

MALDANIDS KNOWN FROM CITY OF SAN DIEGO OCEAN MONITORING PROGRAM

Family Maldanidae

Subfamily Clymenurinae

Clymenura gracilis Hartman, 1969

Subfamily Euclymeninae

Clymenella complanata Hartman, 1969

[*Euclymene grossi newporti* Berkeley and Berkeley, 1941] = *Petaloclymene pacifica*

Euclymeninae sp. A SCAMIT

Isocirrus longiceps (Moore, 1923)

Praxillella gracilis (Sars, 1861)

Praxillella pacifica Berkeley, 1929

Green, 1997

Subfamily Lumbriclymeninae

Notoproctus pacificus (Moore, 1906)

Praxillura maculata Moore, 1923

Subfamily Nicomachinae

Nicomache lumbricalis (Fabricius, 1780)

Petaloproctus neoborealis Hartman, 1969

Subfamily Maldaninae

Maldane sarsi Malmgren, 1865

Metasychis disparidentata (Moore, 1904) fide Light, 1991

Subfamily Rhodininae

Rhodine bitorquata Moore, 1923

KEY TO THE MALDANIDS COLLECTED OFF POINT LOMA

- 1a. Cephalic plaque present (Euclymeninae or Maldaninae) 6
 1b. Cephalic plaque absent (Lumbriclymeninae, Nicomachinae or Rhodininae) 2
- 2a. Rostrate neurosetae in double rows from setiger 5; conspicuous collars directed forward on setigers 2 and 3 (Fig. 1) *Rhodine bitorquata*
 2b. Rostrate neurosetae in single rows 3
- 3a. Acicular neurosetae present in first 6-9 setigers (Fig. 2) *Praxillura maculata*
 3b. Acicular neurosetae restricted to first 3-4 setigers 4
- 4a. Acicular neurosetae restricted to first 3 setigers; anterior end short, thick and rounded; whole specimen has cup-like anal funnel, its margin with a cirlet of 14-21 short teeth (Fig. 3) *Nicomache lumbricalis*
 4b. Acicular neurosetae restricted to first 4 setigers 5
- 5a. Prostomium broadly rounded and produced; white dorsal internotopodial bands on red-brown base color; anal plaque forms flat plain with anal pore dorsal to plaque (Fig. 4) *Notoproctus pacificus*
 5b. Prostomium broadly truncate and compressed; anal plaque large, foliose and produced ventrally (Fig. 5) *Petaloproctus neoborealis*

- 6a. Cephalic plaque with median keel low or absent 7
 6b. Cephalic plaque with well developed (high) median keel; lateral lobes of cephalic plaque smooth; anal plaque broadly oval, with margin entire except for lateral notches (Fig. 6) *Maldane sarsi*
- 7a. Cephalic plaque without median keel; lateral lobes of cephalic plaque not crenulate 8
 7b. Cephalic plaque with low keel; lateral lobes of cephalic plaque strongly crenulate; anal plaque divided into two smooth lobes; enlarged dorsal lobe petaloid in shape, ventral margin forms deep funnel-like pocket (Fig. 7) *Metasychis disparidentata*
- 8a. Cephalic plaque developed, lateral lobes with prominent flange (see Fig. 11); rostrate uncini in anterior neuropodia (larger specimens may appear to have acicular uncini) 9
 8b. Cephalic plaque flat, smooth with a deep transverse groove medially, lateral lobes without flange; acicular spines in anterior neuropodia (Fig. 8) *Chymenella complanata*
- 9a. Lateral lobes with or without flange, lateral notches absent 10
 9b. Lateral lobes with well developed flange, lateral notches present (see Fig. 11) 11
- 10a. Lateral lobes with poorly developed flange; cephalic plaque long, sloping posteriorly; "∩" shaped glandular area absent from setiger 8; anal pore surrounded by about 30-33 trim crenulations (Fig. 9) *Isocirrus longiceps*
 10b. Lateral lobes with developed flange; large "∩" shaped glandular area on setiger 8 (visible with methyl green stain); anal pore surrounded by about 20 cirri (Fig. 10) *Chymenura gracilis*
- 11a. Palpode prolonged into a digitate extension (Figs. 11-12) *Praxillella gracilis*
 11b. Palpode not prolonged; methyl green staining pattern used to distinguish among remaining species (Staining process needs to be done with concentrated stain. Leave in stain for at least 30-60 min.) setigers 4-8 stain dark green (Figs. 12-13) *Praxillella pacifica*
 ventral stripes from set. 9-14 (Fig. 14) *Euclymeninae* sp. A
 similar to *P. pacifica* but with white girdle on set. 8 (Fig. 15) *Euclymene grossi newporti*

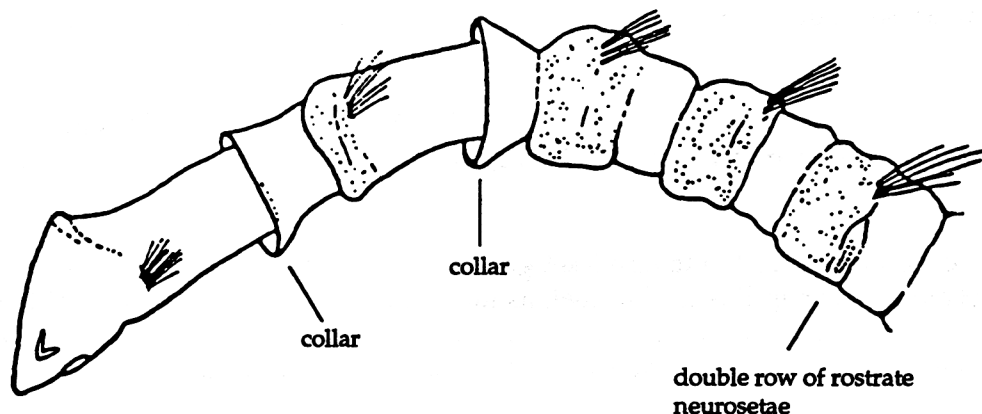


Figure 1. *Rhodine bitorquata* : anterior end, lateral view

MALDANIDS KNOWN FROM CITY OF SAN DIEGO

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 Subfamily Clymenurinae
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 Subfamily Euclymeninae
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 Euclymene grossi newporti Berkeley and E
 Euclymeninae sp. A SCAMIT
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 Notoproctus pacificus (Moore, 1906)
 Praxillura maculata Moore, 1923
 Subfamily Nicomachinae
 Nicomache lumbricalis (Fabricius, 1780)
 Petaloproctus neoborealis Hartman, 1969
 Subfamily Maldaninae
 Maldane sarsi Malmgren, 1865
 Metasychis disparidentatus (Moore, 1904) f
 Subfamily Rhodininae
 Rhodine bitorquata Moore, 1923

RHODININAE
 ANT./POST. PLAQUES ABSENT
 POST. SET. WITH ENCIRCLING COLLARS
 SOME UNCINI IN DOUBLE ROWS

LUMBRICLYMENINAE
 ANT/POST. PLAQUES ABSENT
 ALL UNCINI IN SINGLE ROWS
 POST. SEGMENTS w/c COLLARS

NICOMACHINAE
 ANT. PLAQUE ABSENT
 ANAL PLAQUE PRESENT
 UNCINI IN SINGLE ROWS

CLYMENURINAE
 VENTRAL GLANDULAR SHIELD ON 8th SET.
 ANT/POST. PLAQUES VARY OR ABSENT

MALDANINAE
 ANT/POST. PLAQUES PRESENT
 ANUS DORSAL

EUCLYMENINAE
 ANT/POST. PLAQUES PRESENT
 ANUS TERMINAL

KEY TO THE MALDANIDS COLLECTED OFF POINT LOMA

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- 5a. Prostomium broadly rounded and produced; white dorsal internotopodial bands on red-brown base color; anal plaque forms flat plain with anal pore dorsal to plaque (Fig. 4) *Notoproctus pacificus*
 5b. Prostomium broadly truncate and compressed; anal plaque large, foliose and produced ventrally (Fig. 5) *Petaloproctus neoborealis*

SMALL SPECIMEN WITH ONLY 4 SETIGER WITH ACICULAR NEUROSETAE (SP/100-2132) (15.01.56) (15.7.56)



BANDS OF PIGMENT

YES TWO DOT VENTRAL WITH ORANGE STRIPES

2 STAIN DOTS IN 2nd SEGMENT (1st SETIGER) AT FAR END MALDAN

BLACK LINE MORE COMMON COARSE SETIGER (E-S HAD B)

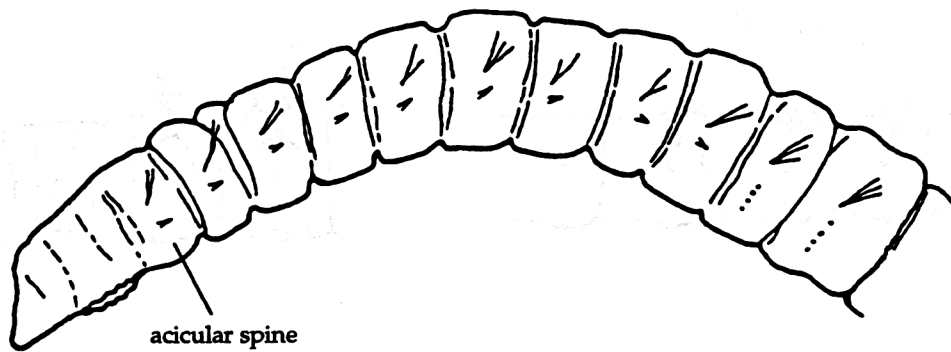
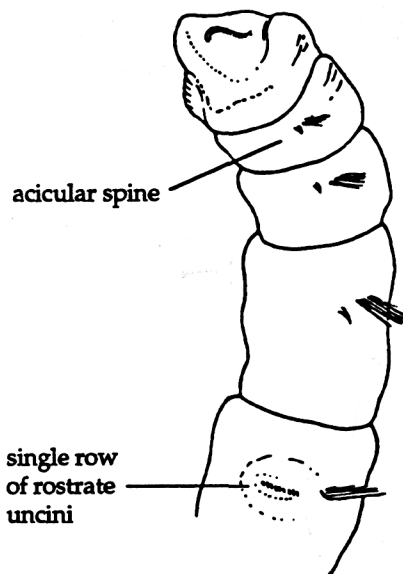
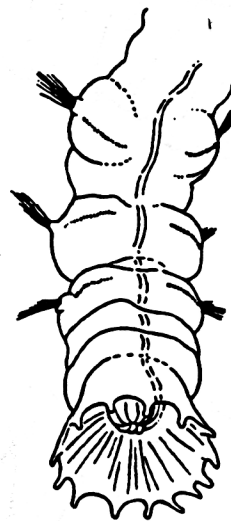


Figure 2. *Praxillura maculata* :
anterior end, lateral view



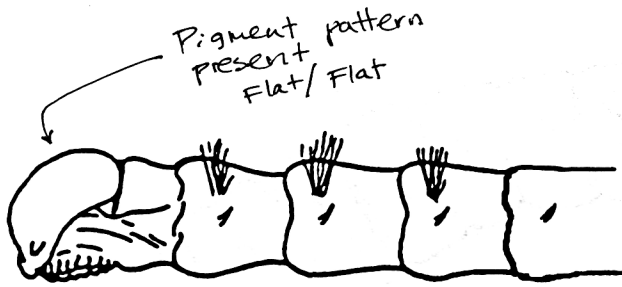
A.



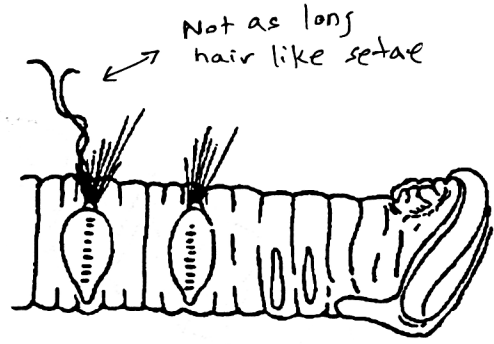
B.

Figure 3. *Nicomache lumbricalis* : A. anterior end, lateral view;
B. posterior end, ventral view

1 May 96



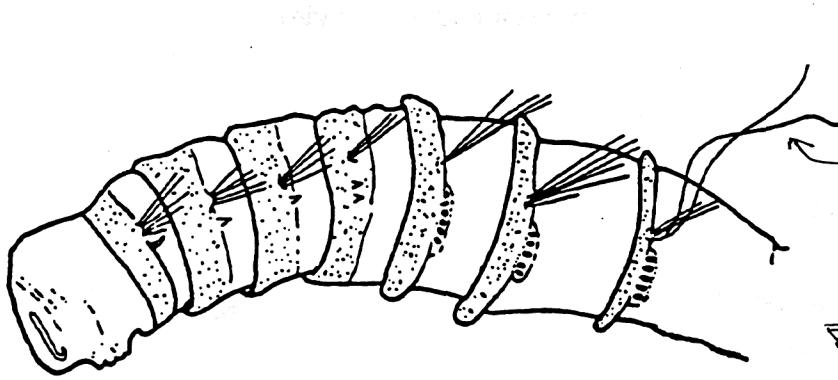
A.



B.

Figure 4. *Notoproctus pacificus* : A. anterior end, lateral view;
B. posterior end, lateral view

Pinched Prostemium as in Rhodine

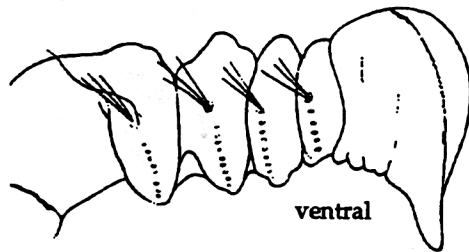


A.

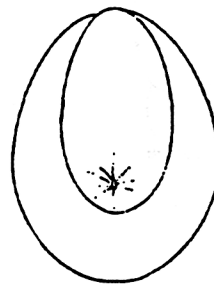
long hair-like setae start on setiger 7



Compressed



B.



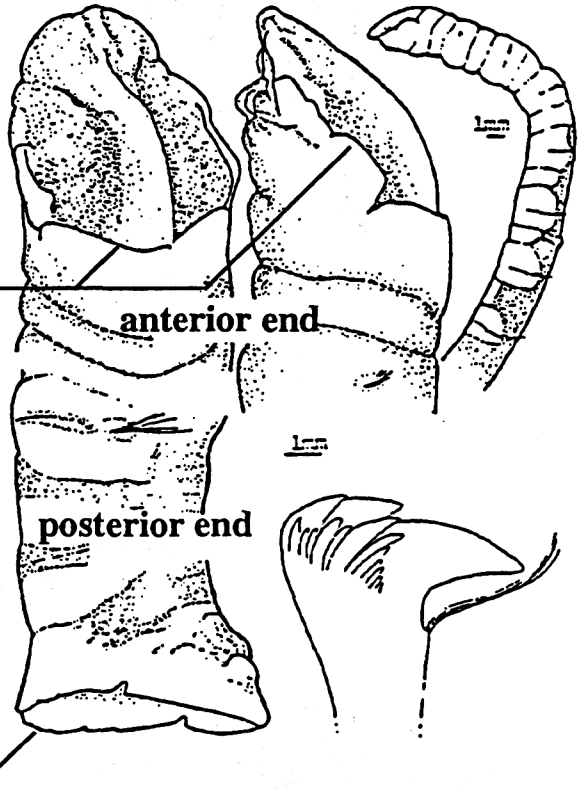
C.

Figure 5. *Petaloproctus neoborealis* : A. anterior end, lateral view;
B. posterior end, lateral view; C. anal plaque, posterior view

Separating *Maldane sarsi* & *Metasychis disparidentatus*

Maldane sarsi

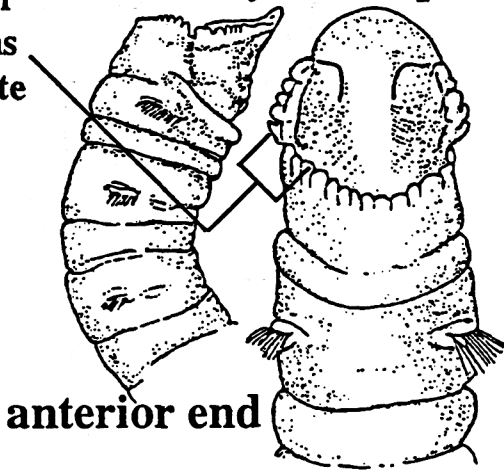
Anterior end formed into a cephalic plaque with smooth lateral and posterior margins



Posterior end formed into an anal plaque which is flat with slightly raised smooth to crenulate margins

Posterior
Anterior
margins
crenulate

Metasychis disparidentatus



Posterior end with large petaloid dorsal margin & deep funnel-like pocket formed by ventral margin

margins can be crenulated

drawings from Imajima and Shiraki 1982

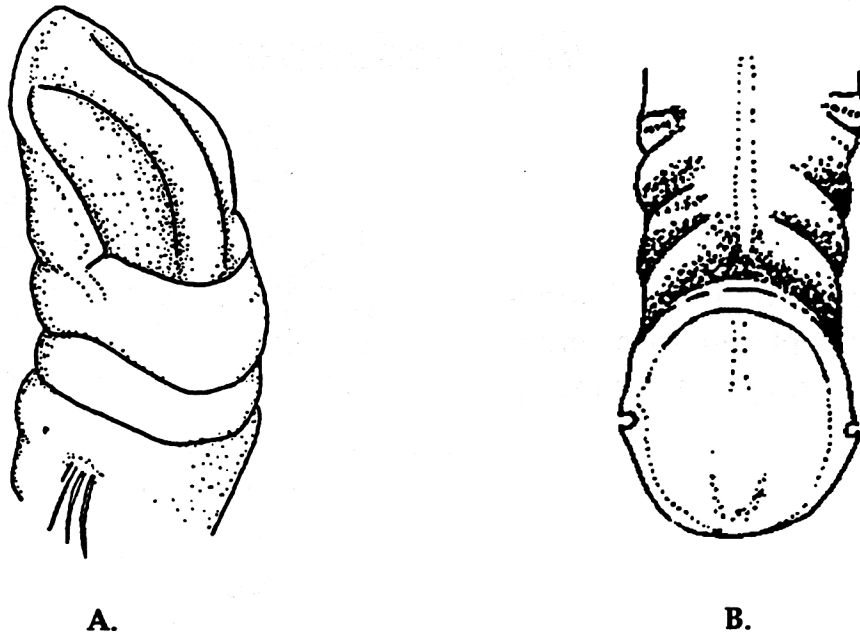


Figure 6. *Maldane sarsi* A. anterior view; B. anal plaque, posterior view

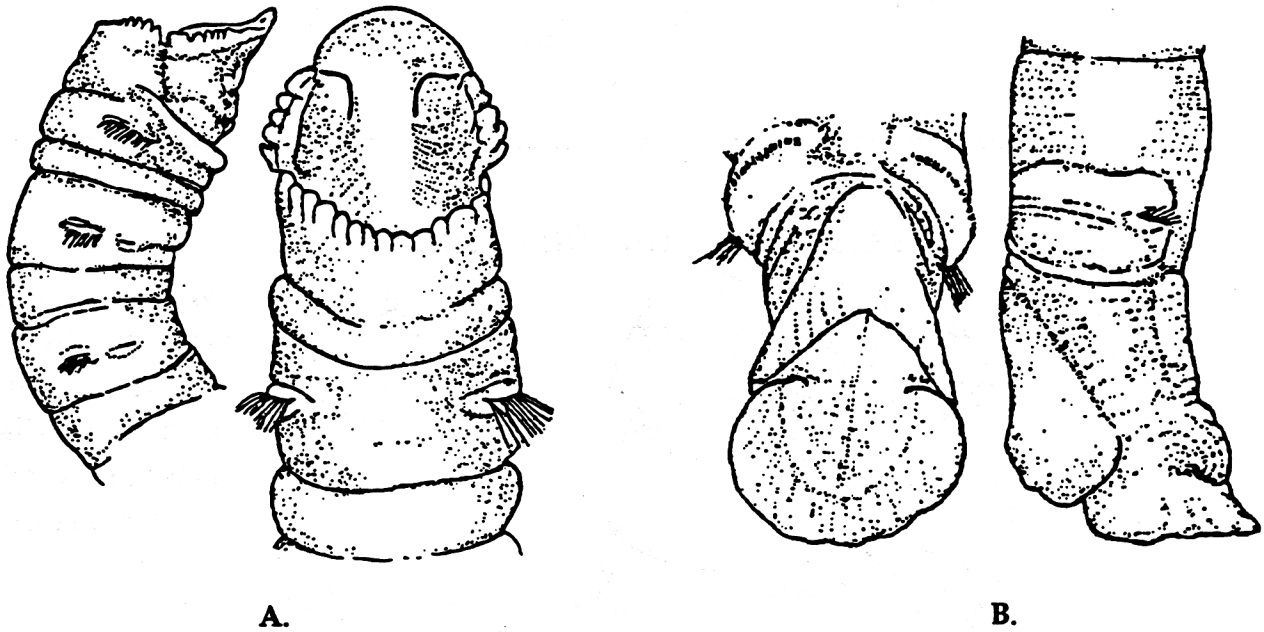


Figure 7. *Metasychis disparidentata* ^{vs} A. anterior end, lateral and ventral view; B. anal plaque, lateral and dorsal view

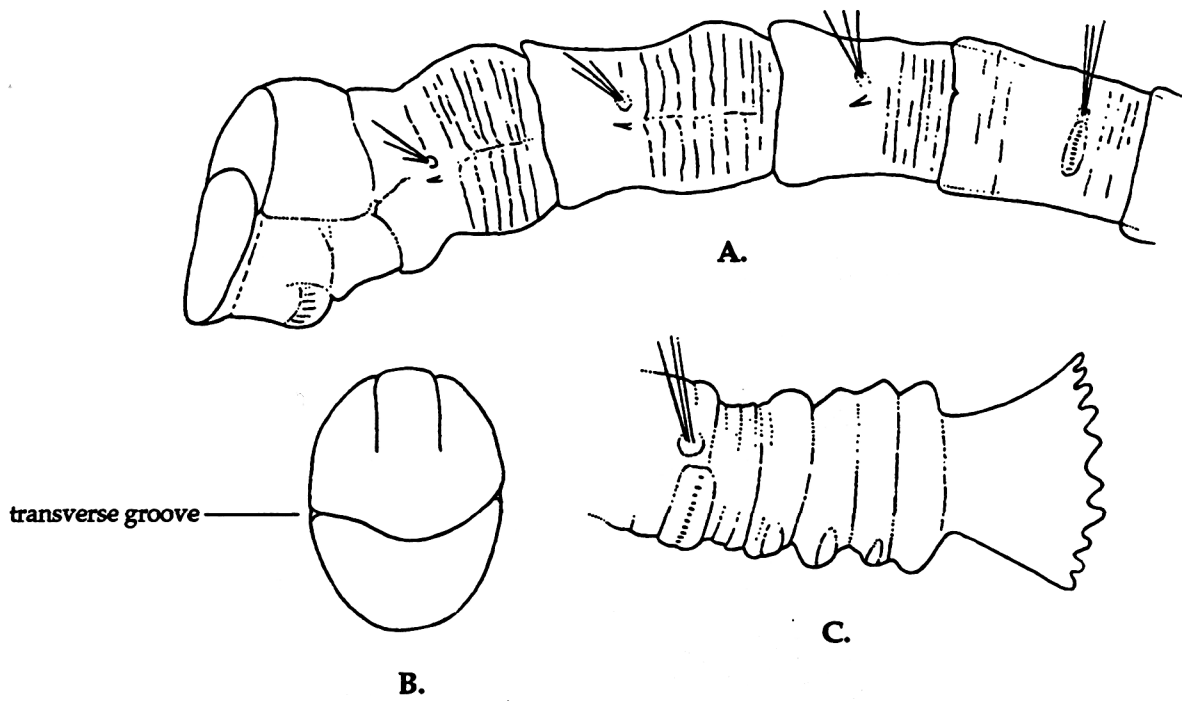


Figure 8. *Chymenella complanata* : A. anterior end, lateral view; B. cephalic plaque with transverse groove; C. posterior end, lateral view

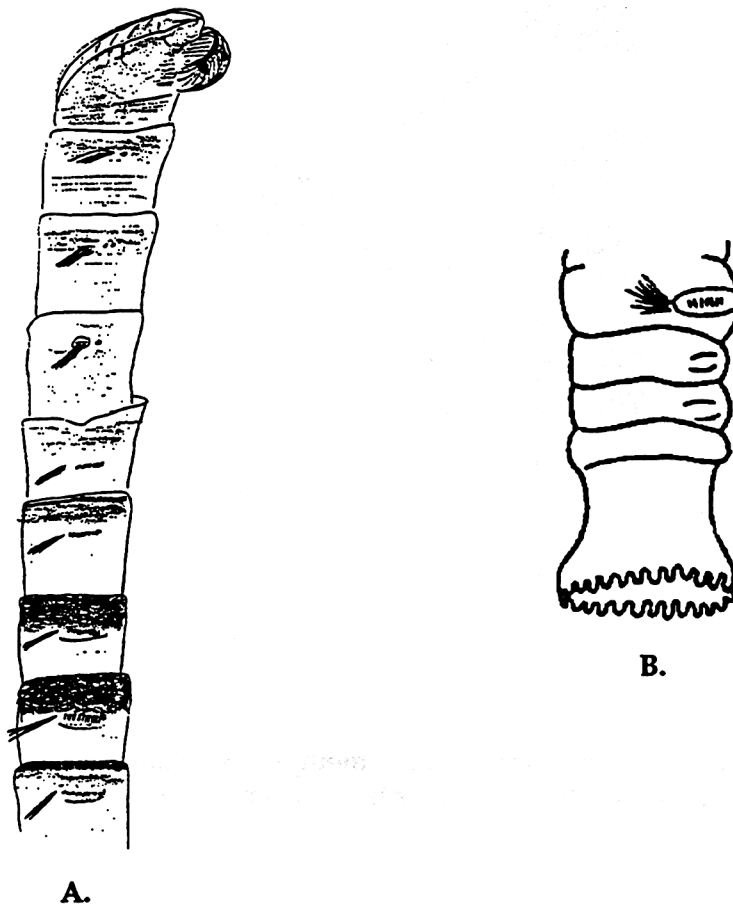


Figure 9. *Isocirrus longiceps* : methyl green staining pattern A. anterior segments 1-8, lateral view; B. posterior end, lateral view

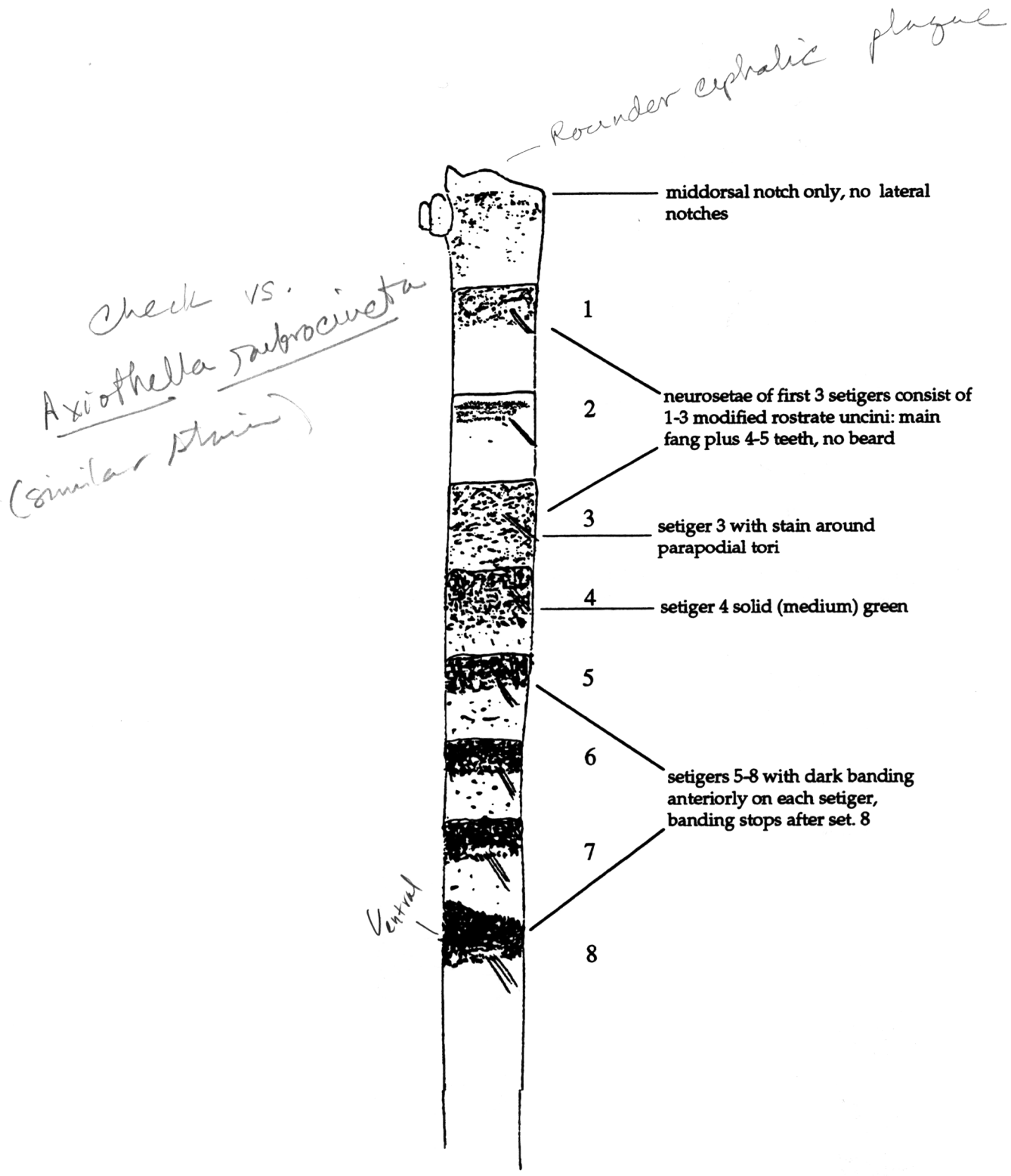


Figure 10. *Chymenura gracilis* : methyl green staining pattern; anterior segments 1-8, lateral view

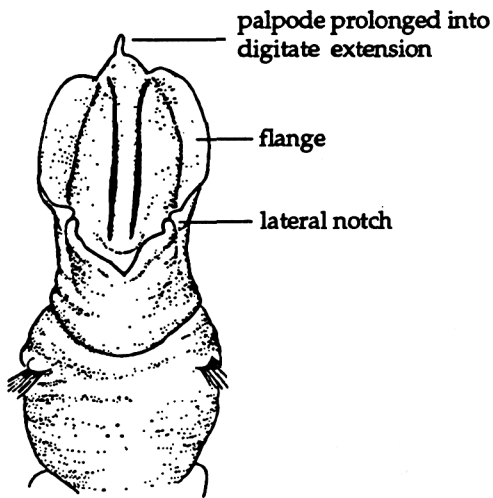


Figure 11. *Praxillella gracilis* :
anterior end, dorsal view

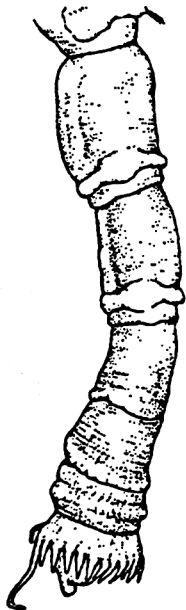


Figure 12. typical *Praxillella* pygidium

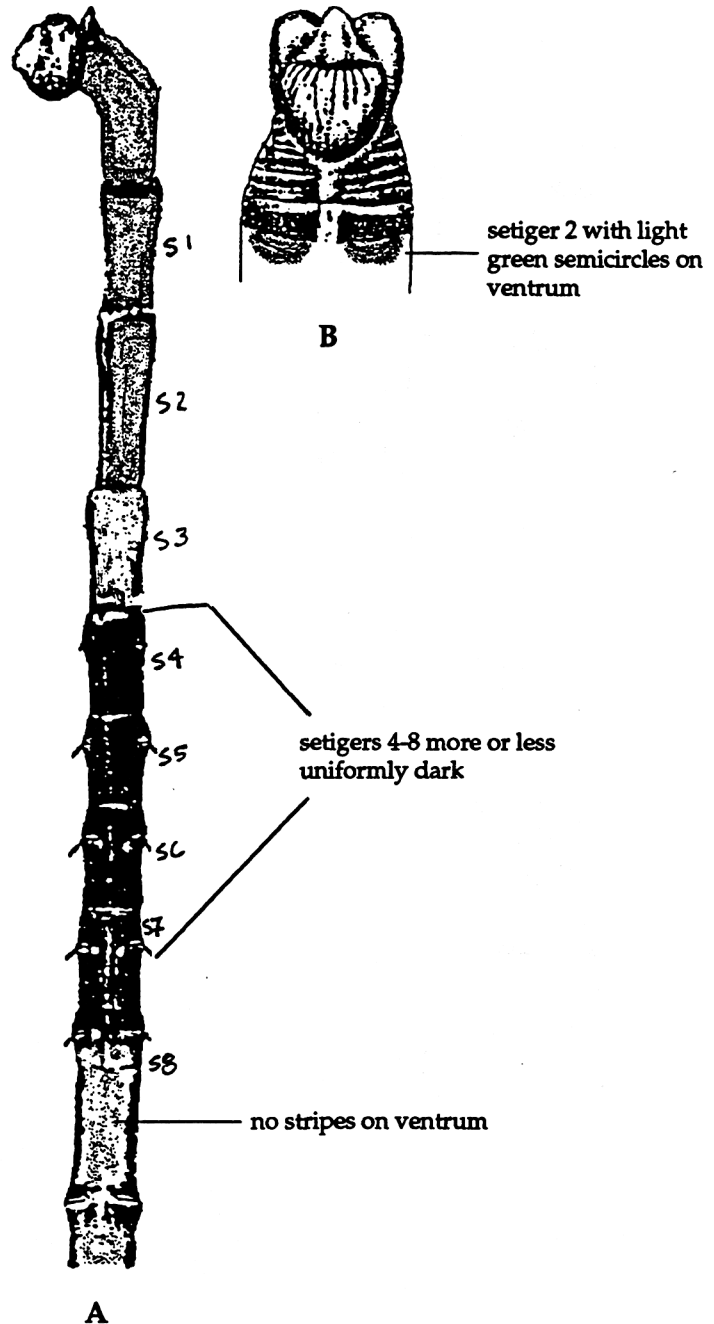


Figure 13. *Praxillella pacifica* : methyl green
staining pattern A. anterior segments 1-10,
lateral view; B. anterior segments 1-2,
ventral view.

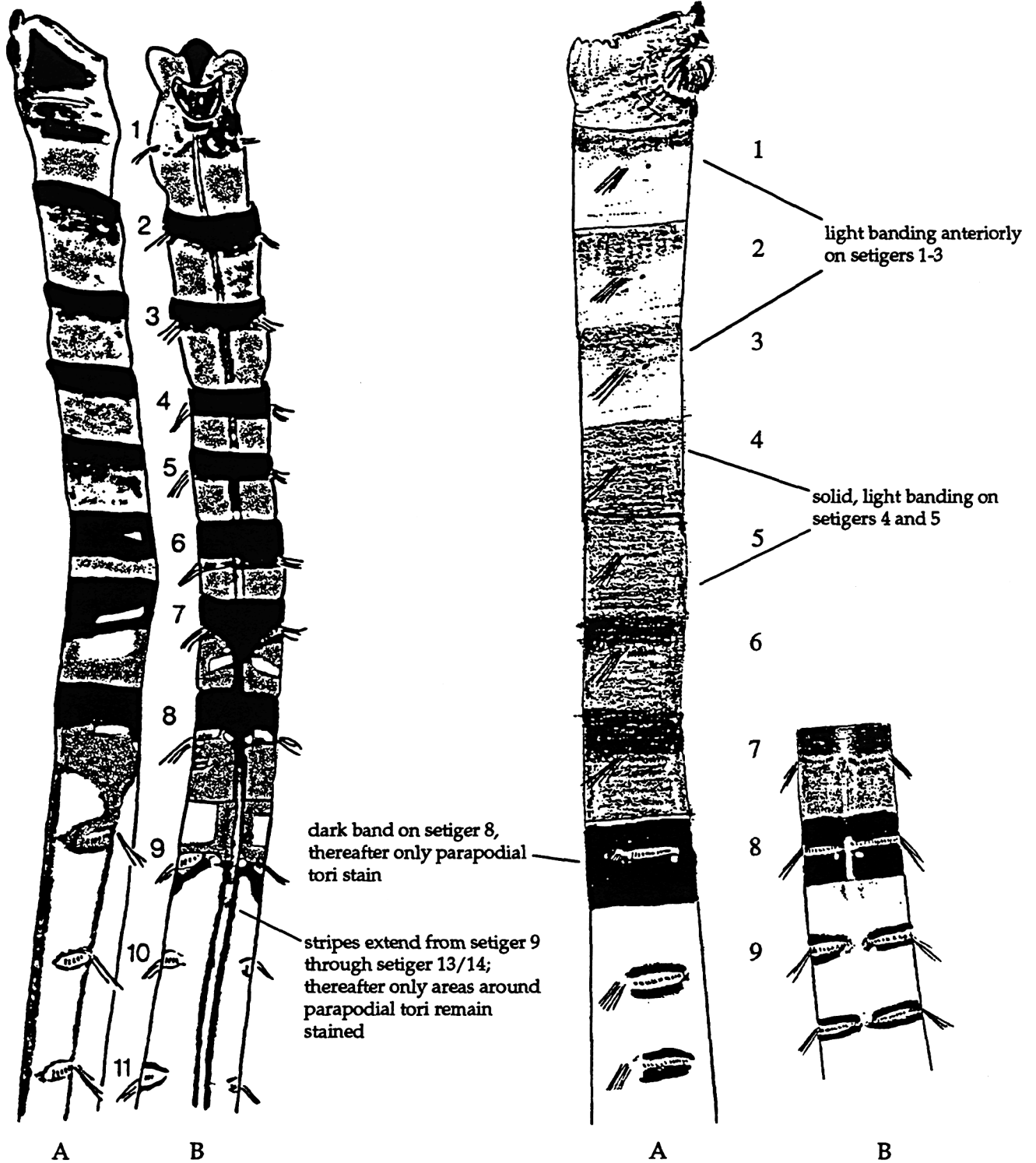


Figure 14. *Euclymeninae* sp. A: methyl green staining pattern A. anterior segments 1-11, lateral view; B. anterior segments 1-11, ventral view

Figure 15. *Euclymene grossi newporti*: methyl green staining pattern A. anterior segments 1-10, lateral view; B. anterior segments 7-10, ventral view

COMPARISON OF
Euclymene grossa newporti
AND
Praxillella pacifica

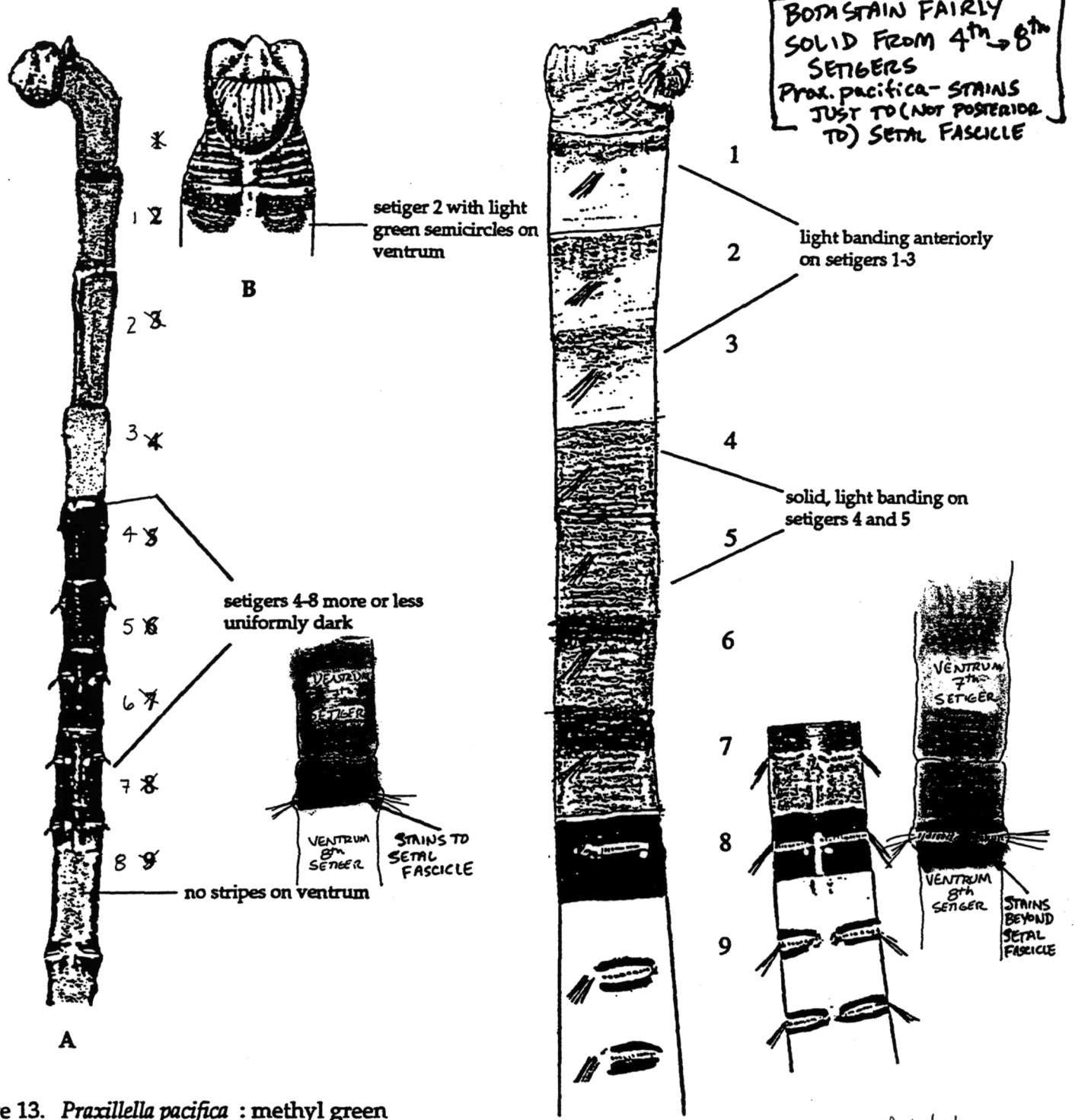


Figure 13. *Praxillella pacifica* : methyl green staining pattern. A. anterior segments 1-10, lateral view; B. anterior segments 1-2, ventral view.

Figure 15. [*Euclymene grossa newporti*]: methyl green staining pattern. A. anterior segments 1-10, lateral view; B. anterior segments 7-10, ventral view.

SCAMIT Code: HYP 44 (in part)

Date examined: 13 July 1987

Voucher by: Leslie H. Harris (AHF)

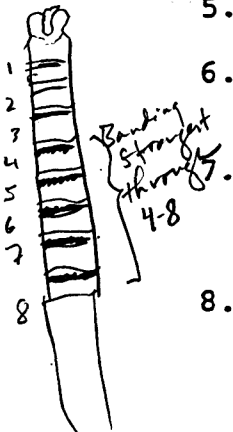
SYNONYMY: Clymenella rubrocincta Johnson, 1901

LITERATURE: Arwidsson, 1907 (placed into unnamed new genus)
Monro, 1937 (put into Axiiothella)
Berkeley and Berkeley, 1941 (Axiiothella)
Hartman, 1969 (Axiiothella)
Clark and Dawson, 1963 (discusses generic confusion)
Harris, 1985 (SCAMIT Newsletter, vol. 3, no. 12)
Imajima and Shiraki, 1982

DIAGNOSTIC CHARACTERS:

1. Nuchal organs and carina extend $2/3$ length of cephalic plaque; slight lateral notches, deeper mid-dorsal notch; proboscis smooth.
2. Usually thick fold on anterior margin of setiger (pseudocollar).
3. Neuropodial uncini of first three setigers with 4 teeth above main fang, no beard; number varies with size, holotype (162 x 3.5mm) has 4 uncini in 1st setiger, 6 uncini in 2nd setiger, 7/8 uncini in 3rd setiger; another specimen (40 x 1.5mm) has 4 uncini in each of first three setigers. Neurosetae in following setigers with 5-6 teeth above main fang, beared, 12 to 24 in number.
4. Notosetae consist of bilimbate capillaries, hirsute capillaries, and simple capillaries.
5. Nephridial pores on setigers 7-8-9.
6. Specimens have 18 setigers and 2 pre-anal asetigerous segments.
7. Pygidium with callus ring and anal funnel rimmed with 18-30 filaments alternating long and short, the mid-ventral filament longest.
8. Methyl green staining pattern (Fig. 1)
 - cephalic plaque, head light.
 - presetal portions of setigers 1-8 dark, postsetal portions light; bands of setigers 4-8 darkest.
 - no color after setiger 8 except for slight traces around tori.

Stripes presetal
Anterior 7-8



RELATED SPECIES AND CHARACTER DIFFERENCES:

1. Axiothella rubrocincta complexa Berkeley and Berkeley, 1941: 3-4 lateral notches on each side of cephalic rim; low collar on anterior margin of 4th setiger.
2. Clymenura gracilis Hartman, 1969: Cephalic rim smooth, only mid-dorsal notch; rounded ventral projection of glandular band on setiger 8; papillated proboscis; 5-6 asetigerous pre-anal segments.

ADDITIONAL NOTES:

Because specimens under 0.75mm in width may only have 1-2 uncini in the first three neuropodia, A. rubrocincta is easily mistaken for other species which have acicular hooks. Great care must be taken in examination of small specimens.

REMARKS:

A. rubrocincta has been one of the commonest maldanids reported in environmental studies, occurring from the intertidal zone through canyon and basin depths. Examination of specimens, however, revealed four undescribed and three described euclymenid species misidentified under this name. In reality, A. rubrocincta is found in shallow water, rarely deeper than 20-30 meters.

DISTRIBUTION:

Western Canada through the Mexican border. Reported from intertidal, shelf, basin and canyon depths, but in central and southern California, found mostly in bays, mudflats, and shallow shelf. Recorded from Japan, 130-295 meters.



Figure 1. Axiiothella rubrocincta (Johnson, 1901). Methyl green staining pattern of anterior end, lateral view.

SCAMIT Codes: HYP 44 (in part), Date examined: 13 July 1987
LACO 49, SCCWRP 54 Voucher by: Leslie H. Harris (AHF)

SYNONYMY: Euclymeninae sp. C Harris

LITERATURE: Harris, 1985 (SCAMIT Newsletter, vol. 3, no. 12)

DIAGNOSTIC CHARACTERS:

1. Nuchal organs and carina extend $3/4$ - $4/5$ length of cephalic plaque; slight lateral and mid-dorsal notches, posterior margin smooth.
2. Presence of thick fold (pseudocollar) on 4th setiger variable, depends on degree of contraction.
3. Neurosetae of first three setigers single acicular spines, bent at tips. Neurosetae of following setigers rostrate uncini with 5 teeth above main fang plus accessory denticles (see additional remarks).
4. Notosetae consist of narrow-edged limbate capillaries and laterally hirsute thinner capillaries.
5. Nephridial pores on setigers 7-8-9 usually obscure.
6. Complete specimens have up to 27 setigers (number varies with size); no asetigerous pre-anal segments.
7. Pygidium with pronounced callus ring (flange) and anal funnel with up to 27 filaments (number varies with size); midventral filament longest, others alternate 1-2 short and 1 long. No anal cone, except as artifact of contraction.
8. Staining pattern (Fig. 1)
 - palpode and inside of flange dark, rest of plaque light.
 - presetal portions of setigers 1-8 dark, postsetal portions light; bands on setigers 6-7-8 darkest.
 - lateral and ventral stripes extend from setiger 9 through 13/14; thereafter only area around parapodial tori stained. No dorsal stripe, slight triangular extension on setiger 9.

RELATED SPECIES AND CHARACTER DIFFERENCES:

1. Euclymeninae sp. B: Different staining pattern, especially in possession of a dorsal stripe through setigers 11-12, darkest bands on setigers 2-3-4, dark carina; two asetigerous pre-anal segments; anal filaments subequal in length.
2. Clymenella californica Blake and Kudenov, 1974: Lateral, ventral and dorsal stripes through setiger 14, pigmented areas around posterior tori extend and form encircling bands; one asetigerous pre-anal segment; anal filaments subequal; anal cone may be present.
3. Euclymene campanula Hartman, 1969: 19 setigers; 7-8 asetigerous pre-anal segments; posterior segments strongly campanulate.
4. Euclymene grossa newporti Berkeley and Berkeley, 1941: 19 setigers; two asetigerous pre-anal segments; posterior margin of cephalic plaque serrated; no stripes in stain pattern.
5. Praxillella pacifica Berkeley, 1929: Different staining pattern (Fig. 2): setigers 4-8 more-or-less uniformly dark, no great contrast in presetal and postsetal portions of setigers, no stripes; anal cone present, usually projecting from anal funnel.
6. Praxillella gracilis (Sars, 1861): Stain pattern and pygidium as in P. pacifica; palpode prolonged into digitate extension.

REMARKS:

Euclymeninae sp. A and B belong in a generic complex that is the most poorly defined in the family Maldanidae. The characters used to separate such genera as Clymenella Verrill, 1873, Axiothella Verrill, 1900, Euclymene Verrill, 1900, and Praxillella Verrill, 1881, are considered inadequate by some authors because of their variability or because the same characters are used on the species level within these genera. Adding to the difficulty of distinguishing between genera and assigning species is the vagueness of original and even emended descriptions, plus the practice of describing animals from incomplete specimens.

The taxa listed under Related Species all have similar cephalic plaques, acicular spines in the first three neuropodia, and anal funnels rimmed with many filaments

REMARKS: (continued)

Euclymenè delineata Moore, 1923 and E. reticulata Moore, 1923, have not been included because they were described from anterior fragments; until examination of the holotypes they should be considered nomen dubia. Euclymeninae sp. A and B have been previously identified as all of these, and as Axiothella rubrocincta (Johnson, 1901), which has modified uncini in the first three neuropodia.

ADDITIONAL NOTES:

Juveniles may have modified uncini instead of simple acicular hooks in the first three neuropodia because the type of uncini change with size in some species. The stripe pattern is constant in adults, but in specimens under 0.75mm in width, the stripes become spotty and may disappear entirely leaving only pigmented areas around the tori. The stain pattern of setigers 1-9 remains the same regardless of size.

DISTRIBUTION:

Euclymeninae A is one of the two most abundant maldanids in shelf depths throughout southern California in soft sediments.

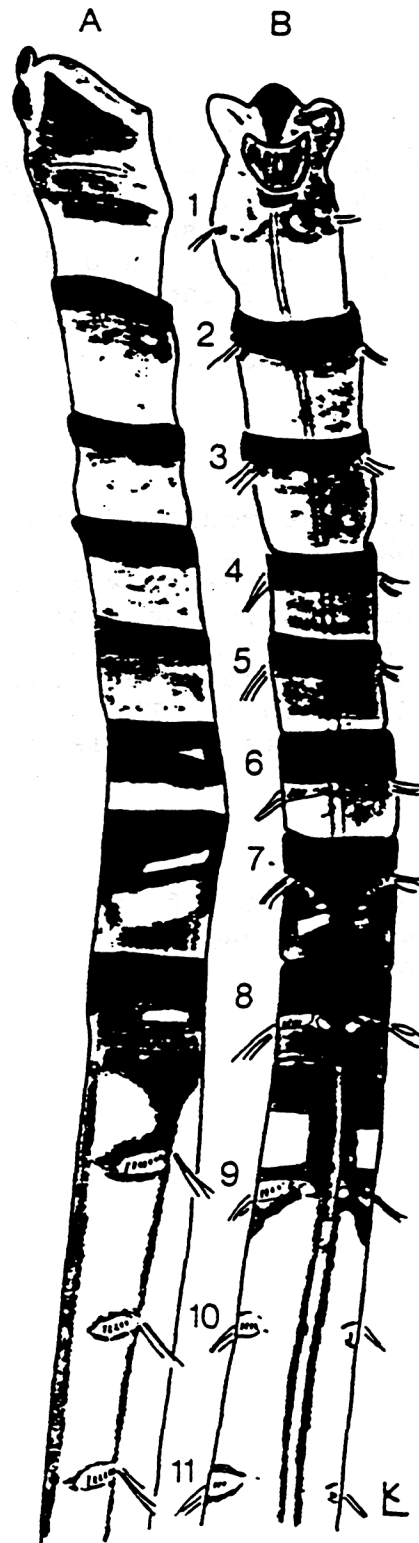


Figure 1. Euclymeninae sp. A SCAMIT. Methyl green staining pattern. A, anterior end, lateral view; B, anterior end, ventral view.

SCAMIT Code: HYP 44 (in part) Date examined: 13 July 1987
Voucher by: Leslie H. Harris AHF)

SYNONYMY: Euclymeninae sp. D Harris

LITERATURE: Harris, 1985 (SCAMIT Newsletter, vol. 3, no. 12)

DIAGNOSTIC CHARACTERS:

1. Nuchal organs and carina extend $3/4$ - $4/5$ length of cephalic plaque; slight lateral and mid-dorsal notches, posterior margin smooth.
2. Presence of thick fold (pseudocollar)² on 4th setiger variable, depends on degree of contraction.
3. Neurosetae of first three setigers single acicular spines, bent at tips. Neurosetae of following setigers rostrate uncini with five teeth above main fang plus accessory denticles. Juveniles may have modified uncini instead of acicular spines.
4. Notosetae consists of narrow-edged limbate capillaries and laterally hirsute thinner capillaries.
5. Nephridial pores on setigers 7-8-9, usually difficult to distinguish except in reproductive specimens.
6. Complete specimens have up to 21 setigers (number varies with size) and two asetigerous pre-anal segments.
7. Pygidium with pronounced callus ring (flange) and anal funnel with up to 19 subequal filaments (number varies with size). No anal cone, except as artifact of contraction.
8. Staining pattern (Fig. 1)
 - palpode, marginal flange and carina dark, rest of palpode light.
 - presetal portions of setigers 1-6 usually darker than postsetal sections, distinction may be blurred on setigers 4 and 5; bands on setigers 2-3 darkest.
 - setiger 7 with three colored areas ventrally, two dorsally.
 - lateral and ventral stripes extend from setiger 9 through tori of 14th, thereafter only area around tori darkly stained. Dorsal stripe from setiger 9 through setiger 11 or 12.

RELATED SPECIES AND CHARACTER DIFFERENCES:

1. Euclymeninae sp. A: Different staining pattern, especially absence of dorsal stripe; darkest bands on setigers 6-7-8; unstained carina; no asetigerous pre-anal segments; anal filaments alternate long and short with mid-ventral one longest.

See other species listed for Euclymeninae sp. A.

ADDITIONAL NOTES:

See Euclymeninae sp. A.

REMARKS: See Euclymeninae sp. A.

DISTRIBUTION:

Euclymeninae sp. B is infrequently encountered in southern California; it is found in soft sediments between 50 and 200m.

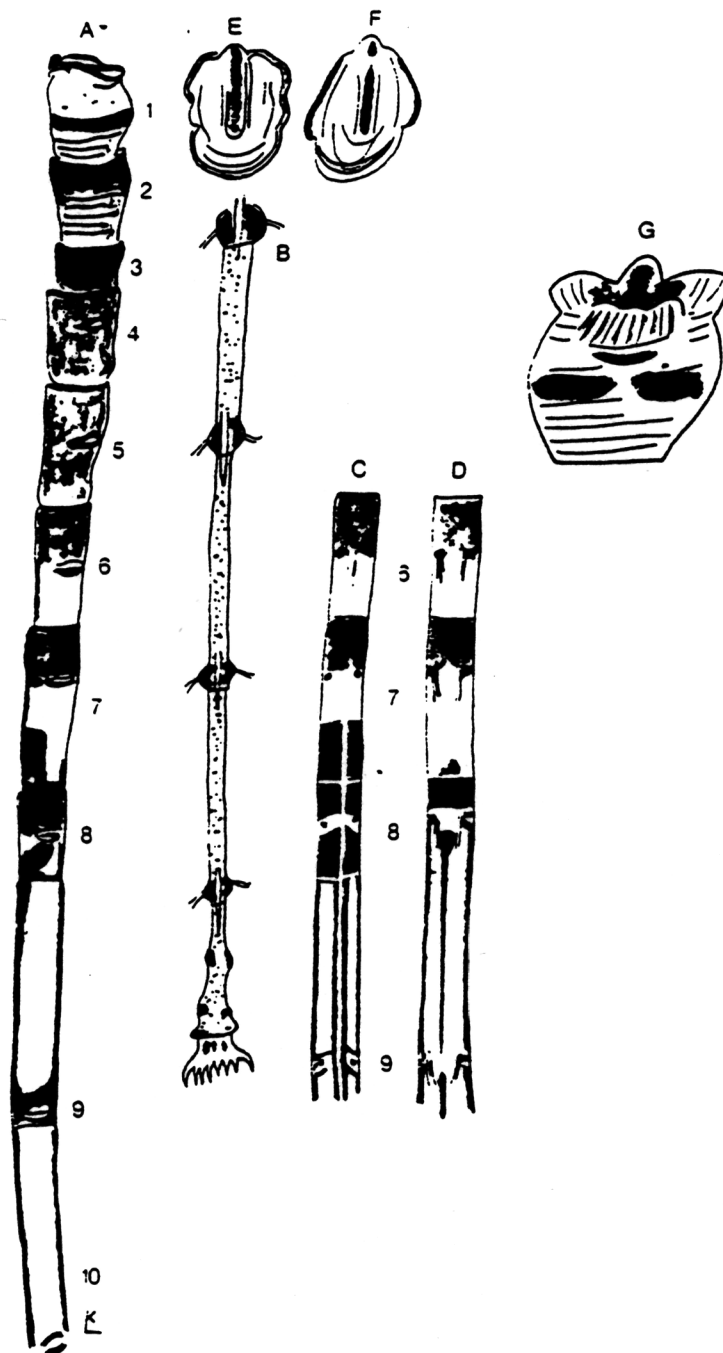


Figure 1. *Euclymeninae* sp. B SCAMIT. Methyl green staining pattern. A, anterior end, lateral view; B, posterior end; C, setigers 6 to 9, ventral view; D, setigers 6 to 9, dorsal view; E, F, cephalic plaques; G, prostomium, ventral view.

Maldane californiensis (85m → 650m)

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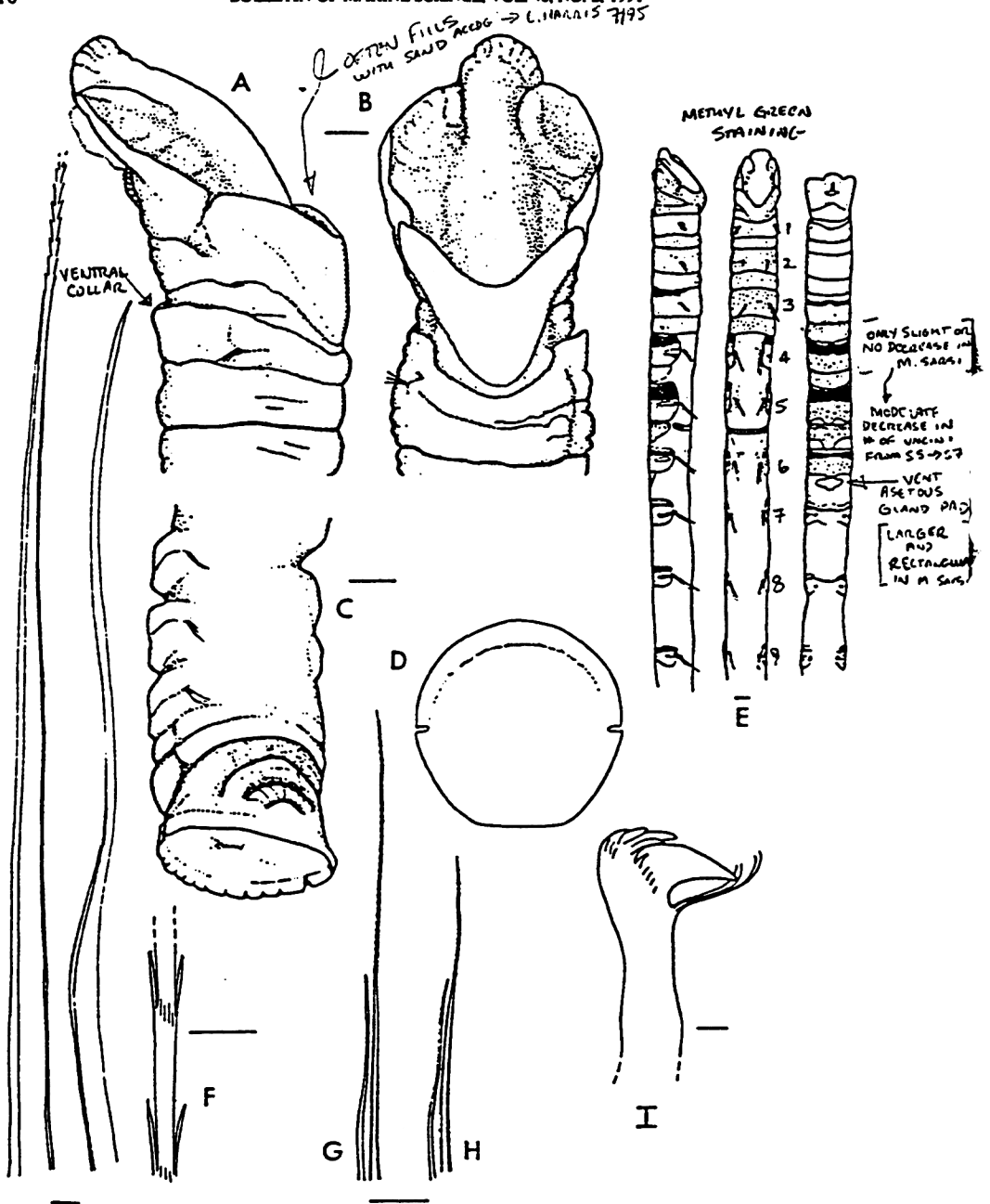


Figure 1. *Maldane californiensis*: A, Cephalic plaque and first setiger, lateral view, ventral collar unshaded and to left of notopodia; B, Cephalic plaque, top view; C, Anal plaque and setigers 17-19, dorso-lateral view, glandular areas unshaded on neuropodial tori and on preanal pads below last setiger; D, Anal plaque, bottom view, dorsal side down; E, Anterior nine setigers, shading indicates methyl green staining pattern on lateral (drawing on left), dorsal (drawing at center), and ventral (drawing on right) sides of body; F, Notosetae, setiger 13, bilimbate seta with haired tip (entire tip not shown) (left), geniculate seta (center), and detail of haired portion of bilimbate seta (right); G, geniculate (left) and bilimbate setae (right), setiger 6; H, geniculate (left) and bilimbate setae (right), setiger 18; I, Neuroseta, setiger 15. Line scales are 1.0 mm for A-E, 0.1 mm for G, H, and 0.01 mm for F and I. Drawings A-C from holotype (AHF 1496); drawings D-I from specimens from Santa Monica Bay, stations 5071 and C-22.

SCAMIT Codes: LACO 47, PL 58

Date examined: March 3, 1985
Voucher by: Karen Green (MEC)

Literature:

Arwidsson, 1907
Fauvel, 1914
Green, 1984

Diagnostic characters:

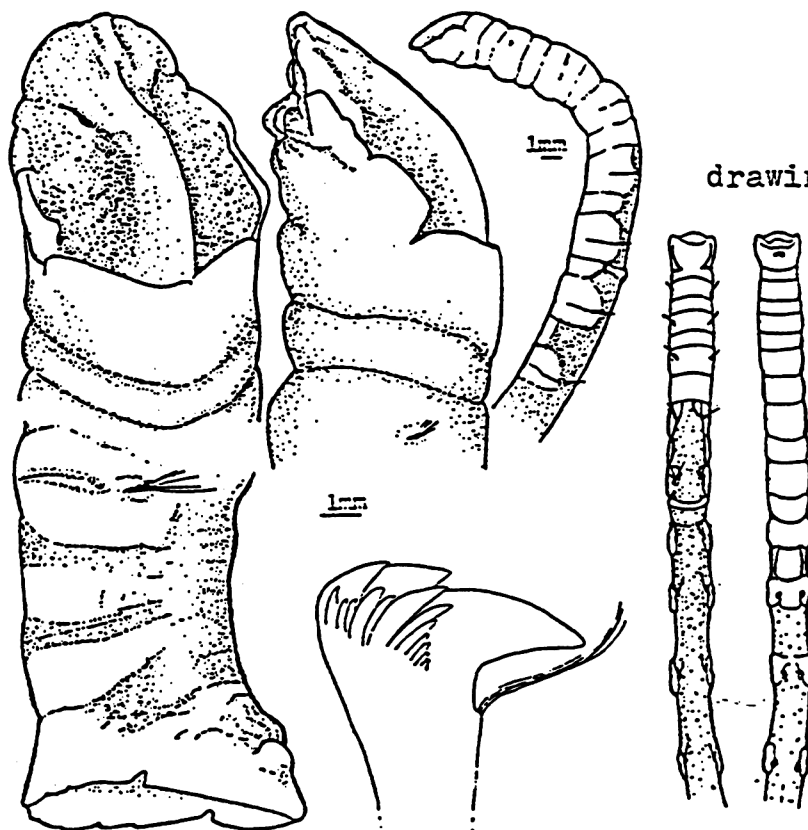
1. 19 setigerous segments, 2 asetous preanal glandular pads.
2. Cephalic plaque with smooth lateral and posterior margins. Posterior margin forms deep pocket. Prostomial palpode semi-triangular, keel long and high, and nuchal organs short and gently curved.
3. Anal plaque divided into two reduced lobes; dorsal margin smooth, ventral margin smooth to crenulate.
4. Dorsal glandular band behind glandular tori of setiger 5.

Additional notes:

The syntype of Maldane cristata and type material of M. sarsi were examined and are equivalent; records of M. glebifex from the eastern Pacific are questionable (Green, 1984; unpublished thesis).

Distribution:

Alaska south to Antarctica, Japan, Arctic Ocean, Baffin Bay, Davis Strait, and Skagerrak. Depths from 3 to 3034 m.



drawings from Green, 1984

SCAMIT Codes: LACO 48, AHF 31

Date examined: March 3, 1985
Voucher by: Karen Green (MEC)

Synonymy:

Maldane disparidentata Moore, 1904

Literature:

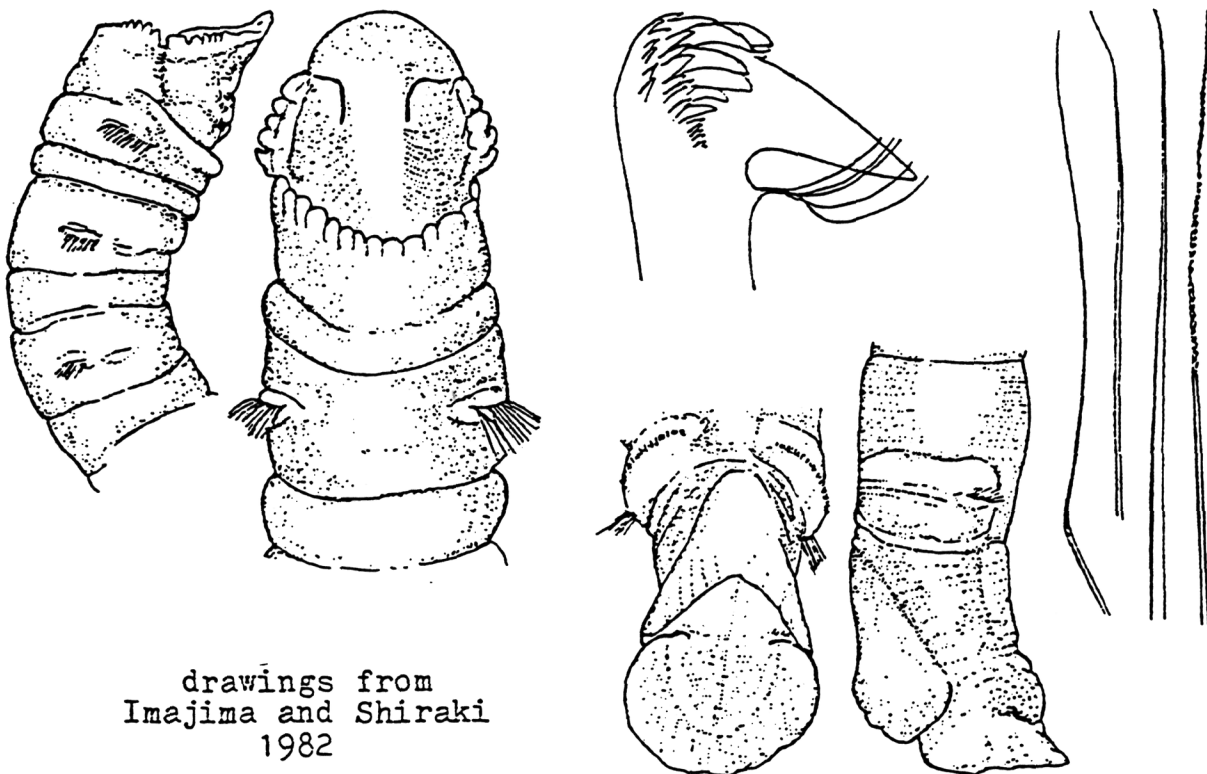
Hartman, 1969
Fauchald, 1972
Imajima and Shiraki, 1982

Diagnostic characters:

1. 19 setigerous segments, no asetous preanal glandular pads.
2. Cephalic plaque with serrate lateral and posterior margins. Prostomial palpode broadly rounded, keel of moderate length and low, and nuchal organs short-moderate length with curved tips.
3. Anal plaque divided into two smooth lobes; enlarged dorsal lobe petaloid in shape, ventral margin forms deep funnel-like pocket.
4. First setiger with ventral collar-like fold.

Distribution:

Western Canada south to Gulf of California; Japan. Shelf, basin, and canyon depths in coarse sand, shelly mixed sediments, silty sands, and mud.



drawings from
Imajima and Shiraki
1982

SCAMIT Codes: MBC 29, SCCWRP 53

Date examined: March 3, 1985
Voucher by: Karen Green (MEC)

Synonymy:

Lumbriclymene pacifica Moore, 1906

Literature:

Hartman, 1969
Hobson and Banse, 1981
Imajima and Shiraki, 1982

Diagnostic characters:

1. Prostomium and pygidium plaque-like but without distinct margins.
2. 19 setigerous segments, 2 preanal asetous glandular pads.
3. Nuchal organs transverse; anal pore dorsal.
4. Anterior 4 setigers with acicular neurospines.
5. Red pigment patch on cephalic plate; white glandular bands at anterior margins of anterior 5-6 setigers.

Additional notes:

1. Only one asetous preanal glandular pad may be obvious on small specimens.
2. Occasionally setiger 19 may be without setae so that there are 3 posterior achaetous segments (Hobson and Banse, 1981).

Distribution:

Alaska south to southern California; Japan. Shelf to abyssal depths.

drawings from
Imajima and Shiraki
1982

