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## **Supplementary material**

## Dicyemida and Orthonectida: Two stories of body plan simplification

Oleg A. Zverkov<sup>1</sup>, Kirill V. Mikhailov<sup>1,2</sup>, Sergey V. Isaev<sup>1,3</sup>, Leonid Y. Rusin<sup>1,4</sup>, Olga V. Popova<sup>2</sup>, Maria D. Logacheva<sup>1,2,5</sup>, Alexey A. Penin<sup>1,4</sup>, Leonid L. Moroz<sup>6</sup>, Yuri V. Panchin<sup>1,2</sup>, Vassily A. Lyubetsky<sup>1</sup>, and Vladimir V. Aleoshin<sup>1,2\*</sup>

<sup>1</sup>Institute for Information Transmission Problems, Russian Academy of Sciences, Moscow, 127051, Russian Federation,

<sup>2</sup>Belozersky Institute for Physico-Chemical Biology, Lomonosov Moscow State University, Moscow, Russian Federation,

<sup>3</sup>Faculty of Bioengineering and Bioinformatics, Lomonosov Moscow State University, Moscow, Russian Federation,

<sup>4</sup>Faculty of Biology, Lomonosov Moscow State University, Moscow, Russian Federation,

<sup>5</sup>Skolkovo Institute of Science and Technology, Moscow, Russian Federation,

<sup>6</sup>Department of Neuroscience and McKnight Brain Institute, University of Florida, Gainesville, 32611, USA

**Table 1** (for page 17). NCBI Sequence Read Archive accessions of transcriptome libraries used in the phylogenetic analysis

Taxonomic group	Species	Experiment ID	Run ID(s)
Acanthocephala	Echinorhynchus gadi	SRX1121912	SRR2131254
A 1º 1	Glycera tridactyla	SRX516622	SRR1237833,70
Anneliaa (Erroptio)	Marphysa bellii	SRX515220	SRR1232833
(Effantia)	Myzostoma cirriferum	SRX516623	SRR1237872
	Megadrilus sp.	SRX1026327	SRR2020581
Annelida	Protodriloides chaetifer	SRX1023293	SRR2016233
(Protodrilidae)	Protodriloides symbioticus	SRX1116278	SRR2124791,92
	Protodrilus adhaerens	SRX1022008	SRR2014684
	Chaetopterus variopedatus	SRX512002	SRR1219647
Annelida	Magelona berkeleyi	SRX522872	SRR1257638,39
(early branches)	Owenia fusiformis	SRX512807	SRR1222288
	Spiochaetopterus sp.	SRX513557	SRR1224605
Brachiopoda	Terebratalia transversa	SRX1015908	SRR2005824
Bryozoa	Membranipora membranacea	SRX1121923	SRR2131259
Dicyemida	Dicyema sp.	SRX265465	SRR827581
Castuatriaha	Diuronotus aspetos	SRX1121926	SRR2131262
Gastrotricita	Mesodasys laticaudatus	SRX872416	SRR1797883
Gnathostomulida	Austrognathia sp.	SRX997150	SRR1976176
Vamptazaa	Loxosoma pectinaricola	SRX731476	SRR1611559
Kamptozoa	Symbion americanus	SRX1122263	SRR2131690
Micrognathozoa	Limnognathia maerski	SRX1121929	SRR2131287
Mollusca	Chiton olivaceus	SRX205322	SRR618506
Nemertea	Nipponnemertes sp.	SRX647389	SRR1508368
Phoronida	Phoronis australis	SRX1025550	SRR2018856
Distail also in the s	Catenula lemnae	SRX871445	SRR1796434
(Catonulida)	Stenostomum leucops	SRX951992	SRR1910423
(Catchunda)	Stenostomum sthenum	SRX872404	SRR1801788
	Bothrioplana semperi	SRX980750	SRR1955240
(Tropayonomata)	Leptoplana tremellaris	SRX872321	SRR1797726
(Trepaxoneniata)	Nematoplana coelogynoporoides	SRX872398	SRR1797817
Rotifera	Lepadella patella	SRX997434	SRR1976570
Sipuncula	Phascolosoma perlucens	SRX755855	SRR1646442

**Supplementary Figure S1** (for page 4). Distribution of circular contig lengths in various assemblies. Discrete length distribution is observed in assemblies by SPAdes (based on De Bruijn graphs, *k*-mer size 55 or 77 bases), as well as Newbler (not based on De Bruijn graphs).

**Supplementary Figure S2** (for page 5). Predicted secondary structures of putative mitochondrial tRNAs of *Dicyema* sp. Co-locating genes and paralogs are outlined (solid and dashed, respectively).

**Supplementary Figure S3** (for page 13). Bayesian tree of the Spiralia/Lophotrochozoa with inclusion of the Mesozoa. By supplementing **Figure 10**, it depicts the consensus of the three chains that passed the AU-test, while **Figure 10** shows the all four-chains consensus (*maxdiff=*1.0).

**Supplementary Figure S4** (for page 13). Maximum likelihood reconstruction with RAxML. The tree was obtained under the PROTCATGTR model; support values are based on 150 rapid bootstrap replicates. Values of 100% are not shown, and corresponding nodes are marked with black dots. Chimeric operational taxonomic units include names of merged species signed with an asterisk.

**Supplementary Figure S5** (for page 13). Maximum likelihood reconstruction with IQ-TREE. The inference was performed under the LG+C60+F+G4 model; node support was evaluated with ultrafast bootstrap approximation (1000 replicates). Nodes with 100% support marked with black dots.

**Supplementary Figure S6** (for page 14). Bayesian inference with the dataset excluding the annelid *Myzostoma cirriferum*. PhyloBayes was run with four chains under the CAT+GTR+ $\Gamma$ 4 model. The consensus tree was constructed after 15,000 cycles with 50% burn-in (*maxdiff* =1.0). Only posterior probability values below 1.0 are shown.

**Supplementary Figure S7** (for page 14). Bayesian tree with the exclusion of two dicyemids and the annelid *Myzostoma cirriferum*. PhyloBayes was run with four chains under the CAT+GTR+ $\Gamma$ 4 model. The consensus tree was constructed after 5,000 cycles with 50% burn-in (*maxdiff*=1.0). Only posterior probability values below 1.0 are shown.

**Supplementary Figure S8** (for page 14). Bayesian tree with the exclusion of the orthonectid *Intoshia linei* and the annelid *Myzostoma cirriferum*. PhyloBayes was run with four chains under the CAT+GTR+ $\Gamma$ 4 model. The consensus tree was constructed after 5,000 cycles with 50% burn-in (*maxdiff*=1.0). Only posterior probability values below 1.0 are shown.

**Supplementary Figure S9** (for page 14). Bayesian inference with the 35K-site dataset excluding protein alignments with high compositional heterogeneity. The inference was carried out under the CAT+GTR+ $\Gamma$ 4 model, and the tree was generated after 50,000 cycles with 50% burn-in (*maxdiff=*0.95).

**Supplementary Figure S10** (for page 14). Bayesian inference with the Dayhoff-recoded alignment. The inference was carried out under the CAT+GTR+ $\Gamma$ 4 model; the tree was generated after 30,000 cycles with 50% burn-in (*maxdiff=*0.17).



**Supplementary Figure S1** (for page 4). Distribution of circular contig lengths in various assemblies. Discrete length distribution is observed in assemblies by SPAdes (based on De Bruijn graphs, *k*-mer size 55 or 77 bases), as well as Newbler (not based on De Bruijn graphs).



**Supplementary Figure S2** (for page 5). Predicted secondary structures of putative mitochondrial tRNAs of *Dicyema* sp. Co-locating genes and paralogs are outlined (solid and dashed, respectively).



✓ Supplementary Figure S3 (for page 13). Bayesian tree of the Spiralia/Lophotrochozoa with inclusion of the Mesozoa. By supplementing Figure 10, it depicts the consensus of the three chains that passed the AU-test, while Figure 10 shows the all four-chains consensus (*maxdiff*=1.0).

Marphysa bellii — Marphysa bellii — Glycera tridactyla — Alvinella pompejana — Capitella teleta — Capitella teleta — Tubifex tubifex — Helobdella robusta 99 — Spiochaetopterus sp. * Chaetopterus variopedatus — Magelona berkeleyi — Phascolosoma perlucens — Owenia fusiformis	Annelida
Nipponnemertes sp. Tubulanus polymorphus	Nemertea
93 <u>97</u> Cephalothrix linearis Phoronis australis	Phoronida
Lingula anatina	rachionoda
71       Ierebratalia transversa         Chiton olivaceus * Chaetopleura apiculata         Neomenia megatrapezata         Euprymna scolopes * Idiosepius paradoxus         Octopus bimaculoides         Lottia gigantea         91         Crassostrea gigas         Mutilus californica * Biomphalaria glabrata	Mollusca
Tibulipora sp.	
Cristatella mucedo	Bryozoa
Bugula neritina	velionhora
Loxosoma pectinaricola	Entoprocta
Pedicellina sp. * P. cernua	Entoprocia
Macrodasys sp. Gastrotricha (Magadasys sp. Dactylopodella baltica	acrodasyida)
Myzostoma cirriferum Annelida (M	Ayzostomida)
	- <i>Dicyema</i> sp. 2
	Intoshia linei
	naetonotida)
Catenula lemnae Catenula lemnae Macrostomum lignano Paraplanocera sp. Leptoplana tremellaris Nematoplana coelogynoporoides Dugesia japonica * D. ryukyuensis Schmidtea mediterranea Bothrioplana semperi 98 Clonorchis sinensis * Opisthorchis viverrini Schistosoma mansoni * S. japonicum Gnathostomula paradoxa	helminthes <sup>Jaris</sup>
Gnathostomula peregrina Gnatho	ostomulida
Limnognathia maerski 59	gnathozoa
Lepadella patella * Lecane inermis	
Adineta vaga	vndermata
59/ Macracanthorhynchus hirudinaceus	
Paratent	hus laevis
Echinorhynchus	gadi * E. truttae
Daphnia pulex     Priapulus caudatus     Echinoderes horni	Ecdysozoa

**Supplementary Figure S4** (for page 13). Maximum likelihood reconstruction with RAxML. The tree was obtained under the PROTCATGTR model; support values are based on 150 rapid bootstrap replicates. Values of 100% are not shown, and corresponding nodes are marked with black dots. Chimeric operational taxonomic units include names of merged species signed with an asterisk.

<u>9</u> 9 <u>6</u> 87 83	Megadrilus sp. Protodrilus adhaerens Protodriloides symbioticus * P. chaetifer Glycera tridactyla Marphysa bellii 86 Alvinella pompejana Capitella teleta Helobdella robusta Tubifex tubifex Myzostoma cirriferum 98 Spiochaetopterus sp. * Chaetopterus variopedatus Magelona berkeleyi Phascolosoma perlucens Owenia fusiformis	Annelida
<u>61</u>	Nipponnemertes sp. Cephalothrix linearis	Nemertea
71	Lingula anatina	Brachionoda
71	Terebratalia transversa	Diachiopoua
69	Phoronis australis	Phoronida
	Membranipora membranacea Cristatella mucedo	Bryozoa
56	Chiton olivaceus * Chaetopleura apiculata Neomenia megatrapezata Euprymna scolopes * Idiosepius paradoxus Octopus bimaculoides Aplysia californica * Biomphalaria glabrata Lottia gigantea Crassostrea gigas	Mollusca
	Mytilus californianus Symbion pandora * S. americanus	Cycliophora
<u>98</u>	Loxosoma pectinaricola	Entoprocta
Ĭ	Pedicellina sp. * P. cernua	Dievema en
		Dicyema sp. 2
	Orthonectida	Intoshia linei
<u>64</u> 82	Macrodasys sp. Mesodasys laticaudatus Megadasys sp. Dactylopodella baltica Diuronotus aspetos	Gastrotricha
97	Catenula lemnae Catenula lemnae Stenostomum leucops * S. sthenum Macrostomum lignano Leptoplana tremellaris Paraplanocera sp. Nematoplana coelogynoporoides Dugesia japonica * D. ryukyuensis Schmidtea mediterranea Bothrioplana semperi Clonorchis sinensis * Opisthorchis viverrini Schistosoma mansoni * S. japonicum Echinococcus granulosus * E. multilocularis Moniezia expansa	Platyhelminthes
	Gnathostomula paradoxa	Gnathostomulida
	Austrognathia sp.	Ghathostomuliua
	Limnognathia maerski	Micrognathozoa
	Brachionus plicatilis * B. manjavacas — Brachionus plicatilis * B. manjavacas — Lepadella patella * Lecane inermis — Adineta vaga — Macracanthorhynchus hirudinaceus	Syndermata
	Echinorhynchus gad	li * E. truttae laevis
	Apis mellifera     Daphnia pulex     Echinoderes horni     Priapulus caudatus	li * E. truttae laevis Ecdysozoa

0.2 Supplementary Figure S5 (for page 13). Maximum likelihood reconstruction with IQ-TREE. The inference was performed under the LG+C60+F+G4 model; node support was evaluated with ultrafast bootstrap approximation (1000 replicates). Nodes with 100% support marked with black dots.

		——Megadrilus sp. ———Protodrilus adhaerens		Annolido
		— Protodriloides symbioticus * P. chaetifer		Annelida
.5	<u>s</u> [	— Glycera tridactyla		
		Marphysa bellii		
.98		— Aivinella pompejana — Capitella teleta		
	┝┥	——————————————————————————————————————		
<u>.98</u>		—— Tubifex tubifex	Orthe are acticle	
	<u> </u>		Onnonectida	Intoshia linei
.75		Spiochaetopterus sp. * Chaetopterus variopedatus		
72		— Mageloria berkeleyi — Phascolosoma perlucens		
		- Owenia fusiformis		
73		—— <i>Nipponnemertes</i> sp.		
	•	— Cephalothrix linearis		Nemertea
50	٦	— Tubulanus polymorphus		Dhananiala
. <u>50</u>		Phoronis australis		Phoronida
./3	•	– Terebratalia transversa		Brachiopoda
		- Chiton olivaceus * Chaetopleura apiculata		
	•	———Neomenia megatrapezata		
L	•	Euprymna scolopes * Idiosepius paradoxus		
		Octopus bimaculoides     Ankaia actificaria a Diamanhalaria alahusta		Mollusca
		—— Apiysia californica * Biomphalaria glabrata		
•	•	— Crassostrea gigan		
	Le-[	—— Mytilus californianus		
			Dicyemida	Dicyema sp.
	89		-	<i>∟Dicyema</i> sp. 2
	.00			
.53		——————————————————————————————————————		Bryozoa
		Bugula neritina		
.75		Symbion pandora * S. americanus		Cvcliophora
		Loxosoma pectinaricola		Entoprocta
.72		Pedicellina sp. * P. cernua		Entoprocia
		Mesodasys sp.     Mesodasys laticaudatus		
		———— Megadasys sp.	Gastrotricha (N	lacrodasylda)
		Dactylopodella baltica		
		Diuronotus aspetos	Gastrotricha ((	Chaetonotida)
Ч		Lepidodermella squamata	Caca carolina (	Shaotonotiday
.75	4	Stenostomum leucops * S. sthenum		
		Macrostomum lignano		
		Leptoplana tremellaris		
		Paraplanocera sp.		
		Nematoplana coelogynoporoides	Pla Pla	atvhelminthes
			is in the second s	atyrioninitatioo
		Bothrioplana semperi		
		Clonorchis sinensis * Opisthorchis	viverrini	
		Schistosoma mansoni * S. japonicu	um	
		Echinococcus granulosus * E	E. multilocularis	
		Gnathostomula paradoxa	Gn	athostomulida
		Austrognathia sp.	Chi	
		——————————————————————————————————————	Mi	crognathozoa
	•	Longdollo notello ± Longno instruis	— Seison sp.	
	└●┤┌╴	Ecpaueira pateria * Lecarre inermis     Brachionus plicatilis * B maniavacas		
	Le-	Adineta vaga		Syndermata
	L	Macracanthorhynchus hirudinac	ceus	Synaonnata
			Paratenuisentis ambig	uus
		•	— Fompnorhynchus laevis	
		— Priapulus caudatus		
		Echinoderes horni		Foducaraa
	•	————Daphnia pulex		Ecuysozoa
	-	Apis mellifera		

**Supplementary Figure S6** (for page 14). Bayesian inference with the dataset excluding the annelid *Myzostoma cirriferum*. PhyloBayes was run with four chains under the CAT+GTR + $\Gamma$ 4 model. The consensus tree was constructed after 15,000 cycles with 50% burn-in (*maxdiff* =1.0). Only posterior probability values below 1.0 are shown.

Protodrilus adhaerens Megadrilus sp. Protodriloides symbioticus * P. chaetifer	Annelida
Marphysa bellii Glycera tridactyla	Orthonostida
.47 Alvinella pompeiana	Onnonectida Intoshia linei
Capitella teleta Capitella teleta Tubifex tubifex Helobdella robusta Spiochaetopterus sp. * Chaetopterus variopedatus Phascolosoma perlucens Magelona berkeleyi Owenia fusiformis	
Nipponnemertes sp. Tubulanus polymorphus Cephalothrix linearis	Nemertea
Phoronis australis	Phoronida
Terebratalia transversa	Brachiopoda
Neomenia megatrapezata Chiton olivaceus * Chaetopleura apiculata Octopus bimaculoides Euprymna scolopes * Idiosepius paradoxus Mytilus californianus Crassostrea gigas Lottia gigantea Aplysia californica * Biomphalaria glabrata	Mollusca
.94 Tubulipora sp. Cristatella mucedo Membranipora membranacea	Bryozoa
Symbion pandora * S. americanus	Cycliophora
Pedicellina sp. * P. cernua	Entoprocta
50 Mesodasys laticaudatus 	Gastrotricha
Stenostomum leucops * S. sthenum Catenula lemnae Macrostomum lignano Paraplanocera sp. Leptoplana tremellaris Nematoplana coelogynoporoides Schmidtea mediterranea Dugesia japonica * D. ryukyuensis Bothrioplana semperi Moniezia expansa Echinococcus granulosus * E. multilocu Schistosoma mansoni * S. japonicum Clonorchis sinensis * Opisthorchis viverrini	Platyhelminthes
Gnathostomula peregrina Gnathostomula paradoxa Austrognathia sp.	Gnathostomulida
Limnognathia maerski	Micrognathozoa
Lepadella patella * Lecane inermis — Lepadella patella * Lecane inermis — Brachionus plicatilis * B. manjavacas — Adineta vaga — Macracanthorhynchus hirudinaceus — Por — Echinol	PParatenuisentis ambiguus phorhynchus laevis hynchus gadi * E. truttae
Priapulus caudatus Echinoderes horni Daphnia pulex Apis mellifera	Ecdysozoa

**Supplementary Figure S7** (for page 14). Bayesian tree with the exclusion of two dicyemids and the annelid *Myzostoma cirriferum*. PhyloBayes was run with four chains under the CAT +GTR+ $\Gamma$ 4 model. The consensus tree was constructed after 5,000 cycles with 50% burn-in (*maxdiff*=1.0). Only posterior probability values below 1.0 are shown.

H

Megadrilus sp. Protodrilus adhaerens Protodriloides symbioticus * P. cha Glycera tridactyla Marphysa bellii Alvinella pompejana Capitella teleta Helobdella robusta Tubifex tubifex .87 Spiochaetopterus sp. * Chaetopterus Magelona berkeleyi .75 Phascolosoma perlucens	etifer variopedatus			Annelida
Owenia fusiformis				Dhoronido
Lingula anatina				Prioronida
Terebratalia transversa				Brachiopoda
.99 Nipponnemertes sp. Cephalothrix linearis Tubulanus polymorphus				Nemertea
.75 Chiton olivaceus * Chaetopleura apie Neomenia megatrapezata Euprymna scolopes * Idiosepiu Octopus bimaculoides Aplysia californica * Biomphalau Crassostrea gigas Mytilus californianus	culata s paradoxus ria glabrata			Mollusca
	•	Dicye	mida	Dicyema sp.
Bugula neritina				<i>∟Dicyema</i> sp. 2
.62 Membranipora membran Cristatella mucedo Tubulipora sp.	acea			Bryozoa
Symbion	pandora * S. americanus			Cycliophora
				Entoprocta
	idatus /lopodella baltica		Gastrotrich	a (Macrodasyida)
	Lepidodermella squamata		Gastrotrich	a (Chaetonotida)
50 Leptoplana tre Paraplanocera Nematoplana coe Bothrioplana	Catenula lemnae - Stenostomum leucops * S. sthenu - Macrostomum lignano mellaris a sp. Nogynoporoides - Dugesia japonica * D. ryuk - Schmidtea mediterranea a semperi - Clonorchis sinensis * Opisth - Schistosoma mansoni * S. ja - Echinococcus granulos - Moniezia expansa	um vyuensis orchis viverrini aponicum sus * E. multilocularis	F	Platyhelminthes
Austrognath	Gnathostomula peregrina Gnathostomula paradoxa ia sp.		G	nathostomulida
Limnognathia maerski		Colora an	Ν	licrognathozoa
Lepadella patella Brachionus plica Adineta	* Lecane inermis atilis * B. manjavacas a vaga ———Macracanthorhynchus hin	udinaceus Para Pomphorhyn	atenuisentis amb chus laevis gadi * E-truttae	Syndermata <sup>iguus</sup>
Priapulus caudatus Echinoderes horni Daphnia pulex Apis mellifera		Lonnonynoids		Ecdysozoa

**Supplementary Figure S8** (for page 14). Bayesian tree with the exclusion of the orthonectid *Intoshia linei* and the annelid *Myzostoma cirriferum*. PhyloBayes was run with four chains under the CAT+GTR+F4 model. The consensus tree was constructed after 5,000 cycles with 50% burn-in (*maxdiff*=1.0). Only posterior probability values below 1.0 are shown.

. <u>73</u> .75	Tubifex tubifex Helobdella robusta Capitella teleta		Annelida
.79	Alvinella pompejana Marphysa bellii		
<u>.78</u>	Protodriloides symbioticus * P. chaetifer		
<u>.49</u>	Megadrilus sp.		
.48	Myzostoma cirriferum C	rthonectida	hia linei
<u>.95</u>	Phascolosoma perlucens		
<u>.96</u>	Spiochaetopterus sp. * Chaetopterus variopedatus		
60	Owenia fusioninis		
	Tubulanus polymorphus Cephalothrix linearis		Nemertea
.94	Tubulipora sp.		Drawa
Ť.	Membranipora membranacea		Bryozoa
ſ	Bugula neritina Phoronis australis		Phoronida
	Terebratalia transversa		Prochionodo
.60	Lingula anatina		Бгастіороца
Ī	Neomenia megatrapezata		
	Octopus bimaculoides		
•	Euprymna scolopes * Idiosepius paradoxus		Mollusca
99	Crassostrea ajaas		
	Lottia gigantea		
	Aplysia californica * Biomphalaria glabrata	iovemida	Dicvema sp. 2
		loycinida	Dicyema sp.
	. <u></u> Mesodasys laticaudatus		
.46	Megadasys sp.	Gastrotricha	(Macrodasyida)
.90	Dactylopodella baltica		<b>.</b>
	Symbion pandora * S. americanus		Cycliophora
.94	Loxosoma pectinaricola		Entoprocta
	Lepidodermella squamata	Gastrotricha	(Chaetonotida)
	Diuronotus aspetos	Castrothona	(Onacionolida)
	Catenula lemnae		
	Macrostomum lignano		
	Paraplanocera sp.		
	Nematoplana coelogynoporoides	Dia	
		Pla	tyneimintnes
	Bothrioplana semperi		
	Moniezia expansa		
	Schistosoma mansoni + S. japonicum		
	Clonorchis sinensis * Opisthorchis viverrini		
	Gnathostomula peregrina	Cna	theatomulida
	Austrognathia sp.	Glia	Inostomunua
	Limnognathia maerski	Mic	rognathozoa
	Lepadella patella * Lecane inermis		
	Brachionus plicatilis * B. manjavacas		
	.91 Adineta vaga		Syndermata
	Paratenuise	entis ambiguus	
	Pomphorhynchus	laevis	
	Priapulus caudatus	* E. truttae	
	Echinoderes horni		Ecdysozoa
L	Daphnia pulex		Louysozoa
H	0.5 <b>Supplementary Figure S9</b> (for page 14). Bayesian inference	e with the 35K-site data	set excluding
	protein alignments with high compositional heterogeneity.	The inference was carr	ied out under

the CAT+GTR+ $\Gamma$ 4 model, and the tree was generated after 50,000 cycles with 50% burn-in (*maxdiff*=0.95).

. <u>89</u> . <u>49</u> . <u>94</u> . <u>65</u> . <u>99</u>	<ul> <li>Tubifex tubifex</li> <li>Helobdella robusta</li> <li>Capitella teleta</li> <li>Alvinella pompejana</li> <li>Marphysa bellii</li> <li>Glycera tridactyla</li> <li>Protodriloides symbioticus * P. chaetifer</li> <li>Protodrilus adhaerens</li> <li>Megadrilus sp.</li> </ul>	Annelida
		Orthonectida Intoshia linei
<u>.99</u> . <u>80</u> .48	Myzostoma cirriferum Spiochaetopterus sp. * Chaetopterus variopedatus Magelona berkeleyi Phascolosoma perlucens Owenia fusiformis	
	Tubulanus polymorphus	Nemertea
<u>.92</u>		Entoprocta
.63	Symbion pandora * S. americanus	Cycliophora
<u>62</u> 79	Catenula lemnae Stenostomum leucops * S. sthenum Macrostomum lignano Leptoplana tremellaris Paraplanocera sp. Nematoplana coelogynoporoides Dugesia japonica * D. ryukyuensis Schmidtea mediterranea Bothrioplana semperi Clonorchis sinensis * Opisthorchis viverr Schistosoma mansoni * S. japonicum Echinococcus granulosus * E. multide Marcostomum leucops * S. sthenum	Platyhelminthes ini ocularis
Ì		Dicvemida Dicyema sp. 2
		Dicyema s
	Mesodasys faircaudatus Macrodasys sp. Megadasys sp. Dactylopodella baltica	Gastrotricha (Macrodasyida)
99	Lepidodermella squamata	Gastrotricha (Chaetonotida)
	Terebratalia transversa	Brachiopoda
	Lingula anatina	Diachiopoda
	<u>Phoronis australis</u> <u>83                                    </u>	Phoronida
	Cristatella mucedo Membranipora membranacea Bugula neritina	Bryozoa
	Neomenia megatrapezata Chiton olivaceus * Chaetopleura apiculata Octopus bimaculoides Euprymna scolopes * Idiosepius paradoxus Mytilus californianus Crassostrea gigas Lottia gigantea Aplysia californica * Biomphalaria glabrata	Mollusca
	Gnathostomula peregrina	Gnathostomulida
	Austrognathia sp.	
	Limnognathia maerski Seison	Micrognatnozoa
	Lepadella patella * Lecane inermis Brachionus plicatilis * B. manjavacas Adineta vaga Macracanthorhynchus hirudinaceus	–Paratenuisentis ambiguus nphorhynchus laevis rhynchus gadi * E. truttae
	────Priapulus caudatus	Ecdysozoa

**Supplementary Figure S10** (for page 14). Bayesian inference with the Dayhoff-recoded alignment. The inference was carried out under the CAT+GTR+ $\Gamma$ 4 model; the tree was generated after 30,000 cycles with 50% burn-in (*maxdiff*=0.17).

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