

## Lab 10 - Cenozoic Index Fossils

For the final 3 labs you will be working with a set of approximately 20 of the most common index fossils from the Paleozoic Era, the Mesozoic Era and the Cenozoic Era. The materials presented in this lab (and from previous labs) will be useful in the completion of these assignments.

**Binomial Nomenclature** - For each of the fossils you will be working with I have given you the *Genus, species*. Note that for some fossils the species is unknown and is just designated with the word “*species*”. Using the table on the following page, complete the classification (naming) of the fossil. You may find additional information for the full classification from the “Cambrian Explosion” lab, from the treatises and/or from the web. Note that subclasses are only important for a few of the phyla (notably the cephalopods).

**Common Name** - The “common name” is simply a means of helping to remember the proper name and classification of the fossils. Names like: snail, clam, brach, foram, fern,... etc. are useful as memory joggers.

**Time Range** - Below is a simplified chart with the time ranges of the major fossil phyla and classes. You can find more specific ranges for individual fossils from many of the previously-mentioned sources.

The Major Invertebrate Groups and Their Stratigraphic Ranges

<b>Phylum Protozoa</b>	Cambrian-Recent	<b>Phylum Mollusca</b>	Cambrian-Recent
Class Sarcodina	Cambrian-Recent	Class Monoplacophora	Cambrian-Recent
Order Foraminifera	Cambrian-Recent	Class Gastropoda	Cambrian-Recent
Order Radiolaria	Cambrian-Recent	Class Bivalvia	Cambrian-Recent
<b>Phylum Porifera</b>	Cambrian-Recent	Class Cephalopoda	Cambrian-Recent
<b>Phylum Archaeocyatha</b>	Cambrian	<b>Phylum Annelida</b>	Precambrian-Recent
<b>Phylum Cnidaria</b>	Cambrian-Recent	<b>Phylum Arthropoda</b>	Cambrian-Recent
Class Anthozoa	Ordovician-Recent	Class Trilobita	Cambrian-Permian
Order Tabulata	Ordovician-Permian	Class Crustacea	Cambrian-Recent
Order Rugosa	Ordovician-Permian	Class Insecta	Silurian-Recent
Order Scleractinia	Triassic-Recent	<b>Phylum Echinodermata</b>	Cambrian-Recent
Class Hydrozoa	Cambrian-Recent	Class Blastoidea	Ordovician-Permian
Order Stromatoporida	Cambrian-Cretaceous	Class Crinoidea	Cambrian-Recent
<b>Phylum Bryozoa</b>	Ordovician-Recent	Class Echinoidea	Ordovician-Recent
<b>Phylum Brachiopoda</b>	Cambrian-Recent	Class Asteroidea	Ordovician-Recent
Class Inarticulata	Cambrian-Recent	<b>Phylum Hemichordata</b>	Cambrian-Recent
Class Articulata	Cambrian-Recent	Class Graptolithina	Cambrian-Mississippian

## CLASSIFICATION OF MAJOR BIOLOGIC GROUPS COMMONLY REPRESENTED BY FOSSILS

### KINGDOM MONERA

bacteria, blue-green algae

### KINGDOM PROTISTA

Phylum Protozoa

Class Sarcodina—"amoebas"

Order Foraminiferida-marine amoebas mostly with calcite skeletons

Order Radiolaria-marine amoebas with opal skeletons

### KINGDOM FUNGI-the fungi

### KINGDOM PLANTAE-the plant kingdom

"algae" — several groups of aquatic plants, some of which secrete calcite or aragonite skeletons

\*Phylum Bryophyta-the mosses and liverworts

Phylum Tracheophyta-the vascular or principal land plants

\*botanists use the term "division" for this rank

### KINGDOM ANIMALIA — the animal kingdom

Phylum Porifera — the sponges

Phylum Cnidaria

Class Scyphozoa — the jellyfish

Class Anthozoa — the corals

Order Rugosa

Order Scleractinia

Order Tabulata

Phylum Bryozoa — the bryozoans or "moss" animals

Phylum Brachiopoda — the "lamp shells"

Class Inarticulata — brachiopods with unhinged valves

Class Articulata — brachiopods with hinged valves

Phylum Mollusca — the mollusks

Class Gastropoda — the snails

Class Pelecypoda (Bivalvia) — the clams

Class Cephalopoda

Subclass Nautiloidea

Subclass Ammonoidea

Subclass Coleoidea — the squids and octopuses

Phylum Arthropoda

Class Trilobita — trilobites

Class Ostracoda — ostracodes

Class Insecta — the insects

Note that these are only a few of, but generally the most commonly fossilized, major groupings of arthropods.

Phylum Echinodermata

Class Blastoidea — blastoids

Class Crinoidea — sea lilies and feather stars

Class Asteroidea — star fish

Class Echinoidea — sea urchins, heart urchins, sand dollars

Phylum Protochordata (Hemichordata) — includes extinct graptolites

Phylum Chordata — chiefly vertebrate animals

Class Pisces — fish

Class Amphibia — frogs, toads, salamanders

Class Reptilia — extinct dinosaurs, turtles, snakes, lizards

Class Aves — birds

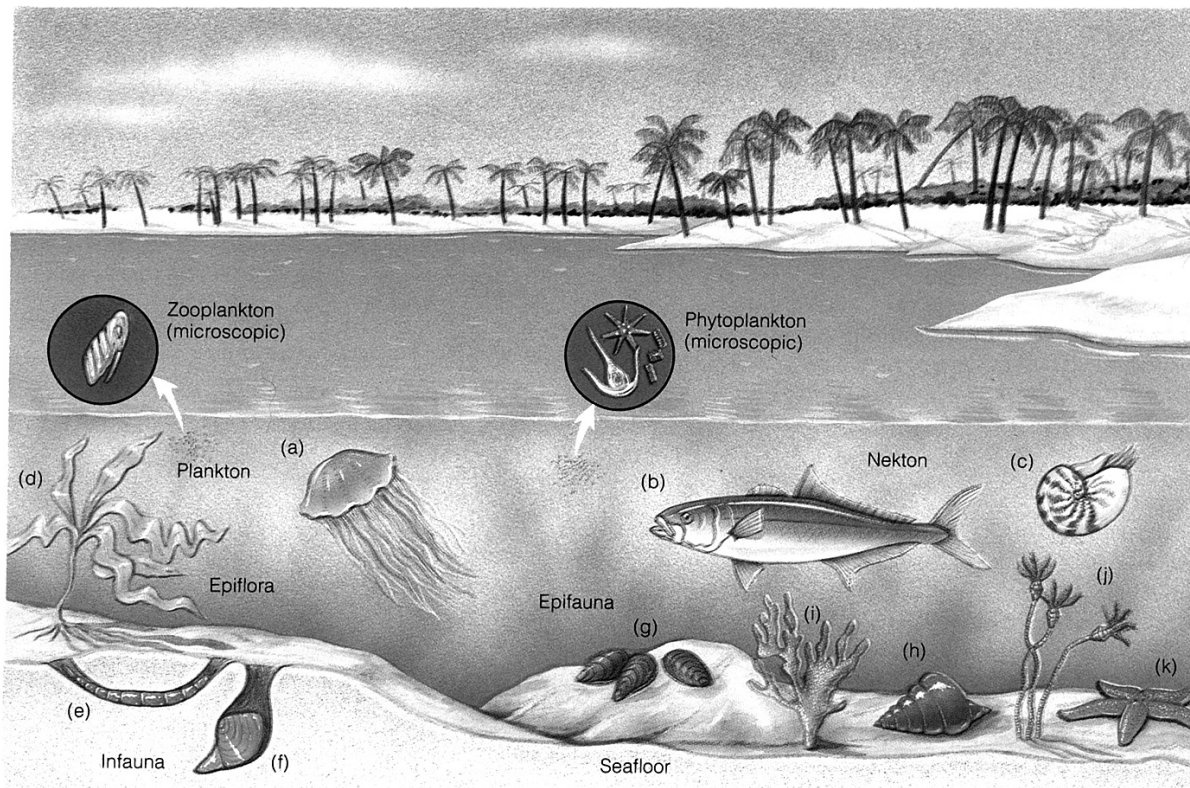
Class Mammalia — mammals

**Environments** - All of the information about which environment a fossil once lived in was presented to you in the Environments Lab. The vast majority of fossils are from the marine environment and it is helpful in understanding the organism to know which of the marine environments it once inhabited. Common marine environments are illustrated in the diagram below:

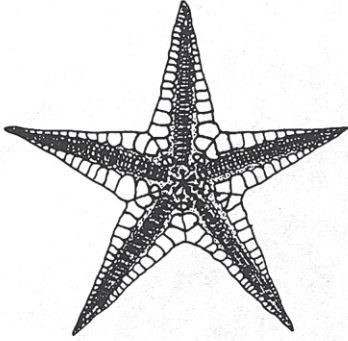
Plankton	- floating
Nekton	- swimming
Benthos	- bottom - dwellers
epifaunal sessile	- stationary
epifaunal mobile	- moving
epifloral	- attached (plants)
infaunal	- burrowers

**Preservation** - The mode of preservation can tell you a great deal about a fossil. For instance Paleozoic fossils are often either replaced or as molds; whereas many Cenozoic fossils have their original hard parts preserved. Preservation may also help you identify a fossil (ie... commonly only bone or wood is permineralized).

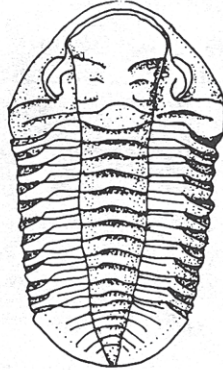
Where and how animals and plants live in the marine ecosystem.  
 Plankton: (a) jellyfish. Nekton: (b) fish and (c) cephalopod. Benthos: (d) through (k).  
 Sessile epiflora: (d) seaweed. Sessile epifauna: (g) bivalve, (i) coral, and (j) crinoid.  
 Mobile epifauna: (k) starfish and (h) gastropod. Infauna: (e) worm and (f) bivalve.  
 Suspension feeders: (g) bivalve, (i) coral, and (j) crinoid. Herbivores: (h) gastropod.  
 Carnivores-scavengers: (k) starfish. Sediment-deposit feeders: (e) worm.



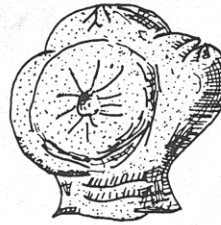
SYMMETRY



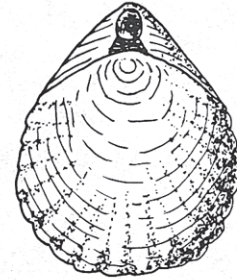
radial  
symmetry



bilateral  
symmetry

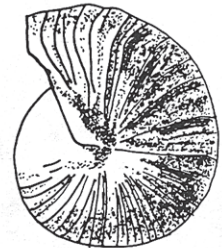
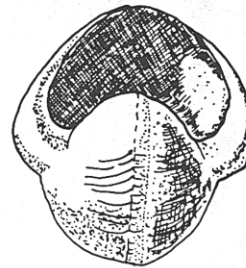
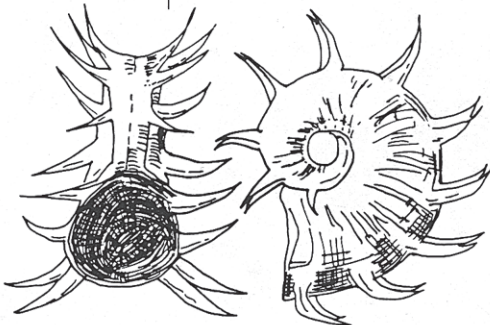
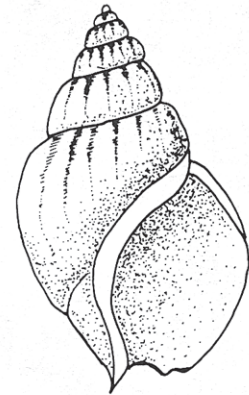
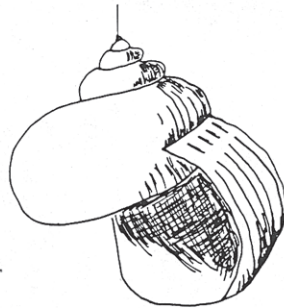
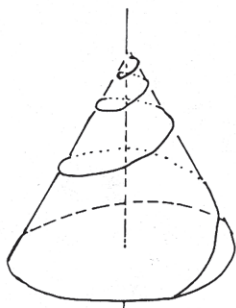


no  
symmetry

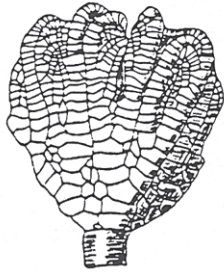


bilateral  
symmetry

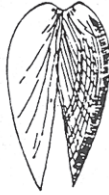
COILED SYMMETRY



NUMBER OF BODY PARTS



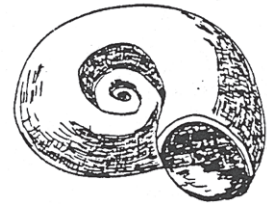
crinoid  
(1000's)



clam  
(2)



trilobite  
(16)



snail  
(1)



Solitary Coral



Colonial Coral

LAB 11

name \_\_\_\_\_

Sample #1 <i>Schizoporella species</i>	
Common Name _____	Time Range _____
Kingdom _____	Environment Marine Transitional Terrestrial
Phylum _____	If Marine _____
Class _____	Symmetry _____
Subclass _____	# Body parts _____
Order _____	Preservation _____
Sample #2 <i>Astrhelia palmata</i>	
Common Name _____	Time Range _____
Kingdom _____	Environment Marine Transitional Terrestrial
Phylum _____	If Marine _____
Class _____	Symmetry _____
Subclass _____	# Body parts _____
Order _____	Preservation _____
Sample #3 <i>Chione latilirata</i>	
Common Name _____	Time Range _____
Kingdom _____	Environment Marine Transitional Terrestrial
Phylum _____	If Marine _____
Class _____	Symmetry _____
Subclass _____	# Body parts _____
Order _____	Preservation _____

Sample #4 *Chlorellopsis coloniata*

Common Name	_____	Time Range	_____
Kingdom	_____	Environment	Marine Transitional Terrestrial
Phylum	_____	If Marine	_____
Class	_____	Symmetry	_____
Subclass	_____	# Body parts	_____
Order	_____	Preservation	_____

Sample #5 *Cassidulus gouldii*

Common Name	_____	Time Range	_____
Kingdom	_____	Environment	Marine Transitional Terrestrial
Phylum	_____	If Marine	_____
Class	_____	Symmetry	_____
Subclass	_____	# Body parts	_____
Order	_____	Preservation	_____

Sample #6 *Helix species*

Common Name	_____	Time Range	_____
Kingdom	_____	Environment	Marine Transitional Terrestrial
Phylum	_____	If Marine	_____
Class	_____	Symmetry	_____
Subclass	_____	# Body parts	_____
Order	_____	Preservation	_____

Sample #7 *Nummulites laevigatus*

Common Name	_____	Time Range	_____
Kingdom	_____	Environment	Marine Transitional Terrestrial
Phylum	_____	If Marine	_____
Class	_____	Symmetry	_____
Subclass	_____	# Body parts	_____
Order	_____	Preservation	_____

Sample #8 *Terebratella species*

Common Name	_____	Time Range	_____
Kingdom	_____	Environment	Marine Transitional Terrestrial
Phylum	_____	If Marine	_____
Class	_____	Symmetry	_____
Subclass	_____	# Body parts	_____
Order	_____	Preservation	_____

Sample #9 *Ursus spelaeus*

Common Name	_____	Time Range	_____
Kingdom	_____	Environment	Marine Transitional Terrestrial
Phylum	_____	If Marine	_____
Class	_____	Symmetry	_____
Subclass	_____	# Body parts	_____
Order	_____	Preservation	_____



Sample #10 *Carcharodon megalodon*

Common Name	_____	Time Range	_____
Kingdom	_____	Environment	Marine   Transitional   Terrestrial
Phylum	_____	If Marine	_____
Class	_____	Symmetry	_____
Subclass	_____	# Body parts	_____
Order	_____	Preservation	_____

Sample #11 *Dentalium sexangulare*

Common Name	_____	Time Range	_____
Kingdom	_____	Environment	Marine   Transitional   Terrestrial
Phylum	_____	If Marine	_____
Class	_____	Symmetry	_____
Subclass	_____	# Body parts	_____
Order	_____	Preservation	_____

Sample #12 *Astrodapsis diabloensis*

Common Name	_____	Time Range	_____
Kingdom	_____	Environment	Marine   Transitional   Terrestrial
Phylum	_____	If Marine	_____
Class	_____	Symmetry	_____
Subclass	_____	# Body parts	_____
Order	_____	Preservation	_____

Sample #13 *Chalina species*

Common Name	_____	Time Range	_____
Kingdom	_____	Environment	Marine   Transitional   Terrestrial
Phylum	_____	If Marine	_____
Class	_____	Symmetry	_____
Subclass	_____	# Body parts	_____
Order	_____	Preservation	_____

Sample #14 *Smilodon californicus*

Common Name	_____	Time Range	_____
Kingdom	_____	Environment	Marine   Transitional   Terrestrial
Phylum	_____	If Marine	_____
Class	_____	Symmetry	_____
Subclass	_____	# Body parts	_____
Order	_____	Preservation	_____

Sample #15 *Euspongea species*

Common Name	_____	Time Range	_____
Kingdom	_____	Environment	Marine   Transitional   Terrestrial
Phylum	_____	If Marine	_____
Class	_____	Symmetry	_____
Subclass	_____	# Body parts	_____
Order	_____	Preservation	_____

Sample #16 *Equus species*

Common Name	_____	Time Range	_____
Kingdom	_____	Environment	Marine   Transitional   Terrestrial
Phylum	_____	If Marine	_____
Class	_____	Symmetry	_____
Subclass	_____	# Body parts	_____
Order	_____	Preservation	_____

Sample #17 *Turritella plebia*

Common Name	_____	Time Range	_____
Kingdom	_____	Environment	Marine   Transitional   Terrestrial
Phylum	_____	If Marine	_____
Class	_____	Symmetry	_____
Subclass	_____	# Body parts	_____
Order	_____	Preservation	_____

Sample #18 *Astropecten species*

Common Name	_____	Time Range	_____
Kingdom	_____	Environment	Marine   Transitional   Terrestrial
Phylum	_____	If Marine	_____
Class	_____	Symmetry	_____
Subclass	_____	# Body parts	_____
Order	_____	Preservation	_____

Sample #19 <i>Anomalocardia caloosana</i>			
Common Name	_____	Time Range	_____
Kingdom	_____	Environment	Marine    Transitional    Terrestrial
Phylum	_____	If Marine	_____
Class	_____	Symmetry	_____
Subclass	_____	# Body parts	_____
Order	_____	Preservation	_____
Sample #20 <i>Fungia species</i>			
Common Name	_____	Time Range	_____
Kingdom	_____	Environment	Marine    Transitional    Terrestrial
Phylum	_____	If Marine	_____
Class	_____	Symmetry	_____
Subclass	_____	# Body parts	_____
Order	_____	Preservation	_____