[Supplement to Palaeontology, 2007, Vol. 50, Part 1, pp. 1-22]

Supplement to

AUTECOLOGY AND THE FILLING OF ECOSPACE: KEY METAZOAN RADIATIONS

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Supplementary data for:
Autecology and the Filling of Ecospace: Key Metazoan Radiations

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Index: Page

(1) **Taxonomic Census of Modes of Life of Recent Marine Fauna — Realized Ecospace**

In a general study of this sort, in which all animals are to be assigned to one of the six subdivisions of each axis, some decisions about axis positions for some kinds of organisms are difficult to make. However, an effort has been made to make assignments consistently, and to have a reason for each assignment, based on the natural history associated with each kind of animal. As one example, the tier for parasites (one of the "other" feeding strategies) is not obvious. Most parasites function in relation to their host, and are either external or internal. But using that as a criterion would make all parasites either surficial epifaunal or shallow to deep infauna. But parasites infect hosts living in all tiers. Hence the decision was made to assign the tier for a parasite as that of its host. Likewise, sponges are now known to make extensive use of dissolved organic matter for food. However, they are well known to filter particulate matter. Brusca and Brusca (2003) devote only 8 lines to sponge absorbtive feeding and 85 lines to various aspects of particulate feeding by sponges. We retain them as suspension feeders rather than listing them as "other." Numerous invertebrates acquire some to much of their nutrition by absorption, but that mode of feeding can be confidently inferred from fossils only if the organism had no apparent functional anatomy for feeding on particulate matter.

Living taxa in bold. [Extinct taxa in brackets and normal font.]

L = Mode of life known in Recent F = Mode of life inferred for fossils

[Interpretations of modes of life of living organisms made from information gleaned from:

Brusca, Richard C. and Gary J. Brusca, 2003, *Invertebrates* (Second Edition), Sinauer Associates, Inc., Sunderland, Massachusetts, 936 pages.

Carroll, Robert L., 1988. *Vertebrate Paleontology and Evolution*, W. H. Freeman and Company, New York, 698 pages.

Cracraft, Joel and Michael J. Donoghue (Editors), 2004, *Assembling the Tree of Life*, Oxford University Press, New York, 576 pages.

Kaufman, Kenneth, 1996, *Lives of North American Birds*, Houghton Mifflin Company, New York, 675 pages.

Long, John A., 1995, *The Rise of Fishes: 500 Million Years of Evolution*, The Johns Hopkins University Press, Baltimore, Maryland, 223 pages.

Margulis, Lynn and Karlene V. Schwartz, 1998, *Five Kingdoms: An Illustrated Guide to the Phyla of Life on Earth* (Third Edition), W. H. Freeman and Company, New York, 520 pages.

Nowak, Ronald M. and John L. Paradiso, 1983, *Walker's Mammals of the World* (Fourth Edition) Volume 2, The Johns Hopkins University Press, Baltimore, Maryland, Pages v–viii+569–1362+xi–xxv.

Parker, Sybil P. (Editor), 1982, *Synopsis and Classification of Living Organisms* (2 Volumes), The McGraw-Hill Companies, New York, Vol. 1 1165 pages, Vol. 2 1232 pages.

Valentine, James W., 2004, *On the Origin of Phyla*, The University of Chicago Press, Chicago, Illinois, 614 pages.

And

Both text and illustrations observed at numerous internet web sites found through searches based on scientific and common names using *Google*.]

Phylum **Porifera** — Sponges ~2 mm – 2 m

Preservation potential varies from unlikely to commonly preserved

Class **Hexactinellida** — Glass sponges, silica megascleres and microscleres

Subclass **Amphidiscophora** — Unfused spicules, microscleres not hexacts, anchor in soft sediments

[Order Reticulosa — Ediacaran–Permian]

[Order Hemidiscosa — Pennsylvanian–Cretaceous]

Order **Amphidiscosa** —

L	Erect	Non-motile attached	Suspension feeding	261

Subclass **Hexasterophora** — Mostly fused spicules, microscleres hexacts Preservation potential reasonably good.

Order **Hexactinosida (= Dictydia)** —

L	Erect	Non-motile attached	Suspension feeding	261

Order **Lychniscosa (= Lychniskida)** —

L	Erect	Non-motile attached	Suspension feeding	261

Order **Lyssacinosida (= Lyssakida)** —

L	Erect	Non-motile attached	Suspension feeding	261

Class **Demospongia** — Silica spicules (not six-rayed) and spongin. Varied preservation.

Subclass **Homoscleromorpha** — Only small spicules, embryos incubated Preservation unlikely

Order **Homosclerophorida** —

L	Erect	Non-motile attached	Suspension feeding	261
L	Surficial	Non-motile attached	Suspension feeding	361

Subclass **Tetractinomorpha** — Megascleres and microscleres arranged in patterns, oviparous Some likely to preserve.

Order **Astrophorida (= Choristida)** —

L	Erect	Non-motile attached	Suspension feeding	261
L	Surficial	Non-motile attached	Suspension feeding	361

Order **Chondrosida** —

L	Erect	Non-motile attached	Suspension feeding	261
L	Surficial	Non-motile attached	Suspension feeding	361

Order **Spirophorida** —

L	Erect	Non-motile attached	Suspension feeding	261

Order **Lithistida** — Rigid skeleton

L	Erect	Non-motile attached	Suspension feeding	261
L	Surficial	Non-motile attached	Suspension feeding	361

Order **Hadromerida** — Include boring sponges visible in the fossil record

L	Erect	Non-motile attached	Suspension feeding	261
L	Surficial	Non-motile attached	Suspension feeding	361
L	Semi-infaunal	Non-motile attached	Suspension feeding	461
L	Shallow infaunal	Non-motile attached	Suspension feeding	561

Order **<u>Chaetetida</u> (= Tabulospondia)** — One living genus *Acanthochaetetes* Well skeletonized

L	Erect	Non-motile attached	Suspension feeding	261
L	Surficial	Non-motile attached	Suspension feeding	361

Subclass **<u>Ceractinomorpha</u>** — Mostly viviparous, megascleres and microscleres, spongin

[Order <u>Stromatoporoidea</u> — Cambrian–Devonian]

[?Order <u>Guadalupiida</u> — Permian]

Order **<u>Agelasida</u>** — includes *Astrosclera* Some well skeletonized

L	Erect	Non-motile attached	Suspension feeding	261
L	Surficial	Non-motile attached	Suspension feeding	361

Order **<u>Dendroceratida</u>** —

L	Erect	Non-motile attached	Suspension feeding	261

Order **<u>Halisarcida</u>** — Lack spongin

L	Surficial	Non-motile attached	Suspension feeding	361

Order **<u>Dictyoceratida</u>** —

L	Erect	Non-motile attached	Suspension feeding	261
L	Surficial	Non-motile attached	Suspension feeding	361

Order **<u>Verongiida</u>** —

L	Erect	Non-motile attached	Suspension feeding	261
L	Erect	Non-motile attached	Other (Photosymbiosis)	266

Order **<u>Haplosclerida</u>** —

L	Erect	Non-motile attached	Suspension feeding	261
L	Surficial	Non-motile attached	Suspension feeding	361
L	Semi-infaunal	Non-motile attached	Suspension feeding	461

Order **<u>Poecilosclerida</u>** — (0ne genus, *Asbestopluma*, carnivorous) The most species-rich sponge order.

L	Erect	Non-motile attached	Suspension feeding	261
L	Erect	Non-motile attached	Predator	265
L	Erect	Non-motile attached	Other (Photosymbiosis)	266
L	Surficial	Non-motile attached	Suspension feeding	361

Order **<u>Halichondrida</u>** —

L	Erect	Non-motile attached	Suspension feeding	261
L	Surficial	Non-motile attached	Suspension feeding	361

Order **<u>Verticillitida</u>** — Sphinctozoans Well skeletonized

L	Erect	Non-motile attached	Suspension feeding	261

Class **<u>Calcarea</u>** — Calcareous sponges, spicules usually not differentiated into mega and microscleres

Subclass **<u>Calcinea</u>** —

[Order <u>Heteractinida</u> — Cambrian–Permian]

Order **<u>Clathrinida</u>** — Simple calcareous sponges, free spicules only

L	Erect	Non-motile attached	Suspension feeding	261
L	Surficial	Non-motile attached	Suspension feeding	361

Order **<u>Murrayonida</u>** — Reinforced skeleton. Includes <u>Inozoa</u> (Permosphinct, Sphaerocoelida).

L	Erect	Non-motile attaced	Suspension feeding	261

Subclass **<u>Calcaronea</u>** —

Order **<u>Baerida</u>** —

L	Erect	Non-motile attached	Suspension feeding	261
L	Surficial	Non-motile attached	Suspension feeding	361

Order **<u>Leucosolenida</u>** — Tubular forms

L	Erect	Non-motile attached	Suspension feeding	261
L	Erect	Non-motile attached	Suspension feeding	361

Order **<u>Lithonida</u>** — Massively reinforced skeletons

L	Erect	Non-motile attached	Suspension feeding	261
L	Erect	Non-motile attached	Suspension feeding	361

[Phylum <u>Archaeocyatha</u> — Archaeocyathids Cambrian]

[Regulares — Cambrian]

[Monocyathida Cambrian]

[Ajacicyathida Cambrian]

[Capsulocyathida Cambrian]

[Tabulocyathida Cambrian]

[Irregulares Cambrian]

[Archaeocyathida Cambrian]

[Kasakhstanicyathida Cambrian]

[? Archaeophyllida Cambrian]

[Phylum Radiocyatha]

[? Phylum Cribricyatha]

[Phylum Chancelloriidae]

[Phylum level Cnidariomorphs — “Vendobionts” and others not listed elsewhere]

(Hydroconozoa)

(Petalonamae)

(Erneittamorpha)

(Rangeomorpha)

[Trilobozoa (includes “Anabaritida”)]

[Cyclozoa

Phylum **Cnidaria** Diploblastic, tissue grade, cnidae ~1,5 mm – 6+ m
Preservation potential varies from unlikely to commonly preserved.

Class **Hydrozoa** — Polypoid hydroids and their medusae, millepores, trachyline medusae, Siphonophores. Only a few groups likely to fossilize.

Order **Hydroida** — Hydroids, millepores, stylasterines and thecata Only skeletal likely to preserve

L	Erect	Non-motile attached	Suspension feeding	261
L	Erect	Non-motile attached	Predator	265
L	Erect	Non-motile attached	Other (Photosymbiosis)	266
L	Surficial	Non-motile attached	Suspension feeding	361
L	Surficial	Non-motile attached	Predator	365
L	Surficial	Non-motile attached	Other (Photosybiosis)	366
L	Surficial	Facultatively motile attached	Predator	345

Order **Trachylina** — Trachyline medusae Preservation potential nil

L	Pelagic	Fully motile slow	Predator	125

Order **Siphonophora** — Colonial pelagic hydroids, includes Portugese Man-of-war Unlikely to preserve

L	Pelagic	Non-motile unattached	Suspension feeding	151
L	Pelagic	Non-motile unattached	Predator	155
L	Pelagic	Non-motile unattached	Other (Photosymbiosis)	156
L	Pelagic	Fully motile slow	Suspenison feeding	121
L	Pelagic	Fully motile slow	Predator	125
L	Pelagic	Fully motile slow	Other (Photosymbiosis)	126

Order **Chondrophora** — Two genera — *Porpita* and *Velella* Unlikely to preserve

L	Pelagic	Non-motile unattached	Suspension feeding	151

Order **Actinulida** — Minute interstitial hydroids Preservation potential nil

L	Shallow infauna	Facultatively motile attached	Predator	445
L	Shallow infauna	Fully motile slow	Predator	425

(Sphaeractinida)

Class **Anthozoa** — Gorgonians, sea pens, soft corals, sea anemones, corals. No medusoid stage
Corals commonly fossilize, others seldom

Subclass **Octocorallia** (=Alcyonaria) — Eight-tentacled polyps

Order **Alcyonacea** — Soft corals Preservation potential low

L	Erect	Non-motile attached	Suspension feeding	261
L	Erect	Non-motile attached	Predator	265
L	Surficial	Non-motile attached	Suspension feeding	361
L	Surficial	Non-motile attached	Predator	365

Order **Gastaxonacea** — Preservation potential nil

L	Erect	Non-motile attached	Suspension feeding	261

Order **Gorgonacea** — Sea fans and sea whips Preservation potential low

L	Erect	Non-motile attached	Suspension feeding	261

Order **Helioporacea** — One genus skeletonized

L	Erect	Non-motile attached	Suspension feeding	261
L	Surficial	Non-motile attached	Suspension feeding	361
L	Surficial	Non-motile attached	Predator	365

Order **Pennatulacea** — Sea pens and sea pansies Preservation potential low

L	Erect	Facultatively motile attached	Suspension feeding	241
L	Erect	Facultatively motile attached	Predator	245
L	Surficial	Facultatively motile attached	Suspension feeding	341
L	Semi-infaunal	Facultatively motile attached	Suspension feeding	441

Order **Protoalcyonaria** — Preservation potential nil

L	Erect	Non-motile attached	Suspension feeding	261

Order **Stolonifera** — Preservation potential varies, *Tubipora* skeletonized

L	Erect	Non-motile attached	Suspension feeding	261
L	Surficial	Non-motile attached	Suspension feeding	361

Order **Telestacea** — Preservation potential low

L	Erect	Non-motile attached	Suspension feeding	261

Subclass **Hexacorallia** (=Zoantharia) —

Order **Actiniaria** — Sea anemones Preservation potential low

L	Pelagic	Non-motile unattached	Predator	155
L	Erect	Facultatively motile attached	Predator	245
L	Erect	Facultatively motile unattached	Predator	235
L	Surficial	Non-motile unattached	Predator	355
L	Surficial	Facultatively motile unattached	Predator	335
L	Semi-infaunal	Facultatively motile unattached	Predator	435
L	Shallow infauna	Facultatively motile unattached	Predator	535

[Order Kilbuchophyllida)

[Order Tabulata)

[Order Rugosa)

[Order Heterocorallia)

Order **Scleractinia** —

L	Erect	Non-motile attached	Suspension feeding	261
L	Erect	Non-motile attached	Predator	265
L	Erect	Non-motile attached	Other (Photosymbiosis)	266
L	Erect	Non-motile unattached	Suspension feeding	251
L	Erect	Non-motile unattached	Predator	255
L	Erect	Non-motile unattached	Other (Photosymbiosis)	256
L	Surficial	Non-motile attached	Suspension feeding	361
L	Surficial	Non-motile attached	Predator	365
L	Surficial	Non-motile attached	Other (Photosymbiosis_	366
L	Surficial	Non-motile unattached	Suspension feeding	351
L	Surficial	Non-motile unattached	Predator	355
L	Surficial	Non-motile unattached	Other (Photosymbiosis)	356

Order **Zoanthidea** —

L	Erect	Non-motile attached	Suspension feeding	261

Order **Corallimorpharia** — Includes “mushroom anemones”

L	Surficial	Non-motile attached	Other (Photosymbiosis)	366
L	Surficial	Facultatively motile attached	Predator	345

Subclass **Ceriantipatharia** —

Order **Antipatheria** — Black or thorny “corals”

L	Erect	Non-motile attached	Suspension feeding	261

Order **Ceriantharia** —

L	Semi-infaunal	Facultatively motile attached	Suspension feeding	441
L	Shallow infaunal	Facultatively motile attached	Suspension feeding	541

Class **Cubozoa** — Sea wasps and box jellyfish Preservation potential nil

L	Pelagic	Fully motile slow	Predator	125

Class **Scyphozoa** — Jellyfish Preservation potential very poor

Order **Stauromedusae** —

L	Surficial	Non-motile attached	Predator	365
L	Surficial	Facultatively motile attached	Predator	345

Order **Coronatae** —

L	Pelagic	Fully motile slow	Predator	125

Order **Semaeostomae** — Typical jellyfish

L	Pelagic	Fully motile slow	Suspension feeding	121
L	Pelagic	Fully motile slow	Predator	125

Order **Rhizostomae** —

L	Pelagic	Fully motile slow	Suspension feeding	121
L	Surficial	Facultatively motile unattached	Suspension feeding	331
L	Surficial	Facultatively motile unattached	Other (Photosymbiosis)	336

(Lithorhizostimatida)

(Conularida)

Phylum **Ctenophora** — Comb jellies 0.4 mm – 1 m Unlikely to be preserved (but some known!)

L	Pelagic	Fully motile slow	Predator	125
L	Pelagic	Facultatively motile attached	Other (parasite)	146
L	Surficial	Fully motile slow	Predator	325

Phylum **Placozoa** — Double layered plate, no symmetry, up to 2–3 mm. Preservation potential nil.

L	Surficial	Fully motile slow	Surface deposit feeding	322

Phylum **Myxozoa** Obligate microscopic endoparasites in fish and some invertebrates. Derived from Cnidaria (“polar capsules” = nematocysts). Preservation potential nil.

L	Pelagic	Facultatively motile attached	Other (parasite)	146
L	Surficial	Facultatively motile attached	Other (parasite)	346

Phylum **Acoelomorpha** Basal billaterians — Acoel flatworms with mouth but no gut (just digestive cell mass) 1 mm – 5 mm Preservation potential nil

Order **Acoela** — Small (1–5 mm) worms

L	Pelagic	Fully motile slow	Other (photosymbiosis)?	126
L	Surficial	Facultatively motile attached	Other (photosymbiosis)	346
L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Shallow infauna	Fully motile slow	Mining	523
L	Shallow infauna	Fully motile slow	Other (chemosymbiosis)	526

Order **Nemertodermatida** — Meiofauna (one genus, *Meara*, parasitic on holothurians)

L	Shallow infauna	Fully motile slow	Mining	523
L	Shallow infauna	Fully motile slow	Other (parasite)	526

(Problematica)

(Tommotiida)

(Coleoloida)

(Cornulitida)

(Hyolohelminthes)

(Machaerida)

(Paiutida)

(Sabelliditida)

(Volborthellida (= Agmata))

(Incertae sedis)

— **Ecdysozoan Bilateria** —

Phylum **Priapulida** — Worm-like with introvert proboscis. 0.5 mm — 32 cm
Preservation potential low (but represented in Burgess Shale)

L	Shallow infauna	Facultatively motile unattached	Suspension	531
L	Shallow infauna	Facultatively motile unattached	Predator	535
L	Shallow infauna	Fully motile slow	Mining	523
L	Shallow infauna	Fully motile slow	Predator	525

Phylum **Kinorhynchia** — 13 segmented worms with spiny scalids on head segment. Most < 1 mm
Preservation potential nil

Order **Cyclorhagida** —

L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Shallow infauna	Fully motile slow	Mining	523

Order **Homalorhagida** —

L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Shallow infauna	Fully motile slow	Mining	523

Phylum **Loricifera** Microscopic meiofauna with cuticular lorica 100 µm — 400 µm
Perservation potential nil.

L	Shallow infauna	Non-motile attached	Suspension feeding?	561

Phylum **Nematomorpha** — "Horsehair" worms with parasitic juvenile stage. 10 cm — 70 cm
Preservation potential poor.

Order **Nectonematoidea** — The only marine Nematophora. One genus, *Nectonema*, in a monotypic order.

L	Pelagic	Fully motile slow	Other (absorptive)	126

Phylum **Nemata** (=Nematoda) — Roundworms. Most < 1mm, to 50 mm. Preservation potential nil.
(An old (1982) classification used because that was best source of mode of life data. New schemes still in flux.)
Modes: (L)

Class **Adenophorea** (=Aphasmida) — Includes all free-living marine nematodes. Preservation nil.

Subclass **Enoplia** —

Order **Enoplida** —

L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Surficial	Fully motile slow	Grazing	324
L	Surficial	Fully motile slow	Predator	325
L	Shallow infauna	Fully motile slow	Mining	523
L	Shallow infauna	Fully motile slow	Grazing	524
L	Shallow infauna	Fully motile slow	Predator	525

Order **Muspiceida** — Marine forms parasitize sharks.

L	Pelagic	Facultatively motile attached	Other (parasite)	146

Subclass **Chromadoria** —

Order **Araeolaimida** — Some are marine bacterial feeders.

L	Surficial	Fully motile slow	Grazing	324

Order **Desmoscolecida** —

L	Surficial	Fully motile slow	Grazing	324
L	Shallow infauna	Fully motile slow	Grazing	524

Order **Desmodorida** —

L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Surficial	Fully motile slow	Grazing	324
L	Surficial	Fully motile slow	Predator	325
L	Shallow infauna	Fully motile slow	Mining	523
L	Shallow infauna	Fully motile slow	Grazing	524
L	Shallow infauna	Fully motile slow	Predator	525

Order **Monhysterida** —

L	Surficial	Fully motile slow	Grazing	324
L	Surficial	Fully motile slow	Predator	325
L	Shallow infauna	Fully motile slow	Grazing	524
L	Shallow infauna	Fully motile slow	Predator	525

Class **Secernentea** (=Phasmida) — Includes most well-known parasitic forms. Preservation nil. Rarely marine, except in vertebrates.

Subclass **Rhabdita** —

Order **Ascaridida** — Parasitize manatees, marine mammals, marine turtles, fish, sharks and rays

L	Pelagic	Facultatively motile attached	Other (parasite)	146

Subclass **Spiruria** —

Order **Spirurida** — Parasitize Sperm whales, marine mammals, marine fish, annelids, mollusks

L	Pelagic	Facultatively motile attached	Other (parasite)	146
L	Surficial	Facultatively motile attached	Other (parasite)	346
L	Shallow infauna	Facultatively motile attached	Other (parasite)	546

Order **Camallanida** — Parasitize crocodiles, fish, copepods

L	Pelagic	Facultatively motile attached	Other (parasite)	146
L	Surficial	Facutlatively motile attached	Other (parasite)	346

[Phylum Palaeoscolecidae]

[Phylum Lobopodia — Living Onychophora (Velvet worms. 14 mm – 20 cm) are non-marine, but marine lobopodians known in Cambrian. Cambrian]

Phylum **Tardigrada** — Water bears. 50 µm – 1.7 mm. Unusual resistant cryptobiotic tun stage. Preservation potential poor, but some are known as fossils.

Order **Heterotardigrada** — Most marine forms.

L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Surficial	Fully motile slow	Grazing	324
L	Shallow infauna	Fully motile slow	Mining	523
L	Shallow infauna	Fully motile slow	Grazing	524

Order **Eutardigrada** — Only one marine genus.

L	Surficial	Fully motile slow	Grazing	324
L	Shallow infauna	Fully motile slow	Mining	523

Phylum **Arthropoda** Varies from unlikely to commonly preserved

[Miscellaneous class level stem groups]

[Class Trilobitomorpha Cambrian–Permian]

Class **Chelicerata** —

Subclass **Merostomata** —

[Order Eurypterida]

Order **Xiphosura** — Horseshoe crabs. Preservation potential fair

L	Surficial	Fully motile fast	Predator	315
L	Semi-infaunal	Fully motile fast	Predator	415
L	Shallow infauna	Fully motile fast	Predator	515

Subclass **Arachnida** — Mostly non-marine

Order **Acari** — Mites and ticks — mostly non-marine (one family, Halacaridae, is associated with shores)

L	Surficial	Facultatively motile attached	Other (parasite)	346
L	Surficial	Fully motile slow	Grazing	324
L	Surficial	Fully motile slow	Predator	325

Order **Araneae** — Spiders, mostly non-marine (one genus, *Desis*, lives intertidally in SE Asia).

L	Surficial	Fully motile fast	Predator	315

Class **Pycnogonida** — "Sea spiders" with sucking mouthparts. 2 mm–60 cm Preservation potential low

L	Surficial	Facultatively motile unattached	Grazing	334
L	Surficial	Facultatively motile unattached	Other (parasite)	336
L	Surficial	Fully motile fast	Predator	315

Subphylum **Crustacea** —

Class **Remipedia** — Preservation potential nil.

Order **Nectiopoda** —

L	Pelagic	Fully motile fast	Suspension feeding	111

Class **Cephalocarida** — up to 3.7 mm Preservation potential nil.

L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Shallow infauna	Fully motile slow	Mining	523

Class **Branchiopoda** — Preservation potential poor

Order **Diplostraca** —

Suborder **Cladocera** — water fleas Only very few species in marine environments.

L	Pelagic	Fully motile slow	Suspension feeding	121
L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Surficial	Fully motile slow	Grazing	324

Class **Maxillopoda** —

Subclass **Ostracoda** — Preservation potential good

Superorder **Myodocopa** —

Order **Myodocopida** —

L	Pelagic	Fully motile fast	Suspension feeding	111
L	Surficial	Fully motile slow	Suspension feeding	321
L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Surficial	Fully motile slow	Grazing	324
L	Surficial	Fully motile slow	Predator	325
L	Shallow infauna	Facultatively motile unattached	Suspension feeding	531
L	Shallow infauna	Fully motile slow	Mining	523

Order **Halocyprida** —

L	Pelagic	Fully motile slow	Suspension feeding	121
L	Pelagic	Fully motile slow	Predator	125
L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Surficial	Fully motile slow	Predator	325

Superorder **Podocopa** —

Order **Platycopida** —

L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Surficial	Fully motile slow	Grazing	324
L	Shallow infauna	Fully motile slow	Mining	523

Order **Podocopida** —

L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Surficial	Fully motile slow	Grazing	324
L	Shallow infauna	Fully motile slow	Mining	523

Subclass **Mystacocarida** — Minute and elongate. 0.5 mm average. Preservation potential nil.

L	Shallow infauna	Fully motile slow	Grazing	524

Subclass **Copepoda** — Preservation potential poor

Order **Calanoida** —

L	Pelagic	Fully motile slow	Suspension feeding	121
L	Pelagic	Fully motile slow	Predator	125
L	Surficial	Fully motile slow	Suspension feeding	321
L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Surficial	Fully motile slow	Predator	325

Order **Cyclopoida** —

L	Pelagic	Fully motile slow	Suspension feeding	121

Order **Harpacticoida** —

L	Pelagic	Fully motile slow	Suspension feeding	121
L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Surficial	Fully motile slow	Grazing	324
L	Shallow infauna	Fully motile slow	Mining	523
L	Shallow infauna	Fully motile slow	Grazing	524

Order **Notodelphyoida** — Parasitic in tunicates

L	Erect	Non-motile attached	Other (parasite)	266
L	Surficial	Non-motile attached	Other (parasite)	366

Order **Monstrilloida** — Parasitic in ophiuroids, polychaetes, gastropods

L	Surficial	Non-motile attached	Other (parasite)	366
L	Shallow infauna	Non-motile attached	Other (parasite)	566

Order **Caligoida** — External parasite of fish

L	Pelagic	Facultatively motile attached	Other (parasite)	146

Subclass **Branchiura** — Fish lice Preservtion potential nil

L	Pelagic	Facultatively motile attached	Other (parasite)	146

Subclass **Thecostraca** — Barnacles and relatives.

Infraclass **Ascothoracica** — Parasitic on crinoids, corals, ophiuroids, asteroids, echinoids.

L	Erect	Non-motile attached	Other (parasite)	266
L	Surficial	Non-motile attached	Other (parasite)	366

Infraclass **Cirripedia** — Barnacles Preservation potential good

Order **Acrothoracica** — Boring barnacles.

L	Shallow infauna	Non-motile attached	Suspension feeding	561

Order **Thoracica** — True barnacles

L	Pelagic	Non-motile attached	Suspension feeding	161
L	Pelagic	Non-motile attached	Other (parasite)	166
L	Surficial	Non-motile attached	Suspension feeding	361

Subclass **Tantulocarida** (=Rhizocephala) — Parasitic in benthic crustaceans

L	Surficial	Non-motile attached	Other (parasite)	366

Class **Malacostraca** —

Subclass **Phyllocarida** —

Order **Leptostraca** — 4–12 mm (max. 35 mm) Preservation potential nil

L	Surficial	Fully motile fast	Suspension feeding	311
L	Surficial	Fully motile fast	Surface deposit feeding	312

Subclass **Eumalacostraca** —

Superorder **Hoplocarida** —

Order **Stomatopoda** — mantis shrimps

L	Surficial	Fully motile fast	Predator	315
L	Shallow infauna	Fully motile fast	Predator	515

Superorder **Eucarida** —

Order **Euphausiacea** — includes krill 5–15 mm Preservation potential poor

L	Pelagic	Fully motile fast	Suspension feeding	111
L	Pelagic	Fully motile fast	Surface deposit feeding	112
L	Pelagic	Fully motile fast	Predator	115

Order **Amphionidacea** — Only one species.

L	Pelagic	Fully motile fast	Suspension feeding	111

Order **Decapoda** —

Suborder **Dendrobranchiata** — Penaeid and sergestid shrimps (“prawns”)

L	Pelagic	Fully motile fast	Suspension feeding	111
L	Pelagic	Fully motile fast	Predator	115
L	Surficial	Fully motile fast	Surface deposit feeding	312
L	Surficial	Fully motile fast	Predator	315

Suborder **<u>Pleocyemata</u>** —

Infraorder **<u>Caridea</u>** — Caridean shrimps

L	Pelagic	Fully motile fast	Predator	115
L	Surficial	Fully motile fast	Predator	315
L	Shallow infauna	Fully motile fast	Predator	515

Infraorder **<u>Stenopodidia</u>** — Stenopodid shrimps, include cleaner shrimps

L	Pelagic	Fully motile fast	Grazing	114
L	Surficial	Facultatively motile unattached	Suspension feeding	331
L	Surficial	Fully motile fast	Surface deposit feeding	312
L	Surficial	Fully motile fast	Grazing	314

Infraorder **<u>Thalassinidea</u>** — Mud or ghost shrimps

L	Surficial	Fully motile fast	Surface deposit feeding	312
L	Shallow infauna	Facultatively motile unattached	Suspension feeding	531
L	Shallow infauna	Facultatively motile unattached	Mining	533
L	Deep infauna	Facultatively motile unatached	Suspension feeding	631
L	Deep infauna	Facultatively motile unattached	Mining	633

Infraorder **<u>Astacidea</u>** — Crayfish and clawed lobsters

L	Surficial	Fully motile fast	Predator	315

Infraorder **<u>Palinura</u>** — Spiny lobsters and slipper lobsters

L	Surficial	Fully motile fast	Predator	315

Infraorder **<u>Anomura</u>** — Hermit, porcelain, mole and sand crabs

L	Surficial	Fully motile fast	Suspension feeding	311
L	Surficial	Fully motile fast	Surface deposit feeding	312
L	Surficial	Fully motile fast	Grazing	314
L	Surficial	Fully motile fast	Predator	315
L	Shallow infauna	Fully motile fast	Suspension feeding	511
L	Shallow infauna	Fully motile fast	Mining	513

Infraorder **<u>Brachyura</u>** — True crabs

L	Surficial	Facultatively motile attached	Other (parasite)	346
L	Surficial	Fully motile fast	Suspension feeding	311
L	Surficial	Fully motile fast	Surface deposit feeding	312
L	Surficial	Fully motile fast	Grazing	314
L	Surficial	Fully motile fast	Predator	315
L	Shallow infauna	Fully motile fast	Predator	515

Superorder **<u>Pericarida</u>** —

Order **<u>Mysida</u>** — Mysids (“fleas of the sea”)Most 2–3 mm. Preservation potential low

L	Pelagic	Fully motile fast	Suspension feeding	111
L	Pelagic	Fully motile fast	Grazing	114
L	Pelagic	Fully motile fast	Predator	115
L	Surficial	Fully motile fast	Suspension feeding	311
L	Surficial	Fully motile fast	Surface deposit feeding	312
L	Surficial	Fully motile fast	Grazing	314
L	Surficial	Fully motile fast	Predator	315

Order **<u>Lophogastrida</u>** — Mysid-like, but larger. Most 1–8 cm, max. 35cm. Preservation potential low

L	Pelagic	Fully motile fast	Predator	115

Order **<u>Cumacea</u>** — Carapace over anterior. 0.5–2 cm. Preservation potential low

L	Surficial	Fully motile fast	Surface deposit feeding	312
L	Surficial	Fully motile fast	Grazing	314
L	Semi-infaunal	Facultatively motile unattached	Suspension	431
L	Shallow infaunal	Fully motile fast	Mining	513
L	Shallow infaunal	Fully motile fast	Predator	515

Order **<u>Tanaidacea</u>** — Elongate, marsupiate. 0.5–120 mm. Preservation potential low

L	Surficial	Fully motile fast	Suspension feeding	311
L	Surficial	Fully motile fast	Surface deposit feeding	312
L	Surficial	Fully motile fast	Predator	315
L	Shallow infauna	Facultatively motile unattached	Suspension feeding	531
L	Shallow infauna	Fully motile fast	Mining	513
L	Shallow infauna	Fully motile fast	Predator	515

Order **<u>Thermosbaenacea</u>** —

L	Surficial	Fully motile fast	Surface deposit feeding	312

Order **<u>Isopoda</u>** — Varied, “pill bugs”, 0.5 mm– 50 cm. Preservation potential poor

L	Pelagic	Non-motile attached	Other (parasite)	166
L	Surficial	Non-motile attached	Other (parasite)	366
L	Surficial	Fully motile fast	Suspension feeding	311
L	Surficial	Fully motile fast	Surface deposit feeding	312
L	Surficial	Fully motile fast	Grazing	314
L	Surficial	Fully motile fast	Predator	315
L	Shallow infauna	Non-motile attached	Other (parasite)	566
L	Shallow infauna	Fully motile fast	Mining	513
L	Shallow infauna	Fully motile fast	Grazing	514
L	Shallow infauna	Fully motile fast	Predator	515

Order **<u>Amphipoda</u>** — amphipods 1 mm– 25 cm. Preservation potential poor

L	Pelagic	Non-motile attached	Other (parasite)	166
L	Pelagic	Facultatively motile attached	Other (parasite)	146
L	Pelagic	Fully motile fast	Suspension feeding	111
L	Pelagic	Fully motile fast	Predator	115
L	Erect	Facultatively motile attached	Other (parasite)	246
L	Surficial	Non-motile attached	Other (parasite)	366
L	Surficial	Facultatively motile attached	Other (parasite)	346
L	Surficial	Facultatively motile unattached	Suspension feeding	331
L	Surficial	Facultatively motile unattached	Grazing	334
L	Surficial	Fully motile fast	Suspension feeding	311
L	Surficial	Fully motile fast	Surface deposit feeding	312
L	Surficial	Fully motile fast	Grazing	314
L	Surficial	Fully motile fast	Predator	315
L	Shallow infauna	Non-motile attached	Other (parasite)	566
L	Shallow infauna	Facultatively motile attached	Suspension feeding	541
L	Shallow infauna	Facultatively motile unattached	Suspension feeding	531
L	Shallow infauna	Facultatively motile unattached	Mining	533
L	Shallow infauna	Fully motile slow	Mining	523
L	Shallow infauna	Fully motile slow	Grazing	524
L	Shallow infauna	Fully motile slow	Predator	525

Order **Mictacea** —

L	Pelagic	Fully motile fast	Suspension	111
L	Surficial	Fully motile fast	Suspension	311

Subphylum **Myriopoda** — [Living are all non-marine, but some marine fossils known.]

Subphylum **Hexapoda** — Insects. Predominantly non-marine, but several forms associate with the intertidal and *Halobates*, a "skater," is oceanic.

L	Pelagic	Fully motile fast	Predator	115
L	Surficial	Fully motile slow	Grazing	324
L	Shallow infauna	Facultatively motile unattached	Predator	535

— Eutrochozoan Lophotrochozoa —

Phylum **Catenulida** — Free-living simple elongate flatworms Preservation potential nil

L	Surficial	Fully motile slow	Surface deposit feeders	322

Phylum **Rhabditophora** — Most of old Platyhelminthes — Free-living and parasitic flatworms

Subphylum **Turbellaria**— Free-living flatworms

Class **Macrostomaphora** — Preservation potential nil

Order **Macrostomida** — Simple, small, mostly interstitial

L	Shallow infauna	Fully motile slow	Mining	523

Order **Haplopharyngida** — Small, to 6 mm

L	Shallow infauna	Fully motile slow	Mining	523

Class "**Polycladomorpha**" — Preservation potential low

Order **Lecithepitheliata** —

L	Shallow infauna	Fully motile slow	Mining	523

Order **Polycladida** — Polyclads. Large, mostly surficial

L	Surficial	Fully motile slow	Grazing	324
L	Surficial	Fully motile slow	Predator	325
L	Surficial	Fully motile slow	Other (Photosymbiosis)	326

Class "**Rhabdomorpha**" — Preservation potential low

Order **Proseriata** —

L	Surficial	Fully motile slow	Predator	325
L	Surficial	Facultatively motile unattached	Other (parasite)	326
L	Shallow infauna	Fully motile slow	Predator	525

Order **Rhabdocoela** —

L	Surficial	Fully motile slow	Grazing	324
L	Surficial	Fully motile slow	Predator	325
L	Surficial	Fully motile slow	Other (parasite)	326
L	Shallow infauna	Fully motile slow	Grazing	524
L	Shallow infauna	Fully motile slow	Predator	525

Order "**Fecampida+Urastomidae+Genostomidae**" —

L	Surficial	Fully motile slow	Grazing	324
L	Surficial	Fully motile slow	Other (parasite)	326
L	Shallow infauna	Fully motile slow	Mining	523

Order **Prolecithophora** —

L	Surficial	Fully motile slow	Predator	325
L	Shallow infauna	Fully motile slow	Predator	525

Order **Tricladida** —

L	Surficial	Fully motile slow	Predator	325
L	Surficial	Facultatively motile unattached	Other (parasite)	326

Subphylum **Neodermata** — Obligate parasitic flatworms Preservation potential nil

Class **Trematoda** — Mostly entoparasitic flukes in gastropods, bivalves, fish, snakes, mammals

Order **Aspidogastrea** —

L	Pelagic	Facultatively motile attached	Other (parasite)	146
L	Surficial	Facultatively motile attached	Other (parasite)	346
L	Shallow infauna	Facultatively motile attached	Other (parasite)	546

Order **Digenea** —

L	Pelagic	Facultatively motile attached	Other (parasite)	146
L	Surficial	Facultatively motile attached	Other (parasite)	346
L	Shallow infauna	Facultatively motile attached	Other (parasite)	546

Class **Monogenea** — Mostly ectoparasitic flukes on fish

Order **Monopisthocotylea** —

L	Pelagic	Facultatively motile attached	Other (parasite)	146
L	Surficial	Facultatively motile attached	Other (parasite)	346

Order **Polyopisthocotylea** —

L	Pelagic	Facultatively motile attached	Other (parasite)	146
L	Surficial	Facultatively motile attached	Other (parasite)	346

Class **Cestoda** — Tapeworms and relatives in elasmobranches and osteichthyes

Subclass **Cestodaria** —

Order **Gyrocotylidea** —

L	Pelagic	Non-motile attached	Other (parasite)	166
L	Surficial	Non-motile attached	Other (parasite)	366

Order **Amphilinidea** —

L	Pelagic	Non-motile attached	Other (parasite)	166
L	Surficial	Non-motile attached	Other (parasite)	366

Order **Eucestoda** —

L	Pelagic	Non-motile attached	Other (parasite)	166
L	Surficial	Non-motile attached	Other (parasite)	366

Phylum **Mollusca**

(Coeloscleritophora)

(Hyolitha)

(Stenothecoida)

Class **Polyplacophora** — Parts regularly preserved

(Subclass Paleoloricata)

Subclass **Neoloricata** — Chitons

Order **Lepidopleurida** —

L	Surficial	Fully motile slow	Grazing	324

Order **Ischnochitonida** —

L	Surficial	Fully motile slow	Grazing	324

Order **Acanthochitonida** —

L	Surficial	Fully motile slow	Grazing	324

Class **Aplacophora** — Vermiform Preservation potential poor

Subclass **Chaetodermomorpha** (=Caudofoveata) —

L	Shallow infauna	Fully motile slow	Grazing	524

Subclass **Neomeniomorpha** (=Solenogastres**) —**

L	Surficial	Fully motile slow	Grazing	324

Class **Monoplacophora** — Preservation potential good

(Subclass Hellcionelloidea)

Subclass **Tergomya** —

L	Surficial	Fully motile slow	Grazing	324

Class **Scaphopoda** — Preservation potential excellent

Dentalida

L	Semi-infaunal	Fully motile slow	Mining	423
L	Shallow infauna	Fully motile slow	Mining	523

Gadilida

L	Shallow infauna	Fully motile slow	Mining	523

Class **Bivalvia** — Clams, mussels, pectens, oysters, etc. Preservation potential excellent

Subclass **Protobranchia** —

Order **Nuculida** —

L	Shallow infauna	Fully motile slow	Mining	523
L	Deep infauna	Fully motile slow	Mining	623

Order **Solemyida** —

L	Shallow infauna	Fully motile slow	Other (chemosymbiotic)	536

Subclass **Lamellibranchia** —

Superorder **Pteriomorphia** —

Order **Arcoida** — Arks

L	Surficial	Non-motile attached	Suspension feeding	361
L	Surficial	Facultatively motile attached	Suspension feeding	341
L	Surficial	Facultatively motile unattached	Suspension feeding	331
L	Semi-infaunal	Facultatively motile unattached	Suspension feeding	431
L	Shallow infauna	Facultatively motile attached	Suspension feeding	541
L	Shallow infauna	Facultatively motile unattached	Suspension feeding	531

Order **Mytiloida** — Mussels

L	Surficial	Facultatively motile attached	Suspension feeding	341
L	Semi-infaunal	Facultatively motile attached	Suspension feeding	331

Order **Pterioida** — Pearl oysters, other alate bivalves and pinnids

L	Surficial	Non-motile attached	Suspension feeding	361
L	Semi-infaunal	Non-motile attached	Suspension feeding	461

Order **Limoida** — "Thorny" oysters

L	Surficial	Facultatively motile attached	Suspension feeding	341
L	Surficial	Facultatively motile unattached	Suspension feeding	331

Order **Ostreoida** — Oysters and pectens

L	Surficial	Non-motile attached	Suspension feeding	361
L	Surficial	Facultatively motile attached	Suspension feeding	341
L	Surficial	Facultatively motile unattached	Suspension feeding	331

Superorder **Heterodonta** —

Order **Palaeoheterodonta** — Trigonids (marine) and Unionids (fresh water)

L	Shallow infauna	Facultatively motile unattached	Suspension feeding	531

Order **Hippuritoida** — Chamids

L	Surficial	Non-motile attached	Suspension feeding	361
L	Surficial	Non-motile unattached	Suspension feeding	351

Order **Veneroida** — Wide range of clams

L	Surficial	Non-motile attached	Suspension feeding	361
L	Surficial	Non-motile attached	Other (photosymbiotic)	366
L	Surficial	Facultatively motile attached	Suspension feeding	341
L	Surficial	Facultatively motile attached	Other (parasite)	346
L	Surficial	Facultatively motile unattached	Suspension feeding	331
L	Surficial	Freely motile slow	Other (parasite)	326
L	Semi-infaunal	Facultatively motile attached	Suspension feeding	441
L	Semi-infaunal	Facultatively motile unattached	Suspension feeding	431
L	Shallow infauna	Non-motile attached	Suspension feeding	561
L	Shallow infauna	Facultatively motile attached	Suspension feeding	541
L	Shallow infauna	Facultatively motile unattached	Suspension feeding	531
L	Shallow infauna	Facultatively motile unattached	Surface deposit feeding	532
L	Shallow infauna	Facultatively motile unattached	Other (chemosymbiosis)	536
L	Shallow infauna	Fully motile slow	Suspension feeding	521
L	Deep infauna	Facultatively motile unattached	Suspension feeding	631
L	Deep infauna	Facultatively motile unattached	Surface deposit feeding	632
L	Deep infauna	Facultatively motile unattached	Other (chemosymbiosis)	636

Order **Myoida** — Mya and allies

L	Shallow infauna	Facultatively motile attached	Suspension feeding	541
L	Shallow infauna	Facultatively motile unattached	Suspension feeding	531
L	Deep infauna	Non-motile attached	Suspension feeding	661
L	Deep infauna	Facultatively motile unattached	Suspension feeding	631

Subclass **Anomalodesmata** — Various relatively odd forms.

L	Surficial	Non-motile attached	Suspension feeding	361
L	Shallow infauna	Non-motile attached	Suspension feeding	561
L	Shallow infauna	Facultatively motile attached	Suspension feeding	541
L	Shallow infauna	Facultatively motile unattached	Suspension feeding	531
L	Shallow infauna	Facultatively motile unattached	Predator	535

(Rostroconchia)

Class **Gastropoda** — Snails   Preservation potential good

[Bellerophontida]

Subclass **Eogastropoda** —

[Eomphalida]

Order Patellogastropoda (=Docoglossa)

L	Surficial	Facultatively motile unattached	Graziing	334
L	Surficial	Fully motile slow	Grazing	324

Subclass **Orthogastropoda** —

Superorder **Vetigastropoda** — include keyhole and slit limpets, top shells, etc.

L	Surficial	Facultatively motile unattached	Graziing	334
L	Surficial	Fully motile slow	Grazing	324

Superorder **Neritopsina** Nerites

L	Surficial	Facultatively motile unattached	Graziing	334
L	Surficial	Fully motile slow	Grazing	324

Superorder **Cocculinida** White limpets

L	Surficial	Facultatively motile unattached	Graziing	334

Subclass**Caenogastropoda**

Superorder**"Mesogastropoda" par**s: littorines, cowries, cerithids, vermetids, naticids, bursids, ampullariids and some others

L	Pelagic	Non-motile unattached	Suspension feeding	151
L	Pelagic	Fully motile slow	Predator	125
L	Surficial	Non-motile attached	Suspension feeding	361
L	Surficial	Facultatively motile attached	Other (parasite)	346
L	Surficial	Facultatively motile unattached	Suspension feeding	331
L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Surficial	Fully motile slow	Grazing	324
L	Surficial	Fully motile slow	Predator	325
L	Semi-infaunal	Fully motile slow	Predator	425
L	Shallow infauna	Fully motile slow	Suspension feeding	531
L	Shallow infauna	Fully motile slow	Predator	525

Superorder **Neogastropoda** whelks, muricids, volutes, harps, cones, augers

L	Surficial	Fully motile slow	Predator	325
L	Shallow infauna	Fully motile slow	Predator	525

Subclass **Heterobranchia**

Superorder **"Mesogastropoda" par**s: architectonicids, pyramidellids, etc.

L	Surficial	Fully motile slow	Grazing	324
L	Surficial	Fully motile slow	Predator	325

Superorder **Euthyneura** —

Order **Opisthobranchia** — includes bullids with shells and nudibranchs without

L	Pelagic	Fully motile slow	Suspension feeding	121
L	Pelagic	Fully motile slow	Predator	125
L	Surficial	Fully motile slow	Grazing	324
L	Surficial	Fully motile slow	Predator	325
L	Shallow infauna	Fully motile slow	Mining	523

Order **Pulmonata** —

L	Surficial	Fully motile slow	Grazing	324

Class **Cephalopoda** —

Subclass **Nautiloidea** —

L	Pelagic	Fully motile slow	Predator	125

Subclass **Coleoidea** —

Order **Sepioida** — Cuttlefish

L	Pelagic	Fully motile slow	Predator	125
L	Pelagic	Fully motile fast	Predator	115
L	Surficial	Fully motile slow	Predator	325
L	Surficial	Fully motile fast	Predator	315

Order **Teuthoida** — Squid

L	Pelagic	Fully motile fast	Predator	115

(Order Ammonoidea)

Order **Octopoda** — Octopuses

L	Pelagic	Fully motile slow	Predator	125
L	Surficial	Fully motile slow	Predator	325

Phylum **Annelida**

Class **Polychaeta** — Segmented worms Preservation potential low, except for jaws and tubes

Order **Phyllodocida** —

L	Pelagic	Fully motile fast	Predator	115
L	Surficial	Fully motile slow	Predator	325
L	Semi-infaunal	Facultatively motile unattached	Predator	435
L	Shallow infauna	Facultatively motile unattached	Suspension feeding	531
L	Shallow infauna	Facultatively motile unattached	Predator	535
L	Shallow infauna	Fully motile slow	Mining	523
L	Shallow infauna	Fully motile slow	Predator	525
L	Deep infauna	Fully motile slow	Mining	623
L	Deep infauna	Fully motile slow	Predator	625

	Order **Eunicida** —			
L	Surficial	Facultatively motile unattached	Grazing	344
L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Shallow infauna	Facultatively motile unattached	Mining	533
L	Shallow infauna	Facultatively motile unattached	Predator	535
L	Shallow infauna	Facultatively motile unattached	Other (parasite)	536
L	Shallow infauna	Fully motile slow	Mining	523
L	Shallow infauna	Fully motile slow	Predator	525
	Order **Spionida** —			
L	Pelagic	Fully motile slow	Suspension feeding	121
L	Shallow infauna	Facultatively motile unattached	Suspension feeding	531
L	Shallow infauna	Facultatively motile unattached	Surface deposit feeding	532
L	Shallow infauna	Fully motile slow	Mining	523
L	Shallow infauna	Fully motile slow	Predator	525
	Order **Chaetopterida** —			
L	Shallow	Facultatively motile attached	Suspension feeding	541
	Order **Cirratulida** —			
L	Shallow infauna	Facultatively motile unattached	Surface deposit feeding	532
L	Shallow infauna	Fully motile slow	Mining	523
	Order **Opheliida** —			
L	Shallow infauna	Fully motile slow	Mining	523
	Order **Capitellida** —			
L	Shallow infauna	Facultatively motile unattached	Suspension feeding	531
L	Shallow infauna	Facultatively motile unattached	Mining	533
	Order **Terebellida** —			
L	Shallow	Facultatively motile attached	Suspension feeding	541
L	Shallow infauna	Facultatively motile attached	Surface deposit feeding	542
L	Shallow infauna	Fully motile slow	Mining	523
	Order **Sabellida** —			
L	Surficial	Non-motile attached	Suspension feeding	361
L	Shallow infauna	Non-motile attached	Suspension feeding	561
	Numerous minor annelid orders —			
L	Surficial	Facultatively motile unattached	Predator	335
L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Surficial	Fully motile slow	Grazing	324
L	Surficial	Fully motile slow	Predator	325
L	Semi-infaunal	Facultatively motile unattached	Surface deposit feeding	432
L	Shallow infauna	Facultatively motile attached	Suspension feeding	541
L	Shallow infauna	Facultatively motile unattached	Surface deposit feeding	532
L	Shallow infauna	Fully motile slow	Mining	523
L	Shallow infauna	Fully motile slow	Grazing	524

Class **Clitellata** —

Subclass **Oligochaeta** —

L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Shallow infauna	Fully motile slow	Mining	523

Subclass **Hirudinoidea** — Leeches

L	Pelagic	Facultatively motile attached	Other (parasite)	146

Phylum **Pogonophora** — "Beard worms" Preservation potential low

L	Erect	Non-motile attached	Other (chemosymbiotic)	266
L	Semi-infaunal	Non-motile attached	Other (absorptive+)	466

Phylum **Echiura** — Three order. Preservation potential poor

L	Surficial	Facultatively motile unattached	Surface deposit feeding	332
L	Shallow infauna	Facultatively motile unattached	Suspension feeding	531
L	Shallow infauna	Facultatively motile unattached	Surface deposit feeding	532
L	Shallow infauna	Fully motile slow	Mining	523

Phylum **Sipuncula** — Worms with introvert, two classes, four orders. Preservation potential poor

L	Shallow infauna	Facultatively motile unattached	Suspension feeding	531
L	Shallow infauna	Facultatively motile unattached	Surface deposit feeding	532
L	Shallow infauna	Facultatively motile unattached	Mining	533
L	Deep infauna	Facultatively motile unattached	Mining	633

Phylum **Nemertea** — Worms with proboscis. Two classes, four orders. Preservation potential poor.

L	Pelagic	Fully motile slow	Predator	125
L	Surficial	Facultatively motile attached	Suspension	341
L	Surficial	Facultatively motile attached	Other (parasite)	346
L	Surficial	Fully motile slow	Predator	325
L	Shallow infauna	Facultatively motile attached	Other (parasite)	546
L	Shallow infauna	Fully motile slow	Mining	523
L	Shallow infauna	Fully motile slow	Predator	525

Phylum **Rhombozoa** — Dicemyids. Parasites of benthic cephalopods. Solid, no cavities. 0.5–5 mm. Preservation potential nil.

L	Surficial	Facultatively motile attached	Other (parasite)	346

Phylum **Orthonectida** — Solid, ciliated and plasmodial parasites of invertebrates. Microscopic (to 300 µm). Preservation potential nil.

L	Surficial	Fully motile slow	Other (parasite)	326

— Lophophorate Lophotrochozoa —

Phylum **Bryozoa** (Ectoprocta) Preservation potential good

Class **Stenolaemata** —

(Trepostomata)

(Cystoporata)

(Cryptostomata)

(Fenestrata)

Order **Cyclostomata** —

L	Erect	Non-motile attached	Suspension feeding	261
L	Surficial	Non-motile attached	Suspension feeding	361

Class **Gymnolaemata** —

Order **Ctenostomata** —

L	Surficial	Non-motile attached	Suspension feeding	361
L	Shallow infauna	Non-motile attached	Suspension feeding	561

Order **Cheilostomata** —

L	Erect	Non-motile attached	Suspension feeding	261
L	Surficial	Non-motile attached	Suspension feeding	361

Phylum **Phoronida** — Lophophoate vermiform Preservation potential nil

L	Surficial	Non-motile attached	Suspension feeding	361
L	Semi-infaunal	Non-motile attached	Suspension feeding	461

Phylum **Brachiopoda** — Preservation potential good

Class **Linguliformea** —

Superorder **Lingulata** —

Order **Lingulida** —

L	Shallow infauna	Facultatively motile unattached	Suspension feeding	531

(Siphonotretida)

(Acrotretida)

(Paterinata)

(Paterinida)

Class **Craniiformea** —

Superorder **Craniata** —

(Craniopsida)

Order **Craniida** —

L	Surficial	Non-motile attached	Suspension feeding	361

(Trimerellida)

Class **Rhynchonelliformea** —

(Chileata)

(Chileida)

(Dictyonellidina)

(Obolellata)

(Obolellida)

(Kutoriginata)

(Kutoriginida)

(Strophomenata)

(Billingselloidea)

(Triplesidina)

(Orthonectidina)

(Clitambonitidina)

(Strophomenidina)

(Productida)

Subclass **Rhynchonellata** —

(Order Protorthida)

(Order Orthida)

(Order Pentamerida)

Order **Rhynchonellida**

L	Surficial	Non-motile attached	Suspension feeding	361

(Order Atrypida)

(Order Spiriferida)

Order **Thecideidina**

L	Surficial	Non-motile attached	Suspension feeding	361

(Order Athyridida)

Order **Terebratulida**

L	Surficial	Non-motile attached	Suspension feeding	361
L	Surficial	Facultatively motile attached	Suspension feeding	341

— Paracoelomate Protostomes (Platyzoa) —

Phylum **Gastrotrichida** — 0.6–3 mm Preservation potential nil

L	Pelagic	Fully motile slow	Suspension feeding	121
L	Surficial	Facultatively motile attached	Surface deposit feeding	342
L	Shallow infauna	Facultatively motile attached	Mining	543

Phylum **Rotifera** — Rotifers 0.04 mm – 2 mm Few marine species Preservation potential nil

L	Surficial	Facultatively motile attached	Surface deposit feeding	342
L	Surficial	Facultatively motile attached	Predator	345
L	Surficial	Facultatively motile attached	Other (Parasite)	346

Phylum **Acanthocephala** — Thorny-headed worms 1 mm – 1 m (commonly 2 cm)

L	Pelagic	Facultatively motile attached	Other (parasite – vertebrates)	146

Phylum **Entoprocta** — Bryozoan-like, small. Preservation potential nil

L	Surficial	Non-motile attached	Suspension feeding	361
L	Surficial	Facultatively motile attached	Suspension feeding	341

Phylum **Cycliophora** — Preservation potential nil

L	Surficial	Non-motile attached	Suspension feeding	361

Phylum **Myzostomida** — Preservation potential nil

L	Surficial	Facultatively motile attached	Grazing	344
L	Surficial	Facultatively motile attached	Other (parasite)	346

Phylum **Gnathostomulida** — Preservation potential nil

L	Shallow infauna	Fully motile slow	Grazing	524

Phylum **Chaetognatha** — “Arrow worms” Preservation potential nil

L	Pelagic	Fully motile fast	Predator	115
L	Surficial	Facultatively motile attached	Predator	345

— Deuterostomes —

Phylum **Hemichordata** —

Class **Enteropneusta** —

L	Pelagic	Fully motile slow	Suspension feeding	121
L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Shallow infauna	Facultatively motile unattached	Suspension feeding	531
L	Shallow infauna	Fully motile slow	Mining	523

Class **Pterobranchia** —

L	Surficial	Non-motile attached	Suspension feeding	361

(Graptolithina)

Phylum **Echinodermata** — Preservation potential fair to good

(Subphylum Blastozoa)

(Eocrinoidea)

(Rhombifera)

(Diploporita)

(Parblastoidea)

(Blastoidea)

Subphylum **Crinozoa** —

Class **Crinoidea** — Crinoids Preservation potential modest

L	Erect	Non-motile attached	Suspension feeding	261
L	Erect	Facultatively motile attached	Suspension feeding	241
L	Surficial	Non-motile attached	Suspension feeding	361
L	Surficial	Facultatively motile attached	Suspension feeding	341

(Paracrinoidea)

Subphylum **Asterozoa** —

Class **Asteroidea** — Starfish   Preservation potential poor

L	Surficial	Facultatively motile unattached	Other (absorptive)	336
L	Surficial	Fully motile slow	Suspension feeding	321
L	Surficial	Fully motile slow	Grazing	324
L	Surficial	Fully motile slow	Predator	325
L	Semi-infaunal	Facultatively motile unattached	Suspension feeding	431
L	Semi-infaunal	Facultatively motile unattached	Surface deposit feeding	432
L	Semi-infaunal	Facultatively motile unattached	Other (absorptive)	436
L	Semi-infaunal	Fully motile slow	Predator	425

Class **Ophiuroidea** — Brittle stars   Preservation potential moderate

L	Surficial	Facultatively motile unattached	Suspension feeding	331
L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Surficial	Fully motile slow	Predator	325

(Subphylum Homalozoa)

(Class Stylophora)

(Class Homoiostelea)

(Class Homostelea)

(Class Ctenocystoidea)

Subphylum **Echinozoa** —

(Edrioasteroidea)

(Helicoplacoidea)

(Ophiocistoidea)

(Cyclocystoidea)

(Edrioblasoidea)

Class **Holothuroidea** — Sea cucumbers   Preservation potential poor except for sclerites

L	Surficial	Facultatively motile attached	Suspension feeding	341
L	Surficial	Facultatively motile unattached	Suspension feeding	331
L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Semi-infaunal	Facultatively motile unattached	Suspension feeding	431
L	Semi-infaunal	Facultatively motile unattached	Surface deposit feeding	432
L	Shallow infauna	Fully motile slow	Mining	523

Class **Echinoidea** — Sea urchins Perservtion potential fair to good

Subclass **Perischoechinoidea** —

Order **Cidaroida** — Cidaroids

L	Surficial	Fully motile slow	Grazing	324

Subclass **Euechinoidea** —

Superorder **Diadematacea** —

L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Surficial	Fully motile slow	Grazing	324

Superorder **Echinacea** — Stirodonts and Camarodonts

L	Surficial	Facultatively motile attached	Suspension feeding	341
L	Surficial	Fully motile slow	Grazing	324
L	Surficial	Fully motile slow	Predator	325
L	Semi-infaunal	Facultatively motile unattached	Grazing	434
L	Shallow infaunal	Facultatively motile unattached	Suspension feeding	531

Superorder **Atelostomata** — Spatangoids+

L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Shallow infauna	Facultatively motile unattached	Suspension	531
L	Shallow infauna	Fully motile slow`	Surface deposit feeding	532
L	Shallow infauna	Fully motile slow	Mining	523
L	Deep infauna	Fully motile slow	Mining	623

Superorder **Neognathostomata** — Clypeasteroids and Cassiduloids

L	Surficial	Fully motile slow	Surface deposit feeding	322
L	Semi-infaunal	Facultatively motile unattached	Suspension feeding	431
L	Semi-infaunal	Fully motile slow	Surface deposit feeding	422
L	Shallow infaunal	Fully motile slow	Surface deposit feeding	522
L	Shallow infauna	Fully motile slow	Mining	523

[Phylum Vetulicolia — Chengjiangian bipartite and gilled oddballs Cambrian]

Phylum **Chordata**

Subphylum **Urochordata** — Tunicates Preservation potential poor

Class **Ascidiacia** — Ascidians or sea squirts

L	Erect	Non-motile attached	Suspension feeding	261
L	Surficial	Non-motile attached	Suspension feeding	361
L	Surficial	Facultatively motile, unattached	Other (photosymbiotic)	336
L	Semi-infaunal	Non-motile unattached	Suspension feeding	451

Class **Thaliacea** — Pelagic tunicates or salps

L	Pelagic	Fully motile, slow	Suspension feeding	121

Class **Appendicularia** — Larvaceans

L	Pelagic	Fully motile, slow	Suspension feeding	121

Class **Sorberacea** — Deep sea predators, lack branchial sac

L	Surficial	Non-motile, attached	Predator	365

[Subphylum Yunnanozoa — Chengjiangian finned swimmers Cambrian]

Subphylum **Cephalochordata** — Lancelets, amphioxus

L	Semi-infaunal	Facultatively motile unattached	Suspension feeding	431

Subphylum **Craniata**

[Infraphylum Conodonta — Conodonts Cambrian–Triassic]

[Class Paraconodonta — Basal conodonts Cambrian–Ordovician]

[Class Conodontophorida — Euconodonts Cambrian–Triassic]

Infraphylum **Agnatha** — "Jawless fish"

Class **Myxinoidea** — Stem agnathans

Order **Myxiniformes** — Hagfish

L	Surficial	Fully motile fast	Predator	315

Class **Pteraspidomorphi** —

[Subclass Arandaspida — Early agnathans (probably suspension or surface deposit) Ordovician]

[Order Arandaspidiformes — Ordovician]

Subclass **Heterostraci** —

[Order Heterostraciformes — Silurian–Devonian]

[Suborder Cyathaspidiformes — Silurian–Devonian]

[Suborder Amphiaspidida — Silurian–Devonian]

[Suborder Pteraspidiformes — Silurian–Devonian]

[Order Theolodontida — Ordovician–Devonian]

[Order Anaspida — Silurian–Devonian]

Order **Petromyzontiformes** — Lampreys

L	Pelagic	Fully motile fast	Other (parasite)	116

[Class Galeaspida — Silurian–Devonian]

[Order Galeaspidiformes — Silurian–Devonian]

[Order Polybranchiaspidida — Devonian]

[Order Hunanaspidiformes — Devonian]

[Class Pituriaspida — Devonian]

[Class Osteostraci — Silurian–Devonian]

[Suborder Cornuata — Silurian]

[Order Cephalaspida — Silurian–Devonian]

[Order Zenaspida — Devonian]

[Order Kiaeraspidida — Devonian]

[Order Benneviaspidida — Devonian]

[Order Thyestiida — Devonian]

Infraphylum **Gnathostomata** — Jawed vertebrates

Class **Chondrichthyes** — Cartilagenous fishes

Subclass **Elasmobranchii** —

[Superorder Cladoselachimorpha — Devonian–Triassic]

[Order Cladodontiformes — Devonian]

[Order Coronodontia — Devonian]

[Order Symmoriida — Devonian–Pennsylvanian]

[Order Eugeneodontida — Mississippian–Triassic]

[Order Squatinactida — Mississippian]

Superorder **Euselachii** —

[Order Ctenacanthiformes — Devonian–Paleocene]

[Order Xenacanthida — Mississippian–Permian]

Order **Galeomorpha** — Sharks

L	Pelagic	Fully motile fast	Suspension feeding	111
L	Pelagic	Fully motile fast	Predator	115

Order **Squalomorpha** — Dogfish

L	Pelagic	Fully motile fast	Predator	115
L	Surficial	Fully motile fast	Predator	315

Order **Batoidea** — Skates and rays

L	Pelagic	Fully motile fast	Suspnsion feeding	111
L	Surficial	Fully motile fast	Predator	315

Subclass **Holocephali** —

[Superorder Paraselachimorpha — Devonian–Permian]

[Order Iniopterygia — Pennsylvanian]

[Order Orodontiformes — Devonian–Pennsylvanian]

[Order Copodontiformes — Devonian–Mississippian]

[Order Petalodontiformes — Mississippian–Permian]

[Order Psammosteiformes — Devonian–Mississippian]

Superorder **Holocephalimorpha** —

[Order Cochliodontiformes — Devonian–Permian]

[Order Chondrenchelyformes — Mississippian–Pennsylvanian]

Order **Chimaeriformes** —

L	Pelagic	Fully motile fast	Predator	115

[Class Placodermi — Armored fishes Devonian]

[Order Stensioellida — Devonian]

[Order Pseudopetalichthyida — Devonian]

[Order Ptyctodontida — Devonian]

[Order Rhenanida — Devonian]

[Order Acanthoraci — Devonian]

[Order Petalichthyida — Devonian]

[Order Arthrodira — Devonian]

[Order Antiarchi — Devonian]

[Class Acanthodii — Silurian–Permian]

[Order Ishnacanthiformes — Silurian–Pennsylvanian]

[Order Climatiiformes — Silurian–Pennsylvanian]

[Order Acanthodiformes — Devonian–Permian]

Class **Osteichthyes** — Bony fishes

Subclass **Actinopterygii** —

Infraclass **Chondrostei** —

[Order Palaeonisciformes — Devonian–Cretaceous]

[Order Haplolepiformes — Pennsylvanian]

[Order Dorypteriformes — Permian]

[Order Tarrasiiformes — Mississippian]

[Order Ptycholepiformes — Triassic–Jurassic]

[Order Pholidopleuriformes — Triassic]

[Order Luganoiformes — Triassic]

[Order Redfieldiiformes — Triassic]

[Order Perleidiformes — Triassic]

[Order Peltopleuriformes — Triassic]

[Order Phanerorhynchiformes — Pennsylvanian]

[Order Saurichthyiformes — Triassic]

Order **Polypteriformes** — Freshwater only

Order **Acipenseriformes** — Sturgeons, etc.

L Surficial Fully motile fast Predator 315

Infraclass **Neopterygii** —

Order **Lepisosteiformes** — Gars — rarely marine

[Order Semionotiformes — Permian–Cretaceous]

[Order Pycnodontiformes — Triassic–Cretaceous]

[Order Macrosemiiformes — Triassic–Cretaceous]

Order **Amiiformes** — Freshwater only

[Order Pachycormiformes — Triassic–Cretaceous]

Order [Aspidorhychiformes — Jurassic–Cretaceous]

Division **Teleostei** —

[Order Pholidophoriformes — Triassic–Cretaceous]

[Order Leptolepiformes — Jurassic–Cretaceous]

[Order Ichthyodectiformes — Jurassic–Cretaceous]

Subdivision **Osteoglossomorpha** —

Order **Osteoglossiformes** — Freshwater only

Subdivision **Elopomorhpha** —

Order **Elopiformes** — Tarpon and ten pounders

L	Pelagic	Fully motile fast	Predator	115

Order **Anguilliformes** — Eels and moray eels

L	Pelagic	Fully motile fast	Predator	115
L	Surficial	Fully motile fast	Predator	315
L	Semi-infaunal	Facultatively motile unattached	Predator	435

Order **Notocanthiformes** — Deep-sea spiney eels

L	Surficial	Fully motile fast	Predator	315

Subdivision **Clupeomorpha** —

[Order Ellimmichthyiformes — Cretaceous–Miocene]

Order **Clupeiformes** — Wolf herring, herring, anchovies, shad, sardines

L	Pelagic	Fully motile fast	Suspension feeding	111
L	Pelagic	Fully motile fast	Predator	115

Subdivision **Euteloeostei** —

Order **Salmoniformes** — Salmon, etc.

L	Pelagic	Fully motile fast	Predator	115

Order **Gonorhynchiformes** — Milkfish, etc.

L	Pelagic	Fully motile fast	Grazer	114
L	Pelagic	Fully motile fast	Predator	115

Order **Characiformes** — Freshwater only

Order **Cypriniformes** — Carp — Freshwater only

Order **Siluriformes** — Catfish

L	Surficial	Fully motile fast	Predator	315

Order **Stomiiformes** — Lightfish, dragonfish

L	Pelagic	Fully motile fast	Predator	115

Order **Aulopiformes** — Deep water, elongate “grinners”

L	Pelagic	Fully motile fast	Predator	115

Order **Myctophiformes** — Lanternfish

L	Pelagic	Fully motile fast	Predator	115

[Order Pattersonichthyiformes — Cretaceous]

[Order Ctenothrissiformes — Cretaceous]

Order **Percopsiformes** — Freshwater only

Order **Batrachoidiformes** — Toadfish

L	Surficial	Facultatively motile unattached	Predator	335

Order **Gobiesciformes** — Clingfishes

L	Surficial	Facultatively motile unattached	Grazer	334
L	Surficial	Facultatively motile unattached	Predator	335

Order **Lophiformes** — Anglerfish, frogfish, batfish

L	Pelagic	Fully motile fast	Predator	115
L	Pelagic	Non-motile attached	Other (Parasite)	166
L	Surficial	Facultatively motile unattached	Predator	335
L	Surficial	Fully motile slow	Predator	325
L	Semi-infaunal	Facultatively motile unattached	Predator	435

Order **Gadiformes** — Cods and hakes

L	Pelagic	Fully motile fast	Suspension	111
L	Pelagic	Fully motile fast	Predator	115

Order **Ophidiiformes** — Cusk eels (Some are commensal and parasitic in holothurians)

L	Pelagic	Fully motile fast	Predator	115
L	Surficial	Facultatively motile unattached	Predator	335
L	Surficial	Facultatively motile unattached	Other (parasite)	336
L	Surficial	Fully motile fast	Predator	315

Order **Atheriniformes** — Silversides

L	Pelagic	Fully motile fast	Suspension	111
L	Pelagic	Fully motile fast	Predator	115

Order **Cyprinidontiformes** — Pupfish, ___fish

L	Pelagic	Fully motile fast	Predator	115

Order **Beryciformes** — Sawbellies, squirrilfish

L	Pelagic	Fully motile fast	Predator	115

Order **Zeiformes** — Dories

L	Pelagic	Fully motile fast	Predator	115

Order **Lampriformes** — Oarfish

L	Pelagic	Fully motile fast	Predator	115

Order **Gasterosteiformes** — Sticklebacks and sea moths

L	Pelagic	Fully motile fast	Predator	115

Order **Syngnathiformes** — Trumpetfish, seahorses, pipefish

L	Pelagic	Fully motile fast	Predator	115
L	Pelagic	Fully motile slow	Predator	125
L	Surficial	Facultatively motile attached	Suspension	341
L	Surficial	Facultatively motile attached	Predator	345

Order **Synbranchiformes** — Freshwater only

Order **Indostomiformes** — Freshwater only

Order **Pegasiformes** —

L	Pelagic	Fully motile fast	Suspension	111
L	Surficial	Fully motile fast	Predator	315

Order **Scorpaeniformes** — Scorpionfish

L	Pelagic	Fully motile fast	Predator	115
L	Surficial	Fully motile fast	Predator	315
L	Shallow	Facultatively motile unattached	Predator	535

Order **Perciformes** — Many types, from groupers to angelfish to parrotfish

L	Pelagic	Fully motile fast	Suspension	111
L	Pelagic	Fully motile fast	Surface deposit feeding	112
L	Pelagic	Fully motile fast	Grazer	114
L	Pelagic	Fully motile fast	Predator	115
L	Surficial	Facultatively motile unattached	Grazer	334
L	Surficial	Facultatively motile unattached	Predator	335
L	Surficial	Fully motile fast	Predator	315
L	Semi-infaunal	Facultatively motile unattached	Predator	435
L	Shallow	Facultatively motile unattached	Suspension	531
L	Shallow	Facultatively motile unattached	Predator	535

Order **Dactylopteridae** — Flying gurnards

L	Surficial	Fully motile slow	Predator	325

Order **Pleuronectiformes** — Flatfish

L	Surficial	Facultatively motile unattached	Predator	335
L	Semi-infaunal	Facultatively motile unattached	Predator	435

Order **Tetraodontiformes** — Puffers, boxfish, ocean sunfish

L	Pelagic	Fully motile fast	Grazer	114
L	Pelagic	Fully motile fast	Predator	115

Subclass **Sarcopterygii** — Lobe-finned fishes

Order **Actinistia** — Coelocanths

L	Pelagic	Fully motile fast	Predator	115

[Order Porolepiformes — Devonian]

[Order Onychodontiformes — Devonian]

[Order Rhizodontiformes — Devonian–Pennsylvanian]

[Order Osteolepiformes — Devonian–Mississippian]

[Order Panderichthyida — Devonian]

[Order Acanthostegida — Basal tetrapods Devonian]

Class **Reptilia** — Turtles, Lizards, Snakes [and extinct groups]

[Subclass Anaspida — Stem amniotes Pennyslvanian–Trissic]

[Order Mesosauria — Mesosaurs Permian]

Subclass **Testudinata** — Turtles

Order **Chelonia** — Turtles

Superfamily **Chelonioidea** — Sea turtles

L	Pelagic	Fully motile fast	Grazer	114
L	Pelagic	Fully motile fast	Perdator	115

Subclass **Diapsida** —

[Order Eosuchia — Only a few aquatic Permian]

[Order Thalattosauria — Triassic]

[Order Choristodera — Crocodile-like Cretaceous–Eocene]

Order **Sphenodontida** —

[Family Pleurosauridae — Pleurosaurs (elongate) Jurassic–Cretaceous]

Order **Squamata** — Lizards and snakes

Suborder **Lacertilia** — Lizards

Infraorder **Iguania** —

L	Pelagic	Fully motile fast	Pedator	115

Infraorder **Diploglossa** —

Superfamily **Varanidea** — Varanid lizards

[Family Dolichosauridae — Cretaceous]

[Family Aigialosauridae — Jurassic–Cretaceous]

[Family Mosasauridae — Mosasaurs (to 10 m) Cretaceous]

Suborder **Serpentes** — Snakes

Infraorder **Caenophidia** —

Superfamily **Colubroidea** —

Family **Elapidae** — Cobras, etc.

Subfamily **Hydropheidae** — Sea snakes

L	Pelagic	Fully motile fast	Pedator	115

[Superorder Sauroptrygia — Permian–Cretaceous]

[Order incertae sedis Permian]

[Family Claudiosauridae — Permian]

[Order Nothosauria — Nothosaurs Triassic]

[Order Plesiosauria — Plesiosaurs and Pliosaurs Jurassic–Cretaceous]

Superfamily Plesiosauroidea — Plesiosaurs Jurassic–Cretaceous]

Superfamily Pliosauroidea — Pliosaurs Jurassic–Cretaceous]

[Diapsida incertae sedis — Triassic–Cretaceous]

[Order Placodontia — Placodonts — Triassic]

[Order Ichthyopterygia — Ichthyosaurs — Trissic–Cretaceous]

Infraclass **Archosauromorpha** —

[Order Protorosauria — Triassic]

[Family Tanystropheidae — Oddballs — Triassic]

[Order Thecodontia — Permian–Jurassic]

Suborder Phytosauria — Phytosaurs — Triassic]

Order **Crocodylia** — Crocodiles, alligators, caimans

L	Surficial	Facultatively motile unattached	Perdator	335

[Order Pterosauria — Pterosaurs — Jurassic–Cretaceous]

Class **Aves** — Birds

Order **Sphenisciformes** — Penguins

L	Pelagic	Fully motile, fast	Predator	115

Order **Procellariiformes** — Albatrosses, shearwaters, petrels, storm-petrels

L	Pelagic	Fully motile, fast	Predator	115

Order **Pelecaniformes** — Tropicbirds, gannets, boobies, pelicans, cormorants, frigatebirds

L	Pelagic	Fully motile, fast	Predator	115

Order **Anseriformes** — Ducks, geese, swans

L	Pelagic	Fully motile, fast	Suspension feeding	111
L	Pelagic	Fully motile, fast	Grazing	114

Order **Phoenicopteriformes** — Flamingoes [One genus: *Phoenicopterus* five species]

L	Surficial	Fully motile, fast	Suspension feeding	311

Order **Ciconiiformes** — Herons, egrets, bitterns, ibises, spoonbills, storks

L	Surficial	Fully motile, fast	Predator	315

Order **Gruiformes** — Includes rails

L	Surficial	Fully motile, fast	Predator	315

Order **Charadriiformes** — Shorebirds and their relatives:

Families **Charadriidae, Haematopodidae, Recurvirostridae, Scolopacidae** — Plovers, oystercatchers, stilts, avocets, sandpipers

L	Surficial	Fully motile, fast	Predator	315

Family **Laridae** — Jaegers, gulls, terns, skimmers

L	Pelagic	Fully motile, fast	Predator	115
L	Surficial	Fully motile, fast	Predator	315

Family **Alcidae** — Auks, murres, puffins

L	Pelagic	Fully motile, fast	Predator	115

Class **Mammalia** — Mammals

Order **Cetacea** — Whales, dolphins, porpoises

Suborder **Odontoceti** — Dolphins, porpoises, toothed whales

L	Pelagic	Fully motile, fast	Predator	115

Suborder **Mysticeti** — Baleen whales

L	Pelagic	Fully motile, fast	Suspension feeding	111
L	Pelagic	Fully motile, fast	Mining	113

Order **Carnivora** — Dogs, bears, raccoons, weasels, mongooses, hyenas, cats

Family **Mustelidae** — includes Sea Otters

L	Pelagic	Fully motile, fast	Predator	115

Order **Pinnipedia** — Seals, sea lions, walruses

L	Pelagic	Fully motile, fast	Predator	115

Order **Sirenia** — Manatees, dugong, sea cow

L	Pelagic	Fully motile, fast	Grazing	114

(2) Tally of Modes of Life for the Living Marine Fauna.

Bold numbers are number of groups (orders or above) in the total global marine fauna with representatives in that mode of life. *Italic* numbers are the number of groups with a diverse fossil record with living representatives in that mode. Small numbers are the number of groups with commonly preserved hard parts with living representatives in that mode. — = modes that probably also exist.

Tiering	Motility Level	Feeding Strategy
1 Pelagic	6 Non-motile, attached	1 Suspension feeding
2 Erect epifauna	5 Non-motile, unattached	2 Surface deposit feeding
3 Surface epifauna	4 Facultatively motile, attached	3 Mining
4 Semi-infaunal	3 Facultatively motile, unattached	4 Grazing
5 Shallow infauna	2 Fully motile, slow	5 Predator
6 Deep infauna	1 Fully motile fast	6 Other (Parasite, photosymbiosis, etc.)

161	**1** *1* 1	261	**39** *37* 12	361	**43** *37* 20	461	**4** *4* 2	561	**7** *6* 6	661	**1** *1* 1
162		262		362		462		562		662	
163		263		363		463		563		663	
164		264		364		464		564		664	
165	—	265	**4** *3* 1	365	**6** *3* 1	465	—	565		665	
166	**7** *4* 1	266	**7** *3* 1	366	**13** *5* 2	466	**1** . .	566	**3** *2* .	666	—
151	**3** *1* 1	251	**1** *1* 1	351	**2** *2* 2	451	**1** . .	551		651	
152		252		352		452		552		652	
153		253		353		453		553		653	
154		254		354		454		554		654	
155	**2** *1* .	255	**1** *1* 1	355	**2** *2* 1	455		555		655	
156	**1** . .	256	**1** *1* 1	356	**1** *1* 1	456	—	556	—	656	—
141	—	241	**2** *2* .	341	**13** *11* 7	441	**3** *3* 1	541	**9** *8* 4	641	
142		242		342	**2** . .	442	—	542	**1** *1* .	642	
143		243		343		443	—	543	**1** . .	643	
144		244		344	**1** *1* 1	444	—	544	—	644	
145	—	245	**2** *2* .	345	**6** *2* .	445	**1** . .	545	—	645	
146	**15** *1* .	246	**1** *1* .	346	**17** *4* 3	446	—	546	**4** . .	646	—
131		231		331	**11** *10* 6	431	**7** *6* 3	531	**21** *17* 10	631	**3** *3* 2
132		232		332	**1** . .	432	**3** *2* .	532	**7** *4* 2	632	**1** *1* 1
133		233		333		433	—	533	**5** *4* 1	633	**2** *1* .
134		234		334	**8** *7* 4	434	**1** *1* 1	534	—	634	
135		235	**1** *1* .	335	**9** *8* .	435	**6** *6* .	535	**8** *5* 2	635	
136	—	236	—	336	**5** *2* .	436	**1** *1* .	536	**3** *3* 3	636	**1** *1* 1
121	**14** *2* 1	221		321	**3** *2* 1	421		521	**1** *1* 1	621	
122		222		322	**26** *11* 9	422	**1** *1* 1	522	**1** *1* 1	622	
123		223		323		423	**1** *1* 1	523	**37** *17* 9	623	**3** *3* 2
124		224		324	**34** *18* 13	424	—	524	**12** *1* .	624	
125	**15** *7* 3	225		325	**27** *14* 6	425	**3** *2* 1	525	**14** *6* 3	625	**1** *1* .
126	**3** . .	226		326	**7** *1* 1	426		526	**2** . .	626	
111	**17** *16* 4	211		311	**9** *9* 2	411		511	**1** *1* 1	611	
112	**2** *2* .	212		312	**12** *12* 2	412		512	—	612	
113	**1** *1* 1	213		313		413		513	**4** *4* 1	613	
114	**8** *8* 2	214		314	**7** *7* 2	414		514	**1** *1* .	614	
115	**47** *46* 8	215		315	**30** *28* 7	415	**1** *1* 1	515	**7** *7* 2	615	
116	**1** *1* .	216		316		416		516		616	
	15 *13* 9 / **137**, *90*, 22		**10** *10* 6 / **59**, *52*, 17		**25** *23* 20 / **245**, 197, 91		**14** *11* 8 / **34**, *28*, 11		**21** *18* 14 / **149**, *89*, 46		**7** *7* 5 / **12**, *11*, 7

(3) Constraints on occupied modes of life.

Either the animal or the food should be mobile. Animals must be able to move to their food or the food must be transported to the animal, otherwise they do not find each other. This is why non-motile animals do not graze, surface deposit feed, or mine. Because there is a danger of exhausting the local food supply, some motility is necessary for successful deposit feeding, mining or grazing. Even tube-dwelling terebellid polychaetes are capable of re-locating or re-burrowing if necessary. Although it is conceivable that a non-motile organism could evolve that would grow ever-longer tentacles to reach new food, the energetic and mass balance demands for growth would require a regular high quality food supply. Such concentrations would be unusual and would be exploited by motile individuals from elsewhere as well, making the likelihood of successful evolution or continued survival of non-motile surface deposit feeding, mining or grazing remote. Thus thirty-six potential modes of life, six in each tier, are eliminated as highly unlikely to nearly impossible. However, suspension feeders can be non-motile because currents carry the food, and predators can be non-motile if the prey comes to them ("ambush" predators).

The animal and the food should be in the same tier. Generally, for efficiency the food an animal eats should be from the tier in which the animal lives. This constraint does not apply to motile pelagic animals, which are free to swim down to the sediment (and in one case even mine), nor does it apply to infaunal suspension feeders that pump water for filtering. These exceptions are positive examples of constraint number one, motile animals going to food or food being transported to the animal.

For the pelagic tier a combination of factors makes six modes of life unlikely in addition to the six mentioned above for non-motile forms in that tier. Surface deposit feeding, mining and grazing are not likely for pelagic facultatively motile forms (a life style utilized only by parasites in our survey) because of the low probability that a pelagic attachment site would encounter benthic food sources reliably. Pelagic motile but slow forms (a life style that includes, for example, pelagic jellyfish) would be out-competed for benthic food resources by fast forms or by benthic residents.

Twelve modes of life in the erect tier beyond the six already ruled out above for non-motile forms are unlikely because the erect growth form is not functionally efficacious for benthic feeding. The selective advantage for erect growth by epifauna is to reach up into the water column to intersect resources in the overlying water mass. Erect growth would not be useful for any bottom-feeding style (surface deposit feeding, mining, or grazing) because of competition from surficial and infaunal forms with more direct access to the food on and in the substratum. Additional physical issues discussed below reinforce this constraint.

It is unlikely that motile or facultatively motile surficial forms will practice mining because probing into the sediment is almost as energetically demanding as burrowing directly, so little efficiency is gained, yet remaining exposed on the surface while probing below would leave the probing animal vulnerable to attack. Hence four more potential modes are unlikely.

Likewise, deep infauna are not expected to be grazers, a feeding strategy used generally to select food from surfaces, not within the sediment, thus making four more modes unlikely. The only infaunal grazers recorded in our survey are meiofauna, tiny animals eating bacterial floras from sediment grains. Their small size makes them functionally grazers, but they exploit the same food source many miners also utilize. We treat the meiofauna as shallow because sediment compaction would limit the depth at which they can remain abundant.

Motility level can be limited by the physical properties of the surrounding medium. Thus, some motility levels are incompatible with the physical conditions of some tiers.

We assigned no pelagic animals to the unattached facultatively motile category (although it is possible some parasites could have that motility level). Sinking is a problem unless an animal is buoyant, and those that are float and are not actively motile (*Physalia*, *Velella*). Although they are often nearly neutrally buoyant, jellyfish and salps are categorized as motile slow. Five more modes are eliminated.

The possibility of damage by being toppled or swept away by currents is a factor that generally precludes free motility for erect epifauna. This constraint selects for attachment or bulky form to resist disturbance for animals with erect morphologies. In contrast, there are freely motile grazers on land (e.g., giraffes) that use their erect stance to reach highly placed food; because air is less viscous than water, giraffes are rarely in danger of being blown over. In addition, an “underwater giraffe” would face competition from fish that could simply swim up to highly placed resource, whereas the low viscosity of air prevents large-bodied grazers from flying. This constraint reinforces the restriction of erect forms from benthic feeding noted above and also makes seven more modes unlikely.

Although a few shallow infauna are categorized as fully motile and fast, such as *Limulus,* which can forcefully push along just underneath the sediment surface with its active legs, deep infauna can not be fully motile fast forms. Some may move rapidly in pre-excavated burrows, but penetrating through deep sediment precludes fast motion. Deep infauna are usually not attached forms, either, because depth of burial alone is sufficient protection from disturbance, although many are facultatively motile and do not move much or often. Hence another 13 potential modes of life are unlikely.

A few unusual, seemingly unlikely modes of life have evolved. For instance, one might not expect non-motile deep infauna because motility seems necessary for deep burrowing. However, some bivalves (Gastrochaenids and *Teredo*) are capable of boring to considerable depths (over one meter) into coral rock or wood. They do this during growth, enlarging the length and width of the boring as they add size and biomass; they are not motile, and in our general scheme are deep infaunal and non-motile because at the level at which we are parsing modes of life we do not separate infaunal animals that penetrate hard and soft substrates. Another unexpected mode of life is pelagic, fully motile fast, mining. However, to catch and eat benthic invertebrates grey whales plow their heads into the sea-floor and scoop up large volumes of sediment that they strain on their baleen. They are carnivorous in diet, but their feeding mechanism is to take useful organic material from the upper layers of the sediment. Although at the scale of a whale this feeding mechanism might be surface deposit feeding, the animals are taking food fully buried in the sediment, not just on the surface. They are sediment miners. Both borings into hard substrates and grey whale skeletons are fossilizable, so both of these odd modes of life could be documented in the fossil record. This would be obvious for borings, but requires taxonomic uniformitarian analogy for the whale.

(4) Tabulations of Adaptive Facies:

The tables that follow (4A, 4B, 4C), designated as adaptive facies, are “cuts” through the three-dimensional ecospace cube. So that the effects of constraint on occupation of ecospace can be seen fully, the complete tabulation is shown for each of the three axes used in this study.

(4A) Adaptive Facies by Tier (see note on preceding page)

Tier: 1 **Pelagic**

161 1 *1* 1	162	163	164	165 —	166 7 *4* 1	6 Non-Motile Attached
151 3 *1* 1	152	153	154	155 2 *1* .	156 1 . .	5 Non-Motile Unattached
141 —	142	143	144	145 —	146 15 *1* .	4 Facultat. Motile Attached
131	132	133	134	135	136 —	3 Facultat. Motile Unattached
121 14 *2* 1	122	123	124	125 15 *7* 3	126 3 . .	2 Fully Motile Slow
111 17 *16* 4	112 2 *2* .	113 2 *2* 2	114 8 *8* 2	115 **46** ***45*** 7	116 1 *1* .	1 Fully Motile Fast
1 Suspension Feeder	2 Surface Deposit Feeder	3 Mining	4 Grazing	5 Predator	6 Other	

In boxes the upper number is the number of groups of all metazoa with one or more members utilizing that mode of life, in the second row, *italic numbers* represent the number of groups that have reasonably diverse representatives in the fossil record and living representatives with that mode, smaller numbers represent the number of groups with readily preserved hard parts commonly found in the fossil record that display that mode in the living fauna.

162-164: Not expected because some motility needed to avoid exhausting local food supply. Also not likely because attachment site could not be expected to maintain access to target food source.
165, 141, 145: Epiplanktonic mode possible but may get classed with surficial or erect forms.
152-154: Not expected because some motility needed to avoid exhausting local food supply. Also this motility type in pelagic generally only for floating and then access to these feeding styles precluded.
142-144: Not expected because attachment site could not be expected to maintain reliable access to target food source.
131, 135: Unlikely because tendency to sink would select for fully motile style of motility (121, 125).
132-134: Not expected because tendency to sink would select for fully motile style of motility and even fully motile slow forms not observed with these feeding strategies, possibly because they fail compared to "fast" forms.
122-124: Unlikely, although possible, probably fail compared to "fast" pelagic forms and efficient surficial forms.
113: Gray whales scoop sediment and strain out enclosed organisms. Although they are technically carnivores, the feeding mechanism is large-scale mining activity.
116: Lamprey are an exception. Normally "fast" motility is not need by organisms that utilize most "other" feeding styles

Adaptive Facies by Tier

Tier: 2 **Erect Epifauna**

	1 Suspension Feeder	2 Surface Deposit Feeder	3 Mining	4 Grazing	5 Predator	6 Other
6 Non-Motile Attached	261 **39** ***37*** 12	262	263	264	265 4 *3* 1	266 7 *3* 1
5 Non-Motile Unattached	251 1 *1* 1	252	253	254	255 1 *1* 1	256 1 *1* 1
4 Facultat. Motile Attached	241 2 *2* .	242	243	244	245 2 *2* .	246 1 *1* .
3 Facultat. Motile Unattached	231	232	233	234	235 1 *1* .	236 —
2 Fully Motile Slow	221	222	223	224	225	226
1 Fully Motile Fast	211	212	213	214	215	216

In boxes the upper number is the number of groups of all metazoa with one or more members utilizing that mode of life, in the second row, *italic numbers* represent the number of groups that have reasonably diverse representatives in the fossil record and living representatives with that mode, smaller numbers represent the number of groups with readily preserved hard parts commonly found in the fossil record that display that mode in the living fauna.

262-264, 252-254: Not expected because danger of exhausting local food supply probably precludes non-motile modes.

242-244: Unlikely because development of erect form is related to access to water off the bottom. Feeding on and in the substratum selects for surficial or infaunal modes.

231-234, 221-226, 211-216: Not expected because of danger of damage to unattached erect forms being toppled by currents (we do not expect marine giraffes). Also, as for all bottom-feeding styles, being erect would be a disadvantage and would be unlikely to evolve in organisms targeting food sources on or in the substratum.

251, 255: Massive forms, such as some corals, can grow as unattached domes and qualify as erect unattached non-motile forms but be immune to most current disturbance because of their mass, but the strategy of using mass for resistance to disturbance is energetically not feasible for motile organisms.

235: There are some actinarians (sea anemones) that cope with unattached life on unconsolidated sediments in fairly quite settings. They can retract and survive rare buffeting.

236: Although not specifically identified in our survey, parasites on erect forms exist and are expected. Some may be facultatively motile but unattached within their host.

Adaptive Facies by Tier

Tier: 3 **Surficial Epifauna**

361 **43** ***37*** **20**	362	363	364	365 6 *3* 1	366 13 5 2	6 Non-Motile Attached
351 2 *2* 2	352	353	354	355 2 *2* 2	356 1 *1* 1	5 Non-Motile Unattached
341 13 *11* 7	342 2 . .	343	344 1 *1* 1	345 6 *2* .	346 17 *4* 3	4 Facultat. Motile Attached
331 11 *10* 6	332 1 . .	333	334 8 *7* 4	335 9 *8* .	336 5 *2* .	3 Facultat. Motile Unattached
321 3 *2* 1	322 **26** *11* 9	323	324 **34** *18* 13	325 **27** *14* 6	326 7 *1* 1	2 Fully Motile Slow
311 9 *9* 2	312 12 *12* 2	313	314 7 *7* 2	315 **30** ***29*** 8	316	1 Fully Motile Fast
1 Suspension Feeder	2 Surface Deposit Feeder	3 Mining	4 Grazing	5 Predator	6 Other	

In boxes the upper number is the number of groups of all metazoa with one or more members utilizing that mode of life, in the second row, *italic numbers* represent the number of groups that have reasonably diverse representatives in the fossil record and living representatives with that mode, smaller numbers represent the number of groups with readily preserved hard parts commonly found in the fossil record that display that mode in the living fauna.

362-364, 352-354: Not expected because danger of exhausting local food supply probably precludes non-motile modes.
343, 333, 323, 313: Unlikely because probing from surface nearly as energetically demanding as burrowing and yet body remains exposed to potential predators. Mining is generally done by infaunal forms.
316: Unlikely. Regular “fast” motility is not need by organisms that utilize most “other” feeding styles (parasitism, photosymbiosis, chemosymbiosis, etc.). Protective adaptations for organisms with “other” feeding strategies tend to be more appropriate for more sedentary modes of life as well.

Adaptive Facies by Tier

Tier: 4 **Semi-infaunal**

461 4 *4* 2	462	463	464	465 —	466 1 . .	6 Non-Motile Attached
451 1 . .	452	453	454	455	456 —	5 Non-Motile Unattached
441 3 *3* 1	442 —	443 —	444 —	445 1 . .	446 —	4 Facultat. Motile Attached
431 7 *6* 3	432 3 *2* .	433 —	434 1 *1* 1	435 6 *6* .	436 1 *1* .	3 Facultat. Motile Unattached
421 —	422 1 *1* 1	423 1 *1* 1	424 —	425 3 *2* 1	426	2 Fully Motile Slow
411 —	412 —	413 —	414 —	415 1 *1* 1	416	1 Fully Motile Fast
1 Suspension Feeder	2 Surface Deposit Feeder	3 Mining	4 Grazing	5 Predator	6 Other	

In boxes the upper number is the number of groups of all metazoa with one or more members utilizing that mode of life, in the second row, *italic numbers* represent the number of groups that have reasonably diverse representatives in the fossil record and living representatives with that mode, smaller numbers represent the number of groups with readily preserved hard parts commonly found in the fossil record that display that mode in the living fauna.

462-464, 452-454: Not expected because danger of exhausting local food supply probably precludes non-motile modes.
451: Some ascidians in deep, quiet water settings function despite being non-motile and unattached.
455: Unlikely because of the problem of recovering from disturbance.
442, 444: Possible mode of life, but little selective advantage if partially resistant to disturbance by being semi-infaunal but able to recover from disturbance because the organism is facultatively motile.
443, 433: Possible, but not likely in competition with fully infaunal miners.
421, 411: Unlikely. Suspension feeders living benthically have little need for continuous motility.
426, 416: Unlikely. Most “other” feeding strategies do not utilize continuous motility.
412-414: Unlikely. Regular “fast” movement, especially when living partially buried, would not be effective with feeding styles targeting immobile food sources.

Adaptive Facies by Tier

Tier: 5 **<u>Shallow Infauna</u>**

1 Suspension Feeder	2 Surface Deposit Feeder	3 Mining	4 Grazing	5 Predator	6 Other	
561: 7 / *6* 6	562	563	564	565	566: 3 / *2* .	6 Non-Motile Attached
551	552	553	554	555	556: —	5 Non-Motile Unattached
541: 9 / *8* 4	542: 1 / *1* .	543: 1 / . .	544: —	545: —	546: 4 / . .	4 Facultat. Motile Attached
531: **<u>21</u>** / *<u>17</u>* <u>10</u>	532: 7 / *4* 2	533: 5 / *4* 1	534: —	535: 8 / *5* 2	536: 3 / *3* 3	3 Facultat. Motile Unattached
521: 1 / *1* 1	522: 1 / *1* 1	523: **<u>37</u>** / *<u>17</u>* 9	524: <u>12</u> / *1* .	525: <u>14</u> / *6* 3	526: 2 / . .	2 Fully Motile Slow
511: 1 / *1* 1	512: —	513: 4 / *4* 1	514: 1 / *1* .	515: 7 / *7* 2	516	1 Fully Motile Fast

In boxes the upper number is the number of groups of all metazoa with one or more members utilizing that mode of life, in the second row, *italic numbers* represent the number of groups that have reasonably diverse representatives in the fossil record and living representatives with that mode, smaller numbers represent the number of groups with readily preserved hard parts commonly found in the fossil record that display that mode in the living fauna.

562-564, 552-554: Not expected because danger of exhausting local food supply probably precludes non-motile modes.
565, 555: Not expected. “Blind” infaunal ambush predation (all that is possible if non-motile) is not feasible because of limited directions open for rapid attack and low likelihood of appropriately placed chance encounters.
551: Unlikely because fully infaunal forms seldom massive enough to be non-motile and yet withstand disturbance.
556: Possible. Some internal parasites on shallow infauna are likely to be non-motile unattached.
544, 534: Possible. Interstitial forms may graze on individual grain surfaces. Some may be lumped with fully motile slow grazers (324). Some infaunal “browsers”may be lumped with deposit feeders (323).
545: Possible. Some could be grouped with fully motile slow (525) or facultatively motile unattached (535).
512: Possible. This is really a gradation from the semi-infaunal mode (412) and some xiphsurans may qualify.
516: Unlikely. Regular “fast” motility is not need by organisms that utilize most “other” feeding styles.

Adaptive facies by Tier

Tier:6 **Deep Infauna**

661 1 *1* 1	662	663	664	665	666 –	6 Non-Motile Attached
651	652	653	654	655	656 –	5 Non-Motile Unattached
641	642	643	644	645	646 –	4 Facultat. Motile Attached
631 3 *3* 2	632 1 *1* 1	633 2 *1* .	634	635	636 1 *1* 1	3 Facultat. Motile Unattached
621	622	623 3 *3* 2	624	625 1 *1* .	626	2 Fully Motile Slow
611	612	613	614	615	616	1 Fully Motile Fast
1 Suspension Feeder	2 Surface Deposit Feeder	3 Mining	4 Grazing	5 Predator	6 Other	

In boxes the upper number is the number of groups of all metazoa with one or more members utilizing that mode of life, in the second row, *italic numbers* represent the number of groups that have reasonably diverse representatives in the fossil record and living representatives with that mode, smaller numbers represent the number of groups with readily preserved hard parts commonly found in the fossil record that display that mode in the living fauna.

661-665, 651-655: Not expected. Deep burrowing in unconsolidated sediment requires some motility. The exception is permanent boring into consolidated material. Myoid bivalves — shipworms (*Teredinidae*) boring into wood and *Gastrochaenidae* (bivalves that bore into carbonates) — account for the recorded exception.

666, 656, 646: Probable. Deep burrowers do have parasites, they just aren't directly mentioned in the literature surveyed.

641-645: Possible but unlikely. At depth attachment is not needed because physical disturbance is unlikely Most deep burrowers don't waste the energy.

626, 616: Not expected. Parasites and chemosymbionts are seldom fully motile in mode of life.

634, 624: Unlikely because at depth larger organisms feeding with a browsing habit would generally be classed as deposit feeding and interstitial forms that graze on sand grains and such are generally shallow infauna.

635: Unlikely because "ambush predation" is not effective at depth because chance encounter with prey would be infrequent.

621-622: Unlikely because of mechanical difficulty of regular movement at depth while maintaining contact with surface for feeding activity would be very difficult.

611-615: Not expected. "Fast" burrowing at depth is not physically possible.

(4B) Adaptive Facies by Motility Level

Motility Level: 6 **Non-motile attached**

	1 Suspension Feeder	2 Surface Deposit Feeder	3 Mining	4 Grazing	5 Predator	6 Other
1 Pelagic	161: 1 / *1* 1	162	163	164	165: —	166: 7
2 Erect Epifauna	261: **39** / ***37*** 12	262	263	264	265: 4 / *3* 1	266: 7
3 Surface Epifauna	361: **43** / ***37*** **20**	362	363	364	365: 6 / *3* 1	366: 13
4 Semi-Infaunal	461: 4 / *4* 2	462	463	464	465: —	466: 1
5 Shallow Infauna	561: 7 / *6* 6	562	563	564	565	566: 3
6 Deep Infauna	661: 1 / *1* 1	662	663	664	665	666: —

In boxes the upper number is the number of groups of all metazoa with one or more members utilizing that mode of life, in the second row, *italic numbers* represent the number of groups that have reasonably diverse representatives in the fossil record and living representatives with that mode, smaller numbers represent the number of groups with readily preserved hard parts commonly found in the fossil record that display that mode in the living fauna.

162-164, 262-264, 362-364, 462-464, 562-564, 662-664: Not expected because some motility needed to seek new food supply when local food supply exhausted.

165, 465. 666: All seem possible but not directly documented from sources used.

565: Not expected because blind "ambush" predation (all that is possible if non-motile) is not feasible because of limited directions open for rapid attack and low likelihood of appropriately placed chance encounters.

661: Myoid bivalves (shipworms — *Teredinidae* — and *Gastrochaenidae* bore into wood or carbonate rock. This apparent exception is a different option than burrowing into unconsolidated sediment.

665: Not expected because deep burrowing in unconsolidated sediment requires some motility.

Adaptive Facies by Motility Level

Motility Level: 5 **Non-motile unattached**

	1 Suspension Feeder	2 Surface Deposit Feeder	3 Mining	4 Grazing	5 Predator	6 Other
1 Pelagic	151 3 *1* 1	152	153	154	155 2 *1* .	156 1 . .
2 Erect Epifauna	251 1 *1* 1	252	253	254	255 1 *1* 1	256 1 *1* 1
3 Surface Epifauna	351 2 *2* 2	352	353	354	355 2 *2* 1	356 1 *1* 1
4 Semi-Infaunal	451 1 . .	452	453	454	455	456 —
5 Shallow Infauna	551	552	553	554	555	556 —
6 Deep Infauna	651	652	653	654	655	656 —

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152-154, 252-254, 352-354, 452-454, 552-554, 652-654: Not expected because some motility needed to seek new food supply when local food supply exhausted.
455: Unlikely because of the problem of recovering from disturbance if non-motile.
456, 556, 656: Possible but not documented directly from sources used.
551: Unlikely because fully infaunal forms seldom massive enouh to be non-motile and yet withstand disturbance.
555, 655: Not expected because “blind” ambush predation (all that is possible if non-motile) is not feasible because of limited directions open or rapid attack and low likelihood of appropriately placed chance encounters.
651: Not expected because deep burrowing requires some motility.

Adaptive Facies by Motility Level

Motility Level: 4 **Facultatively motile attached**

1 Pelagic	141 —	142	143	144	145 —	146 15 *1* .
2 Erect Epifauna	241 2 *2* .	242	243	244	245 2 *2* .	246 1 *1* .
3 Surface Epifauna	341 13 *11* 7	342 2 *2* .	343	344 1 *1* 1	345 6 *2* .	346 17 *4* 3
4 Semi-Infaunal	441 3 *3* 1	442 —	443 —	444 —	445 1 . .	446 —
5 Shallow Infauna	541 9 *8* 4	542 1 *1* .	543 1 . .	544 —	545 —	546 4 . .
6 Deep Infauna	641	642	643	644	645	646 —
	1 Suspension Feeder	2 Surface Deposit Feeder	3 Mining	4 Grazing	5 Predator	6 Other

In boxes the upper number is the number of groups of all metazoa with one or more members utilizing that mode of life, in the second row, *italic numbers* represent the number of groups that have reasonably diverse representatives in the fossil record and living representatives with that mode, smaller numbers represent the number of groups with readily preserved hard parts commonly found in the fossil record that display that mode in the living fauna.

141, 145, 442–444, 544-545, 646: Possible but not directly documented with sources used.
142-144: Not expected because of needed motility to seek new feeding locations and because unlikely attachment site regularly in contact with targeted food sources.
242-244: Unlikely because development of erectd form is related to access to water off the bottom. Feeding on and in te substratum selects for surficial or infaunal modes.
343: Unlikely because probing from surface almost as energetically demanding as burrowing and yet body remains exposed to potntial predators.
641-645: Possible but unlikely. At depth attachment is not needed, so would be a waste of energy.

Adaptive Facies by Motility Level

Motility Level:3 **<u>Facultatively motile unattached</u>**

	1 Suspension Feeder	2 Surface Deposit Feeder	3 Mining	4 Grazing	5 Predator	6 Other
1 Pelagic	131	132	133	134	135	136 —
2 Erect Epifauna	231	232	233	234	235 1 *1* 1	236 —
3 Surface Epifauna	331 <u>11</u> *<u>10</u>* 6	332 1 . .	333	334 8 *7* 4	335 9 *8* .	336 5 *2* .
4 Semi-Infaunal	431 7 *6* 3	432 3 *2* .	433 —	434 1 *1* 1	435 6 *6* .	436 1 *1* .
5 Shallow Infauna	531 **<u>21</u>** *<u>17</u>* <u>10</u>	532 7 *4* 2	533 5 *4* 1	534 —	535 8 *5* 2	536 3 *3* 3
6 Deep Infauna	631 3 *3* 2	632 1 *1* 1	633 2 *1* .	634	635	636 1 *1* 1

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131, 135: Unlikely because tendency to sink would select for fully motile style.
132-134: Deposit feeding and grazing by pelagic organisms only recorded for fully motile fast forms. Effective avoidance of damage may be a factor as well as selective pressure of sinking for full motility.
231-234: Not expected because of danger of damage to unattached erect forms. Also, erect form not best for these feeding strategies.
236, 433, 534: Possible but not directly documented with sources used.
634: Unlikely because browsing organisms at depth classed as deposit feeders.
635: Unlikely because “ambush” predation not effective at depth.

Adaptive Facies by Motility Level

Motility Level: 2 **Fully motile slow**

	1 Suspension Feeder	2 Surface Deposit Feeder	3 Mining	4 Grazing	5 Predator	6 Other
1 Pelagic	121 14 *2* 1	122	123	124	125 15 *7* 3	126 3 . .
2 Erect Epifauna	221	222	223	224	225	226
3 Surface Epifauna	321 3 *2* 1	322 **26** *11* 9	323	324 **34** *18* 13	325 **27** *14* 6	326 7 *1* .
4 Semi-Infaunal	421	422 1 *1* 1	423 1 *1* 1	424 —	425 3 *2* 1	426
5 Shallow Infauna	521 1 *1* 1	522 1 *1* 1	523 **37** *17* 9	524 12 *1* .	525 14 *6* 3	526 2 . .
6 Deep Infauna	621	622	623 3 *3* 2	624	625 1 *1* .	626

In boxes the upper number is the number of groups of all metazoa with one or more members utilizing that mode of life, in the second row, *italic numbers* represent the number of groups that have reasonably diverse representatives in the fossil record and living representatives with that mode, smaller numbers represent the number of groups with readily preserved hard parts commonly found in the fossil record that display that mode in the living fauna

122-124 Unlikely, although possible, probably fail compared to fast and to surficial and epifaunal forms.
221-226: Not expected because of danger of toppling unattached erect benthic forms. Also erect is more remote from the target of food on or in the bottom.
323:Unlikely from energetics of probing versus infaunal style.
421: Semi-infaunal suspension feeders do not require regular motility.
424: Possible but not specifically described in sources used.
426: Most “other” feeding strategies do not require constant movement.
621-622: Unlikely because of difficulty of moving regularly and keeping contact with surface target for feeding.
624: Unlikely, browsing at depth is usually deposit feeding.
626: Not expected. Parasites and most “other” feeding categories do not utilize regular or constant motility.

Adaptive Facies by Motility Level

Motility Level: 1 **Fully motile fast**

	1 Suspension Feeder	2 Surface Deposit Feeder	3 Mining	4 Grazing	5 Predator	6 Other
1 Pelagic	111 17 *16* 4	112 2 *2* .	113 1 *1* 1	114 8 *8* 2	115 **47** ***46*** 8	116 1 *1* .
2 Erect Epifauna	211	212	213	214	215	216
3 Surface Epifauna	311 9 *9* 2	312 12 *12* 2	313	314 7 *7* 2	315 **30** ***28*** 7	316
4 Semi-Infaunal	411	412	413	414	415 1 *1* 1	416
5 Shallow Infauna	511 1 *1* 1	512 —	513 4 *4* 1	514 1 *1* .	515 7 *7* 2	516
6 Deep Infauna	611	612	613	614	615	616

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211-216: Erect form and rapid motility are probably precluded for many reasons.
313: Unlikely because probing from surface inefficient and would be defeated by regular motion.
316, 416, 516: Unlikely because parasites and most “other” feeding types do not move regularly or rapidly.
411-414: Regular of rapid motion in sediment would make feeding strategies inefficient or defeat them.
515: Possible but not directly documented in sources utilized.
611-616: Deep burrowing and regular rapid motility are not functionally possible.

(4C) **Adaptive Facies by Feeding Strategy**

Feeding Strategy: 1 **Suspension feeding**

	1 Actively Motile Fast	2 Actively Motile Slow	3 Facultat. Motile Unattached	4 Facultat. Motile Attached	5 Non-Motile Unattached	6 Non-Motile Attached
1 Pelagic	111 17 *16* 4	121 14 *2* 1	131	141 —	151 3 *1* 1	161 1 *1* 1
2 Erect Epifauna	211	221	231	241 2 *2* .	251 1 *1* 1	261 **39** ***37*** 12
3 Surface Epifauna	311 9 *9* 2	321 3 *2* 1	331 11 *10* 6	341 13 *11* 7	351 2 *2* 2	361 **43** ***37*** **20**
4 Semi-infaunal	411	421	431 7 *6* 3	441 3 *3* 1	451 1 . .	461 4 *4* 2
5 Shallow Infauna	511 1 *1* 1	521 1 *1* 1	531 **21** *17* 10	541 9 *8* 4	551	561 7 *6* 6
6 Deep Infauna	611	621	631 3 *3* 2	641	651	661 1 *1* 1

In boxes the upper number is the number of groups of all metazoa with one or more members utilizing that mode of life, in the second row, *italic numbers* represent the number of groups that have reasonably diverse representatives in the fossil record and living representatives with that mode, smaller numbers represent the number of groups with readily preserved hard parts commonly found in the fossil record that display that mode in the living fauna.

141: Possible but not recorded.
131: Unlikely because of sinking problem.
231, 221, 211: Not expected because of danger of damage to unattached erect forms.
421, 411: Unlikely because benthic suspension feeders have little need of continuous motility.
551: Unlikely because fully infaunal forms seldom massive enough to withstand disturbance.
651: Not expected. Deep burrowers need to have some motility to get there.
641: Unlikely because attachement at depth not needed so energy not spent on it.
621, 611: Unlikely because regular movement would break conncection to surface for suspension feeding.

Feeding Strategy: 2 **Surface deposit feeding**

	1 Actively Motile Fast	2 Actively Motile Slow	3 Facultat. Motile Unattached	4 Facultat. Motile Attached	5 Non-Motile Unattached	6 Non-Motile Attached
1 Pelagic	112 2 *2* .	122	132	142	152	162
2 Erect Epifauna	212	222	232	242	252	262
3 Surface Epifauna	312 12 *12* 2	322 **26** *11* 9	332 1 . .	342 2 . .	352	362
4 Semi-infaunal	412	422 1 *1* 1	432 3 *2* .	442 —	452	462
5 Shallow Infauna	512 —	522 1 *1* 1	532 7 *6* 2	542 1 *1* 1	552	562
6 Deep Infauna	612	622	632 1 *1* 1	642	652	662

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162, 262, 362, 462, 562, 662 and 152, 252, 352, 452, 552, 652: Not expected because motility needed for deposit feeding to seek new food areas when old exhausted.
142: Not expected because of unreliable access to target food.
132: Not expected because of sinking problem
122: Unlikely because of efficiency compared to fast forms.and surficial forms.
232, 222, 212: Not expected because of danger of damage to uaattached erect forms.
412: Unlikely because “fast” movement on a regular basis would not aid deposit feeding
642: Unlikely because at depth attachment is a waste of energy
622: Unlikely because maintaining contact at surface to feed difficult if moving regularly
612: Not expected because “fast” movement at depth not possible.

Feeding Strategy: 3 **Mining**

	1 Actively Motile Fast	2 Actively Motile Slow	3 Facultat. Motile Unattached	4 Facultat. Motile Attached	5 Non-Motile Unattached	6 Non-Motile Attached
1 Pelagic	113 1 *1* 1	123	133	143	153	163
2 Erect Epifauna	213	223	233	243	253	263
3 Surface Epifauna	313	323	333	343	353	363
4 Semi-infaunal	413	423 1 *1* 1	433 —	443 —	453	463
5 Shallow Infauna	513 4 *4* 1	523 **<u>37</u>** ***<u>17</u>*** 9	533 5 *4* 1	543 1 . .	553	563
6 Deep Infauna	613	623 3 *3* 2	633 2 *1* .	643	653	663

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163,263,363,463,563,663 and 153, 253, 353, 453, 553, 653: Not expected because motility needed for deposit feeding.
143: Not expected because attachment site not dependable for feeding.
133: Not expected because of sinking problem.
123: Unlikely because probably fail compared to fast and to surficial and infaunal
233, 223, 213: Not expected because erect unattached in danger of damage.
343, 333, 323, 313: Unlikely because probingfrom surface nearly as energetically demanding as burrowing yet body remains exposed. Mining is generally done by infaunal forms.
413: Unlikely because regular fast movelment when living partially buried would make feeding difficult.
643: Unlikely to be attached at depth
613: Not expecte because fast burrowing at depth is not physically possible.

Feeding Strategy: 4 **Grazing**

	1 Actively Motile Fast	2 Actively Motile Slow	3 Facultat. Motile Unattached	4 Facultat. Motile Attached	5 Non-Motile Unattached	6 Non-Motile Attached
1 Pelagic	114 8 *8* 2	124	134	144	154	164
2 Erect Epifauna	214	224	234	244	254	264
3 Surface Epifauna	314 7 *7* 2	324 **34** *18* 13	334 8 *7* 4	344 1 *1* 1	354	364
4 Semi-infaunal	414	424 —	434 1 *1* 1	444 —	454	464
5 Shallow Infauna	514 1 *1* 1	524 12 *1* .	534 —	544 —	554	564
6 Deep Infauna	614	624	634	644	654	664

In boxes the upper number is the number of groups of all metazoa with one or more members utilizing that mode of life, in the second row, *italic numbers* represent the number of groups that have reasonably diverse representatives in the fossil record and living representatives with that mode, smaller numbers represent the number of groups with readily preserved hard parts commonly found in the fossil record that display that mode in the living fauna.

164, 264, 364, 464, 564, 664 and 154, 254, 354, 554, 654: Not expected because of need for motility to graze so can avoid exhausting local food supply.
144: Not expected because attachment site not reliable for feeding
134: Not expected because of tendency to sink plus difficulty of feeding strategy for pelagic.
124: Unlikely because of competition with fast and with surficial forms.
244: Uulikely because erect not effective form for feeding strategy.
234, 224, 214: Not expected because of potential damage to unattached erect forms.
414: Unlikely because motility level not appropriate for feeding strategy.
644: Unlikely because at depth attachment a waste of energy
634, 624: Unlikely because at depth larger organisms feeding with a browsing habit are generally deposit feeders.
614: Not expected because fast burrowing not possible at depth.

Feeding Strategy: 5 **Predator**

	1 Actively Motile Fast	2 Actively Motile Slow	3 Facultat. Motile Unattached	4 Facultat. Motile Attached	5 Non-Motile Unattached	6 Non-Motile Attached
1 Pelagic	115 **47** ***46*** 8	125 15 *7* 3	135	145 —	155 2 *1* .	165 —
2 Erect Epifauna	215	225	235 1 *1* .	245 2 *2* .	255 1 *1* 1	265 4 *3* 1
3 Surface Epifauna	315 **30** ***28*** 7	325 **27** *14* 6	335 9 *8* .	345 6 *2* .	355 2 *2* 1	365 6 *3* 1
4 Semi-infaunal	415 1 *1* 1	425 3 *2* 1	435 6 *6* .	445 1 . .	455	465 —
5 Shallow Infauna	515 7 *7* 2	525 14 *6* 3	535 8 *5* 2	545 —	555	565
6 Deep Infauna	615	625 1 *1* .	635	645	655	665

In boxes the upper number is the number of groups of all metazoa with one or more members utilizing that mode of life, in the second row, *italic numbers* represent the number of groups that have reasonably diverse representatives in the fossil record and living representatives with that mode, smaller numbers represent the number of groups with readily preserved hard parts commonly found in the fossil record that display that mode in the living fauna.

165, 145: Possible but may get classified with surficial or erect forms.
135: Unlikely because sinking would select for fully motile style.
225, 215: Not expected because of danger of damage for unattached erect form.
465: Possible but not documented with sources used.
455: Unlikely because of problem of non-motile recovering from disturbance
565, 555: Not expected because “blind” ambush predation (all that non-motile can do) ineffective with chance infaunal contacts only.
545: Some could be grouped with fully motile slow (525) or facultatively motiel unattached (535).
665, 655: Not expected because deep burrowers must have some motility.
645: Unlikely because attachment at depth a waste of energy.
635: Unlikely because of the blind ambush predation issue.
615: Not expected because fast burrowing not possible at depth.

Feeding Strategy: 6 **Other (Parasitism, Photosymbiosis, Chemosymbiosis, Etc.)**

1 Pelagic	116 1 *1* .	126 3 . .	136 —	146 15 *1* .	156 1 . .	166 7 *4* 1
2 Erect Epifauna	216	226	236 —	246 1 *1* .	256 1 *1* 1	266 7 *3* 1
3 Surface Epifauna	316	326 7 *1* 1	336 5 *2* .	346 17 *4* 3	356 1 *1* 1	366 13 *5* 2
4 Semi-infaunal	416	426	436 1 *1* .	446 —	456 —	466 1 . .
5 Shallow Infauna	516	526 2 . .	536 3 *3* 3	546 4 . .	556 —	566 3 *2* .
6 Deep Infauna	616	626	636 1 *1* 1	646 —	656 —	666 —
	1 Actively Motile Fast	2 Actively Motile Slow	3 Facultat. Motile Unattached	4 Facultat. Motile Attached	5 Non-Motile Unattached	6 Non-Motile Attached

In boxes the upper number is the number of groups of all metazoa with one or more members utilizing that mode of life, in the second row, *italic numbers* represent the number of groups that have reasonably diverse representatives in the fossil record and living representatives with that mode, smaller numbers represent the number of groups with readily preserved hard parts commonly found in the fossil record that display that mode in the living fauna.

136, 236, 456, 446, 556, 666, 656, 646: Possible, especially for parasites on hosts in these tiers, but not directly noted in sources used.
226, 216: Not expected because erect and unattached not viable because of danger of damage.
316: Unlikely because "other" feeding strategies do not need active locomotion.
426, 416: Unlikely because "other" feeding strategies generally do not utilize active locomotion.
516: Unlikely because fast locomotion styles not utilized by most "other" feeding strategies
626, 616: Not expected because "other" feeding strategies generally do not utilize active locomotion.

(5) Ediacaran Modes of Life:

Interpreting the modes of life of Ediacaran animals

The autecology of the Ediacarans, the earliest animals, has been discussed in less detail than that of Phanerozoic invertebrates. Therefore, we discuss their function and ecology in detail below.

Four recent developments have improved our ability to interpret the biology of the earliest animals: (1) discoveries about taphonomy in a world without bioturbation (Gehling 1999, Gehling *et al.* 2000, Jensen 2003, Jensen *et al.* 2005, Droser *et al.* 2006); (2) thinking about animals intermediate between the origin of multicellularity and fully established crown-group members as representing stem groups with some, but not all, characters of established crown groups (Gehling 1991, Budd 2003); (3) critical new discoveries about the morphology of early animals, such as the fractal modularity of the rangeomorphs (Narbonne 2004, Xiao *et al*. 2005) and the remarkable preservation of fossil embryos in the Duoshantuo Formation (Xiao *et al.* 1998, Xiao and Knoll 2000); and, finally, (4) comparative developmental biology ("evo-devo") has revealed a rich source of information about highly conserved aspects of metazoan development, and allowed insights into the nature of the earliest animals (Knoll and Carroll 1999; Valentine *et al.* 1999; Erwin and Davidson 2002; Davidson and Erwin 2006).

Molecular evidence confirms that extant metazoans are monophyletic, with choanoflagellates as their sister clade, and placozoa, siliceous sponges, calcareous sponges, ctenophores and cnidarians basal in animal phylogeny (Eernisse and Peterson 2004, Dellaporta *et al.* 2006). Eernisse and Peterson also state that, "because the monophyly of Metazoa is robust, multicellularity evolved just once within the animal lineage" (p. 198), something the new report by Dellaprta *et al.* (2006), which places the Placazoa as the basal metazoan phylum, continues to support. However, the existence of numerous other multicellular clades such as the fungi and the various multicellular algae (Buss, 1987) raises the possibility that animal-grade multicellularity may have arisen more than once. This is a critical issue when considering the phylogenetic affinities of Neoproterozoic fossils; the possibly unique architecture of some Ediacaran fossils (e.g. the "pneu" construction of the forms Seilacher (1989, 1992) has called Vendobionta) may represent either early offshoots of the Metazoa or independent origins of similar levels of complexity. This complicates our abilities to understand the probable modes of life of which they were capable.

The exotic anatomy of these early animals has led some to hypothesize non-animal affinities, such as lichens (Rettalack 1994) and fungi (Peterson *et al.* 2003). The non-animal hypotheses have not gained much acceptance. If the exotic Ediacaran organisms are not animals they would not be included in our analyses, but we have two reasons for not ignoring them. First, the morphology of many "pneu"-bearing Ediacaran forms does resemble morphologies common among tissue-grade animals, suggesting, at best, that they were, in fact metazoans or, at worst, that they display convergent form, suggesting that they were functionally similar to metazoan organisms, no matter what their phylogenetic affinities. Secondly, to be conservative and not bias our results in favour of seeing change in ecospace use, we will interpret animal-style modes of life for these fossils and include them in our data. This will maximize the number of modes of life apparently present in early faunas, reducing the likelihood of incorrectly recording an increase in number of modes of life over time.

Seilacher (1989, 1992) has argued that many Ediacaran taxa, especially the rangeomorph-dickinsnonid-pteridinid spectrum of modular forms, are an extinct branch of the metazoan bush of evolution. The novelty of Seilacher's idea that the Vendobionta are a separate clade should not distract from the point that these organisms were very simple in body plan. Seilacher interprets them as modular forms of tubular "pneu" and no other internal features. Xiao et al. (2005) recently reported the only direct evidence of any internal structure in these organisms. It is consistent with much of Seilacher's interpretation, but with the distal ends of the tubes open to the environment. There are two alternative interpretations of these organisms: (1) that they represent the radiation of early, simple basal metazoa, either sponges or cnidarian or now-extinct "stem-groups" within the Metazoa (Buss and Seilacher 1994) or (2) that vendobionts are an independent origination of a metazoan-like clade (Seilacher 1989, 1992), a possibility which cannot be excluded on developmental grounds (Erwin, 1992). In either case, the organisms appear to have the beginning of tissue grade organization, but with little or no differentiation into internal (endodermal) and external (ectodermal) organization, and no apparent mesodermal development.

Although some have argued that Ediacaran fossils include representatives of more complex metazoans of triploblastic grade, including arthropods, echinoderms and annelids (e.g. Glaessner 1984, Jenkins 1992), we feel the evidence is against most of these forms being advanced bilaterians. A mouth, gut, anus and internal organs of mesodermal origin are synapomorphies of complex bilateria, and none occur in most Ediacaran fossil organisms. Undoubted complex crown group bilateria first appear in the fossil record at various times in the Cambrian and later, with most fossils in the Early and even Middle Cambrian better regarded as stem-group representatives rather than crown-group members. Stem taxa leading to bilateria must have existed prior to the evolution crown group members and would be expected in the time interval prior to the appearance of their descendents. Unlike members of crown groups, the initial stem-groups leading to bilateria would not yet have all synapomorphies of the eventual crown groups and the earliest forms might be difficult to distinguish from cnidaria because they were probably at a similar organizational level.

Ediacaran assemblages

The Ediacaran Period of the Neoproterozoic marks the first appearance of metazoan fossils. Three assemblages of metazoans of Ediacaran age have been recognized (Waggoner 2003, Narbonne 2005): (1) the Avalon assemblage, best known from southeastern Newfoundland, but also reported from England and Russia; (2) the White Sea/Ediacara assemblage, the most diverse Precambrian assemblage, with extensive occurrences near the White Sea coast near Arkhangelsk, Russia, and in the Ediacara Member of the Rawnsley Quartzite in South Australia; and (3) the Nama assemblage, best known from the Nama Group, Namibia. A temporal sequence has been suggested for these assemblages because the earliest known Ediacaran fauna (between 575 and 560 million years ago) is the Avalonian assemblage from Mistaken Point on the Avalon Peninsula of Newfoundland and the youngest (549–542 million years ago) is the Nama assemblage from strata just below the base of the Cambrian in Namibia. An alternative was proposed by Grazhdankin (2004), who argued that representatives of all three assemblages co-occurred between about 558 and 546 million years ago in different environmental settings in the Arkhangelsk region of Russia, indicating that the three assemblages might represent faunas inhabiting different marine environments rather than different evolutionary phases. Avalon-type assemblages occur in deep-water settings, White Sea/Ediacara-type assemblages are from shallow shelf environments and Nama-type assemblages are from high sedimentation rate settings like distributary-mouth bars. Nonetheless, the Avalon assemblage does occur up to fifteen million years earlier than the other assemblages and no trace fossils or bilaterian-like body fossils occur in those earliest faunas, so some evolutionary significance may pertain to this earliest occurrence and the later appearance of traces and bilaterian-like body fossils. Also, mineralized tissues, other than sponge spicules, only occur in the latest Neoproterozoic faunas.

Avalon assemblage. The Avalonian biota is characterized by rangeomorphs — bizarre frond-, spindle-, bush-, or comb-shaped colonies composed of highly fractal modular elements. None of the taxa were skeletonized or capable of mobility (Narbonne 2005, p. 426). A number of different forms (with informal descriptive form names such as spindles, “duster”, “network”, “ostrich feather”, “xmas tree”, as well as formally named taxa such as *Bradgatia*, and *Charnia*) are found, some up to two meters in length. Non-rangeomorphs are also present, such as the pennatulid-like *Charniodiscus*, the apparently conical *Thectardis*, a bizarre “lumpy” tethered ball now named *Ivesia*, a form still just called “lobate disc”, and several apparent holdfasts (*Hiemalora*, *Aspidella*). None of these forms appears to have been capable of motility, either.

The fractal nature of the detailed morphology of rangeomorphs (Narbonne 2004) creates the impression of some repeated localizing of function in the organism and arraying of that activity in a spatially regular pattern. This is what would be expected of suspension feeders if the finest-scale modules were arrayed to intersect current flow. Neither photo- nor chemo-symbiosis creates a strong selective pressure for a fine-scale tertiary fractile branching system. If rangeomorphs were either a now extinct clade at the poriferan grade of organization (as were the extinct Archaeocyatha in the Cambrian) or if they were a stem group leading toward the Cnidaria, suspension feeding would have been their most likely feeding strategy.

If, however, rangeomorphs were a third, but now extinct, branch of basal metazoan organization (poriferan and cnidarian patterns representing the other two), then absorption could have been their feeding strategy. This also could be the case if they were stem cnidaria. Prior to the acquisition of nematocysts and evolution of a mouth and coelenteron (crown-group synapomorphies) absorptive feeding may have been the practice in stem cnidarians. It is worth noting that absorption is quite different than suspension feeding. Although the food source is also taken from the water, dissolved and colloidal organic matter is in an entirely different physical state than the particulate food captured by suspension feeders; thus absorption is an entirely different physical process than filtering particulate matter. The increase in surface area generated by the fine-scale tertiary branching system of rangeomorphs would be advantageous for an absorptive feeding strategy, and this would be effective even for the forms that did not have currents passing through their arrayed modules, a process needed for suspension feeding. If the interpretation of Grazhdankin and Seilacher (2002) that later modularized, “pneu”-bearing vendobionts, such as *Pteridinium* and some similarly structured taxa, were largely infaunal is correct, these organisms would almost necessarily have needed to be absorptive feeders, although they seem to lack the fine-scale fractile branching of the Avalonian rangeomorphs. Equally compelling, the recumbent spindle-form rangeomorphs were modular on the finest scale on their lower surface in contact with the sediment (Narbonne 2004), as well as on their upper surfaces, precluding them from having been suspension feeders. Selection works fast enough and effectively enough that it is unlikely these organisms had not yet been able to differentiate top from bottom; erect forms certainly differentiated holdfasts and stalks from fronds. For these reasons we list rangeomorphs as having “other” as their feeding strategy (presumably absorptive) and list similar general forms of non-rangeomorphs as suspension feeders. The non-rangeomorphs would include otherwise unrecognized poriferans and cnidarians that were in fact suspension feeders. Although this is an arbitrary choice, it is conservative in that it covers the two possible feeding strategies for such morphologies. In fact, only one may have characterized all the animals in the Avalonian assemblage.

The Avalon assemblage represents at most four modes of life (Text-fig. 4A), all appropriate for survival in deep, quiet water conditions. *Bradgatia*, *Charnia*, and the other rangeomorphs described as comb-shaped, duster, ostrich-feather, spoon frond, and xmas tree were erect, non-motile attached forms here interpreted as with an absorptive feeding strategy, so listed as “other.” The numerical designation for this category as displayed in Text-figure 4A would be 266. *Charnodiscus*, *Thectardis, Ivesia* and various holdfasts were erect, non-motile attached forms here interpreted as suspension feeders. The numerical designation is 261. The spindle form rangeomorphs were surficial, non-motile attached, and probably absorptive feeders (366) and the fossil called a “lobate disc” was surficial, non-motile attached and possibly a suspension feeder (361).

White Sea/Ediacara assemblage. The classic White Sea fauna was summarized by Fedonkin (1992) and summaries of the fauna from the Ediacara Member of the Rawnsley Quartzite of South Australia are given by Gehling (1991), Jenkins (1992) and Droser *et al.* (2006), with reinterpretation of a number of discoid forms in Gehling *et al.* (2000). The existence of sponges in the Australian fauna has been corroborated by Gehling and Rigby (1996) and the presence of bilaterians is recorded by both the first trace fossils (Jensen 2003, Jensen *et al.* 2005) and the body fossil *Kimberella* (Fedonkin and Waggoner 1997).

The diverse White Sea/Ediacara assemblage has representatives of ten modes of life, some of which are probably related to living in association with microbial mats. A variety of discoid forms, many originally interpreted as medusae, have been redesignated as holdfasts with various morphologies depending on the details of their preservational regime and grouped under the name *Aspidella* (Gehling *et al.* 2000). Seventeen old names have been synonomized. The animal would have been an erect, non-motile attached, suspension feeder (261). *Charnodiscus* and similar forms were also erect, non-motile attached, suspension-feeders (261) and *Rangia* is interpreted here as an erect, non-motile attached, other (absorptive feeder) (266). Sponges include the mound-shaped *Palaeophragmodictyon*, categorized as a surficial, non-motile attached, suspension-feeder (361). Tri-radiate discoid forms, such as *Albumares*, *Anfesta*, and *Tribrachidium* may also have been holdfasts, but some may have been small mound-shaped suspension-feeding forms and can be listed as surficial, non-motile attached, suspension-feeders (361). *Dickinsonia* is a form with modular "pneu" construction, but does not seem to have the fine-scale modularity of rangeomorphs, nor does it seem to have been firmly attached, although there is no convincing evidence that it had active motility. It apparently was commonly associated with microbial mats. Its mode of life is interpreted as surficial, non-motile unattached, other (either chemosymbiotic or absorptive — possibly digesting the microbial mat it rested on) (356). Bilaterally symmetrical forms with differentiated apparently anterior and posterior ends and a tapering, metameric body include *Praecamridium*, *Vendia*, *Parvancornia*, *Spriggina* and some others. None show any convincing evidence of a gut or internal anatomy and none show unequivocal evidence of motility. However, the apparent anterior-posterior orientation with bilateral general symmetry is almost universal among motile animals. If these forms were of low biomass and moved by ciliary traction they may not have left any trails, especially if they lived on cohesive microbial mats. They appear to have been surficial, facultatively motile unattached and apparently were absorptive feeders akin to *Dickinsonia* and thus also are put in the "other" feeding category (336). *Kimberella* is regarded as the first bilaterian body fossil and may be a stem mollusc (Fedonkin and Waggoner 1997). If one accepts this interpretation it would have been a surficial, fully motile slow or facultatively motile unattached, grazer (324). Several types of trace fossils record evidence of other bilaterians. Unbranched, meandering trails and very shallow sinuous unbranched burrows occur in shallow water facies beginning shortly after 560 million years ago (Martin *et al.* 2000). Jensen (2003) interprets the burrows as possible feeding/scavenging traces made within the sediment, but generally less than 10 mm from the sediment-water interface. Such burrowers would be shallow infauna, fully motile slow and, because they were moving below the sediment-water interface, miners (523). The surface traces include a rare meandering form (*Helminthoraphe*) that in one specimen from South Australia grades into an involute/evolute spiral (*Spiroraphe*), the only evidence of that type of behaviour prior to the Ordovician (Jensen 2003). Other surface traces appear possibly molluscan. For instance, *Archaeonassa* trails are flat-bottomed with raised ridges of varied height on either side, indicating the makers ploughed through surface sediments at different depths (Jensen 2003, Jensen *et al.* 2005). These creeping organisms were surficial to semi-infaunal, fully motile slow, surface deposit feeders (322, 422). Most other reported Neoproterozoic trace fossils are now interpreted as tubes, not trace fossils, or features formed in other ways than by animal locomotion (Jensen 2003, Jensen *et al.* 2005).

Nama assemblage. The Nama assemblage is of lower diversity than the White Sea/Ediacara assemblage (Droser *et al*. 2006), possibly because it inhabited more stressful settings where the fauna had to cope with greater sedimentation rates and potential disturbance. The Nama assemblage is characterized by two unusual groups of organisms, each common in different shoal water facies: (1) siliceous sandstones contain a suite of "vendobiont" style animals (Petalonamae), including *Pteridinium*, *Ernietta*, *Swartpuntia* and others, and (2) thrombolite-stromatolite biohermal carbonates contain *Cloudina*, *Namacalathus* and *Namapoikia*, the first calcified metazoans.

Grazhdankin and Seilacher (2002) have interpreted *Pteridinium* as largely infaunal, although this interpretation has been controversial. We interpret it as having been shallow infaunal, non-motile unattached, other (absorptive feeding) (556). *Ernietta* lived partly buried, so it is interpreted as having been semi-infaunal, non-motile unattached, other (absorptive feeding) (456). *Swartpuntia* had a distinct stalk and must have been erect, non-motile attached, other (absorptive feeding) (266).

Cloudina, with a tube made of a stacked series of cone-like flanges, was the first mineralized Neoproterozoic animal fossil described. *Cloudina* tubes varied in orientation from horizontal to vertical. *Cloudina* was erect to surficial, non-motile attached (Grotzinger *et al.* 2000), and was probably a suspension feeder (261, 361). *Namacalathus* has a globular ball up to 2.5 cm in diameter with holes in it atop a stalk (Grotzinger *et al.* 2000). It was an erect, non-motile attached, suspension feeder (261). *Namapoikia* is composed of multiple labyrinthine tubules from 1-5 mm in diameter forming domes to 0.25 m high and over one meter across (Wood *et al.* 2002). As is common with the Ediacaran age fauna, its affinities are not clear, although in tube size and general morphology it resembles some aspects of tabulate corals (although it lacks tabulae). However, the morphology supports the interpretation of the mode of life as surficial, non-motile attached, suspension feeder (361).

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6) Listing of interpreted modes of life for the Ediacaran fauna

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Avalon assemblage:

Bradgatia, "duster", *Charnia* A, "comb-shaped" rangeomorph, "spoon frond" rangeomorph, *Charnia* B, "ostrich-feather" rangeomorph, "xmas tree" rangeomorph — all were:

Erect, non-motile attached, other (rangeomorphs interpreted as absorptive) 266

Charnodiscus, Thectardis, *Ivesia*, various holdfasts — all were:

Erect, non-motile attached, suspension feeders (a generalized interpretation) 261

Spindle rangeomorphs were:

Surficial, non-motile attached, other (as rangeomoprhs interpreted as absorptive) 366

Lobate disc was:

Surficial, non-motile attached, suspension feeder (a generalized interpretation) 361

White Sea/Ediacaran assemblage:

Holdfasts and traces of holdfasts (including *Asidella* and its synonyms *Beltanella, Cyclomedusa, Ediacaria, Glaessneria, Irridinitus, Jampolium, Madigania, Medusinites, Paliella, Paramedusium, Planomedusinites, Protopleurisoma, Spriggia, Tateana, Tirasiana, Vendella* plus likely holdfasts *Eoporpita, Evmiaksia, Nemiana, Nimbia, Ovatoscutum, Pomoria*):

Erect, non-motile attached, suspension feeding 261

Sponges Erect, non-motile attached, suspension feeding 261

Surficial, non-motile attached, suspension feeding 361

Tri-radiate forms

Some (*Albumares, Anfesta*) are possible holdfasts:

Erect, non-motile attached, suspension feeding 261

Tribrachidium holdfast OR surficial, non-motile attached, suspension 361

Various frondose forms —

Rangeomorphs as in Avalon assemblage

Erect, non-motile attached, other (absorptive) 266

Surficial, non-motile attached, other (absorptive) 366

Others (*Charnodiscus*-like) erect, non-motile attached, suspension 261

Bilateral symmetry

Dickinsonia Surficial, non-motile unattached, other (absorptive) 356

“Head-shields” with tapering, often metameric looking bodies (*Praecambridium, Vendia, Parvancornia, Vendomia, Spriggina* and others):

Surficial, faculatatively motile unattached, other (absorptive) 336

Kimberella Surficial, fully motile slow, grazer 324

Trace fossils

Meandering surface traces Surficial, fully motile slow, surface deposit feeder 322

“Grooved” traces with side-walls Semi-infaunal, fully motile slow, surface deposit feeder 422

Very shallow burrows Shallow infauna, fully motile slow, mining 523

Nama assemblage:

Scwartpuntia Erect, non-motile attached, other (absorptive) 266

Ernietta Semi-infaunal, non-motile unattached, other (absorptive) 456

Pteridinium Shallow infauna, non-motile unattached, other (absorptive) 556

Calcareous fossils

Namacalathus Erect, non-motile attached, suspension feeding 261

Cloudina Erect, non-motile attached, suspension feeding 261

Tabulate-like coralimorph Surficial, non-motile attached, suspension feeding 361

(7) Early and Middle Cambrian modes of life interpreted from:

Zhuravlev, A. Y. and R. Riding (Eds.). 2001. *The Ecology of the Cambrian Radiation*. Columbia University Press, New York. 525 pages.

Porifera				
Hexactinellids	Erect	Non-motile attached	Suspension	261
Demospongia	Erect	Non-motile attached	Suspension	261
	Surficial	Non-motile attached	Suspension	361
Boring sponge?	Shallow	Non-motile attached	Suspension	561
Calcarea	Erect	Non-motile attached	Suspension	261
	Surficial	Non-motile attached	Suspension	361
Archaeocyatha	Erect	Non-motile attached	Suspension	261
	Surficial	Non-motile attached	Suspensin	361
Cnidaria				
Corallimorphs	Erect	Non-motile attached	Suspension	261
	Surficial	Non-motile attached	Suspension	361
Trypanites	Shallow	Non-motile attached	Suspensin	561
Burrows	Shallow	Fully motile slow	Mining	523
Mollusca, etc.				
Helcionellids and “Paragastropoda”				
Helcionellids	Surficial	Fully motile slow	Surf. Deposit	322
	Surficial	Fully motile slow	Grazer	324
Lat. Comp. Shells	Surficial	Fac. Motile unattached	Suspension	331
	Surficial	Fac. Motile unattached	Surf. Deposit	322
	Semi-infaunal	Non-motile unattached	Suspension	451
	Semi-infaunal	Fac. Motile unattached	Surf. Deposit	432
Elongate coiled	Surficail	Fully motile slow	Grazer	324
Rostroconchs	Semi-infaunal	Non-motile unattached	Suspension	451
Pelecypoda	Shallow	Fac. Motile unattached	Suspension	531
Tergomyans	Surficial	Fully motile slow	Grazer	324
Gastropods	Surficial	Fully motile slow	Grazer	324
Coeloscleritophoans				
Chancellorid-like	Erect	Non-motile attached	Suspension	261
Halkierid-like	Surficial	Fully motile slow	Grazing	324
Stenothecoids	Surficial	Non-motile attached	Suspension	361
	Semi-infaunal	Non-motile unattached	Suspension	451
Hyoliths				
Hyolithimorphs	Surficial	Non-motile unattached	Suspension	351

Orthothecimorphs	Surficial	Fac. Motile unattached	Suspension	331
Brachiopoda	Surficial	Non-motile attached	Suspension	361
	Surficial	Non-motile unattached	Suspensin	351
	Shallow	Facultatively motile attach.	Suspension	541
Trilobita				
Agnostids	Pelagic	Fully motile slow	Suspension	121
Conterminent hypostomes	Surficial	Fully motile fast	Predator	315
Natant hypowstomes	Surficial	Fully motile fast	Surf. Deposit	312
Branchiopods	Pelagic	Fully motile slow	Suspension	121
Bivalved arth. — ostracods	Surficial	Fully motile slow	Surf. Deposit	322
Echinoderms				
Edrioaasteroids	Surficial	Non-motile attached	Suspension	361
Cystoids	Surficial	Non-motile attached	Suspension	361
Helicoplacoids	Erect	Non-motile attached	Suspension	261
Eocrinoids	Erect	Non-motile attached	Suspension	261
Stylophorans	Surficial	Facultatively motile unattach.	Suspension	331
Homosteleans	Surficial	Facultatively motile unattach.	Suspension	331

Late Cambrian additions:

Polyplacophorans	Surficial	Fully motile slow	Grazing	324
Rostroconchs	Surficial	Non-motile unattached	Suspension	351
	Shallow	Facultatively motile unattach.	Mining	533
Gastropoda	Surficial	Non-motile unattached	Suspension	351
Cephalopoda	Pelagic	Fully motile slow	Predator	125
	Surficial	Facultatively motile unatt.	Predator	335

(8) Modes of life interpreted from Bengston, S., S. Conway Morris, B. J. Cooper, P. A. Jell, and B. N. Runnegar, 1990. ***Early Cambrian Fossils from South Australia*.** Association of Australasian Paleontologists, Brisbane. 364 pp.

Spicules of Porifera				
Hexactinellida	Erect	Non-motile attached	Suspension	261
Calcarea	Erect	Non-motile attached	Suspension	261
	Surficial	Non-motile attached	Suspension	361
Archaeocyatha (undescr.)	Erect	Non-motile attached	Suspension	261
	Surficial	Non-motile attached	Suspension	361
Coeloscleritophorans	Surficial	Fully motile slow	Grazer	324
Chancellorids	Erect	Non-motile attached	Suspension	261
Halkierids	Surficial	Fully motile slow	Grazer	324
Cambroclavids	Surficial	Fully motile slow	Surface dep.	322
Tommotids	Surficial	Facultatively motile	Suspension	331
Ornamented cones		unattached or	or surface	321
Smooth caps		Fully motile slow	deposit or`	322
Smooth cones			Grazer	324
Bivalved cf. Brachiopods	Surficial	Non-motile unattached	Suspension	351
Hyolithelminthes	Surficial	Non-motile unattached	Suspension	351
	Semiinfaunal	Non-motile unattached	Suspension	451
Anabaritids	Surficial	Non-motile unattached	Suspension	351
Decollating tubular fossils	Surficial	Facultatively motile unattach.	Surface dep.	332
Hyolithids	Surficial	Non-motile unattached	Suspension	351
	Surficial	Facultatively motile unattach.	Suspension	331
Mollusca				
Monoplacophorans	Surficial	Fully motile slow	Grazer	324
Gastropoda	Surficial	Fully motile slow	Grazer	324
Planispiral problem.	Surficial	Fully motile slow	Grazer	324
Bivalvia	Shallow	Facultatively motile unattach.	Suspension	531
Lobopoda (as Incertae sedis)				
Microdictyon	Surficial	Fully motile slow	Grazer	324
Trilobita				
Eodiscoidea	Surfacial	Fully motile fast	Surf. Deposit	312
Redlichiids	Surficial	Fully motile fast	Surf. Deposit	312
Corynexochids	Surficial	Fully motile fast	Predator	315
Crustacea				
Ostracods	Surficial	Fully motile slow	Surf. Deposit	322
Protoconodonts	Pelagic	Fully motile fast	Suspension	111

111	261	361	351	331	332	321	322	324	312	315	451	531
1	4	2	4	2	1	1	3	7	2	1	1	

(9) Modes of life interpreted from:

Wolfart, Reinhard, 1994. **Middle Cambrian Faunas** (Brachiopoda, Mollusca, Trilobita) from Exotic Limestone Blocks, Reilly Range, North Victoria Land, Antarctica: Their Biostratigraphic and Paleobiogeographic Significance." *Geologishes Jahrbuch*, Reihe B, *Regionale Geologie Ausland*, Heft 84.

Dorypyge australis/Centonella glomerata faunule:

Trilobita:				
Ptychagnostus	Pelagic	Fully motile slow	Suspension feeder	121
Dorypyge	Surficial	Fully motile fast	Predator	315
Centonella	Surficial	Fully motile fast	Predator	315
Lyriaspis	Surficial	Fully motile fast	Surface deposit	312
Scottia	Surficial	Fully motile fast	Surface deposit	312
Parasolenopleura	Surficial`	Fully motile fast	Surface deposit	312
Cf. *Chondradraulus*	Surficial	Fully motile fast	Predator	315
Corynexochid	Surficial	Fully motile fast	Predator	315
Cf. *Solenopleura*	Surficial	Fully motile fast	Surface deposit	312
Cf. *Liopeishania*	Surficial	Fully motile fast	Surface deposit	312

121 — 1 312 — 5 315 — 4

Eurodeous tessenosohni faunule:

Brachiopoda:				
Protreta	Surficial	Non-motile attached	Suspension feeder	361
Paterina	Surficial	Non-motile attached	Suspension feeder	361
Billingsella	Surficial	Non-motile attached	Suspension feeder	361
Hyolitha:				
Hyolithid	Surficial	Non-motile unattached	Suspension feeder	351
Contitheca	Surficial	Facultatively motile unattach.	Suspension feeder	331
Mollusca:				
Pelagiella	Surficial	Fully motile slow	Grazer	324
Scenella	Surficial	Facultatively motile unattach.	Grazer	324
Trilobita:				
Hypagnostus	Pelagic	Fully motile slow	Suspension feeder	121
Kootenia	Surficial	Fully motile fast	Predator	315
Ogygopsis	Surficial	Fully motile fast	Predator	315
Eurodeous	Surficial	Fully motile fast	Predator	315
Gaphuraspis	Surficial	Fully motile fast	Surface deposit	312
Lyriaspis	Surficial	Fully motile fast	Surface deposit	312
Suludella	Surficial	Fully motile fast	Surface deposit	312
Solenopleura	Surficial	Fully motile fast	Surface deposit	312
Sudanomocarina	Surficial	Fully motile fast	Surface deposit	312
Liopeishania	Surficial	Fully motile fast	Surface deposit	312

121 — 1 361 — 3 351 — 1 331 — 1 324 — 2 312 — 6 315 — 3

(10) Modes of life represented in the Chengjiang Fauna

[Hou Xian-Guang et al. 2004. *The Cambrian Fossils of Chengjiang, China.* Blackwell Publishing]

Phylum **Porifera** (13 species)

Allantospongia	Erect	Non-motile attached	Suspension	261
Choia	Surficial	Non-motile attached	Suspension	361
Or	Surficial	Non-motile unattached	Suspension	351
Choiaella	Erect	Non-motile attached	Suspension	261
	Surficial	Non-motile attached	Suspension	261
Leptomitella (2 sp.)	Erect	Non-motile attached	Suspension	261
Leptomitus	Erect	Non-motile attached	Suspension	261
Paraleptomitella (2 sp.)	Erect	Non-motile attached	Suspension	261
Quadrolaminiella (2 sp.)	Erect	Non-motile attached	Suspension	261
Saetaspongia	Erect	Non-motile attached	Suspension	261
Sinoflabrum				
Triticispongia	Erect	Non-motile attached	Suspension	261

Phylum **Cnidaria** (2 species)

Priscapennamarina	[Semi-infaunal	Facultatively motile unattached	Suspension	431]
Xianguangia	Erect	Facultatively motile unattached	Predator	335

Phylum **Ctenophora** (2 species)

Maotianoascus	Pelagic	Fully motile slow	Predator	125
Sinoascus	[Pelagic	Fully motile slow	Predator	125]

Phylum **Nematomorpha** (3 species) — phylum assignment questionable, may be priapulids

Cricocosmia	Shallow	Fully motile slow	Mining	523
Maotianshania	Shallow	Fully motile slow	Mining	523
Palaeoscolex	Shallow	Fully motile slow	Predator	525

Phylum **Priapulida** (6 species)

Acosmia	Shallow	Facultatively motile unattached	Mining	533
Archotuba	Erect	Non-motile attached	Suspension	261
Corynetis				
Palaeopriapulites	Shallow	Fully motile slow	Predator	525
Paraselkirkia	Semi-infaunal	Facultatively motile unattached	Predator	435
Protopriapulites	Shallow	Fully motile slow	Mining	523

Phylum **Chaetognatha** (1 species)

Eognathacantha	Pelagic	Fully motile fast	Predator	115

Phylum **Hyolitha** (4 species)

Ambrolinevitus (2 sp.)	Surficial	Non-motile unattached	Suspension	351
Burithes	Surficial	Non-motile unattached	Suspension	351
Linevitus	Surficial	Non-motile unattached	Suspension	351

Phylum **Lobopodia** (5 species)

Cardiodictyon	Surficial	Fully motile slow	Grazer	324
Hallucigenia	Surficial	Fully motile slow	Grazer	324
Luolishania	Surficial	Fully motile slow	Grazer	324
Microdictyon	Surficial	Fully motile slow	Grazer	324
Onychodictyon	Surficial	Fully motile slow	Grazer	324
Paucipodia	Surficial	Fully motile slow	Grazer	324

?Phylum **Anomalocardidae** (5 species)

Amplectobelua	Pelagic	Fully motile fast	Predator	115
Anomalocaris (2 sp.)	Pelagic	Fully motile fast	Predator	115
Cucumericrus	Pelagic	Fully motile fast	Predator	115
Parapeyotia	Pelagic	Fully motile fast	Predator	115

Phylum **Arthropoda** (55 species)

Acanthomeridion	Surficial	Fully motile fast	Surface deposit	312
Almenia				
Branchiocaris?	Pelagic	Fully motile fast	Suspension	111
Canadaspis	Surficial	Fully motile fast	Surface deposit	312
Chengjiangocaris	Surficial	Fully motile slow	Predator	325
Cindarella	Semi-infaunal	Fully motile slow	Surface deposit	422
Clypecaris	Surficial	Fully motile slow	Surface deposit	322
Combinivalvula	Pelagic	Fully motile fast	Suspension	111
Comptaluta				
Dongshanocaris	Surficial	Fully motile slow	Surface deposit	322
Eoredlichia	Surficial	Fully motile fast	Predator	315
Ercaia				
Forfexicaris	Surficial	Fully motile slow	Suspension	321
Foriforceps	Pelagic	Fully motile fast	Predator	115
Fuxianhuia	Surficial	Fully motile slow	Predator	325
Isoxys (3 sp.)	Pelagic	Fully motile fast	Suspension	111
Jianfengia	Pelagic	Fully motile fast	Predator	115
Jiucunella				
Kuamaia (2 sp.)	Surficial	Fully motile slow	Predator	325
Kuanyangia	Surficial	Fully motile fast	Predator	315
Kunmingella	Surficial	Fully motile slow	Surface deposit	322
Kunyangella				
Leanchoilia	Surficial	Fully motile slow	Predator	325
Liangshanella				
Naraoia (2 sp.)	Surficial	Fully motile fast	Predator	315
Occacaris				
Odaraia ?	Pelagic	Fully motile fast	Predator	115
Parapaleomerus	Surficial	Fully motile slow	Surface deposit	322
Pectocaris	Pelagic	Fully motile fast	Suspension	111
Pisinnocaris	Surficial	Fully motile slow	Surface deposit	322
Pseudoiulia				
Pygmaclypeatus				
Retifacies	Surficial	Fully motile slow	Predator	325
Rhombicalvaria				
Saperion	Semi-infaunal	Fully motile slow	Surface deposit	422
Sidneyia				
Sinoburius	Surficial	Fully motile fast	Surface deposit	312
Skioldia	Semi-infaunal	Fully motile slow	Surface deposit	422

Squamacula	Semi-infaunal	Fully motile slow	Surface deposit	422
Tanglangia				
Tsunyiella				
?Tuzoia				
Urokodia	Surficial	Fully motile slow	Surface deposit	322
Waptia	Surficial	Fully motile fast	Surface deposit	322
Wutingaspis				
Wutingella				
Xandarella	Surficial	Fully motile slow	Surface deposit	322
Yunnanocaris				
Yunnanocephalus	Surficial	Fully motile fast	Predator	315

Phylum **Phoronida** (1 species)

Iotuba

Phylum **Brachiopoda** (5 species)

Diandongia	Surficial	Non-motile attached	Suspension	361
Heliomedusa	Surficial	Non-motile unattached	Suspension	351
Lingulella	Shallow	Facultatively motile unattached	Suspension	531
Lingulellotreta	Pelagic	Non-motile attached	Suspension	161
Longtancunella	Erect	Non-motile attached	Suspension	261

Phylum? **Vetulicolia** (5 species)

Banffia	Pelagic	Fully motile slow	Suspension	121
Didazoon				
Pomatrum				
Vetulicolia	Pelagic	Fully motile slow	Suspension	121
Xidazoon				

Phylum **Chordata** (4 species)

Cathaymyrus (2 sp.)				
Myllokunmingia	Pelagic	Fully motile slow	Suspension	121
?Zhongxiniscus				

Enigmatic animals (12 species)

Allonnia	Erect	Non-motile attached	Suspension	261
Batofasciculus				
Cotyledion				
Dinomischus	Erect	Non-motile attached	Suspension	261
Eldonia	Pelagic	Fully motile slow	Suspension	121
Facivermis	Semi-infaunal	Facultatively motile unattached	Suspension	431
Jiucunia	Erect	Non-motile attached	Suspension	261
Maanshania				
Parvulonoda	Erect	Non-motile attached	Suspension	261
Phlogites				
Rotadiscus	Pelagic	Fully motile slow	Suspension	121
Yunnanozoon	Pelagic	Fully motile fast	Suspension	111

(11) Burgess Shale Animal Modes of Life interpreted from BRIGGS, D. E. K., ERWIN, D. H. and COLLIER, F. J. 1994. *The fossils of the Burgess Shale*. Smithsonian Institution Press, Washington, xvii +238 pp.

Species	Mode of life	% (Part)	Mode
Porifera			
Demospongia			
Capsospongia undulata	Erect, Non-motile attached, Suspension	0.01	261
Choia carteri	Surficial, Non-motile attached, Suspension	0.1	361
Choia ridleyi	Surficial, Non-motile attached, Suspension		361
Crumillospongia biporosa	Erect, Non-motile attached, Suspension	0.1	261
Crumillospongia frondosa	Erect, Non-motile attached, Suspension		261
Falospongia falata			
Fieldospongia bellilimata			
Hallichondrites elissa	Erect, Non-motile attached, Suspension	0.01	261
Hamptonia bowerbanki			
Hazelia conferta	Erect, Non-motile attached, Suspension	0.1	261
Hazelia criteria	Erect, Non-motile attached, Suspension		261
Hazelia delicatula	Erect, Non-motile attached, Suspension	0.1	261
Hazelia dignata	Erect, Non-motile attached, Suspension		261
Hazelia grandis	Erect, Non-motile attached, Suspension		261
Hazelia luteria	Erect, Non-motile attached, Suspension		261
Hazelia nodulifera	Erect, Non-motile attached, Suspension		261
Hazelia obscura	Erect, Non-motile attached, Suspension		261
Hazelia palmate	Erect, Non-motile attached, Suspension		261
Leptomitus lineatus	Erect, Non-motile attached, Suspension	0.1	261
Moleculopina mammillata			
Pirania muricata	Erect, Non-motile attached, Suspension	0.32	261
Sentinelia draco			
Takakkawia lineata	Erect, Non-motile attached, Suspension	0.1	261
Vauxia bellula	Erect, Non-motile attached, Suspension		261
Vauxia densa	Erect, Non-motile attached, Suspension		261
Vauxia gracilenta	Erect, Non-motile attached, Suspension	2.0	261
Wapkia grandis	Erect, Non-motile attached, Suspension	0.1	261
Hexactinellida			
Diagoniella hindei	Erect, Non-motile attached, Suspension	0.1	261
Protospongia hicksi	Erect, Non-motile attached, Suspension	0.1	261
Stephanospongia magnipora			
Calcarea			
Canistrumella alternata			
Eiffelia globosa	Erect, Non-motile attached, Suspension	0.04	261
Cnidaria			
?Anthozoa			
?Pennatulacea			
Thaumaptilon walcotti	Erect, Non-motile attached, Suspension	0.01	261
?Actinaria			
Mackenzia costalis	Erect, Non-motile attached, Predator	0.2	265
? Hydrozoa			
?Chondrophorina			
Gelenoptron tentaculatum			
?Cnidaria			
Cambrorhyium fragilis			
Cambrorhytium major			

Ctenophora			
Fasciculus vesanus	Pelagic, Fully motile slow, Predator	0.01	125
?Lophophorata			
Odontogriphus omalus			
Lophophorata			
Brachiopoda			
Inarticulata			
Acrothyra gregaria	Shallow, Facultatively motile unattached, Suspension	1.0	531
Lingulella waptaensis	Shallow, Facultatively motile unattached, Suspension	1.0	531
Micromitra burgessensis	Surficial, Non-motile, attached, Suspension	1.0	361
Paterina zenobia	Shallow, Facultatively motile unattached, Suspension	1.0	531
Articulata			
Dirphora bellicostata	Surficial, Non-motile attached, Suspension	1.0	361
Nisusia burgessensis	Surficial, Non-motile attached, Suspension	1.0	361
?Mollusca			
Monoplacophora			
Hellcionelloida			
Scenella amii	Surficial, Flly motile slow, Grazer	1.0	324
Hyolitha			
Haplophretis carinatus	Surficial, Fac. motile unattached, Suspension	0.13	331
Priapulida			
Ancalagon minor	Shallow, Fully motile slow, Predator	0.1	525
Fieldia lanceolata	Shallow, Fully motile slow, Mining	0.1	523
Louisella pedunculata	Deep, Fully motile slow, Predator	0.5	625
Ottoia prolifica	Shallow, Fully motile slow, Predator	3.7	525
Selkirkia columbia	Semi-infaunal, Facultatively motile unattached, Predator	0.47	435
Probable Priapulids			
Lecythioscopa simplex			
Scolecofurca rara			
Annelida			
Polychaeta			
Burgessochaeta setigera	Shallow, Fully motile slow, Mining	0.94	523
Canadia spinosa	Surficial, Fully motile slow, Surface deposit feeding	0.47	322
Insolicorypha psygma	Pelaic, Fully motile slow, Suspensin	0.01	121
Peronochaeta dubia	Shallow, Fully motile slow, Mining	0.1	523
Stephenoscolex argutus	Shallow, Fully motile slow, Mining	0.01	523
Onychophora (Lobopoda)			
Aysheaia pedunculata	Surficial, Fully motile slow, Grazer	0.05	324
Hallucigenia sparsa	Surficial, Fully motile slow, Grazer	0.1	324
Arthropoda			
Primitive			
Branchiocaris pretiosa	Surficial, Fully motile slow, grazer (scavenger)	0.01	324
Marrella splendens	Surficial, Fully motile fast, Surface deposit feeder	37.4	312
Crustacea			
Canadaspis ovalis	Surficial, Fully motile fast, Predator		315
Canadaspis perfecta	Surficial, Fully motile fast, predator	11.69	315
Carvarvonia venosa			
[*Isoxys acutangulus*			]
[*Isoxys longissimus*			]
Odaraia alata	Pelagic, Fully motile fast, Predator	0.06	115

Perspicaris dictynna	Pelagic, Fully motile fast, Predator	0.1	115
Perspicaris recondite	Pelagic, Fully motile fast, Predator		115
Plenocaris plena			
[*Tuzoia burgessensis*			]
[*Tuzoia canadensis*			]
[*Tuzoia? parva*			]
[*Tuzoia praemorsa*			]
[*Tuzoia retifera*			]
Waptia fieldensis	Surficial, Fully motile fast, Surface deposit feeder	2.55	312
Ostracoda			
Aluta			
Cirripedia?			
Priscansermarinus barnetti			
Aracnomorpha			
Trilobita			
Chancia palliseri	Surficial, Fully motile fast, Surface deposit feeding		312
Ehmaniella burgessensis	Surficial, Fully motile fast, Surface deposit feeding		312
Ehmaniella wataensis	Surficial, Fully motile fast, Surface deposit feeding		312
Elrathia permulta	Surficial, Fully motile fast, Surface deposit feeding		312
Cf. *Elrathina brevifrons*	Surficial, Fully motile fast, Surface deposit feeding		312
Elrathina cordillerae	Surficial, Fully motile fast, Surface deposit feeding		312
Hanburia gloriosa			
Kootenia burgessensis	Surficial, Fully motile fast, Predator		315
Naraoia compacta	Surficial, Fully motile fast, Predator	0.32	315
Naraoia spinifer	Surficial, Fully motile fast, Predator		315
Olenoides serratus	Surficial, Fully motile fast, Predator	0.21	315
Oryctocephalus burgessensis	Surficial, Fully motile fast, Predator		315
Oryctocephalus matthewi	Surficial, Fully motile fast, Predator		315
Oryctocephalus reynoldsi	Surficial, Fully motile fast, Predator		315
Pagetia bootes	Pelagic, Fully motile fast, Suspension		111
Parkaspis decamera	Surficial, Fully motile fast, Predator		315
Peronopsis montis	Pelagic, Fully motile fast, Suspension		111
Ptychagnostus praecurrens	Pelagic, Fully motile fast, Suspension		121
Spencella sp. indet. 1			
Spencella sp. indet. 2			
Tegopelte gigas			
Chelicerata			
Sanctacaris uncata	Pelagic, Fully motile fast, Predator	0.05	115
Other Arthropods			
Actaeus armatus			
Alalcomenaeus cambricus			
Burgessia bella	Surficial, Fully motile fast, Surface deposit feeder	5.35	312
Emeraldella brocki	Surficial, Fully motile fast, Predator	0.2	315
Habelia? brevicauda	Surficial, Fully motile fast, Surface deposit feeding		312
Habelia optata	Surficial, Fully motile fast, Surface deposit feeding	0.1	312
Helmetia expansa	Pelagic, Fully motile fast, Suspension	0.05	111
Houghtonites gracilis			
Leanchoilia superlata	Surficial, Fully motile slow, Predator	0.2	325
Molaria spinifera	Surficial, Fully motile fast, Surface deposit feeding	0.3	312
Mollisonia rara			
Mollisonia symmetrica			
Sarotrocercus oblita	Pelagic, Fully motile fast, Suspension	0.1	111
Sidneyia inexpectans	Surficial, Fully motile fast, Predator	0.44	315
Skania fragilis			
Thelxiope palaeothallasia			
Yohoia tenuis	Pelagic, Fully motile fast, Predator	0.96	115

Echinodermata			
Cystoidea			
Gogia readiata	Erect, Non-motile attached, Suspension		261
Crinoidea			
Echmatocrinus brachiatus	Erect, Non-motile attached, Suspension	0.012	261
Edrioasteroidea			
Walcottidiscus magister	Surficial, Non-motile attached, Suspension		361
Wallcottidscus typicalis	Surficial, Non-motile attached, Suspension		361
Holothuroidea			
Eldonia ludwigi	Pelagic, Fully motile slow, Suspension	2.0	121
Hemichordata			
?Enteropneusta			
"Ottoia" tenuis			
?Graptolithina			
Chaunograptus scandens			
Chordata			
Metaspriggina walcotti	Pelagic, Fully motile fast, Suspension	0.01	111
Pikaia gracilis	Pelagic, Fully motile fast, Suspension	0.15	111
Animals not assigned to Major Crown Groups			
Anomalocarida			
Amiella ornate			
Anomalocaris canadensis	Pelagic, Fully motile fast, Predator	0.1	115
Anomalocaris nathorsti	Pelagic, Fully motile fast, Predator		115
Hurdia dentate			
Hurdia victoria			
Proboscicaris agnosta			
Proboscicaris ingens			
Proboscicaris obtuse			
Others			
Amiskwia sagittiformis	Pelagic, Fully motile fast, Predator	0.01	115
Banffia constricta			
Dinomischus isolatus	Erect, Non-motile attached, Suspension	0.01	261
Nectocaris pteryx	Pelagic, Fully motile fast, Predator	0.01	115
Oesia disjuncta			
Opabinia regalis	Pelagic, Fully motile fast, Predator	0.07	115
"Platydendron ovale"			
Pollingeria grandis			
Portalia mira	Surficial, Fully motile slow, Surface deposit feeding	0.01	322
Worthenella cambria			
Sclerotome-bearing animals			
Chancelloria eros	Erect, Non-motile attached, Suspension	1.0	261
Wiwaxia corrugata	Surficial, Fully motile slow, Grazer	0.34	324

(12) Modes of life in the Late Ordovician interpreted from: WEBBY, B. D., PARIS, F., DROSER, M. L. and PERCIVAL, I. G. (eds.) 2004. *The great Ordovician biodiversification event*. Columbia University Press, New York, x + 484 pp.

Porifera	Erect	Non-motile attached	Suspension feeding	261
	Surficial	Non-motile attached	Suspension feeding	361
Stromatoporoids	Erect	Non-motile attached	Suspension feeding	261
	Surficial	Non-motile attached	Suspension feeding	361
Conulariids	Erect	Non-motile attached	Suspension feeding	261
	Surficial	Non-motile attached	Suspension feeding	361
Corals: Tetradiids, Tabulata, Rugosa				
	Erect	Non-motile attached	Suspension feeding	261
	Erect	Non-motile attached	Predator	265
	Surficial	Non-motile attached	Suspension feeding	361
	Surficial	Non-motile attached	Predator	265
Bryozoa	Erect	Non-motile attached	Suspension feeding	261
	Surficial	Non-motile attached	Suspension feeding	361
Brachiopoda				
Linguliforma	Shallow	Facultatively motile	Suspension feeding	531
Rhynchonelliforma	Surficial	Non-motile attached	Suspension feeding	361
	Surficial	Non-motile unattached	Suspension feeding	351
Mollusca				
Polyplacophora	Surficial	Fully motile slow	Grazing	324
	Surficial	Facultatively motile unattached	Grazing	334
Bellerophontida	Surficial	Fully motile slow	Surface deposit feeding	322
Gastropoda				
Euomphalidiforma	Surficial	Non-motile attached	Suspension feeding	361
	Surficial	Non-motile unattached	Suspension feeding	351
Pleurotomariforma	Surficial	Fully motile slow	Grazing	324
Murchinsoniforma	Surficial	Facultatively motile unattached	Suspension feeding	331
Loxinematoforma	Surficial	Facultatively motile unattached	Suspension feeding	331
Trochoforma	Surficial	Fully motile slow	Grazing	324
Subulitiforma	Surficial	fully motile slow	Predator	325
Bivalvia				
Nuculoids	Shallow	Fully motile slow	Mining	523
Solemyoids	Shallow	Facultatively motile unattached	Other (chemosymiosis)	536
Trigonioids	Shallow	Facultatively motile unattached	Suspension feeding	531
Heteroconchs	Shallow	Facultatively motile unattached	Suspension feeding	531
Anomalodesmatans	Semi-infaunal	Facultatively motile attached	Suspension feeding	441
	Shallow	Facultatively motile attached	Suspension feeding	541

Pteromorphians	Surficial	Facultatively motile attached	Suspension feeding	341
	Semi-infaunal	Facultatively motile attached	Suspension feeding	441
	Shallow	Facultatively motile attached	Suspension feeding	541
Rostroconchia	Semi-infaunal	Non-motile unattached	Suspension feeding	451
Nautiloids	Pelagic	Fully motile slow	Predator	125
	Surficial	Fully motile slow	Predator	325
Tube-shaped incertae sedis				
Hyolithids	Surficial	Non-motile unattached	Suspension feeding	351
	Surficial	Facultatively motile unattached	Surface deposit	332
Cornulitids	Erect	Non-motile attached	Suspension feeding	261
Byroniids	Surficial	Non-motile attached	Suspension feeding	361
Tentaculitids	Surficial	Non-motile unattached	Suspension feeding	351
“Worms”				
Jawed polychaetes	Surficial	Fully motile slow	Surface deposit	322
	Shallow	Fully motile slow	Mining	323
	Shallow	Fully motile slow	Predator	325
Macheridians	Surficial	Fully motile slow	Grazing	324
Chaetognaths	Pelagic	Fully motile fast	Predator	115
Trilobites	Pelagic	Fully motile fast	Suspension feedig	111
	Pelagic	Fully motile fast	Predator	115
	Surficial	Facultatively motile unattached	Suspension	331
	Surbicial	Fully motile fast	Surface deposit	312
	Surficial	Fully motile fast	Predator	315
	Semi-infaunal	Facultatively motile unattached	Suspension	431
	Semi-infaunal	Fully motile fast	Surface deposit	412
Eurypterids	Pelagic	Fully motile fast	Predator	115
	Surficial	Fully motile fast	Predator	315
Phyllocarids	Surficial	Fully motile fast	Suspension feeding	311
	Surficial	Fully motile fast	Surface deposit	312
Ostracods	Surficial	Fully motile slow	Suspension feeding	321
	Surficial	Fully motile slow	Surface deposit	322
	Surficial	Fully motile slow	Grazer	324
	Surficial	Fully motile slow	Predator	325
Echinoderms				
Crinozoa	Erect	Non-motile attached	Suspension feeding	261
	Surficial	Non-motile attached	Suspension feeding	361
Blastozoa	Erect	Non-motile attached	Suspension feeding	261
	Erect	Non-motile unattached	Suspension feeding	251
Echinozoa	Surficial	Fully motile slow	Surface deposit	322

Asterozoa	Surficial	Fully motile slow	Predator	325
Homalozoa	Surficial	Facultatively motile unattached	Suspension	331
Graptolites	Pelagic	Non-motile unattached	Suspension feeding	151
	Surficial	Non-motile attached	Suspension feeding	361
Conodonts	Pelagic	Fully motile fast	Suspension feeding	111
	Pelagic	Fully motile fast	Predator	115
Vertebrates	Pelagic	Fully motile fast	Suspension feeding	111
	Pelagic	Fully motile fast	Predator	115
	Surficial	Fully motile fast	Suspension feeding	311
	Surficial	Fully motile fast	Surface deposit	312
	Surficial	Fully motile fast	Predator	315