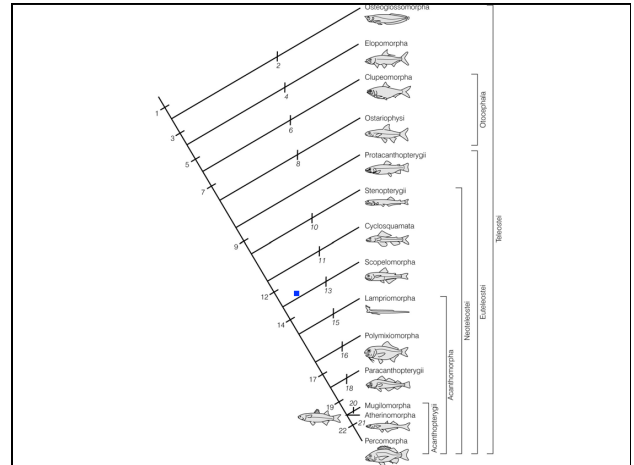


**Teleosts II:**

**Acanthomorpha: spiny teleosts**

Division: **Teleostei**  
 Subdivision: **Euteleostei**  
**Acanthomorpha**

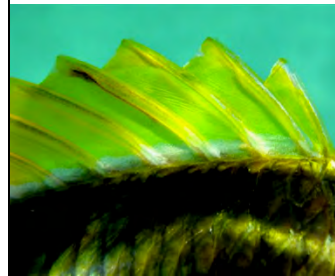


**Acanthomorpha: spiny teleosts**

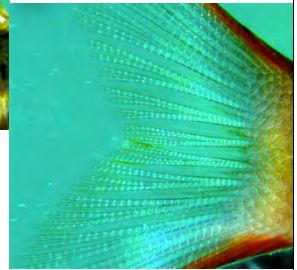
- **true spines** occur in the dorsal, anal, and pelvic fins
- strengthening of vertebral parts
- maxilla becomes a pivot/lever for the premaxilla

- Superorders:
  - Lampridiomorpha (deep sea)
  - Polymixiomorpha
  - Paracanthopterygii
  - Acanthopterygii

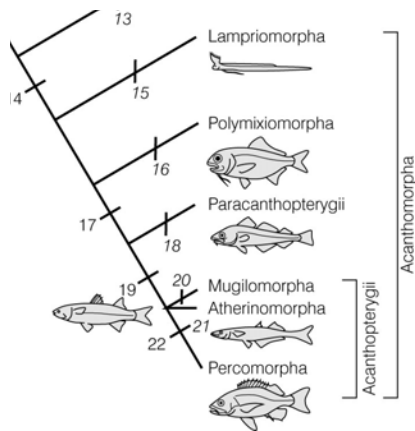
Spine: unsegmented



Ray: segmented



**Acanthomorpha**



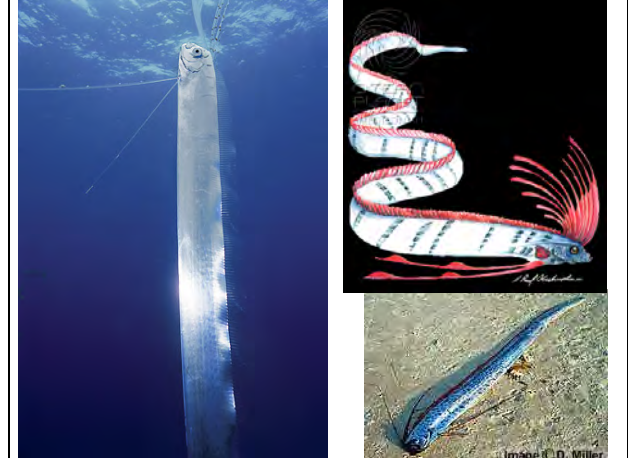
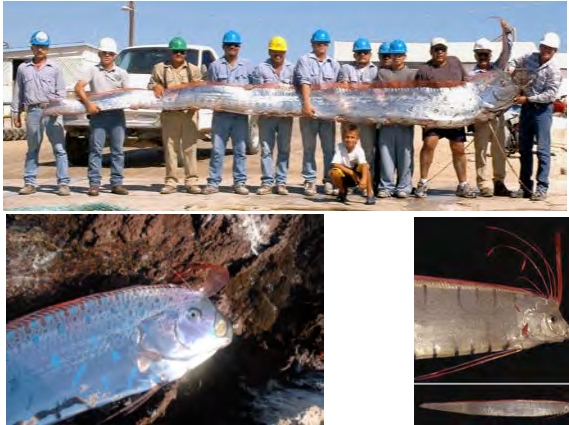
**Superorder Lampridiomorpha**  
**Order Lampridiformes**  
 (5 families, 21 spp.)



- large pelagic predators
- Characteristics:
  - no true spines, but...
  - maxilla levers premaxilla (somewhat protusible jaw)
  - mouth oblique ("strange jaws")
  - P<sub>1</sub> elevated to side of body

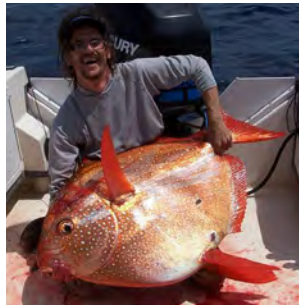
Representative Groups  
 Opahs, Oarfishes, Ribbonfishes, Crestfishes

Order Lampridiformes, oarfish: world's longest teleost! (30' +)



Order Lampridiformes

opah (*Lampris guttatus*)



Superorder **Polymixiomorpha**  
Order **Polymixiiformes** (beardfishes)  
(1 family, 10 spp.)

Characteristics:

- taxonomic status uncertain
- 4-6 true *spines* in D; 4 spines in A
- chin barbels
- two sets of intermuscular bones (primitive trait)
- P<sub>2</sub> thoracic



Superorder **Paracanthopterygii**

(5 orders, 30 families, 200-250 genera, 1200+ spp.)



- Order **Percopsiformes** (troutperches, cavefishes)
- Order **Ophidiiformes** (cusk-eels)
- Order **Gadiformes** (cods, hakes, rattails)
- Order **Batrachoidiformes** (toadfishes, midshipmen)
- Order **Lophiiformes** (goosefishes, anglers, batfishes)  
(might not be monophyletic)

Characteristics:

- changes in the caudal fin and skull
- reduced number of caudal and pelvic fin rays
- mostly marine

Order **Percopsiformes** (9 spp.)

- trout-perch, cavefish
- small freshwater fishes
- North America



trout-perch



Order Percopsiformes



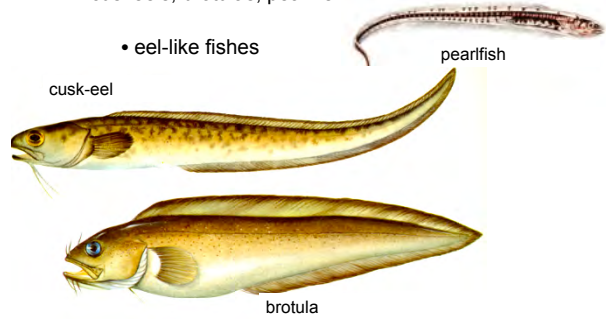
cavefish



Order: **Ophidiiformes** (385 spp.)

cuskeels, brotulas, pearlfish

- eel-like fishes



cusk-eel

pearlfish

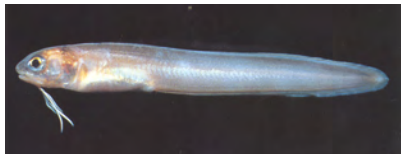
brotula

Order: **Ophidiiformes**

Family: **Ophidiidae** (cusk-eels)



- includes deepest dwelling fish in the world, *Abyssobrotula* (8000 m +)



Order: **Ophidiiformes**

Family: **Carapidae** (pearlfishes)

- live inside sea cucumbers & other inverts!



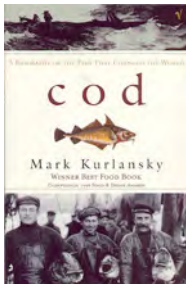
[http://www.youtube.com/watch?v=\\_y4DbZivHCY](http://www.youtube.com/watch?v=_y4DbZivHCY)



Order **Gadiformes** (555 spp.)

Cods, hake, pollock, rattails

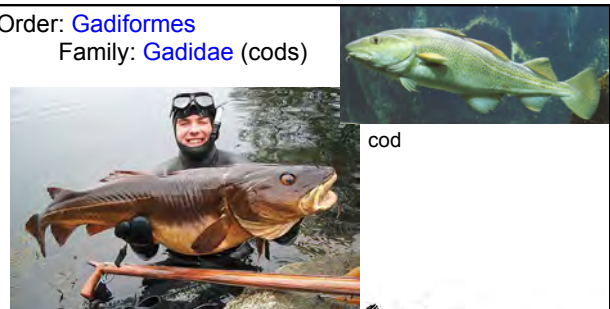
- commercially important fish
- some produce antifreeze glycoprotein in blood
- lack true spines



rattail

Order: **Gadiformes**

Family: **Gadidae** (cods)



cod



pollock

Order: **Gadiformes**  
 Family: **Merlucciidae** (hakes)

**Pacific hake**






largest fishery off west coast of US and Canada, averaging 400,000,000 pounds caught per year since 2000 ("Pacific whiting")

Family: **Merlucciidae** (hakes)


**World's largest fishery: 12,000,000,000 pounds in 1989!**  
 (averages 6,000,000,000 per year)

Pacific walleye pollock  
 or  
 "Alaska pollock"


Order **Batrachoidiformes** (1 family, 78 spp.)  
 toadfish, midshipmen

- well camouflaged benthic fish
- sound production with swimbladder
- venomous dorsal spine in some
- only 3 pairs of gills (instead of 5)





Pacific toadfish


Order: **Batrachoidiformes**  
 Family: **Batrachoididae** (toadfish & midshipman)



midshipman



specklefin midshipman



ventral view – note *photophores*  
 plainfin midshipman

Order: **Batrachoidiformes**  
 Family: **Batrachoididae**

toadfish






Order **Lophiiformes** (18 families, 313 spp.)  
 Anglerfishes, goosefish, frogfishes

Characteristics:

- first dorsal spine (if present) on head
- small tubelike gill opening
- oddly shaped
- anglerfish: modified first dorsal spine into illicium (rod/line) and esca (bait)
- parasitic males in anglers

<http://www.youtube.com/watch?v=Z-BbpaNXbXg>

Order: **Lophiiformes**

goosefish (Lophiidae)  
"monkfish"

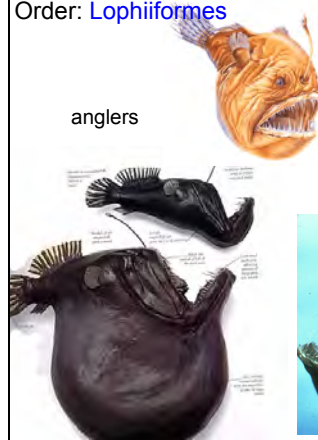


Goosefish (Lophius americanus)  
4 ft (120 cm)



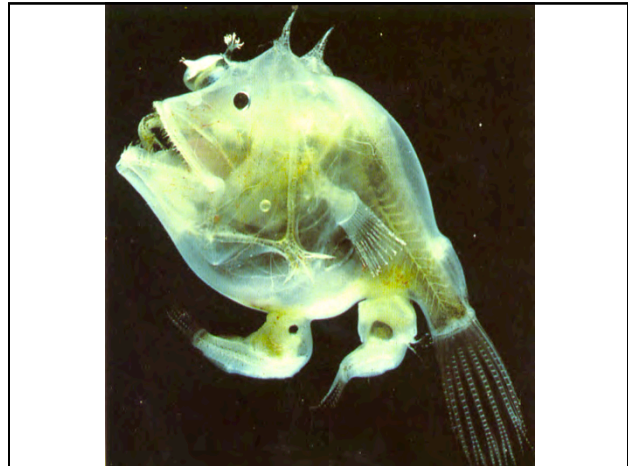
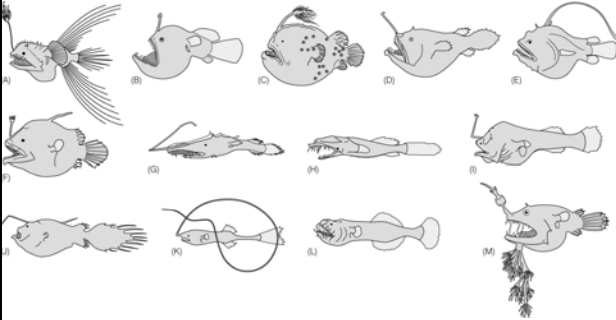
Order: **Lophiiformes**

anglers



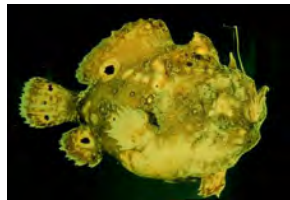
Order: **Lophiiformes**

anglers



Order: **Lophiiformes**

Family: **Antennariidae** (frogfish)



batfish (Ogcocephalidae)



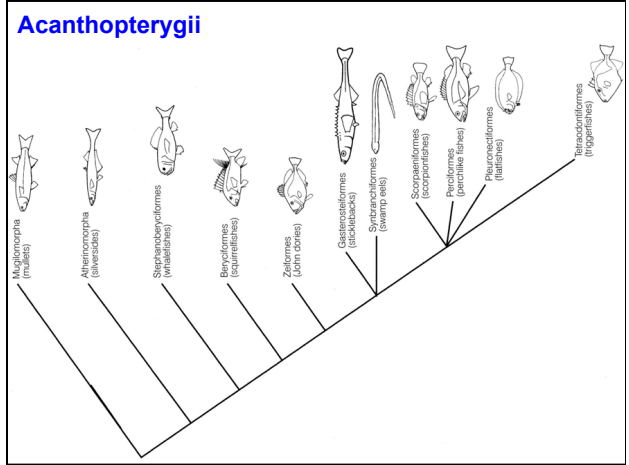
Division Teleostei  
 Subdivision Euteleostei  
 Superorder **Acanthopterygii** ("spine fin")

**"the Crowning Glory of Fish Evolution"**  
 (13 orders, 267 families, 14,800 spp.)

**3 Series:**

- **Mugilomorpha** (1 order, 1 family, 72 spp.)
- **Atherinomorpha** (3 orders, 21 families, 1,551 spp.)
- **Percomorpha** (9 orders, ~230 families ~12,000 spp.)  
 Order **Perciformes** - ~18 suborders; ~140 families  
 Suborder **Percoidae** - ~70 families

• **mostly shallow-water marine fishes**  
 • **highly diverse, with extremely varied mechanisms for feeding**



**Acanthopterygians**

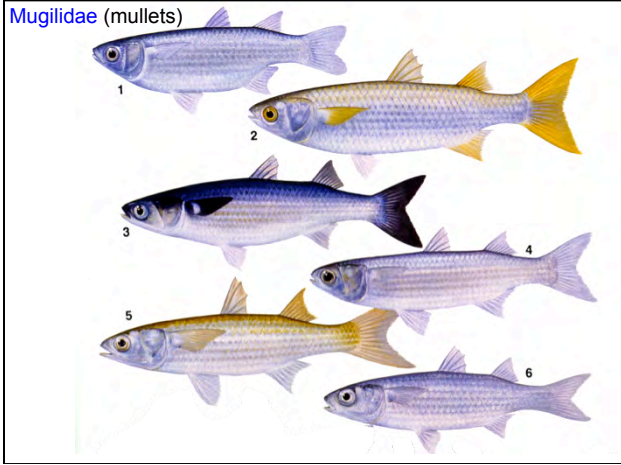
**Characteristics:**

- protrusible jaws; premax excludes max; premax with large ascending process
- pharyngeal jaws: upper and lower sets of pharyngeal teeth
- fin spines: stout, conical spines in D, P<sub>2</sub>, A
- 2 dorsal fins: first spiny, second soft rays
- ctenoid scales usually
- symmetrical tail w/ fused basal elements
- P<sub>1</sub> high; P<sub>2</sub> thoracic
- physoclistus swimbladders
- no otophysic connections (or very rarely)
- mainly eggs layers (oviparous)
- photophores rare

"Series" – **Mugilomorpha**  
 Order **Mugiliformes**  
 Family **Mugilidae** (mullet)  
 (1 family, 72 spp.)

**Characteristics:**

- stout D spines
- cycloid scales usually
- abdominal P<sub>2</sub> with no connection to P<sub>1</sub> girdle
- gizzardlike stomach
- catadromous
- nearshore



**Series Atherinomorpha**

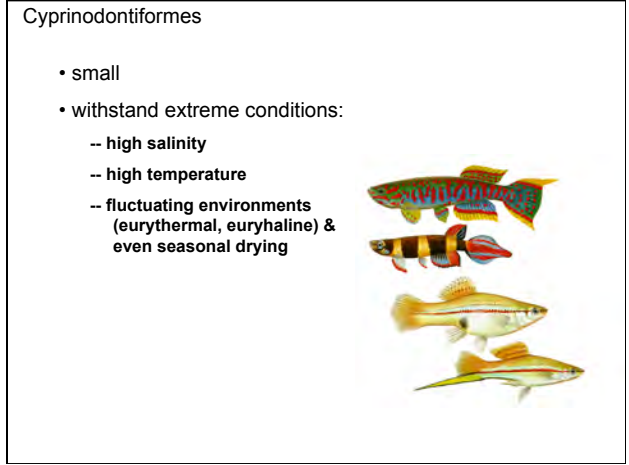
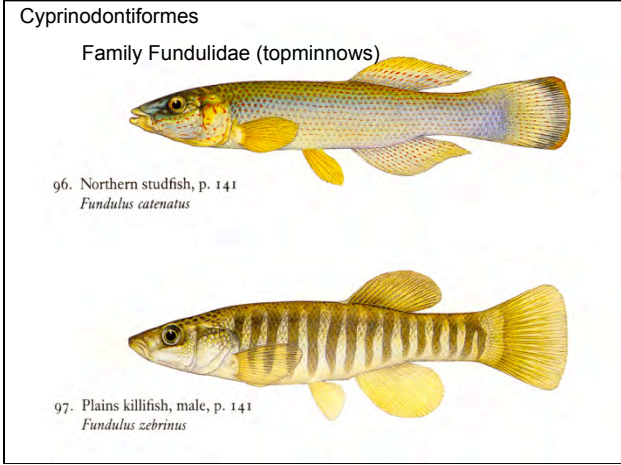
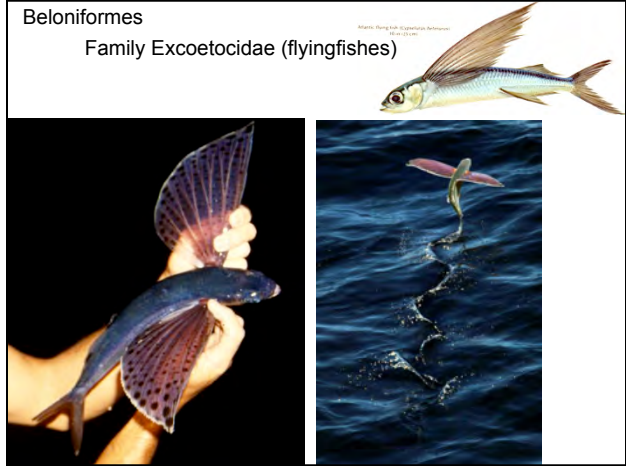
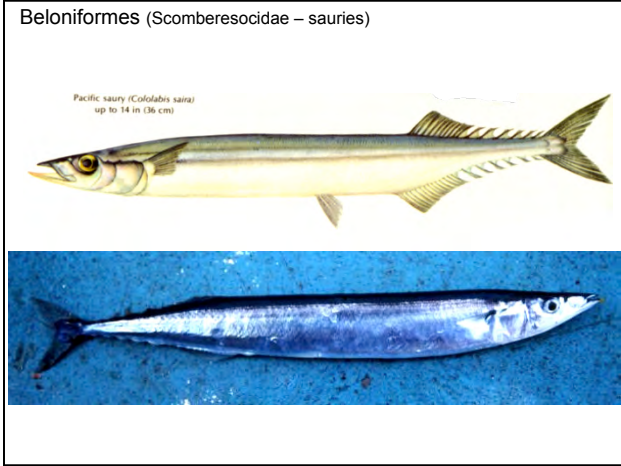
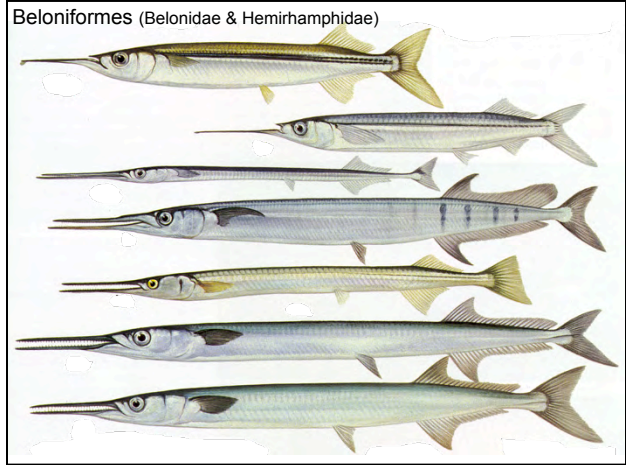
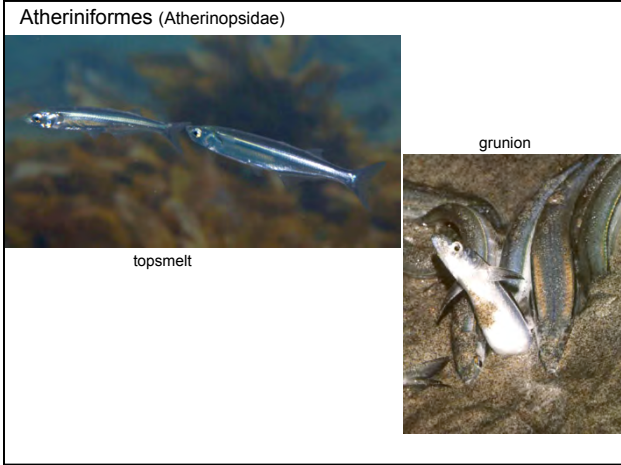
**Characteristics**

- protrusible jaws (unique: premax & max not directly connected)
- weak fin spines
- P<sub>2</sub> abdominal to thoracic
- many euryhaline
- many viviparous (mainly family Poeciliidae)
- surface feeders

**Groups:**

1. Order **Atheriniformes** (6 families, 312 spp.)  
 Atherinopsidae (silversides, topsmelts, grunion)
2. Order **Beloniformes** (5 families, 227 spp.)  
 Exocoetidae (flyingfishes)  
 Belonidae (needlefishes)  
 Hemirhamphidae (halfbeaks)  
 Scomberesocidae (sauries)
3. Order **Cyprinodontiformes** (10 families, 1012 spp.)  
 Fundulidae (topminnows)  
 Poeciliidae (livebearers, e.g., guppies)

The image shows several line drawings of fish from the Atherinomorpha series, including a flyingfish, a needlefish, a halfbeak, a saurie, and a guppy.



Cyprinodontiformes  
Family Cyprinodontidae (pupfishes)

Pecos pupfish, male, p. 145  
*Cyprinodon pecosensis*

Pecos pupfish, female, p. 145  
*Cyprinodon pecosensis*

Cyprinodontiformes

Lyretail  
(*Aphyosemion australe*)

Redjaw killifish  
(*Epiplatys chappei*)

Clown killifish  
(*Epiplatys annulatus*)

Ladiges' gauscho  
(*Cyprospirocha ladiges*)

American flagfish  
(*Jordanella floridae*)

Ahl's aphyosemion  
(*Aphyosemion callurum*)

Gery's aphyosemion  
(*Aphyosemion geryi*)



Cyprinodontiformes  
Family Poeciliidae (livebearers)

Cuppy  
(*Poecilia reticulata*)

Topail variatus  
(play)

Variegated play  
(*Xiphophorus variatus*)

Flaty  
(*Xiphophorus maculatus*)

Black-banded livebearer  
(*Quintana atzozoa*)

Shortfin molly  
(*Poecilia mexicana*)

Sailfin molly  
(*Poecilia latipinna*)

Merry widow  
(*Phallichthys amates*)

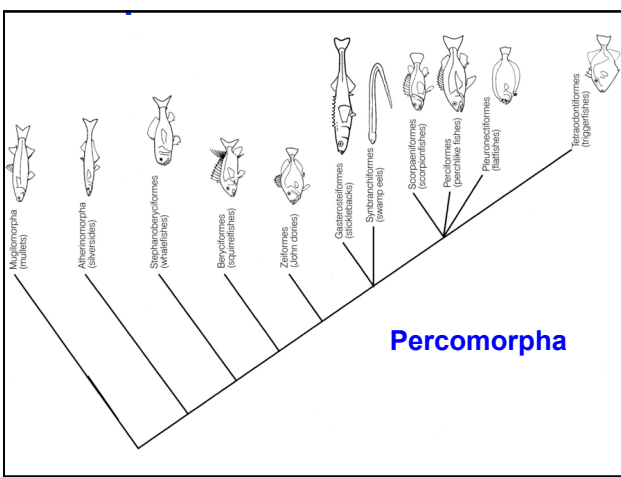
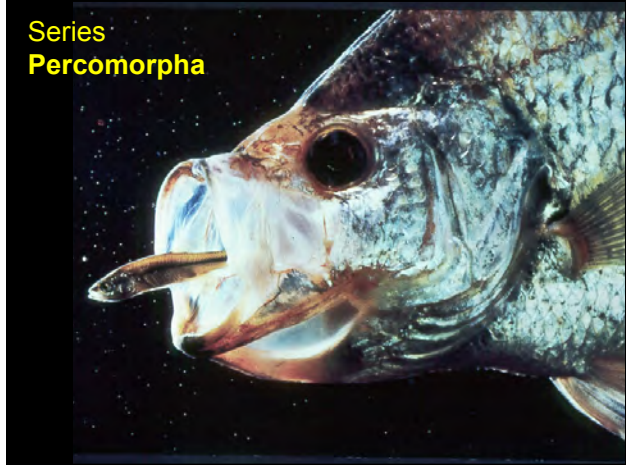
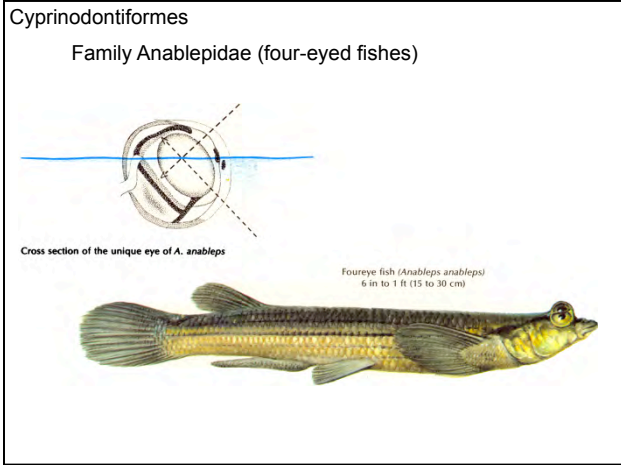
Cyprinodontiformes  
Family Poeciliidae (livebearers)

Mosquitofish, female,  
p. 149  
*Gambusia affinis*

Mosquitofish, male, p. 149  
*Gambusia affinis*







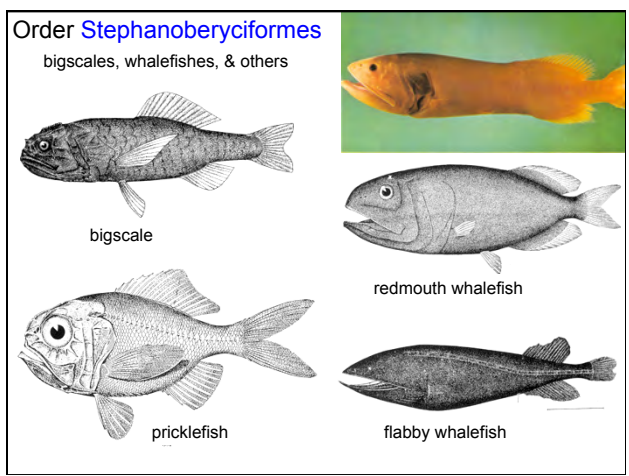
**Percomorpha**

Characteristics:

- protrusible jaws
- stout fin spines on D, A, P<sub>1</sub>
- P<sub>2</sub> thoracic; & normally w/ 1 spine + 5 rays
- P<sub>2</sub> girdle connected to P<sub>1</sub> girdle directly or by ligament
- pharyngeal jaws well developed and toothed

**Groups (primitive to derived)**

1. Order **Stephanoberyciformes** (9 fam., 75 spp.)
  - deep sea
  - spines weak or absent
2. Order **Beryciformes** (7 fam., 144 spp.)
  - Holocentridae – squirrelfishes; flashlight fishes (Anomalopidae)
  - coral reefs
  - many D spines
3. Order **Zeiformes** (6 fam., 32 spp.)
  - John Dories, boarfishes, orees



Order **Beryciformes**  
Family **Holocentridae**



Order **Beryciformes**  
flashlight fishes



Order **Beryciformes**  
pinccone fish

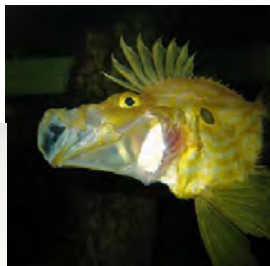


Order **Beryciformes**  
fangtooth

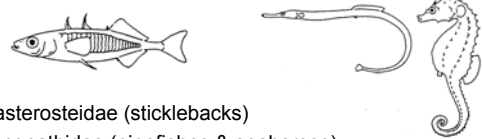


Order **Zeiformes**  
(6 families, 32 spp.)

John Dory



Order **Gasterosteiformes** (11 families, 278 spp.)



- Gasterosteidae (sticklebacks)
- Syngnathidae (pipefishes & seahorses)
- + tubesnouts, trumpetfishes, cornetfishes, snipefishes, shrimpfishes

Characteristics:

- armored
- small mouths
- mostly marine
- parental care (male)

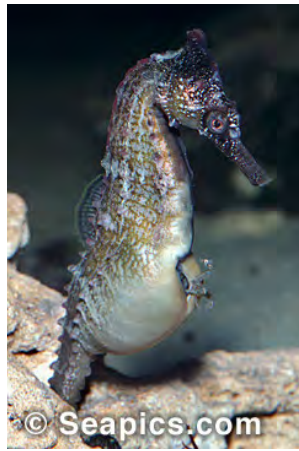
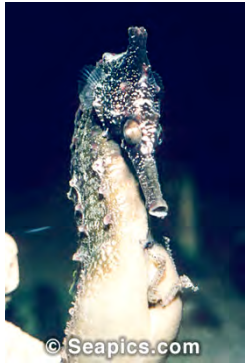
Order **Gasterosteiformes**  
Family **Gasterosteidae**



Order **Gasterosteiformes**  
Family **Syngnathidae**



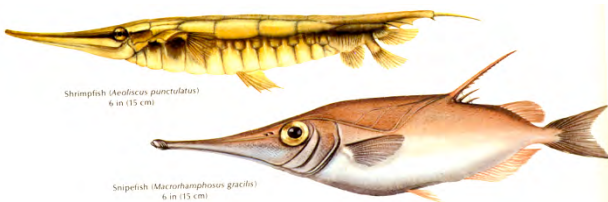
Order **Gasterosteiformes**  
Family **Syngnathidae**



Order **Gasterosteiformes**  
trumpetfish & coronetfish



Order **Gasterosteiformes**  
shrimpfish & snipefish



Order **Gasterosteiformes**  
shrimpfish

- second dorsal & caudal fins point ventrally
- hide among sea urchin spines



Order **Gasterosteiformes**  
seamoth



Order **Scorpaeniformes** (26 families, 1477 spp.)

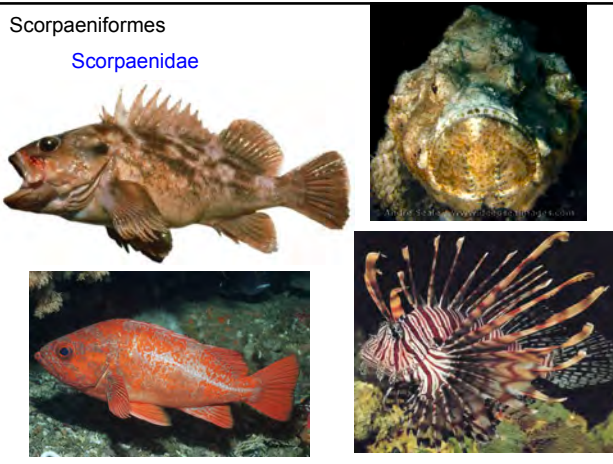


- Scorpaenidae (scorpionfishes, rockfishes, lionfishes, stonefishes)
- Agonidae (poachers)
- Cottidae (sculpins)
- Hexagrammidae (greenlings)
- snailfishes (Liparidae)
- sablefish (Anoplopomatidae)
- flying gurnards (Dactylopteridae)
- lumpfishes (Cyclopteridae)

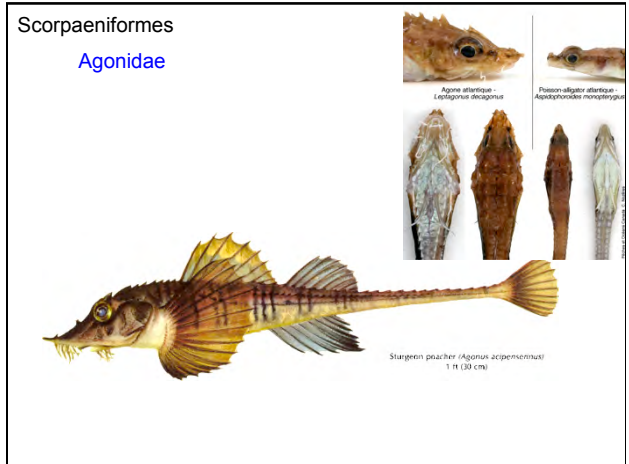
Characteristics:

- "mail cheeked" (spines on head and operculum)
- suborbital stay
- many venomous

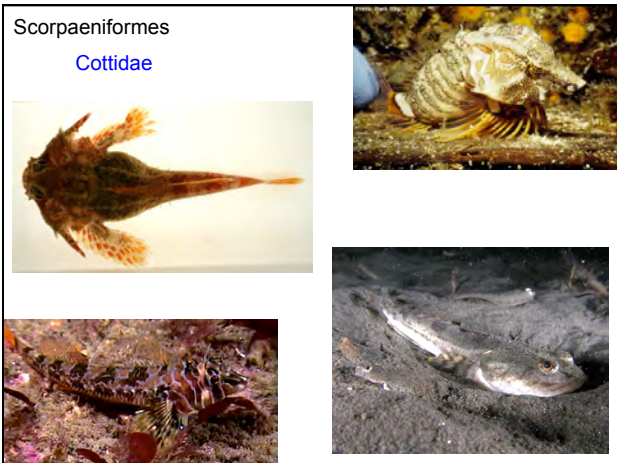
Scorpaeniformes  
**Scorpaenidae**



Scorpaeniformes  
**Agonidae**



Scorpaeniformes  
**Cottidae**



Scorpaeniformes  
**Hexagrammidae**

