# Field Methods in Fish Biology

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Instructor: Jon Velotta

# Jon Velotta

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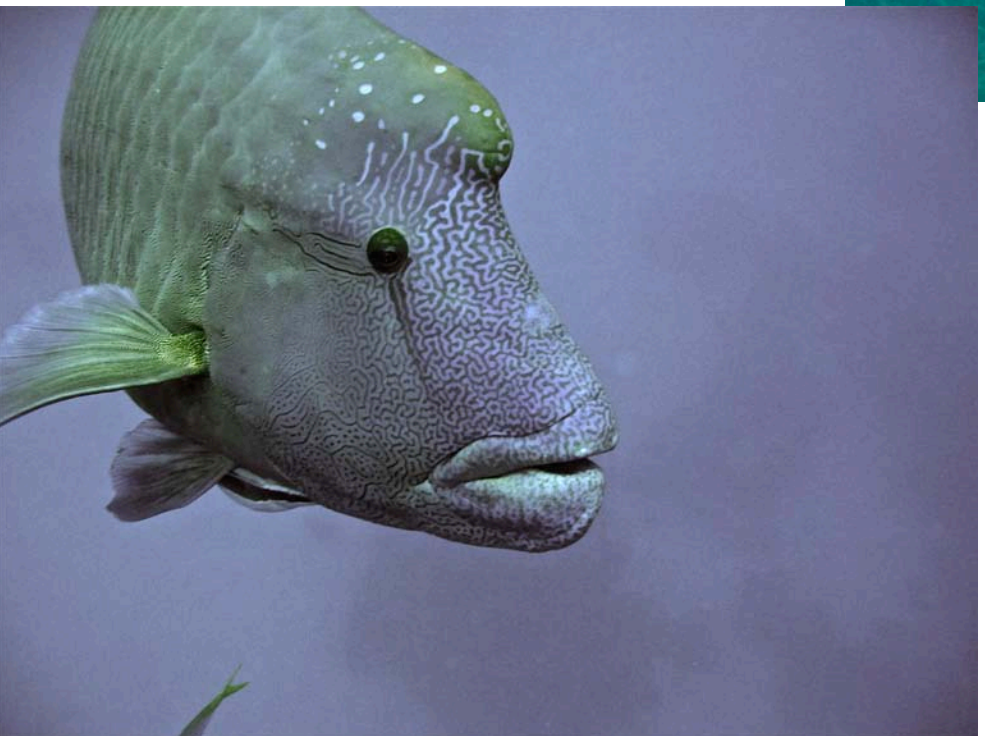
B.S. Biology, Fairfield University, 2007
M.S. Ecology and Evolutionary Biology, UConn, 2011
Ph.D. Ecology and Evolutionary Biology, UConn, present

The University of Connecticut
Ecology & Evolutionary Biology

FAIRFIELD
UNIVERSITY

At Fairfield, I studied the stress response in wild birds





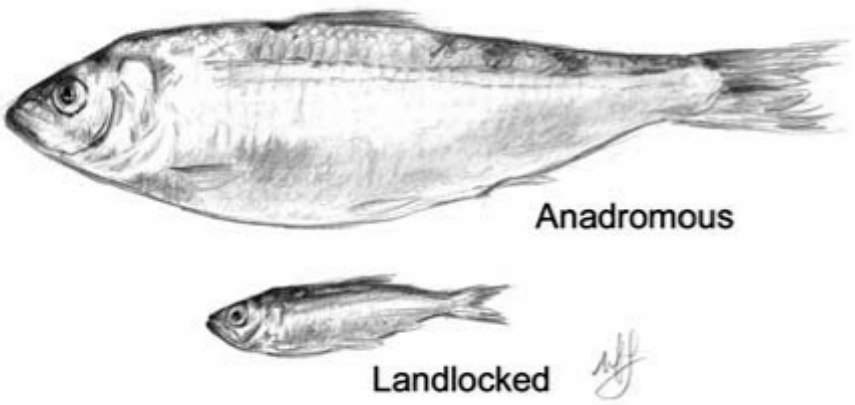
I Australia, I studied the effects of nutrient deposition on coral reefs

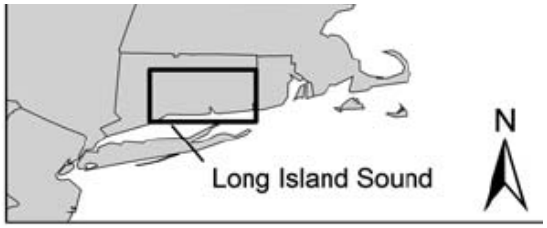
# We are physiological ecologists

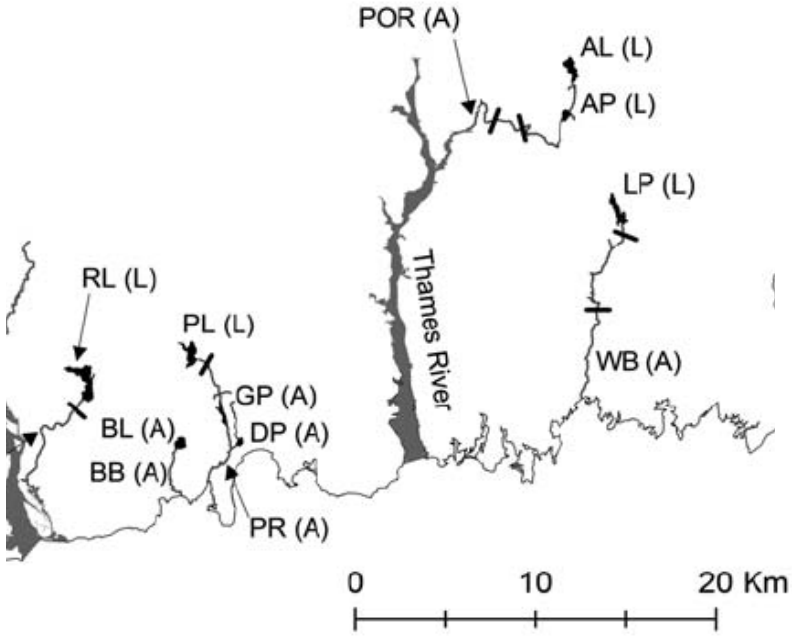
My work centers around the comparative physiology of fishes, specifically, the alewife

Alewives are anadromous -
they migrate to freshwater from the ocean to breed

Alewife populations differ in **life history traits** and are found in two distinct forms: ***anadromous and landlocked***



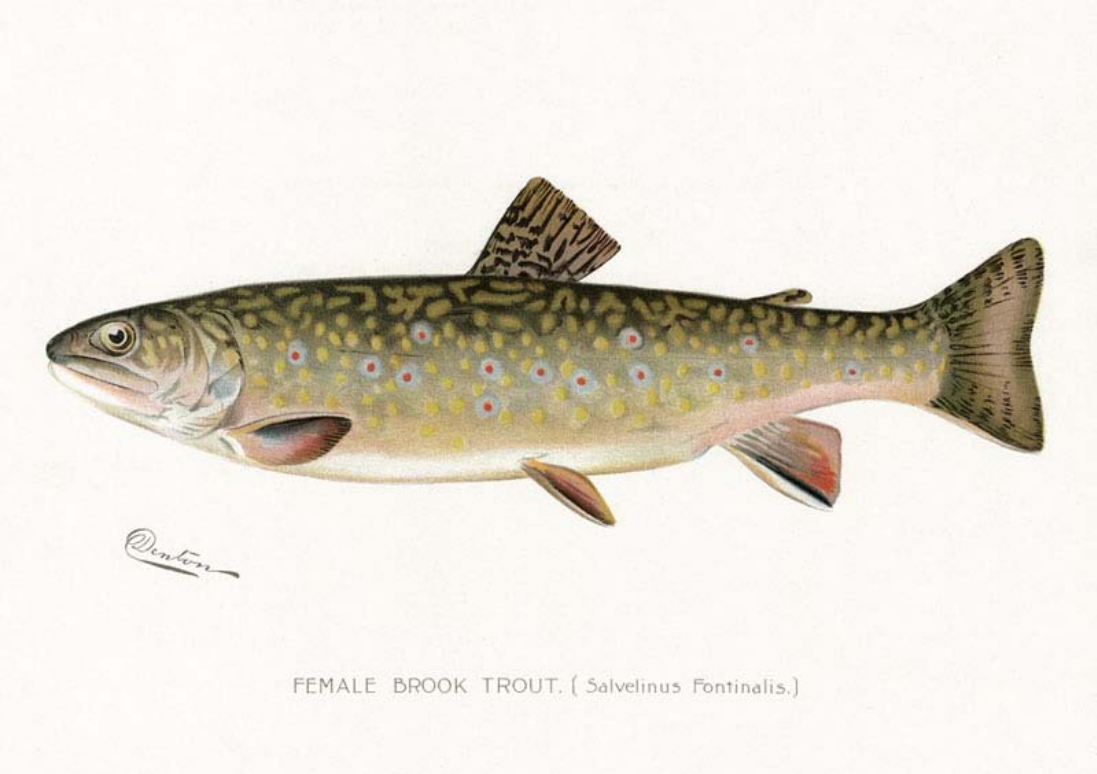




Palkovacs et al. 2008, Mol Ecol 17, 582–597

I study the differences in salinity tolerance, water balance, and ion regulation between anadromous and landlocked populations

# Our Syllabus

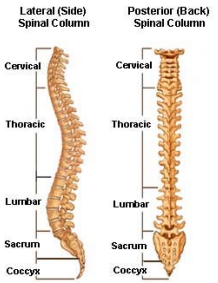
# What is a fish?



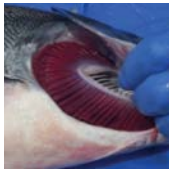
# What is a fish?

- Aquatic

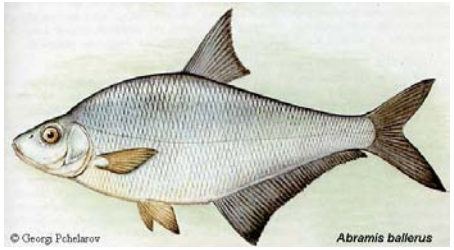
- Vertebrate




- Gills

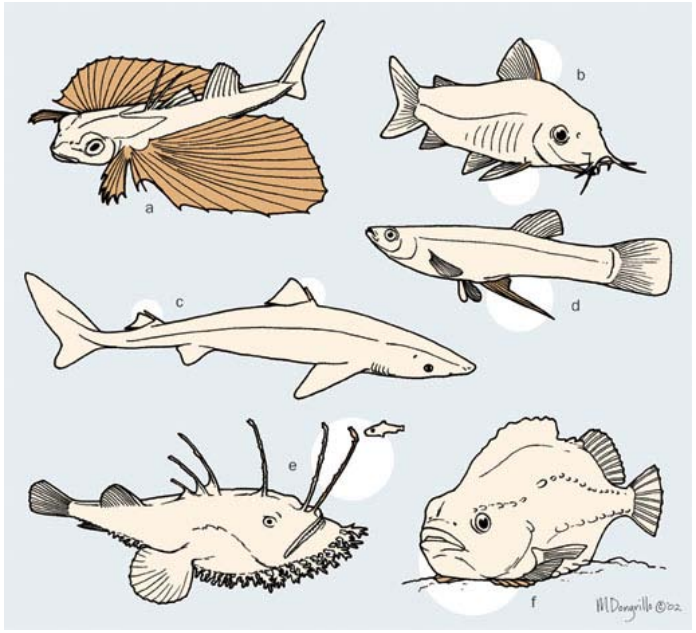


- Limbs in the shape of fins




- Ectothermic

# There are 27,977 known species



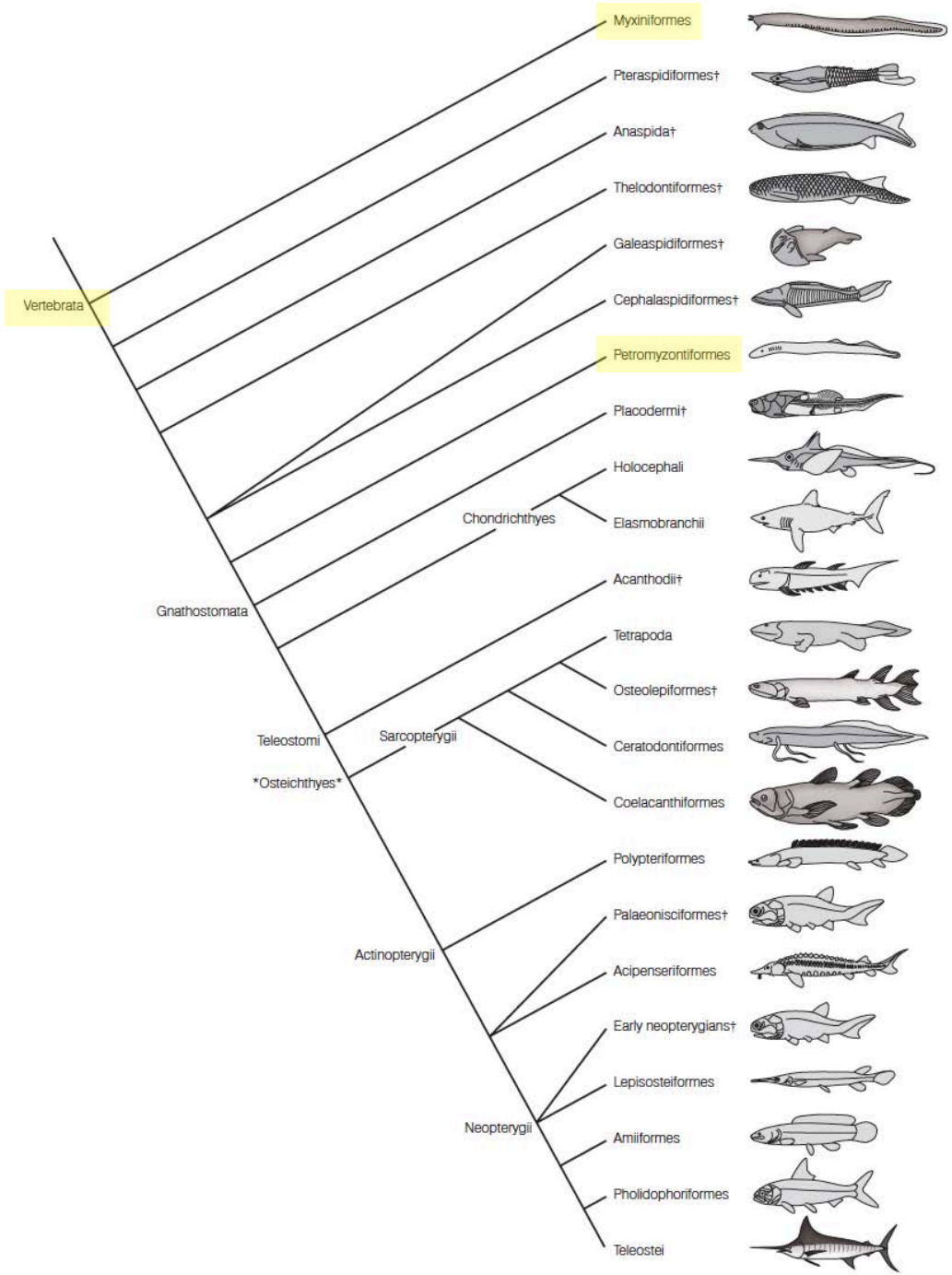

Helfman et al. 2009. *Diversity of Fishes*

# There are 27,977 known species

- 108 jawless fish
- 970 cartilaginous fish
- 26,000+ bony fishes

# All fish are vertebrates

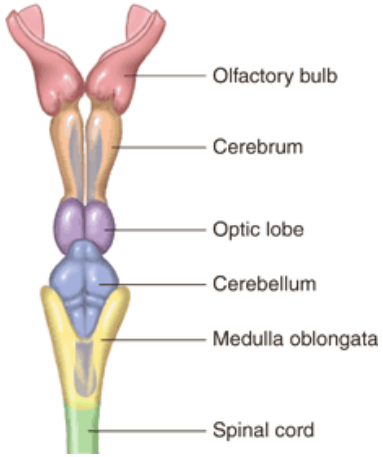
- A **vertebrate** is an chordate with a vertebral column
- **Agnathostomata** or jawless fishes lack jaws
  - hagfish (**Myxiniformes**)
  - lamprey (**Petromyzontiformes**)

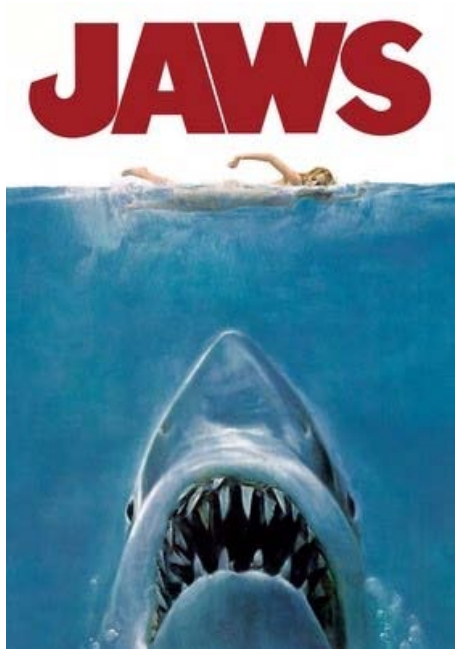


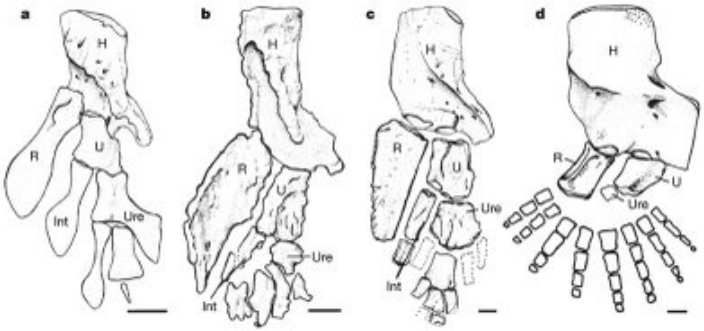

Hypothesized phylogenetic relationships among living and extinct (†) fish groups. Mostly after Nelson (2006). (See Chapters 11, 13.)

Helfman et al. 2009.
*Diversity of Fishes*

# Fish innovations:

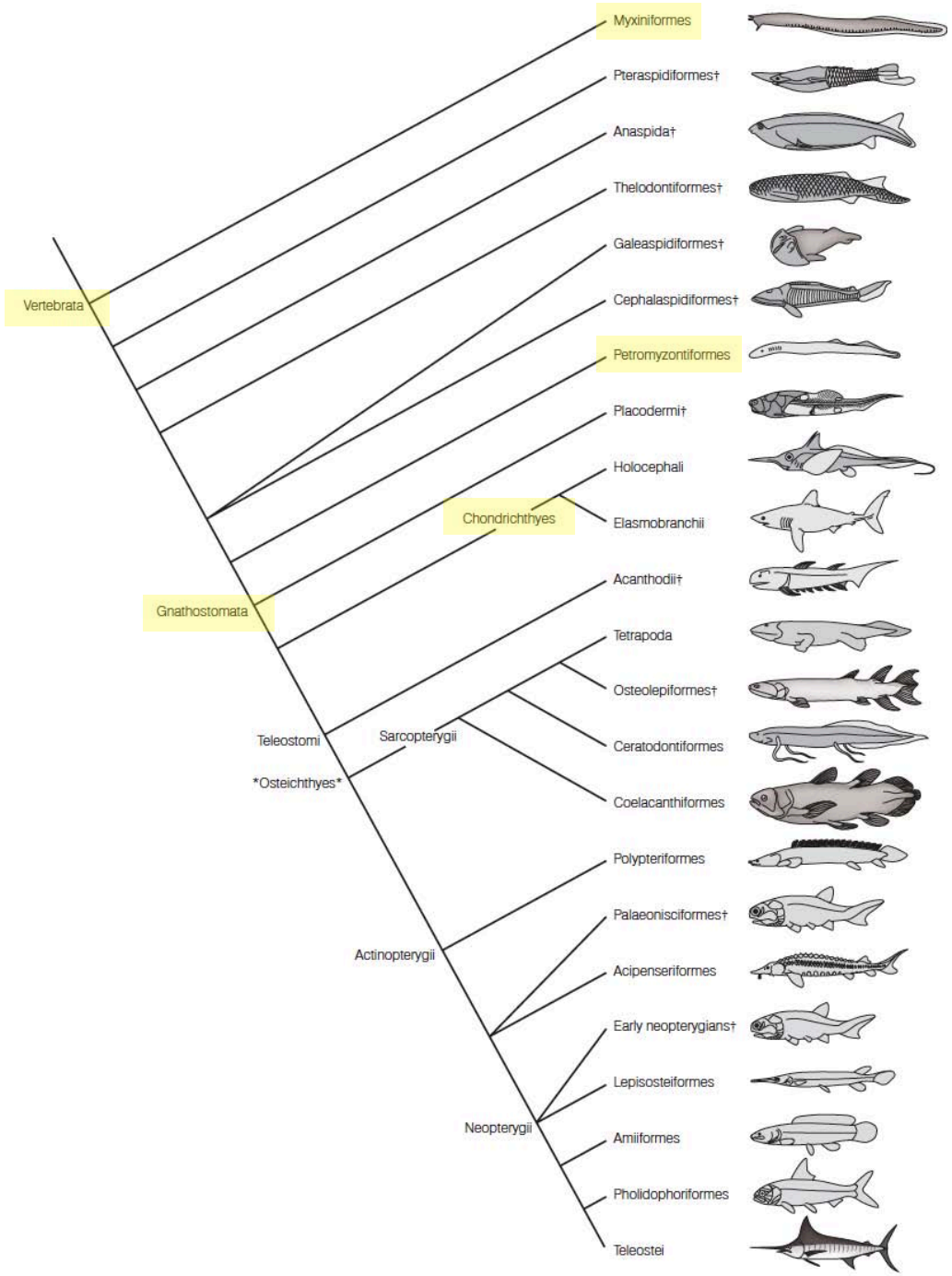



# **Gnathostomata** are the jawed fishes

- Gnathostomes include:
  - **Chondrichthyes**, which include the sharks, rays, skates

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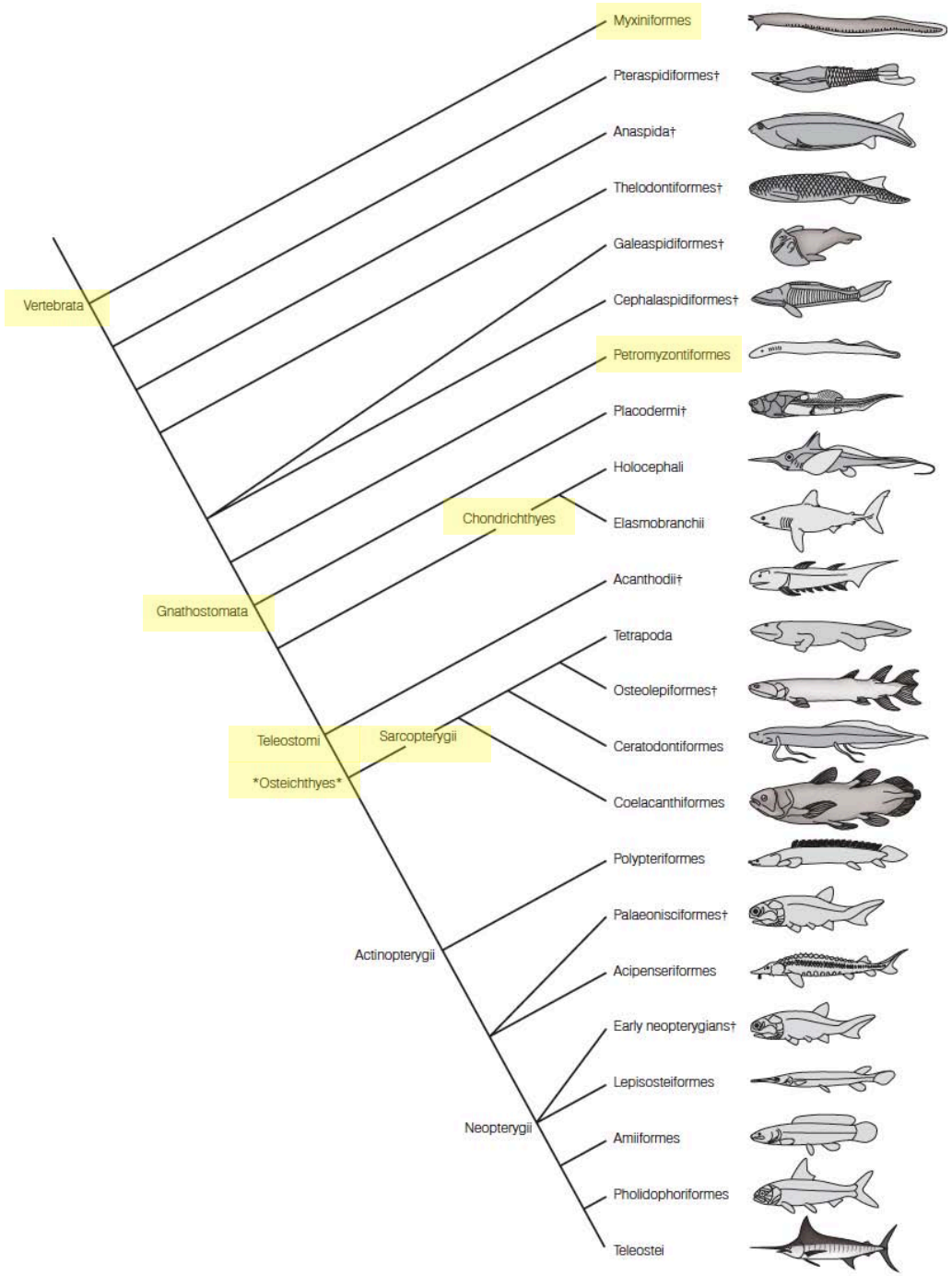
# **Gnathostomata** are the jawed fishes

- Gnathostomes include:
  - **Chondrichthyes**, which include the sharks, rays, skates
  - All the **Teleostomi**
    - The **Teleostomi** are the *bony fishes*
    - **Osteichthyes** (which means bony fish) is the name for all bony fishes that are NOT Acanthodii.
      - **Sarcopterygii** (the lobed-finned fishes; e.g., coelocanths) and the **Actinopterygii** (the ray finned fishes)

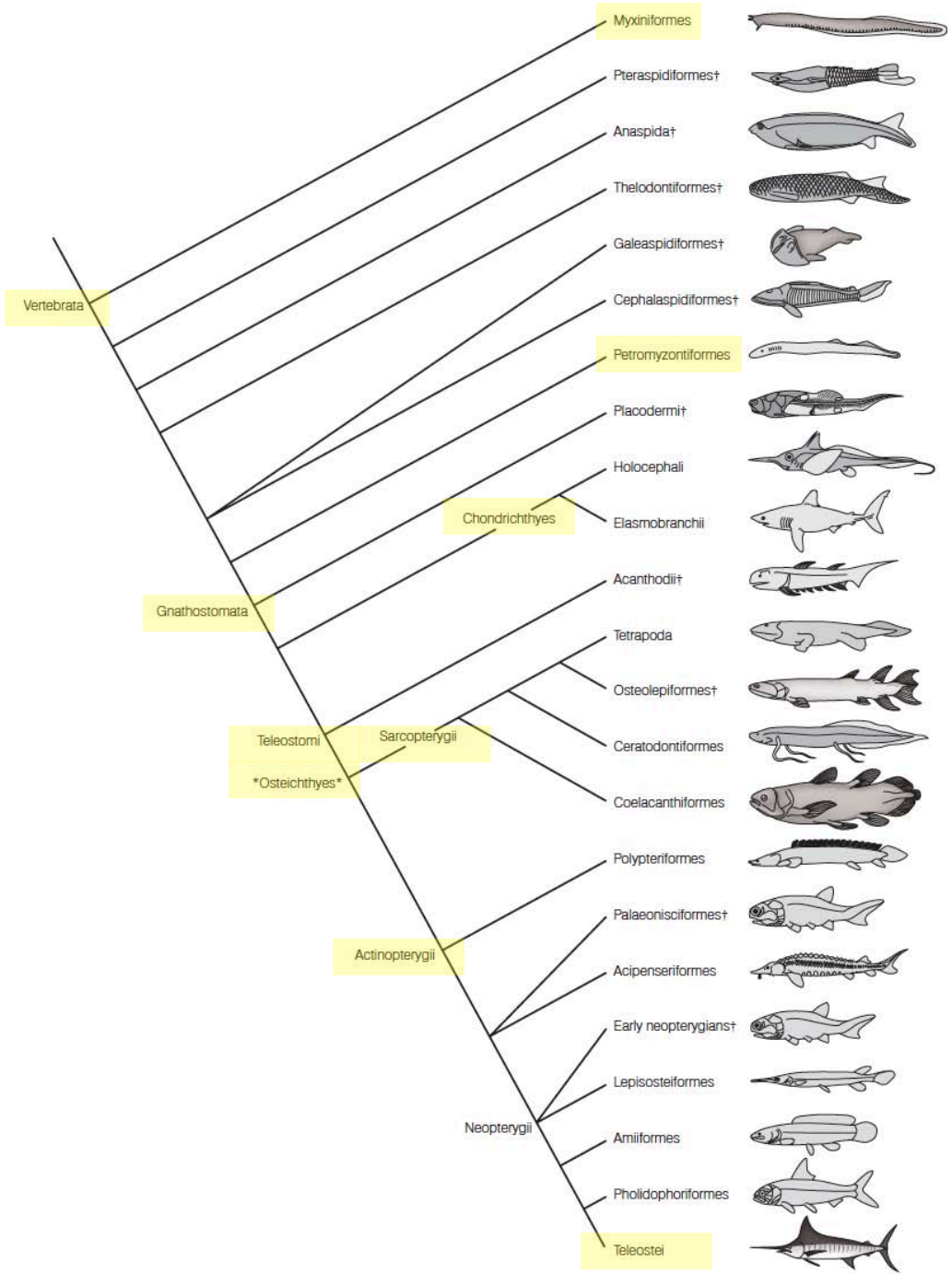



Hypothesized phylogenetic relationships among living and extinct (†) fish groups. Mostly after Nelson (2006). (See Chapters 11, 13.)

Helfman et al. 2009.
*Diversity of Fishes*

# **Actinopterygii** are the ray finned fishes

- The **Actinopterygii** have fins composed of rays
  - Rays are modified scales
- Most Actinopterygii, and most fishes, are **teleosts**
  - *That's **Teleostei**, NOT **Teleostomi**…note the difference.*
- **Teleosts** are united by bones of the **tail and skull**
  - **Almost all the fish we will catch will be teleosts**

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Helfman et al. 2009.
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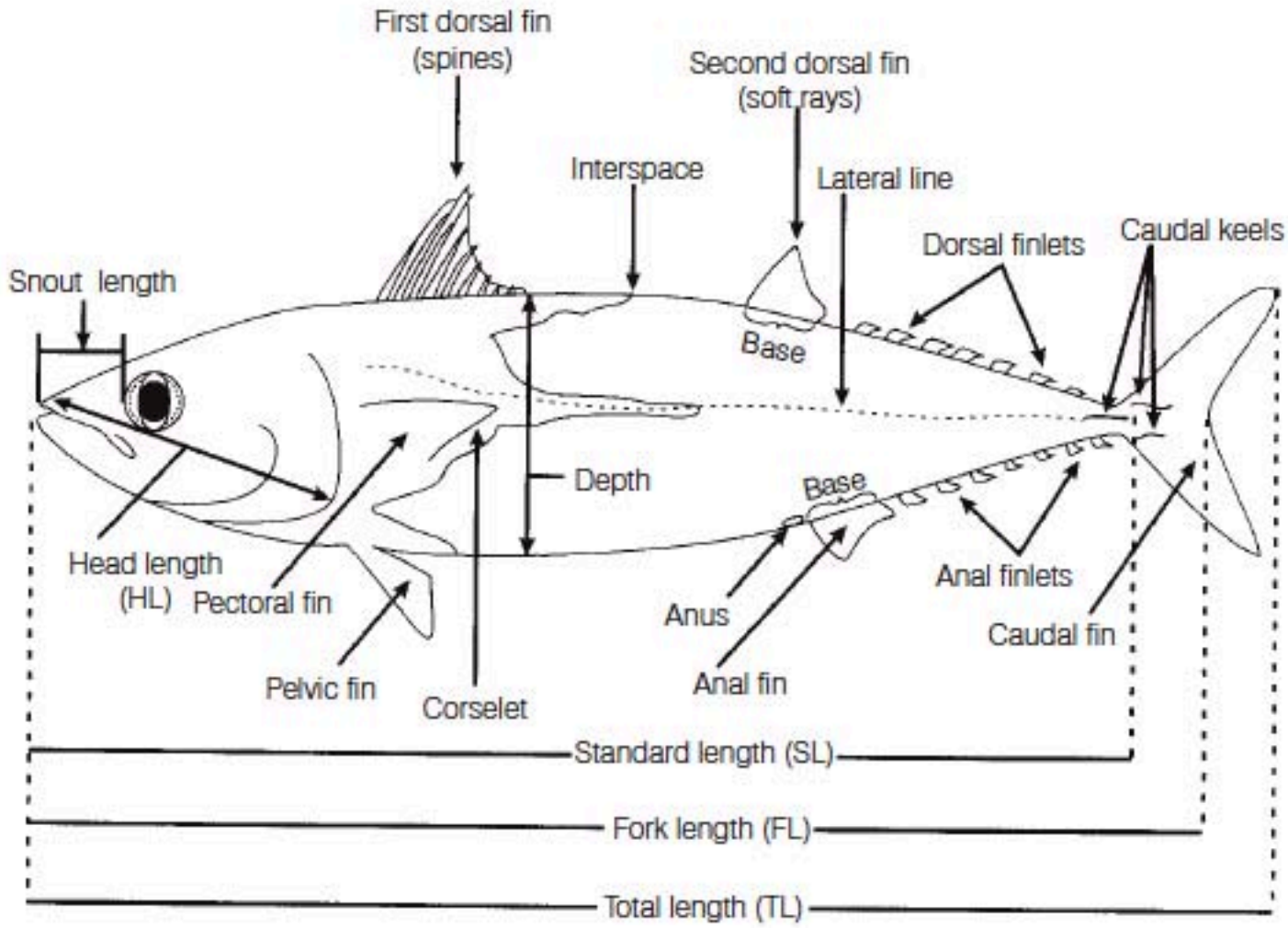
# Connecticut fishes

- ~80 known freshwater species
  - Some common, some known from only one location

- ~100 saltwater and brackish water species
  - Many LIS resident species as well as pelagic and migratory species (e.g., sharks).




Helfman et al. 2009, *Diversity of Fishes*; Fig 2.2

# Field fish biology

- Why do we capture fish in the field and what data do we take?
- What research questions do we want to answer?

# Field fish biology – what we will study

- Population abundance – *how many fish?*
- Size – *how big are the fish?*
- Condition – *are the fish in good condition?*
- Age and growth – *how old are the fish, how fast or slow do they grow?*
- Reproductive condition – *how much energy is allocated to reproduction?*
- Assemblage structure – *what species are present and how diverse are they?*
- Behavior – *what are reproductive behaviors, etc*.?
- Habitat use – *do different species use different habitats?*

# Field fish biology – other considerations

- Movements – *Where do fish go, do they migrate?*
- Survival and mortality – *how many survive to a particular age?*
- Ecological niche – *what is the ecological function of a species?*
- Species home range – *what are there geographic limits?*
- Diet and energy flow – *what does a fish eat?*
- Catch and harvest – *how many fish are being taken?*
- Community interactions – *how do fish interact with other taxa?*

# Field methods of fish biology

- Active gear – requires energy
- Passive gear – gear not actively moved
- Electrofishing – use of electricity
- Tagging – marking fish
- Acoustics – use of sound
- Biotelemetry – implantation of a recording device
- Visual observations – snorkeling, scuba, etc.
- Angler/commercial fishery survey's

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