

Supplementary Figures and Tables

Supplementary Figure S1— Comparison of preliminary results from phylogenetic reconstruction of the OF-PTP_62tx and AG_62_tx datasets.

Supplementary Figure S2—Phylogenetic estimation of the 47 AG_62tx partitions that had greater than three myxozoan species present in each.

Supplementary Figure S3—Data occupancy mapped onto ML phylogeny for OF_PTP_62tx

Supplementary Figure S4—Data occupancy mapped onto ML phylogeny for AG_62tx

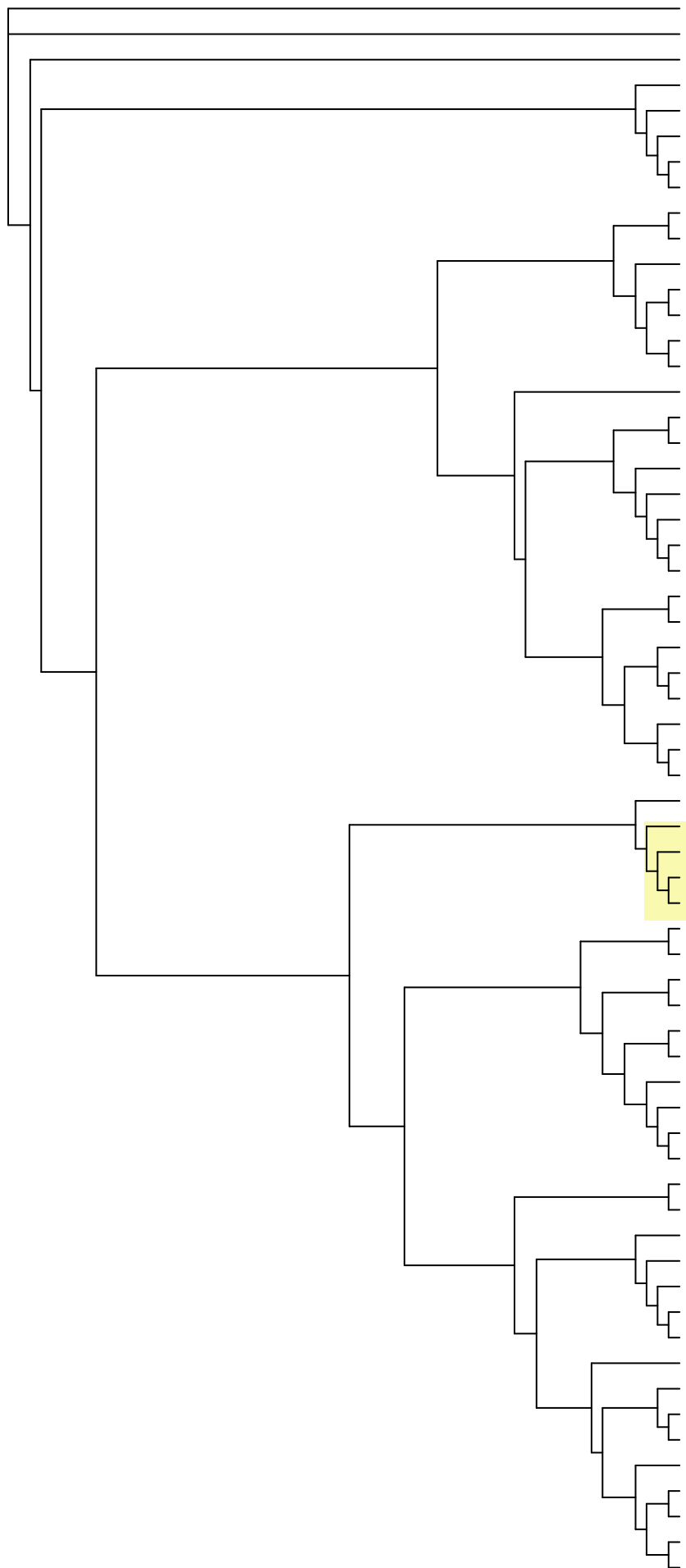
Supplementary Figure S5—GO analyses of *N. vectensis* complements from phylogenomic datasets analyzed, including the molecular function and biological processes categories. For each GO category, functional classes are annotated by color and their relative enrichment (green) or depletion (red) is given in heatmaps left of the GO term description. Inset describes dataset order for heatmaps.

Supplementary Figure S6—ML analyses of the partitioned final data matrix OF-PTP_75tx with bootstrap support.

Supplementary Figure S7—Bayesian MCMC analyses of the concatenated OF-PTP_75tx dataset run under CAT-GTR

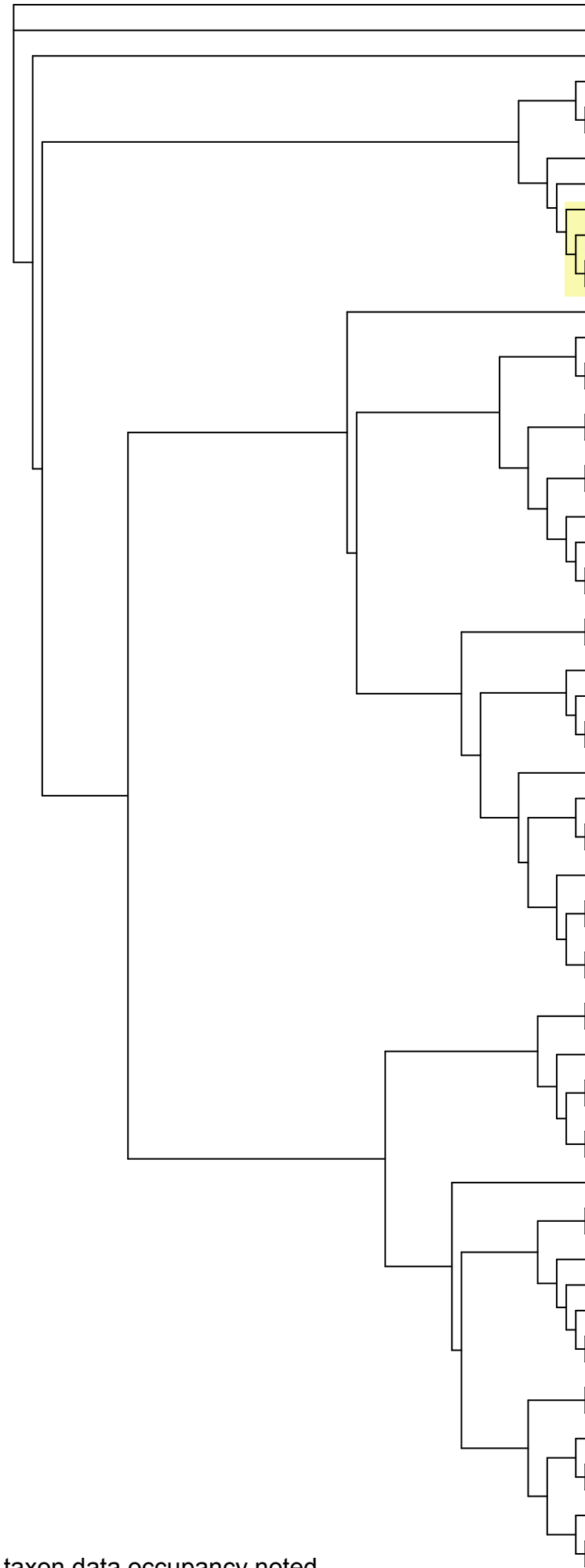
Supplementary Table 1—Information on data sources and size of files. Hx# identifiers are internal (these records are being processed at ENA). All transcriptomes are available here: http://ryanlab.whitney.ufl.edu/downloads/Cnidaria_transcriptomes/

OF-PTP_62tx



- *Amphimedon queenslandica*
- *Mnemiopsis leidyi*
- *Trichoplax adhaerens*
- *Taeniopygia guttata*
- *Strongylocentrotus purpuratus*
- *Drosophila melanogaster*
- *Capitella teleta*
- *Lottia gigantea*
- *Corallium rubrum*
- *Renilla*
- *Nephthyigorgia*
- *Eunicella verrucosa*
- *Eunicella cavolinii*
- *Gorgonia ventalina*
- *Leptogorgia sarmentosa*
- *Cerianthus borealis*
- *Acropora digitifera*
- *Porites asteroides*
- *Seriatopora hystrix*
- *Lobactis scutaria*
- *Montastraea cavernosa*
- *Platygyra carnosus*
- *Montastraea faveolata*
- *Nematostella vectensis*
- *Edwardsiella lineata*
- *Bolocera tuediae*
- *Anthopleura elegantissima*
- *Anemonia viridis*
- *Hormathia digitata*
- *Metridium senile*
- *Aiptasia pallida*
- *Polypodium hydriforme*
- *Kudoa iwatai*
- *Myxobolus cerebralis*
- *Thelohanellus kitauei*
- *Myxobolus pendula*
- *Calvadosia cruxmelitensis*
- *Craterolophus convolvulus*
- *Alatina alata*
- *Tripedalia cystophora*
- *Periphylla periphylla*
- *Atolla vanhoeffeni*
- *Cyanea capillata*
- *Aurelia aurita Dave*
- *Cassiopea*
- *Stomolophus meleagris*
- *Craspedacusta sowerbyi*
- *Aegina citrea*
- *Ectopleura larynx*
- *Hydra viridissima*
- *Hydra oligactis*
- *Hydra vulgaris*
- *Hydra magnipapillata*
- *Clytia hemisphaerica*
- *Podocoryna carnea*
- *Hydractinia symbiolongicarpus*
- *Hydractinia polyclina*
- *Physalia physalis*
- *Agalma elegans*
- *Nanomia bijuga*
- *Abylopsis tetragona*
- *Craseoa lathetica*

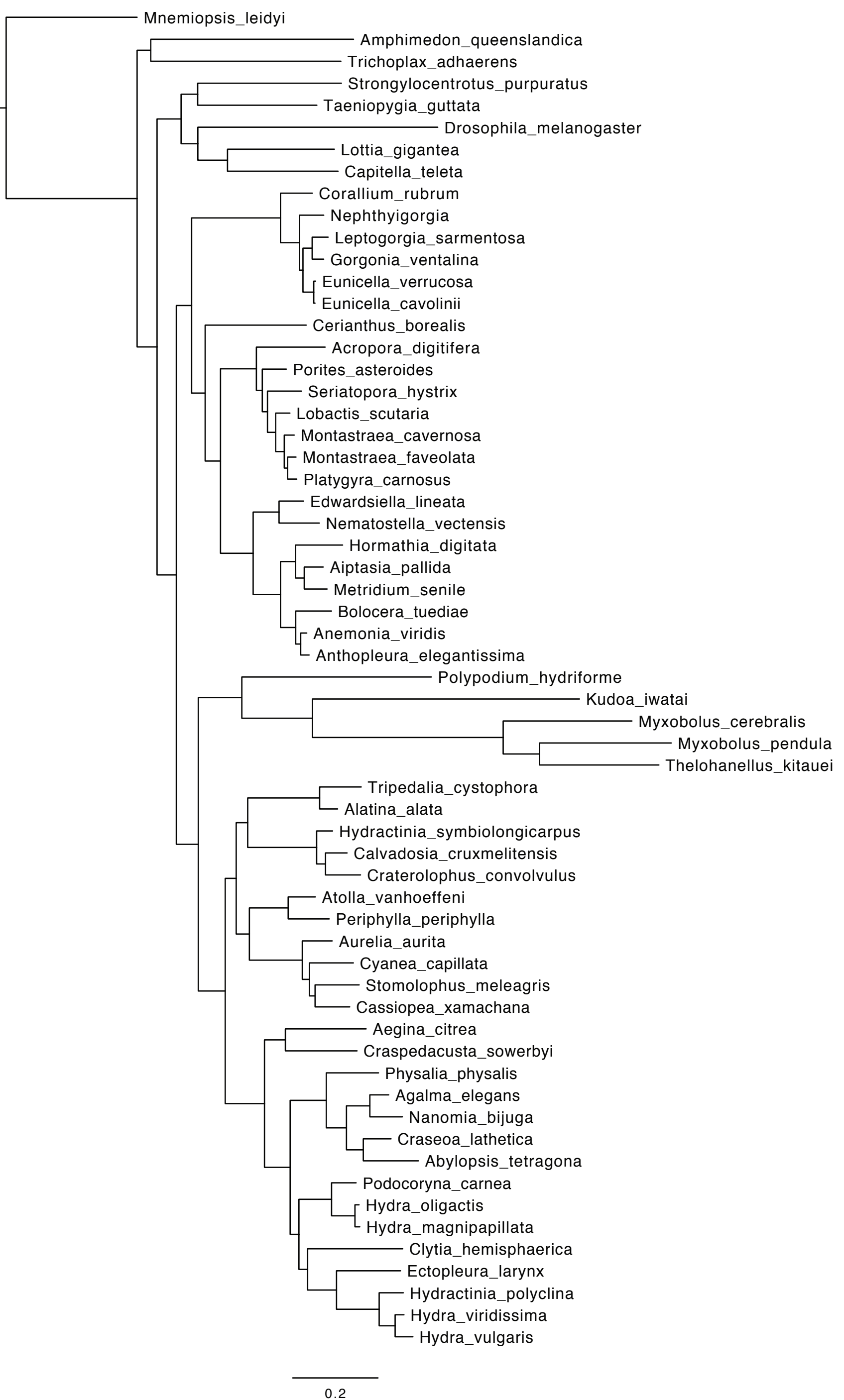
AG_62_tx



- *Mnemiopsis leidyi*
- *Amphimedon queenslandica*
- *Trichoplax adhaerens*
- *Drosophila melanogaster*
- *Capitella teleta*
- *Lottia gigantea*
- *Strongylocentrotus purpuratus*
- *Taeniopygia guttata*
- *Kudoa iwatai*
- *Myxobolus pendula*
- *Thelohanellus kitauei*
- *Myxobolus cerebralis*
- *Polypodium hydriforme*
- *Hydractinia symbiolongicarpus*
- *Calvadosia cruxmelitensis*
- *Craterolophus convolvulus*
- *Alatina alata*
- *Tripedalia cystophora*
- *Atolla vanhoeffeni*
- *Periphylla periphylla*
- *Cyanea capillata*
- *Aurelia aurita*
- *Cassiopea xamachana*
- *Stomolophus meleagris*
- *Craspedacusta sowerbyi*
- *Aegina citrea*
- *Ectopleura larynx*
- *Hydractinia polyclina*
- *Hydra viridissima*
- *Hydra vulgaris*
- *Clytia hemisphaerica*
- *Podocoryna carnea*
- *Hydra oligactis*
- *Hydra magnipapillata*
- *Physalia physalis*
- *Abylopsis tetragona*
- *Craseoa lathetica*
- *Agalma elegans*
- *Nanomia bijuga*
- *Renilla reniformis*
- *Corallium rubrum*
- *Nephthyigorgia*
- *Leptogorgia sarmentosa*
- *Gorgonia ventalina*
- *Eunicella cavolinii*
- *Eunicella verrucosa*
- *Cerianthus borealis*
- *Porites asteroides*
- *Acropora digitifera*
- *Seriatopora hystrix*
- *Lobactis scutaria*
- *Montastraea cavernosa*
- *Platygyra carnosus*
- *Montastraea faveolata*
- *Edwardsiella lineata*
- *Nematostella vectensis*
- *Hormathia digitata*
- *Metridium senile*
- *Aiptasia pallida*
- *Bolocera tuediae*
- *Anemonia viridis*
- *Anthopleura elegantissima*

Supplementary Figure S1

Comparison of preliminary ML analyses for both the AG_62tx and OF-PTP_62tx data matrices with per taxon data occupancy noted.



Supplementary Figure S2

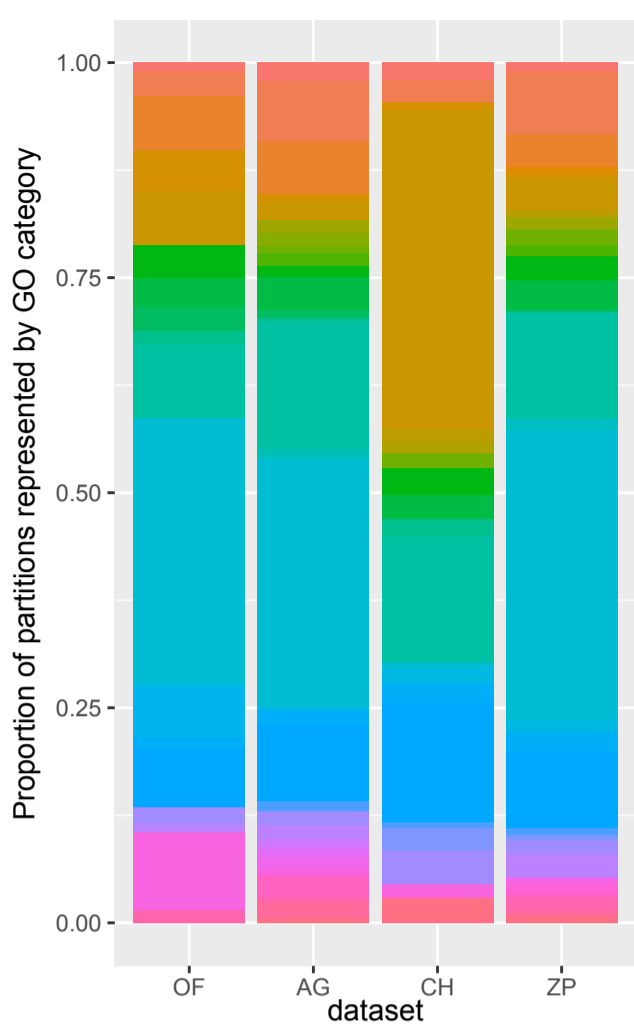
ML tree of 47 *Agalma* partitions with greater than three myxozoan species present in each. Note: *Renilla reniformis* is absent from these partitions.

Supplementary Figure S3
Data data occupancy mapped onto ML phylogeny for OF_PTP_62tx

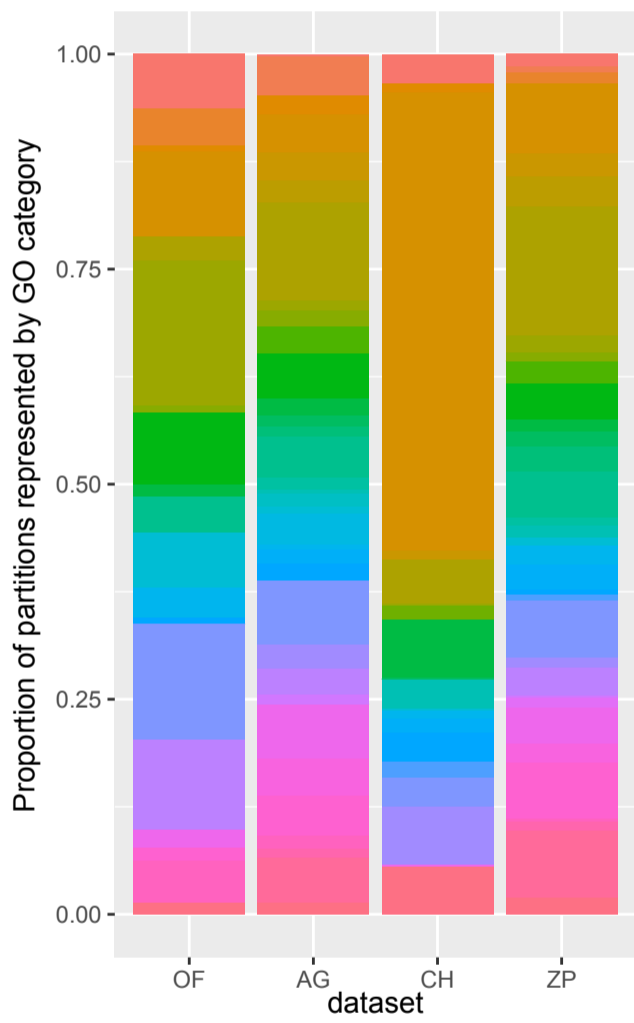
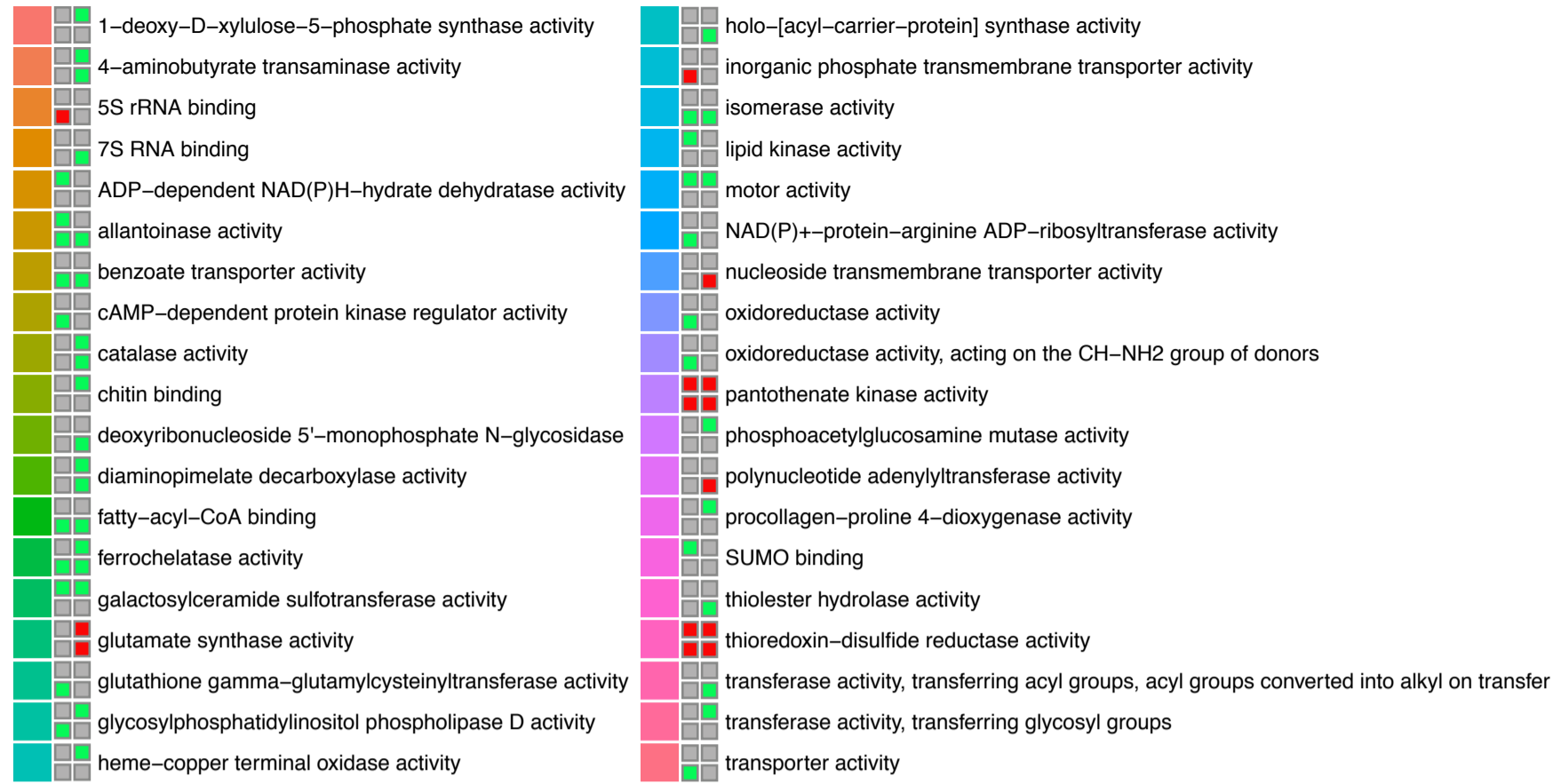


Supplementary Figure S4
Data data occupancy mapped onto ML phylogeny for AG_62tx

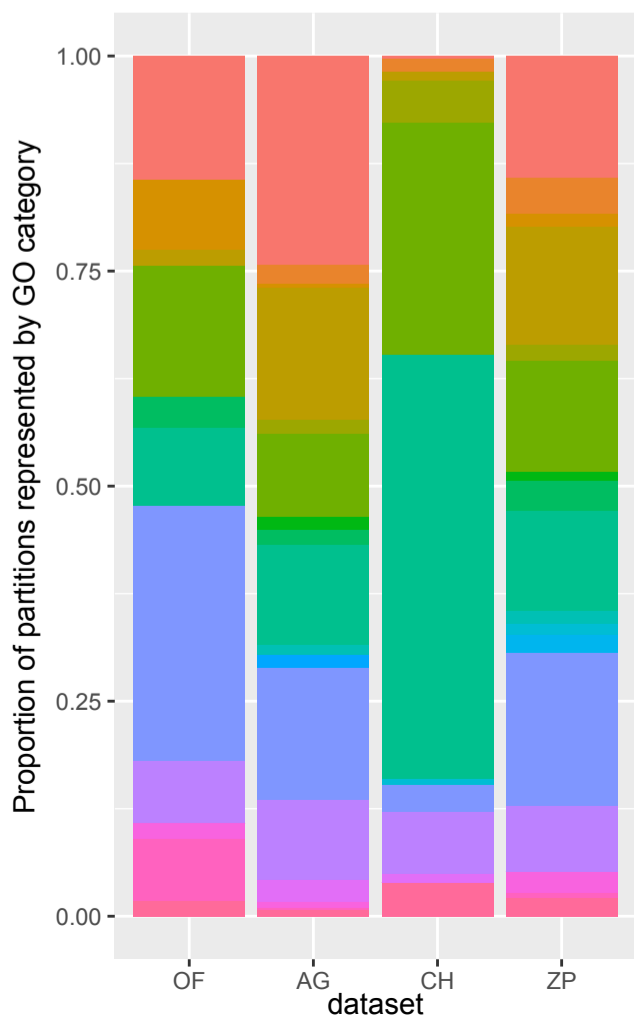
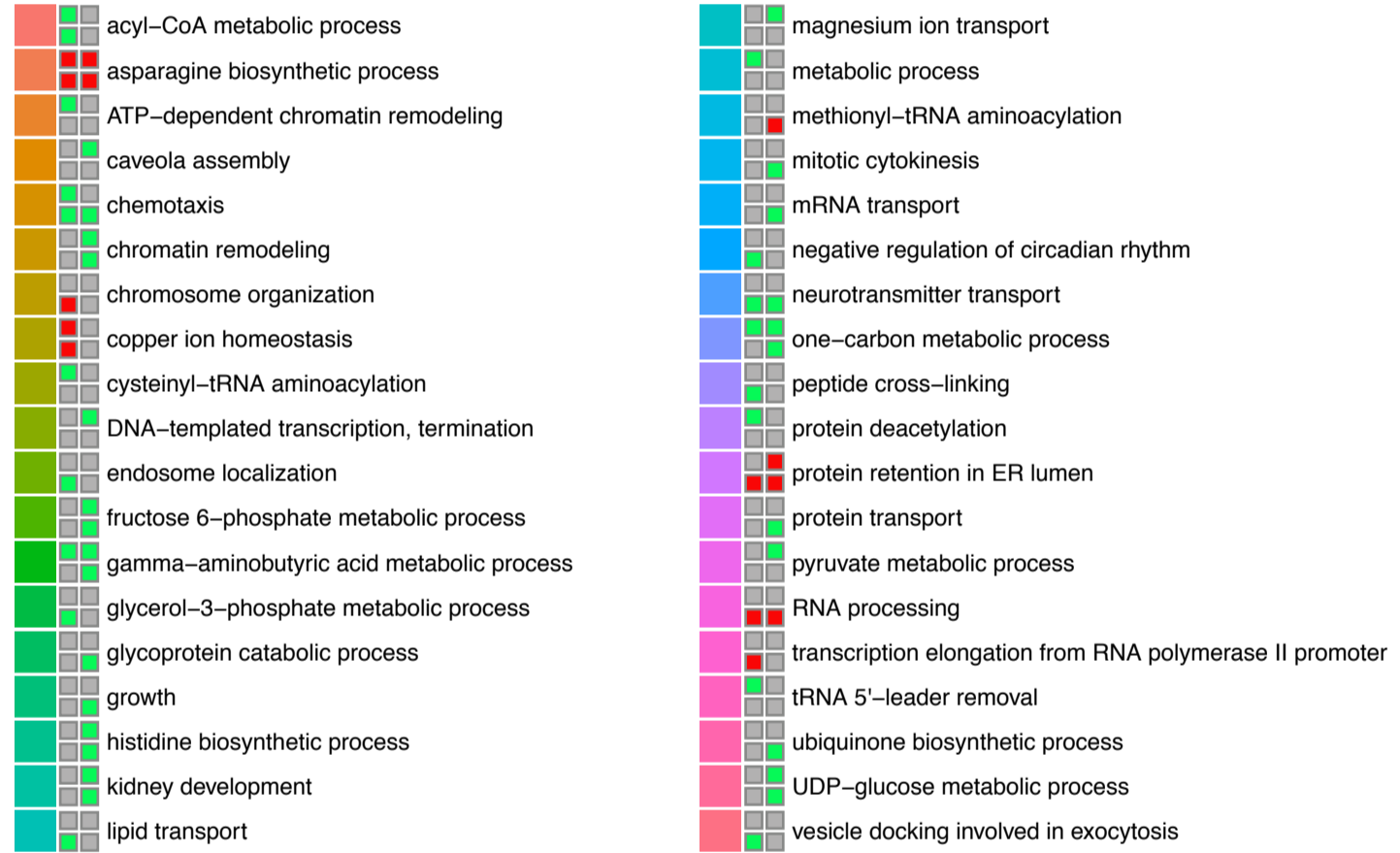




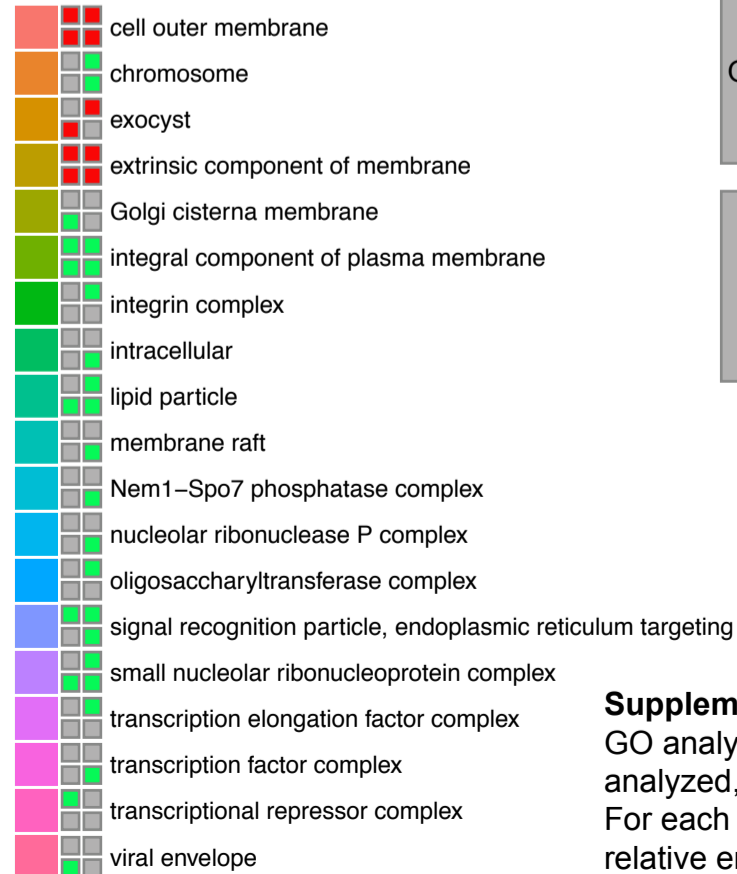
GO: Molecular Function



GO: Biological Process

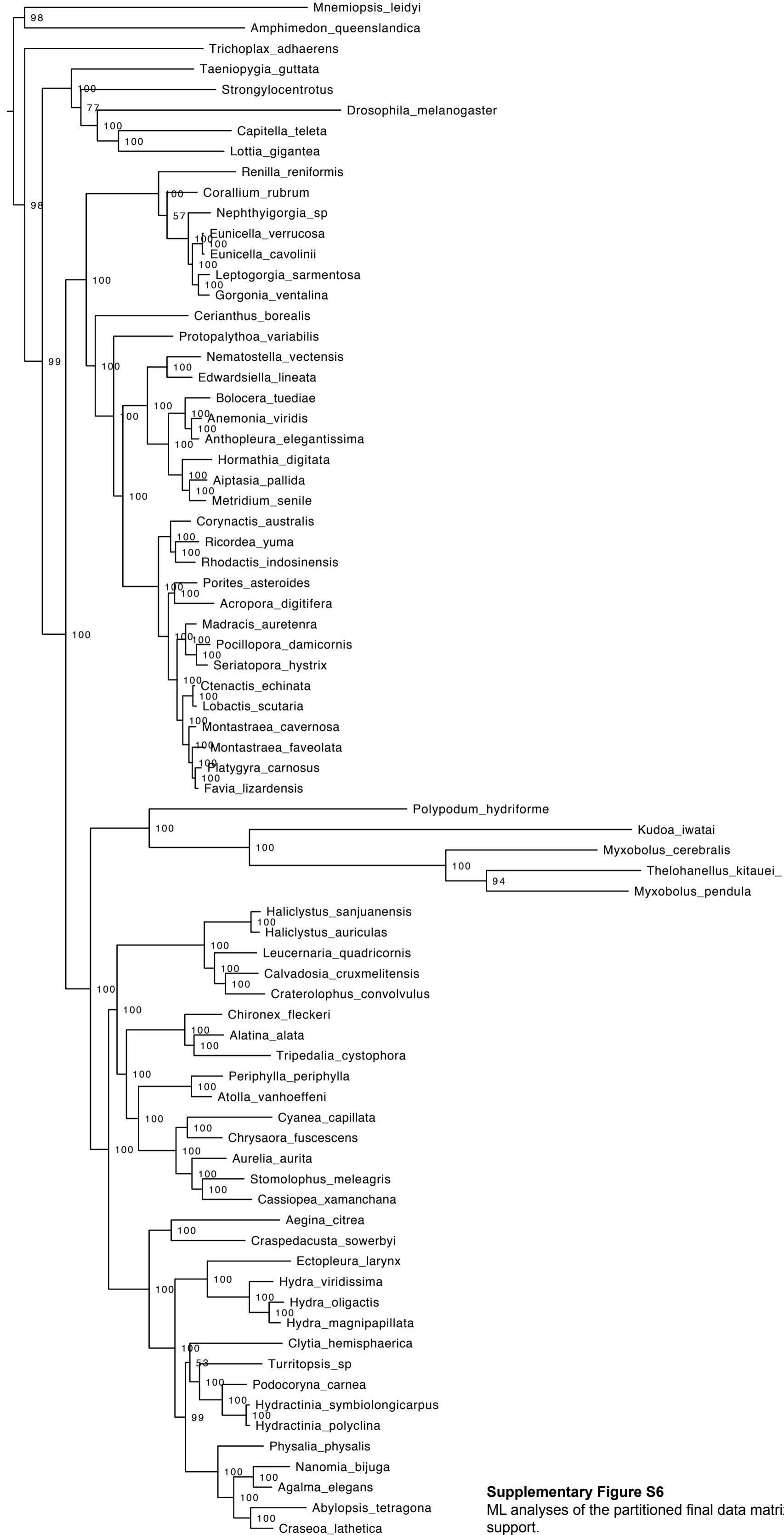


GO: Cell Component



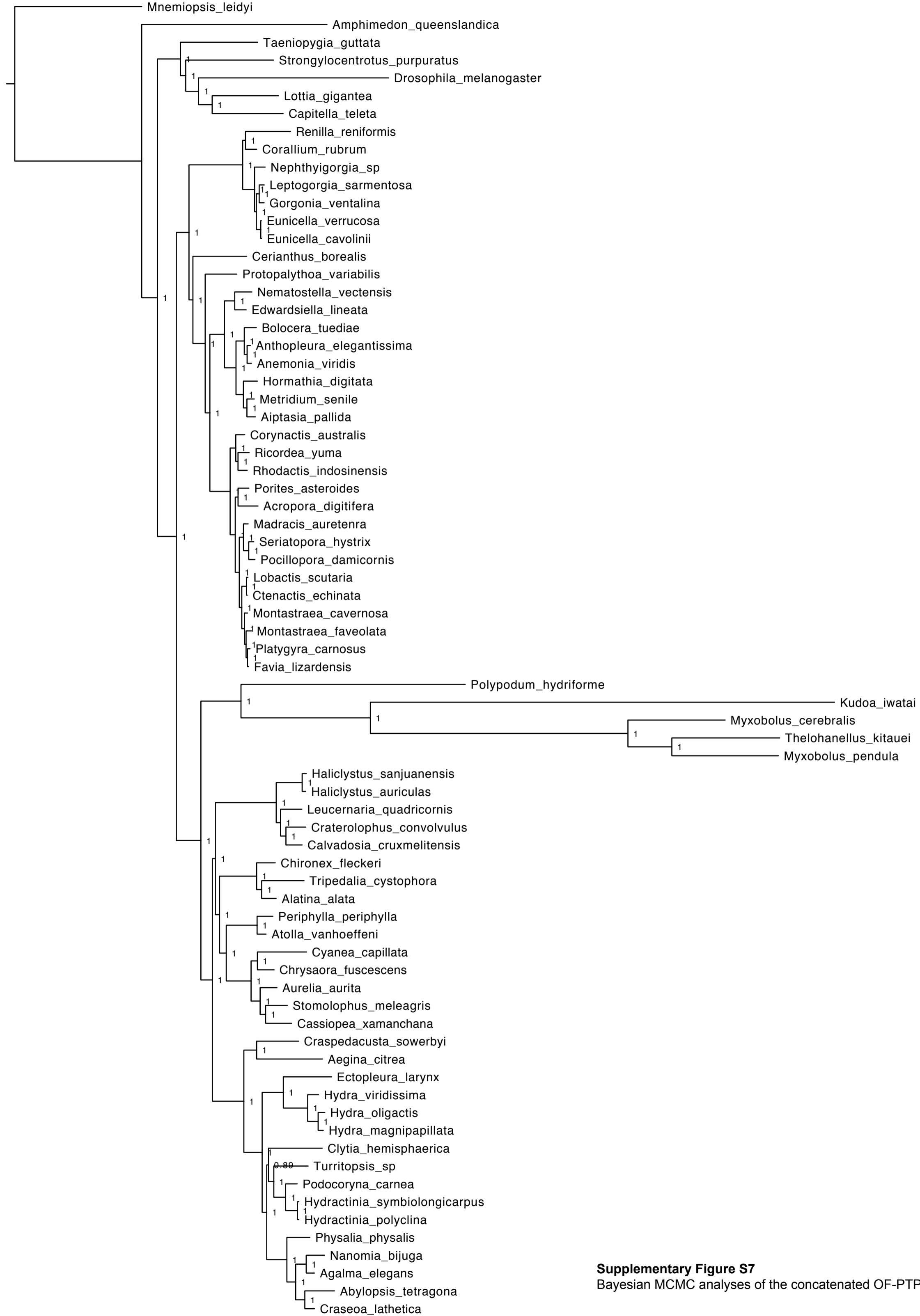
Supplementary Figure S5

GO analyses of *N. vectensis* complements from phylogenomic datasets analyzed, including the molecular function and biological processes categories. For each GO category, functional classes are annotated by color and their relative enrichment (green) or depletion (red) is given in heatmaps left of the GO term description. Inset describes dataset order for heatmaps.



Supplementary Figure S6
ML analyses of the partitioned final data matrix OF-PTP_75tx with bootstrap support.

0.4



Supplementary Figure S7

Bayesian MCMC analyses of the concatenated OF-PTP_75tx dataset run under CAT-GTR

Table 1: Taxonomic list used in this study

Higher taxonomic clade	Species name	Size of original pepfile	Size after AI filtering	Source*
Cnidaria				
Anthozoa				
Hexacorallia				
Actiniaria	<i>Aiptasia pallida</i>	53752	51251	Zapata <i>et al.</i> 2014
Actiniaria	<i>Anemonia viridis</i>	31571	27557	Sabourault <i>et al.</i> 2009
Actiniaria	<i>Anthopleura elegantissima</i>	228540	199978	SRR1645256
Actiniaria	<i>Bolocera tuediae</i>	32915	31128	SRR504347
Actiniaria	<i>Edwardsiella lineata</i>	44159	42824	Stefanik <i>et al.</i> 2014
Actiniaria	<i>Hormathia digitata</i>	38115	35785	SRR504348
Actiniaria	<i>Metridium senile</i>	23324	21910	Richardson <i>et al.</i> 2007
Actiniaria	<i>Nematostella vectensis</i>	27273	27231	Nordberg <i>et al.</i> 2014
Ceriantharia	<i>Cerianthus borealis</i>	19368	16623	Hx2000059695
Corallimorpharia	<i>Corynactis australis</i>	174179	159032	SRR3198576;SRR3198579-80
Corallimorpharia	<i>Rhodactis indosinensis</i>	244841	220083	SRR3201278-81
Corallimorpharia	<i>Ricordea yuma</i>	192043	168258	SRR3201251-3
Scleractinia	<i>Acropora digitifera</i>	33880	33657	Shinzato <i>et al.</i> 2011
Scleractinia	<i>Ctenactis echinata</i>	25097	23886	Okubo <i>et al.</i> 2016
Scleractinia	<i>Favia lizardensis</i>	28655	27425	Okubo <i>et al.</i> 2016
Scleractinia	<i>Lobactis scutaria</i>	53619	50836	SRR2300562
Scleractinia	<i>Madracis auretenra</i>	77305	69464	http://people.oregonstate.edu/~meyere/data.html
Scleractinia	<i>Montastraea cavernosa</i>	100658	96103	SRR2306543
Scleractinia	<i>Montastraea faveolata</i>	19231	18037	Edge <i>et al.</i> 2005
Scleractinia	<i>Platygyra carnosus</i>	201885	177262	SRR402974-5
Scleractinia	<i>Pocillopora damicornis</i>	24619	22865	Traylor-Knowles <i>et al.</i> 2011
Scleractinia	<i>Porites asteroides</i>	18763	17836	Kenkel <i>et al.</i> 2013
Scleractinia	<i>Seriatopora hystrix</i>	131408	114899	SRR2300678
Zoantharia	<i>Protopalpythoa variabilis</i>	128261	110652	Huang <i>et al.</i> 2016
Octocorallia				
Alcyonacea	<i>Corallium rubrum</i>	115612	104600	SRR1552944
Alcyonacea	<i>Eunicella cavolinii</i>	37801	32950	SRR1324943
Alcyonacea	<i>Eunicella verrucosa</i>	21209	18449	SRR1324944
Alcyonacea	<i>Gorgonia ventalina</i>	199368	169298	SRR935083
Alcyonacea	<i>Leptogorgia sarmentosa</i>	23127	19877	SRR1324968
Alcyonacea	<i>Nephytygorgia</i> sp.	13148	11230	Zapata <i>et al.</i> 2014
Pennatulacea	<i>Renilla reniformis</i>	12689	11579	PRJEB20462
Medusozoa				
Cubozoa				
Carybdeida	<i>Alatina alata</i>	55005	46646	Zapata <i>et al.</i> 2014
Carybdeida	<i>Tripedalia cystophora</i>	12219	10309	SRR1182852;SRR2103559
Chirodropida	<i>Chironex fleckeri</i>	36424	33051	SRR1819888
Endocnidozoa				
Myxozoa	<i>Kudawia iwatai</i>	116287	66828	SRR1300899
Myxozoa	<i>Myxobolus cerebralis</i>	31525	22820	SRR1557039
Myxozoa	<i>Myxobolus pendula</i>	104786	61674	SRR2472984;SRR2472987;SRR2472989
Myxozoa	<i>Thelohanellus kitauei</i>	20745	15941	SRR1103279
Polypodiozoa	<i>Polypodium hydriforme</i>	40691	36554	SRR1336770
Hydrozoa				
Aplanulata	<i>Ectopleura larynx</i>	48126	45677	Zapata <i>et al.</i> 2014
Aplanulata	<i>Hydra magnipapillata</i>	21990	16714	Chapman <i>et al.</i> 2010
Aplanulata	<i>Hydra oligactis</i>	19670	19273	SRR040466-9
Aplanulata	<i>Hydra viridissima</i>	22207	21659	SRR040470-3
Filifera IV	<i>Hydractinia polyclina</i>	85853	74193	SRR923509
Filifera IV	<i>Hydractinia symbiolongicarpus</i>	42614	39436	Zapata <i>et al.</i> 2014
Filifera IV	<i>Podocoryna carnea</i>	80105	58126	Zapata <i>et al.</i> 2014
Filifera IV	<i>Turritopsis</i> sp.	40303	34933	Hasegawa <i>et al.</i> 2016
Leptothecata	<i>Clytia hemisphaerica</i>	109443	99814	Philippe <i>et al.</i> 2009
Siphonophorae	<i>Abylopsis tetragona</i>	66814	62430	Zapata <i>et al.</i> 2014
Siphonophorae	<i>Agalma elegans</i>	57194	52953	Zapata <i>et al.</i> 2014
Siphonophorae	<i>Craseoa lathetica</i>	68649	63471	Zapata <i>et al.</i> 2014
Siphonophorae	<i>Nanomia bijuga</i>	54202	50701	Zapata <i>et al.</i> 2014
Siphonophorae	<i>Physalia physalis</i>	41818	37880	Zapata <i>et al.</i> 2014
Trachylinae	<i>Aegina citrea</i>	39295	35862	Zapata <i>et al.</i> 2014
Trachylinae	<i>Craspedacusta sowerbyi</i>	107130	101380	SRR923472
Scyphozoa				
Coronatae	<i>Atolla vanhoeffeni</i>	19117	17024	Zapata <i>et al.</i> 2014
Coronatae	<i>Periphylla periphylla</i>	52821	47414	SRR1915828
Discomedusae	<i>Aurelia aurita</i>	99449	91169	Brekman <i>et al.</i> 2015
Discomedusae	<i>Cassiopea xamachana</i>	52116	46778	PRJEB21012
Discomedusae	<i>Chrysaora fuscescens</i>	26833	24360	SRR3180892
Discomedusae	<i>Cyanea capillata</i>	36327	33903	SRR1930118
Discomedusae	<i>Stomalophus meleagris</i>	50348	46299	SRR1168418
Staurozoa				
Stauromedusae	<i>Calvadosia cruxmelitensis</i>	69073	62986	Hx2000059702
Stauromedusae	<i>Craterolophus convolvulus</i>	35843	30307	Hx2000059696
Stauromedusae	<i>Halicystus auricula</i>	34950	30195	Hx2000059697
Stauromedusae	<i>Halicystus sanjuanensis</i>	41787	36977	Hx2000059698
Stauromedusae	<i>Leucernaria quadricornis</i>	74822	68427	Hx2000059765
Outgroups				
Annelida	<i>Capitella teleta</i>	32415	31385	Simakov <i>et al.</i> 2013
Arthropoda	<i>Drosophila melanogaster</i>	30438	30360	Gramates <i>et al.</i> 2017
Chordata	<i>Taeniopygia guttata</i>	18204	18147	Warren <i>et al.</i> 2010
Ctenophora	<i>Mnemiopsis leidyi</i>	16548	16198	Ryan <i>et al.</i> 2013
Echinodermata	<i>Strongylocentrotus purpuratus</i>	29129	28913	Cameron <i>et al.</i> 2009
Mollusca	<i>Lottia gigantea</i>	23340	23251	Simakov <i>et al.</i> 2013
Placozoa	<i>Trichoplax adhaerens</i>	11540	11093	Srivastava <i>et al.</i> 2008
Porifera	<i>Amphimedon queenslandica</i>	29883	28514	Srivastava <i>et al.</i> 2010

* SRR correspond to GenBank SRA run numbers; references correspond to predicted proteome or transcriptomes.

List of species included in the first dataset and used for comparing Agalma and OrthoFinder

Species sequenced for this study