (Note: A worm of similar appearance, but not tending to con-
 tract into a spiral, is Cephalothrix linearis, not reported
 south of Cape Cod).
18. Without longitudinal cephalic grooves 19
 18. With longitudinal cephalic grooves 20
19. Caudal cirrus present; head narrow, without oblique cephalic
 grooves Zygeupolia rubens
19. Caudal cirrus absent; head broad; with oblique cephalic
 grooves Parapolia aurantiaca
20. Caudal cirrus absent; body long and slender, filiform in
 some species, rounded or flattened in others, very contrac-
 tile; ocelli present in most species Lineus 21
20. Caudal cirrus present; body not very slender, ocelli pre-
 sent or absent 23
21. With conspicuous median dorsal stripe, but without trans-
 verse markings; reddish brown or olive, with median dorsal
 stripe of white or yellow extending whole length of body
 and head (fig. 7) Lineus bicolor
21. Without conspicuous median dorsal stripe 22
22. Head rather broad, cephalic grooves short; body contracts
 by shortening and thickening -- not by coiling in spiral Lineus ruber
22. Head narrow, cephalic grooves long; body contracts by
 coiling in spiral Lineus socialis
23. Body firm, long and ribbon-like, sometimes very large; much
 flattened in intestinal region, with thin lateral margins
 and well adapted for swimming; body less contractile than in
 other genera; mouth large and elongated, ocelli absent (fig.
 12) Cerebratulus lacteus
23. Body slender, flattened in intestinal region, but with lateral
 margins not thin; incapable of swimming; mouth small and round;
 ocelli present or absent Micrura 24
24. Head with a row of 4-6 ocelli on each side Micrura affinis
24. Head without ocelli 25
25. Color of body red or reddish 26
25. Color of body whitish or pale yellowish; may show a tinge of
 red or orange anteriorly Micrura albida
26. Deep red or purplish red; common Micrura leidyi
26. Pale red, yellowish-red, or brownish-red Micrura caeca

ANNOTATED LIST OF NEMERTEANS

CLASS ANOPLA

Order Paleonemertea

- Carinoma tremaphoros Thompson, 1900. Common in sand, clay, mud, or under stones.
Cephalothrix linearis (Rathke, 1799). Not reported south of Cape Cod.
Procephalothrix spiralis (Coe, 1930). Common.
Tubulanus pellucidus (Coe, 1895). Not very common.

Order Heteronemertea

- Cerebratulus lacteus (Leidy, 1851). The commonest large nemertean; classical embryological material.
Lineus bicolor Verrill, 1892. Common; usually subtidal.
Lineus ruber (O. F. Müller, 1771). Often in low or variable salinity; color varies.
Lineus socialis (Leidy, 1855). Common; often gregarious.
Micrura affinis (Girard, 1853). A northern species; below 10 m off Martha's Vineyard.
Micrura albida Verrill, 1879. Not reported south of Cape Cod.
Micrura caeca Verrill, 1895. Under stones or in sand.
Micrura leidyi (Verrill, 1892). Common in protected bays.
Parapolia aurantiaca Coe, 1895.
Zygeupolia rubens (Coe, 1895). Abundant in sand in bays and estuaries.

CLASS ENOPLA

Order Hoplonemertea

- Amphiporus bioculatus McIntosh, 1873. Common, subtidally in Vineyard Sound.
Amphiporus cruentatus Verrill, 1879. Common locally in Woods Hole area.
Amphiporus griseus (Stimpson, 1857). Occasional at Woods Hole.
Amphiporus ochraceus (Verrill, 1873). Common in Woods Hole area.
Carinonemertes carcinophila (Kolliker, 1845).
Oerstedia dorsalis (Abildgaard, 1806). Locally abundant, among growth on rocks and pilings.
Ototyphlonemertes pellucida Coe, 1943. A minute form. Not in key. The genus is unique in possessing statocysts.
Prostoma rubrum (Leidy, 1850). In fresh water swamps and ponds. Coe reports a green variety in a cedar swamp near Woods Hole.
Tetrastemma candidum (Müller, 1874). Common.
Tetrastemma elegans (Girard, 1852). Occasional.
Tetrastemma vermiculus (Quatrefages, 1846). Common.
Tetrastemma vittatum Verrill, 1874. Occasional, in protected muddy situations.
Tetrastemma wilsoni Coe, 1943. Among Bryozoa, sponges, etc. on pilings.
Zygonemertes virescens (Verrill, 1879). Common.

Order Bdellonemertea

- Malacobdella grossa (O. F. Müller, 1776). In mantle cavity of Mya, Mercenaria, Ostrea and other bivalves. Not common around Woods Hole. M. obesa and M. mercenaria of Verrill are synonyms.

REFERENCES

- Coe, W. R., 1943. Biology of the Nemerteans of the Atlantic Coast of North America. Trans. Conn. Acad. Arts & Sci., 35: 129-328.
Verrill, A. E., 1892. The marine nemerteans of New England and adjacent waters. Trans. Conn. Acad. Arts & Sci., 8: 328-456, pl. 33-39.
McCaul, W. E., 1963. Rhynchocoela: Nemerteans from marine and estuarine waters of Virginia. J. Elisha Mitchell Sci. Soc., 79: 111-124.

Plate 5

VARIOUS UNSEGMENTED WORMS

Polycladida (figs. 1-6), Nemertea (figs. 7-12), Sipunculoida (figs. 13, 14), Nematomorpha (figs. 15-18). Figs. 11, 12, 15 by Mrs. Emily Reid; figs. 13, 14, 16-18 by Bruce Shearer. Scales various.

- Fig. 1. Prostheceraeus maculosus, outline to show marginal tentacles; note cerebral and tentacular eyes.
2. Gnesioceros floridana, simplified after Hyman (1939) to show body outline, cerebral and tentacular eyes.
 3. Stylochus ellipticus, simplified, showing tentacles and eyes.
 4. Stylochus ellipticus, viewed from side to show dorsal tentacles, and marginal, tentacular, and cerebral eyes.
 5. Euplana gracilis, from life, showing pattern of cerebral and "tentacular" eyes. Note that actual tentacles are absent.
 6. Notoplana atomata, outline of body and pattern of eyes, simplified after Hyman (1939).
 7. Lineus bicolor (Heteronemertea), head in dorsal view, from life, showing left cephalic slit and eyes.
 8. Amphiporus ochraceus (Hoplonemertea), proboscis stylets as seen in a worm flattened on a slide; central stylet on pear shaped basis and accessory stylets in 2 lateral pouches. Drawn from a photo taken by Dr. W. E. McCaul.
 9. Zygonemertes virescens, head of older animal with many eyes, stylet with truncated basis. After Coe.
 10. Amphiporus cruentatus, head and stylet. After Coe.
 11. Malacobdella grossa. After Verrill.
 12. Cerebratulus lacteus (Heteronemertea), whole animal with head in ventral view, showing mouth, left cephalic slit, proboscis pore anteriorly, and caudal cirrus. After Verrill.
 13. Golfingia gouldi, from life; one with extended introvert showing tentacles, other with introvert withdrawn; about half natural size.
 14. Phascolion strombi, with extended introvert; much enlarged (scale bar equals one mm).
 15. Nectonema agilis, impression of the worm as seen swimming. About natural size.
 16. Nectonema agilis, anterior end of living specimen much contracted after shedding eggs. Note 2 rows of natatory bristles.
 17. Nectonema agilis, anterior end of relaxed, living specimen, prior to shedding of eggs.
 18. Nectonema agilis, posterior end of the above specimen.

Plate 5

