I. Systematic Paleontology

Superphylum: Panarthropoda Nielsen 1995 (Nielsen 1995)
Phylum (Stem-group): Tardigrada Doyère, 1840 (Dòyere 1840)

Genus: *Aysheaia* Walcott 1911 (Walcott 1911)

Emended Diagnosis: Lobopodian having a wide and elongated body, with a pair of laterally attached anterior appendages followed by ten pairs of ventro-lateral legs. The mouth is surrounded by at least six semi-flexible elongated papillate structures. The anterior appendages have at least three spinous structures running along the anterior side and three more at the terminal end. The trunk, anterior appendages, and legs are annulated. On larger specimens (longer than ~2 cm), conical structures can sometimes be observed on the dorsal side of the trunk running along the ridges separated by the annulations. Each leg bears two spinous structures at the lateral side and ends with (at most) eight scythe-like claws

Type species: *Aysheaia pedunculata* Walcott 1911 (Walcott 1911)

Locality: Burgess Shale, Cambrian Wuliuan Stage, Stephen Formation, Mount Stephen, Yoho National Park, British Columbia, Canada.

Type material: Holotype: USNM 57655. Paratypes: Sixteen described in this study (Figs 1, S1-4) and fourteen described in Whittington, 1978 (Whittington 1978) (Figs S5-11) (see Table S1 and S2 for specimen numbers). Specimens are stored either in the Royal Ontario Museum, Canada or Smithsonian National Museum of Natural History, USA.

Diagnosis: As for genus.

Description: See main manuscript for full morphological description.

Remarks: By examining new materials and re-examining previous specimens described in the latest extensive redescription of *A. pedunculata* (Whittington 1978), we were able to provide a reassessment of the morphology of the species.

The new materials offered a better view of the foregut region of *A. pedunculata*. For example, the mouth opening of *A. peduncalata* (visible as a dark stain) is clearly observable at the anterior end confirming its position (Figs 1D, S1E,F). Surrounding this opening are at least six elongated papillate structures that are semi-flexible in form (Figs 1D, S1E,F). Because of this flexibility, these circumoral structures probably were not used for laceration or digestion as previously suggested (Whittington 1978) but could have sensorial functions like the cephalic papillae of the tardigrade *Milnesium* (Dewel and Clark 1973). In some specimens, these papillae appear to be positioned more laterally (e.g., Fig 2M, S3D,E) which suggests that a portion of the mouth is retractable similar to the mouth cones of some heterotardigrades (e.g., *Cornechiniscus mystacinus* (Gąsiorek 2022)). A morphologically similar structure can be found in two previously described specimen (Fig 2M, S6B, S8A,B). Alternatively, this lateral position could be a result of displacement due to the expulsion of the internal fluids from the anterior side during fossilization and evinced by a dark stain (Fig S3D,E). Similar configuration of the cephalic papillae can be observed in *Milnesium* when its internal fluid is expelled from its anterior end (Fig S3F). Lastly, one new specimen showed, for the first time, that *A. pedunculata* has a bulbous pharynx and thus, a differentiated foregut (Fig 1E,2J). Since the black film in this specimen originated from the anterior end of the body, narrowed down, and continued to the rest of the body, we interpret this as a true biological signal of the gut (Fig S2B).

The new specimens also verified the presence of the conical structures found at the dorsal side of the body (Fig 1B, S3B,C). Interestingly, among the complete specimens, this ornamentation is only observed in larger specimens (i.e., longer than ~2 cm, Table S3). Whittington also previously noted that specimen he analyzed that are longer than 3 cm have evident ridges. Since the new materials are generally smaller (i.e., shorter) than the ones previously described by Whittington (Table S3), we were able to confirm this difference of pattern between smaller and larger *A. pedunculata*. This can either be evidence of ontogenetic change wherein *A. pedunculata* acquire dorsal cuticular ornamentation as it matures or a preservation bias which does not allow the structures in shorter specimens to be preserved since they are presumably smaller than those in the longer specimens. Similar to the conical structures, annulations, particularly along the trunk,

are more evident in larger specimens (e.g., Table S1). New samples also confirm the pattern of the trunk annulations observed by Whittington – one annulation opposite the anterior appendages with three annulations before it; five to six annulations before the first pair of legs; one annulation opposite the midline of the legs followed by three annulations before the next pair of legs (Fig S2A,B).

The anterior appendages are also annulated, but lack the conical structures found along the body (Fig 1D). At the terminal end of the appendages, three long spines pointing at different directions can be observed (Figs S1F, S3A,B). Similarly, at least three spines can be seen at the anterior side of the appendages (Fig 1A,D, S1E,F, S2C, S3A). All these spines appear to be more rigid and thicker compared to the papillate structures around the mouth. Whittington hypothesized that the anterior appendages could have been used for feeding, such as lacerating sponges (Whittington 1978). However, if the "sensorial hypothesis" (see Supplementary text II for explanation of the hypothesis) is true, these appendages could instead have sensorial functions. This is further supported by the spines being morphologically similar to the leg spines which are hypothesized to also be sensorial (see below).

Like the anterior appendages, all the 10 legs are annulated and devoid of the conical structures (Fig S2A,S3A-C,). In larger specimens (e.g., Fig S2A,B,S5A,S8A,B), these annulations and the ridges in between them are more evident. This is perhaps why these legs are depicted as having an accordion-like morphology by Whittington (see Fig 86 in (Whittington 1978). This morphology is not observed in legs of smaller samples (i.e., length <2 cm, e.g., Fig 1A, S1A,D), and sometimes even in larger specimens (e.g., Figs S6A,B, S7A,B). Interestingly, this morphology is evident in legs that are more bent (e.g., legs 1 vs 4 in Fig S2B, legs 6 vs 8 in Fig S4F, legs 2 vs 9 in Fig S8A). Given these observations, we acknowledge that *Aysheaia* have strongly annulated legs, but we doubt the authenticity of the accordion-like morphology. If annulated legs are compressed during preservation, it is not surprising that the ridges in between them will be more pronounced due to the pressure of compaction.

In the previous description, it was noted that the legs vary in length – increasing from legs 1-3, similar from legs 4-7, and decreasing from legs 8-10. However, the new examined specimens do not show this pattern and have outstretched legs that are almost, if not, equal in length (e.g., Figs 1A, S1A,B,D). Even in the previously described specimens, the same pattern can be observed

(e.g., Figs S3B, S9C, S10D). Thus, we argue that the legs of *A. pedunculata* have equal length and the observed differences are probably due to their articulation during preservation.

It has also been presumed by Whittington that all legs, except for leg 1, have associated spines. Specifically, legs 3-8 have two spines wherein one is near the distal tip of the leg and another longer spine is at a more proximal orientation, while legs 2, 9, and 10 only have one spine near the claws. The new specimens reveal that there are two spines on each of the 10 legs (Figs 1B-D, S4C), similar to what was observed in legs 3-8. Additionally, we were able to observe the bases of these spines (Fig S4B) to conclude that they are attached at the lateral side of the leg relative to the claws contrary to what was suggested by Whittington that they are found opposite to the claws. This orientation can also be observed with the leg sensory organs of heterotardigrades (Fig 2E). Given the similarity of the position and morphology of these structures, the spines of *A. pedunculata* could probably also have sensorial functions. Furthermore, if the spines on the legs and the anterior appendages are morphologically similar, this further support the sensorial function of the anterior appendages. If the tardigrade legs underwent reduction and only retained its distal identity as previously suggested (Mapalo *et al.* 2024), this could explain why *A. pedunculata* has two spines while tardigrades only have one. Lastly, we speculate that the tip of the leg that Whittington described could be the distal-most spine preserved in a way that it extends outside the distal end of the leg (e.g., Fig S4B).

By looking at both new and old materials, we also cast doubt on the proposed orientations of the legs wherein the claws of legs 1-8 points backwards while legs 9-10 are in reverse. Out of the 15 specimens that Whittington described, three have legs 9 that obviously exhibit the suggested reversed orientation (Figs S5A, S7D, S10D). However, in the same specimens, some anterior legs (leg 8 in Fig S5A and leg 6 in Fig S7D) also showed similar orientation. Among the specimens, there are those where leg 9 is observed to have forward-facing orientation, one of which is the same specimen with one leg 9 in a reversed orientation (Figs S4A and S10D). Thus, it is ambiguous whether legs 9 truly has the same orientation as legs 10. Given the position of this penultimate leg pair, we speculate that they probably face the same direction as the other anterior legs. It is also possible that this leg pair can rotate freely so *A. pedunculata* can utilize it as either an extra leg pair for grasping into substrates similar to legs 10 or for walking similar to legs 1-8.

Our investigation allowed us to obtain high quality images of the *A. pedunculata* claws and confirms its scythe-like morphology (i.e., has an evident straight and long stalk) (Figs 1C, 2B,

S4E,G) that are very similar to heterotardigrades (Fig 2C). The highest number of claw count observed was 8 (Figs 2B, S4E). Due to preservation issue, it is not possible to verify whether all legs have the same numbers of claws (i.e., isonych) or not (i.e., anisonych). The same claw variability between legs can again be observed in heterotardigrades (Fontoura *et al.* 2017). In fact, claw number can also differ between ontogenetic stages in this group of tardigrades (e.g., *Echiniscus testudo* (Gąsiorek *et al.* 2017)), and thus, could also happen in *A. pedunculata*. Unfortunately, the claws of the smaller materials that we analyzed were not well-preserved to confirm their numbers.

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II. Supplementary Figures

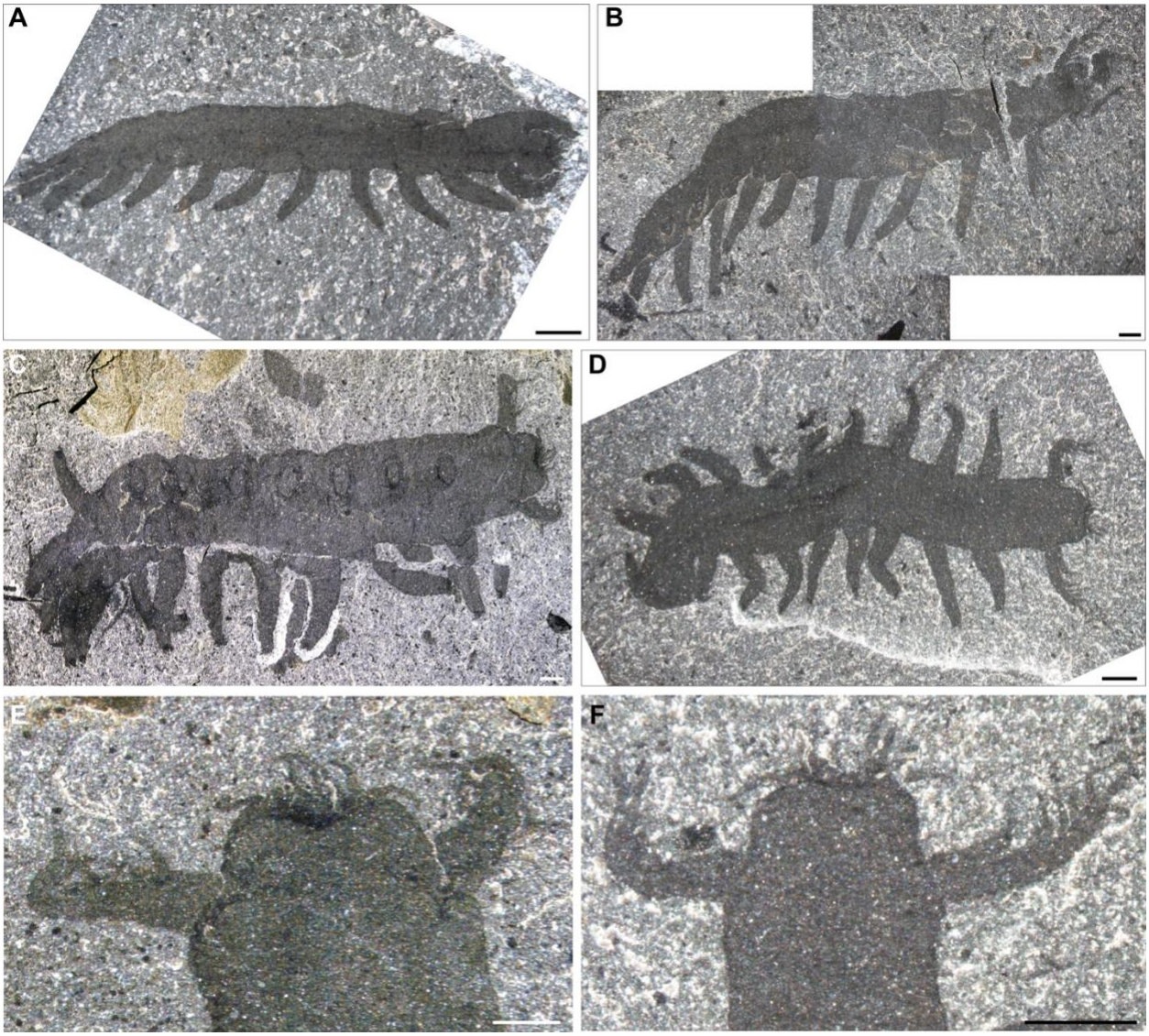

Figure S1. New specimens of *Aysheaia pedunculata* Walcott, 1911. (A-D) Complete specimens with 10 pairs of legs and anterior appendages: (A) ROMIP 68036, (B) ROMIP 68045, (C) ROMIP 63052, (D) ROMIP 68046. (E,F) Retracted mouth surrounded by six papillate structures: (E) ROMIP 63052, (F) ROMIP 68046. Specimens photographed dry using cross-polarized light. Scale bars: 1 mm.

Figure S2. New specimens of *Aysheaia pedunculata* Walcott, 1911 showing annulations and dorsal cuticular ornamentations. (A) ROMIP 68038. (B) ROMIP 68037, counterpart. (C) ROMIP 61132. Specimens photographed using cross-polarized light under water (A,B) or dry (C). Scale bars: 1 mm.

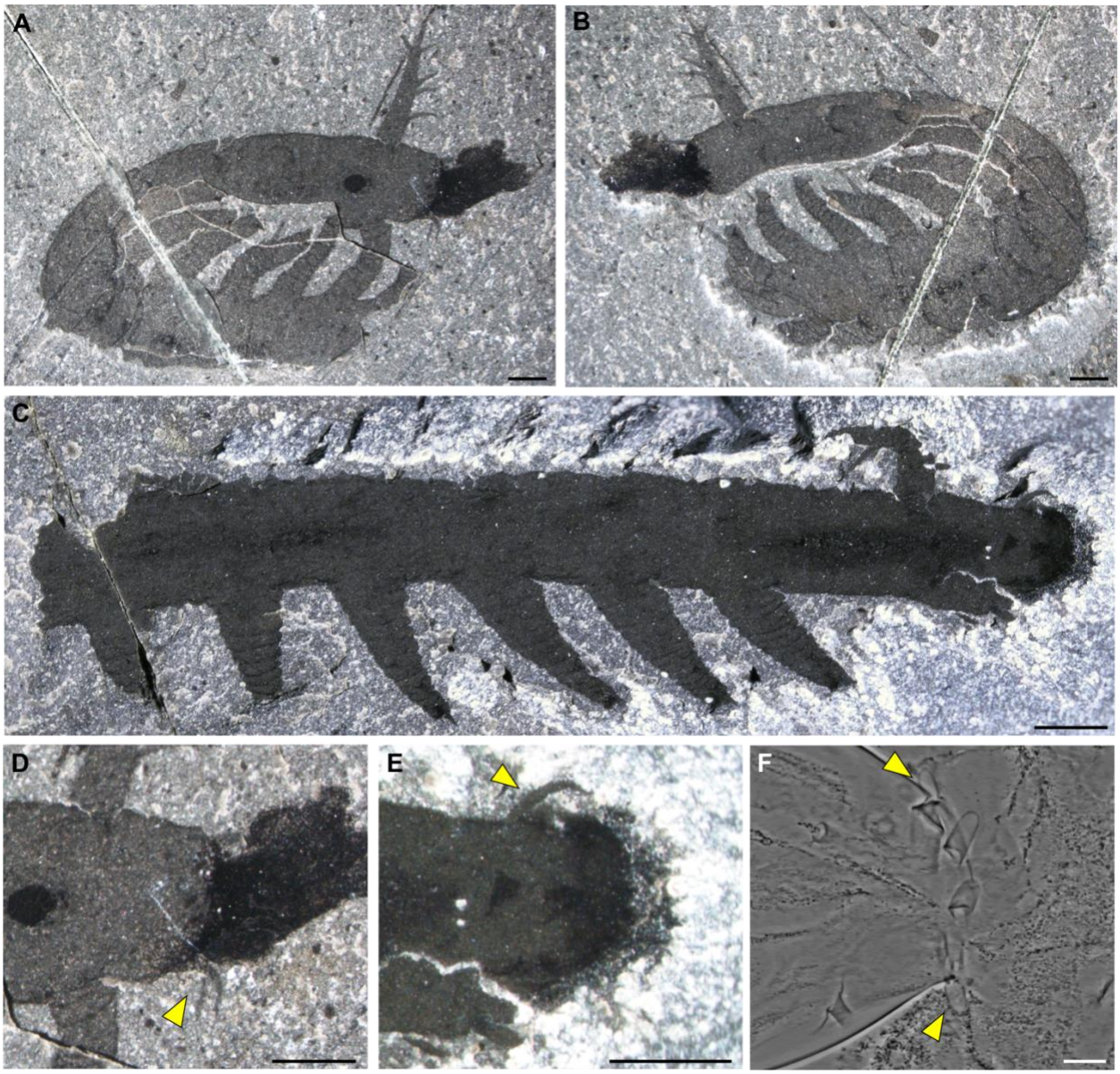

Figure S3. New specimens of *Aysheaia pedunculata* Walcott, 1911. (A,B,D) ROMIP 68042 – (A,D) counterpart, (B) part, have spines of the anterior appendages clearly visible. (C,E) ROMIP 57537, lateral view with the circumoral papillate structures (yellow arrowheads) displaced laterally. (F) *Milnesium* with displaced cephalic papillae (yellow arrowheads) due to some internal fluid spilling out at the anterior end. Specimens photographed dry using cross-polarized light (A-E). Scale bars: *A. pedunculata* – 1 mm; tardigrades – 10 μm.

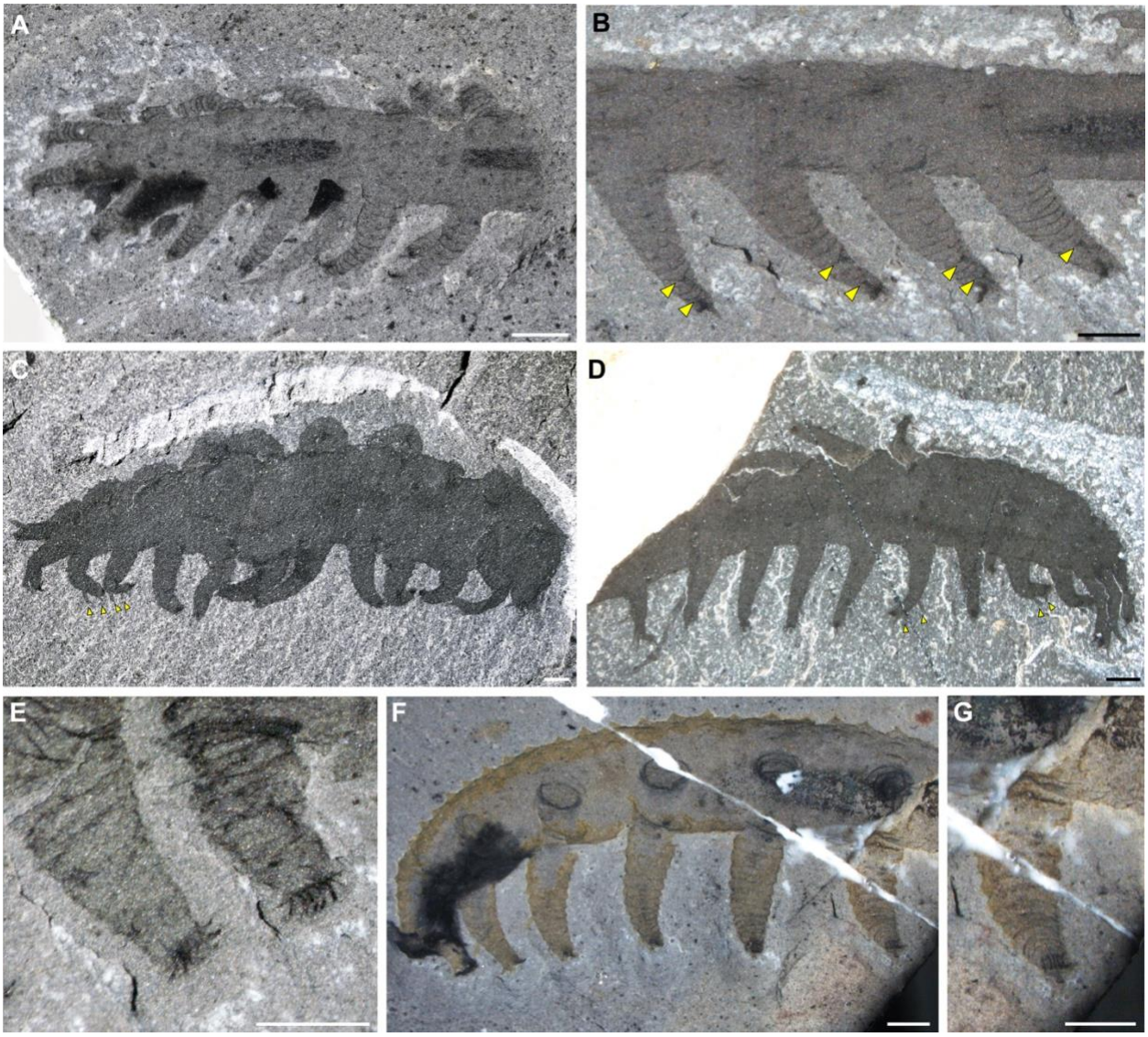

Figure S4. New specimens of *Aysheaia pedunculata* Walcott, 1911 highlighting leg morphology. (A) ROMIP 68041 with hind leg pointing anteriorly while the rest of the leg pairs point posteriorly. (B-D) Specimens with evident leg spines (yellow arrowheads): (B) ROMIP 57537, (C) ROMIP 68039, (D) ROMIP 68044. (E-G) Specimens showing clear morphology of the claws: (E) ROMIP 68040, (F,G) ROMIP 68043. Specimens photographed using cross-polarized light under water (A,B,E-G) or dry (C,D). Scale bars: 1 mm.

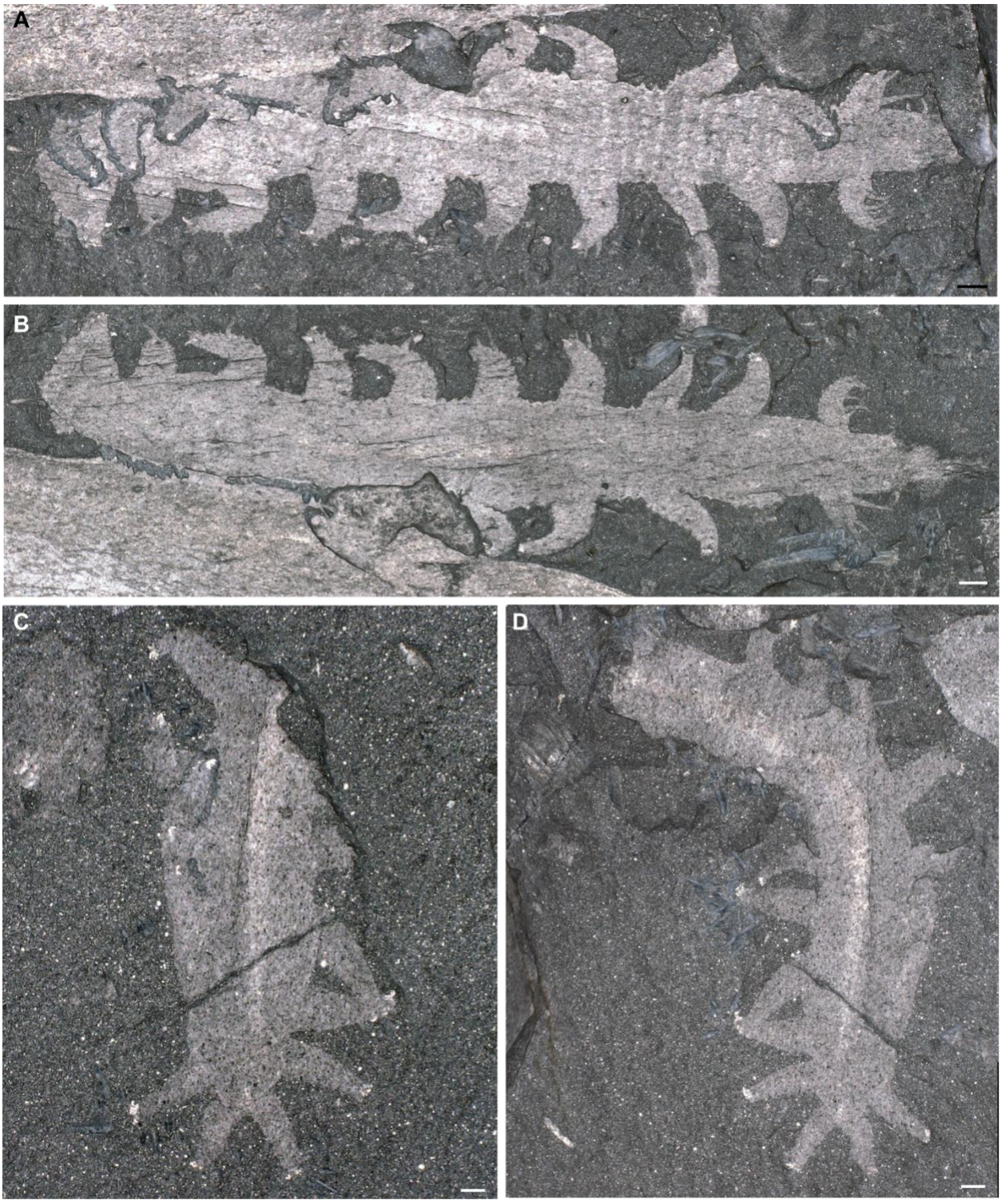

Figure S5. Specimens of *Aysheaia pedunculata* Walcott, 1911 described in Whittington, 1978. (A,B) USNM 57655, holotype. (C,D) USNM 139206a. Specimens photographed dry using cross-polarized light. Scale bars: 1 mm.

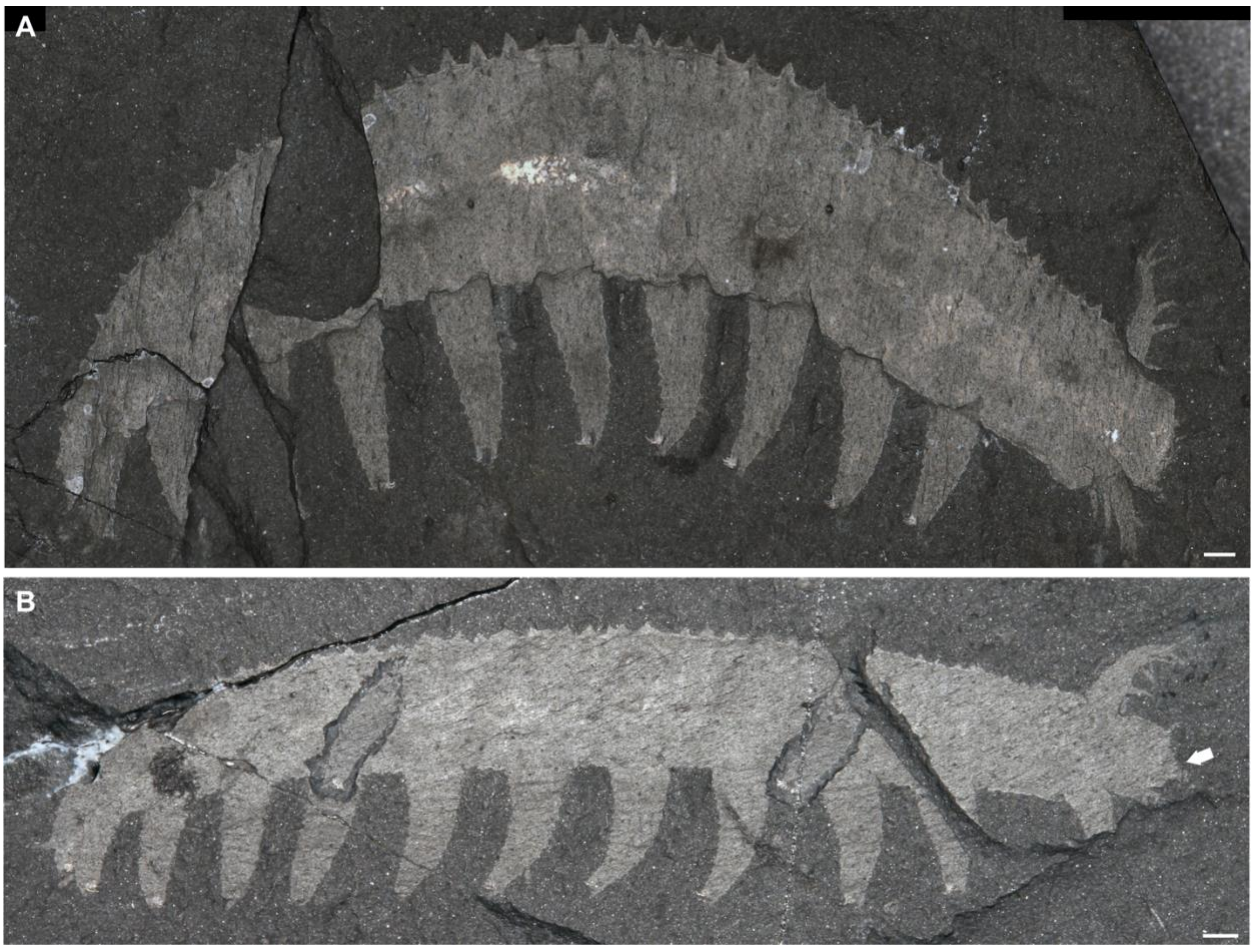

Figure S6. Specimens of *Aysheaia pedunculata* Walcott, 1911 described in Whittington, 1978. (A) USNM 139206b. (B) USNM 83942a. Specimens photographed dry using cross-polarized light. White arrow – possible mouth cone. Scale bars: 1 mm.

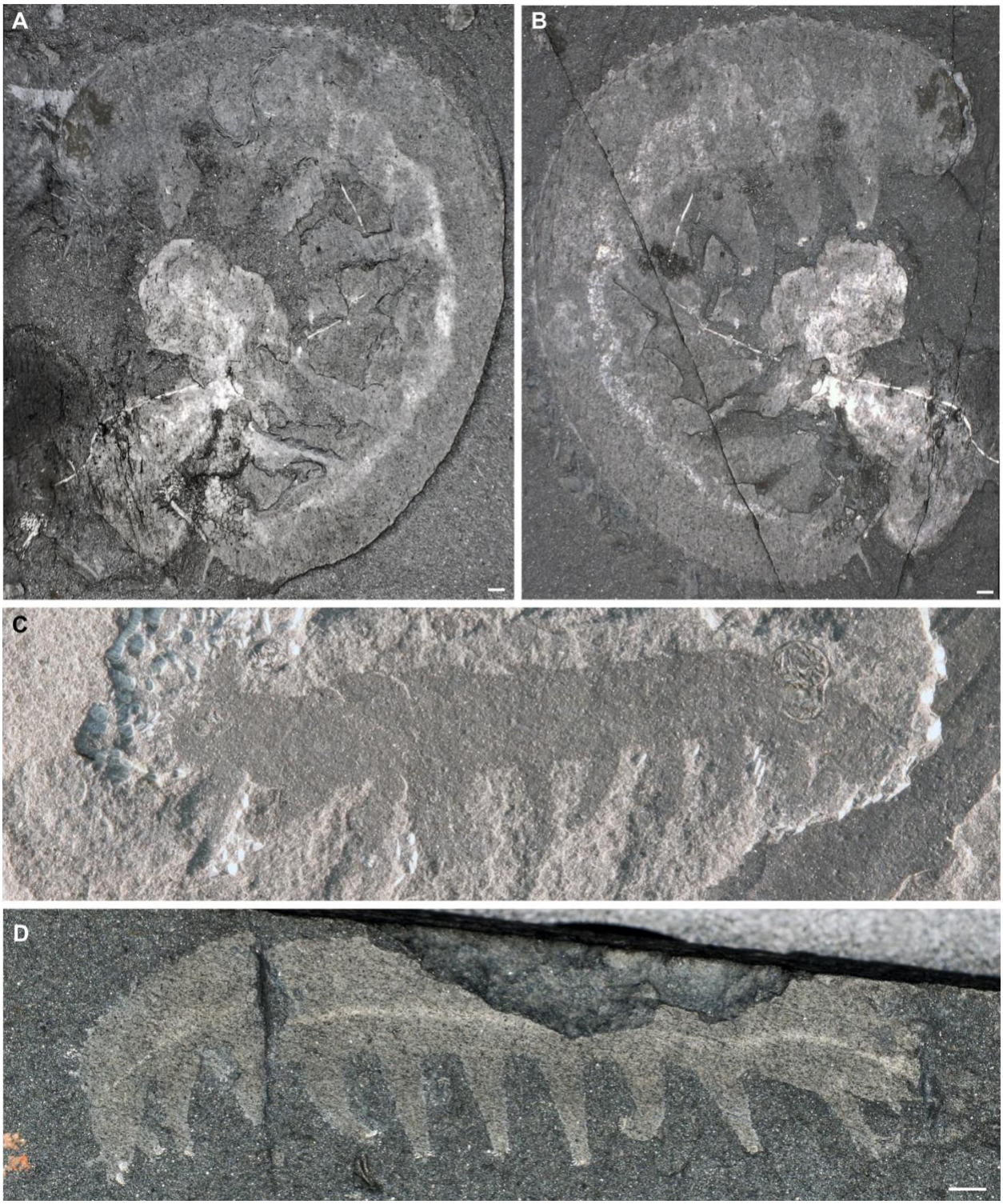

Figure S7. Specimens of *Aysheaia pedunculata* Walcott, 1911 described in Whittington, 1978. (A,B) USNM 83942b. (C) USNM 20033. (D) USNM 235879. Specimens photographed dry using cross-polarized light (A,B,D) or with low-angle light (C). Scale bars: 1 mm.

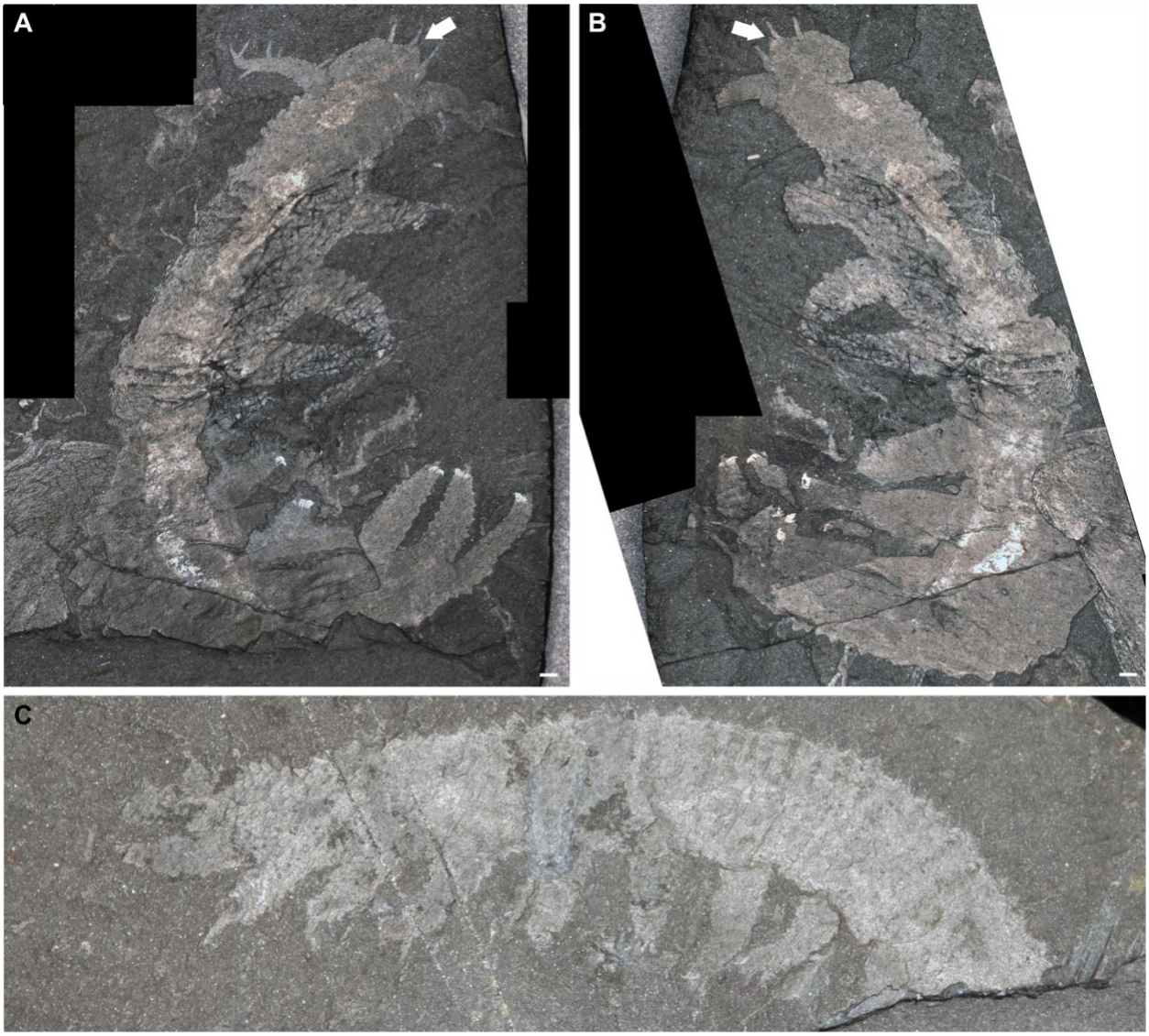

Figure S8. Specimens of *Aysheaia pedunculata* Walcott, 1911 described in Whittington, 1978. (A,B) USNM 235880. (C) USNM 235882. Specimens photographed dry using cross-polarized light. White arrow – possible mouth cone. Scale bars: 1 mm.

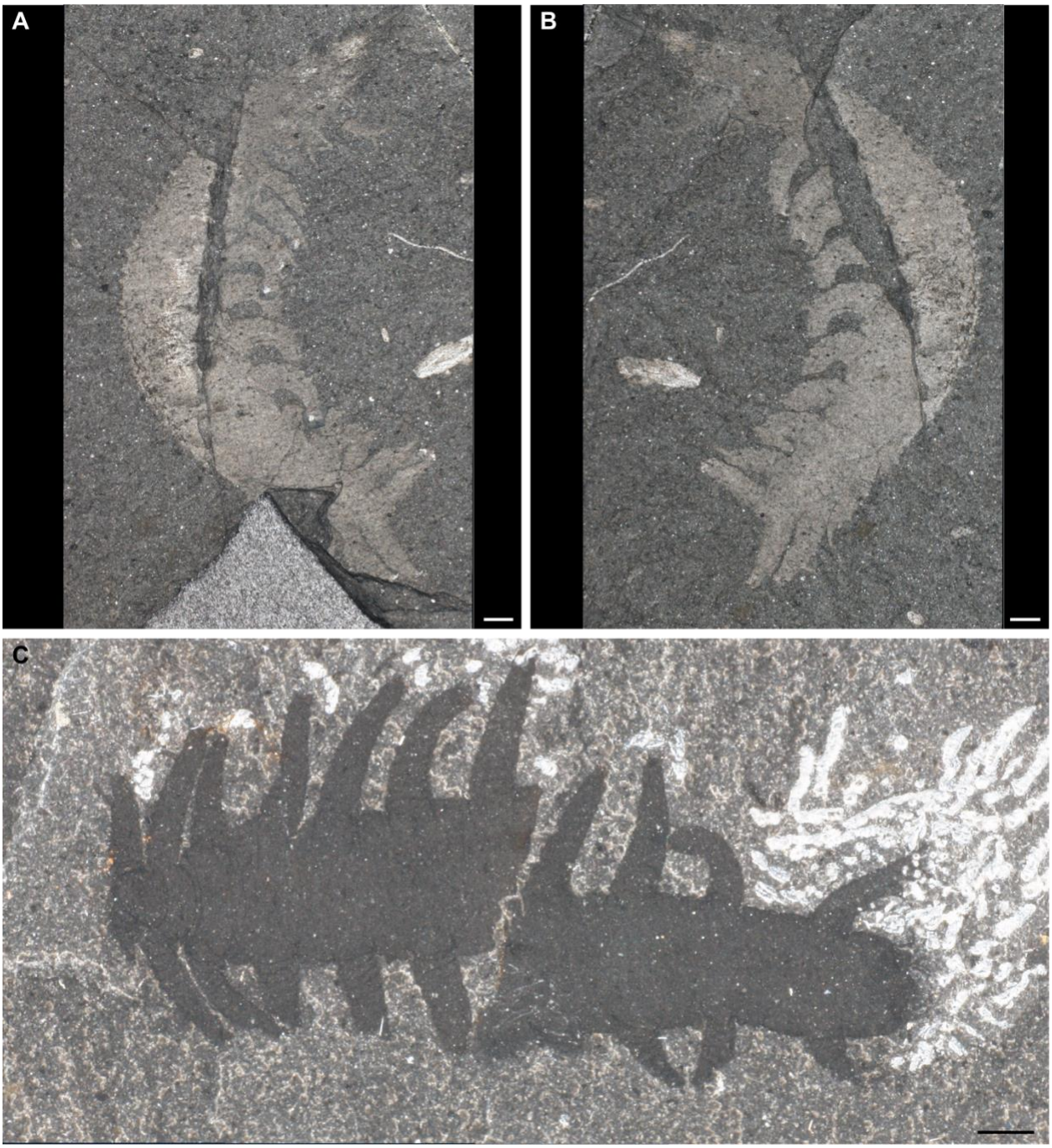

Figure S9. Specimens of *Aysheaia pedunculata* Walcott, 1911 described in Whittington, 1978. (A,B) USNM 235883. (C) USNM 235884. Specimens photographed dry using cross-polarized light. Scale bars: 1 mm.

Figure S10. Specimens of *Aysheaia pedunculata* Walcott, 1911 described in Whittington, 1978. (A,B) USNM 235885. (C) USNM 35412. (D) USNM 35413. (E) USNM 235881. Specimens photographed dry using cross-polarized light. Scale bars: 1 mm.

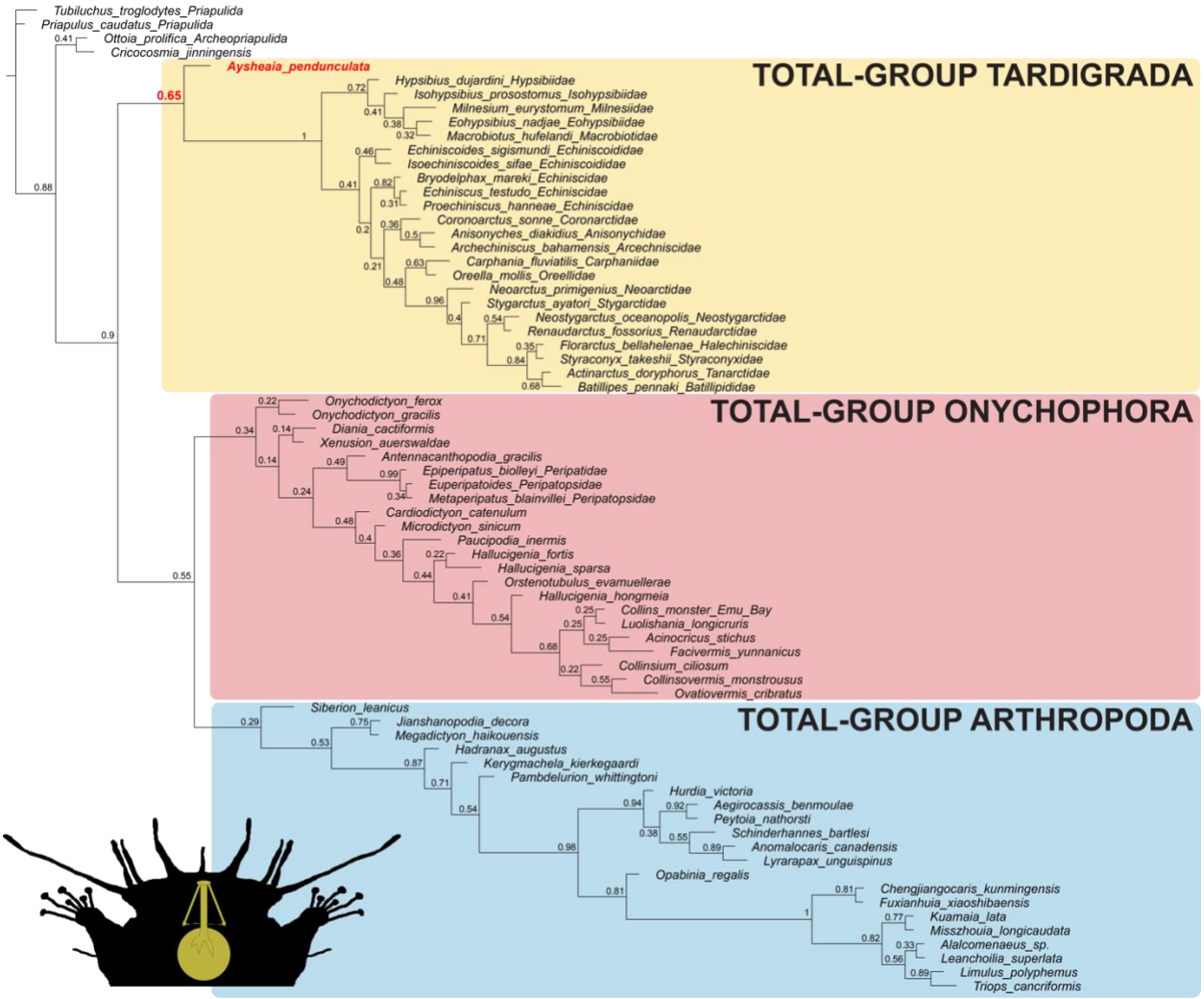

Figure S11. Phylogenetic result of the Bayesian inference using MRBayes under the stylet hypothesis. Reconstruction was done using 94 morphological characters. Values above or below the node represent the posterior probability values.

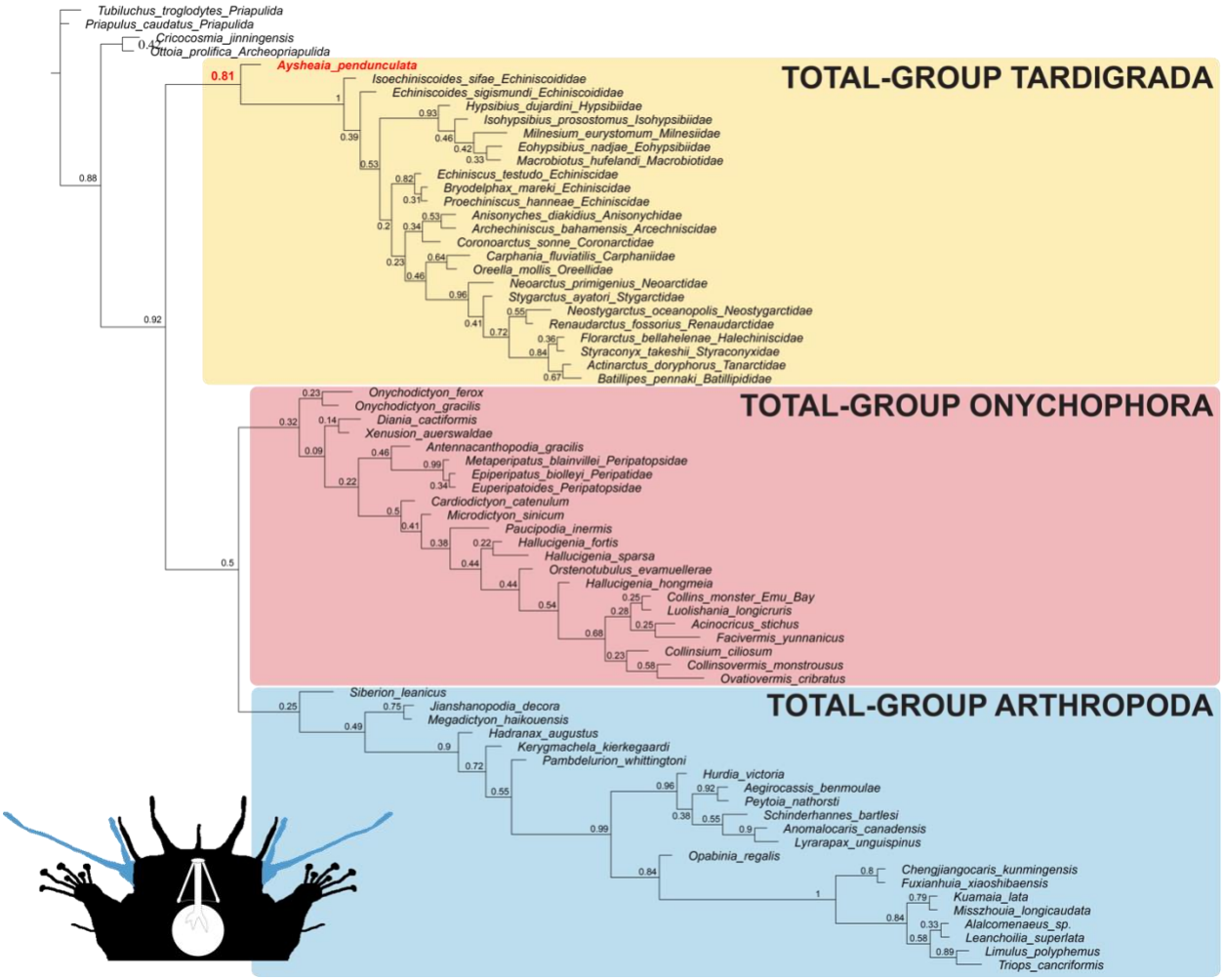

Figure S12. Phylogenetic result of the Bayesian inference using MRBayes under the sensorial hypothesis. Reconstruction was done using 93 morphological characters. Values above or below the node represent the posterior probability values.

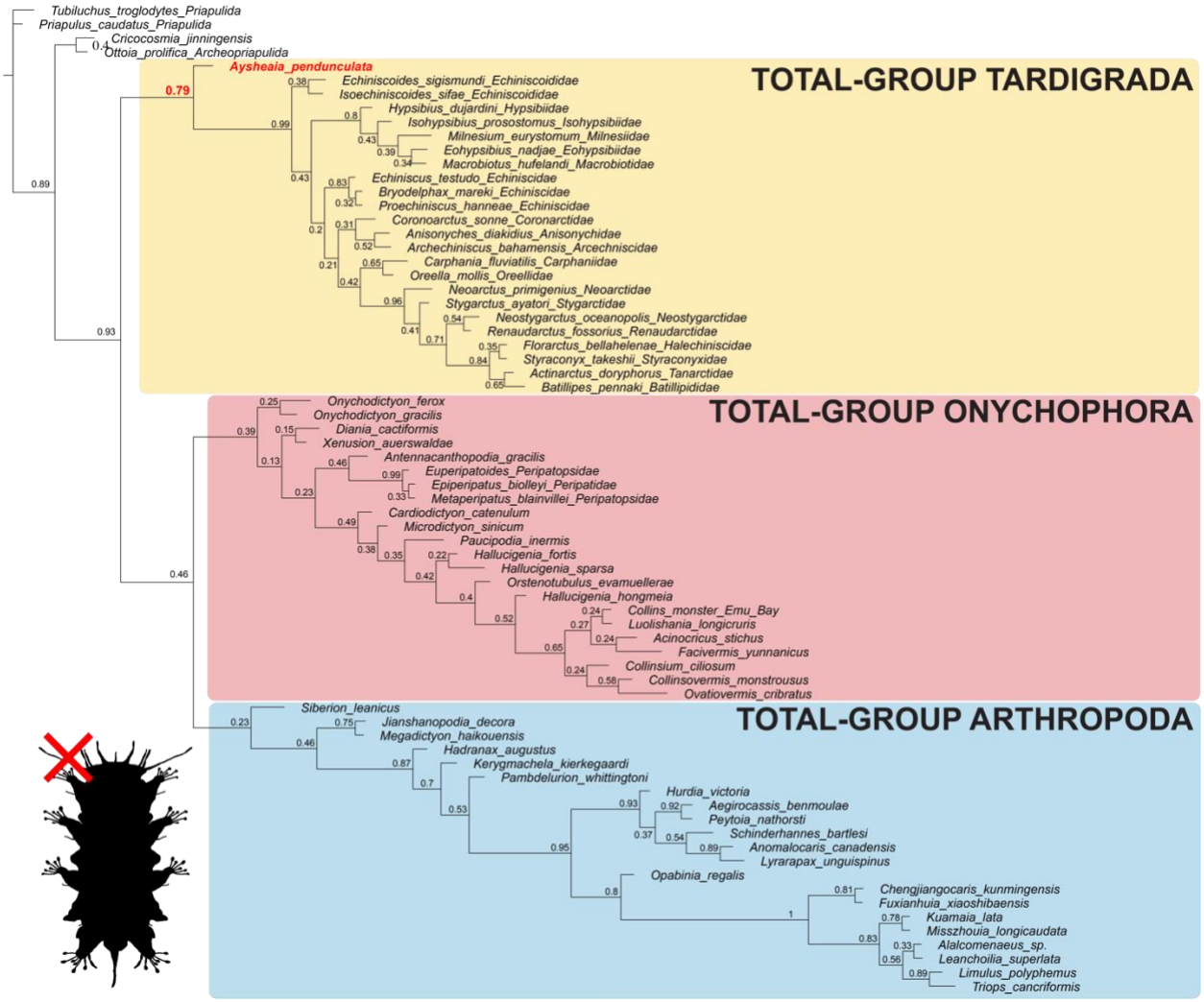

Figure S13. Phylogenetic result of the Bayesian inference using MRBayes under the lost hypothesis. Reconstruction was done using 93 morphological characters. Values above or below the node represent the posterior probability values.

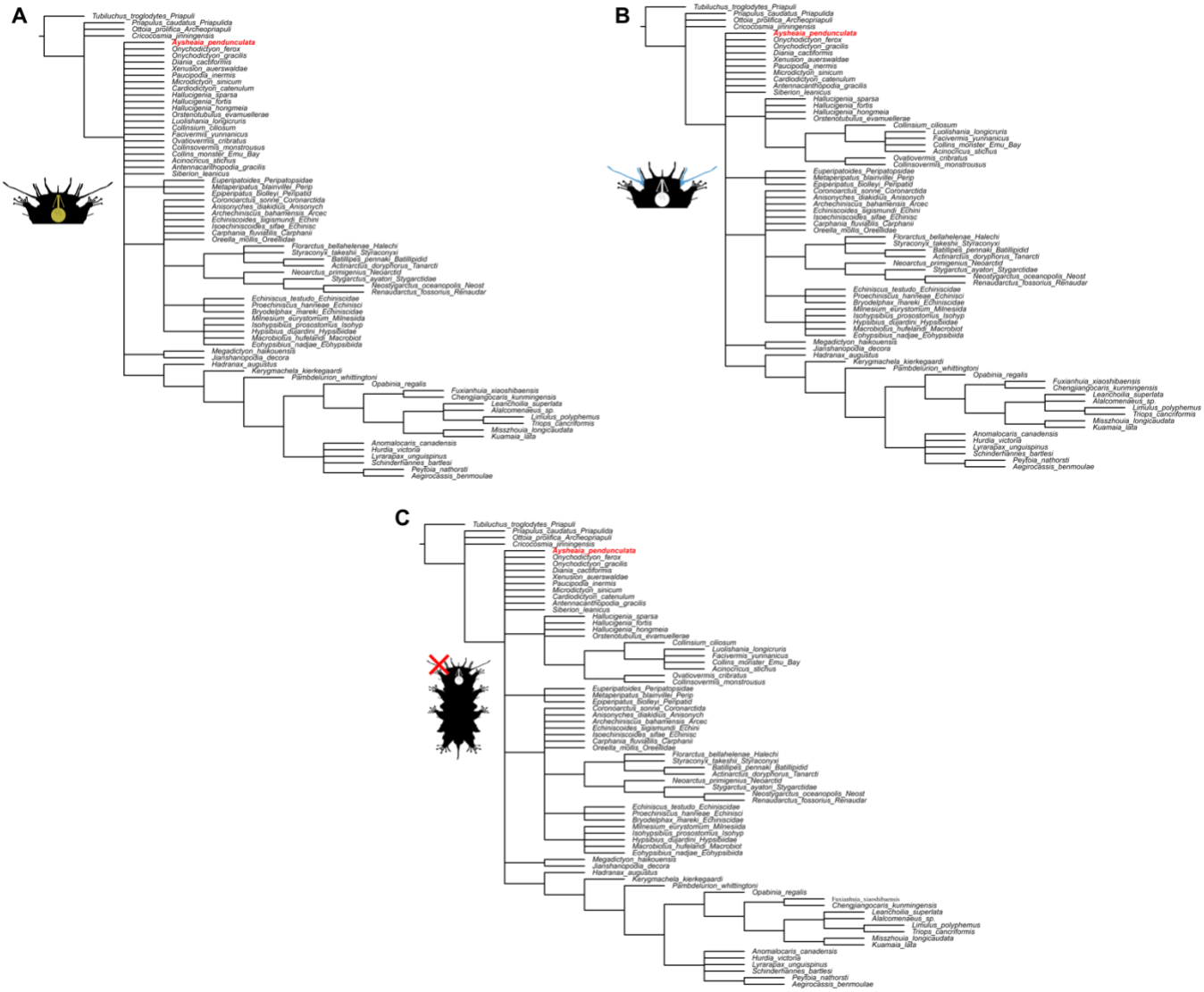

Figure S14. Phylogenetic reconstruction using Maximum Parsimony in TNT under equal weights. (A) Stylet hypothesis, (B) Sensorial hypothesis, and (C) Lost hypothesis. Trees were built using strict consensus of (A) 705, (B) 701, (C) 712 trees.

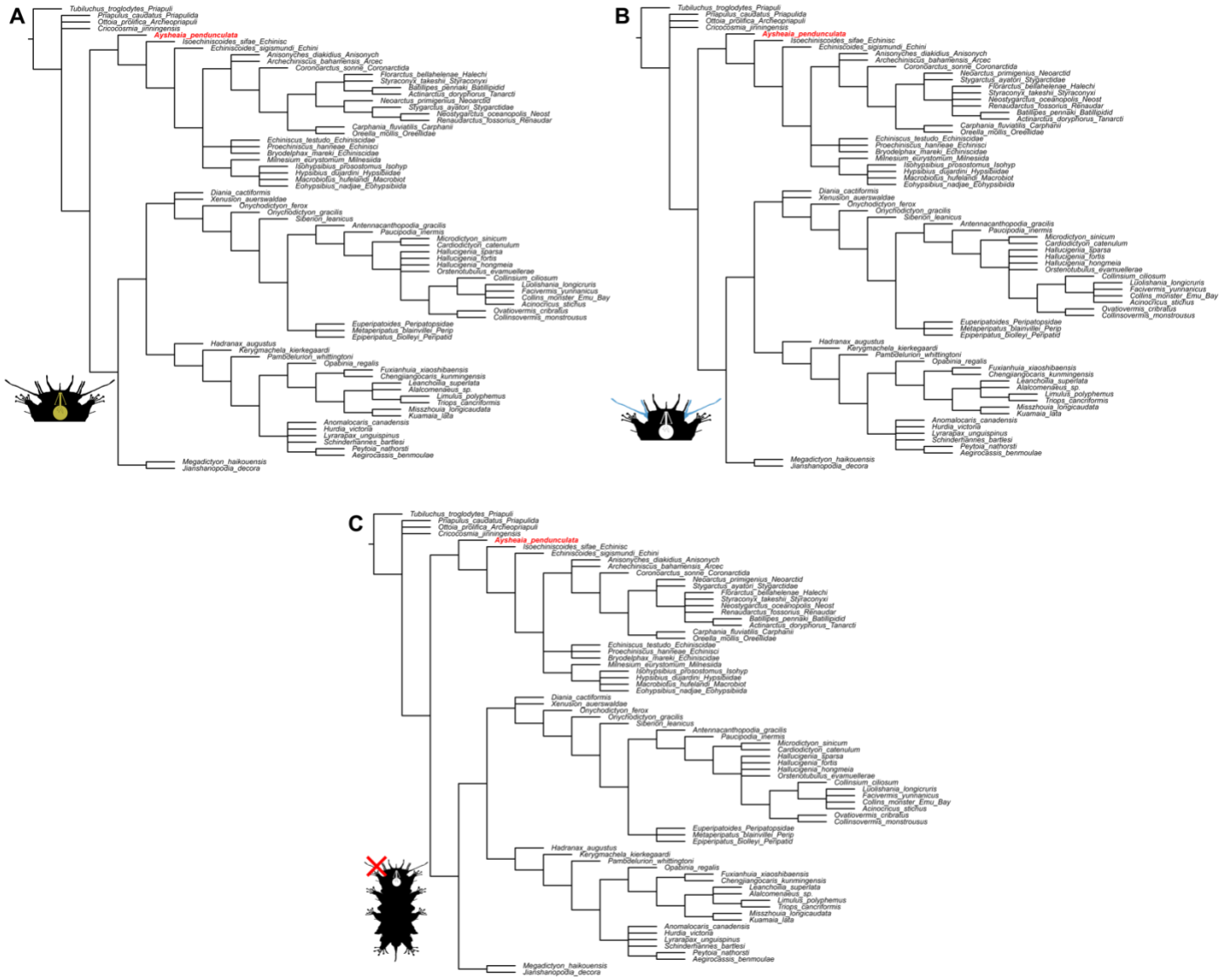

Figure S15. Phylogenetic reconstruction using Maximum Parsimony in TNT under implied weights. (A) Stylet hypothesis, (B) Sensorial hypothesis, and (C) Lost hypothesis with k=10 (B,C) and k=20 (A). Trees were built using strict consensus of (A) 129, (B) 271, (C) 272 trees.

III. Supplementary Tables

Table S1. Description of new specimens of *Aysheaia pedunculata* Walcott, 1911 analyzed in this study

SPECIMEN	REFERENCE/FIGURE	NOTES ON PRESERVATION	LENGTH
ROMIP 61108	This study Fig 1A	***Complete specimen in ventral view*** **Mouth papillae:** not observed **Gut:** mostly preserved (especially at the median portion) and visible as dark films along the body axis **Frontal appendage:** visible including the spines (but mostly the lateral ones) **Legs:** all 10 legs visible; leg spines not observed **Claws:** slightly visible on legs 1 and 9 **Annulations:** clear annulation on the legs perpendicular to the leg axis; trunk annulation not observed **Cuticular ornamentation:** not observed	~1.42 cm
ROMIP 68043	This study Figs 1B, 2H Figs S4F, S4G	***Incomplete specimen in oblique view (ventro-lateral) – from leg 4 to the posterior end*** **Mouth papillae:** not observed **Gut:** not well-preserved; visible as a large dark stain in between the 5th and 6th pair of limbs **Frontal appendage:** not observed **Legs:** legs 5-10 are visible; leg spines are visible on legs 8 and 9 (leg 8 – 1 spine visible, leg 9 – 2 spines visible) **Claws:** visible on legs 5-9; claw morphology is evident on leg 5 **Annulations:** clear annulations on the legs perpendicular to its axis; trunk annulation not observed **Cuticular ornamentation:** dorsal ornamentation visible as conical structures	>1.54 cm
ROMIP 68040	This study Fig 1C Fig S4E	***Incomplete specimen possibly in ventral view, lacking the anterior end, possibly compressed*** **Mouth papillae:** not observed **Gut:** not observed **Frontal appendage:** not observed **Legs:** legs 2-10 visible; 2 spines observed on leg 10 **Claws:** visible on legs 7-10; claw morphology is evident on legs 8 and 9 **Annulations:** clear annulations on the legs perpendicular to its axis; unclear if the annulations along the trunk are biological or caused by taphonomic processes **Cuticular ornamentation:** not observed	>1.1 cm
ROMIP 68035	This study Fig 1D	***Incomplete specimen in ventral view – from the anterior end to the leg 2*** **Mouth papillae:** visible with 6 papillate-structure surrounding the mouth **Gut:** not well-preserved; visible as small discontinuous dark stains along the center of the body **Frontal appendage:** visible with the lateral spines pointing anteriorly, the terminal spines are not clear **Legs:** only the first 2 pairs of limbs are visible with 2 spines on each **Claws:** not observed **Annulations:** clear annulations on the legs perpendicular to its axis; trunk annulation not observed **Cuticular ornamentation:** not observed	>0.75 cm

ROMIP 68037	This study Figs 1E, 2J Fig S2B	***Complete articulated specimen in lateral view*** **Mouth papillae:** not observed **Gut:** preserved and mostly visible as dark films at the anterior end; the part shows a wide bulbous dark film from the anterior end continuing until the start of the first limb pair interpreted as the pharynx **Frontal appendage:** visible but the spines are not clearly visible **Legs:** not all legs visible (at most 8); 2 spines visible on legs 1 and 8 **Claws:** slightly visible on legs 2 and 8 **Annulations:** clear annulation on the trunk and legs perpendicular to the body and leg axes **Cuticular ornamentation:** dorsal ornamentation visible as conical structures	~2.18 cm
ROMIP 68039	This study Fig 2D Fig S4C	***Mostly complete specimen in ventral view with the head region not completely observable*** **Mouth papillae:** at least 2 papillate-structures visible **Gut:** preserved and mostly visible at the middle part of the body as dark films **Frontal appendage:** visible but the spines are not observed **Legs:** all 10 legs visible; leg spines visible on legs 3 (1 spine visible), legs 8-9 (2 spines visible), and legs 10 (1 spine visible) **Claws:** visible on legs 1-3, 7-10 but claw morphology not evident **Annulations:** not observed **Cuticular ornamentation:** not observed	~2.36 cm
ROMIP 63052	This study Fig 2F Figs S1C, S1E	***Complete specimen in in oblique view (ventro-lateral)*** **Mouth papillae:** visible with 6 papillate-structure surrounding the mouth **Gut:** not observed **Frontal appendage:** visible including the spines (but mostly the lateral ones) **Legs:** all 10 legs visible; leg spines visible on legs 9 and 10 (1 spine visible) **Claws:** visible on legs 1-10 but claw morphology not evident **Annulations:** trunk and leg annulations visible but not evident **Cuticular ornamentation:** not observed	~2.08 cm
ROMIP 68036	This study Fig S1A	***Complete specimen in lateral view*** **Mouth papillae:** visible but not evident **Gut:** not well-preserved; visible as dark stains along the anterior portion of the body (between the frontal appendage and leg 1) **Frontal appendage:** visible but the spines are not evident **Legs:** all 10 legs visible; leg spines not observed **Claws:** not clear **Annulations:** trunk and leg annulations not observed **Cuticular ornamentation:** not observed	~1.06 cm
ROMIP 68045	This study Fig S1B	***Complete specimen in lateral view*** **Mouth papillae:** not observed **Gut:** not well-preserved; visible as dark stains mostly along the posterior portion of the body (from leg 4) **Frontal appendage:** visible including the spines (but mostly the lateral ones) **Legs:** legs 2-9 visible; leg spines not evident but can be observed on legs 6 and 9 **Claws:** not clear **Annulations:** trunk and leg annulations not observed **Cuticular ornamentation:** not observed	~2.21 cm

ROMIP 68046	This study Figs S1D, S1F	***Complete specimen in dorsal view*** **Mouth papillae:** visible with at least 6 papillate-structure surrounding the mouth **Gut:** not well-preserved **Frontal appendage:** visible with lateral and terminal spines observable **Legs:** all 10 legs visible; leg spines not observed **Claws:** not clear **Annulations:** trunk and leg annulations not evident **Cuticular ornamentation:** not observed	~1.45 cm
ROMIP 68038	This study Fig S2A	***Incomplete specimen in dorsal view – from the anterior end to leg 7*** **Mouth papillae:** not observed **Gut:** not observed **Frontal appendage:** not observed **Legs:** legs 1-7 visible; leg spines not observed **Claws:** not observed **Annulations:** clear annulation on the trunk and legs perpendicular to the body and leg axes **Cuticular ornamentation:** not observed	>3.48 cm
ROMIP 61132	This study Fig S2C	***Incomplete specimen in oblique view (ventro-lateral) – from the anterior end to leg 8*** **Mouth papillae:** at least 1 papillate-structure visible **Gut:** not observed **Frontal appendage:** visible including the spines (but mostly the lateral ones) **Legs:** legs 1-8 visible; leg spines not observed **Claws:** visible on legs 1, 3-7 but claw morphology not evident **Annulations:** trunk and leg annulations not evident **Cuticular ornamentation:** dorsal ornamentation visible as conical structures	>1.8 cm
ROMIP 68042	This study Figs S3A, S3B, S3D	***Complete articulated specimen in dorsoventral view – preserved in a curled position*** **Mouth papillae:** at least 1 papillate-structure and 2 papillate structures visible in the part and counterpart, respectively **Gut:** not well-preserved; visible as small discontinuous dark stains along the posterior portion of the body (from leg 6) **Frontal appendage:** visible with lateral and terminal spines observable **Legs:** legs 4-10 visible in the part, legs 3-9 visible in the counterpart; leg spines visible on legs 4, 6 and 9 (1 spine visible) **Claws:** visible on legs 3-5 in the counterpart but claw morphology not evident **Annulations:** clear annulations on the legs perpendicular to its axis; trunk annulation not evident **Cuticular ornamentation:** few observable conical structures	~1.93 cm
ROMIP 57537	This study Figs S3C, S3E, S4B	***Incomplete specimen in lateral view – from the anterior end to leg 6*** **Mouth papillae:** at least 1 papillate-structure visible **Gut:** mostly preserved and visible as dark films along the anterior portion of the body (between frontal appendages and legs 1) and towards the posterior portion (from legs 4) **Frontal appendage:** visible but spines not evident	>1.53 cm

		Legs: legs 1-6 visible; leg spines visible on legs 1-4 (at least 1 spine visible including the basal connection of the spine to the leg) **Claws:** visible on legs 1-4 but claw morphology not evident **Annulations:** clear annulations on the legs perpendicular to its axis; trunk annulation not evident **Cuticular ornamentation:** not observed	
ROMIP 68041	This study Fig S4A	***Incomplete specimen in dorsoventral view – preserved in a curled position with the different ends of the body on top of each other*** **Mouth papillae:** not observed **Gut:** mostly preserved and visible as dark films along the portion of the body before leg 5 and between legs 7 and 8 **Frontal appendage:** visible in between legs 6 and 7; spines visible but mostly the lateral one **Legs:** legs 5-10 visible; leg spines not observed **Claws:** visible on legs 5-10 but claw morphology not evident, claws on leg 9 pointing towards the posterior end **Annulations:** clear annulations on the legs perpendicular to its axis; trunk annulation not evident **Cuticular ornamentation:** not observed	>0.93 cm
ROMIP 68044	This study Fig S4D	***Incomplete specimen in dorsal view – from the frontal appendage to the posterior end*** **Mouth papillae:** not observed **Gut:** mostly preserved (especially at the median portion) and visible as dark films along the body axis **Frontal appendage:** visible including the spines (but mostly the lateral ones) **Legs:** legs 5-10 visible; leg spines visible on legs 3-5,7 (2 spines visible and leg 10 (1 spine visible) **Claws:** visible on legs 2-7, 9-10 but claw morphology not evident **Annulations:** clear annulations on the legs perpendicular to its axis; trunk annulation not evident **Cuticular ornamentation:** not observed	>1.55 cm

Table S2. Specimens of *Aysheaia pedunculata* Walcott, 1911 described in Whittington, 1978.

SPECIMEN	PLATE NO. in Whittington, 1978	THIS STUDY	LENGTH
USNM 57655 (Holotype)	1,2	Figs S5A, S5B	~3.2 cm
USNM 139206a	2	Figs S5C, S5D	~2.53 cm
USNM 139206b	3,14	Fig S6A	~3.86 cm
USNM 83942a	4	Fig 2M, S6B	~3.17 cm
USNM 83942b	5,6,14	Figs S7A, S7B	~5.4 cm
USNM 200331	6	Fig S7C	
USNM 235879	7	Fig S7D	~2.42 cm
USNM 235880	8,9,13	Figs 2B, S8A, S8B	~5.33 cm
USNM 235882	10	Fig S8C	
USNM 235883	11	Figs S9A, S9B	~2.19 cm
USNM 235884	11	Fig S9C	~1.47 cm
USNM 235885	12	Figs S10A, S10B	
ROM 35412	13	Fig S10C	>3.88 cm
ROM 35413	14	Fig S10D	~1.11 cm
USNM 235881	14	Fig S10E	~1.4 cm

Table S3. List of complete specimens analyzed in this study. The specimens are arranged from smallest to largest indicating which ones show the conical structures on the dorsal side of the body (in red text).

SPECIMEN	SOURCE	LENGTH (CM)	ORIENTATION	PRESENCE OF DORSAL CUTICULAR ORNAMENTATION
ROMIP 68036	This study	~1.06	Lateral	no
ROM 35413	Whittington, 1978	~1.11	Ventral	no
USNM 235881	Whittington, 1978	~1.4	Lateral	no
ROMIP 61108	This study	~1.42	Ventral	no
ROMIP 68046	This study	~1.45	Dorsal	no
USNM 235884	Whittington, 1978	~1.47	Dorsal	no
ROMIP 68042	This study	~1.93	Dorso-ventral	yes
ROMIP 63052	This study	~2.08	Ventro-lateral	no
ROMIP 68037	This study	~2.18	Lateral	yes
USNM 235883	Whittington, 1978	~2.19	Dorsal	yes
ROMIP 68045	This study	~2.21	Lateral	no
USNM 235879	Whittington, 1978	~2.42	Lateral	yes
USNM 139206a	Whittington, 1978	~2.53	Dorsal	no
USNM 83942a	Whittington, 1978	~3.17	Lateral	yes
USNM 57655 (Holotype)	Whittington, 1978	~3.2	Dorsal	yes
USNM 139206b	Whittington, 1978	~3.86	Lateral	yes
USNM 235880	Whittington, 1978	~5.33	Lateral	yes
USNM 83942b	Whittington, 1978	~5.4	Lateral	yes