LOS ANGELES COUNTY
SANITATION DISTRICTS
Converting Waste Into Resources

The Family Cossuridae Day, 1963

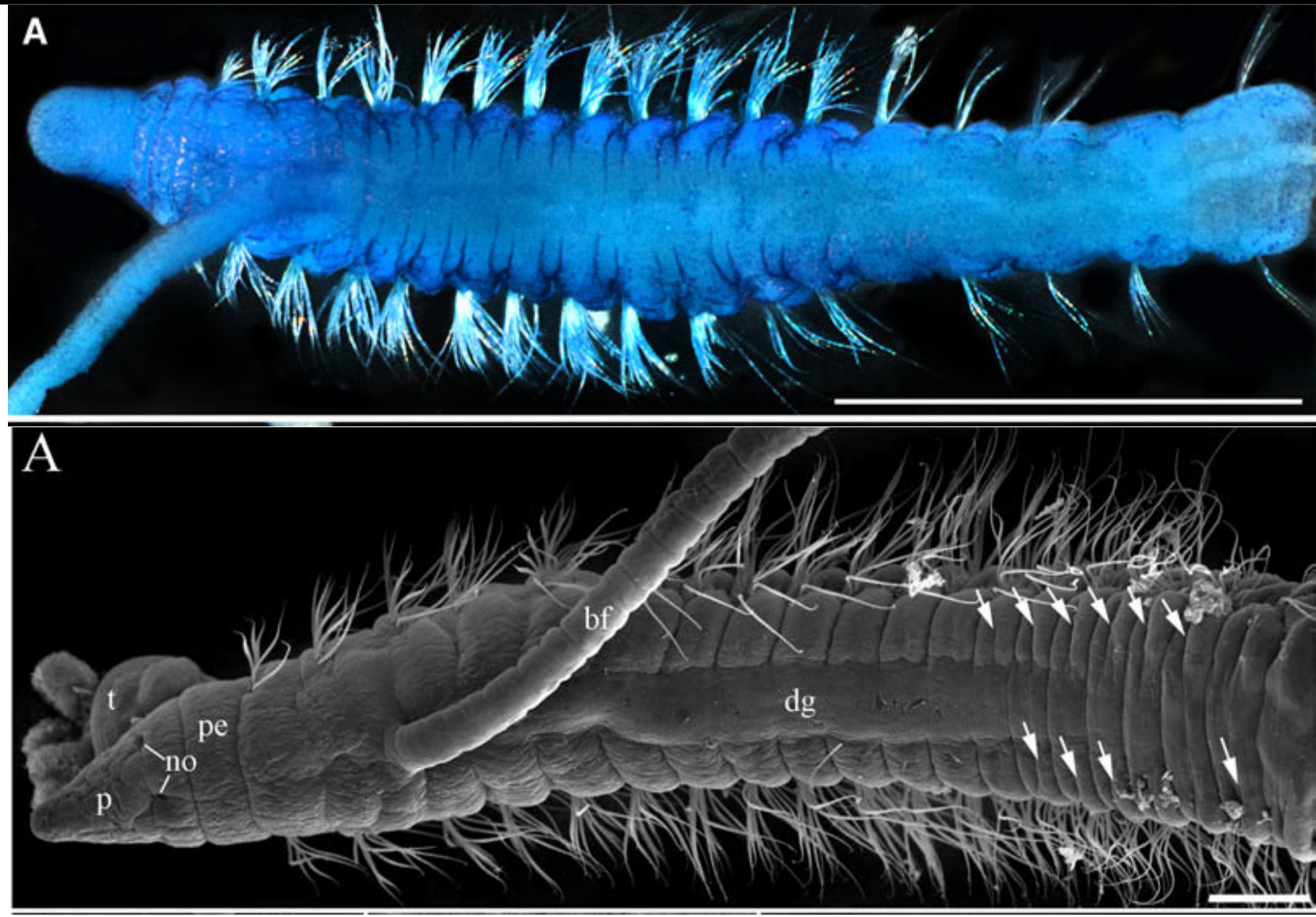
of the Southern California Bight

Brent Haggin

June 2025

Cossuridae

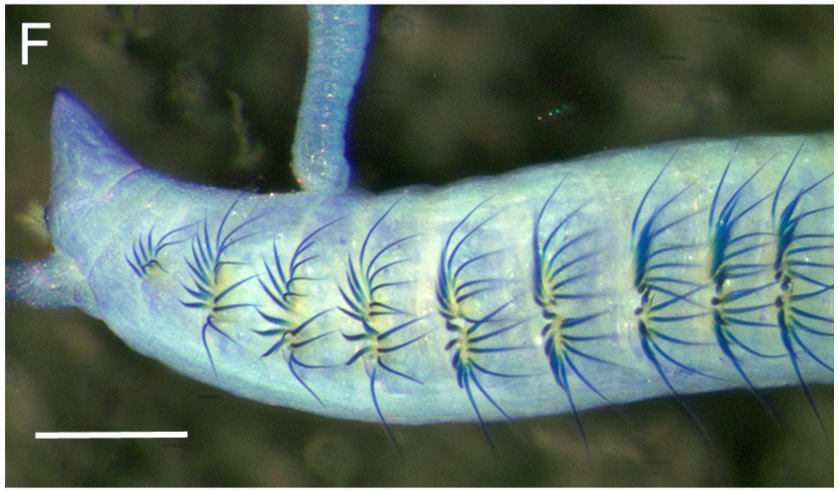
- “They are inconspicuous and relatively featureless, but instantly recognizable by their single middorsal branchial filament …” (Hilbig, 1996)

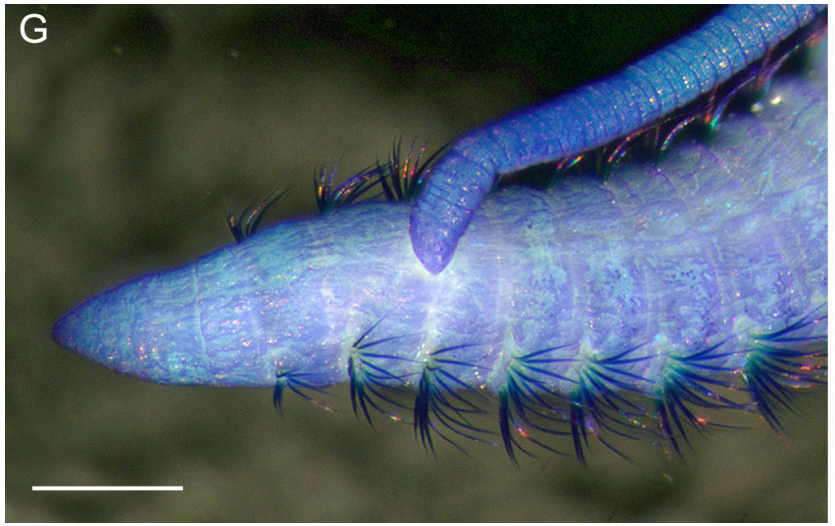


Source: Hilbig (1996); image of *Cossura platypus* Zhadan, 2017 (top) from Zhadan (2017); SEM image of *Cossura pygodactylata* Jones, 1956 (bottom) from Zhadan et al. (2012)

Cossuridae

- Small, burrowing worms
- Occur in high densities in deep-sea communities (1000+ m)
- Surface or subsurface deposit feeders
- No tubes

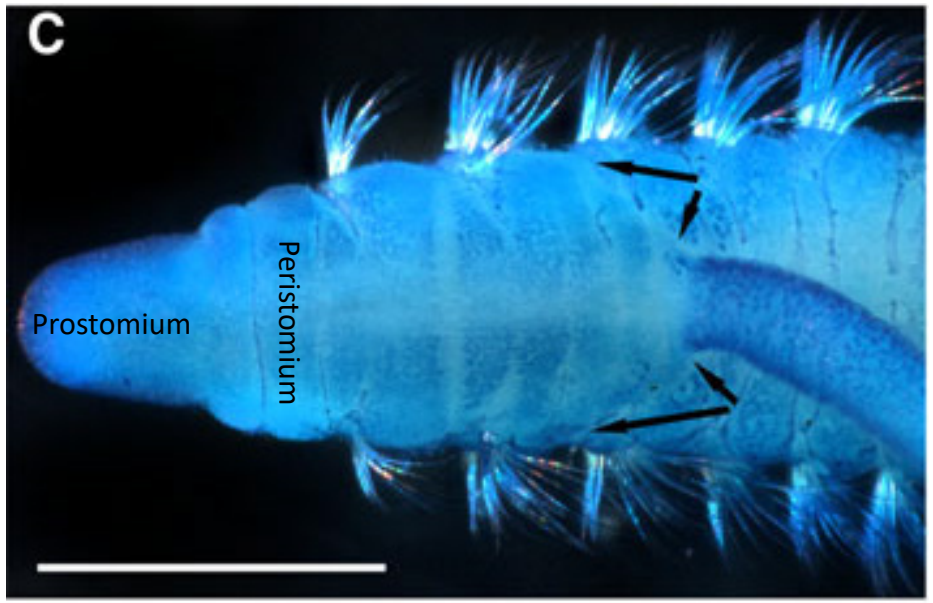


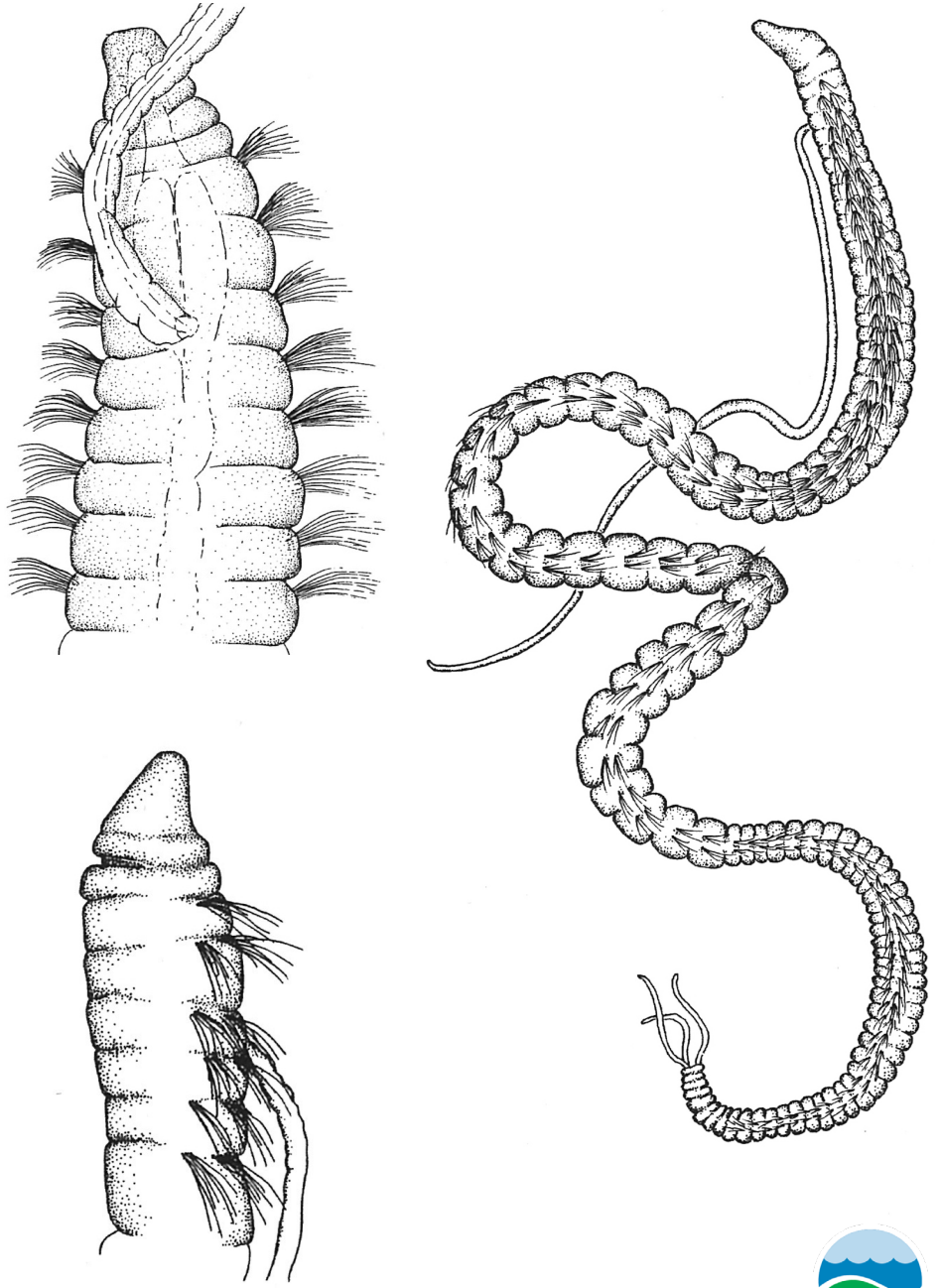


Source: Hilbig (1996); images of *Cossura consimilis* Read, 2000 from Zhadan (2015)

Characteristics

- Prostomium conical with rounded anterior
  - Lacks appendages
- Posterior of prostomium sometimes separated into rings
  - Sometimes confused with the peristomium

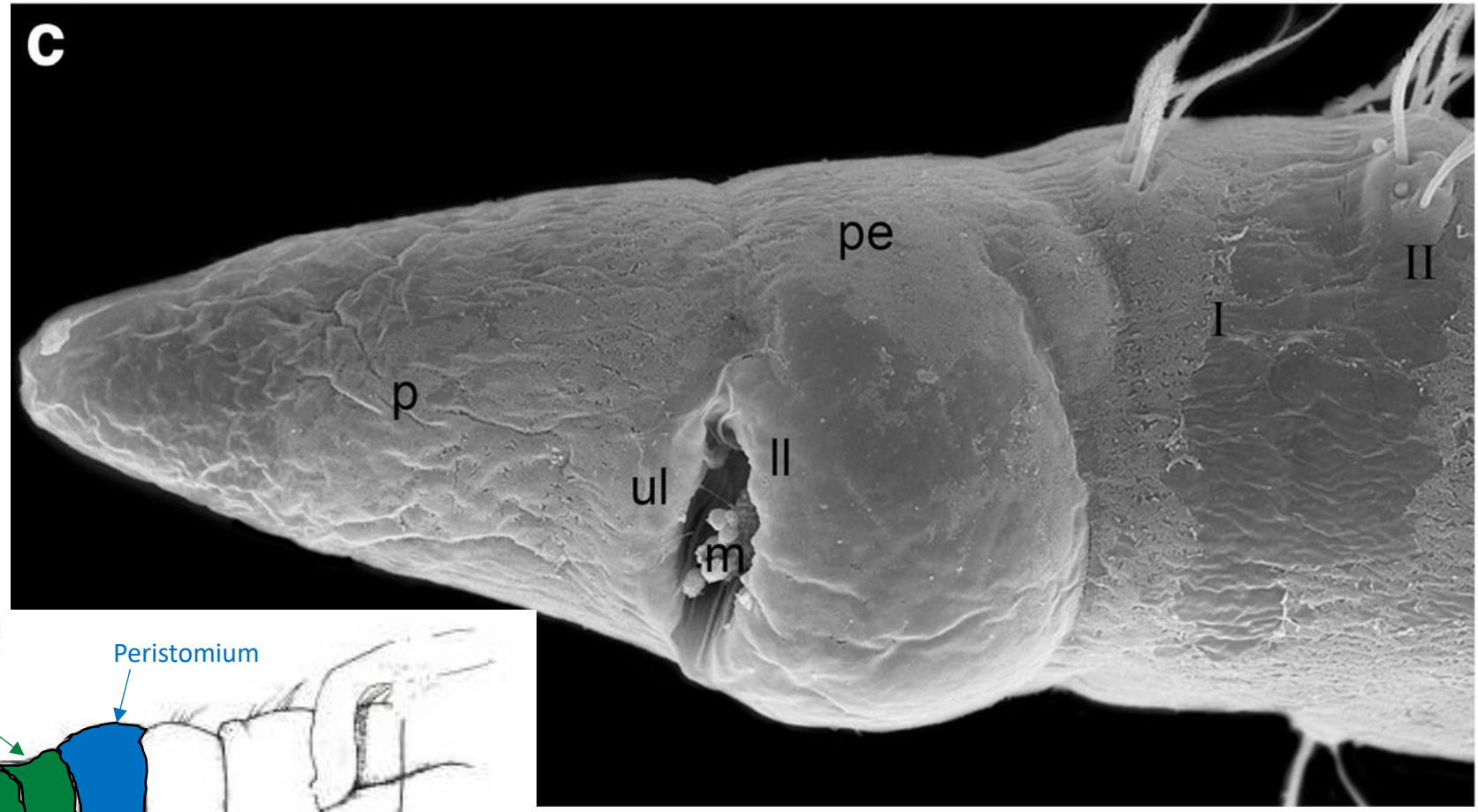


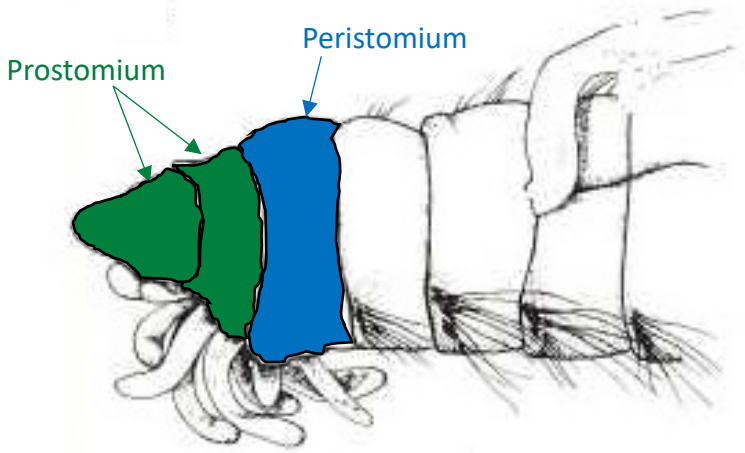


Source: Hilbig (1996); drawings from Hilbig (1996); image of *C. platypus* modified from Zhadan (2017)

Characteristics

- Peristomium a single segment
  - Without chaetae
- Ventrally produced to form lower lip
- Pharynx thin-walled pouch with several dorsally attached finger-like lobes
  - Buccal tentacles

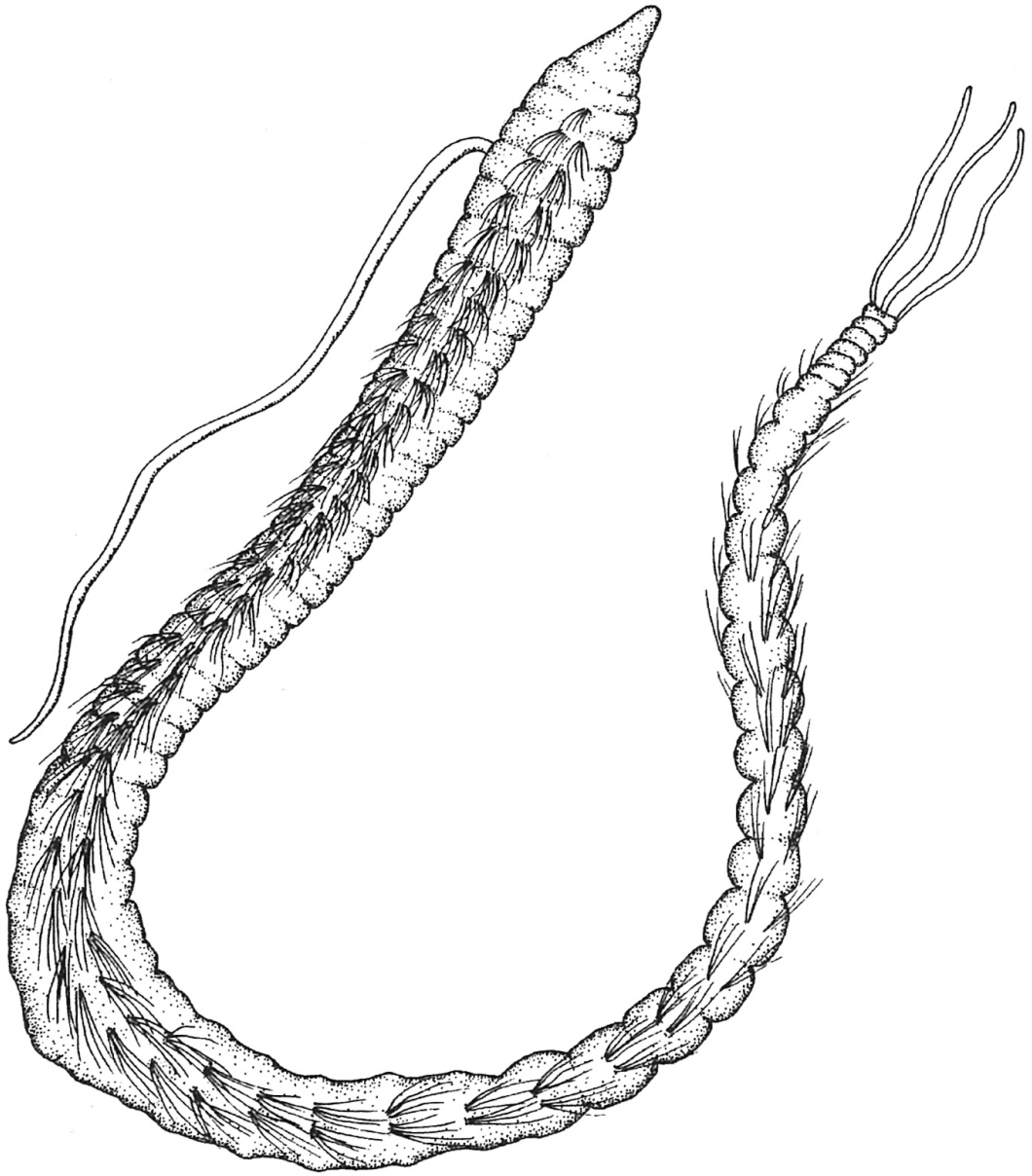




Source: Hilbig (1996); drawing modified from Fournier & Petersen (1991); SEM image of *C. pygodactylata* from Zhadan *et al*. (2015)

Characteristics

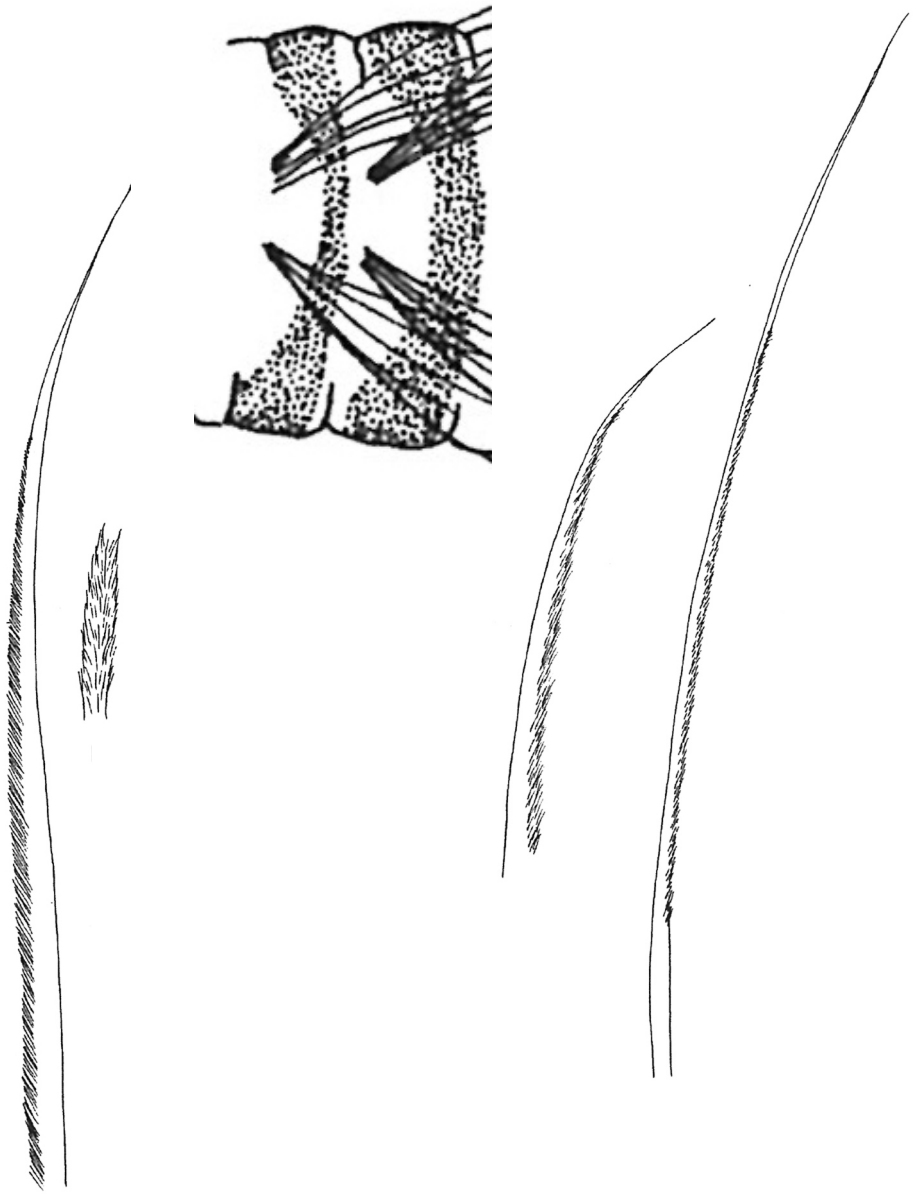
- Body composed of many similar segments
- Unpaired, slender, long branchial filament
  - Emerges from segments 2 to 5
  - Insertion point is diagnostic
    - Can be difficult to determine actual segment of insertion
    - I have been using the position of the branchial filament insertion relative to the # of chaetal bundles before the insertion point



Source: Hilbig (1996)

Characteristics

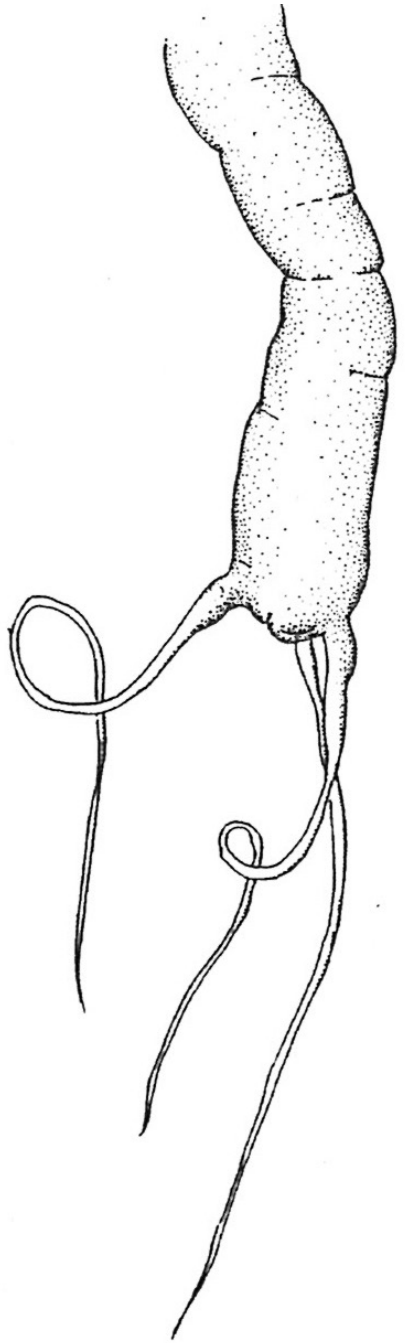
- Division between thorax and abdomen indistinct
  - Marked by a shift in chaetal position
    - Thorax – anterior in segment
    - Abdomen – median in segment
  - Thorax with many transitional segments as chaetal bundles migrate
    - Makes for some confusion in the literature as to where and how the thoracic chaetigers are counted
- Parapods reduced to inconspicuous lobes surrounding chaetal fascicles
- Uniramous in first (sometimes first 2) segment(s)
- Biramous in remaining chaetigers
- Chaetae smooth, geniculate capillaries with mucronate tip
  - Edges often frayed



Source: Hilbig (1996)

Characteristics

- Pygidium short ring
- Anus slightly dorsal
- With 3 anal cirri
  - Cossurids easily fragment and do not often contain the pygidial region



Source: Hilbig (1996)

Taxonomy

- Class Polychaeta
  - Subclass Sedentaria
    - Infraclass Scolecida
      - Family Cossuridae

- A single genus is recognized
  - *Cossura*
- 30 accepted species
- 6 species on SCAMIT Ed. 14 + 1 (2?) provisional species

Source: WoRMS

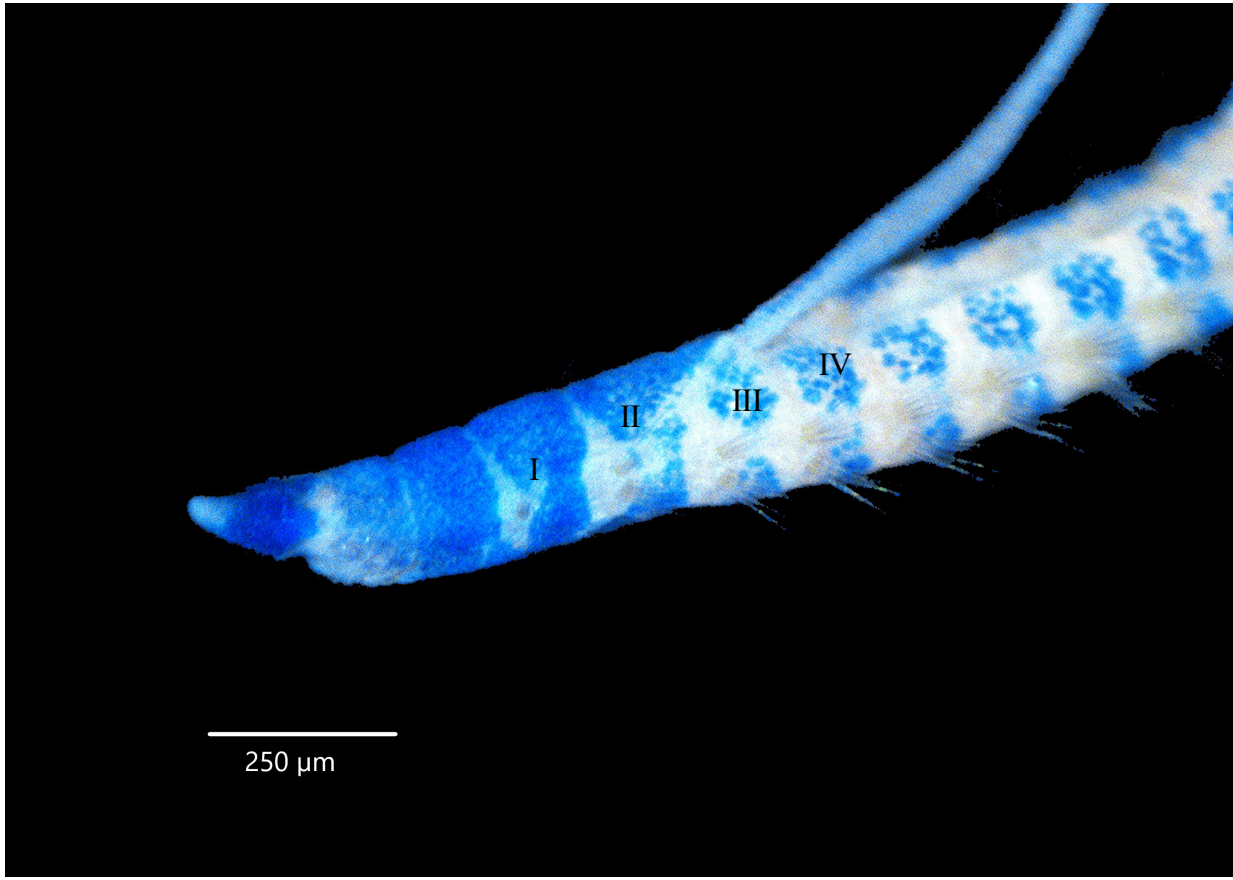
Cossura

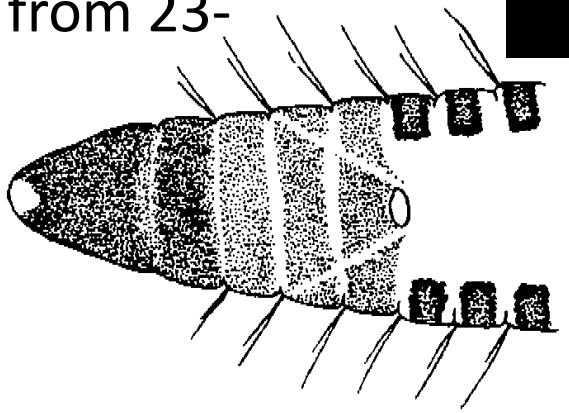
- **Generic Diagnosis** – (after Read, 2000) – Prostomium conical without appendages, without eyes; peristomium achaetigerous, usually subdivided at least dorsally by a transverse furrow. Single branchial filament arising middorsally on chaetiger 2, 3, 4 or 5. Chaetiger one uniramous, thereafter chaetigers biramous; chaetal lobes rarely present. A variable number of narrow anterior chaetigers with chaetal fascicles at anterior chaetal borders; grading thereafter into longer, often beaded chaetigers with chaetal fascicles emerging at midlength. Anterior chaetae hirusute capillaries (usually in distinct rows, anterior row with shorter, thicker chaetae); from midbody chaetae fewer and less hirsute, always several per fascicle unless thickened chaetae or short spines present; last few segments may be achaetigerous. Pygidium with three anal cirri, which may be branched; intercirral perianal processes may be present.

Source: Read (2000)

Cossura bansei Hilbig, 1996

- Characteristics
  - Brancial filament arising from posterior border of chaetiger 3
  - Thorax with 20-31 chaetigers
  - Pygidium with 3 anal cirri (usually fragmented and missing)
  - Pygidial processes absent (pers. obs.)
- Distribution
  - British Columbia?? to California
  - 18 – 160m
  - LACSD reports *C. bansei* from 23-152m off Palos Verdes





Source: Hilbig (1996); image by B. Haggin

Cossura bansei Hilbig, 1996

- Material Examined
  - LACSD stn 0721-7C – Palos Verdes, 61m; coll. 14JUL2021 (2 ind.)
  - LACSD stn 0722-9B – Palos Verdes, 152m; coll. 11JUL2022 (1 ind.)

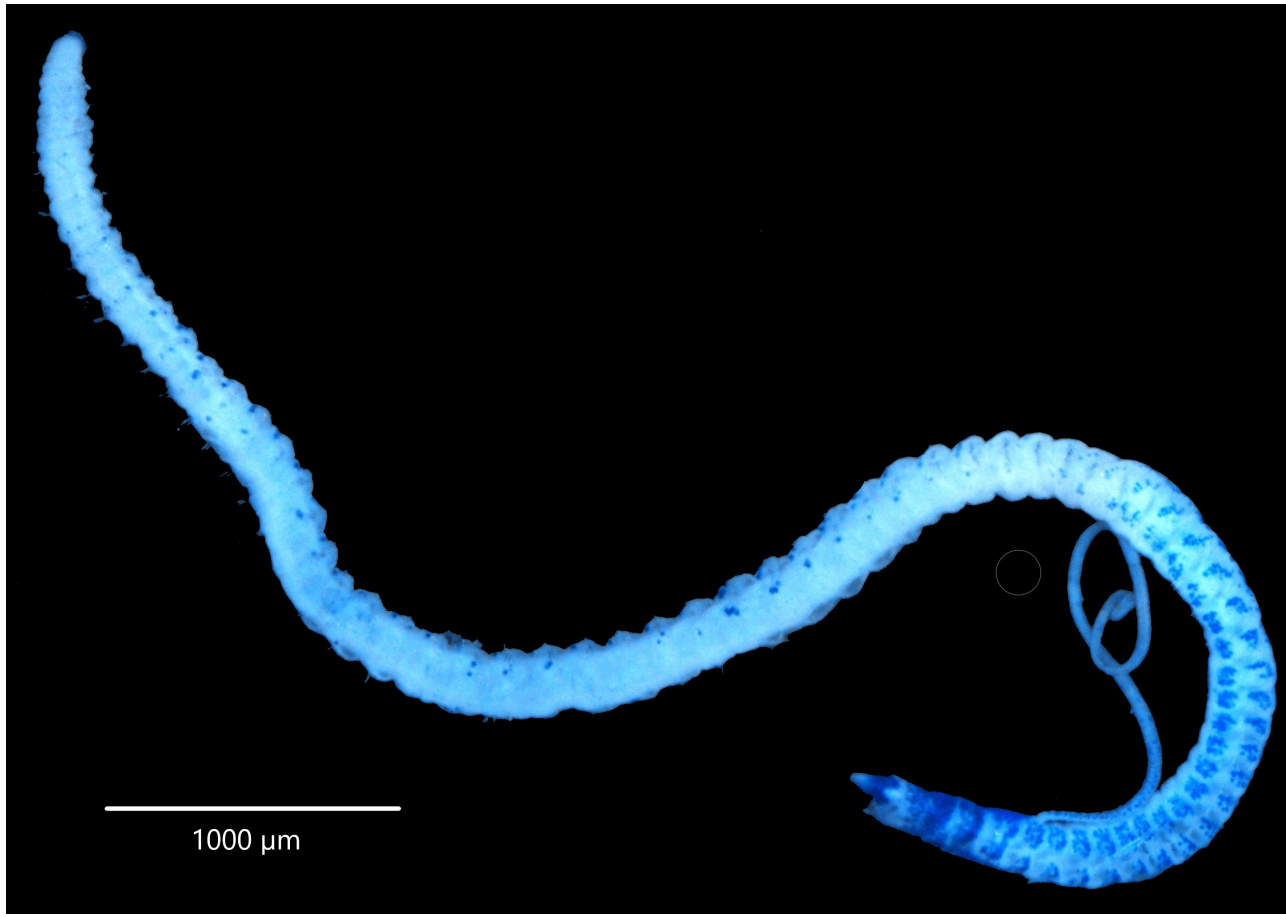
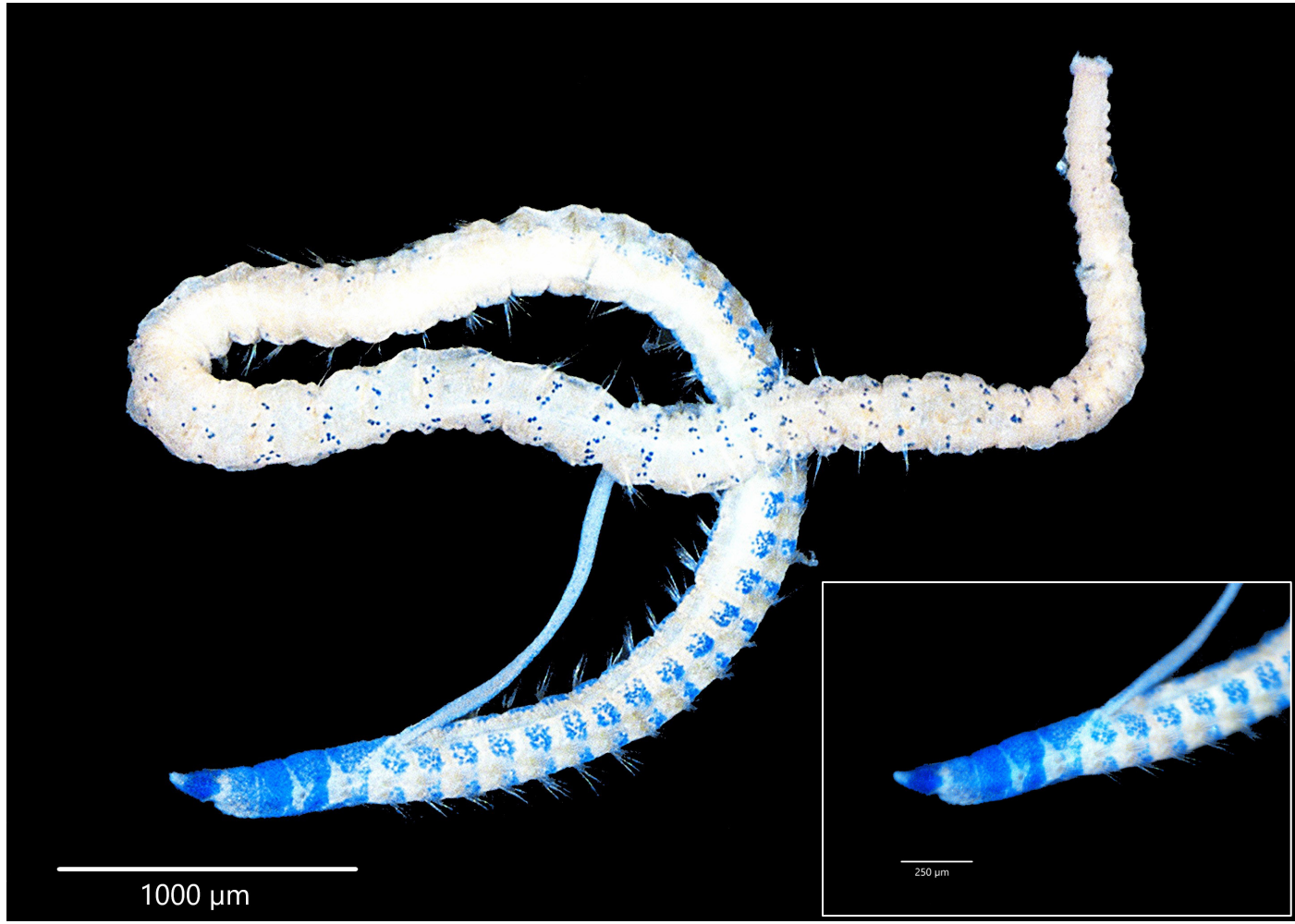


Image by B. Haggin

Cossura bansei Hilbig, 1996

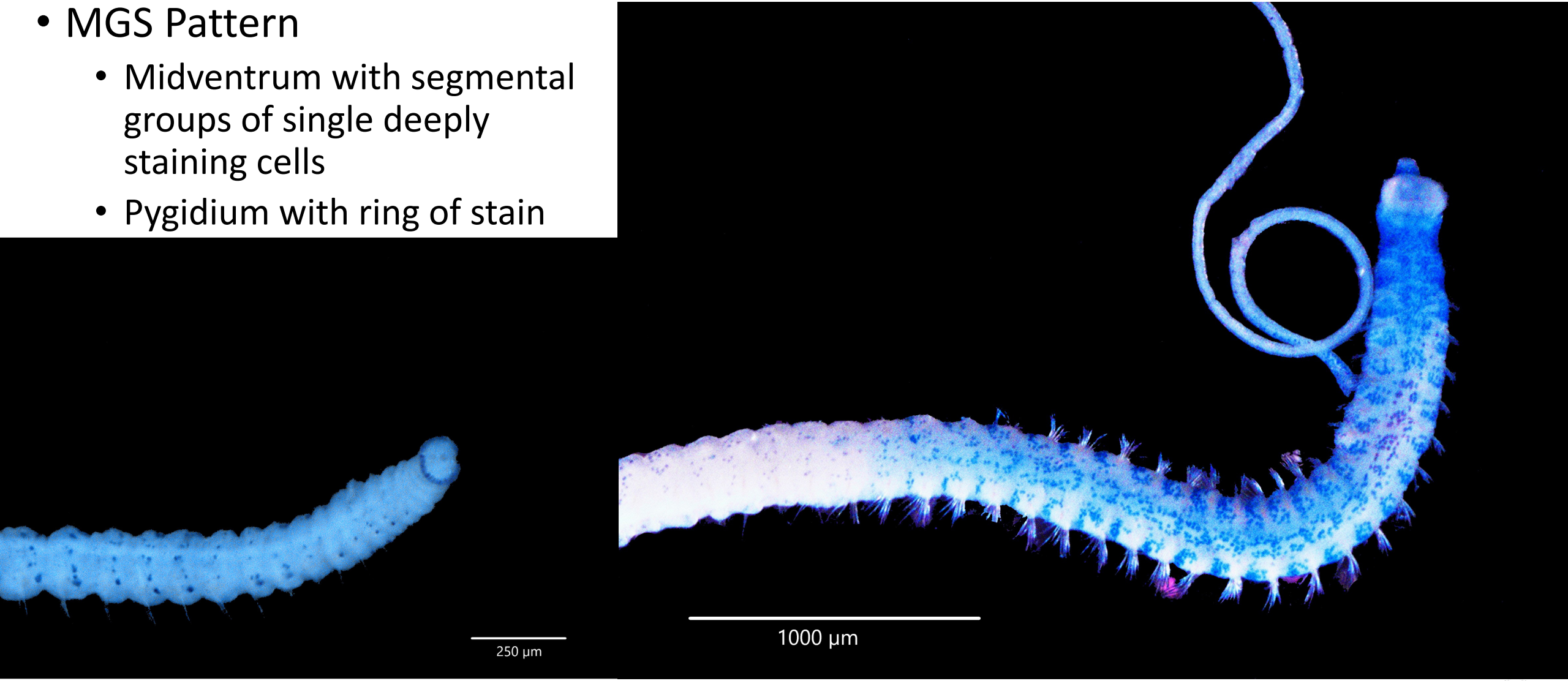
- MGS Pattern
  - Prostomium, peristomium & chaetigers 1-3 staining solidly except for tip of prostomium
  - Large rectangular dorso- and ventrolateral patches present on all but last 1 or 2 thoracic chaetigers (covering ~1/4 body width)
    - Diminishing in size posteriorly but present as small rounded patches above and below chaetae to end of body
  - Not staining laterally between chaetal fascicles



Source: Hilbig (1996); images by B. Haggin

Cossura bansei Hilbig, 1996

- MGS Pattern
  - Midventrum with segmental groups of single deeply staining cells
  - Pygidium with ring of stain



Source: Hilbig (1996); images by B. Haggin

Cossura bansei Hilbig, 1996

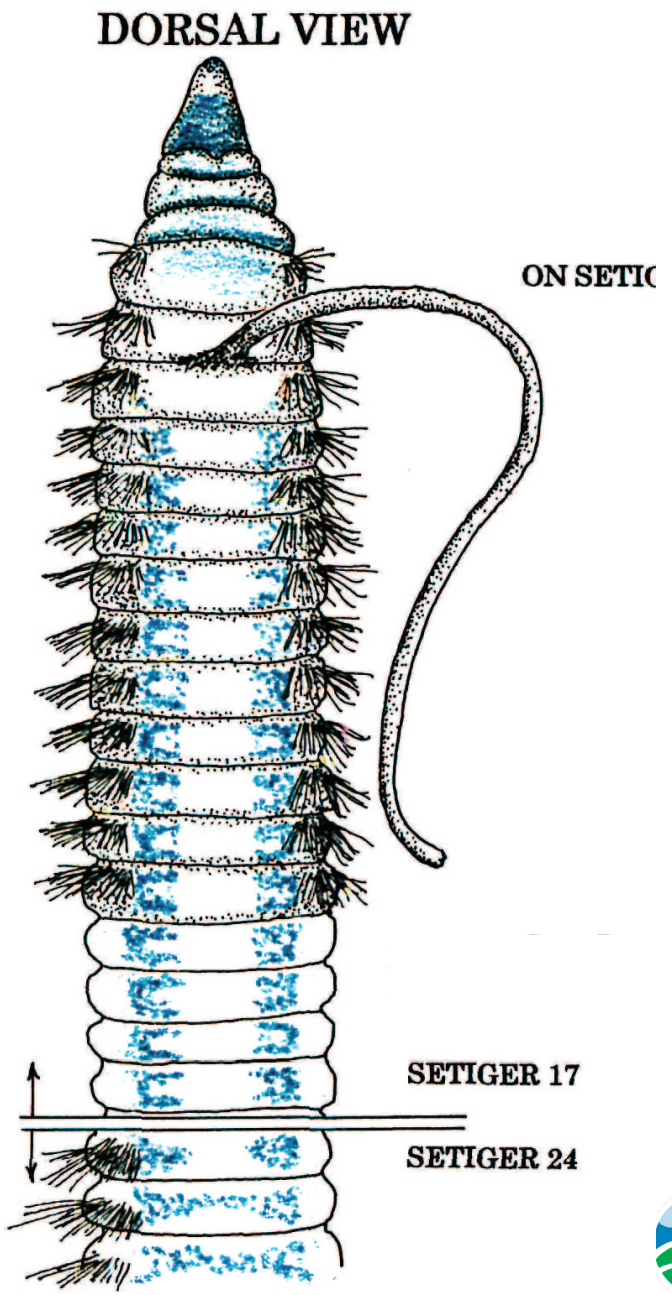
- Named for Karl Banse
  - WoRMS lists type locality as “off Ridley Island, Chatham Sound, British Columbia, Canada”
  - Banse described a *Cossura* sp. from BC & Washington that Hilbig thought might be the same species
    - Was too small to confirm some characters and did not stain.
    - Not registered as a Holotype or Paratype
- All registered types from Santa Maria Basin

Material Examined. Canada, British Columbia: Chatham Sound, off Ridley Island, 54°14'N, 130°20'W, 18 m (1, *Cossura* sp. of Banse, BCPM 974-628-1).—California: Santa Maria Basin, off Point San Luis, Sta. R-1, 35°05.83'N, 120°49.16'W, 91 m: 3 **paratypes** (LACM-AHF 1833 & 1834), Sta. R-2 (2); off Point Sal, Sta. R-8, 34°55.30'N, 120°45.87'W, 90 m: **holotype** (USNM 172565) 1 **paratype** (USNM 172566), 2 **paratypes** (LACM-AHF 1796) Sta. PJ-1 (1), Sta. PJ-6 (1), Sta. PJ-10 (1), Sta. PJ-11 (1), Sta. PJ-22, 34°55.25'N, 120°49.93'W, 143 m: 1 **paratype** (SBMNH 143205).

Sources: Hilbig (1996); SCAMIT (1996)

Cossura sp A Phillips, 1987 §

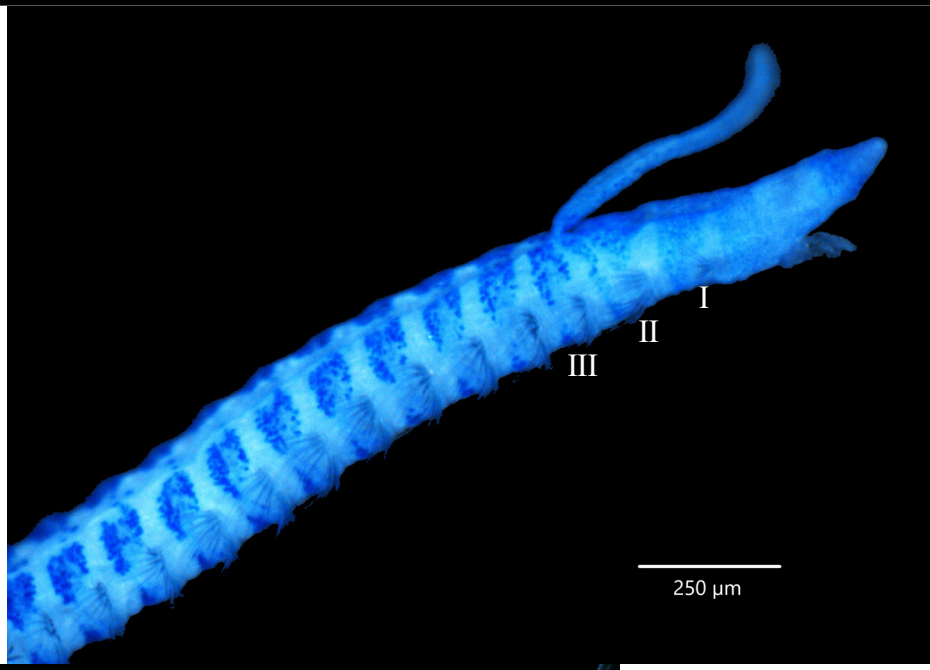
- Characteristics
  - Branchial filament arising from intersegmental furrow between chaetigers 2 & 3
    - anterior to chaetal fascicle of chaetiger 3
  - Thorax with 22-25 chaetigers & 2-5 transitional (24-30 total)
  - Pygidium with 3 long pygidial cirri & pygidial processes are absent (personal observation)
- Distribution
  - Known from southern California
    - San Francisco ??
  - Depth 8-305m
    - LACSD reports *Cossura* sp A from all stations along PV and from LA/LB Harbor

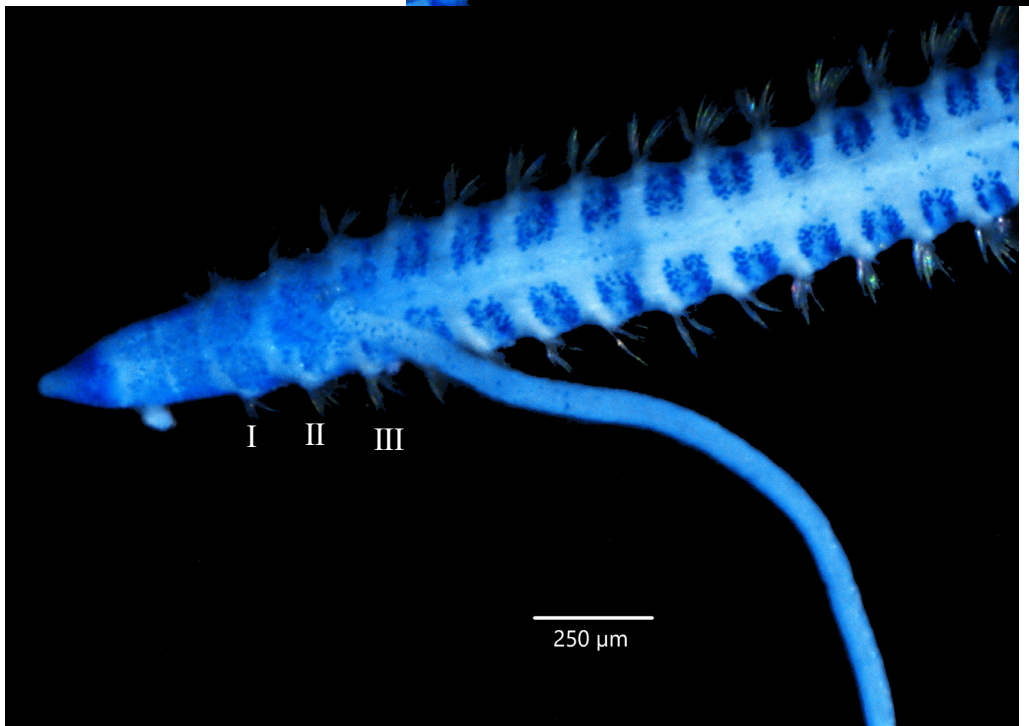


Source: Rowe (1995)

Cossura sp A Phillips, 1987 §

- Material examined
  - B23-12043 – LA/LB Harbor, 8m; coll. 13SEP2023 (12 ind.)
  - LACSD stn 0719-4B – Palos Verdes, 152m; coll. 16JUL2019 (3 ind.)
  - LACSD stn 0724-3B – Palos Verdes, 152m; coll. 18JUL2024 (1 ind.)

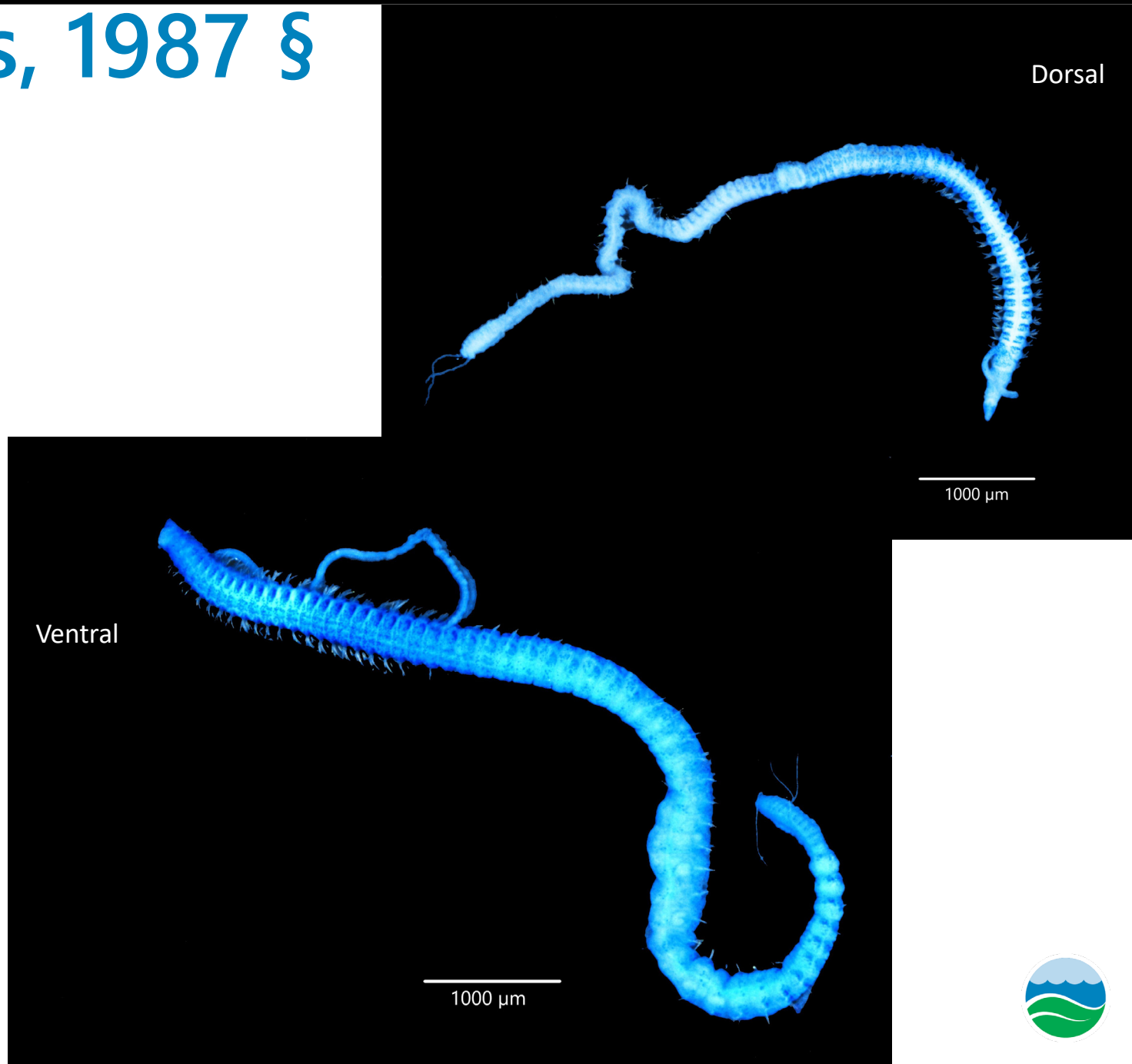




Source: Rowe (1995)
images by B. Haggin : top – stn 0719-4B, bottom – stn 0724-3B

Cossura sp A Phillips, 1987 §

- MGS Pattern
  - Prostomium staining solidly except for tip
  - Peristomium & chaetigers 1-2 staining lightly
  - Large rectangular dorso- and ventrolateral patches present on all but last 1 or 2 thoracic chaetigers (covering ~1/4 body width)
  - Not staining laterally between chaetal fascicles



Source: Rowe (1995)
images by B. Haggin : top – stn 0719-4B, bottom – stn B23-12043

Cossura sp A Phillips, 1987 §

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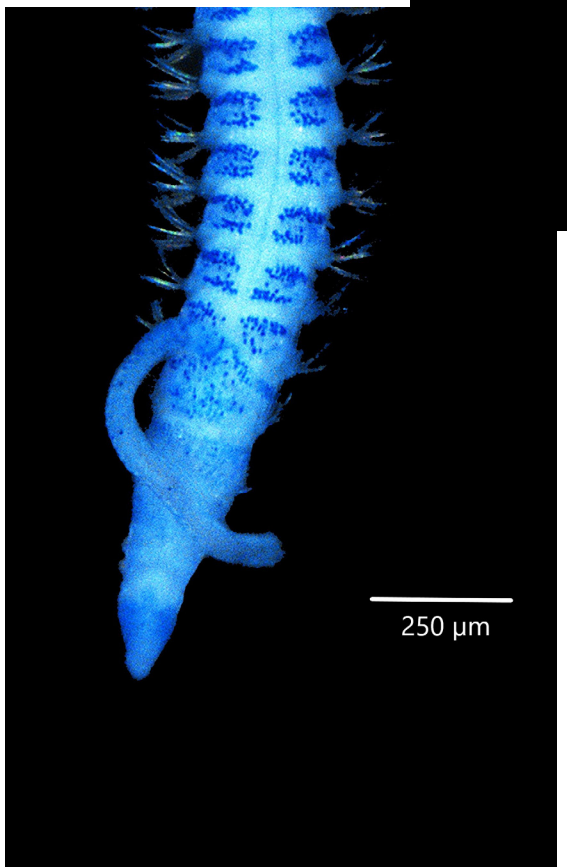
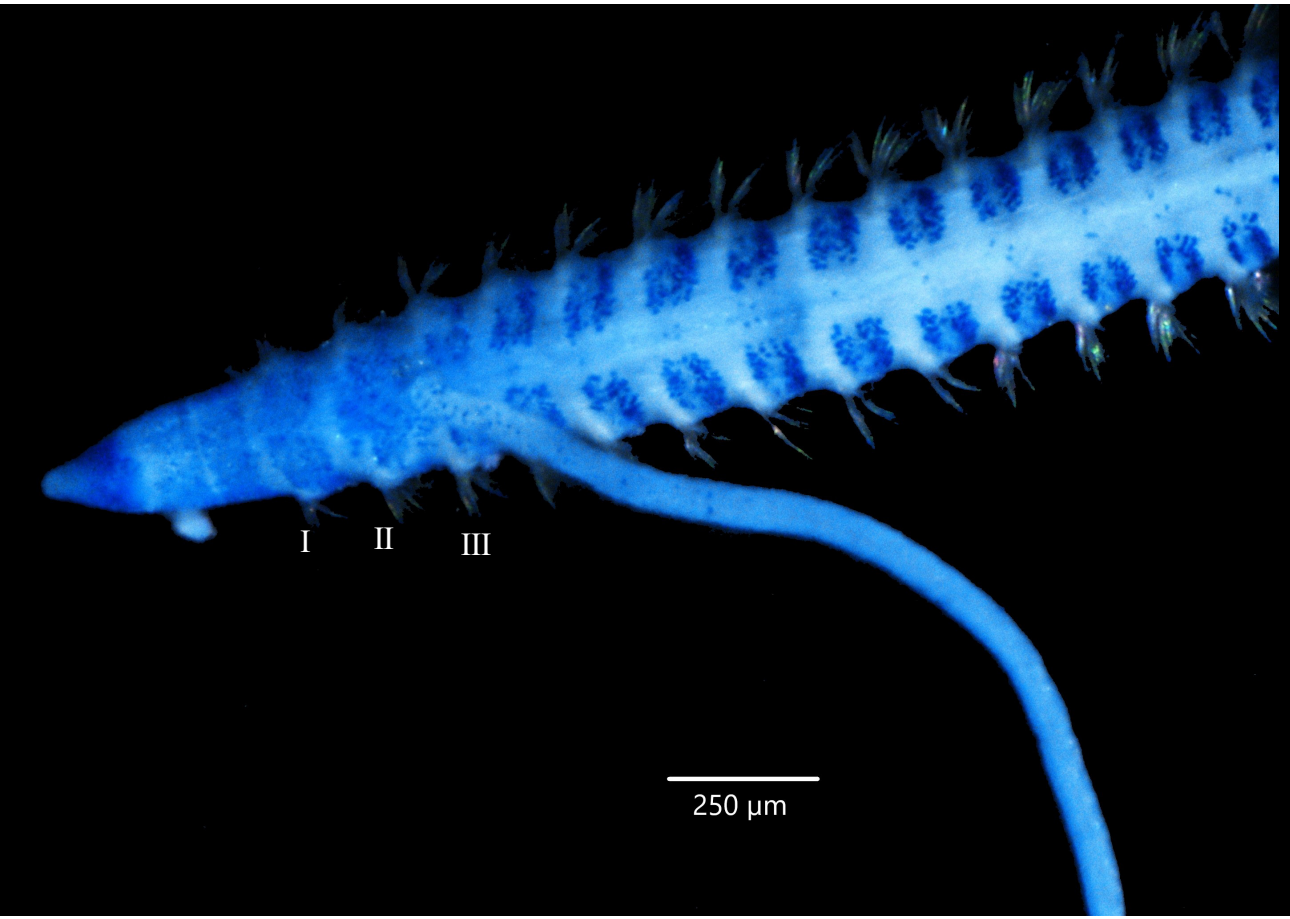
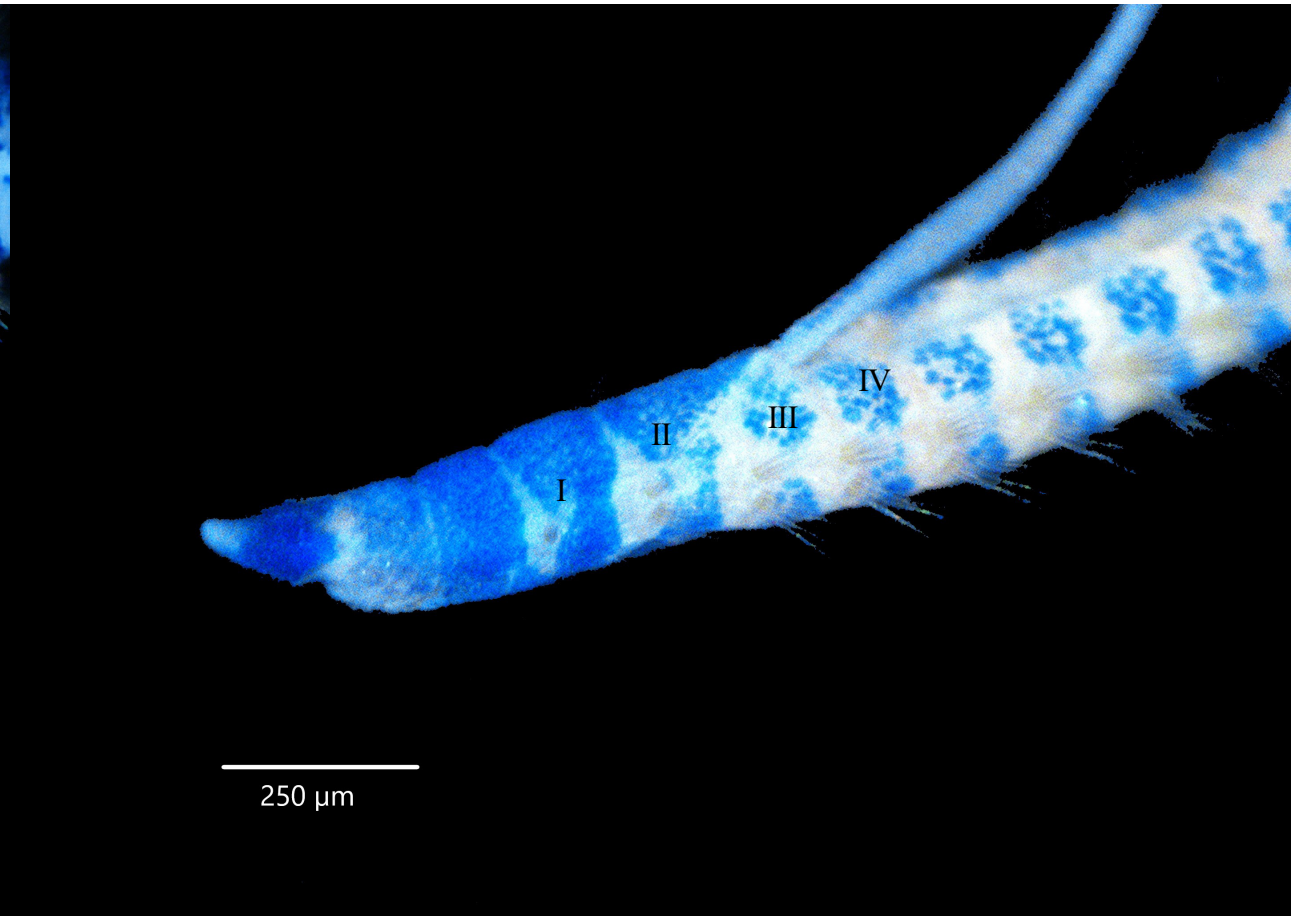


Source: Rowe (1995)
images by B. Haggin : top – stn 0719-4B, bottom – stn B23-12043

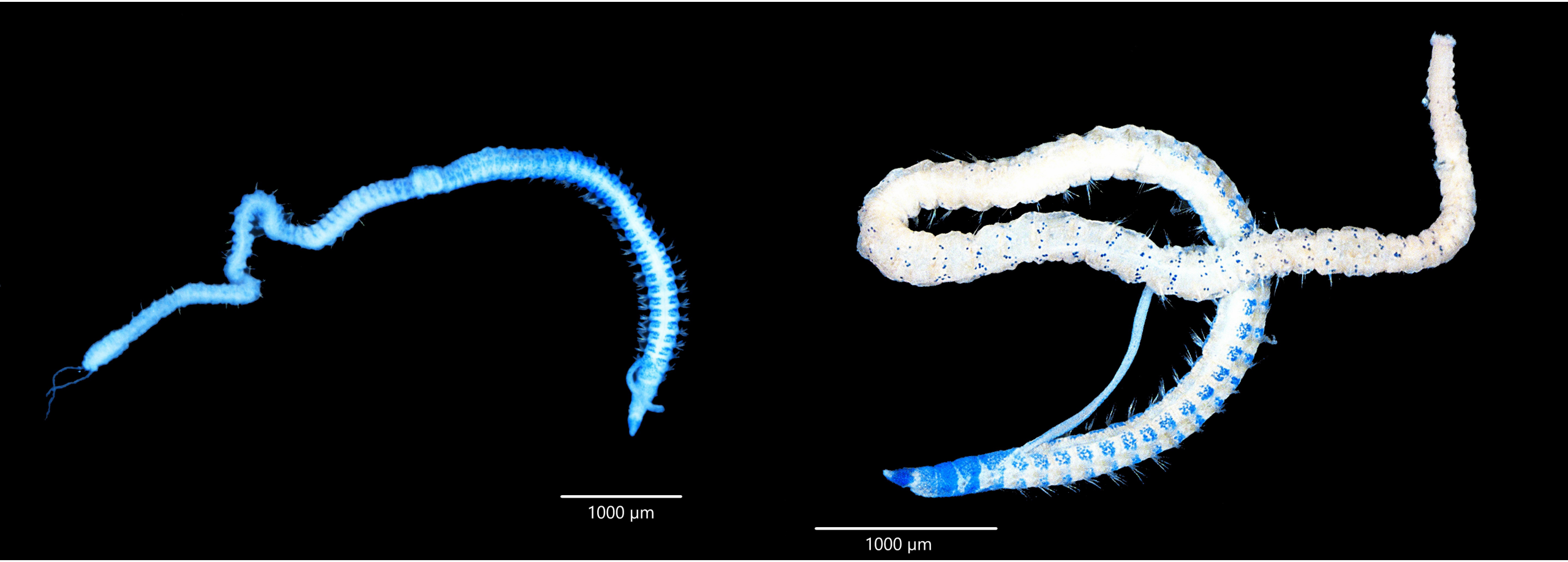
Cossura sp A vs. *Cossura bansei*





Images by B. Haggin : left – *Cossura* sp A stn 0724-3B , right – *Cossura bansei* stn 0721-7C

Cossura sp A vs. *Cossura bansei*



Images by B. Haggin : left – *Cossura* sp A stn 0719-4B , right – *Cossura bansei* stn 0721-7C

Cossura sp A vs. *Cossura bansei*

- SCAMIT 15(5) – "Our commonly seen *Cossura* sp A fits the description of the Hilbig's new species, *Cossura bansei*. However, this new species is based on a specimen of Karl Banse's from British Columbia that does not have a methyl green stain pattern."
  - Was this misinterpreted and our *Cossura* sp A should be *Cossura bansei*?

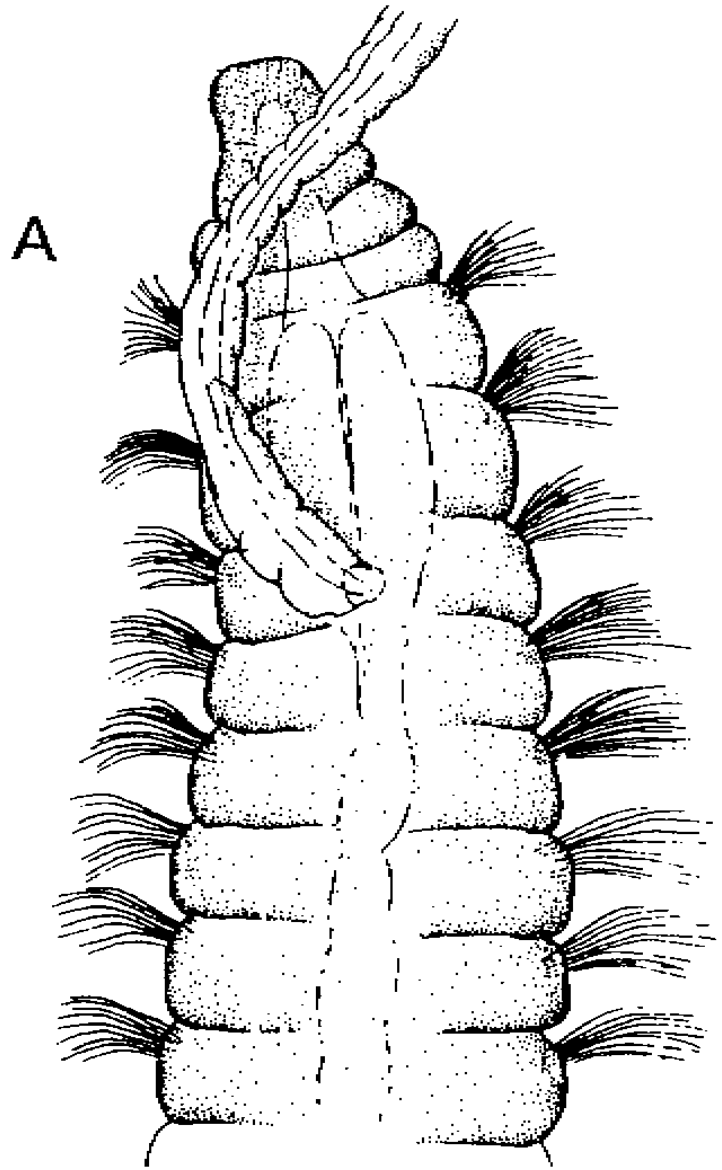
- Branchial filament insertion – segmental furrow between chaetigers 2 & 3 (anterior to chaetae of chaetiger 3)
  - Preservation artifact??
- Thoracic chaetigers – 24-30 (with transitional chaetigers)
- 3 pygidial cirri
- Pygidial processes absent
- MGS not staining laterally between chaetal fascicles

- Branchial filament insertion – Posterior border of chaetiger 3 (sometimes appearing to originate on chaetiger 4)
  - Preservation artifact??
- Thoracic chaetigers – 20-31
- 3 pygidial cirri (easily broken off)
- Pygidial processes absent (pers. obs.)
- MGS not staining laterally between chaetal fascicles

Sources: Hilbig (1996); SCAMIT (1996)

Cossura brunnea Fauchald, 1972

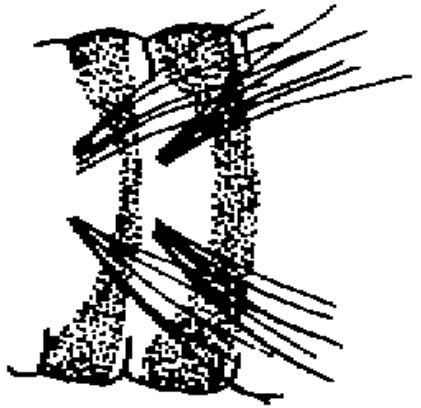
- Characteristics
  - Prostomium broadly triangular
  - Branchial filament arising from middle of chaetiger 3
  - Thorax with 16 – 18 chaetigers
    - Unsure if this includes transitional chaetigers
  - Pygidium with 3 very long pygidial cirri
  - Often with brown pigmentation when preserved
- Distribution
  - Oregon – Western Mexico; New England – North Carolina
  - 1600 – 2200m

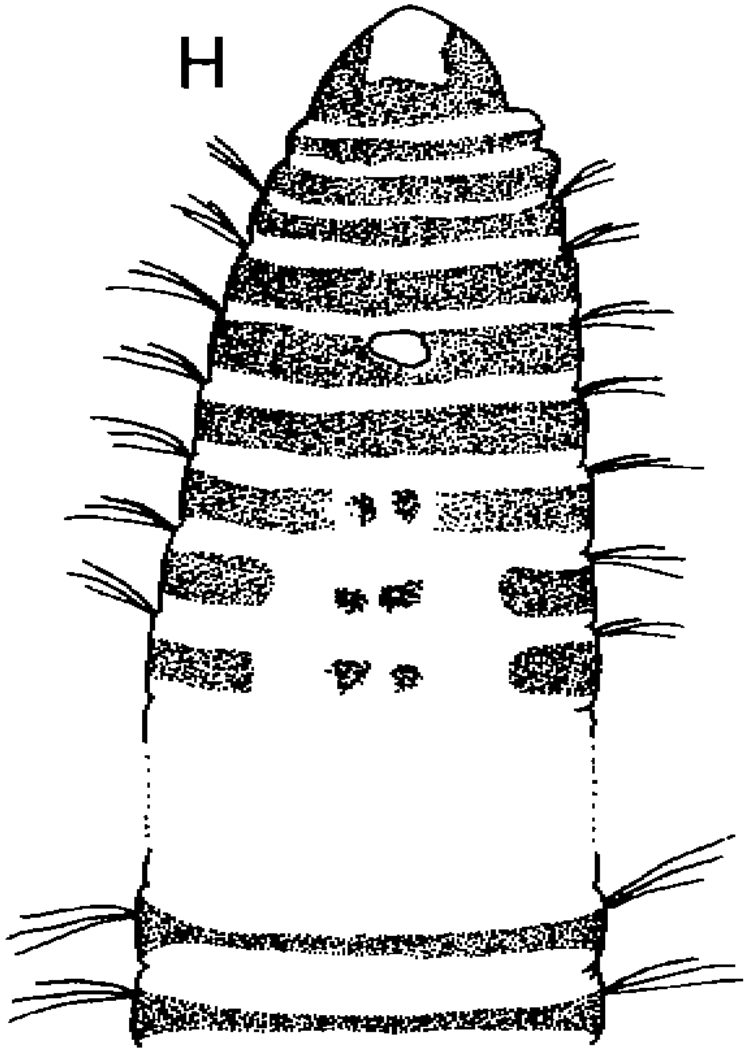


Sources: Fauchald (1972) ; Fauchald & Hancock (1981); Hilbig (1996)

Cossura brunnea Fauchald, 1972

- MGS Pattern
  - Sides and posterior of prostomium staining, leaving large area unstained **(Image H)**
  - Broad dorsal bands through chaetiger 4, breaking into dorsolateral & poorly defined middorsal patches **(Image H)**
    - Becoming continuous but narrow bands in anterior abdomen, becoming ventrolateral & midventral patches **(Images H & I)**
  - Lateral stain connects behind chaetal fascicle **(Image J)**

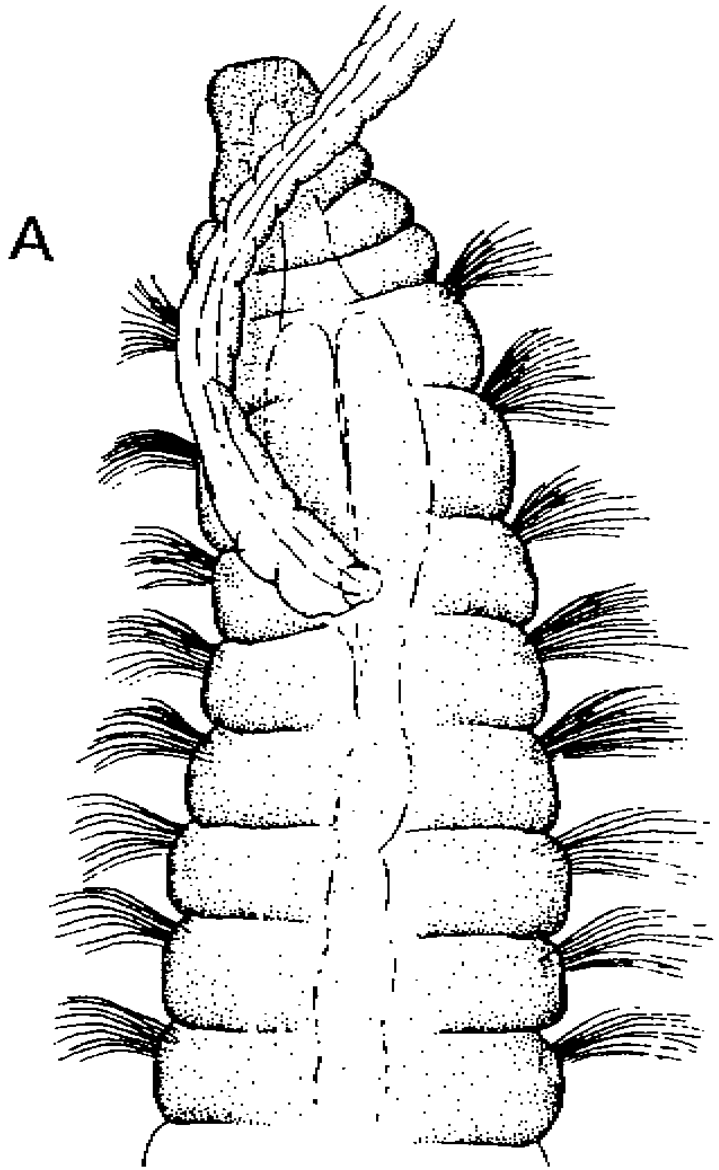




Source: Hilbig (1996)

Cossura brunnea Fauchald, 1972

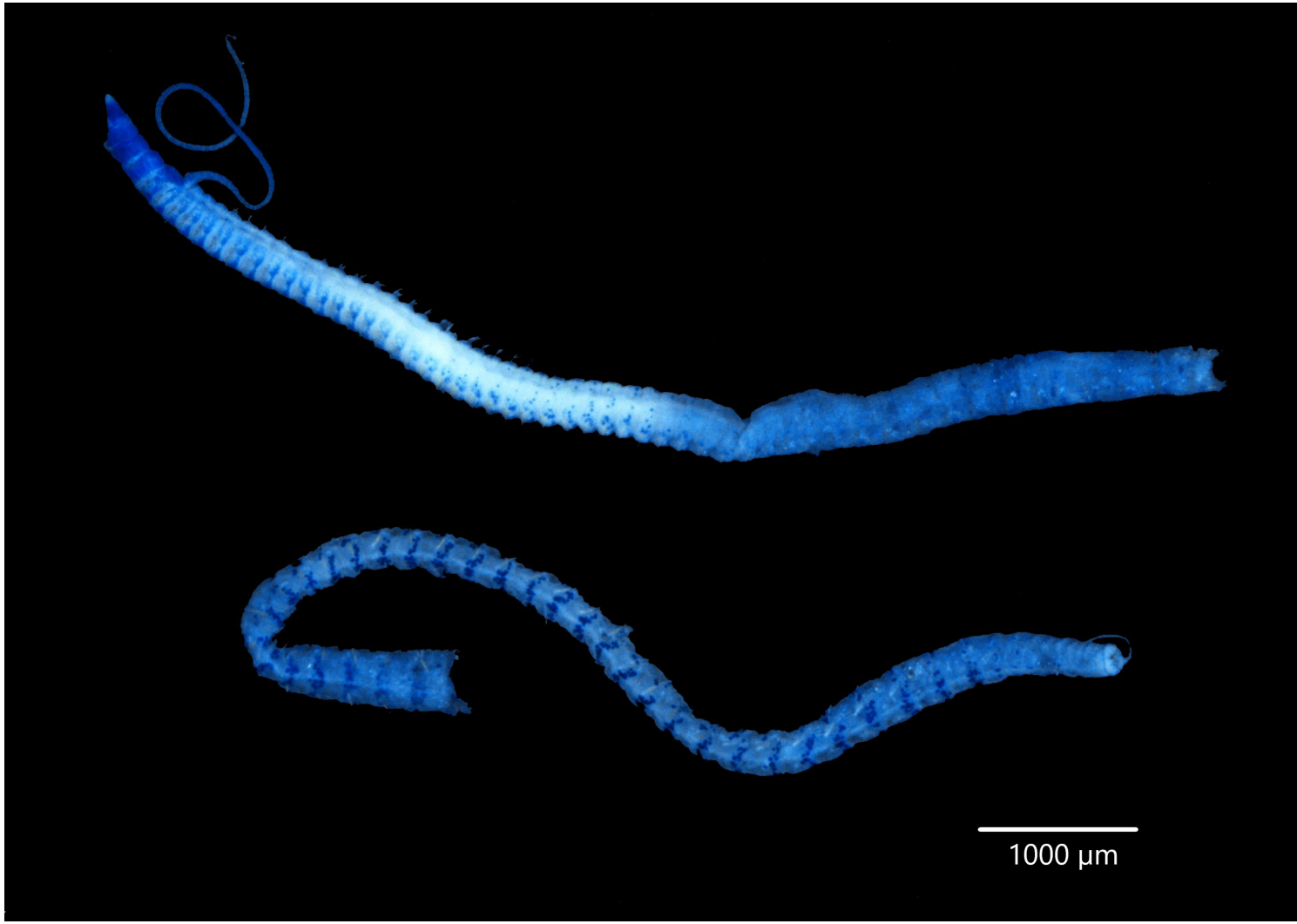
- This is an extremely deep-water organism with a restricted depth range.
  - MMS atlas reports 1600-2200m
- Local reports must have come from a Bight project
  - Would represent a depth expansion of ~700m
  - This report should be confirmed



Sources: Fauchald (1972); Fauchald & Hancock (1981); Hilbig (1996)

Cossura candida Hartman, 1955

- Characteristics
  - Branchial filament arising from chaetiger 3
  - Thorax with 24-35 chaetigers
  - Pygidium small, with 3 slender anal cirri
    - With 5 achaetigerous pre-pygidial segments
- Distribution
  - Central California – Baja California, Mexico
  - 11 - 2400m
    - Leslie suggest possible issues with this depth range (SCAMIT (2008))



Sources: Hartman (1955); Fauchald (1972); Hilbig (1996); Read (2000); SCAMIT (2008)
Image by B. Haggin – stn 0721-10B

Cossura candida Hartman, 1955

- Material Examined
  - LACSD stn 0719-7C – Palos Verdes, 61m; coll. 31JUL2019 (1 ind.)
  - LACSD stn 0721-10B – Palos Verdes, 152m; coll. 12JUL2021 (1 ind.)
  - LACSD stn 0724-7C – Palos Verdes, 61m; coll. 17JUL2024 (5 inds.)

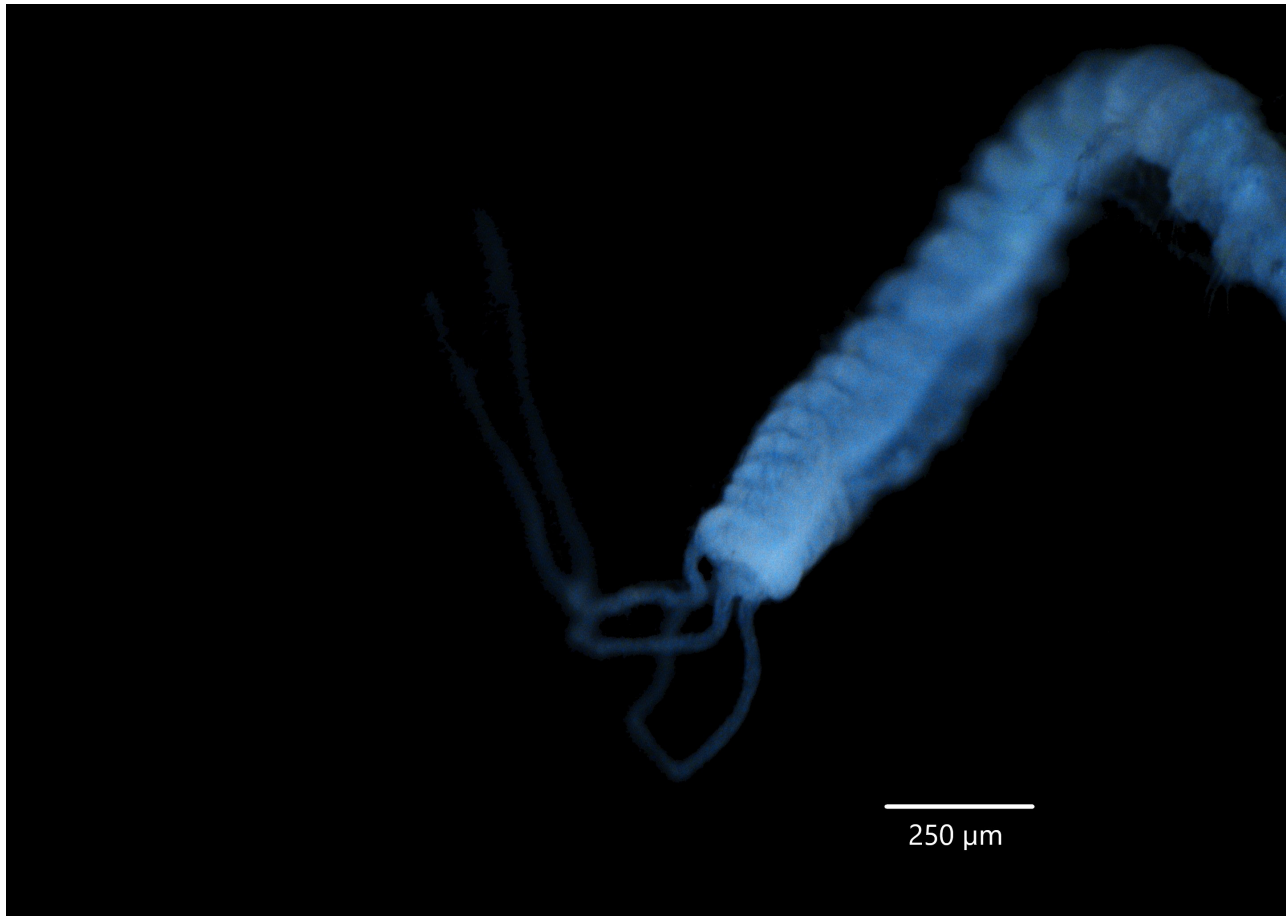
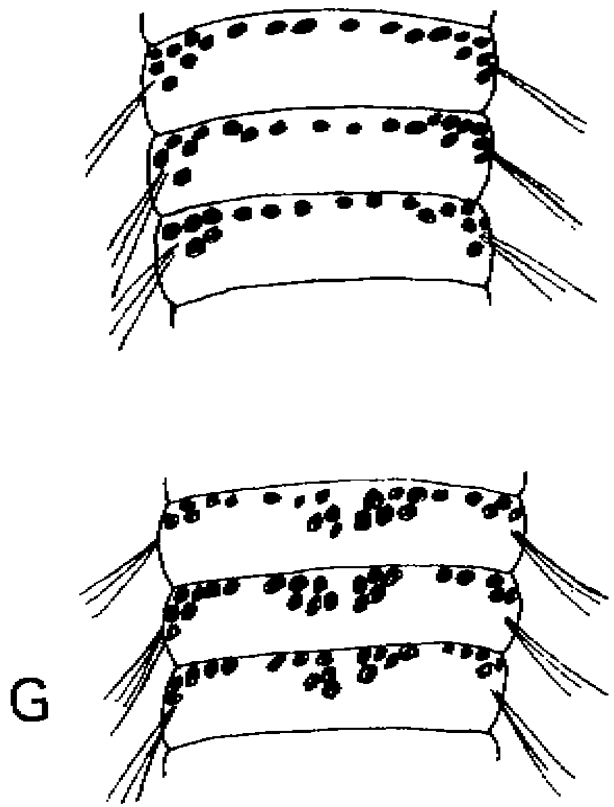
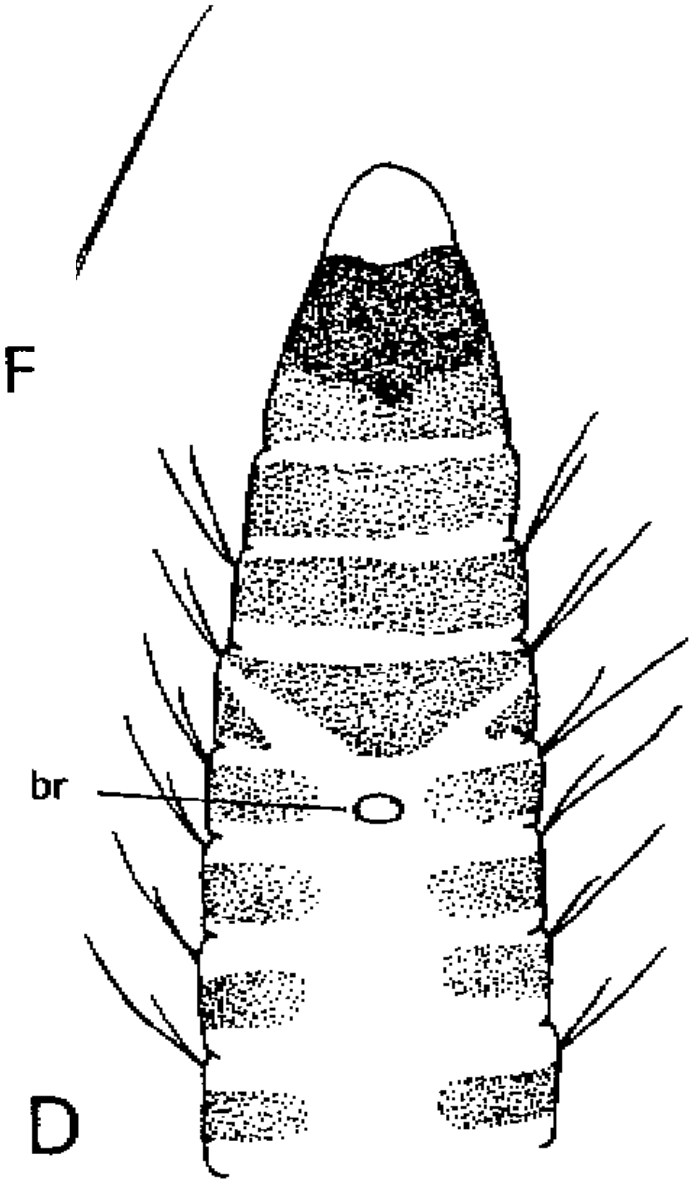


Image by B. Haggin – stn 0719-7C

Cossura candida Hartman, 1955

- MGS Pattern
  - Prostomium staining darkly, but with unstained tip
  - Peristomium & chaetiger 1 staining solidly
  - Chaetiger 2 with dark wedge-shaped dorsal area pointing to branchial filament insertion **(Image D)**
  - Thorax with lateral patches among chaetal fascicles, extending dorsolaterally
    - Stains laterally between chaetal fascicles
    - Diminishing to 2 round patches between neighboring chaetal fascicles
  - Abdomen with with midventral & ventrolateral patches in posterior ½ of segment **(Image G)**, dorsum with narrow transverse bands of stain **(Image F)**





Source: Hilbig (1996)

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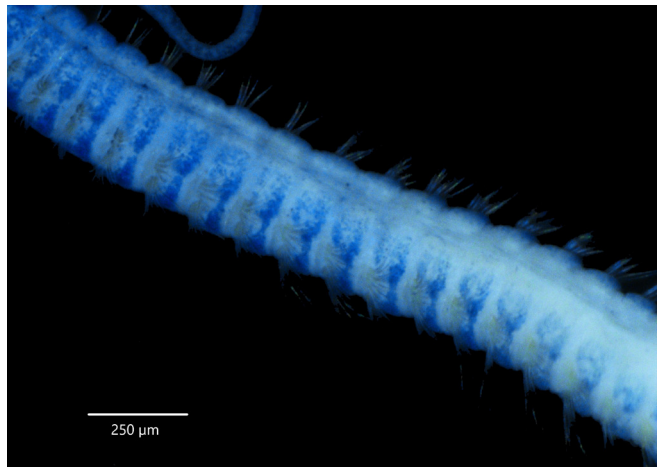
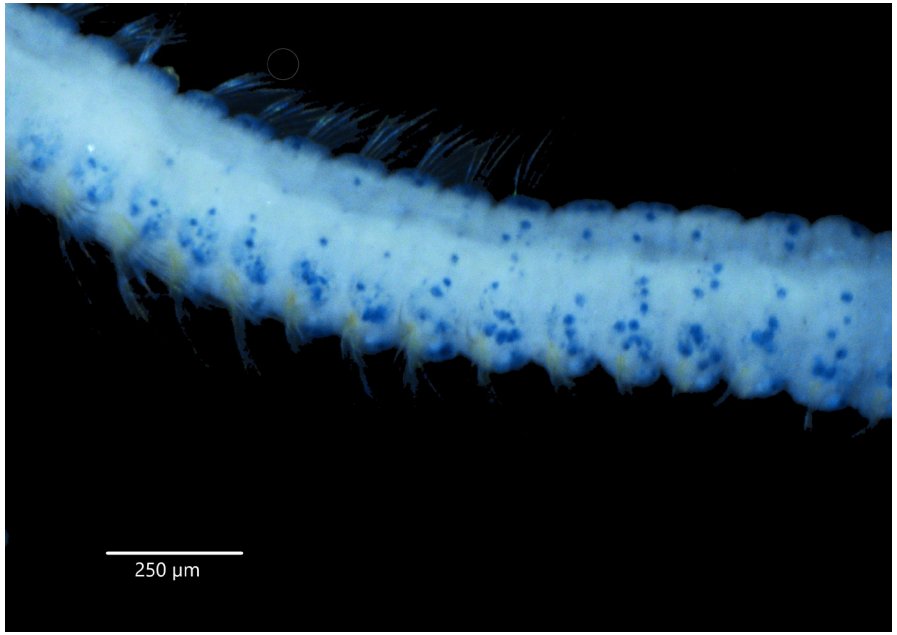
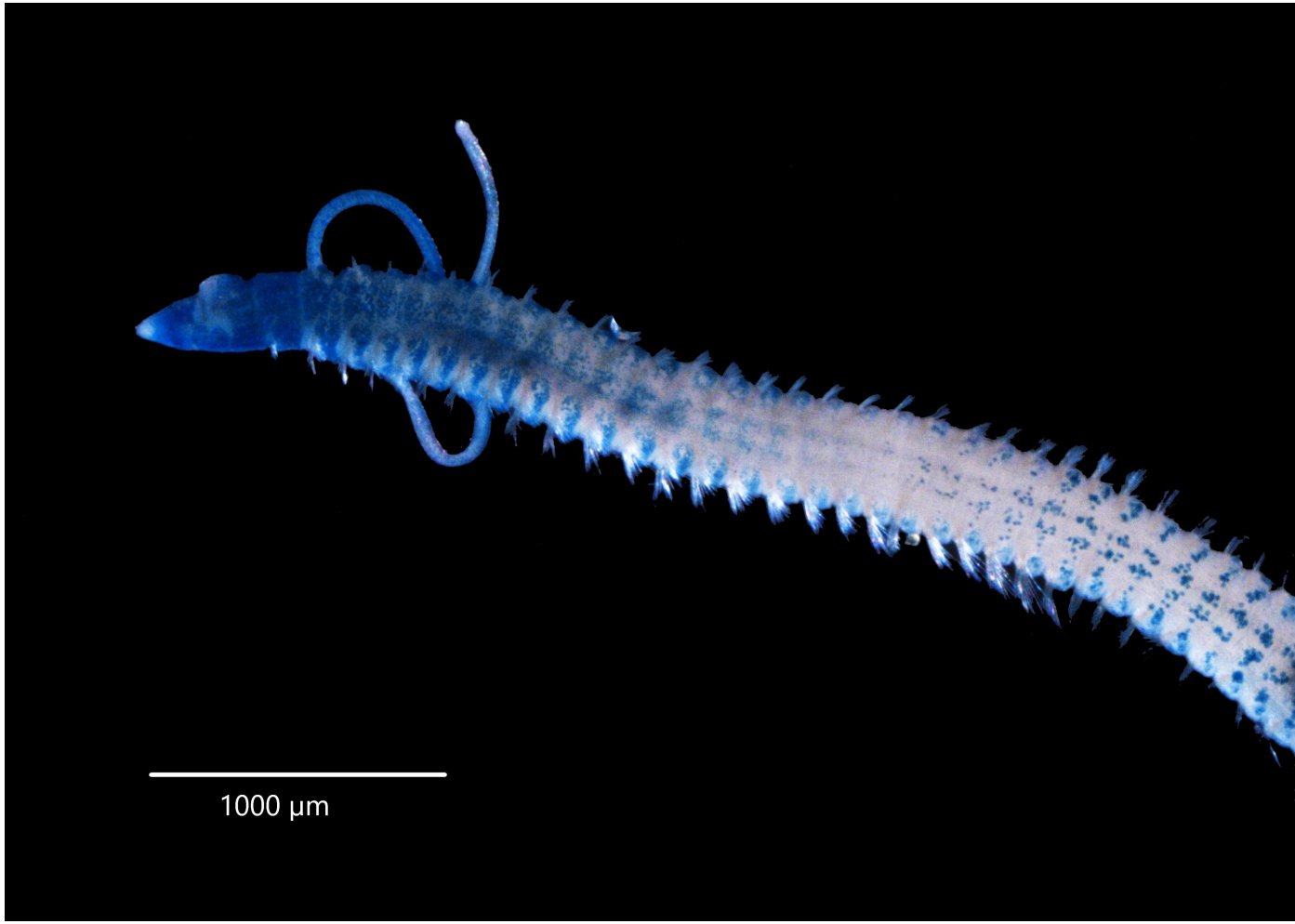


Source: Hilbig (1996)
Images by B. Haggin bottom – stn 0721-10B

Cossura candida Hartman, 1955

- MGS Pattern
  - Abdomen with with midventral & ventrolateral patches in posterior ½ of segment, dorsum with narrow transverse bands of stain





Source: Hilbig (1996)
Images by B. Haggin – stn 0721-10B

Cossura candida Hartman, 1955

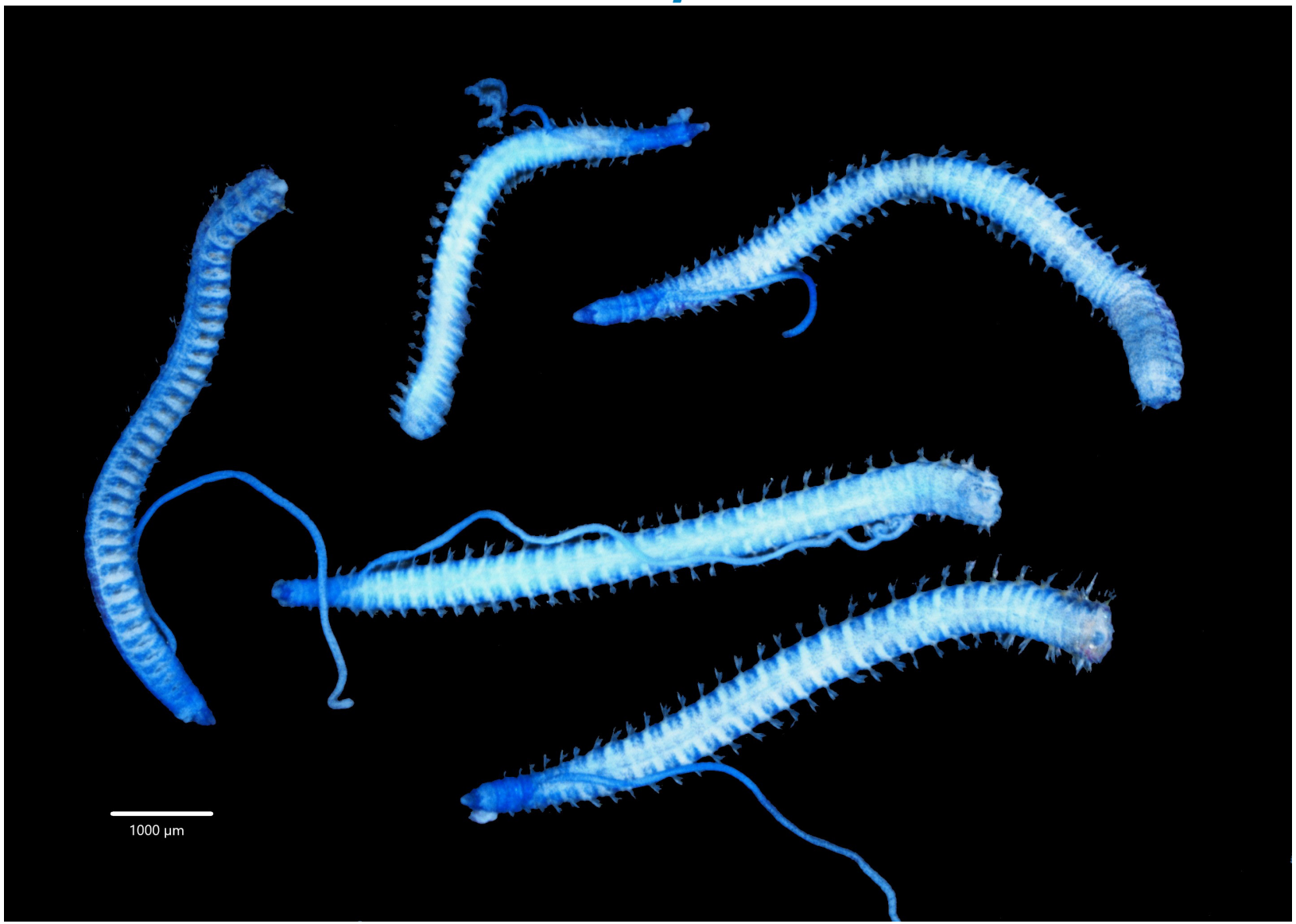


Image by B. Haggin – stn 0724-7C

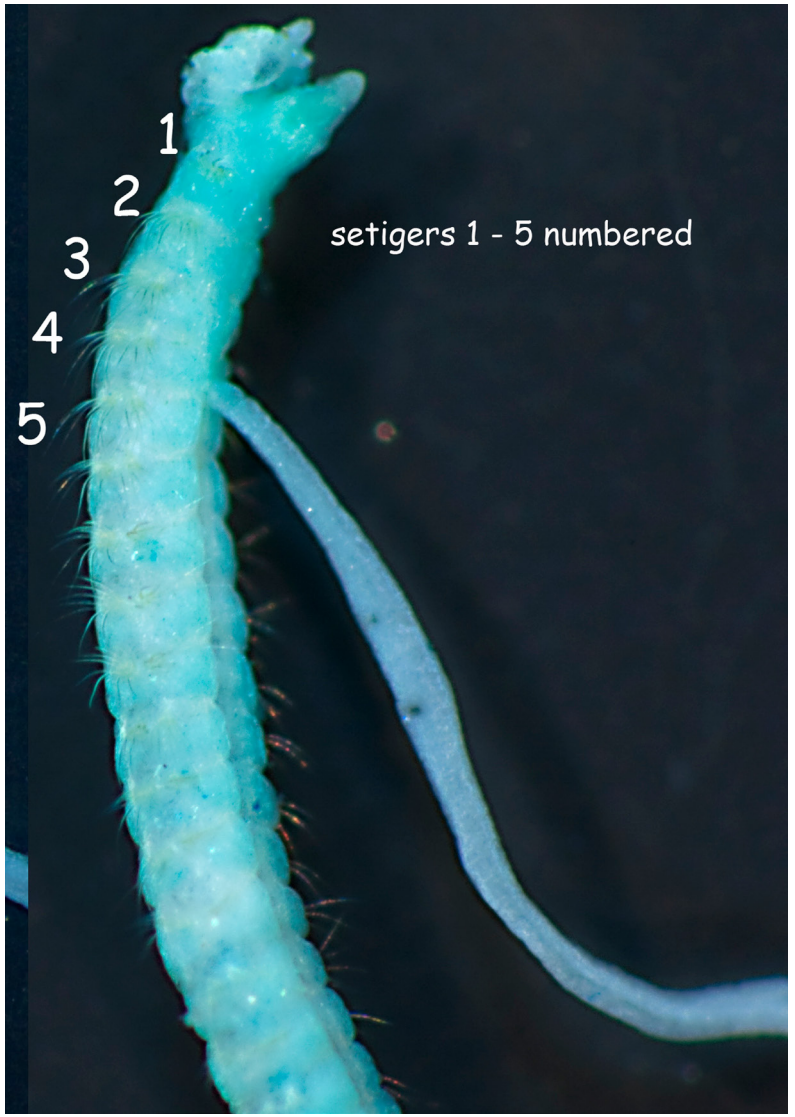
Cossura candida Hartman, 1955

- Originally described from outer LA Harbor in 12m
  - Original distribution from 12-805m from San Francisco – Baja California, Mexico
- Depth expanded to 1387m from Santa Cruz canyon – Hartman (1963)
- Depth expanded to 2478m from western Mexico – Fauchald (1972)
  - 4 individuals from 259m, 843m, 1188m & 2478m
  - At the time of publication, the only difference to separate *Cossura candida* from *Cossura rostrata* was the state of chaetiger 1
    - Uniramous for *C. rostrata* & biramous for *C. candida*
      - This has been misinterpreted by many authors in the past. All cossurids are uniramous in the first chaetiger.
      - Is it possible that the deep-water *Cossura candida* of Hartman (1955 & 1963) & Fauchald (1972) were actually *Cossura rostrata* as methyl green stain was not being used yet (regularly)?

Sources: Hartman (1955); Hartman (1963); Fauchald (1972)

Cossura modica Fauchald & Hancock, 1981

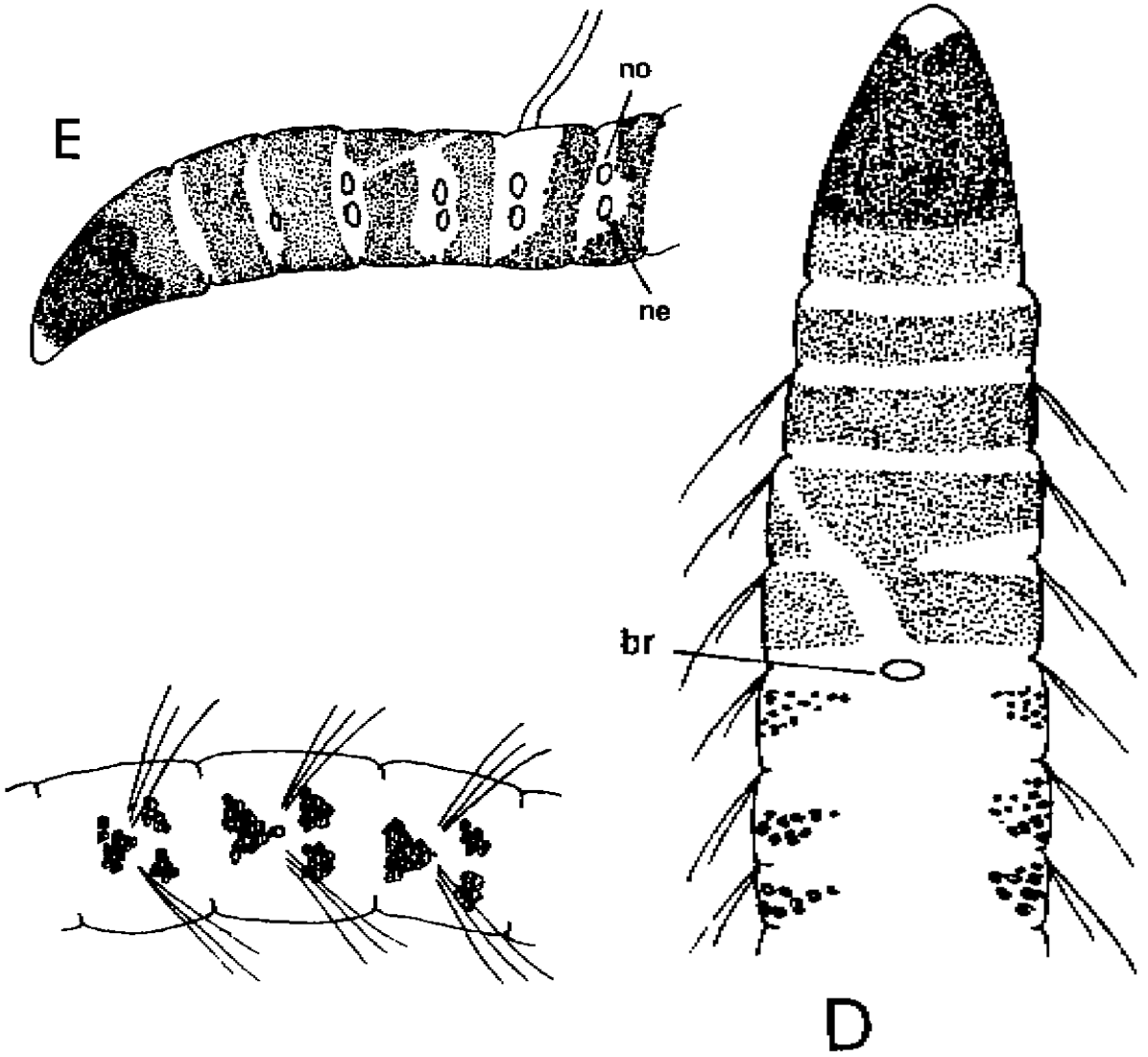
- Characteristics
  - Branchial filament arising from posterior margin of chaetiger 4
  - Thorax with 14-26 chaetigers
  - Pygidium with 3 short anal cirri
- Distribution
  - Oregon – California
  - 985 – 2955m



Sources: Fauchald & Hancock (1981); Hilbig (1996); Read (2000)
Image by OCSD – stn 57(1) 200m – as *Cossura* cf *modica*

Cossura modica Fauchald & Hancock, 1981

- MGS Pattern
  - Prostomium, peristomium & chaetigers 1-3 staining deeply except for small unstained tip **(Image D)**
    - with unstained oblique line extending from C2 to branchial insertion
  - Thorax with dorsolateral patches, fading toward abdomen
  - Thorax with lateral stain between chaetal fascicles **(Image E)**
  - Abdomen with dark lateral patches anterior to fascicles and 2 smaller patches posterior **(Image F)**



Source: Hilbig (1996)

Cossura modica Fauchald & Hancock, 1981

- *Cossura modica* is easily distinguished from other local Cossurids by the insertion of the branchial filament on chaetiger 4
- Only other described Cossurid with a branchial filament on chaetiger 4 is *Cossura alba* Hartman, 1967 and possibly *Cossura pettiboneae* (Ewing, 1987)
  - *Cossura alba* is from the Antarctic region (between 4 & 5)
  - *Cossura pettiboneae* is from Puerto Rico (between 3 & 4)
- Deep-water species likely to only be encountered during Bight

Sources: Fauchald & Hancock (1981); Hilbig (1996); Read (2000); Sousa *et al*. (2019)

Cossura modica Fauchald & Hancock, 1981

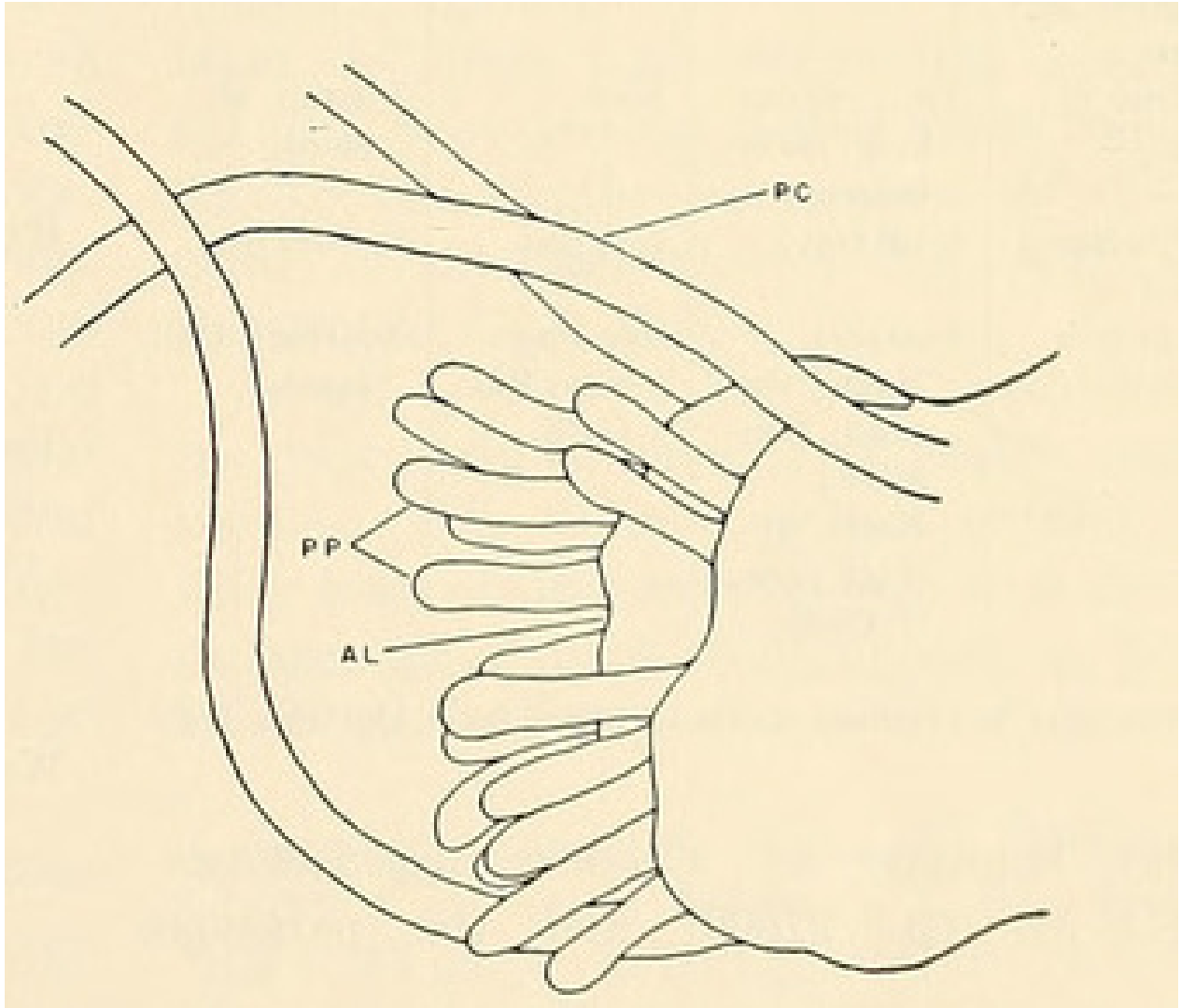
- The image from OCSD stn 57(1) – 200m – does not seem to stain as is described for *C. modica* and comes from a much shallower depth
  - Could this be another provisional species?

Sources: Fauchald & Hancock (1981); Hilbig (1996); Read (2000)
Image by OCSD – stn 57(1) 200m – as *Cossura* cf *modica*

Cossura pygodactylata Jones, 1956

Cossura lepida Tamai, 1986

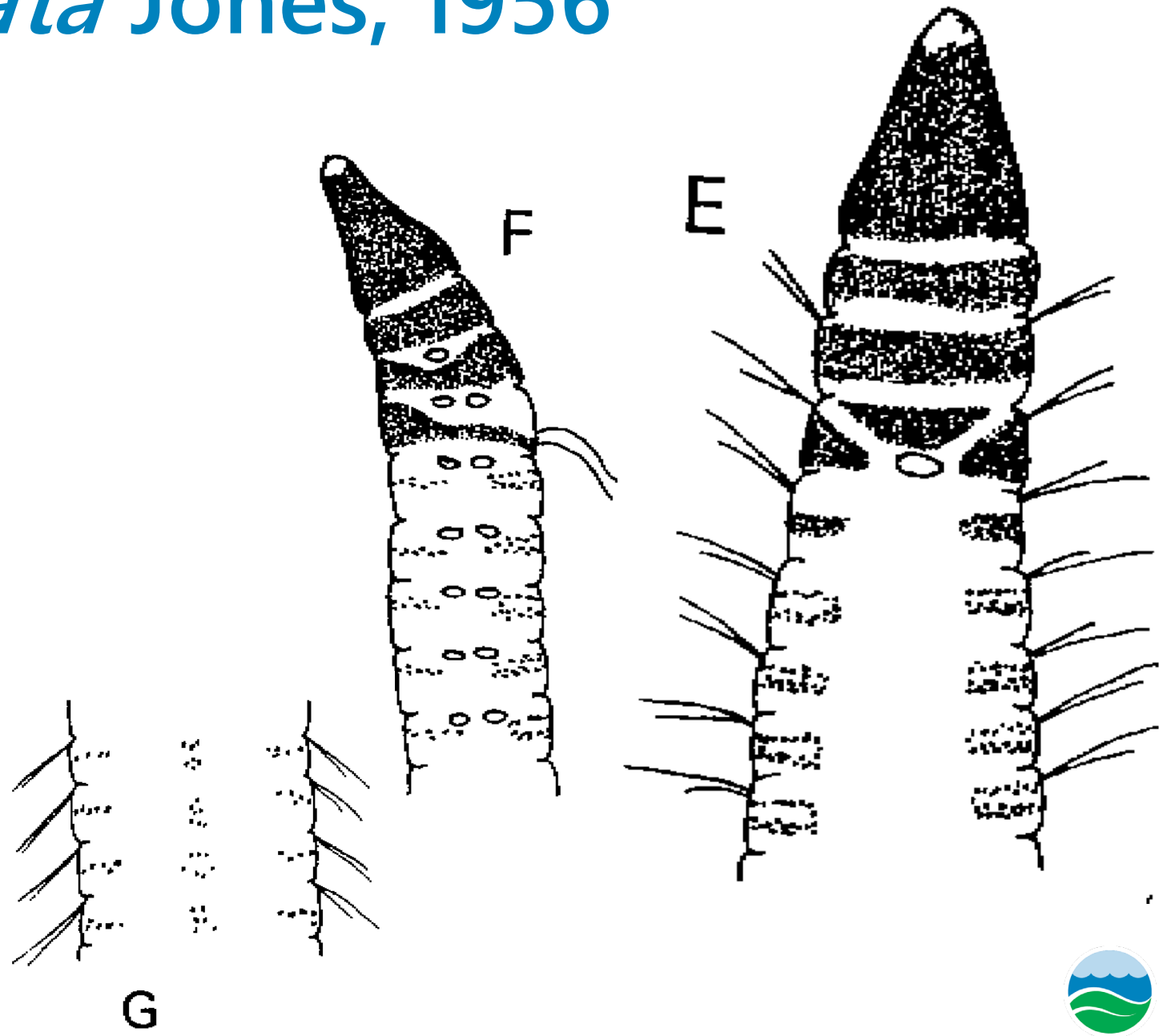
- Characteristics
  - Branchial filament arising from middle-posterior of chaetiger 2
  - Thorax with 13-21 chaetigers (most commonly 17-18 – Hilbig (1996))
  - Pygidium with a dorsal cleft, 3 long anal cirri (2 dorsolateral, 1 ventral) & 6-10 short cirri on each side
- Distribution
  - Washington – central CA; Japan; Whites Sea; Cape Hatteras – South Carolina; western France
  - 1 – 2720m
- Redescribed by Zhadan *et al*. (2012) from Whites Sea material but did not give a description or images of MGS



Sources: Jones (1956); Tamai (1986); Hilbig (1996); Read (2000); Zhadan *et al*. (2012)
Image from Jones (1956) – PC: pygidial cirrus; PP: pygidial process; AL: anal lobe

Cossura pygodactylata Jones, 1956

- MGS Pattern
  - Prostomium (except for tip), peristomium & chaetiger 1 staining deeply
  - Chaetiger 2 with wedge shape pointing toward branchial insertion **(Image E)**
  - Thorax with dorsolateral patches of scattered cells, not connecting laterally **(Images E & F)**
  - Ventrolateral & midventral patches weakly staining **(Image G)**
  - Abdomen without stain
  - Pygidium with thin ring of stain



Source: Hilbig (1996)

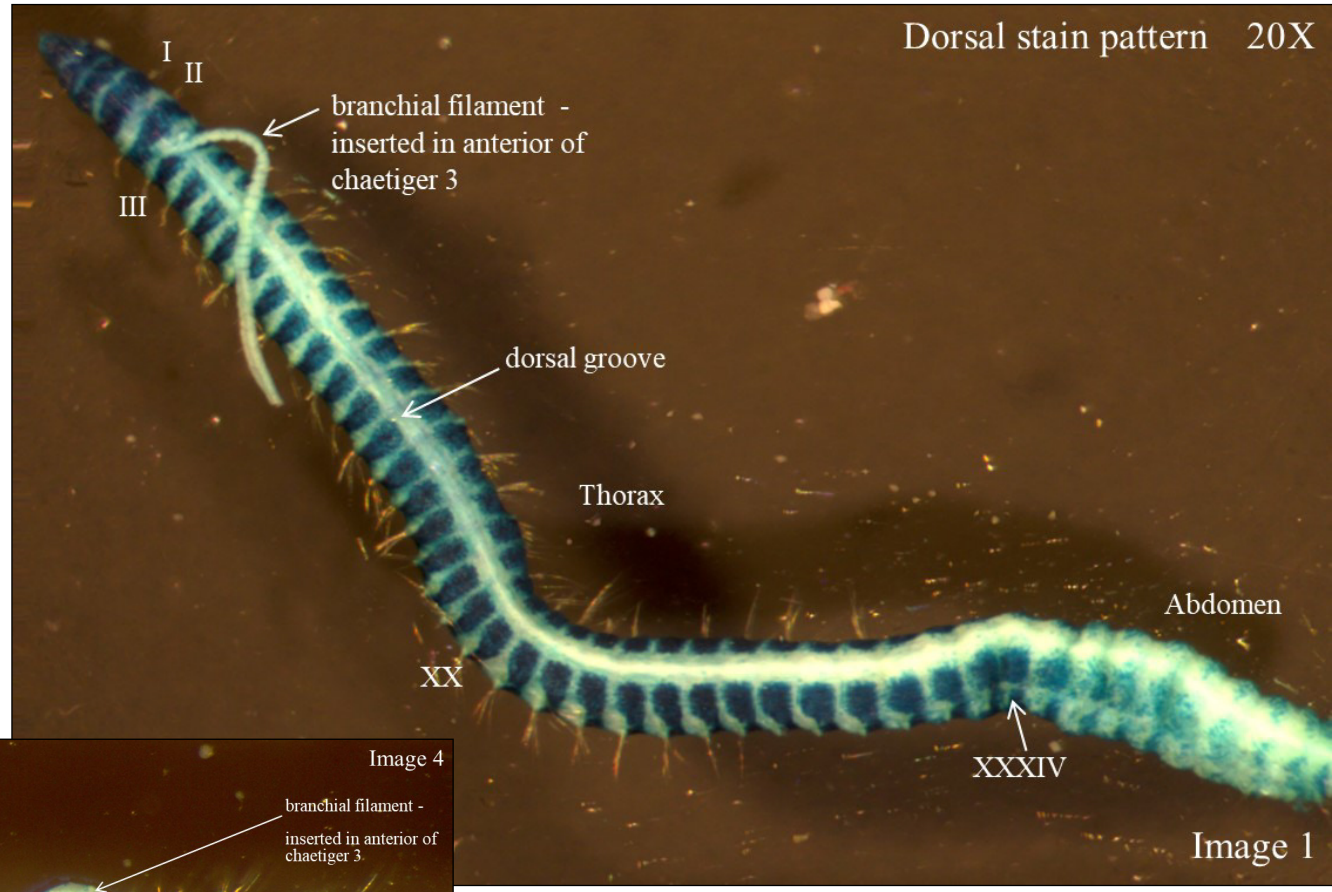
Cossura pygodactylata Jones, 1956

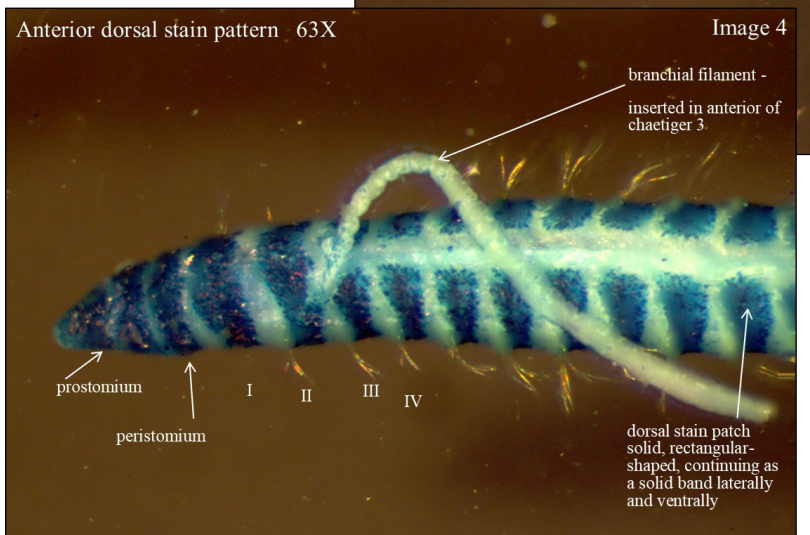
- This is likely a species complex
  - Originally described from San Francisco Bay from 1 – 10m
    - Range expanded to both sides of the Atlantic & France through review of *Cossura soyeri* (Bachelet & Laubier (1994))
      - Depth expanded to 100m
    - Thoracic Chaetigers – 13-21 (16-21 adults) – Bachelet & Laubier (1994)
      - Recognized the lower thoracic chaetiger count (13-15) as not being important while using the difference in # of thoracic chaetigers to separate *C. pygodactylata* from *C. soyeri* (30-31)
      - No description of MGS
    - Range expanded to Japan through synonymy of *Cossura lepida* by Hilbig (1996)
      - Thoracic Chaetigers – 10-12 for *C. lepida* vs. 17-19 for *C. pygodactylata*
    - Depth expanded to 2720m by Hilbig (1996)
      - MMS material – 91m, 1263m & 2720m
      - Unsure what material Hilbig used for the MGS description
    - Range expanded to North Sea – Zhadan *et al*. (2012)
      - 19-22 thoracic chaetigers
      - Normally occurring in shallow waters (1 – 30m) but up to 300m in the North Sea
- Characters used for grouping
  - Branchial filament insertion on chaetiger 2, 3 long pygidial cirri & 10-20 pygidial processes
  - # of thoracic chaetigers not used
- Examination of MGS patterns & DNA likely needed to resolve
- Larry & Tony have considered the possibility of *Cossura* sp A being *C. pygodactylata* (SCAMIT (2014)).
  - *Cossura* sp A lacks the pygidial processes that are present on *C. pygodactylata*. The two are different.

Sources: Jones (1956); Tamai (1986); Bachelet & Laubier (1994); Hilbig (1996); Zhadan *et al*. (2012); SCAMIT (2014)

Cossura rostrata Fauchald, 1972

- Characteristics
  - Branchial filament arising from chaetiger 3
  - Thorax with 19 – 21 chaetigers (up to 34 counting transitional chaetigers)
  - Pygidium with 3 long anal cirri
- Distribution
  - Oregon – Western Mexico
  - 6 – 3348m

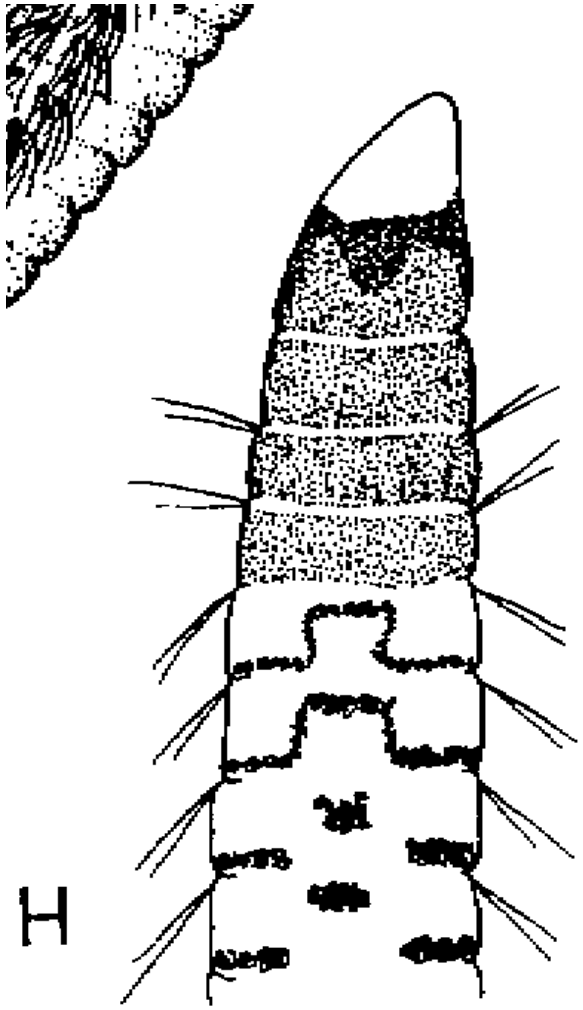


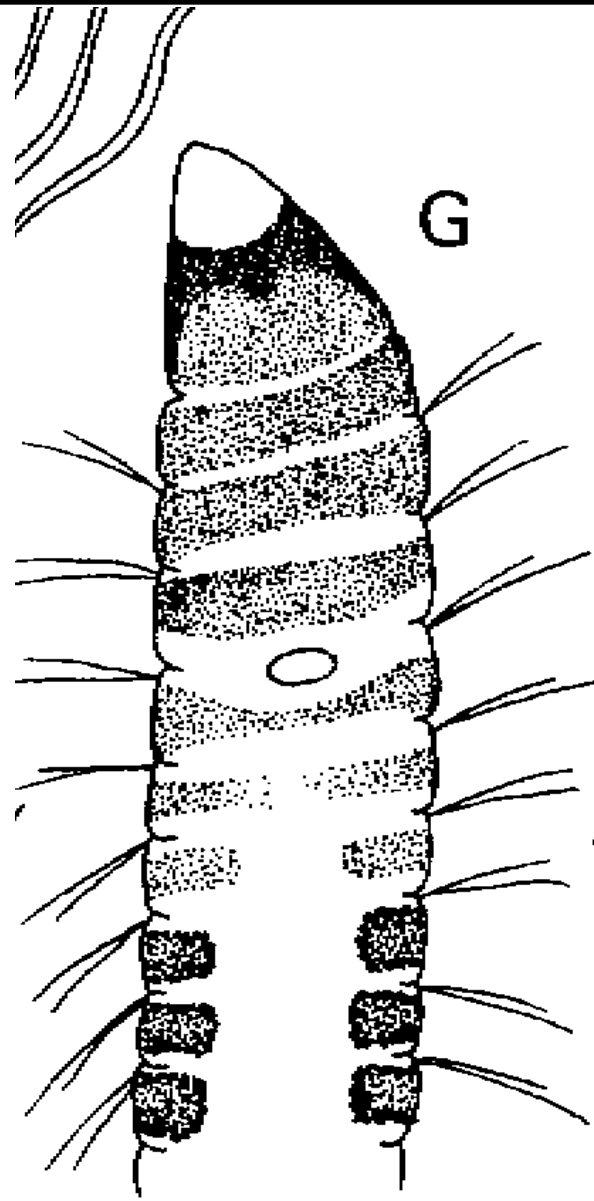


Sources: Fauchald (1972); Hilbig (1996)
images by B. Haggin

Cossura rostrata Fauchald, 1972

- MGS Pattern
  - Prostomium staining deeply except for tip
  - Peristomium staining weakly
  - Thorax with dark, broad dorsolateral & ventrolateral patches **(Image G)**, stain connects laterally behind chaetal fascicles
  - Midventrum with rectangular patches **(Image H)**, merging with ventrolateral patches in posterior thorax, becoming a continuous band

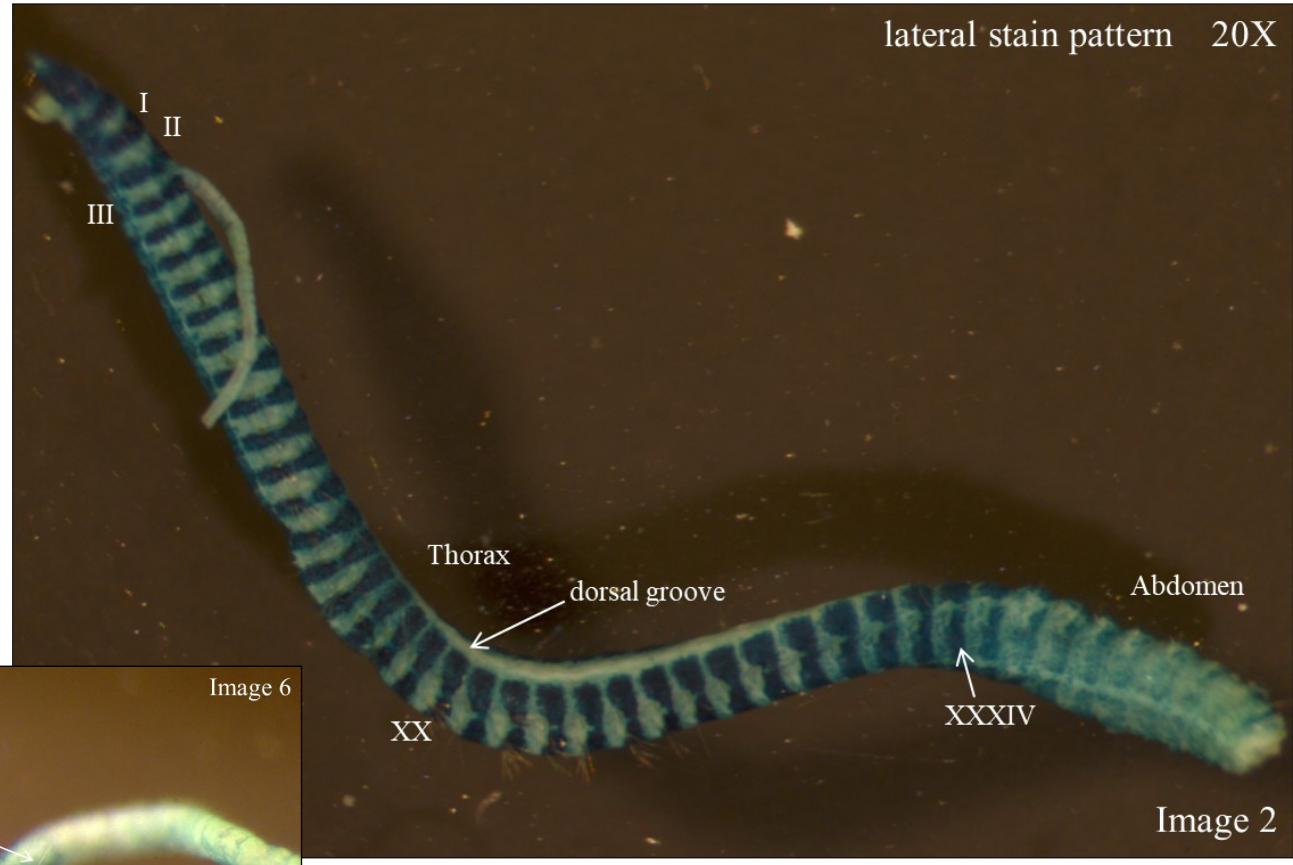


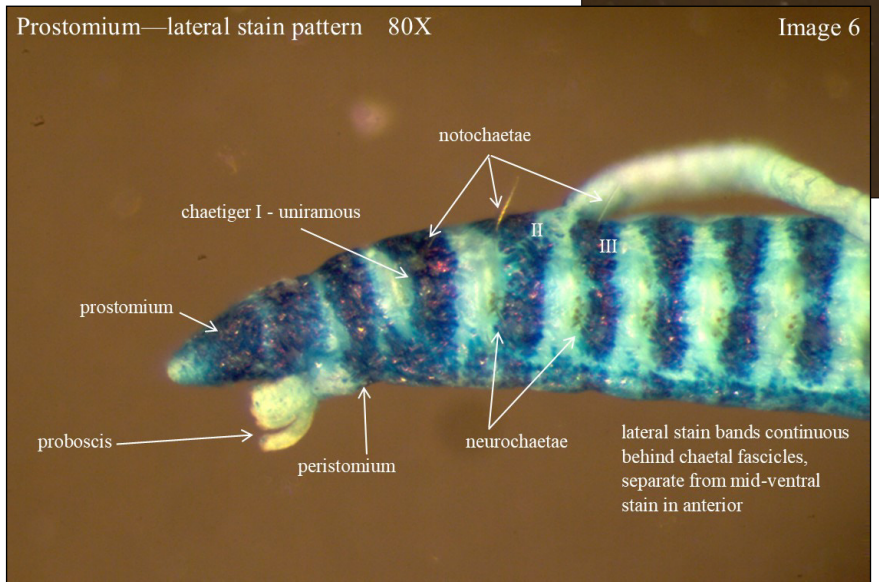


Sources: Fauchald (1972); Hilbig (1996);
Images from Hilbig (1996)

Cossura rostrata Fauchald, 1972

- MGS Pattern
  - Prostomium staining deeply except for tip **(Image 6)**
  - Peristomium staining weakly
  - Thorax with dark, broad dorsolateral & ventrolateral patches, stain connects laterally behind chaetal fascicles **(Image 2)**

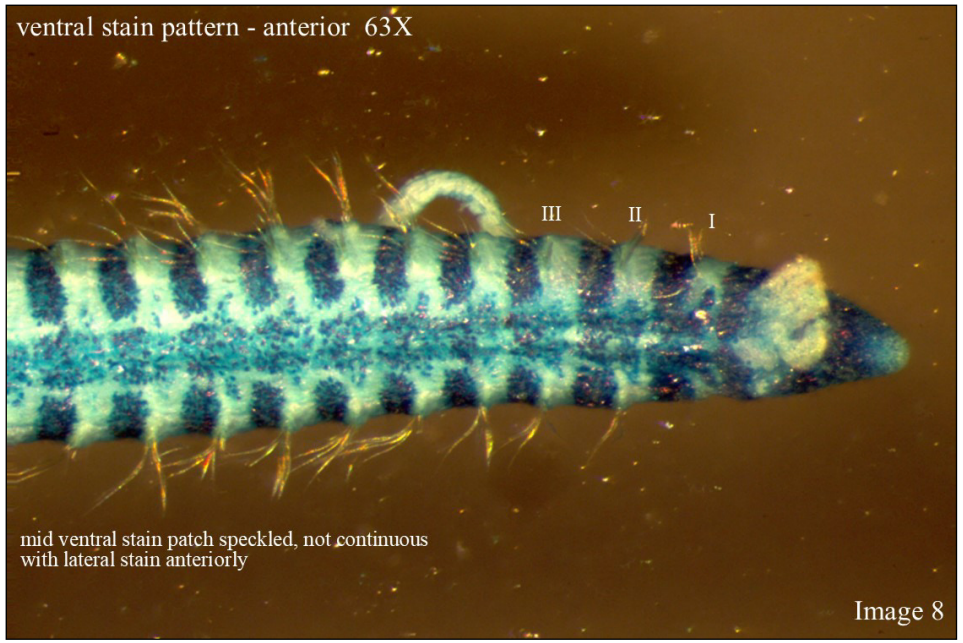


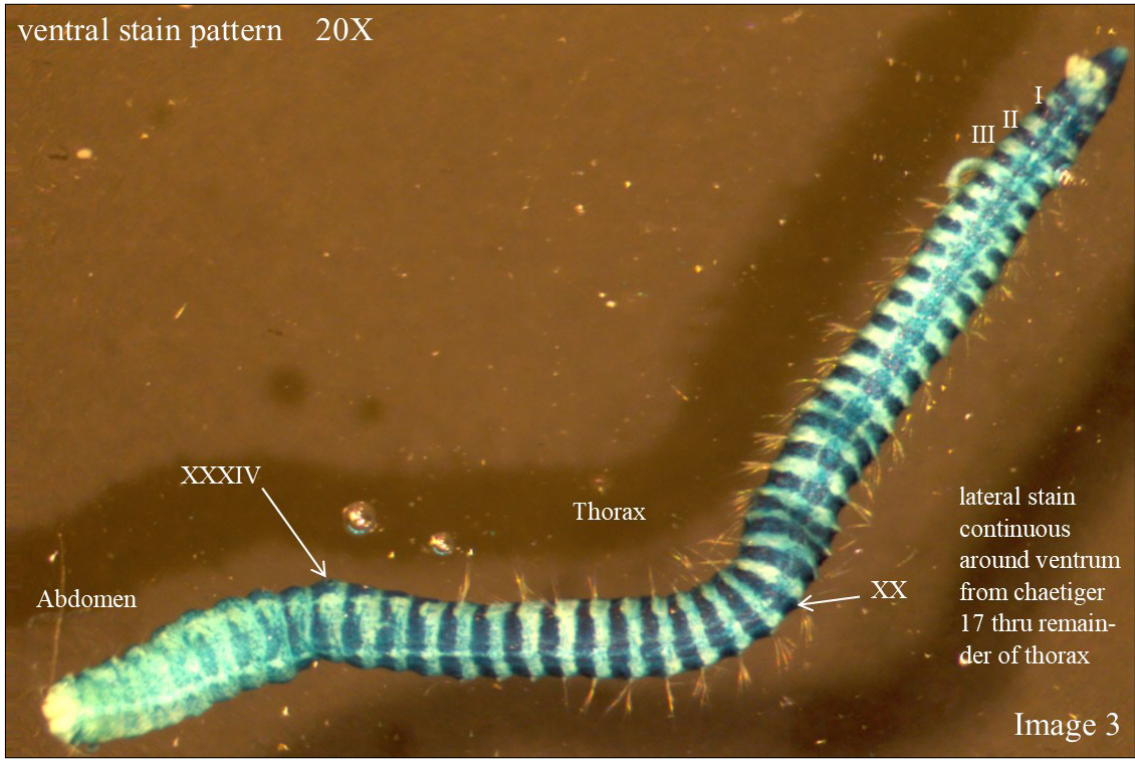


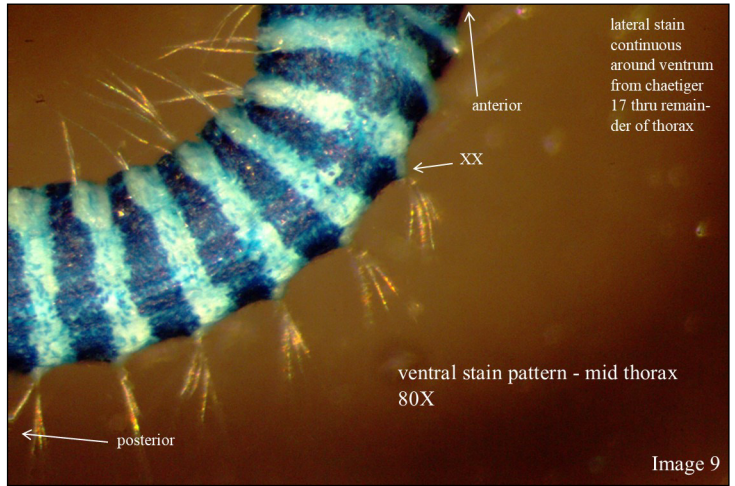
Sources: Fauchald (1972); Hilbig (1996)
Images by B. Haggin

Cossura rostrata Fauchald, 1972

- MGS Pattern
  - Midventrum with rectangular patches **(Images 3 & 8)**, merging with ventrolateral patches in posterior thorax, becoming a continuous band **(Image 9)**



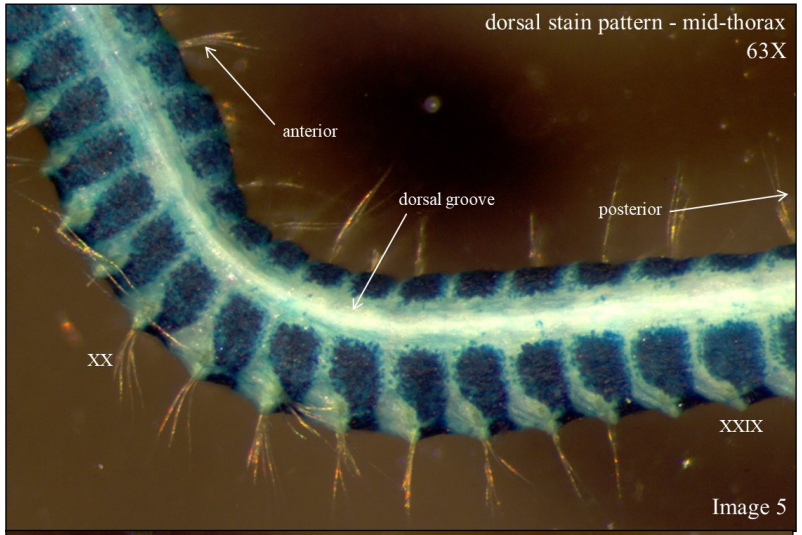


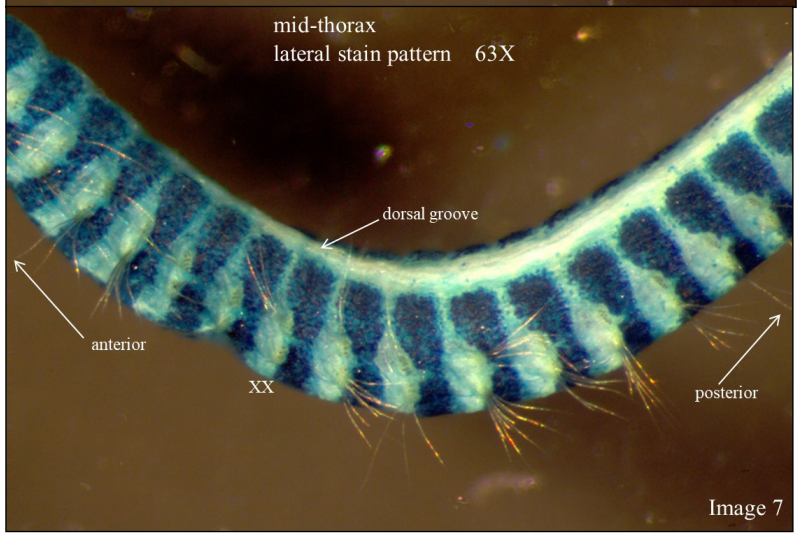


Sources: Fauchald (1972); Hilbig (1996)
Images by B. Haggin

Cossura rostrata Fauchald, 1972

- This species was described by Hilbig (1996) as having 19-21 thoracic chaetigers & 10-15 transitional chaetigers, giving a final thoracic count of 29-36 chaetigers
  - These counts correspond with the MGS stain pattern which fades quickly in abdominal chaetigers
- *Cossura rostrata* was originally described from deep-water off Western Mexico
  - Depth was expanded to 6m based on unpublished data from Bodega Bay in MMS Atlas (Hilbig, 1996)
    - Possibly *Cossura* sp LA2??

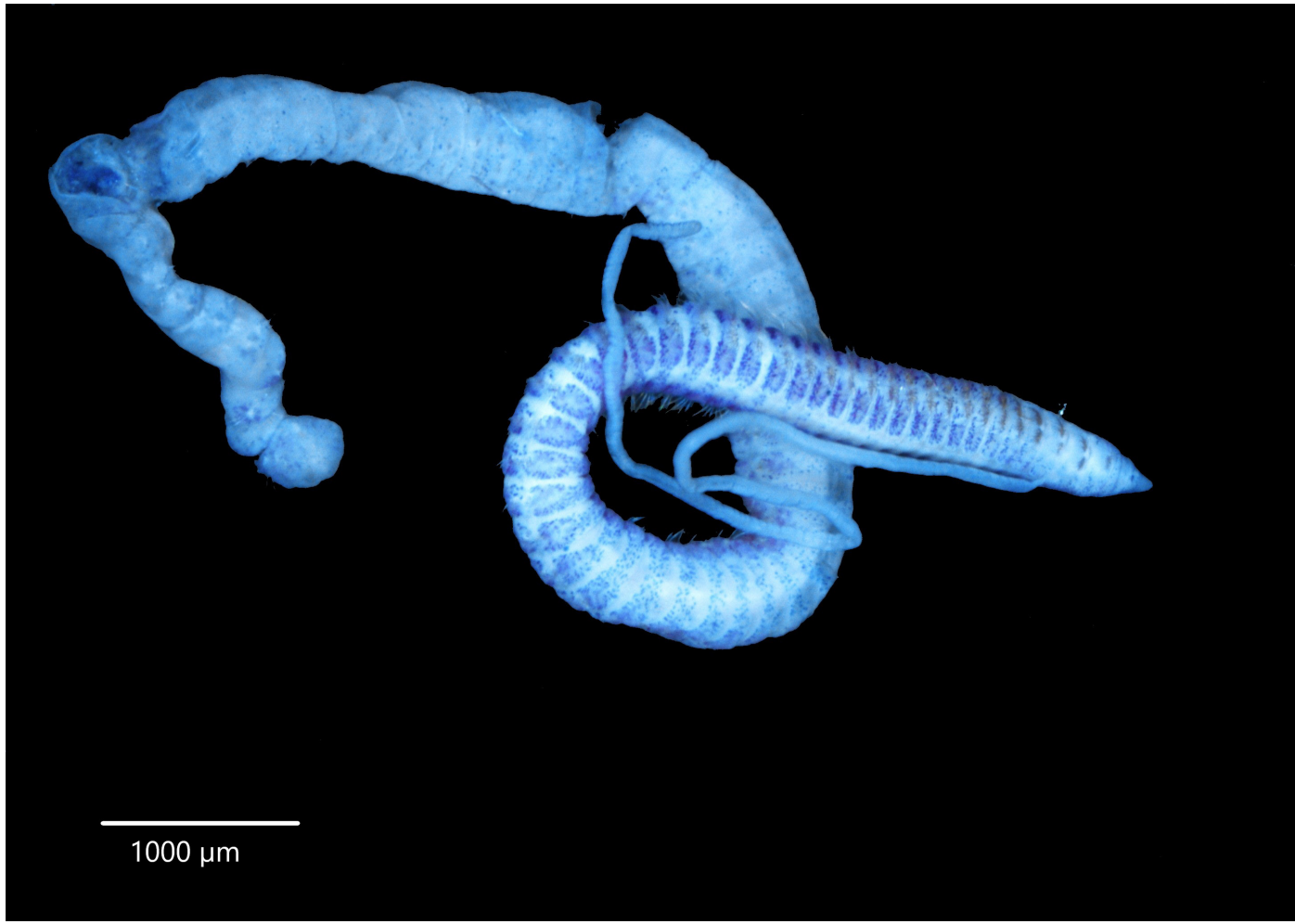




Sources: Fauchald (1972); Hilbig (1996); Haggin (2022)

Cossura sp LA2 Haggin, 2025 §

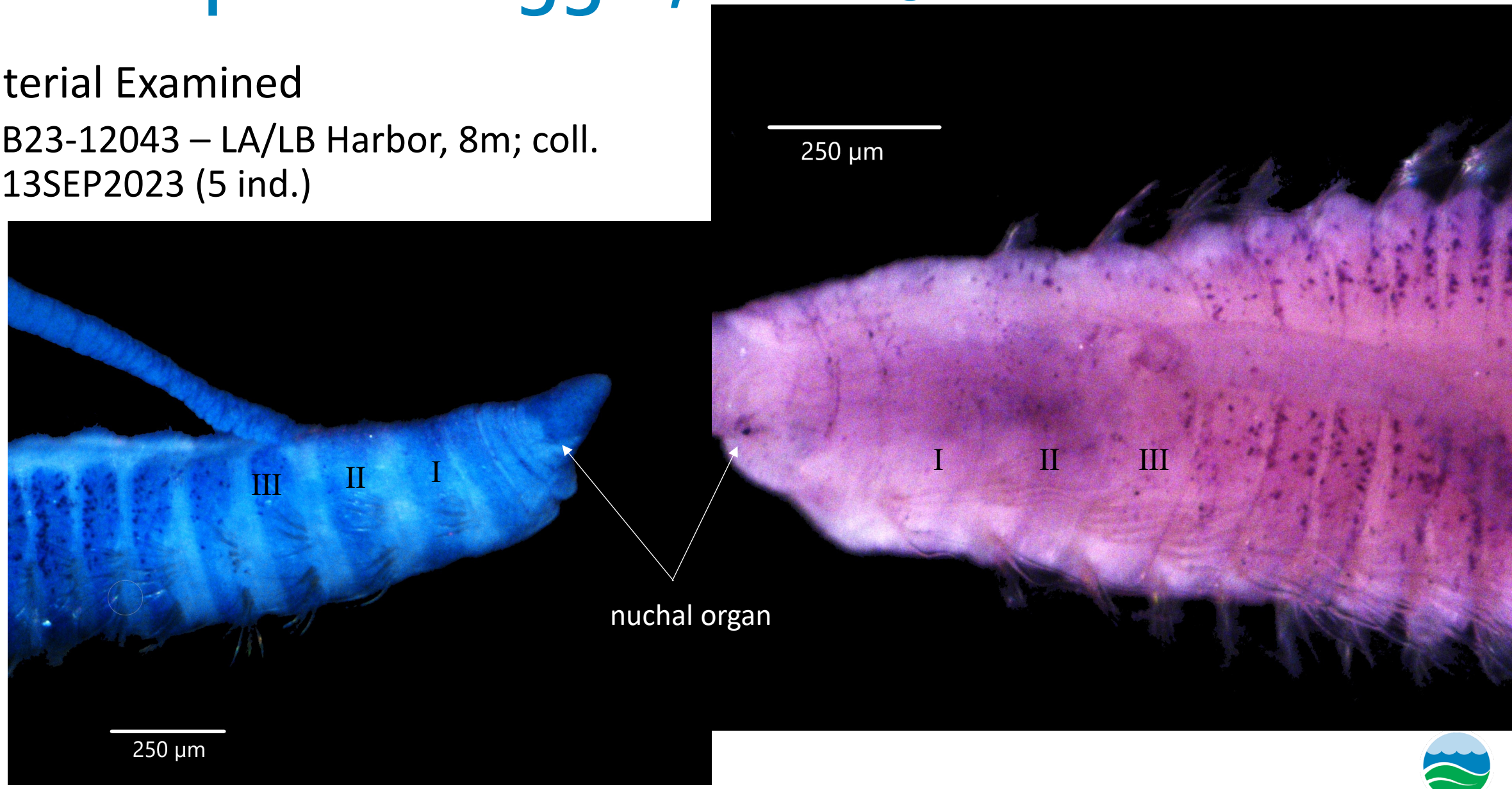
- Characteristics
  - Branchial filament arising from segmental furrow between chaetigers 2 & 3
    - Branchial filament very long, extending back at least 50 chaetigers
  - Thorax with 27-28 chaetigers & 4-6 transitional chaetigers (32-33 total)
  - Pygidium unknown
- Distribution
  - Known only from LA/LB Harbor
  - 8m



Sources: Haggin (2025); Images by B. Haggin

Cossura sp LA2 Haggin, 2025 §

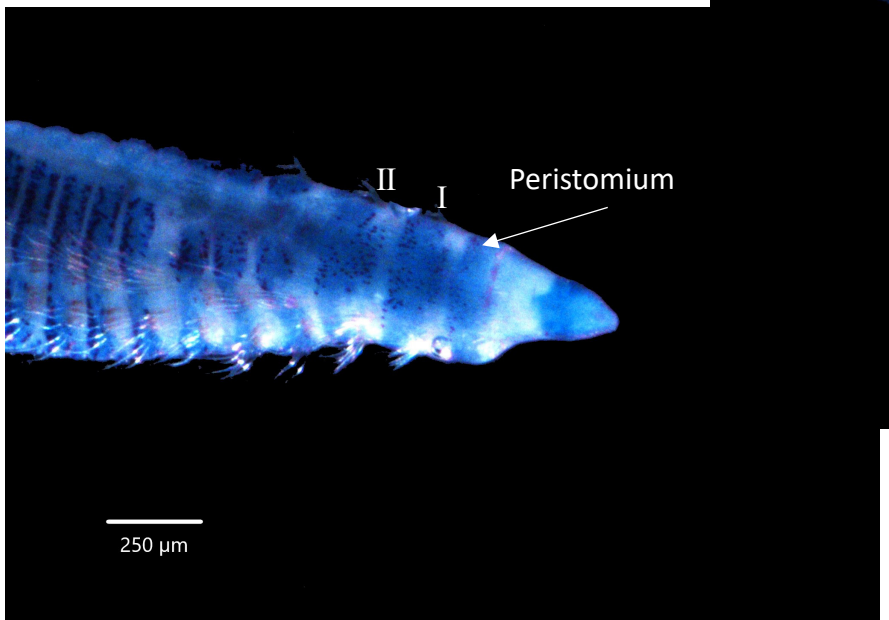
- Material Examined
  - B23-12043 – LA/LB Harbor, 8m; coll. 13SEP2023 (5 ind.)

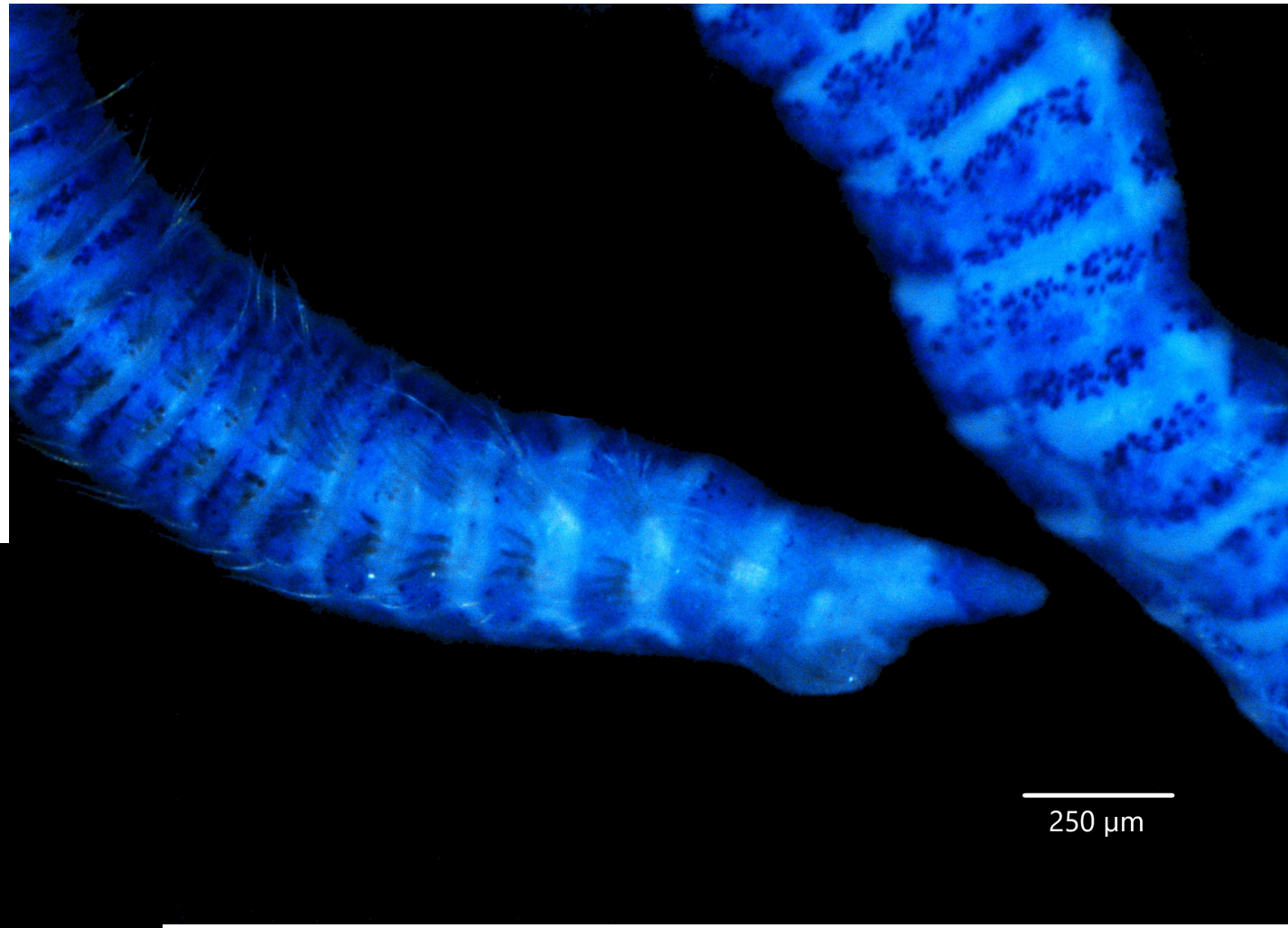


Sources: Haggin (2025); Images by B. Haggin

Cossura sp LA2 Haggin, 2025 §

- MGS
  - Anterior ½ of prostomium (except tip) staining deeply, posterior ½ not staining
    - Gives appearance of unstained ocular region (similar to *Aphelochaeta petersenae*) **(bottom)**
  - Peristomium & C1-C2 staining weakly





Images by B. Haggin

Cossura sp LA2 Haggin, 2025 §

- MGS
  - Thorax with broad dorso- & ventrolateral patches
    - Patches do not connect laterally behind chaetal fascicles
    - Patches merge medially on dorsum & ventrum in posterior thorax, creating continuous bands, still separated laterally
  - Stain fades quickly in abdomen

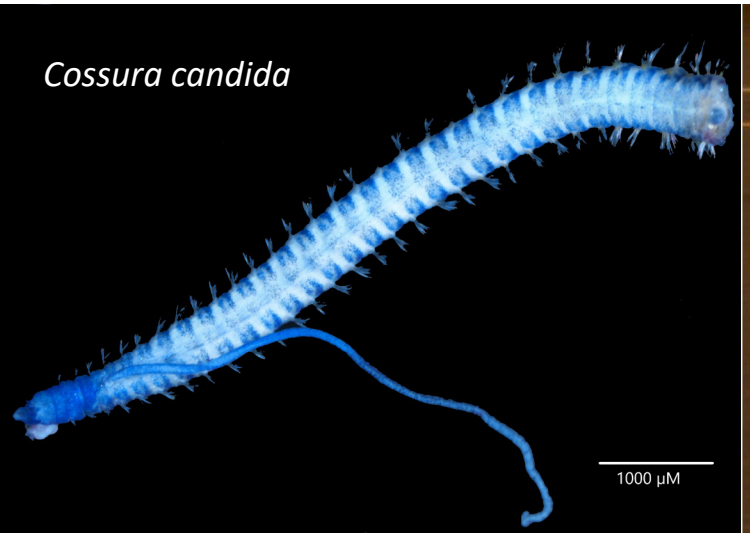
Sources: Haggin (2025); Fauchald (1972)

Cossura sp LA2 Haggin, 2025 §

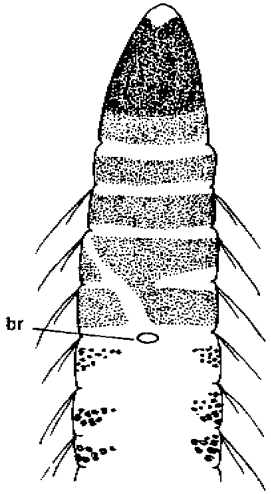
- MGS
  - Thorax with broad dorso- & ventrolateral patches
    - Patches do not connect laterally behind chaetal fascicles
    - Patches merge medially on dorsum & ventrum in posterior thorax, creating continuous bands, still separated laterally
  - Stain fades quickly in abdomen

Images by B. Haggin

Cossura Stain Comparison - Dorsal

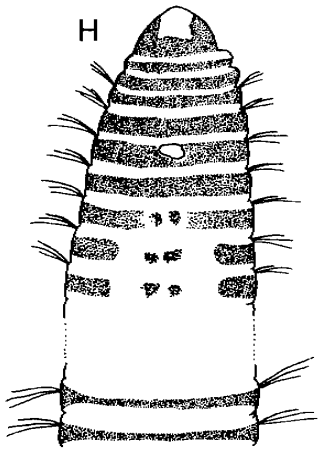


Cossura modica

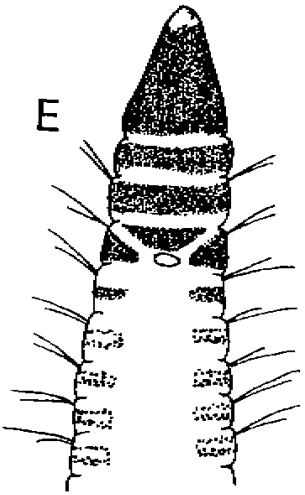


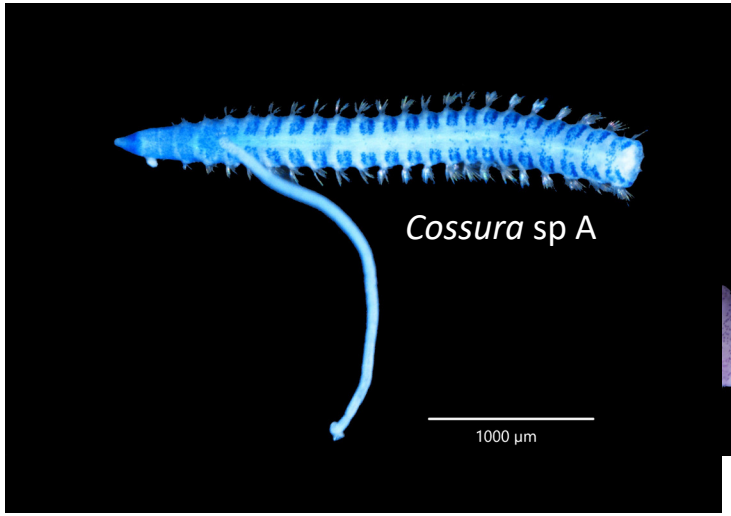
D

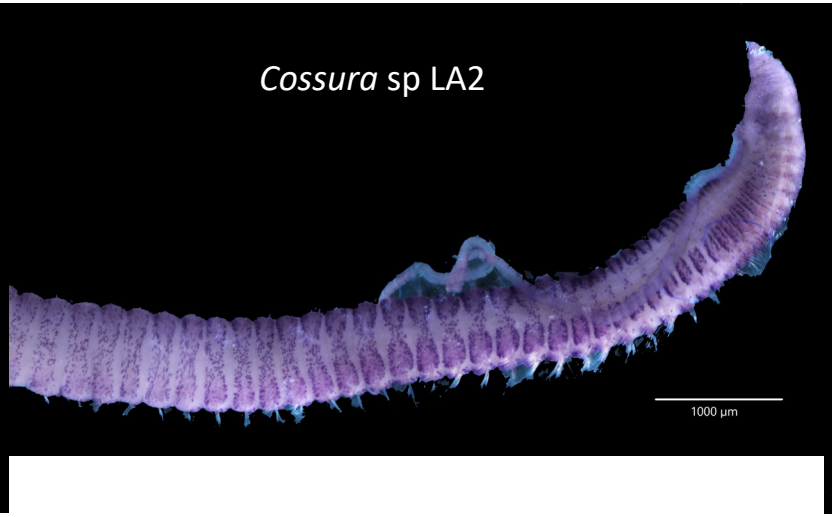
Cossura brunnea

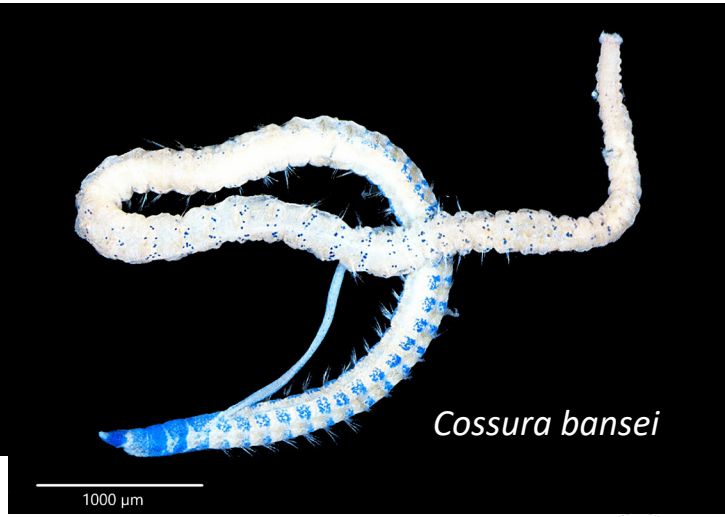


Cossura pygodactylata



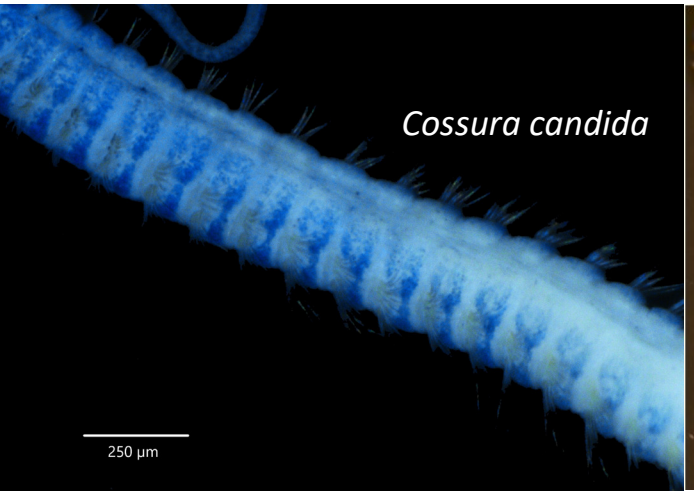


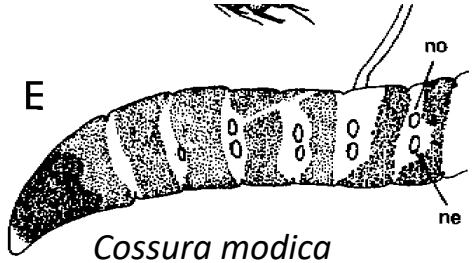


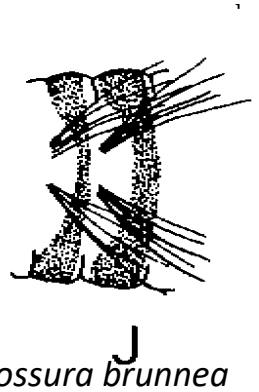


Source: Hilbig (1996); Images by B. Haggin

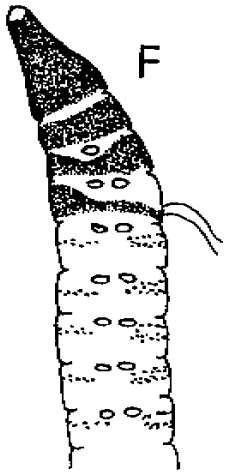
Cossura Stain Comparison - Lateral

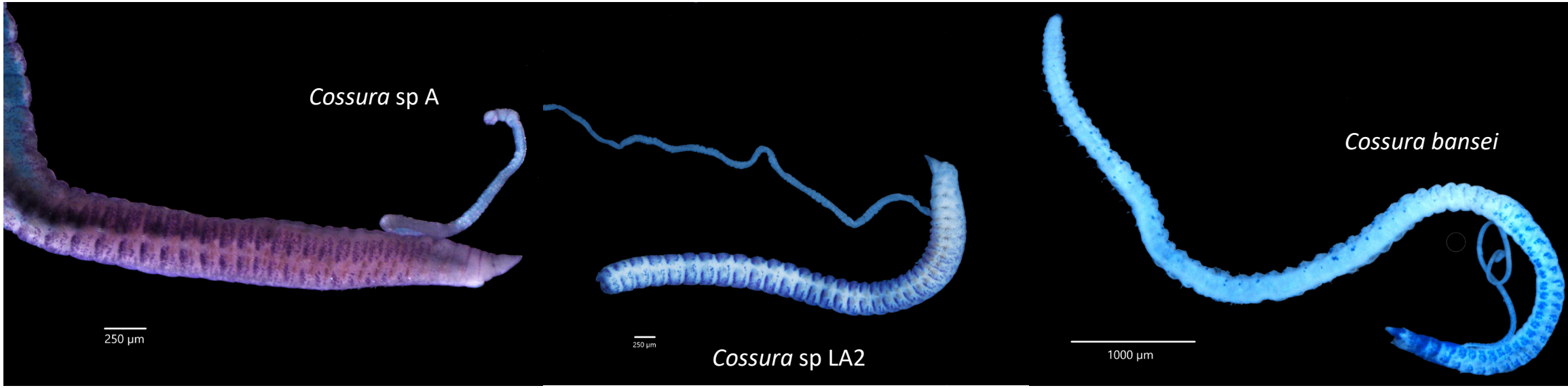






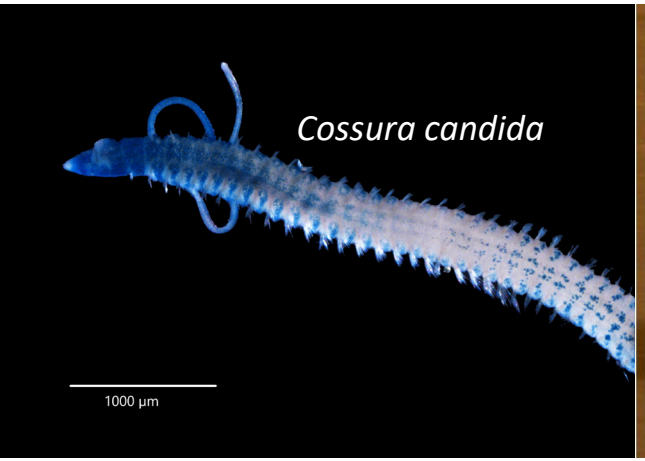
Cossura pygodactylata





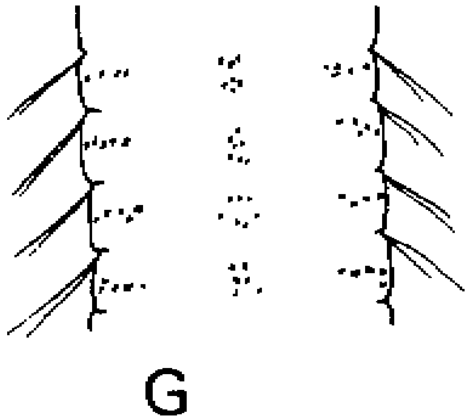
Source: Hilbig (1996); Images by B. Haggin

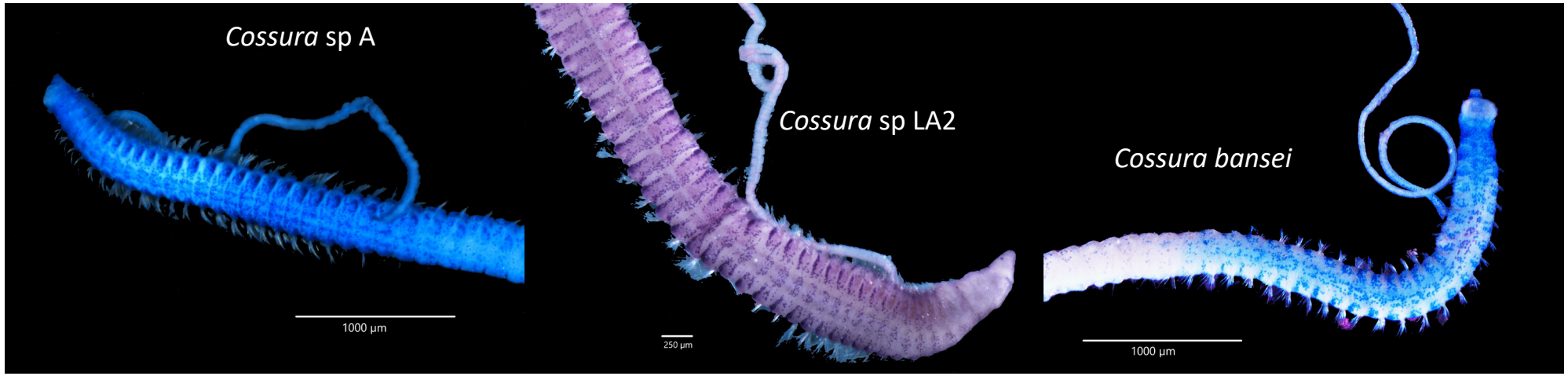
Cossura Stain Comparison - Ventral



Cossura brunnea

Cossura pygodactylata

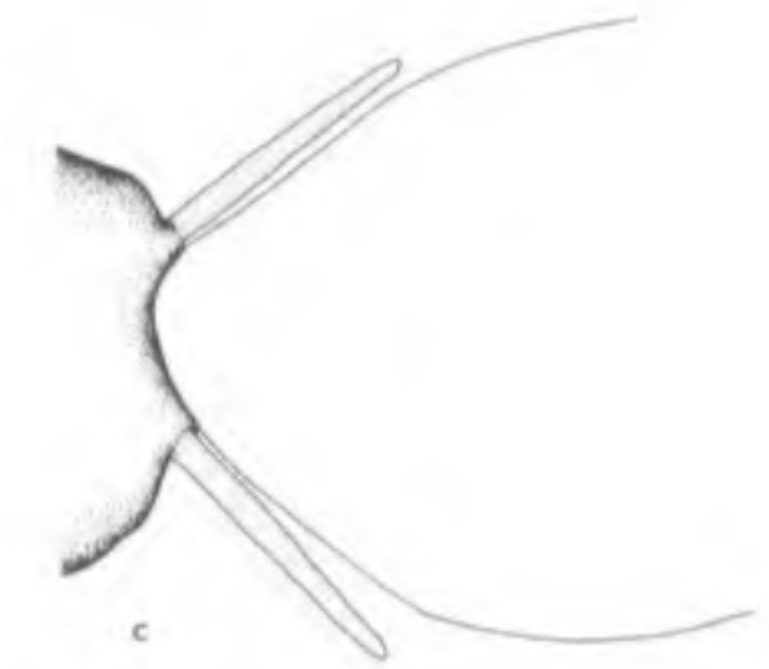




Source: Hilbig (1996); Images by B. Haggin

Other potential *Cossura*

- *Cossura sima* Fauchald, 1972
  - Described from deep-water off western Mexico with *Cossura rostrata* & *C. brunnea*
  - Branchial filament arises from Chaetiger 3
  - Thorax with 29-30 Chaetigers
  - Pygidium w/ 3 pygidial cirri
  - Abdominal chaetigers w/ 1 spine & 1 capillary chaetae in each fascicle **(Image C)**



Source: Fauchald (1972)

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