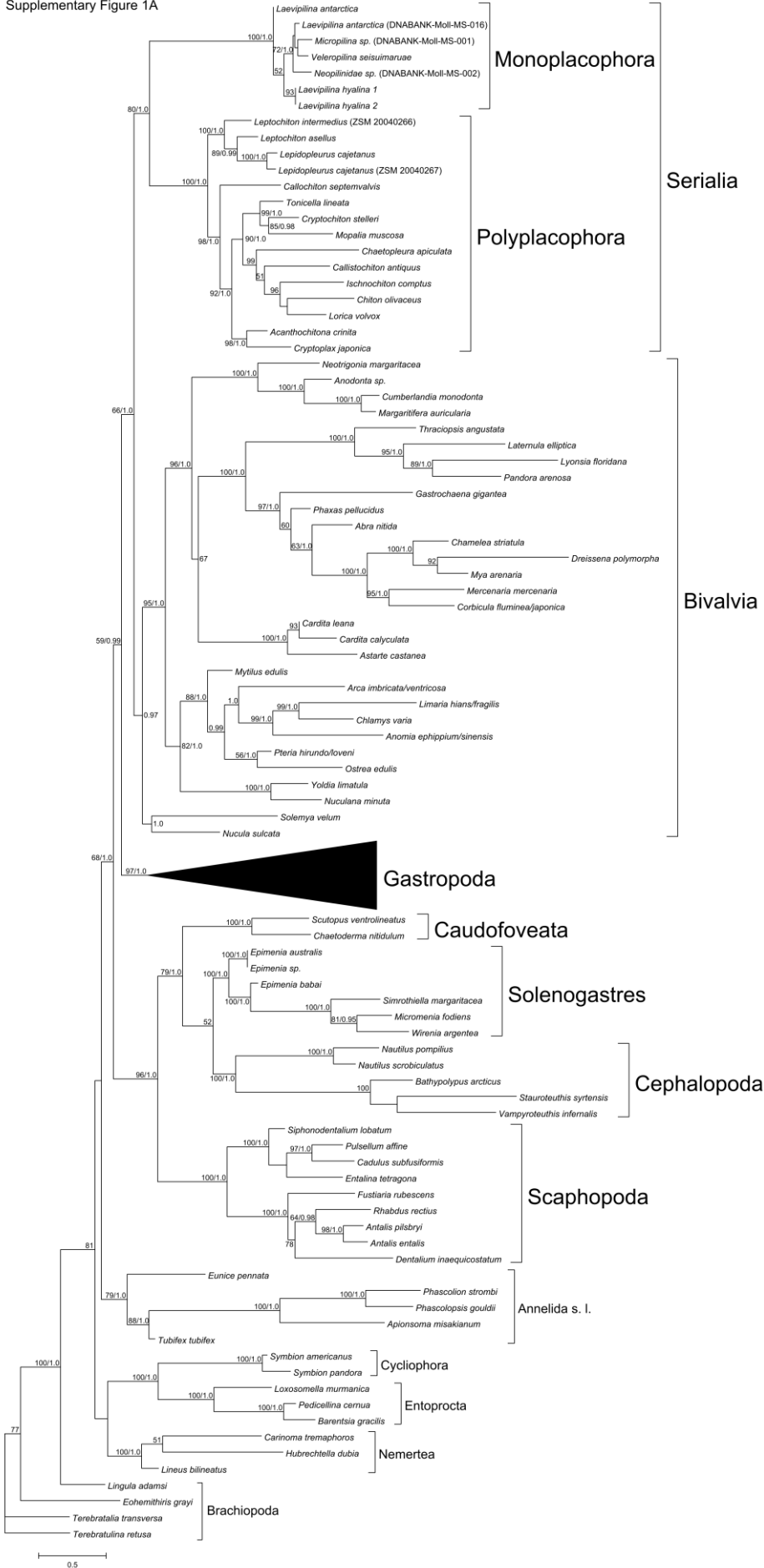
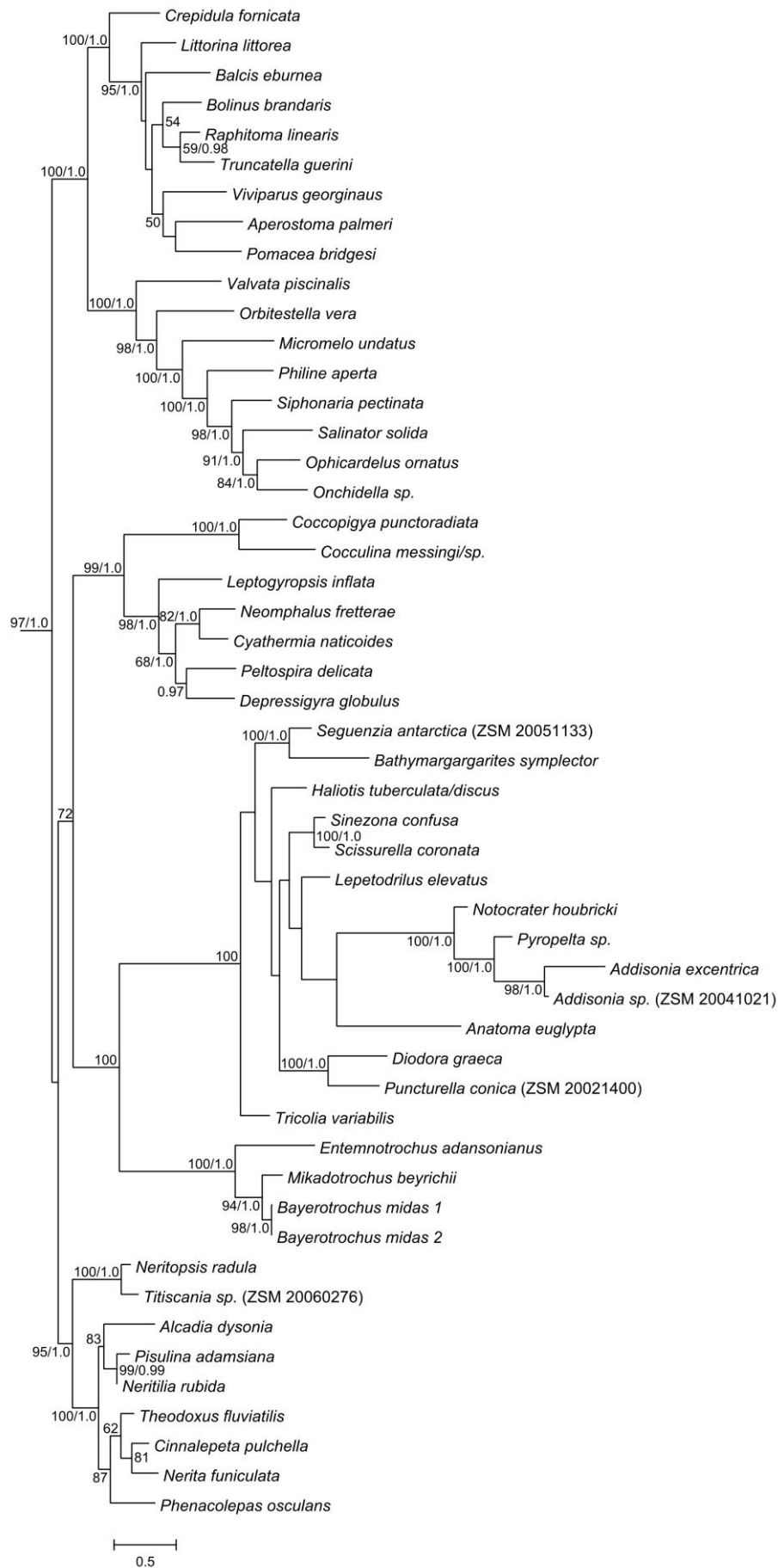


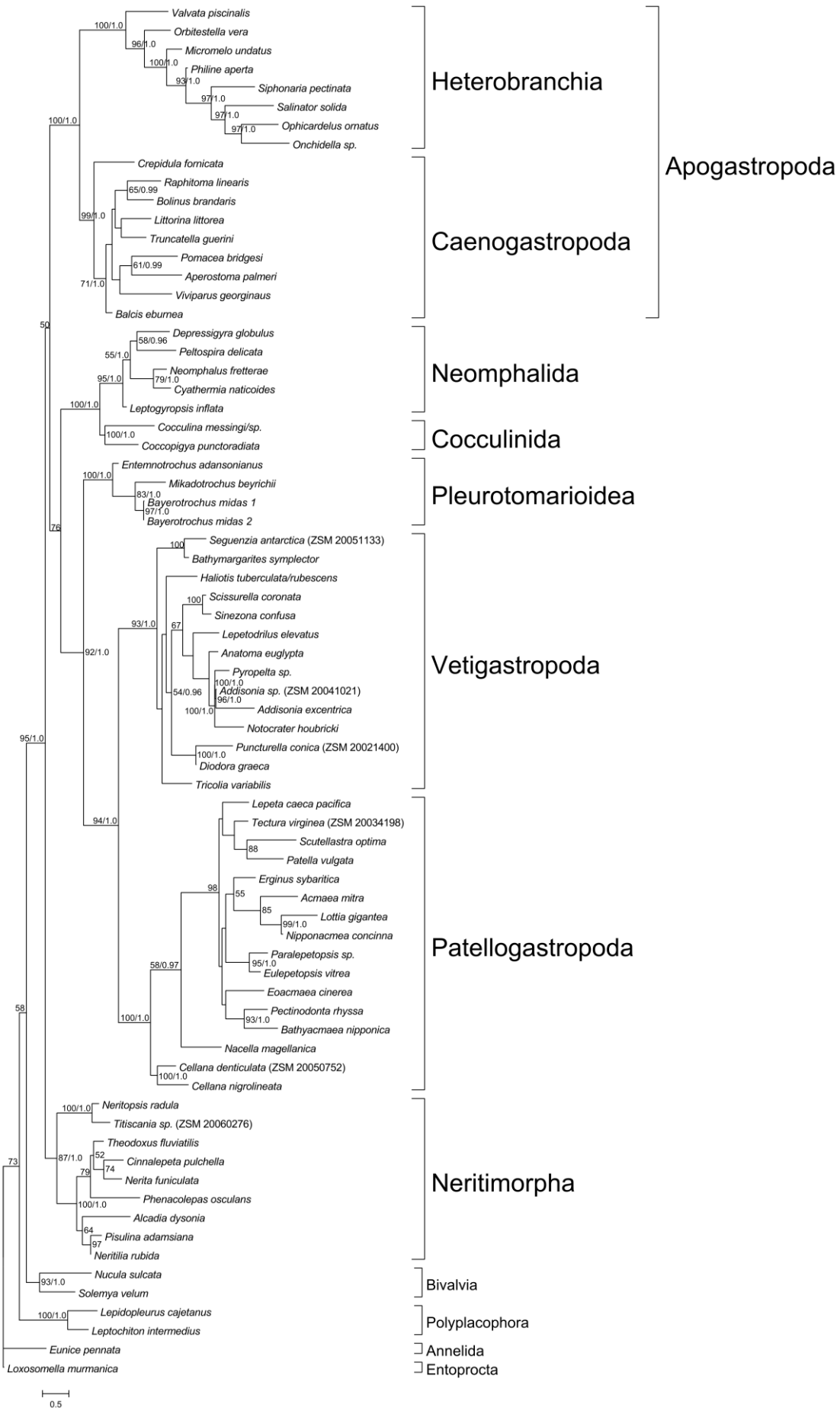
Supplementary Figure 1A



Supplementary Figure 1B



Supplementary Figure 2



## Supplementary Table 1

Fragment	Primer	Primer sequence
28S rRNA small	28SF	5'-GAC CCG TCT TGA AGC ACG-3'
	28SR	5'-CCA CAG CGC CAG TTC TGC TTA C-3'
28S rRNA large	28SF2	5'-ACC TAT TCT CAA ACT TTA AAT GG-3'
	28SR2	5'-GAC TTC CCT TAC CTA CAT-3'
18S rRNA part A	18Sa2.0	5'-ATG GTT GCA AAG CTG AAA C-3'
	18S9R	5'-GAT CCT TCC GCA GGT TCA CCT AC-3'
18S rRNA part B	18S1F	5'-TAC CTG GTT GAT CCT GCC AGT AG-3'
	18S5R	5'-CTT GGC AAA TGC TTT CGC-3'
18S rRNA part C	18S3F	5'-GTT CGA TTC CGG AGA GGG A-3'
	18Sbi	5'-GAG TCT CGT TCG TTA TCG GA-3'
16S rRNA	16Sa	5'-CGC CTG TTT ATC AAA AAC AT-3'
	16Sb	5'-CTC CGG TTT GAA CTC AGA TCA-3'
H3	H3aF	5'-ATG GCT CGT ACC AAG CAG ACV GC-3'
	H3aR	5'-ATA TCC TTR GGC ATR ATR GTG AC-3'

### PCR conditions

Initial step	94°C	6min
Denaturation	94°C	1min
Annealing	50°C	1min
Elongation	72°C	1min 30sec
Final elongation	72°C	6min
Cycles		45

Supplementary Table 2

Species		18S	28S1	28S2	28S3	28S4	H3	COI	16S
<b>Outgroups</b>									
Annelida	<i>Eunice pennata</i>	AY040684	AY340391				DQ779731		AF321418
	<i>Tubifex tubifex</i>	GQ355437	GQ355465	GQ355465				EF179544	EU117545
Brachiopoda	<i>Eohemithiris grayi</i>	AF025936	AY839242	AY839242	AY839242				
	<i>Lingula adamsi</i>	U08329							
	<i>Terebratalia transversa</i>	FJ196115	AF342802	AF342802	AF342802	AF342802		FJ196085	
	<i>Terebratulina retusa</i>	U08324	AY839244	AY839244	AY839244		DQ779768		AF334238
Cycliophora	<i>Symbion americanus</i>	EF142068		EF142087	EF142087			EF140778	EF140771
	<i>Symbion pandora</i>	Y14811		AY218133				AY218084	
Entoprocta	<i>Barentsia gracilis</i>	FJ196109	AY210456	AY210456	AY210456	AY210456		FJ196079	
	<i>Loxosomella murmanica</i>	AY218100	DQ279950	DQ279950	DQ279950	DQ279950	AY218150		
	<i>Pedicellina cernua</i>	FJ196111						FJ196081	
Nemertea	<i>Carinoma tremaphoros</i>	AY039675	AJ436888	AJ436888			AJ436986	AJ436943	AJ436833
	<i>Hubrechtella dubia</i>	AY039674	AJ436889	AJ436889				EU489495	AJ436834
	<i>Lineus bilineatus</i>		DQ279947	DQ279947			DQ279996	DQ280014	DQ280022
Sipuncula	<i>Apionsoma misakianum</i>	AY210440	AY210454	AY210454	AY210454	AY210454	DQ300052	EU267000	
	<i>Phascolion strombi</i>	DQ299984	AY210468	AY210468	AY210468	AY210468	DQ279998		
	<i>Phascolopsis gouldii</i>	AF342796	AF342795	AF342795	AF342795	AF342795	AF519297	DQ300134	
<b>Mollusca</b>									
Bivalvia	<i>Abra nitida</i>	DQ279940	DQ279965		DQ279965	DQ279965	DQ280005		
	<i>Anodonta sp.</i>	AY579090	DQ279964				AY579132	AY579122	
	<i>Anomia ephippium/sinensis</i>	AF120535	AB102739		AB102739	AB102739			
	<i>Arca imbricata/ventricosa</i>	AY654986	AB101612		AB101612	AB101612	AY654989	AY654988	
	<i>Astarte castanea</i>	AF120551	AF131001				DQ280004	AF120662	
	<i>Cardita calyculata</i>	AF120549		AF120610				AF120660	
	<i>Cardita leana</i>	AM774481	AM779655						
	<i>Chamelea striatula</i>	DQ279943		DQ279967	DQ279967	DQ279967	DQ280009	AF120668	DQ280041

	<i>Chlamys varia</i>	DQ279939	DQ279962	DQ279962	DQ279962	DQ280003		DQ280033
	<i>Corbicula fluminea/japonica</i>	AF120557	AB126330	AB126330	AB126330	AY070161	AF120666	DQ280039
	<i>Cumberlandia monodonta</i>	AY579105				AY579144	AY579131	AY579089
	<i>Dreissena polymorpha</i>	AF120552	AF131006			AY070165	AF120663	DQ280038
	<i>Gastrochaena gigantea</i>	AM774515	AM779689					
	<i>Laternula elliptica</i>	AY192687	EU734752					GU227003
	<i>Limaria hians/fragilis</i>	AF120534	AB102742	AB102742	AB102742	AY070152	AF120650	
	<i>Lyonsia floridana</i>	AF120540					AF120654	
	<i>Margaritifera auricularia</i>	AY579097		AY579113		AY579137	AY579125	DQ280035
	<i>Mercenaria mercenaria</i>	AF120559	AF131019			DQ280008	DQ399403	DQ280040
	<i>Mya arenaria</i>	AF120560	AB126332	AB126332	AB126332	AY377770	AY070140	AY377618
	<i>Mytilus galloprovincialis</i>	L33452	AB103129	AB103129	AB103129	AY267748	AY497292	AY497292
	<i>Neotrigonia margaritacea</i>	AF411690	DQ279963	DQ279963		AY070155	U56850	DQ280034
	<i>Nucula sulcata</i>	DQ279937	DQ279960	DQ279960	DQ279960	DQ280001	DQ280017	DQ280029
	<i>Nuculana minuta</i>	DQ279938	DQ279961	DQ279961	DQ279961	DQ280002	DQ280018	DQ280030
	<i>Ostrea edulis</i>	L49052	AF137047/AF120596			AY070151	AF120651	DQ280032
	<i>Pandora arenosa</i>	AF120539		AF120601				
	<i>Phaxas pellucidus</i>	DQ279941	AY145420	AY145420	AY145420	DQ280006	DQ280019	DQ280036
	<i>Pteria hirundo/loveni</i>	AF120532	AB102767	AB102767	AB102767		AF120647	DQ280031
	<i>Solemya velum</i>	AF120524	AY145421	AY145421	AY145421	AY070146	U56852	DQ280028
	<i>Thraciopsis angustata</i>	AM774491	AM779664					
	<i>Yoldia limatula</i>	AF120528	AY145424	AY145424	AY145424	AY070149	AF120642	
Caudofoveata	<i>Chaetoderma nitidulum</i>	AY377658		FJ445775		AY377763	AY377726	AY377612
	<i>Scutopus ventrolineatus</i>	X91977						
Cephalopoda	<i>Bathypolypus arcticus</i>	AY557465		AY557554			AF000029	DQ280044
	<i>Nautilus pompilius</i>	AY557455		AY145417			AY557514	AY377628
	<i>Nautilus scrobiculatus</i>	AF120504		AF120567		AF033704		U11606
	<i>Stauroteuthis syrtensis</i>	AY557457				AY557406	AF000067	DQ280042
	<i>Vampyroteuthis infernalis</i>	AY557459	AH012197	AH012197	AH012197	AY557408	AF000071	DQ280043
Gastropoda	<i>Acmaea mitra</i>	AB282760	AB282781	AB282781	AB282781		AB238459	AB106518

<i>Addisonia excentrica</i>	AY603096							
<i>Addisonia sp.</i> (ZSM 20041021)	KF527260		KF527269	KF527269		KF527283		
<i>Alcadia dysonia</i>	DQ093428		DQ279974	DQ279974		DQ093496		DQ093469
<i>Anatoma euglypta</i>	AY923897					AY923971	AY923934	
<i>Aperostoma palmeri</i>	DQ093435	DQ279983	DQ279983	DQ279983		DQ093505	DQ093523	DQ093479
<i>Balcis eburnea</i>	AF120519		AF120576				AF120636	DQ280051
<i>Bathyacmaea nipponica</i>	AB282772	AB282793					AB238588	AB238451
<i>Bathymargarites symplector</i>	DQ093433	DQ279982	DQ279982	DQ279982	DQ279982	DQ093503	DQ093521	DQ093477
<i>Bayerotrochus midas 1</i>	AF120510		DQ093453			DQ093500	AY296820	DQ093474
<i>Bayerotrochus midas 2</i>	FJ977637	FJ977668	FJ977668	FJ977668				
<i>Bolinus brandaris</i>	DQ279944	DQ279986	DQ279986	DQ279986		DQ280010	DQ280020	DQ280052
<i>Cellana nigrolineata</i>	DQ013353		DQ279971			DQ093493	DQ093515	DQ093467
<i>Cinnalepeta pulchella</i>			AB087192	AB087192				
<i>Coccapigya punctoradiata</i>	AB282774	AB282795					AB238590	AB238453
<i>Cocculina messingi/sp.</i>	AF120508	DQ279973	DQ279973	DQ279973		AY377777	AY377731	AY377624
<i>Crepidula fornicata</i>	AY377660					AY377778	AF353154	AY377625
<i>Cyathernia naticoides</i>	DQ093430	DQ279977	DQ279977	DQ279977		DQ093498	DQ093518	DQ093472
<i>Depressigyra globulus</i>	DQ093431	DQ279978	DQ279978	DQ279978	DQ279978	AF033689	DQ093519	DQ093473
<i>Diodora graeca</i>	AF120513	DQ279980	DQ279980	DQ279980	DQ279980	DQ093502	AF120632	DQ093476
<i>Entemnotrochus adansonianus</i>	AF120509	DQ279979	DQ279979	DQ279979		AY377774		AY377621
<i>Eoacmaea conoidalis</i>	AB282757	AB282778					AB238505	AB238375
<i>Erginus sybaritica</i>	AB282761	AB282782	AB282782	AB282782			AB238461	AB238350
<i>Eulepetopsis vitrea</i>	DQ093427	DQ279972	DQ279972			DQ093495	DQ093516	DQ093468
<i>Haliotis tuberculata/discus</i>	AF120511	AY145418	AY145418	AY145418	AY145418	AY070145	AY377729	AY377622
<i>Lepeta caeca pacifica</i>	AB282759	AB282780	AB282780	AB282780			AB238458	AB238347
<i>Lepetodrilus elevatus</i>	DQ093432	AY145413	AY145413	AY145413	AY145413	DQ093501	DQ093520	DQ093475
<i>Leptogyropsis inflata</i>	AB365313					AB365300	AB365258	
<i>Littorina littorea</i>	DQ093437	DQ279985	DQ279985			DQ093507	DQ093525	DQ093481
<i>Lottia gigantea</i>	AB282762	AB282783	AB282783	AB282783			AB238466	AB106498
<i>Micromelo undatus</i>	DQ093443		DQ279995			DQ093513		DQ093487

<i>Mikadotrochus beyrichii</i>	AM048636	AM048695	AM048695	AM048695		AM049331	
<i>Nacella magellanica</i>	AB282769	AB282790	AB282790		AB433689	EU870985	AB238433
<i>Neomphalus fretterae</i>	AY090806						
<i>Nerita funiculata</i>	DQ093429		DQ279976	DQ279976		DQ093517	DQ093471
<i>Neritilia rubida</i>			AB087190	AB087190			
<i>Neritopsis radula</i>			AB087186				
<i>Nipponacmea concinna</i>	DQ013354					AB238486	AB106511
<i>Notocrater houbrieki</i>	L78881				AF033700	AY296822	
<i>Onchidella sp.</i>	DQ093441		DQ279992		DQ093511	DQ093529	DQ093485
<i>Ophicardelus ornatus</i>	DQ093442				DQ093512	DQ093530	DQ093486
<i>Orbitestella vera</i>	FJ917207	FJ917239	FJ917239		EF561623	FJ917268	FJ917250
<i>Paralepetopsis sp.</i>	FJ977635	FJ977665	FJ977665		FJ977728	FJ977752	FJ977699
<i>Patella vulgata</i>	AB282770	AB282791	AB282791	AB282791		AB238580	AB238445
<i>Pectinodonta rhyssa</i>	AB282773	AB282794	AB282794	AB282794		AB238589	AB238452
<i>Peltospira delicata</i>	AY923893				AY923967	AY923931	
<i>Phenacolepas osculans</i>	AY923890					AY923928	
<i>Philine aperta</i>	DQ093438	DQ279988	DQ279988	DQ279988	DQ093508		DQ093482
<i>Pisulina adamsiana</i>			AB087191	AB087191			
<i>Pomacea bridgesi</i>			DQ279984	DQ279984	DQ093506	DQ093524	DQ093480
<i>Puncturella conica</i> (ZSM 20021400)	KF527257		KF527266	KF527266	KF527278		KF527251
<i>Pyropelta sp.</i>	FJ977636	FJ977666	FJ977666	FJ977666	FJ977729	FJ977753	FJ977700
<i>Raphitoma linearis</i>	DQ279945		DQ279987		DQ280011		DQ280053
<i>Salinator solida</i>	DQ093440	DQ279991	DQ279991	DQ279991	DQ093510	DQ093528	DQ093484
<i>Scissurella coronata</i>	AM048637	AM048696	AM048696				
<i>Scutellastra optima</i>	AB282771	AB282792				AB238585	AB106482
<i>Seguenzia antarctica</i> (ZSM 20051133)	KF527261		KF527270	KF527270	KF527279		KF527253
<i>Sinezona confusa</i>	AF120512	DQ279981	DQ279981	DQ279981	AY377773		
<i>Siphonaria pectinata</i>	X91973	DQ279993	DQ279993		AY377780	AF120638	AY377627
<i>Theodoxus fluviatilis</i>	AF120515		DQ279975	DQ279975		AF120633	DQ093470
<i>Titiscania sp.</i> (ZSM 20060276)	KF527262		KF527271	KF527271	KF527280		KF527254



	<i>Tricolia variabilis</i>	AB365304				AB365267	AB365219	
	<i>Truncatella guerini</i>	AF120518		AF120575			AF120635	
	<i>Valvata piscinalis</i>	FJ917222	FJ917224	FJ917224	FJ917224	FJ917224	FJ917267	FJ917248
	<i>Viviparus georginaus</i>	AF120516		AF120574		AY377779	AF120634	AY377626
Monoplacophora	<i>Laevipilina antarctica</i>			DQ279958				
	<i>Laevipilina antarctica</i> (DNABANK-Moll-MS-016)	KF527265		KF527274	KF527274	KF527276		KF527256
	<i>Laevipilina hyalina 1</i>	FJ445774	FJ445777	FJ445777	FJ445777	FJ445778	FJ445781	FJ445782
	<i>Laevipilina hyalina 2</i>	FJ449542	FJ449541	FJ449541	FJ449541		FJ449540	FJ449543
	<i>Micropilina sp.</i> (DNABANK-Moll-MS-001)	KF527263		KF527272	KF527272	KF527277		KF527255
	<i>Neopilimidae sp.</i> (DNABANK-Moll-MS-002)	KF527264		KF527273	KF527273	KF527275		
	<i>Veleropilina seisuimaruae</i>	AB669192	AB669193	AB669193	AB669193	AB669193	AB669194	AB669195
Polyplacophora	<i>Acanthochitona crinita</i>	AF120503	DQ279957	DQ279957	DQ279957	AY377759	AF120627	AY377609
	<i>Callistochiton antiquus</i>	AY377645	DQ279953	DQ279953	DQ279953	AY377749	AY377712	AY377599
	<i>Callochiton septemvalvis</i>	AY377632		DQ279952	DQ279952	AY377736	AY377700	
	<i>Chaetopleura apiculata</i>	AY377636	AY145398	AY145398	AY145398	AY377741	AY377704	AY377590
	<i>Chiton olivaceus</i>	AY377651		DQ279955	DQ279955	AY377755	AY377716	AY377605
	<i>Cryptochiton stelleri</i>			AY377686		AY377760	AY377720	AY377610
	<i>Cryptoplax japonica</i>	AY377656	AY145402	AY145402	AY145402	AY377761	FJ445780	AY377611
	<i>Ischnochiton comptus</i>	AY377639	AY145412	AY145412	AY145412	AY377744	AY377709	AY377593
	<i>Lepidopleurus cajetanus</i>	AF120502	FJ445776	FJ445776	FJ445776	AY377735	AF120626	AY377585
	<i>Lepidopleurus cajetanus</i> (ZSM 20040267)	KF527259		KF527268	KF527268	KF527282		KF527252
	<i>Leptochiton intermedius</i> (ZSM 20040266)	KF527258		KF527267	KF527267	KF527281		
	<i>Leptochiton asellus</i>	AY377631	AY145414	AY145414	AY145414	AY377734	FJ461256	AY377586
	<i>Lorica volvox</i>	AY377647	DQ279954	DQ279954	DQ279954	AY377751		AY377601
	<i>Mopalia muscosa</i>	AY377648	DQ279956	DQ279956	DQ279956	AY377752		AY377602
	<i>Tonicella lineata</i>	AY377635		AY377665		AY377739	AY377702	AY377588
Scaphopoda	<i>Antalis entalis</i>	DQ279936	AY145388	AY145388	AY145388	DQ280000	DQ280016	DQ280027
	<i>Antalis pilsbryi</i>	AF120522		AF120579			AF120639	
	<i>Cadulus subfusiformis</i>	AF490603						
	<i>Dentalium inaequicostatum</i>	DQ279935		DQ279959	DQ279959	DQ279999	DQ280015	DQ280026

	<i>Entalina tetragona</i>	AF490598				
	<i>Fustiaria rubescens</i>	AF490597				
	<i>Pulsellum affine</i>	AF490600				
	<i>Rhabdus rectius</i>	AF120523	AF120580	AY377772	AF120640	AY377619
	<i>Siphonodentalium lobatum</i>	AF490601				
Solenogastres	<i>Epimения sp.</i>	AY377657	AY377691	AY377765	AY377723	AY377615
	<i>Epimения australis</i>		AY377689	AY377767	AY377722	AY377614
	<i>Epimения babai</i>	AY212107	AY377690	AY377766	AY377724	AY377616
	<i>Micromenia fodiens</i>	FJ649601				
	<i>Simrothiella margaritacea</i>	FJ649600				
	<i>Wirenia argentea</i>	FJ649599				

Supplementary Table 3A

	<b>Species</b>	<b>18S</b>	<b>28S1</b>	<b>28S2</b>	<b>28S3</b>	<b>28S4</b>	<b>H3</b>	<b>COI</b>	<b>16S</b>
Annelida	<i>Eunice pennata</i>							AY838870	
	<i>Lineus bilineatus</i>	DQ279932			DQ279947	DQ279947			
Bivalvia	<i>Cardita calyculata</i>						AY070156		
	<i>Cumberlandia monodonta</i>		AF305382						
Brachiopoda	<i>Eohemithiris grayi</i>							AB053200	
	<i>Lingula adamsi</i>							AB128054	
	<i>Terebratulina retusa</i>							NC000941	
Cephalopoda	<i>Nautilus pompilius</i>		AY145417		AY145417	AY145417			
	<i>Stauroteuthis syrtensis</i>			DQ279968	DQ279968				
Cycliophora	<i>Symbion pandora</i>						AY218153		
Gastropoda	<i>Coccolpiza punctoradiata</i>							AB365301	
	<i>Crepidula fornicata</i>		AY145406	AY145406	AY145406	AY145406			
	<i>Nerita funiculata</i>						DQ093497		
	<i>Neritilia rubida</i>							AB102712	
	<i>Neritopsis radula</i>					AB087186			
	<i>Ophicardelus ornatus</i>		DQ279994	DQ279994	DQ279994				
	<i>Pomacea bridgesi</i>	DQ093436							
	<i>Scissurella coronata</i>							AM049332	AM116867
	<i>Sinezona confusa</i>						AF120631		
Nemertea	<i>Hubrechtella dubia</i>						AJ436987		
Polyplacophora	<i>Mopalia muscosa</i>						AY377713		

## Supplementary Table 3B

	Species	28S2
<b>Bivalvia</b>	<i>Gastrochaena gigantea</i>	AM779689
	<i>Thraciopsis angustata</i>	AM779664
	<i>Solemya velum</i>	AY145421
	<i>Nucula sulcata</i>	DQ279960
	<i>Nuculana minuta</i>	DQ279961
	<i>Yoldia limatula</i>	AY145424
	<i>Mytilus galloprovincialis</i>	AB103129
	<i>Arca imbricata/ventricosa</i>	AB101612
	<i>Pteria hirundo/loveni</i>	AB102767
	<i>Ostrea edulis</i>	AF137047 + AF120596
	<i>Limaria hians/fragilis</i>	AB102742
	<i>Anomia ephippium/sinensis</i>	AB102739
	<i>Chlamys varia</i>	DQ279962
	<i>Neotrigonia margaritacea</i>	DQ279963
	<i>Anodonta sp.</i>	DQ279964
	<i>Abra nitida</i>	DQ279965
	<i>Phaxas pellucidus</i>	AY145420
	<i>Dreissena polymorpha</i>	AF131006
	<i>Corbicula fluminea / japonica</i>	AB126330
	<i>Mercenaria mercenaria</i>	AF131019
	<i>Mya arenaria</i>	AB126332
	<i>Astarte castanea</i>	AF131001
	<i>Cardita leana</i>	AM779655

Supplementary Table 4

Data set	Number of taxa	Total length of alignment (aligned with Mafft, masked with Aliscore)	Model of sequence evolution (AIC)	Proportion of invariable sites	Gamma distribution shape parameter
16S (142 taxa)	87	519	TVM+I+G	0.1554	0.6522
18S (142 taxa)	133	3617	GTR+I+G	0.1739	0.5009
28S (142 taxa)	118	3583	GTR+I+G	0.2126	0.5255
H3 (142 taxa) all codon positions	94	322	TVM+I+G	0.5221	1.0204
H3 (142 taxa) 1st codon position	94	322	SYM+I	0.8382	equal
H3 (142 taxa) 2nd codon position	94	322	GTR+G	-	1.7209
H3 (142 taxa) 3rd codon position	94	322	GTR+I+G	0.5797	2.5094
COI (142 taxa) all codon positions	92	678	GTR+G	-	0.2944
COI (142 taxa) 1st codon position	92	678	GTR+I+G	0.1649	0.6211
COI (142 taxa) 2nd codon position	92	678	GTR+G	-	0.7885
COI (142 taxa) 3rd codon position	92	678	GTR+I+G	0.2253	0.8226
16S (81 taxa)	51	459	GTR+I+G	0.1784	0.7234
18S (81 taxa)	78	3449	GTR+I+G	0.1271	0.4028
28S (81 taxa)	68	3465	GTR+I+G	0.2235	0.4999
H3 (81 taxa) all codon positions	55	327	GTR+I+G	0.5395	1.3596
H3 (81 taxa) 1st codon position	55	327	SYM+I	0.8289	equal
H3 (81 taxa) 2nd codon position	55	327	SYM+I+G	0.0332	2.0347
H3 (81 taxa) 3rd codon position	55	327	GTR+I+G	0.5940	7.1635
COI (81 taxa) all codon positions	51	666	GTR+G	-	0.2723
COI (81 taxa) 1st codon position	51	666	GTR+I+G	0.2019	0.6262
COI (81 taxa) 2nd codon position	51	666	GTR+G	-	0.4874
COI (81 taxa) 3rd codon position	51	666	GTR+I+G	0.2320	0.7413
16S (Gastropods)	53	531	TVM+I+G	0.1968	0.9294
18S (Gastropods)	67	1959	TrN+I+G	0.1772	0.4059
28S (Gastropods)	62	2808	GTR+I+G	0.2945	0.4736

<b>H3 (Gastropods) all codon positions</b>	47	326	GTR+I+G	0.5564	1.3578
<b>H3 (Gastropods) 1st codon position</b>	47	326	SYM+I+G	0.7580	0.1501
<b>H3 (Gastropods) 2nd codon position</b>	47	326	GTR+I+G	0.0330	0.7695
<b>H3 (Gastropods) 3rd codon position</b>	47	326	GTR+I	0.6461	equal
<b>COI (Gastropods) all codon positions</b>	51	672	GTR+I+G	0.2489	0.4266
<b>COI (Gastropods) 1st codon position</b>	51	672	GTR+I+G	0.2541	0.6279
<b>COI (Gastropods) 2nd codon position</b>	51	672	GTR+G	-	0.6405
<b>COI (Gastropods) 3rd codon position</b>	51	672	GTR+I+G	0.2950	0.7110

Supplementary Table 5

<b>Data set</b>	<b>Variations on data sets</b>	<b>Partition</b>	<b>Alignment length</b>	<b>proportion of gaps</b>
142 taxa	-	9: 16S, 18S, 28S, COI 1st, 2nd, 3rd codon position, H3 1st, 2nd, 3rd codon position	8721	60%
81 taxa	-	9: 16S, 18S, 28S, COI-1st, -2nd, -3rd codon position, H3-1st, -2nd, -3rd codon position	8367	57%
134 taxa, without Aplacophora	exclusion of Aplacophora; exclusion of 3rd codon positions of COI and H3	5: 16S, 18S, 28S, COI, H3	8122	58%
74 taxa, without Aplacophora	exclusion of Aplacophora; exclusion of 3rd codon positions of COI and H3	5: 16S, 18S, 28S, COI, H3	7812	55%
142 taxa	COI and H3 coded as amino acids	5: 16S, 18S, 28S, COI (aa), H3 (aa)	8052	62% (16S-18S-28S); 25% (COI-H3)
142 taxa	only fragments 18S, 28S and H3 are used	5: 18S, 28S, H3-1st, -2nd, -3rd codon position	7527	61%
Gastropods (67 gastropods including patellogastropods, 6 outgroups)	only gastropod taxa are used (including Patellogastropoda)	9: 16S, 18S, 28S, COI-1st, -2nd, -3rd codon position, H3-1st, -2nd, -3rd codon position	6296	53%

Supplementary Table 6

<b>Data set</b>	<b>saturation</b>	<b>Iss</b>	<b>Iss c Sym (P)</b>
<b>H3 (142 taxa) all codon positions</b>	no	0,330	< 0,692 (0,0000)
<b>H3 (142 taxa) 1st and 2nd codon positions</b>	no	0,215	< 0,749 (0,0000)
<b>H3 (142 taxa) 3rd codon position</b>	no	0,192	< 0,949 (0,0000)
<b>COI (142 taxa) all codon positions</b>	no	0,410	< 0,697 (0,0000)
<b>COI (142 taxa) 1st and 2nd codon positions</b>	no	0,239	< 0,683 (0,0000)
<b>COI (142 taxa) 3rd codon position</b>	yes	0,918	> 0,720 (0,0000)
<b>H3 (81 taxa) all codon positions</b>	no	0,392	< 0,689 (0,0000)
<b>H3 (81 taxa) 1st and 2nd codon positions</b>	no	0,045	< 0,722 (0,0000)
<b>H3 (81 taxa) 3rd codon position</b>	no	0,814	< 1,039 (0,0001)
<b>COI (81 taxa) all codon positions</b>	no	0,418	< 0,703 (0,0000)
<b>COI (81 taxa) 1st and 2nd codon positions</b>	no	0,251	< 0,685 (0,0000)
<b>COI (81 taxa) 3rd codon position</b>	yes	0,925	> 0,704 (0,0000)
<b>H3 (Gastropods) all codon positions</b>	no	0,414	< 0,687 (0,0000)
<b>H3 (Gastropods) 1st and 2nd codon positions</b>	no	0,046	< 0,715 (0,0000)
<b>H3 (Gastropods) 3rd codon position</b>	no	0,842	< 1,009 (0,0001)
<b>COI (Gastropods) all codon positions</b>	no	0,466	< 0,706 (0,0000)
<b>COI (Gastropods) 1st and 2nd codon positions</b>	no	0,164	< 0,687 (0,0000)
<b>COI (Gastropods) 3rd codon position</b>	yes	0,929	> 0,700 (0,0000)



## Supplementary Table 7

Calibration node on preferred tree	Fossil calibration	Date range (Ma)	Reference	Prior settings in BEAST v. 1.6.1 (distribution; gamma shape, gamma scale, zero offset)
1 Mollusca	first shell record	~ 545	Parkhaev 2008	Gamma; 2.5, 2.0, 542.0
2 Serialia/Bivalvia	<i>Fordilla</i>	~ 530	Parkhaev 2008	Gamma; 3.3, 2.2, 525.0
3 Cephalopoda/Solenogastres	<i>Plectronoceras</i>	~ 505	Nishiguchi and Mapes 2008	Gamma; 2.4, 7.0, 495.0
4 Polyplacophora/Monoplacophora	<i>Orthiochiton</i>	~ 490	Vendrasco and Runnegar 2004	Gamma; 5.0, 5.0, 470.0
5 Origin of Pteriomorpha	Cyrtodontidae	~ 475	Pojeta 1978	Gamma; 1.9, 9.5, 465.0
6 Origin of Caenogastropoda	Sublitoidea	~ 418	Nützel et al. 2000	Gamma; 2.3, 9.0, 405.0
7 Scaphopoda	<i>Dentalium</i>	~ 353	Yochelson 1999	Gamma; 2.2, 6.7, 345.0
8 <i>Astarte/Cardita</i>	<i>Astartella concentrica</i>	~ 322	Hoare et al. 1989	Gamma; 2.6, 5.0, 315.0
9 Polyplacophora	<i>Leptochiton davolii</i>	~ 231	Laghi 2005	Gamma; 5.0, 2.7, 220.0

Parkhaev PY: **The early molluscan radiation**. In: *Phylogeny and evolution of the Mollusca*. Edited by Ponder WF, Lindberg DR. Berkeley, Univ. California Press 2008, 33-69.

Nishiguchi MK, Mapes RH: **Cephalopoda**. In: *Phylogeny and evolution of the Mollusca*. Edited by Ponder WF, Lindberg DR. Berkeley, Univ. California Press 2008, 163-199.

Vendrasco MJ, Runnegar B: **Late Cambrian and Early Ordovician stem group chitons (Mollusca: Polyplacophora) from Utah and Missouri**. *J Paleontol* 2004, **78**:675-689.

Pojeta J: **The origin and early taxonomic diversification of pelecypods**. *Phil Trans R Soc Lond B* 1978, **284**:225-246.

Nützel A, Erwin DH, Mapes RH: **Identity and phylogeny of the Late Paleozoic Sublitoidea (Gastropoda)**. *J Paleontol* 2000, **74**:575-598.

Yochelson EL: **Scaphopoda**. In: *Functional morphology of the invertebrate skeleton*. Edited by Savazzi E. Chichester. John Wiley and Sons 1999, 363-377.

Hoare RD, Heaney III MJ, Mapes RH: **Bivalves (Mollusca) from the Imo Formation (Mississippian, Chesterian) of North-Central Arkansas**. *J Paleontol* 1989, **63**:582-603.

Laghi GF: **Upper triassic chitons from the Italian Dolomites**. *Lav Sci Nat* 2005, **30**:79-84.

## Supplementary Table 8

	<b>time estimation (BEAST v. 1.6.1)</b>
<b>Calibrated nodes</b>	
Diversification of Mollusca	551,02 (542,88-559,94)
Split Serialia/Bivalvia	530,93 (525,89-536,72)
Split Cephalopoda/Solenogastres	504,92 (495,72-516,34)
Split Polyplacophora/Monoplacophora	493,06 (476,69-511,76)
Origin of Pteriomorpha	475,07 (465,17-487,24)
Origin of Caenogastropoda	421,49 (405,93-441,94)
Diversification of Scaphopoda	359,95 (345,61-379,28)
Split <i>Astarte/Cardita</i>	325,43 (315,69-337,77)
Diversification of Polyplacophora	233,44 (223,22-244,78)
<b>Major molluscan groups</b>	
Diversification of Dorsoconcha	541,69 (532,24-551,28)
Diversification of Bivalvia	495,69 (478,15-514,89)
Diversification of Gastropoda	493,14 (444,21-531,35)
Diversification of Monoplacophora	65,29 (30,36-110,8)
Diversification of Variozoa	534,2 (515,99-550,29)
Split Caudofoveata/Cephalopoda+Solenogastres	518,59 (501,75-536,16)
Diversification of Cephalopoda	364,19 (255,97-467,95)
Diversification of Solenogastres	195,61 (117,78-277,8)
Diversification of Caudofoveata	160,52 (19,5-274,97)