Filogenia dos Metazoa

AULA 5

Histórico da Classificação e Filogenia de Cnidaria

Prof. Dr. Felipe B. Ribeiro

FFCLRP
EXPERIENTIA FIDES NOSTRA - 1964
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USP

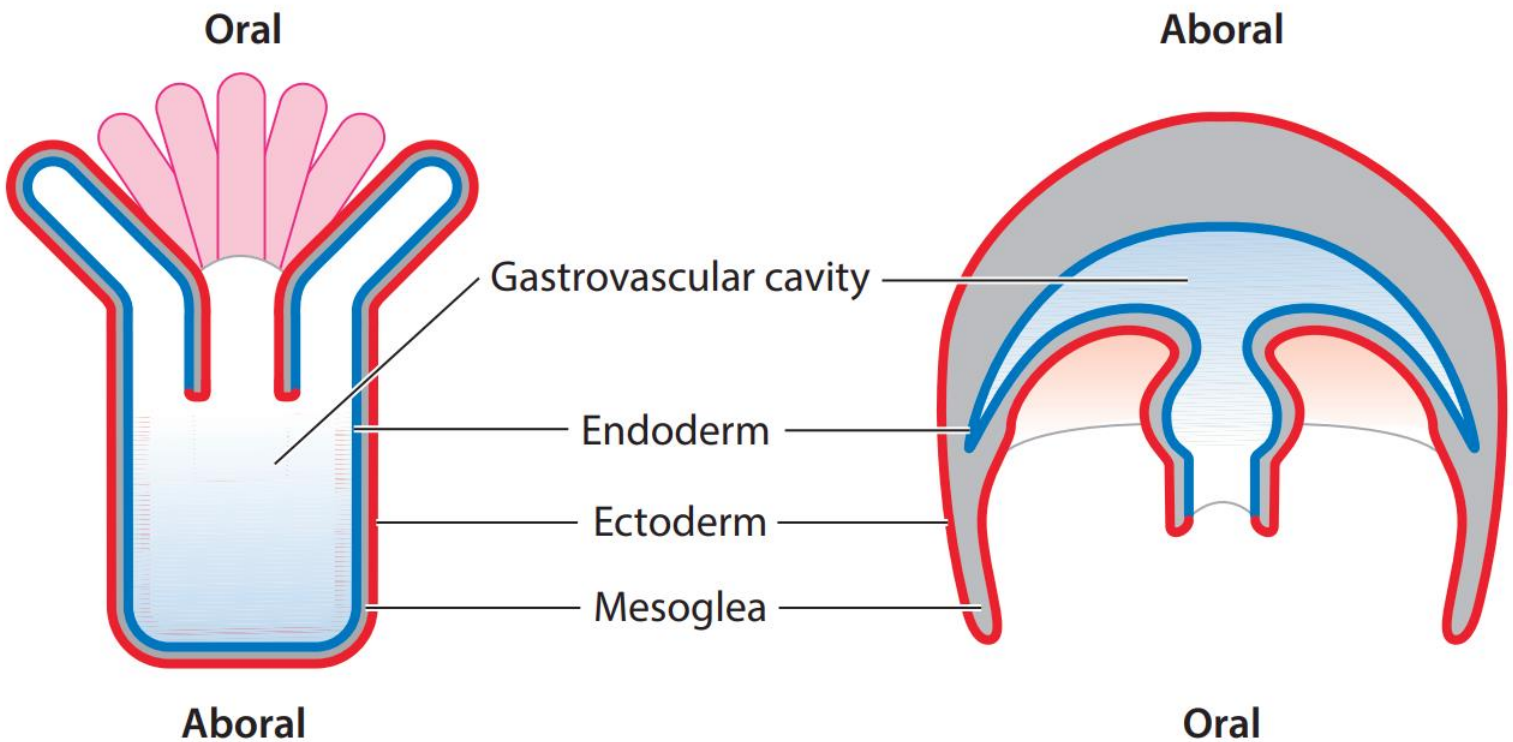
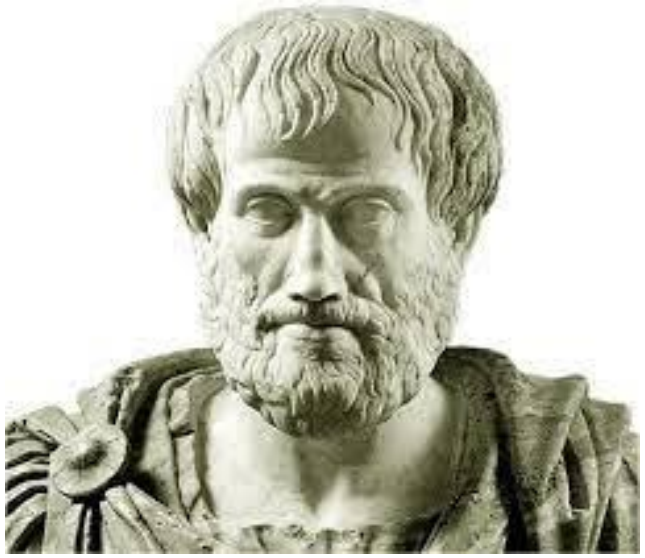
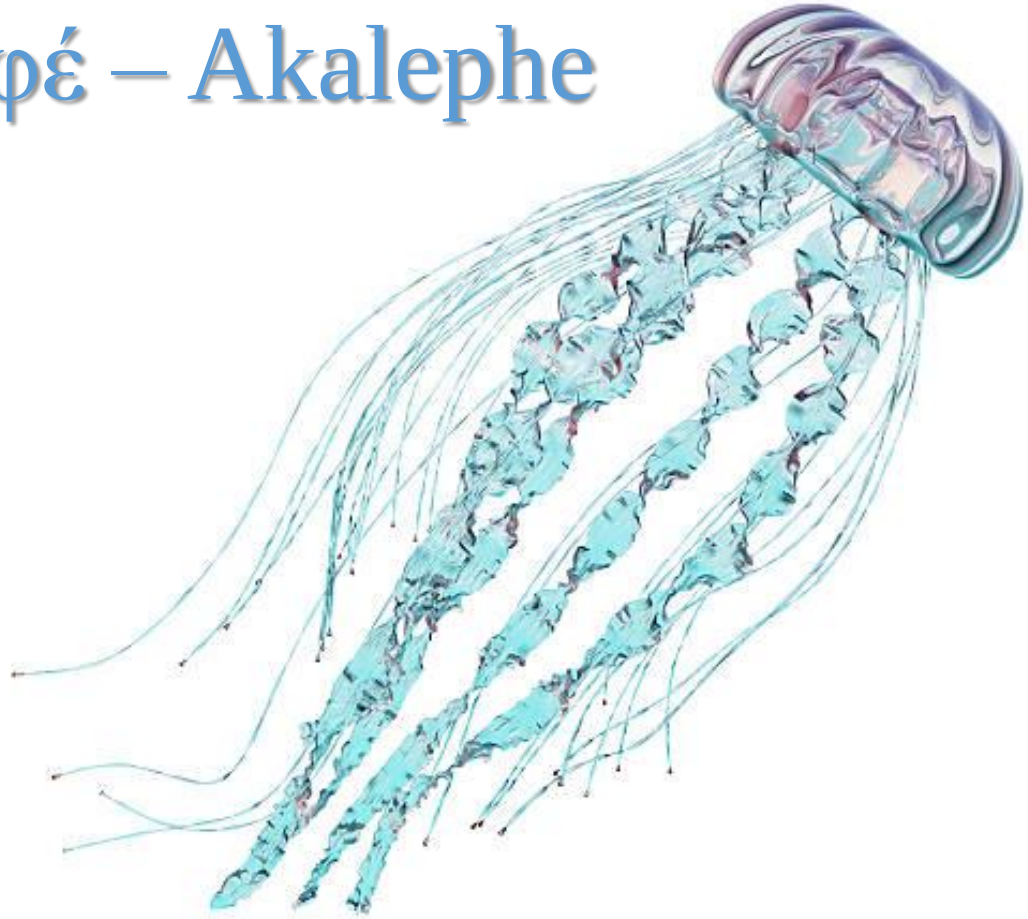


FIGURE 8.1. Schematic drawing of cross sections of the polyp (left) and medusa (right) of cnidarians.

Histórico Taxonômico e Classificação



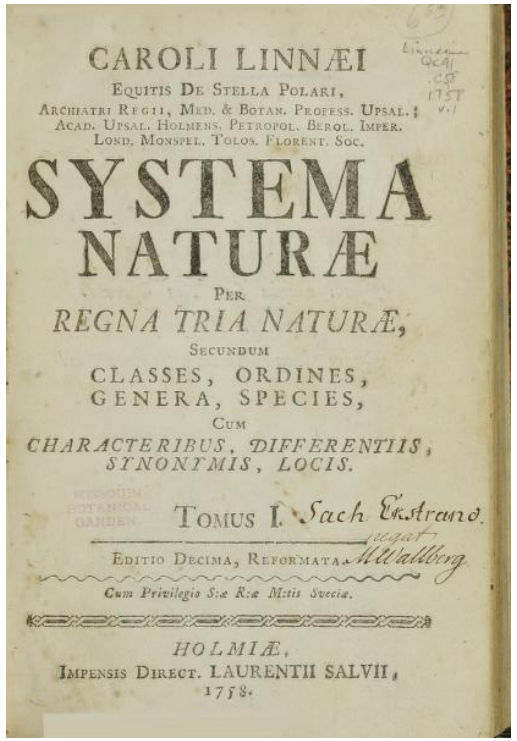
Ακαλεφέ – Akalephe



Κνίδαε – Cnidae

Histórico Taxonômico e Classificação

Século XVIII - Zoophyta


CAROLI LINNÆI
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ACAD. UPSAL. HOLMENS. PETROPOL. BEROL. IMPER.
LOND. MONSPEL. TOLOS. FLORENT. SOC.

SYSTEMA NATURÆ

PER
REGNA TRIA NATURÆ,
SECUNDUM
CLASSES, ORDINES,
GENERA, SPECIES,
CUM
CHARACTERIBUS, DIFFERENTIIS,
SYNONYMIS, LOCIS.

TOMUS I.

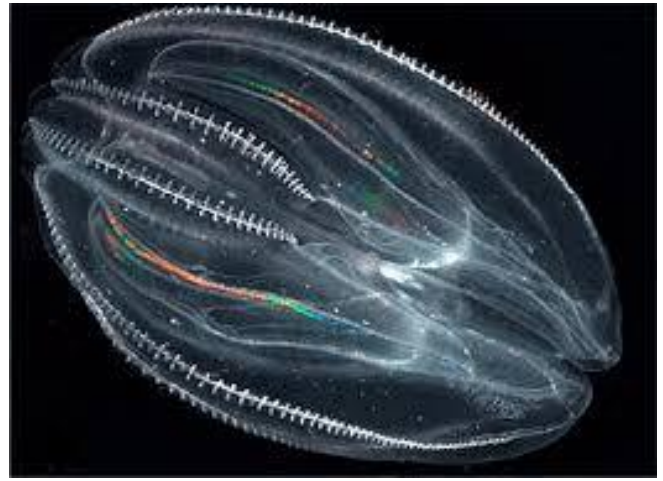
EDITIO DECIMA, REFORMATA.

Cum Privilegio S:æ R:æ M:tis Sveciæ.

HOLMIÆ,
IMPENSIS DIRECT. LAURENTII SALVII,
1758.

Histórico Taxonômico e Classificação

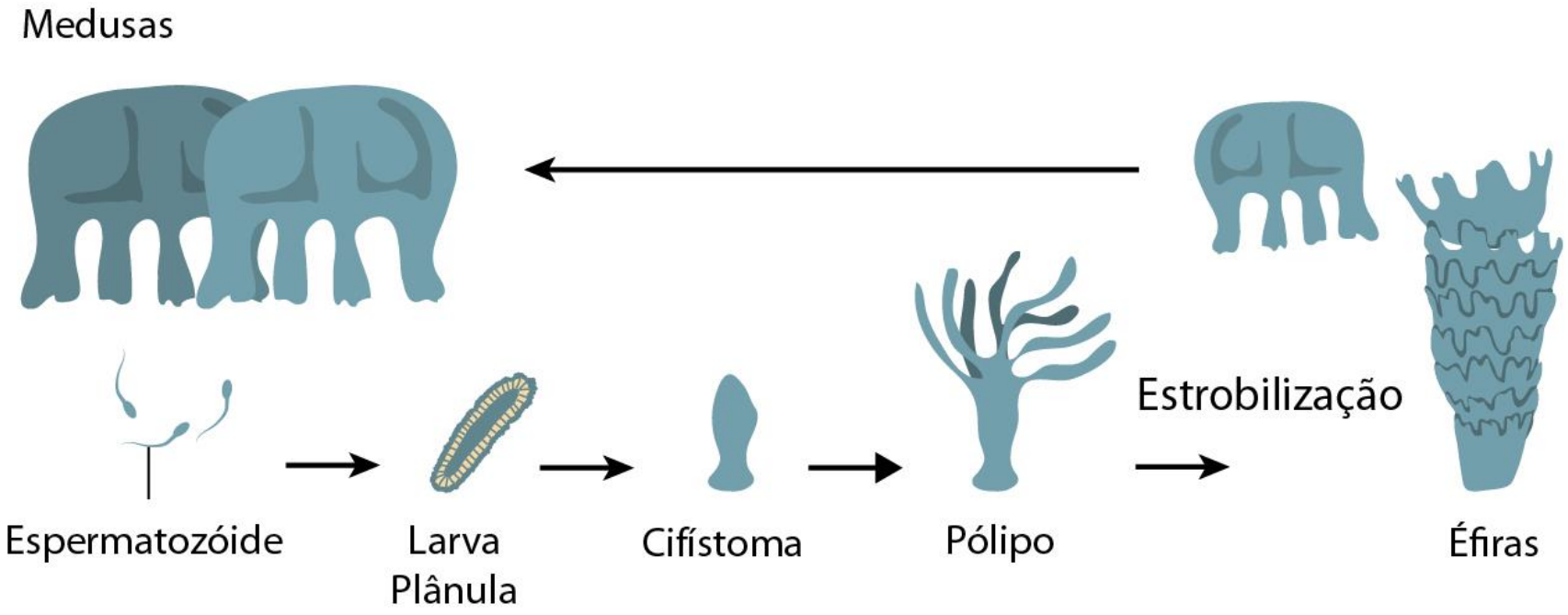
Radiata (Radiaires)



Histórico Taxonômico e Classificação

Século XIX

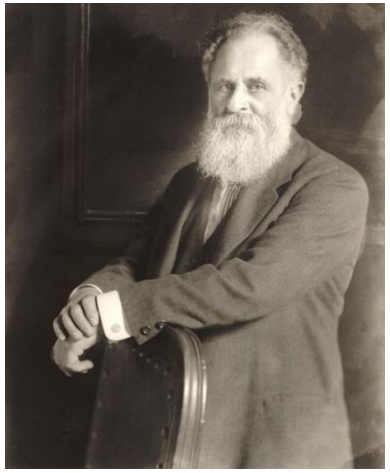
- Michael Sars: *Scyphistoma*, *Strobila* e *Ephyra* representavam, na verdade, estágios do ciclo de vida de certas medusas (cifozoários);

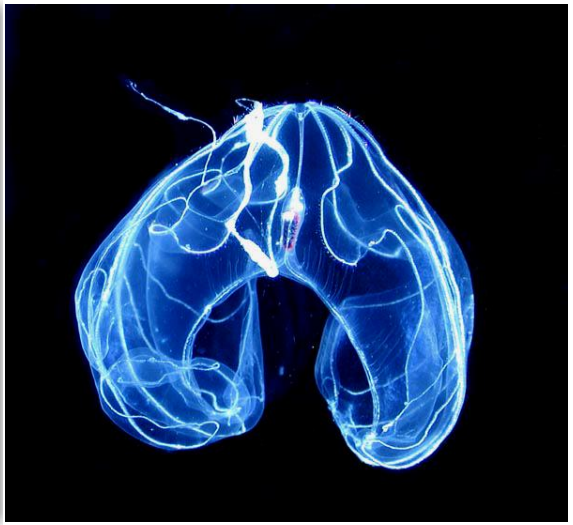


Histórico Taxonômico e Classificação

Século XIX

- **Rudolf Leuckart:** Coelenterata (*koilos*, "cavidade"; e *enteron*, "intestino") → "intestino" como única cavidade do corpo.
- **Berthold Hatschek:** dividiu Coelenterata em três filos;

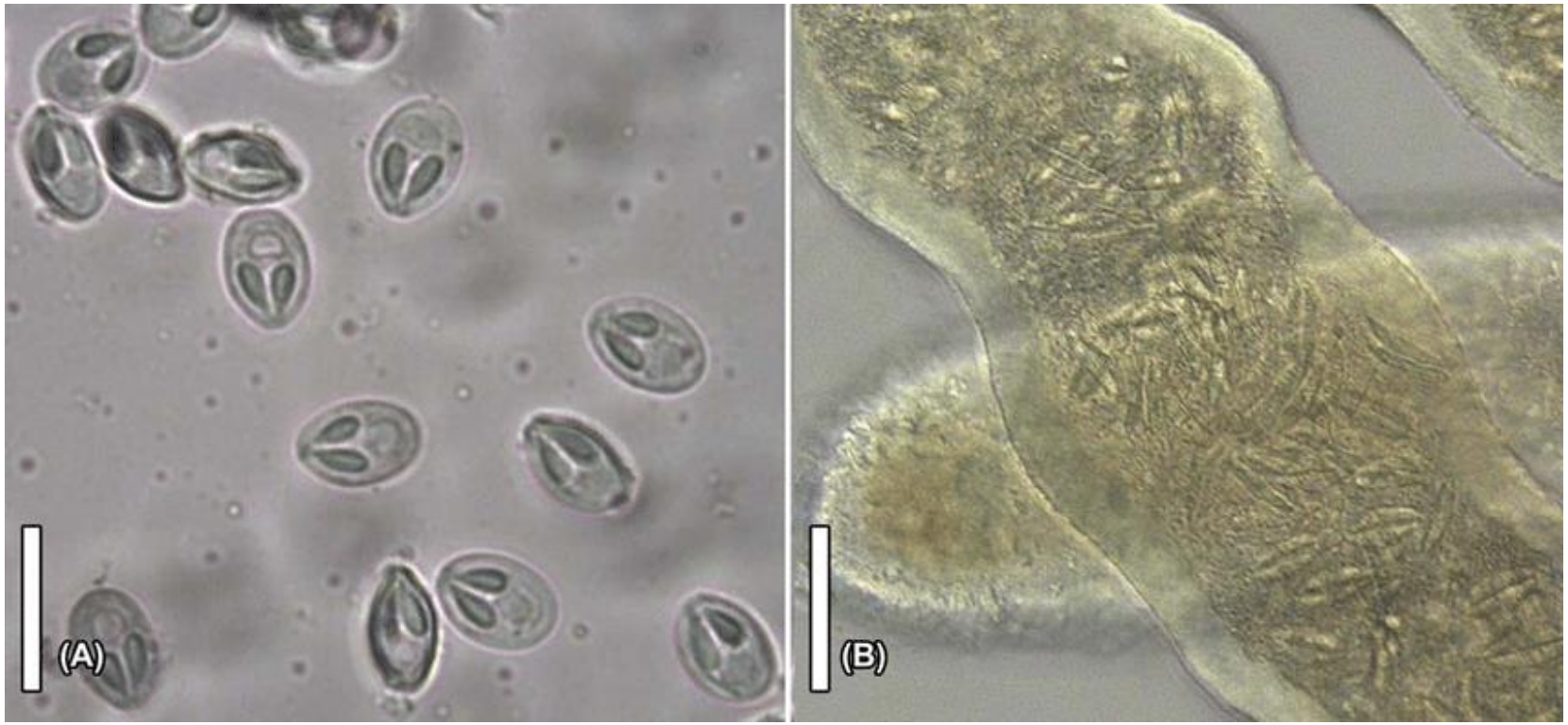



Histórico Taxonômico e Classificação

Século XIX

- Descoberta de Myxozoa



Histórico Taxonômico e Classificação

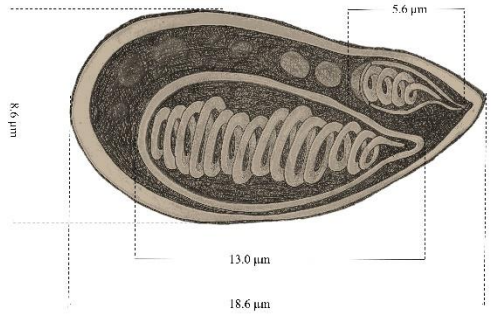
Século XX – Atualidade

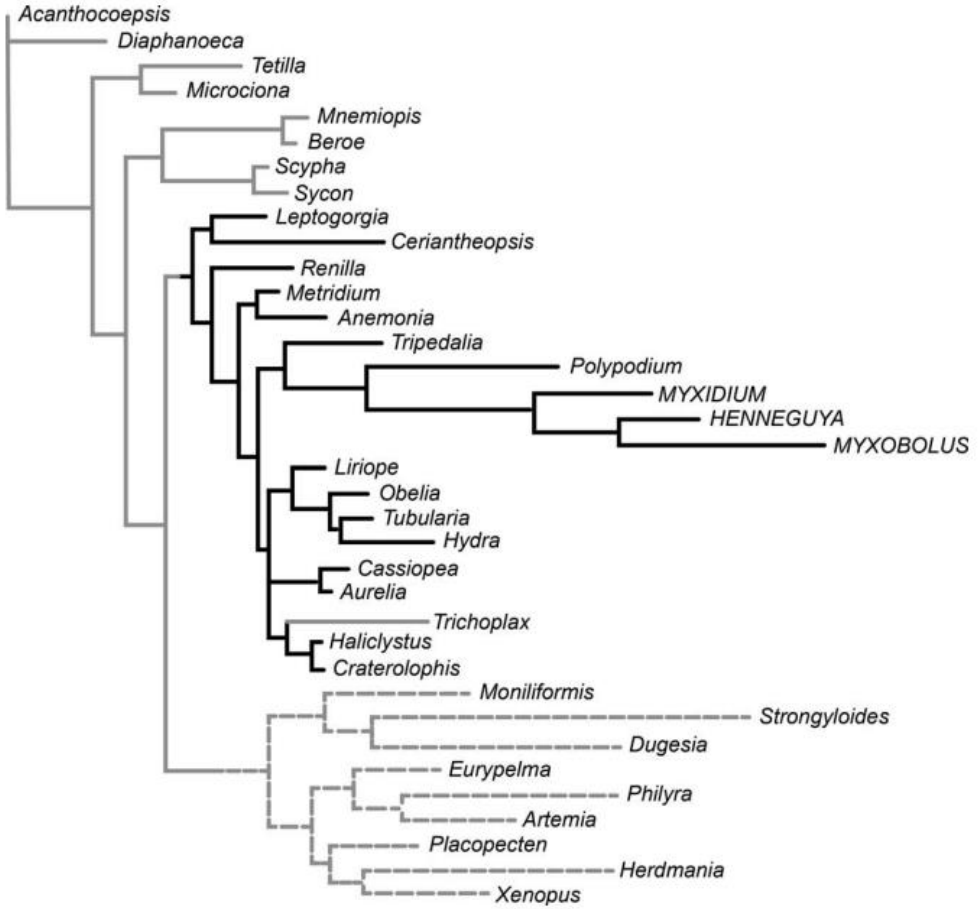
”The loss of metazoan apomorphies such as epithelia, nerve cells, and sensory systems, as well as cnidarian apomorphies such as a gastrovascular system, underscore that the Myxozoa represent one of the most striking examples of the loss of complexity found in the evolutionary transition to parasitism”

J. Parasitol., 101(3), 2015, pp. 269–274

THE ROAD TO CNIDARIA: HISTORY OF PHYLOGENY OF THE MYXOZOA

Jonathan Foox and Mark E. Siddall*
Richard Gilder Graduate School, American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024. Correspondence should be sent to: *jfoox@amnh.org*





Siddall et al. (1995; Fig. 3B)

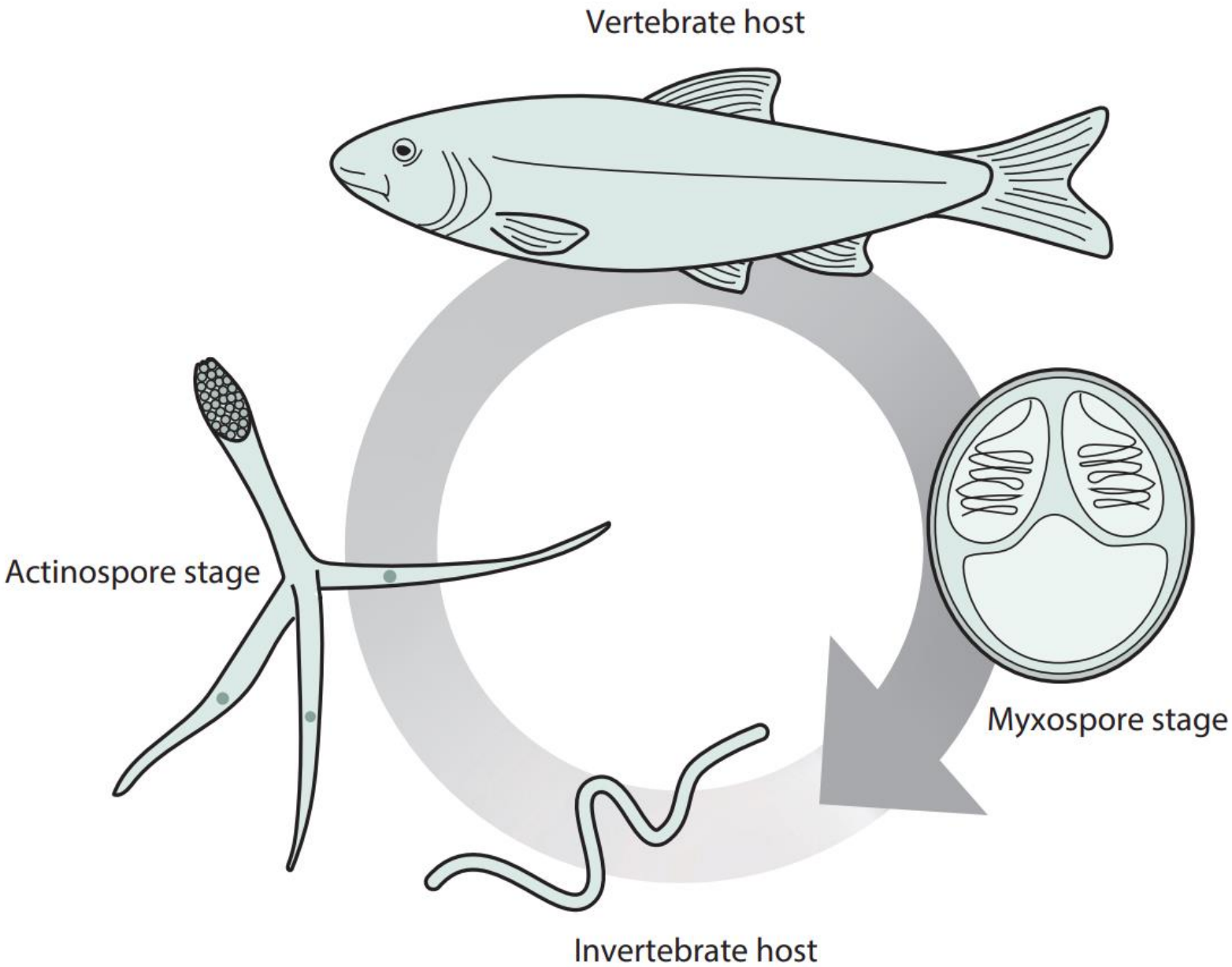
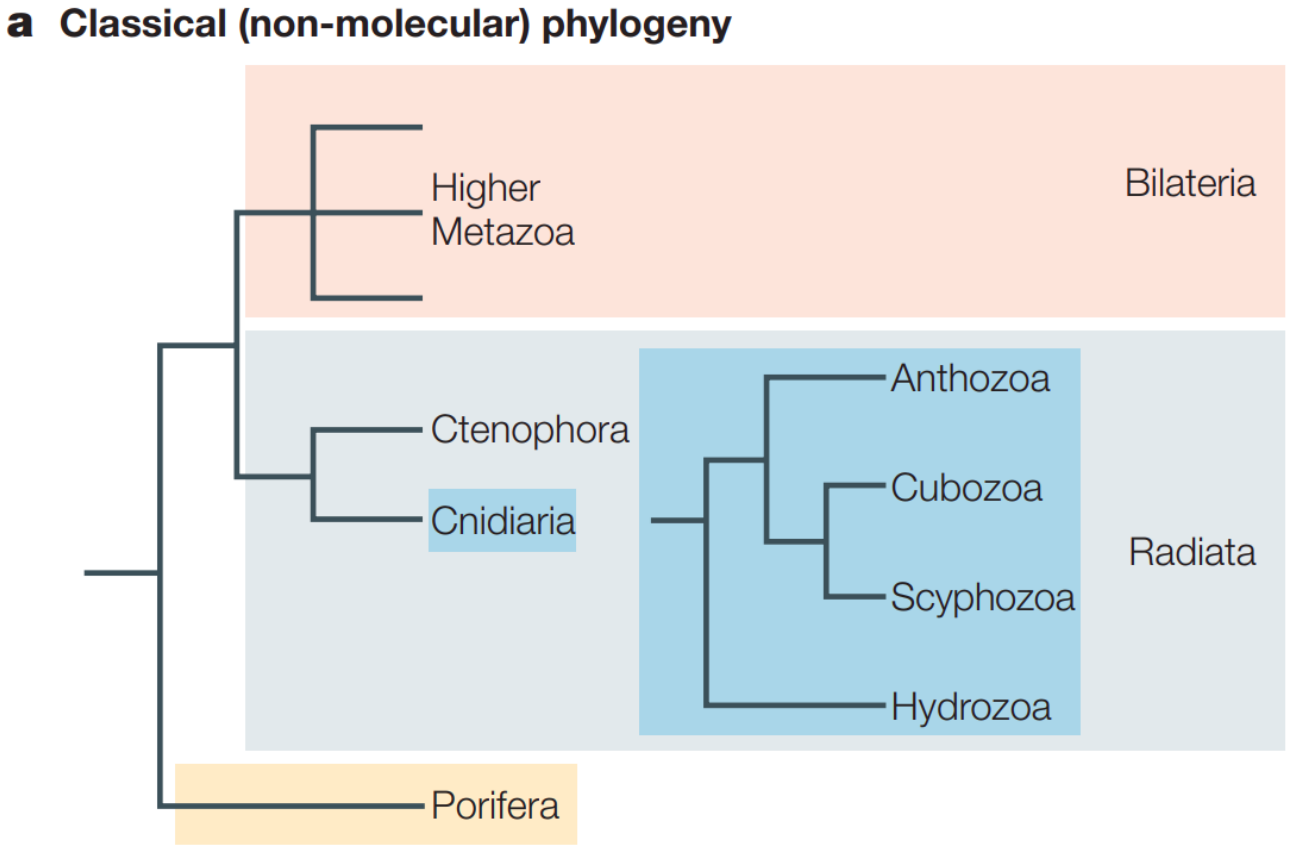
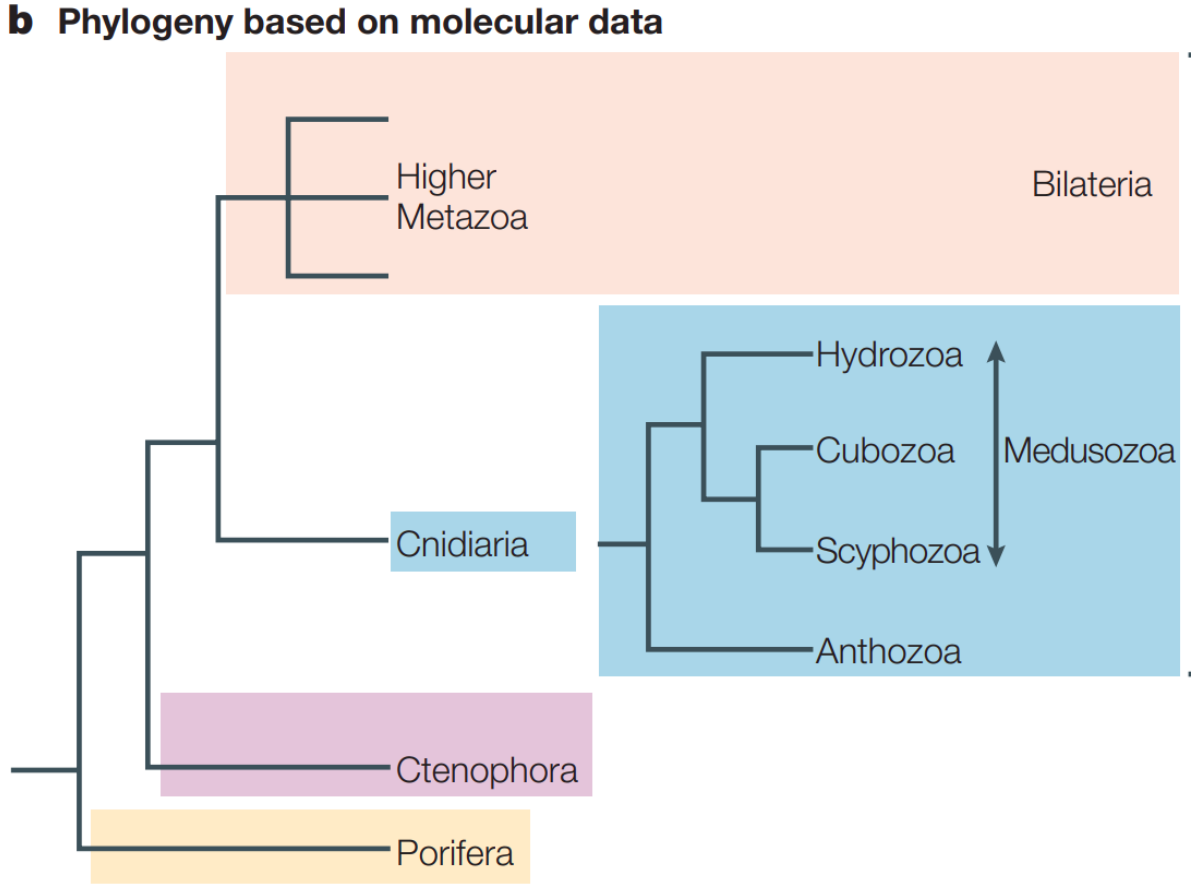


FIGURE 8.4. Life cycle of the myxozoan *Myxobolus cerebralis*. Based on an illustration from S. Atkinson for fish-pathogens.net.

Histórico Taxonômico e Classificação





Invertebrate Biology 123(1): 23–42.

Cladistic analysis of Medusozoa and cnidarian evolution

Antonio C. Marques[1,a] and Allen G. Collins[2]

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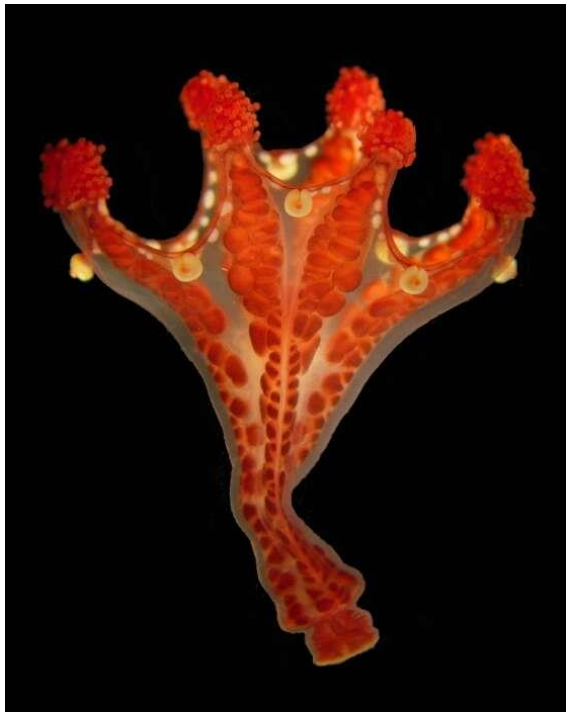
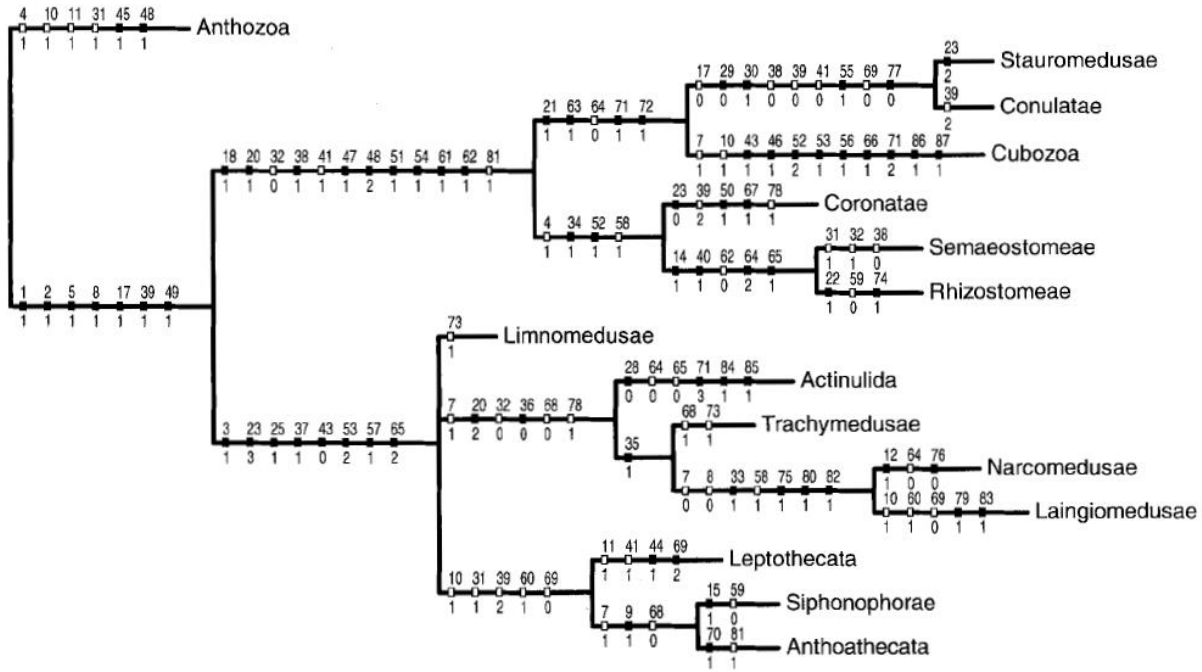
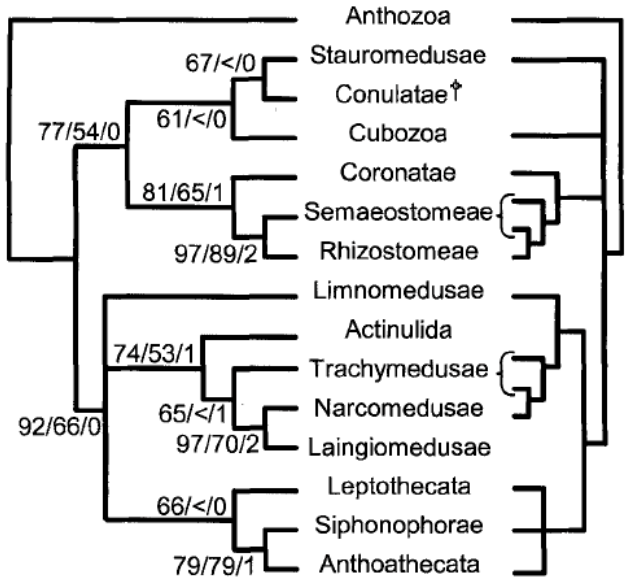
[2] ITZ, Ecology & Evolution, Tierärtzliche Hochschule Hannover, Bünteweg 17d, 30559 Hannover, Germany





Propõem uma nova classe: Staurozoa



Histórico Taxonômico e Classificação

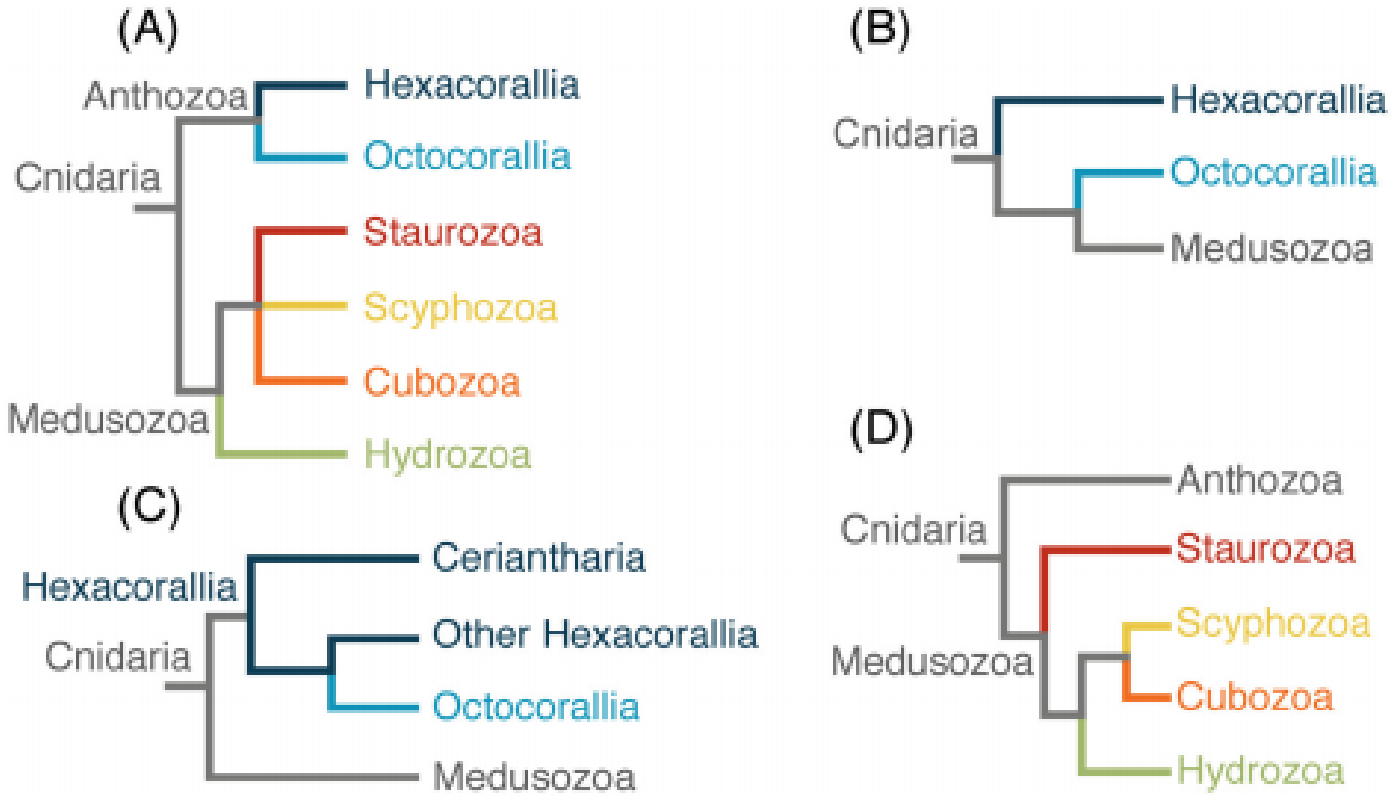


Fig 2. Alternative hypotheses for internal relationships within Cnidaria. (A) Traditional classification and relationships within Cnidaria. (B) Anthozoa paraphyletic with Octocorallia sister to Medusozoa [8]. (C) Hexacorallia paraphyletic with Ceriantharia sister to Hexacorallia + Octocorallia clade [17]. (D) Staurozoa as the sister taxon to the rest of Medusozoa [7]. The color of the branches corresponds to the color of clades in the results and supplemental figures.

doi:10.1371/journal.pone.0139068.g002

RESEARCH ARTICLE

Phylogenomic Analyses Support Traditional Relationships within Cnidaria

Felipe Zapata[1]*, Freya E. Goetz[1¤a], Stephen A. Smith[1¤b], Mark Howison[1,2], Stefan Siebert[1], Samuel H. Church[1¤c], Steven M. Sanders[3¤d], Cheryl Lewis Ames[4,5], Catherine S. McFadden[6], Scott C. France[7], Marymegan Daly[8], Allen G. Collins[4,9], Steven H. D. Haddock[10], Casey W. Dunn[1], Paulyn Cartwright[3]

Histórico Taxonômico e Classificação

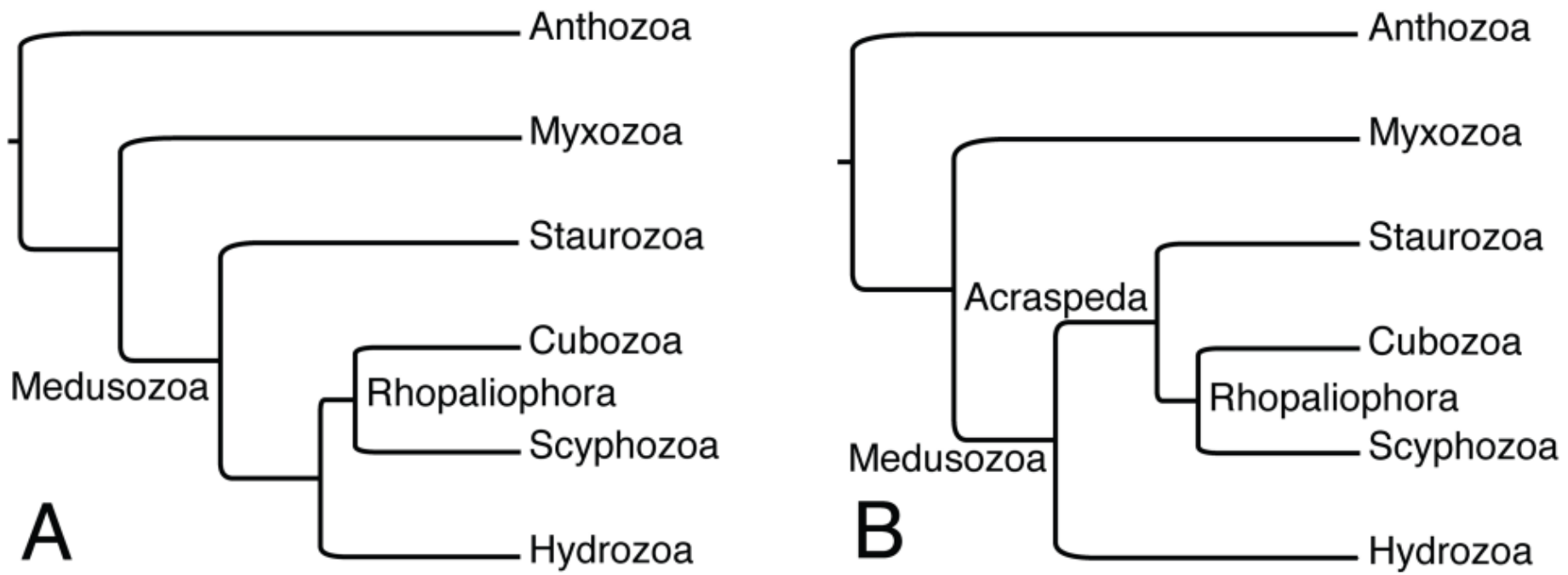
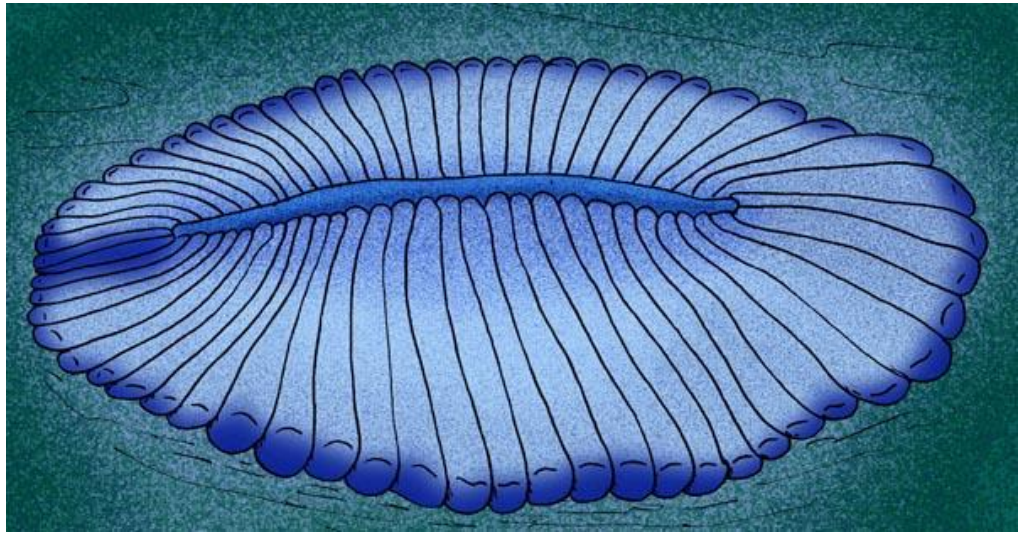


Figure 3 Alternative phylogenetic hypotheses for the placement of Staurozoa within Medusozoa. (A) Based on analyses of ribosomal and mitochondrial markers of *Picciani et al. (2018)*. (B) Based on phylogenomic analyses of *Kayal et al. (2018)*. Myxozoa has been added to (A) for comparability, but this group has generally not been treated in analyses of ribosomal and mitochondrial markers data due to highly accelerated rates of evolution.

Full-size DOI: 10.7717/peerj.6693/fig-3

Origem e evolução dos cnidários

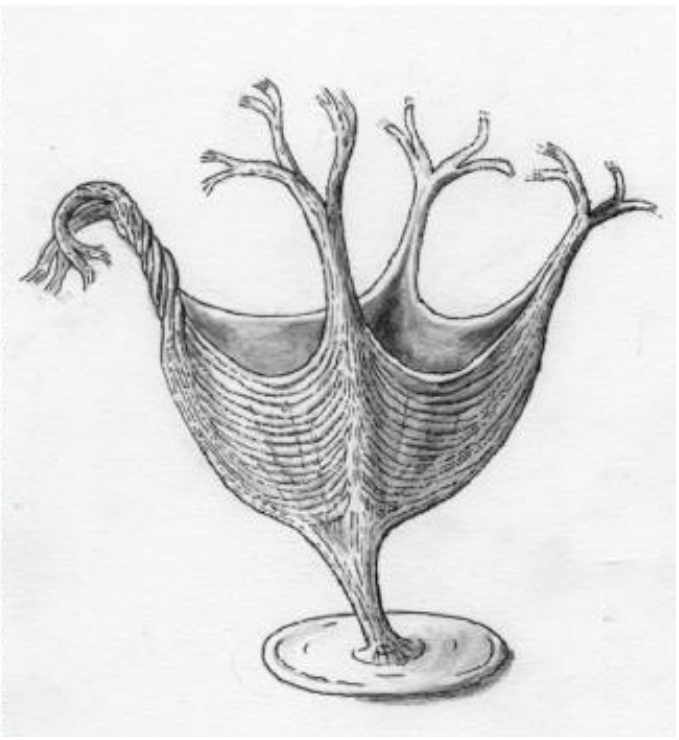
Período Ediacarano



Dickinsonia

Origem e evolução dos cnidários

Período Ediacarano



Haootia quadriformis

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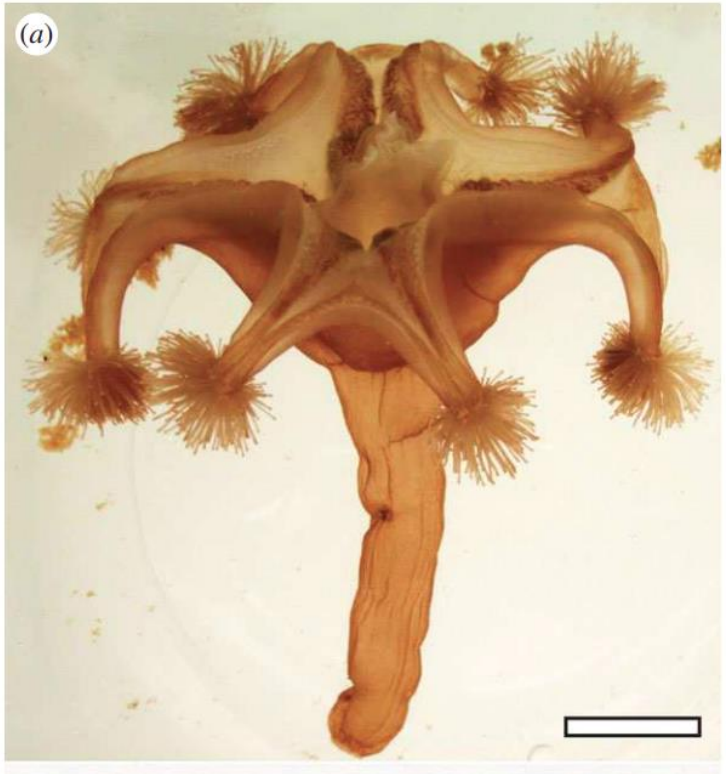
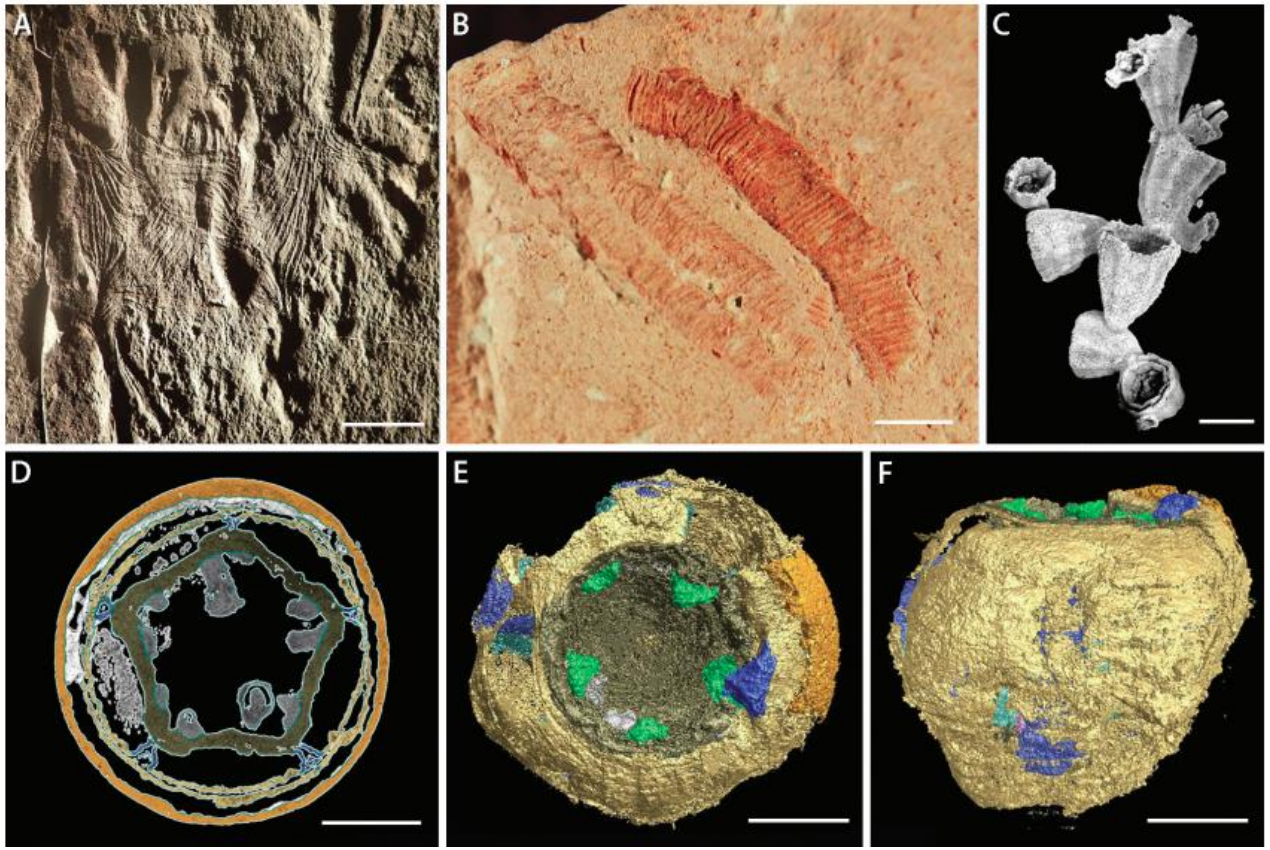
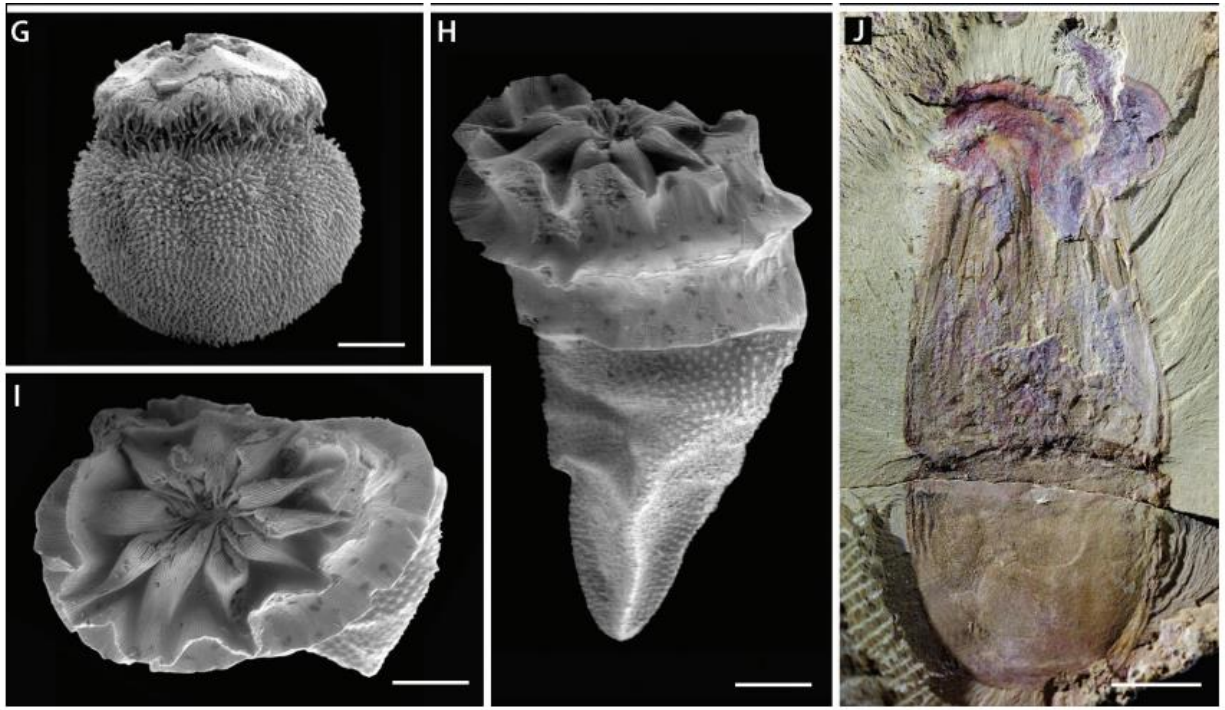
Haootia quadriformis n. gen., n. sp., interpreted as a muscular cnidarian impression from the Late Ediacaran period (approx. 560 Ma)

Alexander G. Liu[1], Jack J. Matthews[2], Latha R. Menon[2], Duncan McIlroy[3] and Martin D. Brasier[2,3]



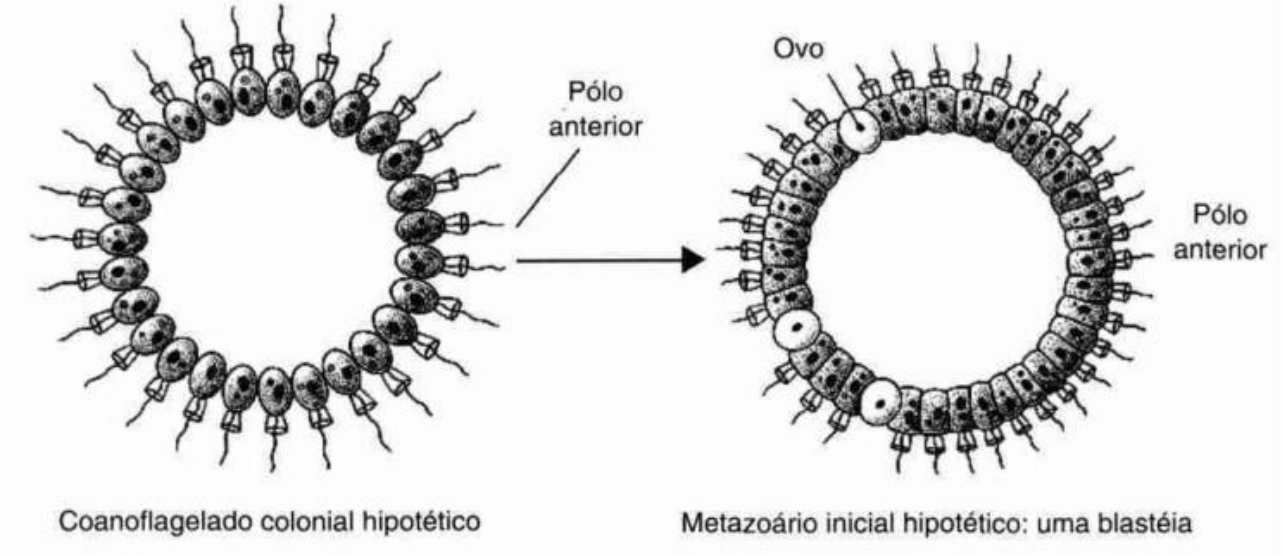
Origem e evolução dos cnidários



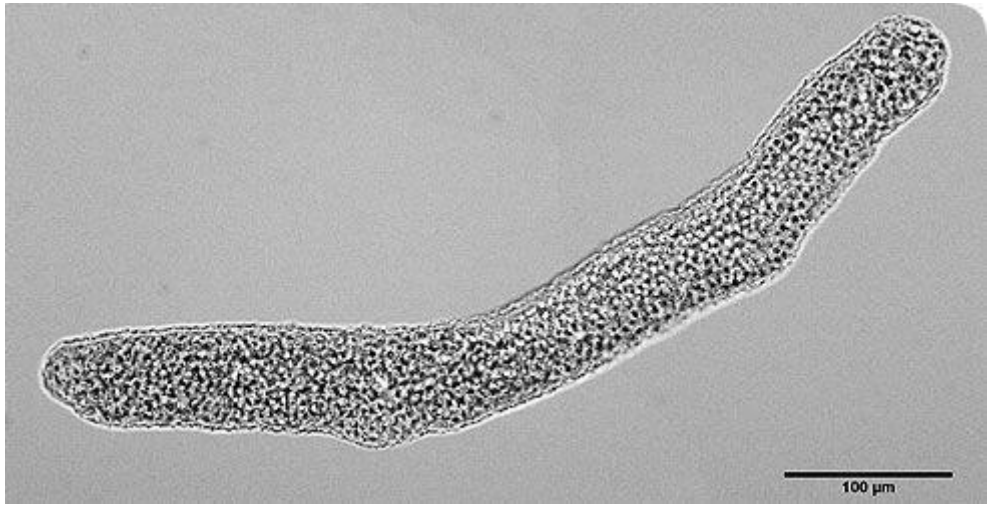


Origem e evolução dos cnidários

Hipótese Colonial (Blasteia)



Hipótese Tripoblástica (Turbelária)



Evolução degenerativa?

Planulozoa

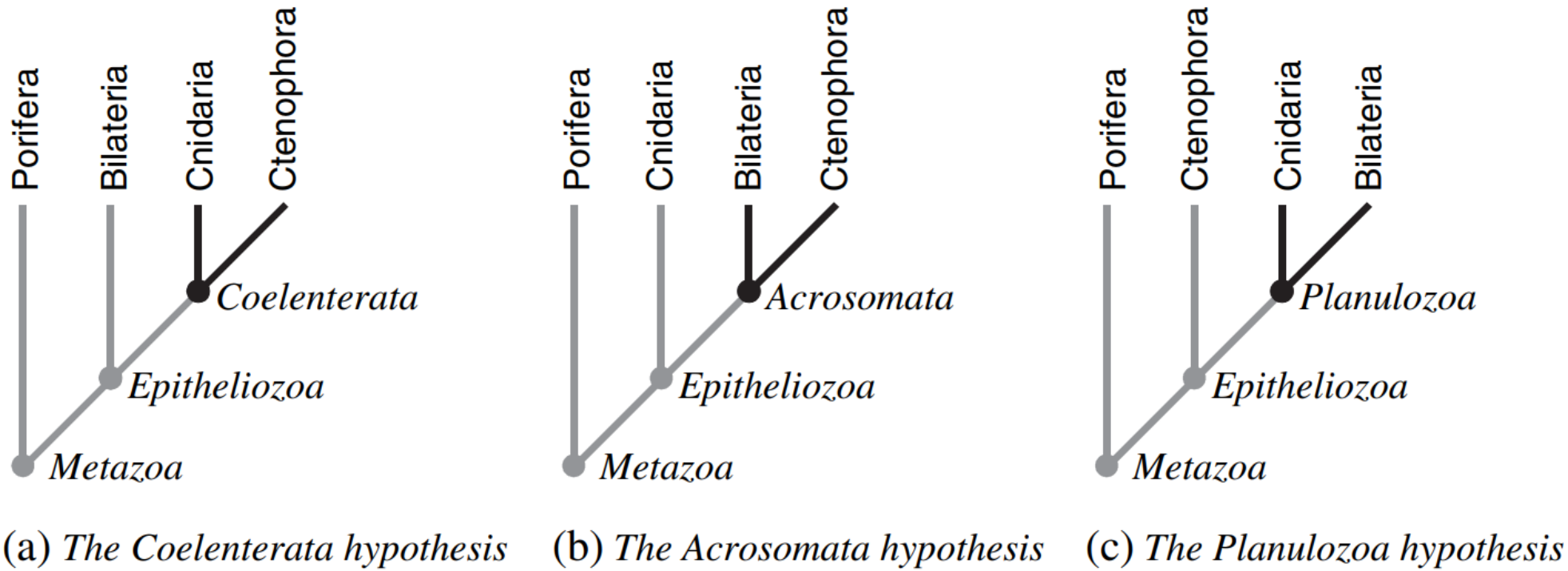
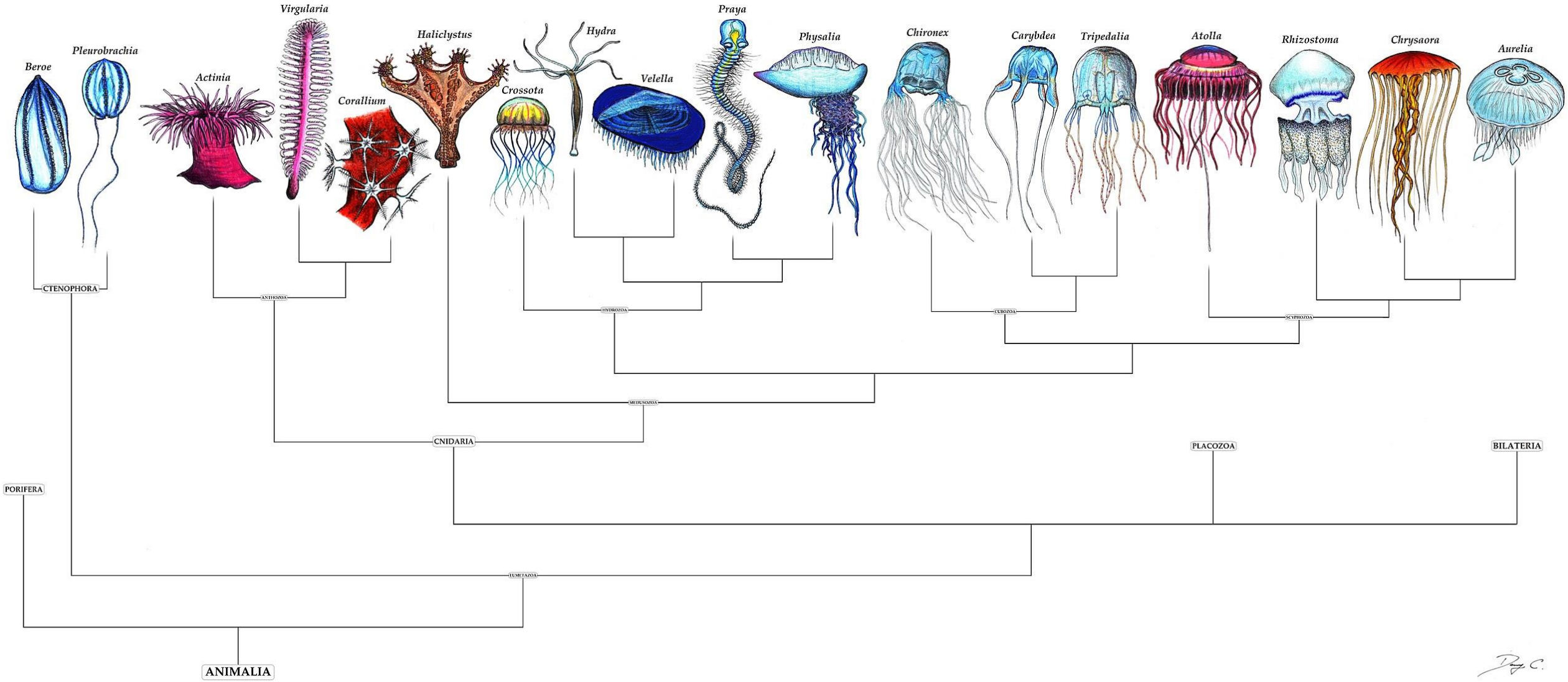


Fig. 1. Three hypotheses on the early evolution of the metazoans.

Origem e evolução dos cnidários



Origem e evolução dos cnidários

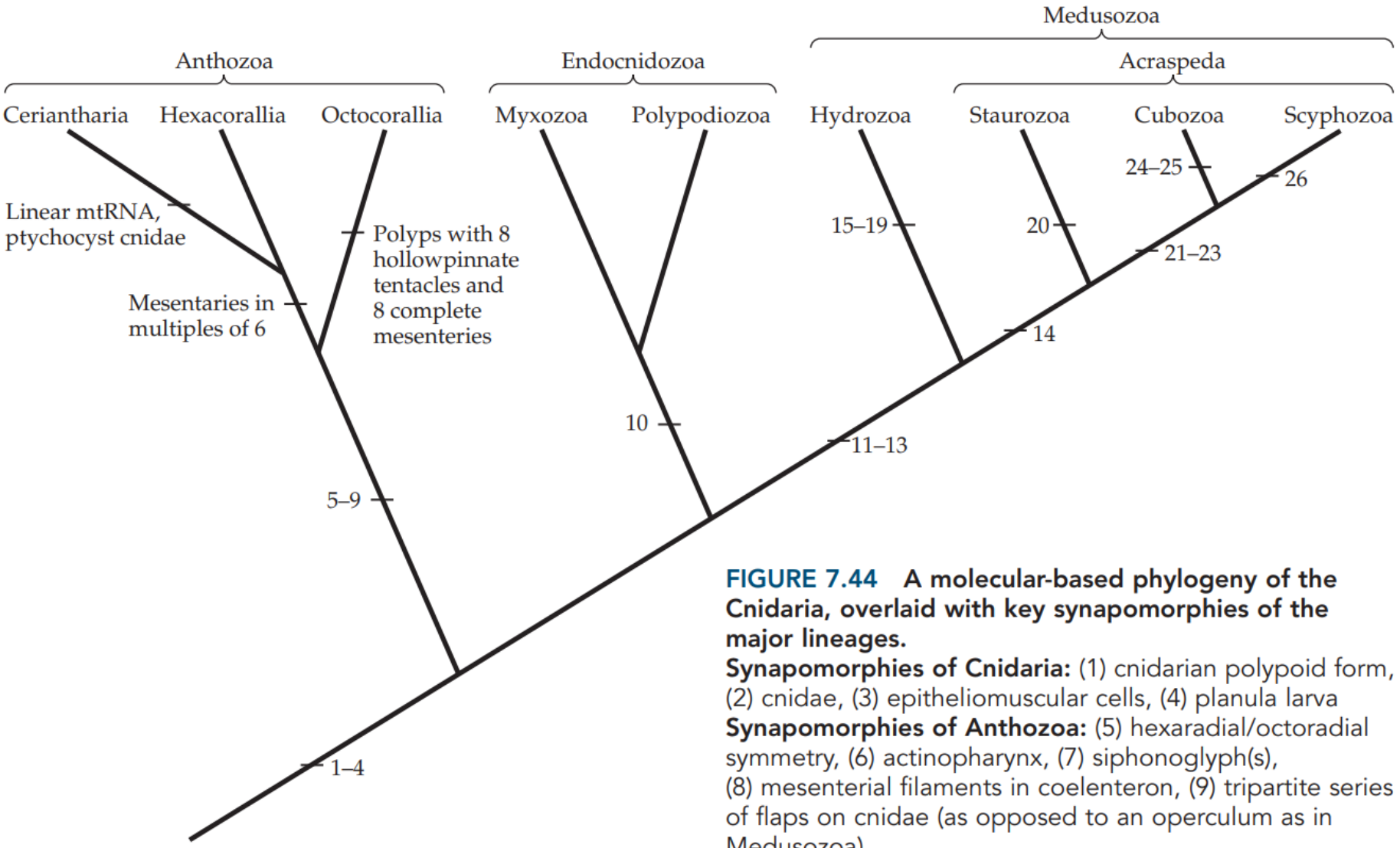


FIGURE 7.44 A molecular-based phylogeny of the Cnidaria, overlaid with key synapomorphies of the major lineages.
Synapomorphies of Cnidaria: (1) cnidarian polypoid form, (2) cnidae, (3) epitheliomuscular cells, (4) planula larva
Synapomorphies of Anthozoa: (5) hexaradial/octoradial symmetry, (6) actinopharynx, (7) siphonoglyph(s), (8) mesenterial filaments in coelenteron, (9) tripartite series of flaps on cnidae (as opposed to an operculum as in Medusozoa)

Synapomorphies of Endocnidozoa: (10) obligatory endoparasitism and complex life cycle
Synapomorphies of Medusozoa: (11) with medusae and alternation of generations, (12) linear mtDNA (also seen in ceriantharian Anthozoa), (13) operculate cnidae (with cnidocil)
Synapomorphies of Acraspeda: (14) medusae acraspedote (without a velum)
Synapomorphies of Hydrozoa: (15) relocation of gamete-forming tissue to epidermis, (16) absence of gut mesenteries, (17) simplification of middle layer to an acellular mesoglea, (18) craspedote medusae, (19) loss of gastrodermal nematocysts
Synapomorphies of Staurozoa: (20) evolution of unique life cycle, with stauropolyps and sessile stauromedusae
Synapomorphies of Cubozoa-Scyphozoa: (21) reduction or loss of polyp, (22) rhopalia, (23) lensed rhopaliar eyes
Synapomorphies of Cubozoa: (24) boxlike medusa form, (25) velarium
Synapomorphies of Scyphozoa: (26) strobilation

Brusca et al. (2023)

Origem e evolução dos cnidários

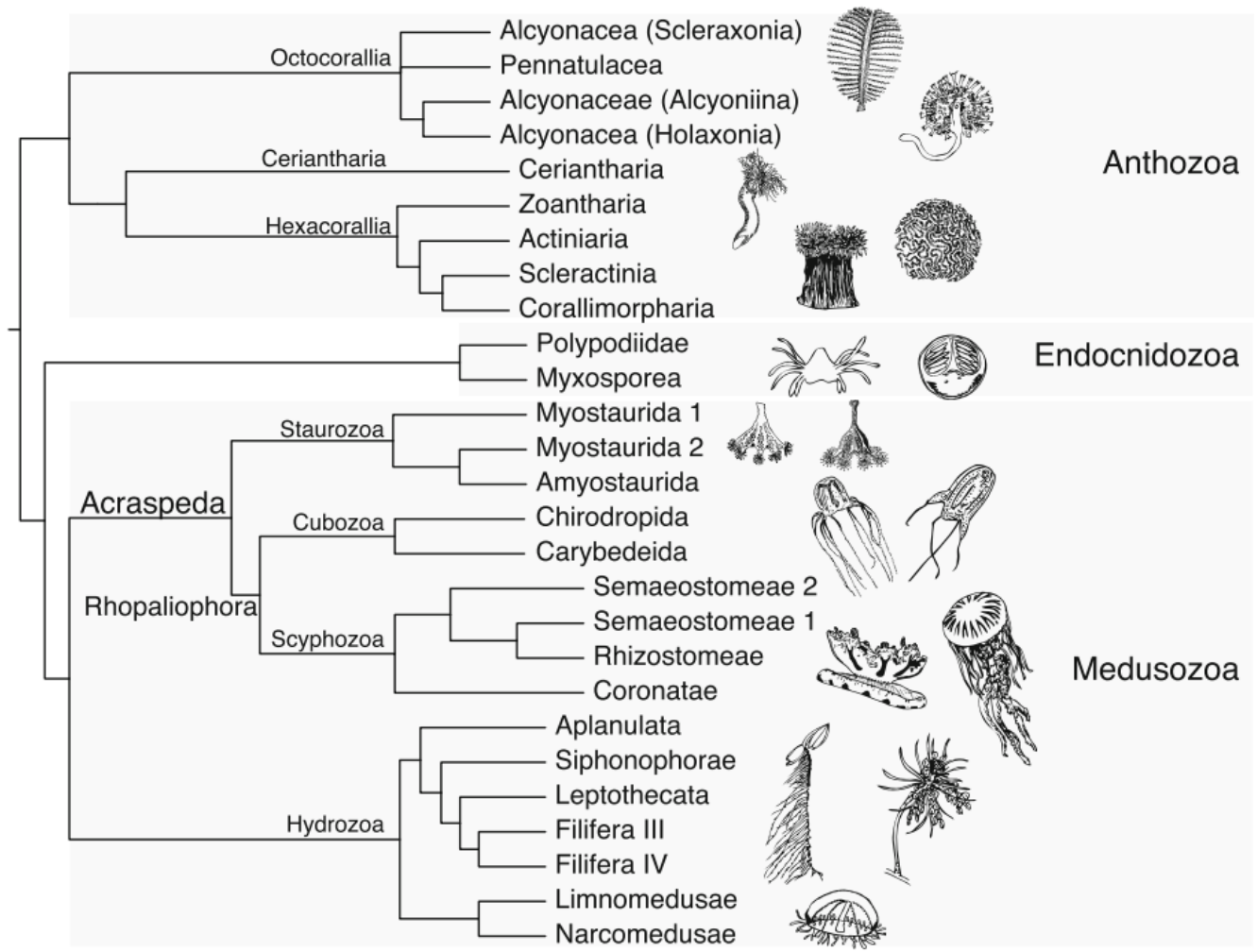
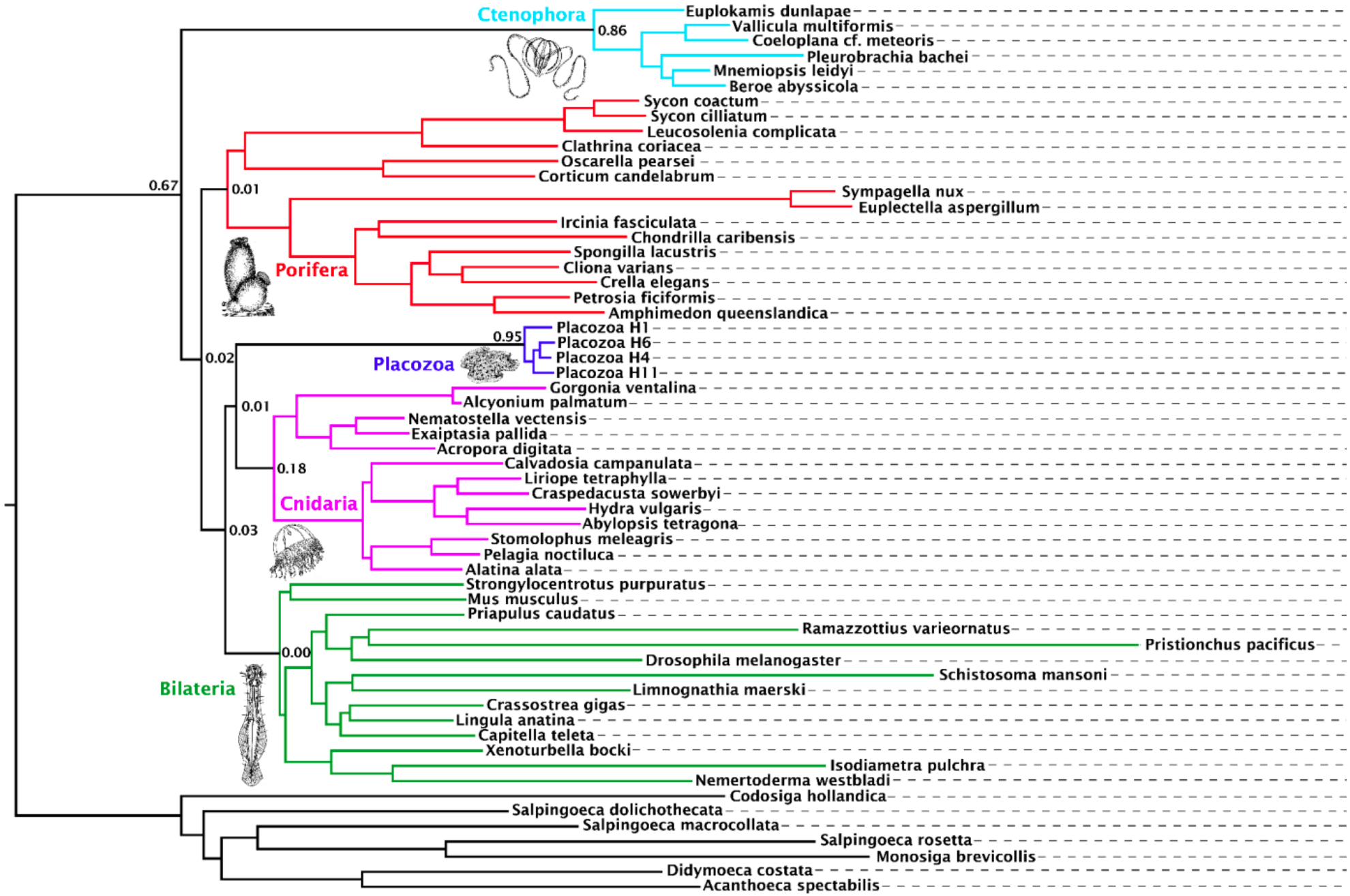
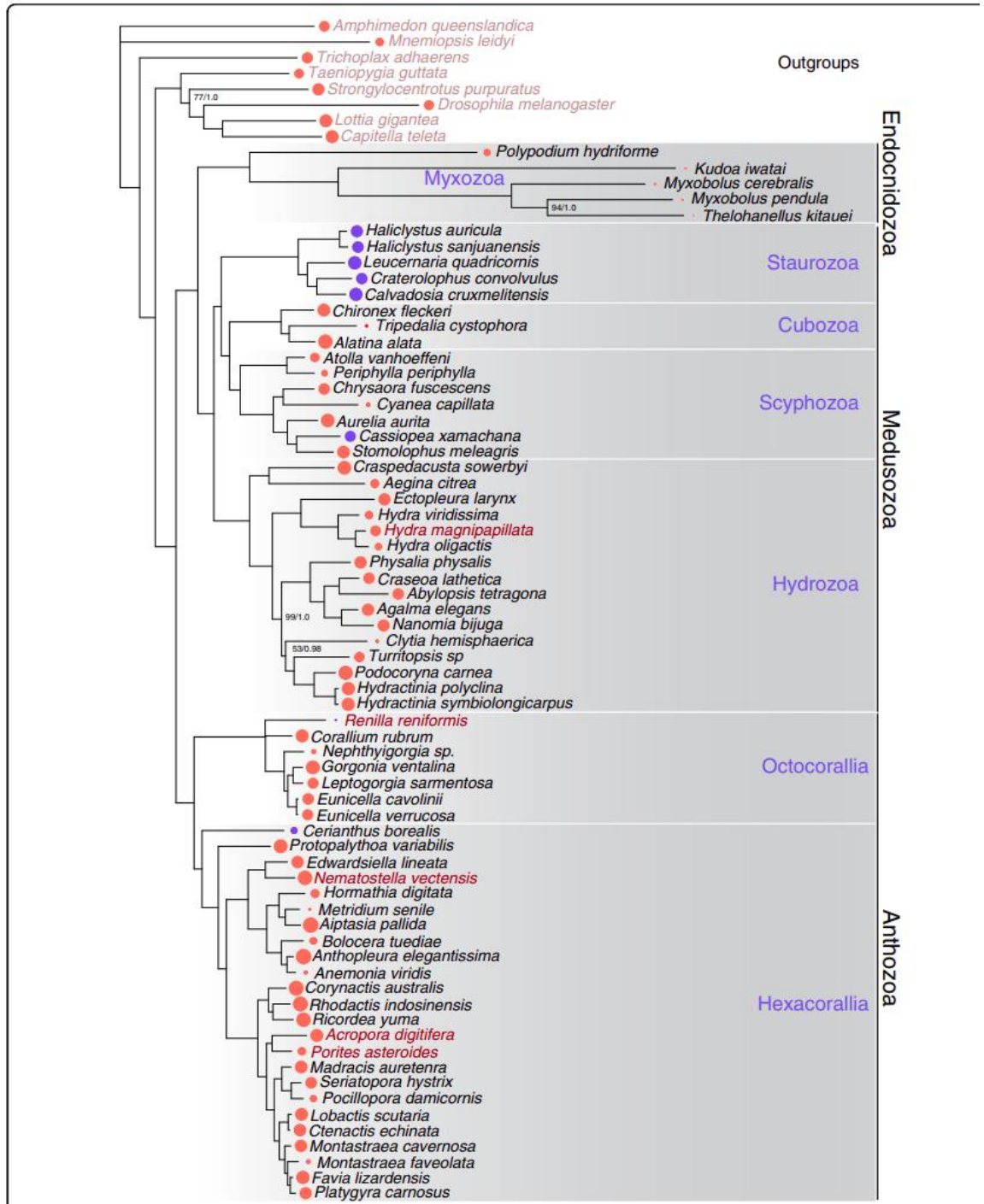
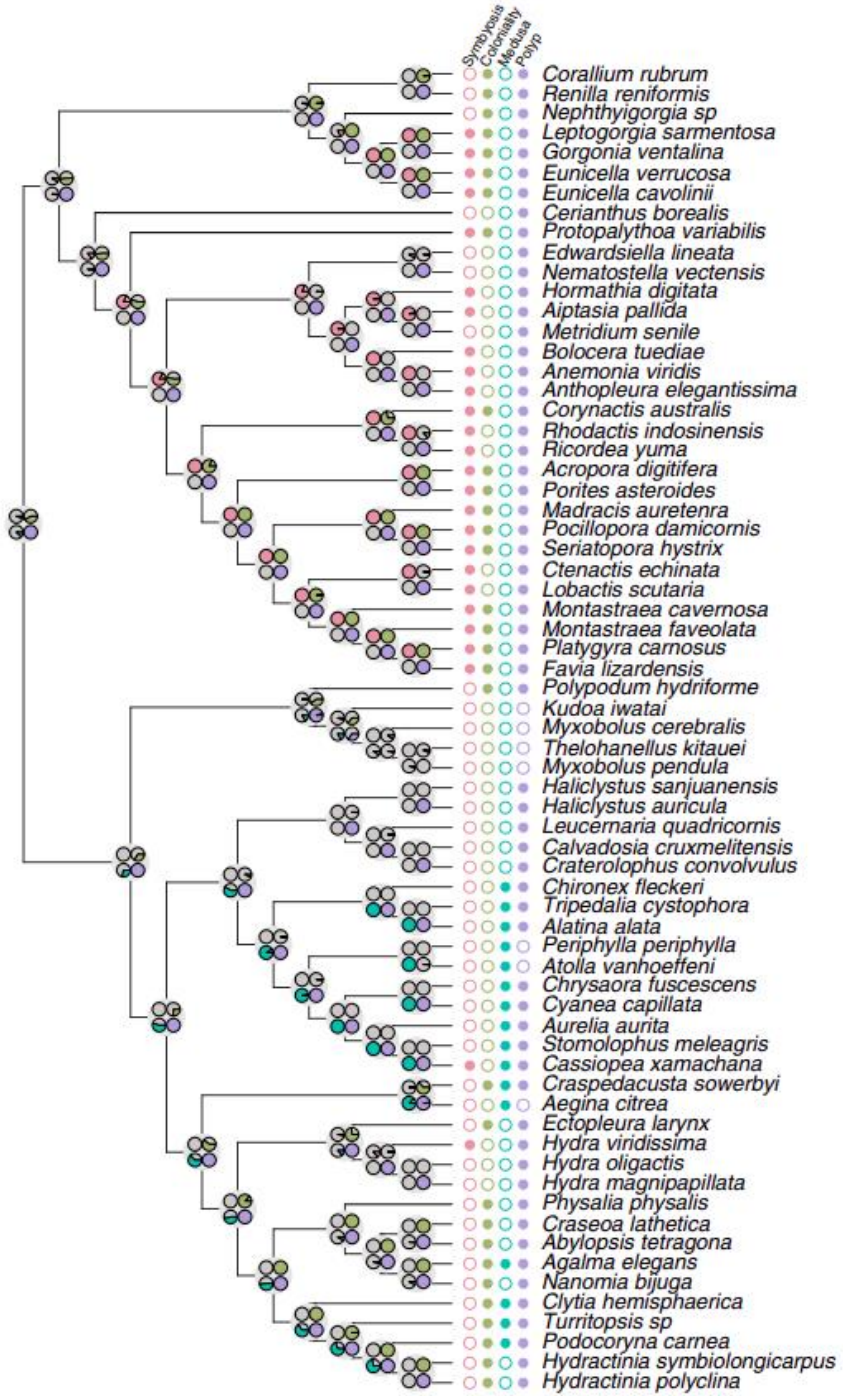


Fig. 7 Summary of results. Our working hypothesis for the topology of major cnidarian lineages based on the present study


Ctenophora
Euplokamis dunlapae
0.86
Vallicula multiformis
Coeloplana cf. meteoris
Pleurobrachia bachei
Mnemiopsis leidyi
Beroe abyssicola
Sycon coactum
Sycon cilliatum
Leucosolenia complicata
Clathrina coriacea
Oscarella pearsei
Corticum candelabrum
0.67
0.01
Sympagella nux
Euplectella aspergillum
Ircinia fasciculata
Chondrilla caribensis
Spongilla lacustris
Porifera
Cliona varians
Crella elegans
Petrosia ficiformis
Amphimedon queenslandica
Placozoa H1
0.95
Placozoa H6
Placozoa H4
0.02
Placozoa
Placozoa H11
Gorgonia ventalina
Alcyonium palmatum
0.01
Nematostella vectensis
Exaiptasia pallida
Acropora digitata
0.18
Calvadosia campanulata
Liriope tetraphylla
Craspedacusta sowerbyi
Cnidaria
Hydra vulgaris
Abylopsis tetragona
0.03
Stomolophus meleagris
Pelagia noctiluca
Alatina alata
Strongylocentrotus purpuratus
Mus musculus
Priapulus caudatus
Ramazzottius varieornatus
Pristionchus pacificus
0.00
Drosophila melanogaster
Schistosoma mansoni
Bilateria
Limnognathia maerski
Crassostrea gigas
Lingula anatina
Capitella teleta
Xenoturbella bocki
Isodiametra pulchra
Nemertoderma westbladi
Codosiga hollandica
Salpingoeca dolichothecata
Salpingoeca macrocollata
Salpingoeca rosetta
Monosiga brevicollis
Didymoeca costata
Acanthoeca spectabilis


Outgroups
Amphimedon queenslandica
Mnemiopsis leidyi
Trichoplax adhaerens
Taeniopygia guttata
Strongylocentrotus purpuratus
Drosophila melanogaster
Lottia gigantea
Capitella teleta
77/1.0
Endocnidozoa
Polypodium hydriforme
Myxozoa
Kudoa iwatai
Myxobolus cerebralis
Myxobolus pendula
Thelohanellus kitauei
94/1.0
Staurozoa
Haliclystus auricula
Haliclystus sanjuanensis
Leucernaria quadricornis
Craterolophus convolvulus
Calvadosia cruxmelitensis
Cubozoa
Chironex fleckeri
Tripedalia cystophora
Alatina alata
Scyphozoa
Atolla vanhoeffeni
Periphylla periphylla
Chrysaora fuscescens
Cyanea capillata
Aurelia aurita
Cassiopea xamachana
Stomolophus meleagris
Medusozoa
Craspedacusta sowerbyi
Aegina citrea
Ectopleura larynx
Hydra viridissima
Hydra magnipapillata
Hydra oligactis
Physalia physalis
Craseoa lathetica
Abylopsis tetragona
Agalma elegans
Nanomia bijuga
Clytia hemisphaerica
Turritopsis sp
Podocoryna carnea
Hydractinia polyclina
Hydractinia symbiolongicarpus
99/1.0
53/0.98
Hydrozoa
Renilla reniformis
Corallium rubrum
Nephthyigorgia sp.
Gorgonia ventalina
Leptogorgia sarmentosa
Eunicella cavolinii
Eunicella verrucosa
Octocorallia
Cerianthus borealis
Protopalythoa variabilis
Edwardsiella lineata
Nematostella vectensis
Hormathia digitata
Metridium senile
Aiptasia pallida
Bolocera tuediae
Anthopleura elegantissima
Anemonia viridis
Corynactis australis
Rhodactis indosinensis
Ricordea yuma
Acropora digitifera
Porites asteroides
Madracis auretenra
Seriatopora hystrix
Pocillopora damicornis
Lobactis scutaria
Ctenactis echinata
Montastraea cavernosa
Montastraea faveolata
Favia lizardensis
Platygyra carnosus
Hexacorallia
Anthozoa


Symbiosis
Coloniality
Medusa
Polyp
Corallium rubrum
Renilla reniformis
Nephthyigorgia sp
Leptogorgia sarmentosa
Gorgonia ventalina
Eunicella verrucosa
Eunicella cavolinii
Cerianthus borealis
Protopalythoa variabilis
Edwardsiella lineata
Nematostella vectensis
Hormathia digitata
Aiptasia pallida
Metridium senile
Bolocera tuediae
Anemonia viridis
Anthopleura elegantissima
Corynactis australis
Rhodactis indosinensis
Ricordea yuma
Acropora digitifera
Porites asteroides
Madracis auretenra
Pocillopora damicornis
Seriatopora hystrix
Ctenactis echinata
Lobactis scutaria
Montastraea cavernosa
Montastraea faveolata
Platygyra carnosus
Favia lizardensis
Polypodum hydriforme
Kudoa iwatai
Myxobolus cerebralis
Thelohanellus kitauei
Myxobolus pendula
Haliclystus sanjuanensis
Haliclystus auricula
Leucernaria quadricornis
Calvadosia cruxmelitensis
Craterolophus convolvulus
Chironex fleckeri
Tripedalia cystophora
Alatina alata
Periphylla periphylla
Atolla vanhoeffeni
Chrysaora fuscescens
Cyanea capillata
Aurelia aurita
Stomolophus meleagris
Cassiopea xamachana
Craspedacusta sowerbyi
Aegina citrea
Ectopleura larynx
Hydra viridissima
Hydra oligactis
Hydra magnipapillata
Physalia physalis
Craseoa lathetica
Abylopsis tetragona
Agalma elegans
Nanomia bijuga
Clytia hemisphaerica
Turritopsis sp
Podocoryna carnea
Hydractinia symbiolongicarpus
Hydractinia polyclina