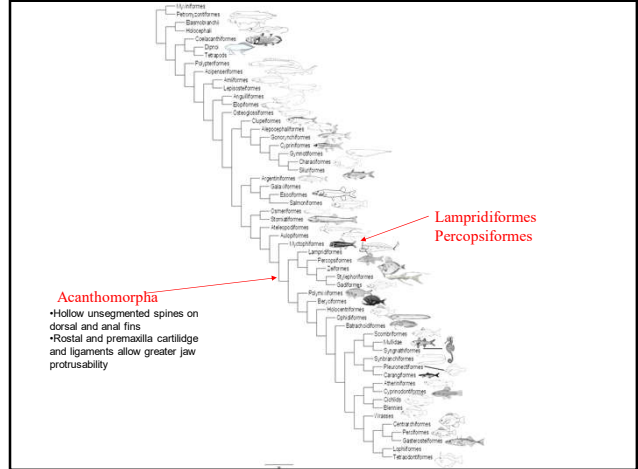
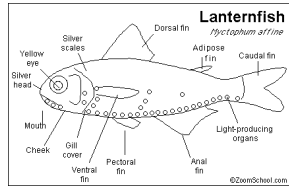


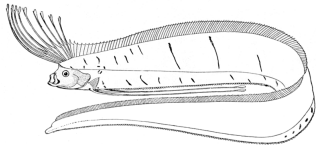
Order Myctophiformes, lanternfishes

- 241 species, 35 genera, 2 families
- Deep sea pelagic and benthic, numerically dominant in deep sea habitats
- Large terminal mouth (reminiscent of anchovy)
- Adipose fin present
- Compressed head and body (Myctophiformes = nose serpent shape)
- Large eyes
- Photophores



Order Lampridiformes, opahs and oarfish

- 19 species, 12 genera, 7 families
- no true spines in fins
- unique upper jaw protrusion – maxilla not directly attached to ethmoid or palatine
- deep bodied or ribbon-like
- pelagic and deep water marine



Order Lampridiformes, opahs and oarfish

- Oarfish
  - Longest teleost – over 30 feet
  - Only one individual observed alive, used amiiform swimming



Oarfish (*Regalecus glesne*) 24 ft long, 300 lbs.  
 Found on Coronado's Silver Strand Beach in October 1996 by the Navy SEALs.  
 Now is part of Maine Vertebrates Collection, Scripps Institute of Oceanography



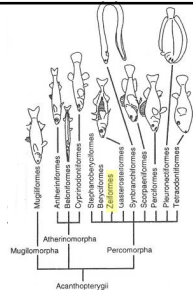
Order Percopsiformes, trout perch, pirate perch, cavefish

- 3 families, 7 genera, 9 species
- All freshwater
- Few with adipose fins – one of the most derived fishes with them
- Pirate perch (Aphredoderidae)
  - One species
  - Fairly extensive parental care
  - Anus migration
- Cavefish (Amblyopsidae)
  - Reduction or loss of eyes
  - Sensory papillae on head, body and tail
  - Anus migration
  - Convergent evolution of cave fish and other cave characins, catfishes etc.



Order Zeiformes

- Dorics
- 6 families, 16 genera, 32 species
- Marine, deep and compressed body
- Unbranched dorsal and anal fin rays
- No gill slit between 4<sup>th</sup> and 5<sup>th</sup> arches
- Vomerine teeth, no palentine teeth
- 5-10 dorsal spines, 22-36 rays



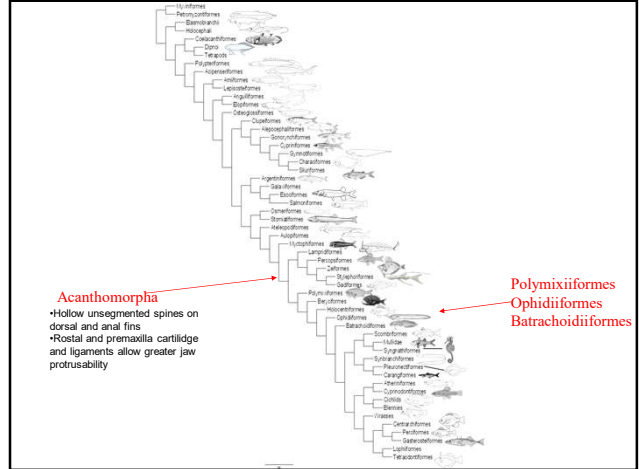
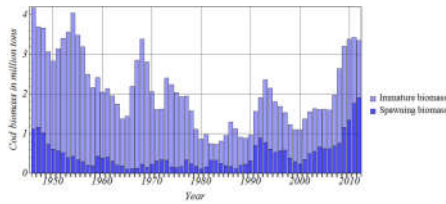
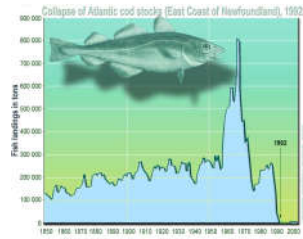
Order Gadiiformes

- 555 species, 75 genera, 9 families
- True cods with 3 dorsal, 2 anal fins
- Pelvic fins absent or in front of pectorals fins
- marine (only 1 freshwater species)
- primarily coldwater
- important commercial fisheries, (>1/4 world catch) second to Clupeidae in global catch



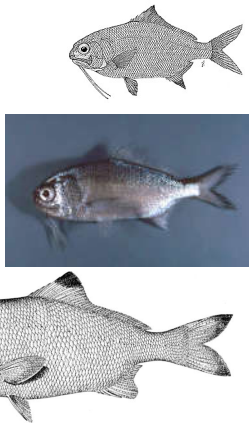
### Collapse of cod fisheries

- Atlantic cod 95-99% decline in biomass in some areas
- Some failed to recover even after cessation of fishing, other stocks appear to be well managed



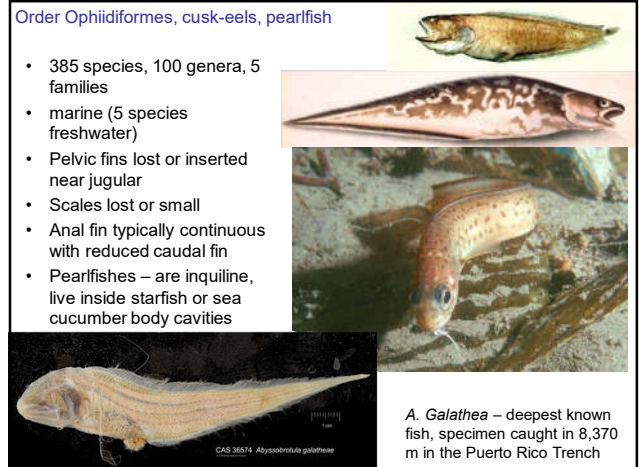
### Order Polymixiiformes, beardfish

- 5 species, 1 genera, 1 family (polymixidae)
- Pair of hyoid barbels
- Marine, Benthic, tropical and subtropical, typically >800m
- Taxonomic status uncertain, frequently classified with Beryciformes



### Order Ophidiiformes, cusk-eels, pearlfish

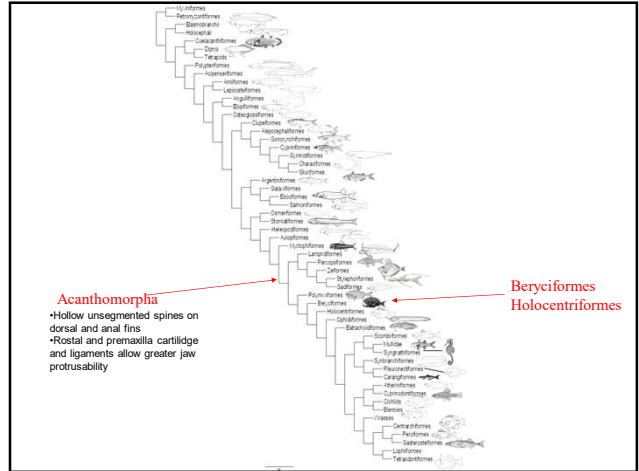
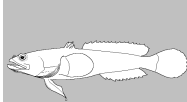
- 385 species, 100 genera, 5 families
- marine (5 species freshwater)
- Pelvic fins lost or inserted near jugular
- Scales lost or small
- Anal fin typically continuous with reduced caudal fin
- Pearlfishes – are inquiline, live inside starfish or sea cucumber body cavities



A. *Galathea* – deepest known fish, specimen caught in 8,370 m in the Puerto Rico Trench

**Order Batrachoidiformes, toadfishes or frogfishes**

- 69 species, 19 genera, 1 family (Batrachoididae)
- shallow mostly marine (one freshwater family), tropical and temperate
- Loss of scales, large dorsal eyes
- First dorsal and pelvic fins with spines
- Uses sounds and photophores (midshipman is shallow water species with photophores) in courtship
- Jugular position of pelvic fins

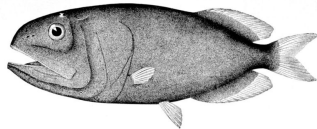
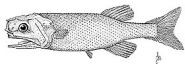


**Order Beryciformes, Pricklefish, gibberfish, whalefish**

- 9 families, 28 genera, 165 species
- Taxonomy unresolved. Formerly consider basal to Percomorpha
- Round, soft bodied, toothless, deep sea predators

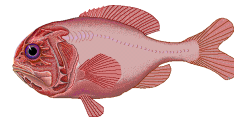


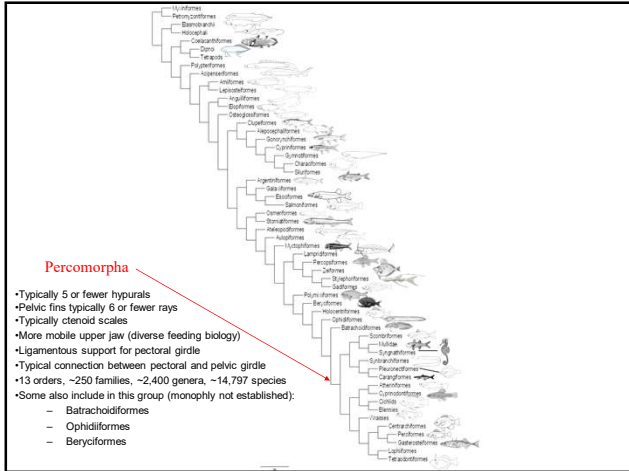
*Berycidae*



**Order Holocentrimorphes**

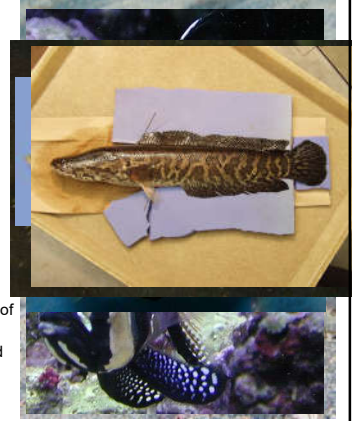
- Squirrelfishes, pinecondfish, roughies
- 7 families, 29 genera, 144 species
- Mostly marine
- Some deep sea: small, robust bodies, some with photophores
- Shallow: nocturnal, large eyes, bright red, perch-like
- Taxonomy unresolved





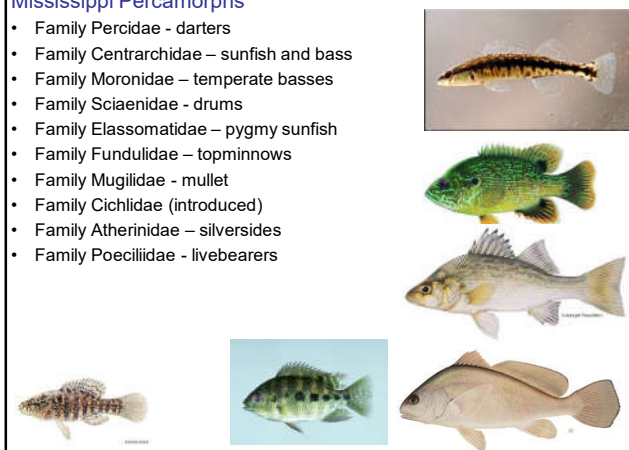
### A few Percamorpha Adaptations

- Scombridae – tuna (endothermy)
- Coryphaenidae – dolphinfishes (skeletal dimorphism)
- Echeneidae – shark suckers (first dorsal fin modified into sucker)
- Opistognathidae – jawfishes (burrowing)
- Apogonidae – cardinalfishes (nocturnal reef mouthbrooders)
- Toxotidae – archerfish (terrestrial insect hunters)
- Scaridae – parrotfishes (coral eaters)
- Channichthyidae – icefishes (loss of ribs, erythrocytes)
- Kurtidae – nurseryfishes (forehead brooders)
- Channidae – snakeheads (suprabranchial organ)



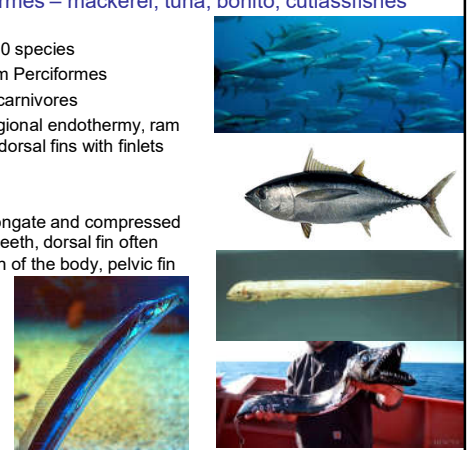
### Mississippi Percamorpha

- Family Percidae - darters
- Family Centrarchidae – sunfish and bass
- Family Moronidae – temperate basses
- Family Sciaenidae - drums
- Family Elasmobranchidae – pygmy sunfish
- Family Fundulidae – topminnows
- Family Mugilidae - mullet
- Family Cichlidae (introduced)
- Family Atherinidae – silversides
- Family Poeciliidae - livebearers



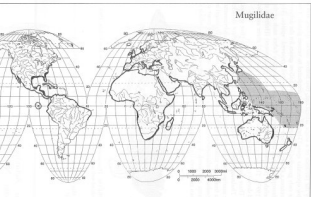
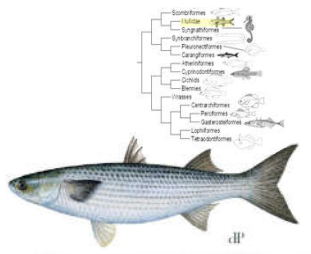
### Order Scombriformes – mackerel, tuna, bonito, cutlassfishes

- 17 families, ~260 species
- Recent split from Perciformes
- Marine pelagic carnivores
- Scombridae: regional endothermy, ram ventilating, two dorsal fins with finlets
- Trichiuridae: elongate and compressed body, fang like teeth, dorsal fin often nearly the length of the body, pelvic fin lost or reduced



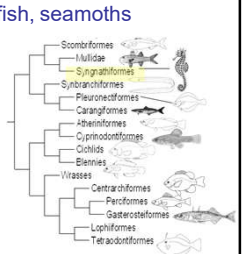
### Order Mugiliformes, mullets

- One family, Mugilidae
- 17 genera, 72 species
- Two widely separated dorsal fins: spiny dorsal fin (4 spines) and soft dorsal fin (8-10 rays)
- Pectoral fins high on the body
- Ctenoid scales, Lateral line absent
- most coastal marine & brackish detritivores
- Mullet most likely belongs in Syngnathiformes



### Order Syngnathiformes, seahorses, pipefish, seamoths

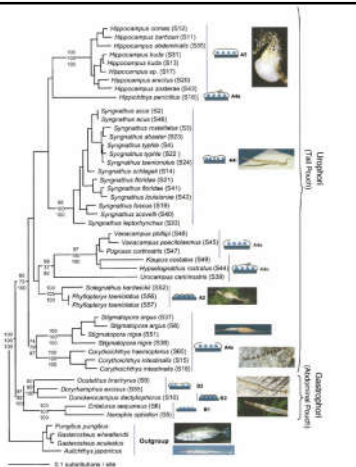
- 10 families, ~65 genera, ~270 species
- Elongate bodies with bony rings
- Reduced anal fin
- Often loss of dorsal, anal or pectoral fins
- Only one kidney (right side) that is aglomerular
- Shallow marine, few freshwater species (how?)
- Males care for eggs, sometimes in a pouch
- Primitive state has females carrying eggs in a "pouch" formed by pelvic fins fused to body
- Global distribution



- Abdominal/tail pouch
- Numbers = increasing pouch complexity

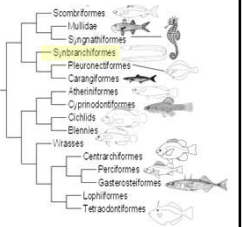
cent et al. 1992). The brooding structures vary in complexity in five steps, from (1) a simple unprotected ventral area for gluing, (2) individual membranous egg compartments, (3) protection of eggs in a pouch with pouch plates, (4) bilateral pouch folds that grow together into a closed pouch, to (5) the most complex and completely enclosed brooding pouch of seahorses (Dawson 1985). There is a further significant

- Reversed sex roles (males pregnant) evolved more than once in group, seen in both abdominal and tail pouches.



### Order Synbranchiformes

- Swamp eels
- 15 genera, 99 species
- Eel like body
- Gill openings on lower half of body
- Non-protrusible mouth
- Freshwater, backwater swampy habitats
- not catadramous
- Some obligate air breathers, some terrestrial

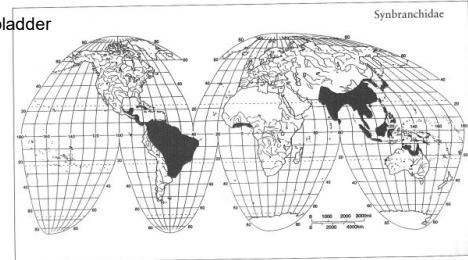




- New species of blind eel that burrows through the soil discovered
- Considered by many to be the least fish-like of fishes, swamp eels are a real oddity and rarely documented. Now Museum scientists have described an entirely new species.
- The fish was discovered not in water but in damp soil. Museum researcher Dr Rachunliu G Kamei uncovered it while searching the rainforest for an entirely different group of animal, the legless amphibians called caecilians.
- **We were digging all day every day for caecilians in the Khasi Hills of Meghalaya, in the north-east of India, when I chanced upon this fish," explains Rachunliu. "This is the only specimen of the species, as we couldn't find any more."**

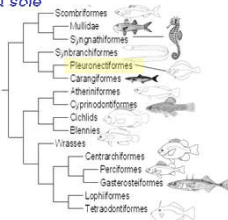
#### Order Synbranchiformes, Family Synbranchidae

- Tropical, subtropical
- Loss of pelvic fins
- Palatoquadrate articulates in two places – only amphistylic teleost
- Gill openings small slit or pore under head
- Loss of ribs
- Loss of swim bladder



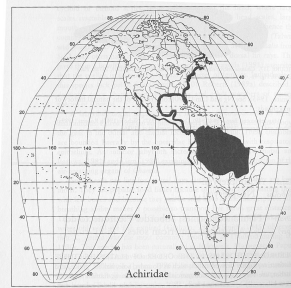
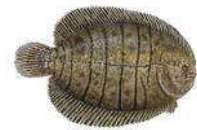
#### Order Pleuronectiformes, flatfish, flounder, halibut sole

- 678 species, 134 genera, 14 families
- highly modified adult morphology, body plan changes ontogenetically
- compressed body, not bilaterally symmetric
- One eye migrates, primitive members show the least movement
- Long dorsal and anal fins
- benthic carnivores, loss of swim bladder
- Some can change colors to match substrate
- commercial interest
- mostly marine, 10 species freshwater only



#### Order Pleuronectiformes, Family Achiridae, American soles

- 7 genera, 33 species
- Dorsal and anal fins free from caudal fin
- Marine and freshwater



Order Pleuronectiformes, Family Pleuronectidae, righteye flounders

- Dorsal fin origin above eye
- Pelvic fins symmetrical
- Well developed lateral line
- Commercial importance (halibut)
  - Slow growth, maturity (8 years)
  - In danger of crash
- 23 genera, 60 species

