This is the major project for the course; it has 2 parts. Part 1 is done in entirely in Belize as a class project. It is due the last day we’re in Belize. See Syllabus for due date of Part 2.

“THE LIST”

□ 1. Holocanthus ciliaris
□ 2. Pomacanthus paru
□ 3. Pomacanthus arcuatus
□ 4. Chaetodon capistratus
□ 5. Chaetodon striatus
□ 6. Chaetodon ocellatus
□ 7. Acanthurus coeruleus
□ 8. Acanthurus chirurgus
□ 9. Caranx ruber
□ 10. Caranx latus
□ 11. Tylosurus crocodilus
□ 12. Hemiramphus brasiliensis
□ 13. Sphyraena barracuda
□ 14. Calamus sp
□ 15. Gerres cinereus
□ 16. Megalops atlanticus
□ 17. Kyphosus sectatrix/incisor
□ 18. Harengula humerali
□ 19. Haemulon flavolineatum
□ 20. Haemulon sciurus
□ 21. Anisotremus virginicus
□ 22. Lutjanus mahogoni
□ 23. Ocyurus chrysurus
□ 24. Lutjanus apodus
□ 25. Stegastes adustus
□ 26. Stegastes planifrons
□ 27. Microspathodon chrysurus
□ 28. Abudefduf saxatilis
□ 29. Chromis cyanea
□ 30. Epinephelus striatus
31. *Mycteroperca bonaci*
32. *Sparisoma viridae female*
33. *Sparisoma viridae male*
34. *Lachnolaimus maximus*
35. *Bodianus rufus*
36. *Halichoeres garnoti*
37. *Thalassoma bifasciatum*
38. *Halichoeres bivittatus*
39. *Holocentrus ascensionis OR Holocentrus rufus*
40. *Cocos nucifera*
41. *Gobisoma sp.*
42. *Bothus lunatus*
43. *Ogocephalus sp.*
44. *Aulostomus maculatus*
45. *Malacanthus plumieri*
46. *Diodon hystrix*
47. *Lactophrys sp.*
48. *Pseudupeneus maculatus*
49. *Mullolichthys martinicus*
50. *Echeneis naucrates*
51. *Gymnothorax funebris OR Gymnothorax moringa*
52. *Ginglymosoma cirratum*
53. *Aetobatus narinari*
54. *Himantura schmardae*
55. *Millepora alcicornis*
56. *Millepora complanata*
57. *Plexura homomalla*
58. *Pseudopterogorgia sp.*
59. *Gorgonia flabellum OR Gorgonia ventalina*
60. *Briareum asbestinum*
61. *Acropora cervicornis*
62. *Acropora palmata*
63. *Porites porites*
64. *Dendrogyra cylindrus*
65. *Porites astreoides*
66. Montastrea annularis
67. Montastrea cavernosa
68. Dichocoenia stokesi
69. Favia fragum
70. Siderastrea sp.

71. Diploria strigosa OR Diploria clivosa
72. Diploria labyrinthiformis
73. Agaricia sp.
74. Eusamilia fastigiana
75. Thalassia testudinum
76. Syringodium filiforme
77. Sargassum sp.
78. Padina jamaicensis
79. Turbinaria sp.
80. Halimeda sp.

81. Penicillus pyriformis
82. Caulerpa sp.
83. Valonia macrophysa OR Ventricaria ventricosa
84. Avrainvillea sp OR Udotea sp.
85. Jania adherens
86. Phormidium corallycticum OR White band disease
87. Coral bleaching OR any Gorgonian disease
88. Cyphoma gibbosum
89. Parrotfish grazing scars
90. Damselfish chimneys

91. any tube sponge
92. Tedania ignis
93. Aplysina fulva
94. any coral-encrusting sponge
95. Halocordyle or any other branching hydroid
96. Cassiopea sp.
97. Condylactis gigantea
98. Bartholomea annulata OR Heteractis lucida
99. Palythoa caribaeorum
100. any feather duster worm
□ 101. any Christmas tree worm
□ 102. *Eupolympnia crassicornis*
□ 103. *Panulirus argus*
□ 104. any true (brachyuran) crab
□ 105. mysid shrimp
□ 106. *Lepas anatifera*
□ 107. *Strombus gigas*
□ 108. *Pleuroloca giganteaa*
□ 109. *Aplysia dactylomela*
□ 110. *Spondylus americanus*
□ 111. any other bivalve mollusk
□ 112. any squid or octopus
□ 113. *Oreaster reticulatus*
□ 114. *Ophiocoma echinata*
□ 115. *Diadema antillarum*
□ 117. *Eucidaris tribuloides*
□ 118. *Tripneustes ventricosus*
□ 119. *Meoma ventricosa*
□ 120. *Holothuria mexicana*
□ 121. *Ecteinascidia turbinata*
□ 122. *Rhizophora mangle*
□ 123. *Avicennia germinans*
□ 124. any sea turtle
□ 125. *Fregata magnificens*
□ 126. *Pelicanus occidentalis*
□ 127. any tern
□ 128. any gull
□ 129. *Cocoloba uvifera*
□ 130. *Homotrema rubrum*
PHOTO JOURNAL PROJECT PART 1 Due 3/22 in Belize

The class will do this project as a group; organize yourselves!! Using the CSM underwater cameras and any of your own cameras the group will make photographs of the 130 organisms above.

Each evening the group will meet and work together to accomplish this task. We will have at least one (mine) and perhaps more laptop computers so you can download and identify the photos you make each day. There are several tasks involved in completing this project. Some of these tasks are: figuring out what each of these organisms is and where you should look to find it, photographing the organisms, downloading and organizing the photos, organizing the organisms by determining correctly how they fit into the higher categories. (Phylum, Class, etc.)

The group must work together and all members are responsible to be involved in whatever way insures the completion of the task. After each group meeting, every member will fill out an evaluation of themselves and the group. You should bring a 4gig thumb drive to get a copy of all the photos to use in Pat 2 at home.

Sample Evaluation Form (Additional copies will be provided)

SUMMARIZE AND EVALUATE YOUR DISCUSSION GROUP
At the end of the meeting:
1. SUMMARIZE the main tasks accomplished and any points of agreement and difference within your group.

2. Briefly summarize your progress to date and your plan of attack towards finishing the rest of the project.

3. EVALUATE THE PERFORMANCE OF THE GROUP AND THE ROLES PLAYED.

OVERALL REACTIONS: GENERAL DYNAMICS

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Completed all steps satisfactorily        |     |     |    |
Everyone participated                     |     |     |    |
Leadership functions were distributed    |     |     |    |
Overall focus on resolving uncertainties and comparing insights  |     |     |    |

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Overall focus on resolving uncertainties and comparing insights  |     |     |    |

ROLES: Check your own – circle those you observed in others.

Positive Roles | Dysfunctional Roles
Initiating | Sought info from books | Sidetrack to own area/interests
Asked for information | Timekeeping | Interrupted others
Gave information | Encouraging | Monopolized discussion
Compiled information | Tension release | Put-down
Gave reactions | Useful pause | Irrelevant stories, etc.
Restated point | Gave/Asked examples | Apologizing
Asked for summary | Summarized discussion | Withdrawal
Others: _________________________________ | Premature evaluation | Failure to listen

3. PARTING THOUGHTS: Summarize your views on your discussion group today, on the impact of this discussion on your progress towards completing the task.


You will do this at home in Maryland Using the photo collection made in Belize.

The class will distribute the collection of photos to all students. YOU GUYS MUST FIGURE OUT TO DO THIS. I suggest you bring thumb drives or other storage devices to get the photos before you leave Belize. From these photos you will choose 30 and produce a photo journal of “Marine Life of Belize.” Each specimen should have its own page with
1) a photo of the organism,
2) its correct classification (to the classification level in the outline below),
3) some research derived descriptive information (do not simply cut and paste from a single source on the Internet; I hate such laziness.)
4) some information derived from your own observations in Belize (this is the part where students’ grades suffer the most. Keep a good Field Journal and work on it daily.) If one of your organisms is Elkhorn Coral you might say: “I saw this coral on almost every dive. It was much more abundant and dominant up toward the reef crest than farther back in the lagoon. It is often a rather large coral and colonies were often more than 6 feet across”

Look at the classification sheet below and notice that a coral (in this case Elkhorn coral, would be classified in great detail.

Kingdom Animalia
Phylum Cnidaria (jellyfish, corals, anemones, hydroids, etc.)
Class Anthozoa (flower animals; anemones and stony and soft corals)
Subclass Zoantharia (anemones and stony corals)
Order Scleractinia (hexacorals or stony corals)
    Acropora palmata (elkhorn coral)

Notice you do not have to re-do this whole thing for a different stony coral. It will be exactly the same except for the species. Here’s the finger coral.

Kingdom Animalia
Phylum Cnidaria (jellyfish, corals, anemones, hydroids, etc.)
Class Anthozoa (flower animals; anemones and stony and soft corals)
Subclass Zoantharia (anemones and stony corals)
Order Scleractinia (hexacorals or stony corals)
    Porites porites (finger coral)

On the other hand, the classification of a Red Mangrove tree would be much less detailed. (It’s not really less detailed, I just do not require the greater detail for THIS course !)

Kingdom Plantae
Phylum Anthophyta (flowering plants)
    Rhizophora mangle (Red Mangrove)
APPENDIX I: THE BINOMIAL NOMENCLATURE

The majority of the names on “The List” are the Latin (or scientific) names of the species. Each name consists of two words, a genus name and a species epithet or trivial name. This two name designation for biological species is called the “Binomial Nomenclature” (two-name naming-system) and was refined and popularized by the Father of Bio-classification, Carlous Linnaeus in the 18th Century. This system is rather universally used by biologists the world over. It codifies, organizes and facilitates communication in bio-classification and it reduces the enormous potential for ambiguity resulting from the use of local or popular names. E.g. there are more than 60 different species of fish called “rock fish” by various people around the world.

- The rock fish of Maryland is an entirely different species than the rock fish of California.
- There are approximately 11,000 species of animals called “ants.”
- The “Dorado,” “Mahi-Mahi,” and Dolphinfish are all the same species, *Coryphaena hippurus.*

A binomial name is always Latinized and therefore is a foreign word and must be *underlined* or *italicized.*

- *Homo sapiens* or *Homo sapiens* but not *Homo sapiens.*
- *Homo sapiens* (thinking man) is the modern human.
- *Homo erectus* (erect man) and *Homo neanderthalis* (Neanderthal man) are extinct ancestors of modern humans.

The first word is the **genus name** and must be capitalized; it is a noun, *Homo* means “man.”

The second word is the **species epithet** or the **trivial name;** it is never capitalized and is an adjective. *Callinectes sapidus,* the blue crab of Maryland means “Beautiful swimmer” that is “tasty/savory.”

The two words together is the **species name.** The species name of humans is NOT *sapiens,* it is *Homo sapiens !!!*

- The word “species” is both singular and plural. One species, two species, never one specie !!

Sometimes binomial names include a few other additions. A third lower-case word underlined or italicized designates that biologists have designated a **subspecies.** The definition of a species is:

“A group of organisms that share a common gene pool and are potentially interbreeding.”

The subspecies of a species are all the same species and share a common gene pool (share similar DNA) and can potentially reproduce. Biologists have determined that the dog and the wolf are the same species but created a subspecies for each. The dog USED TO BE *Canis familiaris* and the wolf was *Canis lupis.* They are both *Canis lupis* now. The wolf subspecies is *Canis lupis lupis* while the dog is *Canis lupis familiaris.* It seems likely that a German Shepard (*Canis lupis familiaris*) is probably more similar to a wolf (*Canis lupis lupis*) than a German Shepard (*Canis lupis familiaris*) is to a Chihuahua (*Canis lupis familiaris*). Oh well! The DNA may say something different.

Sometimes there is also a name and a date after a species name. They recognize the scientist who first named the species and when s/he did that. If the scientist’s name is in (parentheses) that means that that other scientists revised the name since it was first recorded. For example :

- The Atlantic sturgeon is *Acipenser oxyrhynchus* Mitchell, 1814. No one has seen fit to reclassify it since then.
- The cownose ray is *Rhinoptera Bonasus* (Mitchell, 1815). It seems we have decided Mitchell did not classify it correctly in 1815 and we have changed it from whatever Mitchell said in 1815 to the present name. Thus we put his name in parentheses. But he still gets credit for being the first person to describe this species.
- The ballyhoo was first named by Linnaeus himself in 1758, *Hemiramphus brasiliensis* (Linnaeus, 1758).
- The American halfbeak was named recently, *Hemiramphus meeki* Banford and Colette, 1993.
- *Swingleus ancistrus* Billeter and Klink is a parasite of killifish in the Chesapeake and was named in 2000.
- One or more new species of life is probably discovered every day.

YOU need to remember this:
- The species name is always two words.
- Capitalize the genus name and don’t capitalize the species epithet.
- Underline or italicize species names; they are Latin words.

**APPENDIX II: CLASSIFICATION SCHEME TO BE USED FOR YOU PHOTO JOURNAL**

**The Classification Scheme Used in This Class**
(you will find alternate schemes, use this one.)

**KINGDOM BACTERIA**

**KINGDOM PROTISTA**
- Phylum Chlorophyta (the green algae)
- Phylum Phaeophyta (brown algae)
- Phylum Foraminifera (the foraminifera)

**KINGDOM FUNGI**

**KINGDOM PLANTAE**
- Phylum Anthophyta (the flowering plants)

**KINGDOM ANIMALIA**
- Phylum Porifera (sponges)
- Phylum Cnidaria (jellyfish, corals, anemones, hydroids, etc.)
  - Class Hydrozoa (hydrorids, false corals, siphonophores)
    - Order Milleporina (fire corals)
  - Class Scyphozoa (true jellyfishes)
  - Class Anthozoa (flower animals)
    - Subclass Alcyonaria (octacorals)
      - Order Gorgonacea (sea fans, sea whips, etc.)
    - Subclass Zooantharia
      - Order Actinaria (sea anemones)
      - Order Zoanthidea (colonial anemones)
      - Order Scleractinia (hexacorals or stony corals)
- Phylum Ctenophora (comb jellies)
- Phylum Platyhelminthes (flat worms)
- Phylum Mollusca (mollusks)
  - Class Polyplacophora (chitons)
  - Class Bivalvia (= Pelecypoda) (bivalves)
  - Class Gastropoda (snails, sea slugs, etc.)
  - Class Cephalopoda (squids, octopods, nautiluses)
- Phylum Annelida (segmented worms)
  - Class Polychaeta (marine segmented worms)
- Phylum Arthropoda (jointed-legged animals) This large group also includes insects, centipedes, spiders, and scorpions
  - Class Crustacea (crustaceans)
**Phylum Echinodermata** (starfishes, brittlestars, urchins sea cucumbers, etc)

- **Class Asteroidea** (sea stars)
- **Class Ophiuroidea** (brittle stars)
- **Class Echinoidea** (sea urchins, sand dollars, etc)
- **Class Holothuroidea** (sea cucumbers)

**Phylum Chordata**

**Subphylum Urochordata**
- **Class Ascidiacea** (sea squirts)
- **Class Thaliacea** (salps)

**Subphylum Vertebrata**

**Class Chondrichthyes** (cartilaginous fishes)

- **Order Squaliformes** (squaliform sharks)
  - **Family Lamnidae** (mackerel sharks)
  - **Family Sphyrnidae** (hammerheads)
  - **Family Rhincodontidae** (whale shark)
  - **Family Orectolobidae** (carpet sharks, nurse sharks)
  - **Family Carcharhinidae** (requiem sharks)
  - **Family Orectolobidae** (carpet sharks, nurse sharks)

- **Order Rajiformes** (skates, rays etc.)
  - **Family Rhinobatidae** (guitarfishes)
  - **Family Dasyatidae** (stingrays)
  - **Family Torpedinidae** (electric rays)
  - **Family Myliobatidae** (eagle rays)
  - **Family Rajidae** (skates)
  - **Family Mobulidae** (manta rays)

**Phylum Chordata**

**Subphylum Vertebrata** (cont’d)

**Class Osteichthyes** (bony fishes); this is the largest group of vertebrates with about 26,000 species.

(don’t worry about the Orders of bony fish, focus on Families)

- **Family Elopidae** (tarpons)
- **Family Albulidae** (bonefishes)
- **Family Muraenidae** (morays)
- **Family Ophichthidae** (snake eels)
- **Family Clupeidae** (herrings)
- **Family Engraulidae** (anchovies)
- **Family Synodontidae** (lizzardfishes)
- **Family Lophiidae** (goosefishes)
- **Family Ogocephalidae** (batfishes)
- **Family Exocoetidae** (flying fishes, halfbeaks)
- **Family Belonidae** (needlefishes)
- **Family Holocentridae** (squirrelfishes)
- **Family Aulostomidae** (trumpetfishes)
- **Family Fistulariidae** (cornetfishes)
- **Family Syngnathidae** (pipefishes, seahorses)
- **Family Serranidae** (seabasses, groupers)
- **Family Grammistidae** (soapfishes)
- **Family Apogonidae** (cardinalfishes)
- **Family Branchiostegidae** (tilefishes)
- **Family Echeneidae** (remoras)
Family Carangidae (jacks, pompanos)
Family Coryphaenidae (dolphinfishes)
Family Lutjanidae (snappers)
Family Gerridae (mofajras)
Family Pomadasysidae (grunts)
Family Sparidae (porgies)
Family Sciaenidae (drums, croakers)
Family Mullidae (goatfishes)
Family Ephippidae (spadefishes)
Family Chaetodontidae (butterflyfishes and angelfishes)
Family Pomacentridae (damselfishes)
Family Labridae (wrasses)
Family Scaridae (parrotfishes)
Family Sphyraenidae (barracudas)
Family Uranoscopidae (stargazers)
Family Blenniidae (combtooth blennies)
Family Gobiidae (gobies)
Family Acanthuridae (surgeonfishes, tangs)
Family Scombridae (mackerels, tunas)
Family Scorpaenidae (scorpionfishes)
Family Bothidae (lefteye flounders)
Family Ostraciidae (boxfishes)
Family Tetraodontidae (puffers)
Family Balistidae (triggerfishes)
Family Diodontidae (porcupinefishes)

**Phylum Chordata**

**Subphylum Vertebrata**

**Class Reptilia** (reptiles)

- Order Testudines (turtles)
- Order Crocodylia (crocodiles, alligators, caymans)
- Order Squamata (lizards and snakes)

**Class Aves** (birds)

- Order Pelecaniformes (pelicans, frigate birds, boobies, cormorants, etc)
- Order Ciconiiformes (herons, egrets, storks, flamingoes, etc.)
- Order Charadriiformes (shorebirds, gulls, terns, auks, etc)

**Class Mammalia**

- Order Sirenia (manatees, dugongs)
- Order Cetacea (whales, porpoises, dolphins)
  - Suborder Mysticeti (baleen whales)
  - Suborder Odontoceti (toothed whales, dolphins, porpoises, orcas, etc)