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:
- Lamprodiodroma
- Polymixiomorpha
- Paracanthopterygii
- Acanthopterygii

Superorder Lamprodiodroma
Order Lampridentiformes
(5 families, 21 spp.)

- large pelagic predators

Characteristics:
- no true spines, but...
- maxilla levers premaxilla (somewhat protusible jaw)
- mouth oblique ("strange jaws")
- P, elevated to side of body

Representative Groups
Opahs, Oarfishes, Ribbonfishes, Crestfishes
Order Lampridiformes, oarfish: world’s longest teleost! (30+)

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)
• P2 thoracic

Order Lampridiformes
opah (Lampris guttatus)

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

Order: Ophidiiformes (385 spp.)
- cuskeels, brotulas, pearlfish
  - eel-like fishes
  - cusk-eel
  - brotula
  - pearlfish

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=Vd5lbZxHsCY

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: **Merluccidae** (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: Merluccidae (hakes)

*Pacific walleye pollock* or “Alaska pollock”

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

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** (toadfish & midshipman)

*midshipman*

Ventral view – note photophores

Order: **Batrachoidiformes**

*toadfish*

Order: **Lophiiformes** (18 families, 313 spp.)

*Anglerfishes, goosefish, frogfishes*

- 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

Characteristics: [http://www.youtube.com/watch?v=g2-BbspaN6X bg](http://www.youtube.com/watch?v=g2-BbspaN6X bg)
Order: Lophiiformes

- goosefish (Lophiidae)
- "monkfish"

Order: Lophiiformes

- anglers

Order: Lophiiformes

Family: Antennaridae (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 Percoidei - ~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, P2, A
- 2 dorsal fins: first spiny, second soft rays
- ctenoid scales usually
- symmetrical tail w/ fused basal elements
- P1 high; P2 thoracic
- physoclistus swimbladders
- no otophysic connections (or very rarely)
- mainly eggs layers (oviparous)
- photophores rare

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

Characteristics:
- stout D spines
- cycloid scales usually
- abdominal P2 with no connection to P1 girdle
- gizzardlike stomach
- catadromous
- nearshore

Series Atherinomorpha

Characteristics:
- protrusible jaws (unique: premax & max not directly connected)
- weak fin spines
- P2 abdominal to thoracic
- many euryhaline
- many viviparous (mainly family Poeciliidae)
- surface feeders

Groups:
1. Order Atheriniformes (6 families, 312 spp.)
   Athanopidae (silverides, 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)
Atheriniformes (Atherinopsidae)

Beloniformes (Belonidae & Hemirhamphidae)

grunion
topsmelt

Beloniformes (Scomberesocidae – sauries)

Family Excoetocidae (flyingfishes)

Cyprinodontiformes

Family Fundulidae (topminnows)

Cyprinodontiformes

- small
- withstand extreme conditions:
  -- high salinity
  -- high temperature
  -- fluctuating environments (eurythermal, euryhaline) & even seasonal drying
Cyprinodontiformes

Family Cyprinodontidae (pupfishes)

Peach pupfish, male, p. 143
Cyprinodon nelsoni

Peach pupfish, female, p. 143
Cyprinodon nelsoni

Cyprinodontiformes

Family Poeciliidae (livebearers)

American flagfish, p. 141
Poecilia latipinna

Breeding male, p. 141
Poecilia latipinna

Cory’s rainbowfish, p. 141
Corythoichthys conrensoi

Dockside, p. 141
Poecilia sphenops

Cyprinodontiformes

Family Poeciliidae (livebearers)

Cyprinodontiformes

Family Poeciliidae (livebearers)

Mosquitofish, female, p. 149
Gambusia affinis

Mosquitofish, male, p. 149
Gambusia affinis
Cyprinodontiformes

Family Anablepidae (four-eyed fishes)

Cross section of the unique eye of A. anablopus

Series Percomorpha

Characteristics:
• protrusible jaws
• stout fin spines on D, A, P₁
• P₂ thoracic; & normally w/ 1 spine + 5 rays
• P₂ girdle connected to P₁ 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, oreos

Order Stephanoberyciformes
bigscales, whalefishes, & others

bigscale
redmouth whalefish
pricklefish
flabby whalefish
Order Beryciformes
Family Holocentridae

flashlight fishes

Order Beryciformes
pincecone fish

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
Family Syngnathidae

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Family Syngnathidae

Order Gasterosteiformes
Family Syngnathidae

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

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

sablefish

snailfish

lumpfish

Next lecture: Perciformes, Pleuronectiformes, Tetraodontiformes

Perciformes (perchlike fishes)

Pleuronectiformes (flattfishes)

Tetraodontiformes (triggerfishes)