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Rhynchocoela: Nemerteans from Marine and Estuarine Waters of Virginia[1]

WILLIAM E. MCCAUL

Department of Zoology, Eastern Illinois University, Charleston, Ill.

This paper presents twenty-two species of nemerteans collected from various habitats in the York River, the Chesapeake Bay, and the Eastern Shore of Virginia during the summer of 1962. For the presentation of supplementary descriptions, this number includes those already reported from the Chesapeake area (Ferguson and Jones, 1949), besides seventeen species not previously reported from this region and two newly described species.

I have followed Coe's (1943) form in my descriptions to facilitate comparisons of various nemertean faunas. Verrill's (1892, 1895) works on the New England faunas, Corrêa's (1961) studies in the Gulf of Mexico and the Caribbean, and Friedrich's (1955) treatment of the European Hoplonemertini have been especially helpful.

[1] Contribution from Virginia Institute of Marine Science No. 140.

I wish to thank the staff of the Virginia Institute of Marine Science for its help in the preparation of this paper, particularly Dr. Marvin L. Wass for his advice and suggestions throughout the summer, Mr. Robert S. Bailey for help with the illustrations, and Dr. William Hargis and Miss Evelyn Wells for reading and correcting the manuscript.

Taxonomic and Phylogenetic Order of the Species

(Those species marked with an asterisk are newly reported from the Chesapeake area.)

Phylum Rhynchocoela
- Class Anopla
  - Order Paleonemertini
    - Family Tubulanidae
      - Genus *Tubulanus* Renier
        1. *Tubulanus pellucidus* (Coe, 1895)
    - Family Carinomidae
      - Genus *Carinoma* Oudemans
        - *2. *Carinoma tremaphoros* Thompson, 1900
      - Genus *Carinomella* Coe
        - *3. *Carinomella lactea* Coe, 1905
  - Order Heteronemertini
    - Family Lineidae
      - Genus *Zygeupolia* Thompson
        - *4. *Zygeupolia rubens* (Coe, 1895)
      - Genus *Lineus* Sowerby
        - *5. *Lineus bicolor* Verrill, 1892
        - *6. *Lineus pallidus* Verrill, 1879
      - Genus *Micrura* Ehrenberg
        7. *Micrura leidyi* (Verrill, 1892)
        - *8. *Micrura rubra* Verrill, 1892
      - Genus *Cerebratulus* Renier
        9. *Cerebratulus lacteus* (Leidy, 1851)
        - *10. *Cerebratulus luridus* Verrill, 1873
- Class Enopla
  - Order Hoplonemertini
    - Family Carcinonemertidae
      - Genus *Carcinonemertes* Coe
        - *11. *Carcinonemertes carcinophila* (Kölliker, 1845)
    - Family Prosorhochmidae
      - Genus *Oerstedia* Quatrefages
        - *12. *Oerstedia dorsalis* (Abildgaard, 1806)
    - Family Amphiporidae
      - Genus *Zygonemertes* Montgomery
        13. *Zygonemertes virescens* (Verrill, 1879)
      - Genus *Amphiporus* Ehrenberg
        - *14. *Amphiporus bioculatus* (McIntosh, 1872)
        - *15. *Amphiporus caecus* Verrill, 1892
        - *16. *Amphiporus ochraceus* (Verrill, 1873)
        17. *Amphiporus rubropunctus* sp. nov.
    - Family Tetrastemmatidae
      - Genus *Tetrastemma* Ehrenberg
        - *18. *Tetrastemma candidum* (Müller, 1774)
        - *19. *Tetrastemma elegans* (Girard, 1852)
        - *20. *Tetrastemma jeani* sp. nov.
        - *21. *Tetrastemma vermiculus* (Quatrefages, 1846)
  - Order Bdellonemertini
    - Family Malacobdellidae
      - Genus *Malacobdella* Blainville
        - *22. *Malacobdella grossa* (Müller, 1776)

Systematic Descriptions of the Species Collected

1. *Tubulanus pellucidus* (Coe, 1859)

Carinella pellucida Coe, 1895, Trans. Conn. Acad. Arts and Sci., **9**: 515; 1905, Bull. Mus. Comp. Zool., Harvard, No. 47.
Tubulanus pellucidus Coe, 1940, Allan Hancock Pacific Expeditions, **2**: 256.

Living worm distinguishable by the irregular contours of the body due to constrictions occurring at varying intervals along the length. Generally sluggish in movements. A bottom-dwelling form, inhabiting a delicate mucoid tube. Head indistinctly separated from body; blunt or rounded, rarely pointed; may be spatulate. Body generally slender. Anterior third of body somewhat thicker than remainder, rounded in cross section; posterior two-thirds flattened. Posterior extremity bluntly rounded. Worm tends to spiral loosely when disturbed and when fixed in alcohol or formalin. Mouth posterior to brain; intestine lacking lateral diverticula. Cephalic grooves lacking.

Size: Small, local specimens averaging 7 mm. in length and less than 0.5 mm. in width; reported to reach a length of 25 mm. and a width of 1 mm. in the New England area.

Color: Generally drab, varying from nearly white through light ochre to light brown. Distinct brown band around esophageal region after preservation, indicating location of sense organs. Sometimes with circular groove, or "collar," in same region.

Ocelli: Lacking.

Proboscis: Of moderate thickness and length; rhynchocoel restricted to anterior half of the body; rhynchopore subterminal.

Habitat: Relatively abundant in the lower Chesapeake Bay. Dredged from muddy bottom at depth of 16 meters, but also occurring in both shallower and deeper situations. In littoral habitats, occurring among epifauna associated with bryozoans, tunicates, and algae. Marine and estuarine.

Further known occurrence: New England and southward at least as far as Miami; on the Pacific Coast from Monterey Bay to San Diego.

Remarks: Individuals of this species and most nemerteans from Virginia waters are generally smaller than those reported by Coe and Verrill. It appears that nemerteans decrease in size and in the details of pattern and coloration as one follows the southward distribution of the group; a comparison of Corrêa's 1961 studies with those of Coe (1943, 1951) and Verrill (1892, 1895) bears out this premise.

2. *Carinoma tremaphoros* Thompson, 1900
Zool. Anz., **23**: 627–630.

Body small, only slightly flattened; head not distinctly demarcated from body. Both anterior and posterior extremities rounded. Intestine lacking lateral diverticula. Cephalic organs lacking, lateral sense organs present. Worm tends to coil loosely when disturbed.

Size: Small; length 12 mm., width 1 mm. Reported to attain a length of 150 mm. and a width of 5 mm.

Color: Whitish to light brown, with light reddish tinge in esophageal region which persists after preservation.

Ocelli: Lacking.

Proboscis: Slender; of moderate length. Rhynchopore subterminal.

Habitat: Infrequently dredged from muddy bottoms at depths of 13 meters and more. Marine and estuarine.

Further known occurrence: Southward from Cape Cod.

3. *Carinomella lactea* Coe, 1905
Bull. Mus. Comp. Zool., Harvard, No. 47. 318 pp.

Small; head broad, elongate, very thin, slightly narrower than body adjacent. Anterior and posterior extremities abruptly rounded. Body flattened; mouth immediately behind brain.

Ocelli: Lacking.

Size: Length 8 mm., width 0.4 mm.

Color: Pale white; head nearly transparent. Darker in intestinal region. Esophageal region marked by darker, broad band encircling body, beginning abruptly and gradually fading posteriorly.

Proboscis: Thick, relatively long; two proboscidial nerves; rhynchopore subterminal.

Cephalic organs: Cephalic grooves lacking. Two lateral sense organs, one on each side of body, appearing as whitish spots in darker band encircling body.

Habitat: Infrequently dredged from muddy bottoms at depths of 13 meters or more. Marine and estuarine.

Further known occurrence: Coasts of Florida and California.

4. *Zygeupolia rubens* (Coe, 1895)
Valencia rubens Coe, 1895, Trans. Conn. Acad. Arts and Sci., **9**: 521.
Zygeupolia litoralis Thompson, 1900, Zool. Anz., **23**: 151–153; 1902, Zool. Anz., **23**: 627–630.
Zygeupolia rubens Coe, 1940, Allan Hancock Pacific Expeditions, **2**: 263.

Distinctly colored, readily identified. Head long, sharply pointed. Body slender, cylindrical anteriorly, flattened posteriorly. Esophagus long, lateral intestinal diverticula restricted to posterior region. Caudal cirrus long but rarely seen, since worm fragments readily when captured.

Size: Length 40 mm., width 2 mm. May attain a length of 80 mm. and a width of 5 mm.

Color: Head white; mid-region of body light rose-red, fading posteriorly. Contents of intestine sometimes imparting darker red color in diverticula. Light lines laterally indicating location of lateral nerve cords.

Ocelli: Lacking.

Cerebral organs: Cephalic grooves lacking. Lateral pits evident on sides of head slightly posterior to brain.

Proboscis: Relatively long and slender.

Habitat: Abundant in intertidal sand on Eastern Shore; dredged from sandy bottom in 18 meters of water in lower Chesapeake Bay. Marine and estuarine.

Further known occurrence: Southern New England and southward. On Pacific coast from Monterey Bay south to Mexico.

5. *Lineus bicolor* Verrill, 1892
Trans. Conn. Acad. Arts and Sci., **8**: 426.

Body only slightly flattened; extremities bluntly rounded. Head slightly wider than body, demarcated by slight constriction behind brain. Intestinal diverticula limited to posterior third of body. Esophagus long.

Size: Length 15 mm., width 0.8 mm. Maximum length 50 mm.

Color: Ground color ochre; head region and posterior third of body light olive-green; brain bright red. A narrow light-brown mid-dorsal line from tip of head to posterior end. Faint, dark longitudinal striations all over body, dorsally and ventrally.

Ocelli: About ten on each side of the head, irregularly scattered.

Cephalic organs: Long cephalic grooves extending from tip of head to posterior margins of the brain.

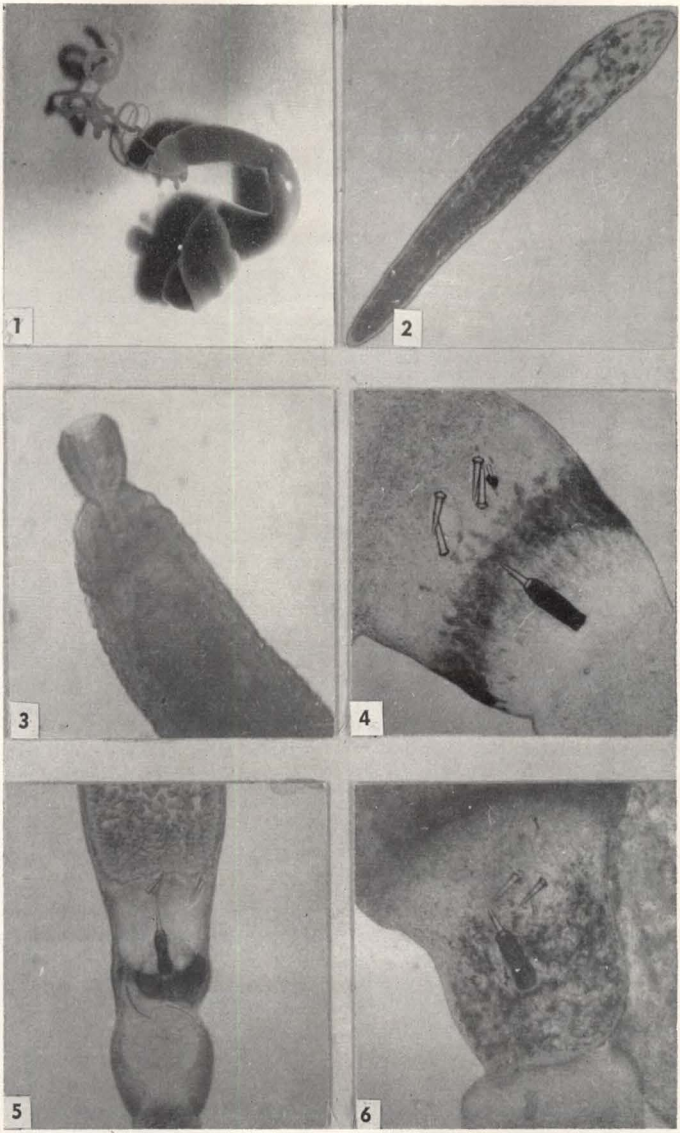


FIG. 1. *Micrura leidyi.* Entire worm, probiscis everted. X300.
FIG. 2. *Carcinonemertes carcinophila.* Immature individual. X300.
FIG. 3. *Carcinonemertes carcinophila.* Mature individual, esophagus everted. X300.
FIG. 4. *Zygonemertes virescens.* Armature. Note truncate base of central stylet. X300.
FIG. 5. *Amphiporus bioculatus.* Armature. X300.
FIG. 6. *Amphiporus caecus.* Armature. X300.

Proboscis: Long and of extremely small diameter. Rhynchocoel extending to posterior end of body.

Habitat: Found rarely in York River. Dredged from muddy bottom at a depth of 13 meters. Usually associated with hydroids, algae, and tunicates. Marine and estuarine.

Further known occurrence: Southward from Cape Cod.

6. *Lineus pallidus* Verrill, 1879

Notice of Recent Add. to Mar. Invertebrates, pt. 1, in Proc. Nat. Mus., **2**: 180.

Body elongate, slender, filiform. Anterior end round in cross section, slightly thicker than posterior regions, which are flattened. Head indistinctly demarcated from body; extremities rounded.

Size: Length 70 mm., width 1 mm. Attains a length of 100 mm.

Color: Whitish anteriorly, pale yellowish pink in posterior regions; a lighter, narrow mid-dorsal line.

Ocelli: Lacking.

Cephalic organs: Indistinct cephalic grooves on sides of head.

Proboscis: Long and very slender; rhynchocoel extending to posterior end of body.

Habitat: One specimen dredged from sandy mud at a depth of 2 meters from Burton's Bay, Eastern Shore.

Further known occurrence: Cape Ann, Massachusetts.

7. *Micrura leidyi* (Verrill, 1892). Figure 1.

Meckelia rosea Leidy, 1851, Proc. Phila. Acad. Nat. Sci. **5**: 244.

Cerebratulus leidyi Verrill, 1892, Trans. Conn. Acad. Arts and Sci., **8**: 436.

Head triangular, narrow; distinct neck. Body slightly flattened, of constant width throughout length. Posterior end rounded, with slender caudal filament 0.15 mm. in length. Worm secretes copious mucus when handled.

Size: Length 180 mm., width 4 mm. May attain 300 mm. in length.

Color: Dark flesh-pink except head, which is white; darker red mid-dorsal line.

Ocelli: Lacking.

Proboscis: Slender; much longer than length of body.

Cephalic organs: Long cephalic grooves.

Habitat: Very abundant in the York River in intertidal sand and mud at depth of from 2 to to 6 inches.

Further known occurrence: In protected bays and estuaries from Massachusetts Bay to Florida.

8. *Micrura rubra* Verrill, 1892

Trans. Conn. Acad. Arts and Sci., **8**: 430.

Body moderately flattened; head not distinctly demarcated. Width uniform to posterior end. Caudal cirrus is present. Worm fragments readily on capture.

Size: Length to 20 mm., width 1.5 mm. Attains length of 25 mm., width of 2.5 mm.

Color: Pale reddish brown; color uniform in preserved specimens, living individuals somewhat mottled.

Proboscis: Typical for genus; of moderate thickness and length.

Cephalic organs: Long cephalic grooves; not very deep in preserved specimens.

Ocelli: Lacking.

Habitat: Dredged from muddy bottom at 15 meters in middle Chesapeake Bay. Occurs to depths of 70 meters.

Further known occurrence: Bay of Fundy; Casco Bay, Maine.

9. *Cerebratulus lacteus* (Leidy, 1851).

Meckelia lactea Leidy, 1851, Proc. Acad. Nat. Sci. Phila., **5**: 243.

Meckelia ingens Verrill, 1873, Inv. Animals of Vineyard Sound, p. 336.

Cerebratulus lacteus Verrill, 1892, Proc. Conn. Acad. Arts and Sci., **8**: 433; Coe, 1895, Proc. Conn. Acad. Arts and Sci., **9**: 479–514.

Largest nemertean from Atlantic Coast. Head slightly spatulate, usually rounded, separated from body by narrow neck. Body flat except for anterior one-fourth, which is rounded in cross section. Remainder thin, lateral margins well adapted for swimming. Intestinal diverticula finely divided and very numerous. Caudal filament present.

Size: Length 300 mm., width 20 mm. Length may exceed 4 meters.

Color: Head cream-white, shading gradually in anterior end to light salmon-pink, then flesh-pink in middle region; posterior extremity, lateral margins, and mid-dorsal line white.

Ocelli: Lacking.

Cephalic organs: Long, deep grooves on sides of head.

Habitat: Frequently encountered in muddy sand in intertidal zone; sometimes dredged from fairly deep water.

Further known occurrence: Atlantic Coast, Maine to Florida.

10. *Cerebratulus luridus* Verrill, 1873

Micrura inornata Verrill, 1879, Notice of Recent Add. to Mar. Invertebrates, pt. 1, in Proc. Nat. Mus., **2**: 186; 1892,

Trans. Conn. Acad. Arts and Sci., **8**: 440.

Cerebratulus luridus Verrill, 1892, Trans. Conn. Acad. Arts and Sci., **8**: 440.

Smaller than *C. lacteus*, which it resembles. Body elongate and flattened. Head distinctly spatulate, sharply pointed at tip. Neck distinct. Mouth long and large, usually gaping open. Brain bright red.

Size: Length 200 mm., width 10 mm.

Color: Anterior third white; remainder very pale flesh color. Margins of body white.

Ocelli: Lacking.

Cephalic organs: Long cephalic grooves extending from rhynchopore to neck, opening widely with edges curled away from each other.

Proboscis: Long, thick.

Habitat: Dredged from muddy bottom in Chesapeake Bay at depth of 13 meters. Marine and estuarine.

Further known occurrence: Nova Scotia, New England, Long Island Sound, and southward.

11. *Carcinonemertes carcinophila* (Kölliker, 1845) Figures 2, 3.

Nemertes carcinophilon Kölliker, 1845, Verh. Schweiz. Nat. Ges., 89–93.

Emplectonema carcinophila Verrill, 1895, Proc. Conn. Acad. Arts and Sci., **9**: 528.

Carcinonemertes carcinophila Coe, 1902, Amer. Nat., **36**: 431–450; Humes, 1941, Jour. Morph., **69**: 443–454; 1942, Illinois Biol. Monogr., **18** (4): 1–105.

Body slender, elongate, and flattened. Head not demarcated from body. Extremities bluntly rounded. Copiously secretes a very sticky mucus.

Size: Length 10 mm., width 0.5 mm. Females to 40 mm., males to 25 mm.

Color: Young pale milky-white; mature individuals pale, whitish or pinkish.

Ocelli: Two, comma shaped.

Proboscis: Very short, much reduced. Posterior chamber short, ending shortly posterior to central bulb. Central stylet short and delicate, its base much longer than stylet and slightly constricted in the middle. Accessory pouches lacking.

Habitat: Of somewhat spotty occurrence in Chesapeake area. Commensally associated with the blue crab, *Callinectes sapidus* Rathbun; immature forms encysted among gill lamellae, sometimes creeping actively on gills; adults in egg masses.

Further known occurrences: Bay of Fundy to Gulf of Mexico and southward; in Europe from English Channel to Mediterranean.

Remarks: The local form has been tentatively identified as the southern subspecies *Carcinonemertes carcinophila imminutus* by Humes, who has worked extensively with the genus (Humes, 1942).

12. *Oerstdia dorsalis* (Abildgaard, 1806)

Planaria dorsalis Abildgaard, 1806, Zool. Danic., **4**: 25.

Tetrastemma fuscum Oersted, 1844, Kroyer's Naturhist. Tidss., **4**: 575.

Oerstedia maculata Quatrefages, 1846, Ann. Sci. Nat., **6**: 222.

Tetrastemma marmoratum Claparède, 1863, Beobach. über Anat. u. Entwicklung., **5**: 24.

Tetrastemma variegatum Johnston, 1865, Cat. Br. Mus., pp. 20, 289.

Tetrastemma dorsalis McIntosh, 1873, British Annelids, pt. 1, Nemerteans, p. 172.

Tetrastemma dorsale Verrill, 1892, Trans. Conn. Acad. Arts and Sci., **8**: 409.

Tetrastemma vermiculus var. *catenulatum* Verrill, 1892, Trans. Conn. Acad. Arts and Sci., **8**: 408.

Oerstedia dorsalis Bürger, 1895, Die Nemertinen des Golfes von Neapel. Fauna u. Flora des Golfes von Neapel, No. 22.

Tetrastemma (Oerstedia) dorsale Coe, 1904, Harriman Alaska Expedition, No. 11; 1905, Bull. Mus. Comp. Zool., No. 47.

Oerstedia dorsalis Stiasny-Wijnhoff, 1930, Zool. Mededeelingen, **13**: 226–240; Coe, 1940, Allan Hancock Pacific Expedition, **2** (13): 294.

Body firm, cylindrical, round in cross section; of uniform width throughout length. Head and posterior extremity acutely truncate. Worm sluggish in its movements.

Size: Length 10 mm., width 0.5 mm. Maximum length 20 mm., width 2 mm.

Color: Variable, but distinctively marked with irregular patches of pigment granules disposed to form irregular bands encircling body. Ground color ochre, the pigment granules dark brown. Pigment lacking in neck region and in head anterior to eyes.

Ocelli: Four, forming the corners of a square.

Proboscis: Relatively short and thick, rhynchocoel ending about 1 mm. from posterior end of body. In addition to central stylet, two accessory pouches containing from 2 to 5 stylets each in reserve. Ten proboscidial nerves.

Cerebral organs: Small, anterior to ocelli.

Habitat: Occasionally on eel grass (*Zostera*

marina), gliding very slowly and rarely moving by the leech-like creeping so characteristic of many nemerteans. Also dredged from sandy mud from 20 meters from middle Chesapeake Bay. Marine and estuarine.

Further known occurrence: From the northern coast of Europe to Spain; Atlantic Coast, Nova Scotia to Florida; southward to Mexico.

13. *Zygonemertes virescens* (Verrill, 1879). Figure 4.

Amphiporus virescens Verrill, 1879, Proc. Nat. Mus., p. 183; 1892, Trans. Conn. Acad. Arts and Sci., **8**: 400.

Zygonemertes virescens Montgomery, 1879, Zool. Jahrb. Abt. Syst., **10**: 1–14.

Ophionemertes agilis Verrill, 1873, Am. Jour. Sci., **7**: 45.

Amphiporus agilis Verrill, 1879, Notice of Recent Add. to Mar. Invertebrates, pt. 1, in Proc. Nat. Mus., **2**: 183; 1892, Trans. Conn. Acad. Arts and Sci., **8**: 400.

Zygonemertes virescens Coe, 1904, Harriman Alaska Expedition, No. 11; 1905, Bull. Mus. Comp. Zool., No. 47.

A very active worm, the shape varying with the activity. When gliding forward, body is slender, nearly round in cross section. Head nearly circular, broader than neck. Width of body fairly constant. Posterior extremity rounded. When moving backward, worm becomes very short and flattened.

Size: Length 40 mm., width 0.5 mm. when fully extended. A worm this size may shorten to 10 mm. in length and measure 1.5 mm. in width when strongly contracted.

Color: Dull, light olive-green; head lighter. Dorsal surface generally diffusely covered with pigment granules; posterior two-thirds of body marked with irregular blotches of pigment; narrow, irregular intestinal diverticula imparting darker color toward sides.

Ocelli: In very young individuals, a single row of ocelli on each side of head; in slightly older individuals, two rows on each side, one lateral and one medial; in fully mature specimens, three irregular rows extending longitudinally on each side of head, a double row laterally and a single row nearer the mid-line.

Proboscis: Relatively short and thick, rhynchocoel extending to 0.3 mm. of posterior end. The armature a massive central stylet mounted on a very distinctive base which is much longer than the stylet, constricted in the middle and acutely truncate posteriorly. Two accessory pouches, each containing 2 or 3 reserve stylets. Ten or 11 proboscidial nerves.

Cerebral organs: Two pairs of oblique grooves.

Habitat: Locally very abundant on eel grass.

Further known occurrence: On Atlantic Coast from Bay of Fundy to North Carolina and southward to Florida. On Pacific Coast from British Columbia to Mexico.

Remarks: It is usually reported that the ocelli in this species extend posteriorly along the nerve cords beyond the brain, but this is rarely true of specimens collected in the York River.

14. *Amphiporus bioculatus* McIntosh, 1873. Figure 5.

Amphiporus (?) *bioculatus* Verrill, 1892, Trans. Conn. Acad. Arts and Sci., **8**: 401.

Head smaller than body adjacent, and not distinctly demarcated from body, which is relatively short and thick. Both anterior and posterior extremities bluntly rounded. Anterior half of body somewhat thicker than posterior half, which is slightly narrower and flattened. Worm tends to coil into a spiral when disturbed.

Color: Uniform light orange.

Ocelli: Two, comma shaped, far anterior near tip of head.

Proboscis: Long and slender; central stylet shorter than base. Base rounded posteriorly, constricted in the middle. Two accessory pouches containing 2 or 3 reserves each.

Habitat: Encountered occasionally in dredge samples from coarse sand mixed with mud, in depths ranging from 1 to 30 meters.

Further known occurrence: Southern New England; in Europe, coasts of Great Britain and France.

15. *Amphiporus caecus* Verrill, 1892. Figure 6. Trans. Conn. Acad. Arts and Sci., **8**: 402.

Relatively short and stout; body flattened. Both extremities abruptly rounded. Coe suggests that this might be a southern variety of *Amphiporus groenlandicus* (Coe, 1943).

Size: One anterior fragment 20 mm. in length, 1 mm. in width.

Color: Creamy white, with darker color laterally due to contents of intestinal diverticula.

Ocelli: Lacking; rather unusual in the Amphiporidae.

Proboscis: Long and slender. Central stylet shorter than its base; latter constricted in middle. Two accessory pouches, each containing 2 reserve stylets.

Habitat: A single specimen dredged from coarse sand at a depth of 6 meters from Chesapeake Bay.

Further known occurrence: From 35 meters off the coast of Massachusetts.

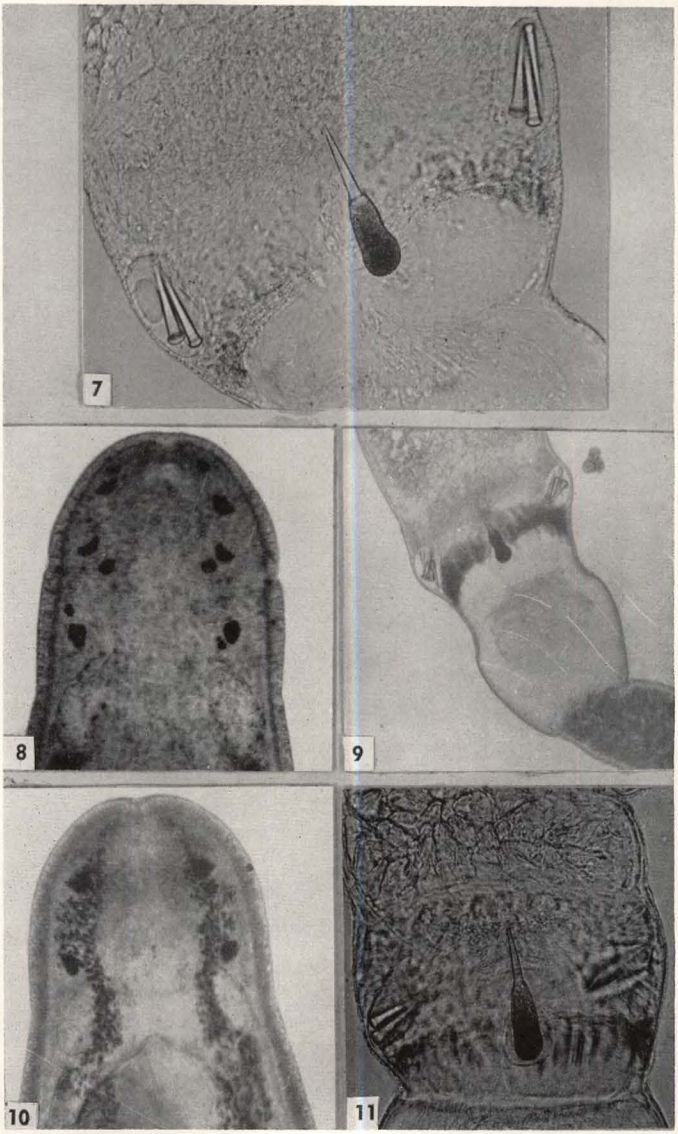


FIG. 7. *Amphiporus ocraceus.* Armature. X1200.

FIG. 8. *Amphiporus ocraceus.* Anterior end, showing characteristic arrangement of ocelli. X300.

FIG. 9. *Amphiporus rubropunctus.* Armature. Note constricted base of central stylet. X300.

FIG. 10. *Tetrastemma elegans.* Anterior end, showing arrangement of ocelli and pigment granules. Cerebral ganglia show clearly. X300.

FIG. 11. *Tetrastemma elegans.* Armature. X300.

16. *Amphiporus ocraceus* (Verrill, 1873). Figures 7, 8.

Cosmocephala ocracea Verrill, 1873, Inv. Animals of Vineyard Sound, pp. 31, 336.
Amphiporus ocraceus Verrill, 1892, Trans. Conn. Acad. Arts and Sci., **8**: 396.
Amphiporus greenmani Montgomery, 1897, Zool. Jahrb. Abt. Syst., **10**: 1–14.

Body elongate, but not filiform; a rounded hemisphere in cross section. Both extremities gently rounded. An inverted V-shaped groove behind head, which is not otherwise demarcated from body. Worm quite active, movements often being leech-like.

Size: Length 40 mm., width 3 mm. Attains a length of 70 mm.

Color: Ochre, hence the trivial name. Very slightly darker in lateral margins, especially in posterior region. Brain yellowish, orange, or red.

Ocelli: One irregular row on each side of head, each with up to 14 ocelli.

Proboscis: Heavy; longer than the body. Rhynchocoel ending about 1 mm. from posterior end. Central stylet longer than its base, which is rounded. Two accessory pouches, each with 3 or 4 reserve stylets. Proboscis showing a peculiar herring bone pattern when retracted, especially near anterior end. Eleven proboscidial nerves.

Cephalic organs: Faint grooves running obliquely posteriorly.

Further known occurrence: From Massachusetts Bay to Florida; on Gulf Coast westward to Texas.

17. *Amphiporus rubropunctus,* sp. nov. Figure 9.

Holotype: One specimen deposited with U. S. National Museum, catalogue no. 30427.

Paratype: One specimen serially sectioned, in V. I. M. S. collection, catalogue no. P–38.

Shape typical for members of the genus; body elongate, moderately flattened, a rounded hemisphere in cross section. Head is vaguely demarcated from body by slightly narrower neck. Body tapers gradually to bluntly pointed tail. Body is relatively thick in middle region. Inverted V-shaped groove on dorsal surface behind head.

Size: Length to 20 mm., width 1 mm.

Color: Ground color ochre; lateral margins darker, or faint greenish hue, owing to intestinal contents; dorsal mid-region lighter, because of rhynchocoel and proboscis. Most distinctive external feature is the multitude of tiny, bright red pigment spots scattered irregularly over both dorsal and ventral surfaces except in head region. Brain bright red.

Ocelli: Ten to 12 on each side of head, scattered irregularly.

Cephalic organs: Relatively large and conspicuous, situated close in front of brain.

Proboscis: Typical for genus; base of central stylet having very pronounced constriction in middle. Two accessory pouches, each with 4 reserve stylets. Ten proboscidial nerves.

Habitat: Three specimens taken from eel grass in shallow water, barely covered at low tide, one from York River across from V. I. M. S., two from a similar situation about 2 miles upriver.

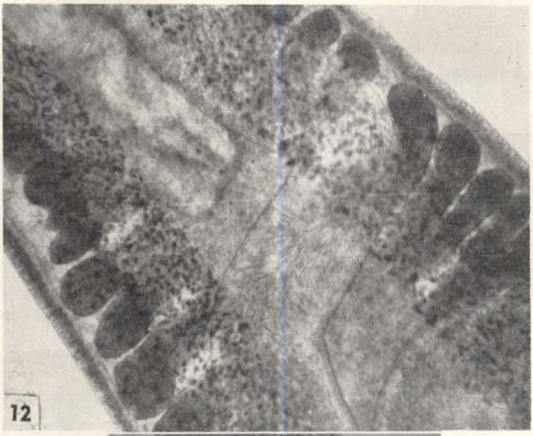
Differential diagnosis: Of the Western Atlantic representatives of this large genus, *A. rubropunctus* most closely resembles *A. ocraceus,* but may be distinguished by means of two characteristics—color and armature. *A. ocraceus* is highly variable in both size and color, but never have the red spots seen in *A. rubropunctus* been reported for the former. A more significant difference is the distinctive shape of the central stylet base in *A. rubropunctus.* That of *A. ocraceus* is usually rounded, sometimes slightly pear shaped, but never as deeply constricted as in *A. rubropunctus.* Since the proboscidial armature is considered to be a highly conservative feature, showing very little variation within a given species, this in itself is probably sufficient to set this form apart. The ten proboscidial nerves in *A. rubropunctus,* compared with eleven in *A. ocraceus,* provide another differential feature.

18. *Tetrastemma candidum* (Müller, 1774)

Planaria quadrioculata (pars) Johnston, 1829, Zool. Jour., **4**: 56.
Nemertes quadrioculata Johnston, 1837, Mag. Zool. and Bot., **1**: 535.
Tetrastemma varicolor (pars) Oersted, 1837, Kroyer's Naturhist. Tidss., **4**: 575; Diesing, 1850, Syst. Helm., **1**: 257.
Tetrastemma groenlandicum Diesing, 1850, Syst. Helm., **1**: 259.
Tetrastemma candida McIntosh, 1873, British Annelids, pt. 1, Nemerteans, p. 167.
Tetrastemma candidum Verrill, 1892, Trans. Conn. Acad. Arts and Sci., **8**: 404.

Head rounded, distinctly demarcated from body by slender neck. Body relatively thick in mid-region, tapering to pointed tail.

Size: Length 20 mm., width 0.5 mm. Reported to attain a length of 35 mm., width of 1.5 mm.



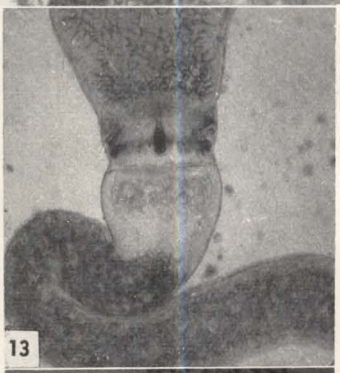


FIG. 12. *Tetrastemma elegans.* Mid-region of body, showing proboscis and intestinal diverticula. X300.

FIG. 13. *Tetrastemma jeani.* Armature. X300.

FIG. 14. *Tetrastemma vermiculus.* Armature. X300.

Color: Light greenish brown; a few inconspicuous reddish brown pigment-granules, irregularly scattered.

Ocelli: Four, forming the corners of a square.

Proboscis: Relatively slender; base of the central stylet rounded posteriorly, only slightly constricted in middle; length of central stylet equal to length of its base. Two accessory pouches, each with 2 to 4 reserve stylets.

Cephalic organs: Small, on a level with the posterior pair of ocelli.

Habitat: Frequently collected from eel grass; marine, estuarine.

Further known occurrence: Circumpolar; in Europe, from Norway to Mediterranean; from Madeira to South Africa. On Atlantic Coast from Labrador to Florida; Gulf Coast to Louisiana; on Pacific Coast from Alaska to Mexico.

19. *Tetrastemma elegans* (Girard, 1852). Figures 10, 11, 12.

Tetrastemma elegans Verrill, 1875, Amer. Jour. Sci., **10**: 40; 1892, Trans. Conn. Acad. Arts and Sci., **8**: 406; Montgomery, 1897, Zool. Jahrb. Abt. Syst., **10**: 1–14.

Head distinctly separated from body by narrow neck. Body graceful, slightly thicker in mid-region, tapering slightly to bluntly rounded posterior end. Body a rounded hemisphere in cross section.

Size: Usually about 15 mm. in length, 0.6 mm. in width. May attain a length of 20 mm.

Color: The most distinctive feature the pair of longitudinal brown stripes extending from the anterior to the posterior extremity, separated throughout by a median lighter stripe, containing only a few scattered pigment granules. Ground color cream. The nearly rectangular, regularly disposed intestinal diverticula alternating with the gonads; eggs sometimes imparting a greenish color to lateral margins.

Ocelli: Four, forming the corners of a square.

Proboscis: Long and slender; rhynchocoel extending to posterior extremity. Armature a single central stylet and two lateral pouches, each containing usually three reserve stylets. Ten proboscidial nerves.

Cephalic organs: Close to and anterior to brain.

Habitat: Very abundant on eel grass. Most abundant species at Gloucester Point.

Further known occurrence: Southern coast of Cape Cod.

20. *Tetrastemma jeani,* sp. nov. Figure 13.

Holotype: One specimen deposited with U. S. National Museum, catalogue no. 30428.

Paratype: One specimen serially sectioned, in V. I. M. S. collection, catalogue no. P–39.

The shape conforms in general to that characteristic of the genus; the body is slender, elongate, a rounded hemisphere in cross section. The head is distinctly set off from the remainder of the body by a slender neck, the posterior extremity tapering gradually to a point. A very active form.

Size: Length 14 mm., width 0.7 mm.

Color: Uniform dark brown on dorsal surface; ventral surface slightly lighter. No stripes, lines, or other patterns disrupting the uniform coloration. Pigmentation extending to a point just ahead of anterior pair of ocelli; tip of head and spaces posterior to rear pair of ocelli clear.

Ocelli: Four, forming the corners of a square; relatively small, posterior pair nearly obscured by pigment.

Proboscis: Long and thick; the central stylet slightly shorter than its base; two accessory pouches each containing up to 5 reserve stylets, a number unusual in the genus. Ten proboscidial nerves.

Cephalic organs: Situated close to and anterior to the brain.

Habitat: Four specimens collected from eel grass in York River from 4 feet of water, 2 miles upriver from V. I. M. S.

Differential diagnosis: The only other reported Western Atlantic species with which this form might be confused is *T. elegans.* The shape of both is roughly similar, although *T. jeani* is less slender and the head not so distinctly demarcated from the body. Coloration in the two species is distinctly different; *T. elegans* always has two longitudinal stripes; these may vary from one individual to another in intensity of pigmentation, but they are always discernible, whereas in *T. jeani* the coloration is uniform, with not the slightest indication of such striping. The ocelli of *T. elegans* are always distinct, while the posterior pair in *T. jeani* are so obscured by heavy pigment that they are difficult to demonstrate. The bases of the central stylets serve further to distinguish the species; that of *T. elegans* is slightly constricted in the middle, that of *T. jeani* rounded throughout. Further differentiation may be made on the basis of the number of accessory stylets—usually five in *T. jeani,* and three in *T. elegans,* in each pouch. Since this form

occurs in habitats shared with *T. elegans,* it probably should not be regarded as an ecotype of *T. elegans* but as a distinct species.

21. *Tetrastemma vermiculus* (Quatrefages, 1846). Figure 14.

Polia vermiculus Quatrefages, 1846, Ann. des Sc. Nat., ser. 3, Zool., **6**: 214.

Tetrastemma vermiculus Stimpson, 1857, Proc. Acad. Nat. Sci. Phila., **9**: 163; Verrill, 1892, Trans. Conn. Acad. Arts and Sci., **8**: 407.

Tetrastemma flagellatum (?) Montgomery, 1897, Zool. Jahrb. Abt. Syst., **10**: 1–14.

Prostomatella vermiculus Friedrich, 1935, Arch. f. Naturgesch., **4**.

Body round in cross-section, fairly constant diameter throughout length. Head broad, truncate anteriorly; posterior end bluntly pointed. Head not demarcated from body. An anterior notch marks location of rhynchopore.

Size: Length 14 mm., width 0.5 mm. Maximum length, 18 mm.; maximum width, 1 mm.

Color: Variable. Local specimens with irregular mottlings of brown pigment granules, in no discernible pattern. Distinctive heavy bands of pigment connecting the two eyes on the same side of the head. Ground color ochre, with a variably broad dorsal band generally devoid of pigment granules.

Ocelli: Four, forming the corners of a rectangle.

Proboscis: Long and slender; rhynchocoel extending to posterior end. Base of central stylet slightly constricted rather than rounded. Two accessory pouches, each containing two or three reserves.

Cephalic organs: Large, close to lateral margins of brain.

Habitat: Found occasionally on eel grass in shallow water in York River; occurs in deeper water, depths to 70 meters. Marine and estuarine.

Further known occurrence: Scandinavia to Mediterranean. On Atlantic Coast from Bay of Fundy to Florida.

22. *Malacobdella grossa* (Müller, 1776)

Malacobdella obesa Verrill, 1892, Trans. Conn. Acad. Arts and Sci., **8**: 444.

Malacobdella mercenaria Verrill, 1892, Trans. Conn. Acad. Arts and Sci., **8**: 445.

Broad and flat; appearance leech-like. Large, conspicuous sucker at posterior end. Intestine sinuous in its extent and lacking diverticula. Anus dorsal, immediately anterior to sucker. Gonads numerous, filling spaces between intestine and body wall. Anteriorly a broad atrium unites mouth and proboscis openings.

Size: Up to 22 mm. in length, 12 mm. in width.

Color: Whitish, often with slight pink tinge.

Proboscis: Slender; musculature weak, incapable of full eversion. Armature lacking.

Habitat: Commensal in the mantle cavity of lamellibranch mollusks: the hard clam, *Mercenaria mercenaria* (Linnaeus); the soft clam, *Mya arenaria* Linnaeus; occasionally the oyster, *Crassostrea virginica* (Gmelin). Occurrence spotty.

Further known occurrence: Both coasts of North America; Mediterranean.

Remarks: The specimens of this species which I examined were in the V. I. M. S. collections. They were collected and prepared by Louis S. Allen, Jr., in conjunction with his studies on the species.

A Key to the Species of Nemerteans Considered in this Paper

1.	Living commensally in mollusks or crabs	2
1.	Free-living	3
2. (1)	Commensal in mantle cavity of mollusks	*Malacobdella grossa*
2.	Commensal in gills or in egg-masses of crabs	*Carcinonemertes carcinophila*
3. (1)	Ocelli present; cephalic grooves lacking (see 17)	4
3.	Ocelli absent	12
4. (3)	Two ocelli	*Amphiporus bioculatus*
4.	More than two ocelli	5
5. (4)	Four ocelli	6
5.	More than four ocelli	10
6. (5)	Striped, mottled, or banded	7
6.	Color uniform, or nearly so	9
7. (6)	With two longitudinal brown stripes	*Tetrastemma elegans*
7.	Irregularly patterned; no stripes	8
8. (7)	Body encircled with irregular bands	*Oerstedia dorsalis*
8.	Irregularly mottled; eyes on same side of head connected by a band of pigment	*Tetrastemma vermiculus*
9. (6)	Color whitish or greenish	*Tetrastemma candidum*
9.	Color uniform dark brown	*Tetrastemma jeani*
10. (5)	Color greenish; base of central stylet massive, truncate posteriorly	*Zygonemertes virescens*
10.	Color variable; base not as above	11
11. (10)	Body soft, color ochre; base of central stylet pear shaped	*Amphiporus ochraceus*

11. Base of central stylet deeply constricted in middle; numerous tiny red spots ... *Amphiporus rubropunctus*
12. (3) Ocelli absent, proboscis armed ... *Amphiporus caecus*
12. Ocelli absent, proboscis unarmed ... 13
13. (12) Cephalic grooves lacking ... 14
13. Cephalic grooves present ... 17
14. (13) Body rounded in cross section, thicker anteriorly; lateral ridges indicating location of lateral nerve cords ... *Tubulanus pellucidus*
14. Body flattened ... 15
15. (14) Pale white; broad, darker band encircling body in the esophageal region ... *Carinomella lactea*
15. White, light brown, or red in color; may be a reddish tinge in esophageal or intestinal region ... 16
16. (15) Small; head rounded anteriorly ... *Carinoma tremaphoros*
16. Head long, sharply pointed ... *Zygeupolia rubens*
17. (13) Cephalic grooves and ocelli both present ... *Lineus bicolor*
17. Cephalic grooves present; ocelli lacking ... 18
18. (17) Color reddish; head rounded anteriorly ... *Micrura rubra*
18. Color red; head spatulate or pointed ... 19
19. (18) Color white; body filiform ... *Lineus pallidus*
19. Lateral margins thin; adapted for swimming ... 20
20. (19) Body large; head rounded ... *Cerebratulus lacteus*
20. Body of medium size, head spatulate ... 21
21. (20) Cephalic grooves long, deep, flaring ... *Cerebratulus luridus*
21. Body rounded, not adapted for swimming ... *Micrura leidyi*

A Check List of the Rhynchocoela Occurring on the Atlantic Coast of North America

Carinina grata
Tubulanus pellucidus
Tubulanus rhabdotus
Carinoma tremaphoros
Carinomella lactea
Procephalothrix spiralis
Parapolia aurantiaca
Zygeupolia rubens
Lineus arenicola
Lineus bicolor
Lineus dubius
Lineus pallidus
Lineus ruber
Lineus socialis
Uniporus borealis
Nectonemertes mirabilis
Malacobdella grossa
Baseodiscus delineatus
Micrura affinis
Micrura albida
Micrura caeca
Micrura dorsalis
Micrura leidyi
Micrura rubra
Cerebratulus ater
Cerebratulus lacteus
Cerebratulus luridus
Cerebratulus marginatus
Cerebratulus melanops
Cerebratulus lineolatus
Cerebratulus leucopsis
Emplectonema giganteum
Emplectonema osceoli
Carcinonemertes carcinophila
Ototyphlonemertes evelinae
Ototyphlonemertes filia
Ototyphlonemertes lactea
Ototyphlonemertes pellucida
Oerstedia dorsalis
Zygonemertes cocacola
Zygonemertes simoneae
Zygonemertes virescens
Amphiporus angulatus
Amphiporus bioculatus
Amphiporus caecus
Amphiporus cruentatus
Amphiporus frontalis
Amphiporus griseus
Amphiporus groenlandicus
Amphiporus lactifloreus
Amphiporus ochraceus
Amphiporus pulcher
Amphiporus rubropunctus
Amphiporus tetrasorus
Amphiporus thallius
Amphiporus texanus
Proneurotes multioculatus
Tetrastemma candidum
Tetrastemma elegans
Tetrastemma jeani
Tetrastemma vermiculus
Tetrastemma verrilli
Tetrastemma vittatum
Tetrastemma wilsoni
Tetrastemma worki
Prostoma rubrum
Drepanophorus lankesteri
Nemertopsis bivittata
Prostomatella enteroplecta
Prostomatella merula

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Notes on the Mammalian Fauna of the Toxaway River Gorge, North Carolina

JOHN R. PAUL AND THOMAS L. QUAY

Department of Zoology, North Carolina State College, Raleigh, N. C.

Introduction

Although the distribution of mammals is well documented for a number of areas in North Carolina, lists of species are lacking or incomplete for others. It is the purpose of this paper to summarize our observations on the mammalian fauna of the Toxaway River Gorge, Transylvania County, North Carolina. The data presented are offered as indication of regional presence and ecological distribution.

The Toxaway River Gorge area is of special interest since it forms an altitudinal transition between the flora and fauna of the piedmont and mountain regions. The gorge begins at an elevation of 3000 feet and ends on the Piedmont Plateau at an elevation of 1000 feet within an aerial distance of approximately five miles. Exposure to moist, southerly winds results in a high rainfall, averaging 70–80 inches per year (Cooper, 1963).

Located in the center of a large tract of timber, the gorge is relatively undisturbed except for logging operations in its more accessible confines. Three major plant communities appear to have importance in so far as the distribution of mammals is concerned. The upland slopes and the slopes of the gorge proper above 2100 feet are characterized by communities dominated by various oaks and are the driest sites in the area. The lower slopes and coves below 2100 feet are of a mixed mesophytic nature and relatively moist. The river flat is typically very gravelly and boulder strewn and in places supports a community dominated by Virginia pine. A detailed coverage of the history, geology, and vegetation of the area is given by Cooper (1963).

Field work was conducted in the Toxaway River Gorge during the following periods: April 28–30, June 10–August 20, and November 9–11, 1961. Collecting was done at elevations of 2700–3000 feet, 1400–1800 feet, and 1000–1200 feet. Most of the collecting was done with Museum Special snap traps and commercial rat traps. Sherman live traps were used during a portion of the study. Trap effort was as follows: 2045 trap nights with kill-type traps, and 1050 trap nights with live traps. All specimens were deposited either in the Zoology Department of North Carolina State College or the North Carolina State Museum, Raleigh, N. C.

Nomenclature follows that of Hall and Kelson (1959).

We are indebted to the Highlands Biological Station and to its executive director, Dr. Thelma Howell, for providing the opportunity to conduct work in this region. This work was supported by a National Science Foundation Grant, NSF G–17005, administered through the Highlands Biological Station. Additional funds, for travel, supplies, and equipment, were provided by the North Carolina Academy of Science and the North Carolina State College Graduate School.

Results

A summary of the collections is made in Table I, giving the number, sex, and altitudinal and ecological distribution of all specimens taken in the gorge.

Populations of most kinds of mammals in the gorge apparently were low at the time the collections were made. Evidence of mammalian