

Phylogenetic tree of the phylum Cnidaria, showing relationships between various genera and species. The tree is rooted on the left and branches out to the right. Bootstrap values are indicated at the nodes. The tree is divided into several major clades, including Anthozoa, Scyphozoa, and Hydrozoa. The scale bar at the bottom indicates a genetic distance of 0.07.

Species listed (from top to bottom):

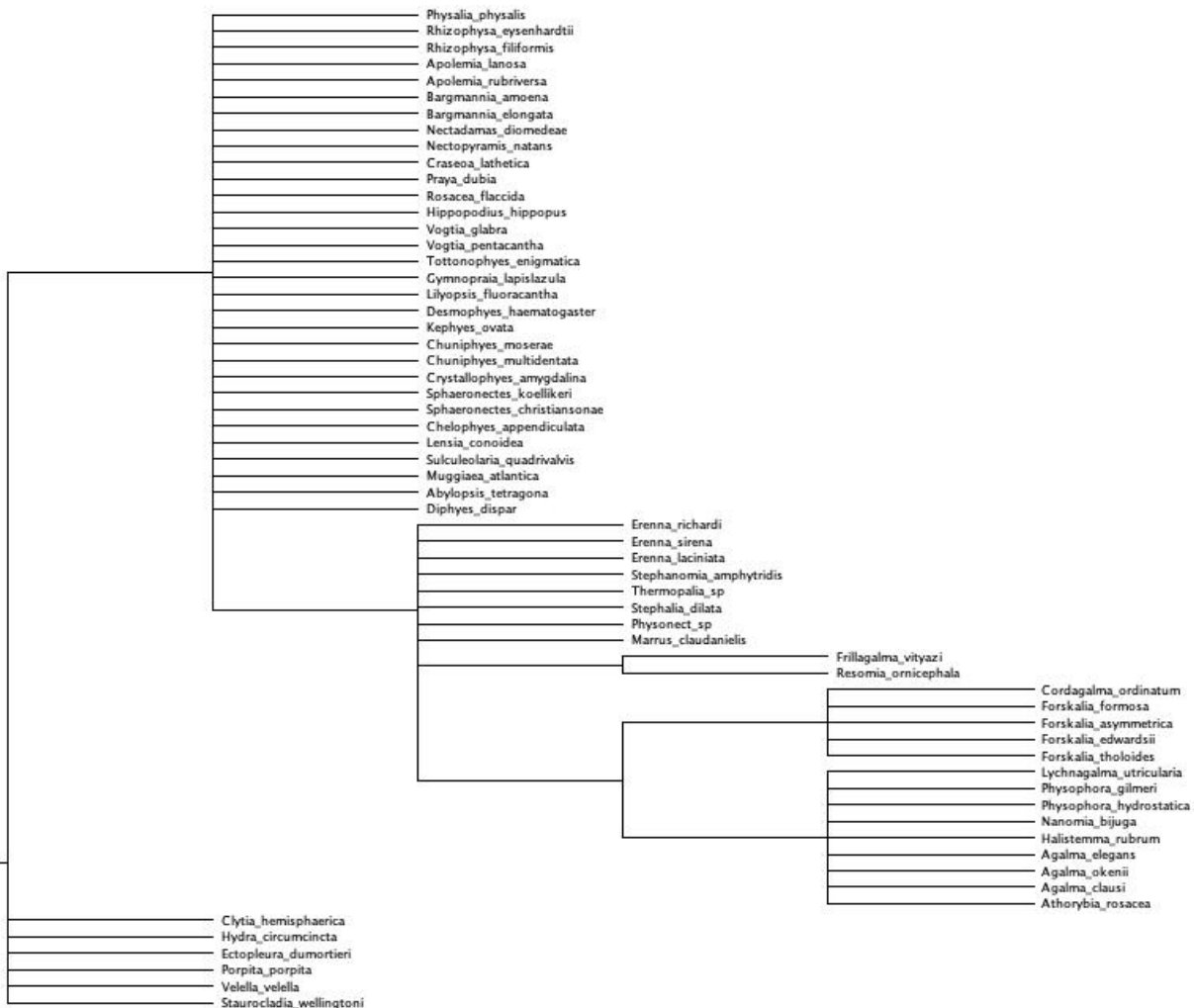
- Physalia physalis*
- Rhizophysa esenhardtii*
- Rhizophysa filiformis*
- Apolemia lanosa*
- Apolemia rubriversa*
- Bargmannia amoena*
- Bargmannia elongata*
- Agalma clausi*
- Agalma elegans*
- Agalma okenii*
- Athyobia rosacea*
- Halistemma rubrum*
- Friellagalma vityazi*
- Nanomia bijuga*
- Forskalia asymmetrica*
- Forskalia edwardsii*
- Forskalia tholoides*
- Forskalia formosa*
- Resomia ornicephala*
- Lychnagalma utricularia*
- Physophora gilmeri*
- Physophora hydrostatica*
- Cordagalma ordinatum*
- Erenna richardi*
- Erenna sirena*
- Erenna laciniata*
- Stephanomia amphitridis*
- Marrus claudanielis*
- Physonect sp.*
- Stephalia dilata*
- Thermopalia sp.*
- Nectadamas diomedae*
- Nectopyramis natans*
- Hippopodius hippopus*
- Vogtia pentacantha*
- Vogtia glabra*
- Praya dubia*
- Craseoa lathetica*
- Desmophyes haematogaster*
- Lilypopsis fluoracantha*
- Gymnopraxis lapistazula*
- Rosacea flaccida*
- Tottonophyes enigmatica*
- Chuniphyes moserae*
- Chuniphyes multidentata*
- Kephyes ovata*
- Crystallophyes amygdalina*
- Sphaeronectes christiansonae*
- Sphaeronectes koelikeri*
- Chelophyes appendiculata*
- Lensia conoidea*
- Sulculeolaria quadrivalvis*
- Muggioia atlantica*
- Abylopsis tetragona*
- Diphyes dispar*
- Clytia hemisphaerica*
- Hydra circumcincta*
- Ectopleura dumortieri*
- Porpita porpita*
- Velella velella*
- Staurocladia wellingtoni*

Scale bar: 0.07

(Abylopsis\_tetragona:0.0737530935,((((((((((((Agalma\_clausi:0.0073772421,(Agalma\_elegans:0.0147327516,  
(Agalma\_okenii:0.0096092722,Athorybia\_rosacea:  
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(Frillagalma\_vityazi:0.0047656982,Nanomia\_bijuga:0.0038745160)100:0.024247)98:0.016231,  
((Forskalia\_asymmetrica:0.0501806465,((Forskalia\_edwardsii:0.0095647201,Forskalia\_tholoides:  
0.0292818859)100:0.016694,Forskalia\_formosa:0.0219560405)96:0.010508)100:0.068062,Resomia\_ornicephala:  
0.1147472041)53:0.009650)55:0.013720,(Lychnagalma\_utricularia:0.0223547096,(Physophora\_gilmeri:  
0.0465924185,Physophora\_hydrostatica:  
0.0431036184)94:0.008085)95:0.012078)84:0.004989,Cordagalma\_ordinatum:0.1473868892)61:0.008539,  
(((Apolemia\_lanosa:0.0075296599,Apolemia\_rubrivarsa:0.0040622198)100:0.023504,(((Clytia\_hemisphaerica:  
0.2666609156,Hydra\_circumcincta:0.0690661253)99:0.032336,Ectopleura\_dumortieri:0.1256826132)98:0.014610,  
(Porpita\_porpita:0.0304534286,Vellella\_vellella:0.0432922408)100:0.089804,Staurocladia\_wellingtoni:  
0.0527824931)100:0.023684)100:0.026913,(Physalia\_physalis:0.0949465521,(Rhizophysa\_eysenhardtii:  
0.0262110684,Rhizophysa\_filiformis:0.0245914685)100:0.014912)100:0.031738)100:0.023036)94:0.011918,  
(Bargmannia\_amoena:0.0109915497,Bargmannia\_elongata:0.0144721012)100:0.028781)83:0.007801)45:0.001881,  
(((Erenna\_richardi:0.0059876549,Erenna\_sirena:0.0031197829)99:0.001691,Erenna\_laciniata:  
0.0037930579)100:0.009073,Stephanomia\_amphytridis:0.0118098191)99:0.006212,((Marrus\_claudanielis:  
0.0199607085,Physonect\_sp:0.0109415556)100:0.010606,(Stephalia\_dilata:0.0031382041,Thermopalia\_sp:  
0.0078663374)100:0.016395)91:0.005724)91:0.007626)68:0.016851,(Nectadamas\_diomedeeae:  
0.0313655101,Nectopyramis\_natans:0.0360237431)99:0.013778)40:0.002694,(((Hippopodius\_hippopus:  
0.0783786182,Vogtia\_pentacantha:0.0601377768)100:0.042899,Vogtia\_glabra:  
0.0683322819)100:0.146336,Praya\_dubia:0.0175990104)53:0.027866)81:0.023624,Craseoa\_lathetica:  
0.0805595864)62:0.020910,((Desmophyes\_haematogaster:0.0443922014,Lilyopsis\_fluoracantha:  
0.0510727436)100:0.072848,(Gymnopraila\_lapislazula:0.1344824183,Rosacea\_flaccida:  
0.1095318238)37:0.011527)45:0.018923)95:0.022356,Tottonophyes\_enigmatica:0.0544277894)100:0.022875,  
(((Chuniphyes\_moserae:0.0402145683,Chuniphyes\_multidentata:0.0407370893)100:0.043737,Kephyes\_ovata:

0.0470403631)98:0.028833,Crystallophytes\_amygdalina:0.1570744992)99:0.030507)99:0.044983,  
 (Sphaeronectes\_christiansonae:0.0000020215,Sphaeronectes\_koellikeri:0.0150093787)100:0.138596)100:0.068345,  
 (Chelophyes\_appendiculata:0.1813002861,((Lensia\_conoidea:0.0592207483,Sulculeolaria\_quadriavlis:  
 0.0729159392)100:0.041953,Muggiaea\_atlantica:  
 0.0702494755)99:0.021958)95:0.022560)83:0.017425,Diphyes\_dispar:0.0759807855);

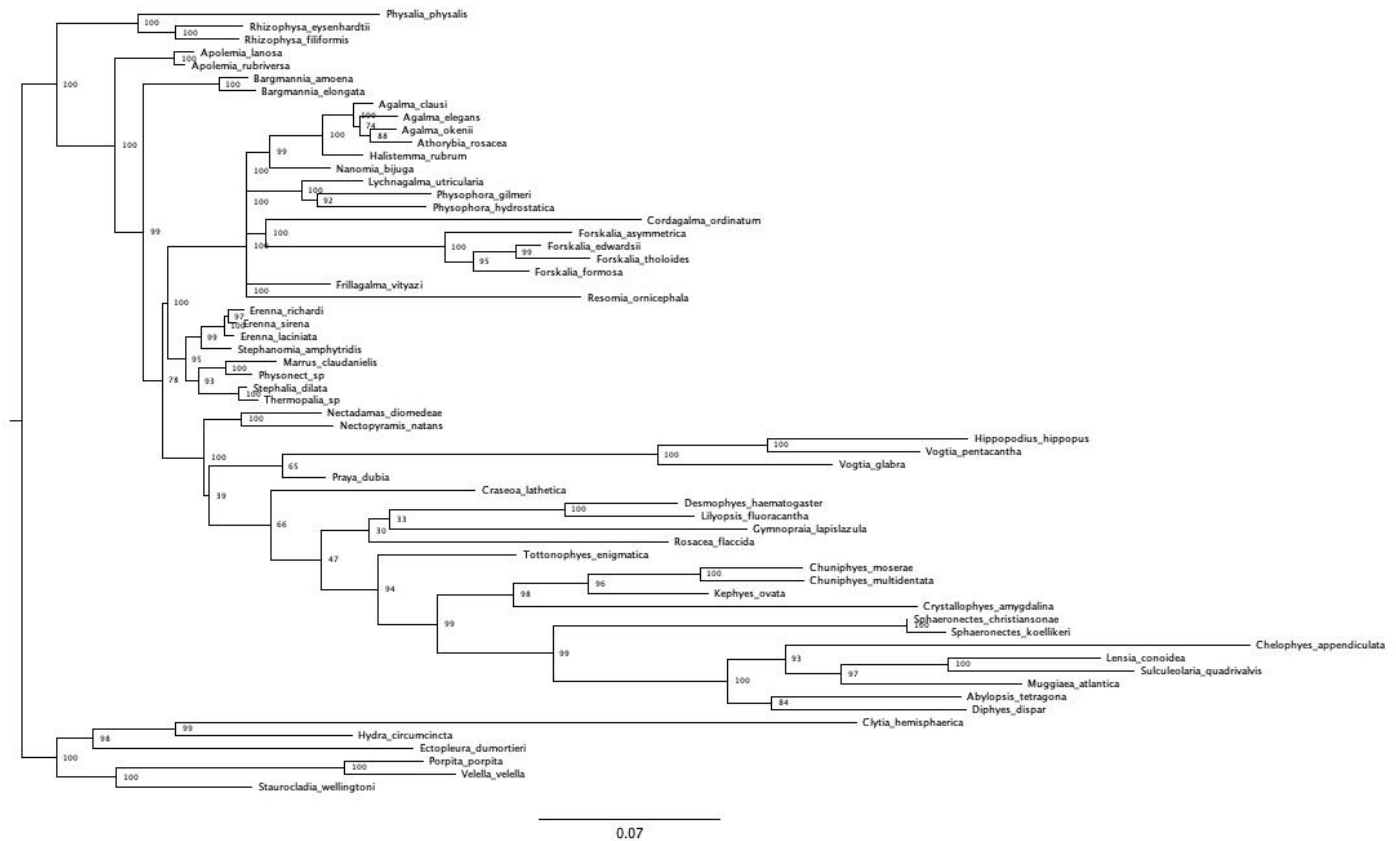
6.2) Topology used to constrain analyses (minimal topological statements based on the incongruences between the unconstrained tree and Munro et al. (2018). Newick tree file underneath.



((Physalia\_physalis, Rhizophysa\_eysenhardtii, Rhizophysa\_filiformis, Apolemia\_lanosa,  
 Apolemia\_rubriversa, Bargmannia\_amoena, Bargmannia\_elongata, Nectadamas\_diomedae, Nectopyramis\_natans,  
 Craseoa\_lathetica, Praya\_dubia, Rosacea\_flaccida, Hippopodius\_hippopus, Vogtia\_glabra, Vogtia\_pentacantha,  
 Tottonophyes\_enigmatica, Gymnopraxis\_lapislazula, Lilyopsis\_fluoracantha,  
 Desmophyes\_haematogaster, Kephyes\_ovata, Chuniphyes\_moserae, Chuniphyes\_multidentata,  
 Crystallophytes\_amygdalina, Sphaeronectes\_koellikeri, Sphaeronectes\_christiansonae, Chelophyes\_appendiculata,  
 Lensia\_conoidea, Sulculeolaria\_quadriavlis, Muggiaea\_atlantica, Abylopsis\_tetragona, Diphyes\_dispar,  
 (Erenna\_richardi, Erenna\_sirena, Erenna\_laciniata, Stephanomia\_amphytridis, Thermopalia\_sp, Stephalia\_dilata,  
 Physonect\_sp, Marrus\_claudanielis, (Frillagalma\_vityazi, Resomia\_ornicephala), (Cordagalma\_ordinatum,  
 Forskalia\_formosa, Forskalia\_asymmetrica, Forskalia\_edwardsii, Forskalia\_tholoides), (Lychnagalma\_utricularia,

Physophora\_gilmeri, Physophora\_hydrostatica, Nanomia\_bijuga, Halistemma\_rubrum, Agalma\_elegans, Agalma\_okenii, Agalma\_clausi, Athorybia\_rosacea)), Clytia\_hemisphaerica, Hydra\_circumcincta, Ectopleura\_dumortieri, Porpita\_porpita, Velella\_velella, Staurocladia\_wellingtoni);

6.3) Constrained IQTree ML inference. Node labels are bootstrap support values. Newick tree file underneath.



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(Abylopsis_tetragona:0.0728388138,((((((((((((Agalma_clausi:0.0072136820,(Agalma_elegans:0.0144926448,
(Agalma_okenii:0.0094858527,Athorybia_rosacea:
0.0156874963)88:0.004405)74:0.002304)100:0.011915,Halistemma_rubrum:
0.0156303285)100:0.020410,Nanomia_bijuga:0.0231381300)99:0.008849,(Lychnagalma_utricularia:0.0235447276,
(Physophora_gilmeri:0.0439158291,Physophora_hydrostatica:
0.0419849050)92:0.006023)100:0.021075)100:0.000002,(Cordagalma_ordinatum:0.1446399042,
(Forskalia_asymmetrica:0.0491811058,((Forskalia_edwardsii:0.0096305682,Forskalia_tholoides:
0.0286755133)99:0.016498,Forskalia_formosa:
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0.2626898568,Hydra_circumcincta:0.0677967486)99:0.031965,Ectopleura_dumortieri:0.1236566102)98:0.014322,
((Porpita_porpita:0.0300939083,Velella_velella:0.0425350705)100:0.088308,Staurocladia_wellingtoni:
0.0522554813)100:0.023249)100:0.026447,(Physalia_physalis:0.0935099505,(Rhizophysa_eysenhardtii:
0.0257953773,Rhizophysa_filiformis:0.0241951861)100:0.014715)100:0.031514)100:0.022836)99:0.010897,
(Bargmannia_amoena:0.0109891990,Bargmannia_elongata:0.0140454763)100:0.029043)78:0.007275)100:0.016103,
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(Nectadamas\_diomedeeae:0.0307683092,Nectopyramis\_natans:0.0355497952)100:0.014391)39:0.001930,  
(((Hippopodius\_hippopus:0.0775070010,Vogtia\_pentacantha:0.0589225229)100:0.042364,Vogtia\_glabra:  
0.0675707968)100:0.144920,Praya\_dubia:0.0166460090)65:0.028266)66:0.023740,Craseoa\_lathetica:  
0.0790972341)47:0.019827,(((Desmophyes\_haematogaster:0.0436658586,Lilyopsis\_fluoracantha:  
0.0502866178)100:0.067356,Gymnopraia\_lapislazula:0.1376720302)33:0.008012,Rosacea\_flaccida:  
0.1153025359)30:0.018345)94:0.021816,Tottonophyes\_enigmatica:0.0532617434)99:0.022959,  
(((Chuniphyes\_moserae:0.0396312867,Chuniphyes\_multidentata:0.0400512717)100:0.043128,Kephyes\_ovata:  
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(Sphaeronectes\_christiansonae:0.0000021509,Sphaeronectes\_koellikeri:0.0147671924)100:0.136871)100:0.067601,  
(Chelophyes\_appendiculata:0.1793164576,((Lensia\_conoidea:0.0584925843,Sulculeolaria\_quadriavlis:  
0.0718377748)100:0.041241,Muggiaea\_atlantica:  
0.0694004916)97:0.021734)93:0.022145)84:0.016987,Diphyes\_dispar:0.0749428976);