

Introduction to the course and Lecture 1: Ecology and Fish Fundamentals

Introduction to the class

- Welcome; distribute syllabus and Fish Facts; take the survey
- Meet your instructor
- Structure of the course: read through syllabus; discuss readings and research paper
- Disclaimer about prerequisite knowledge

Ecology and Fish Fundamentals – laying a foundation for the class

I. Meet the fish

A. What is a fish?

1. Characteristics and exceptions

2. The basic body plan

3. Fish versus fishes

B. Evolutionary history of fishes, in brief

1. Beginnings

2. Endings

3. Surviving lineages

C. Modern fish diversity, and where it occurs

1. Diversity comparisons with other taxa

2. Diversity patterns within the group

3. Where fish live – biogeographic zones

4. The marine/freshwater disparity

D. The importance of fishes

II. Fish ecology as a discipline

A. Fundamentals of ecology

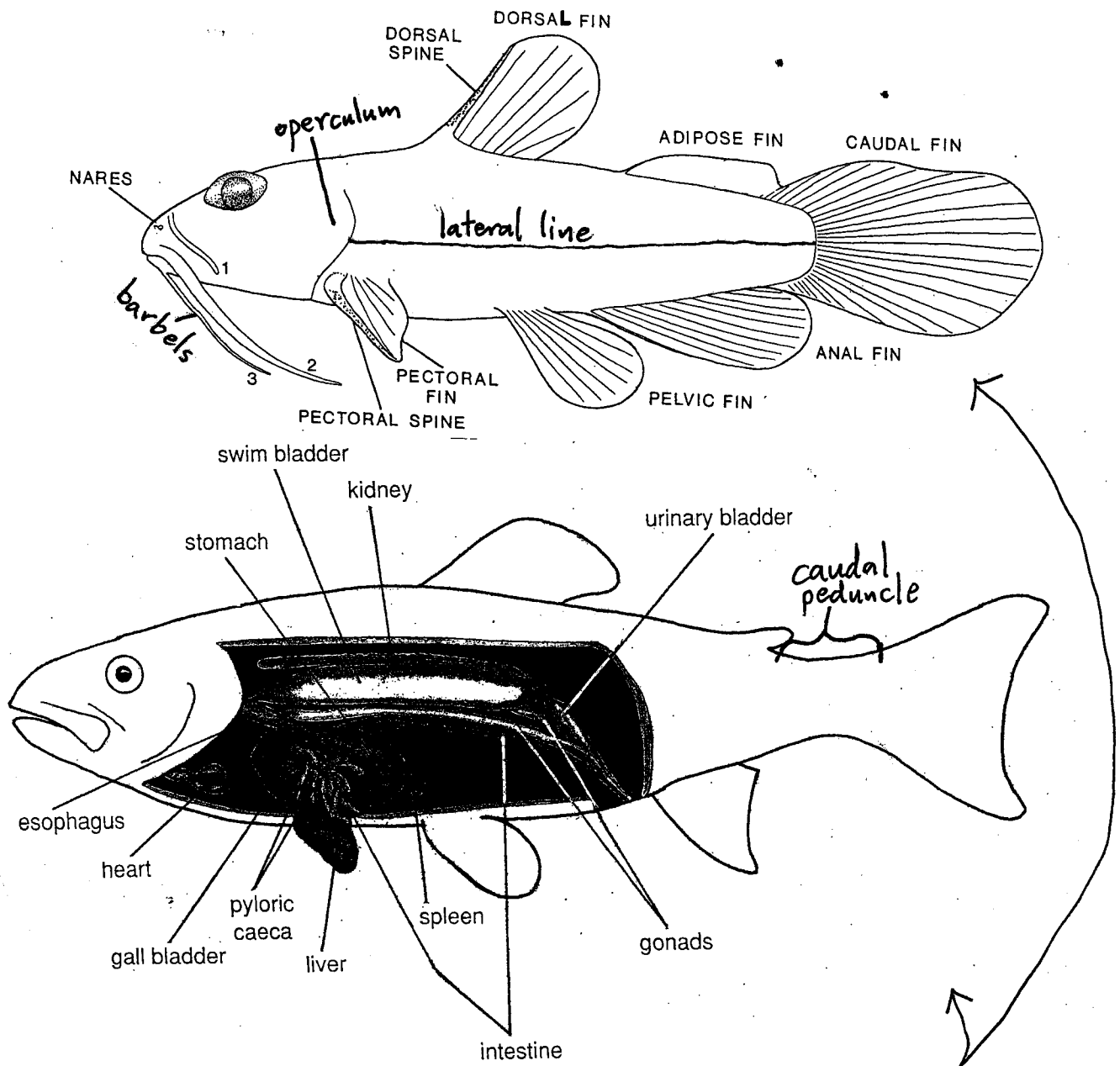
1. Definition
2. Approaches
 - a. Scientific method
 - b. Observation vs. experimentation
 - c. Models
 - d. Hypotheses, paradigms, theories, and laws
3. Levels of biological and ecological organization
4. Emergent properties

B. Areas of emphasis within fish ecology

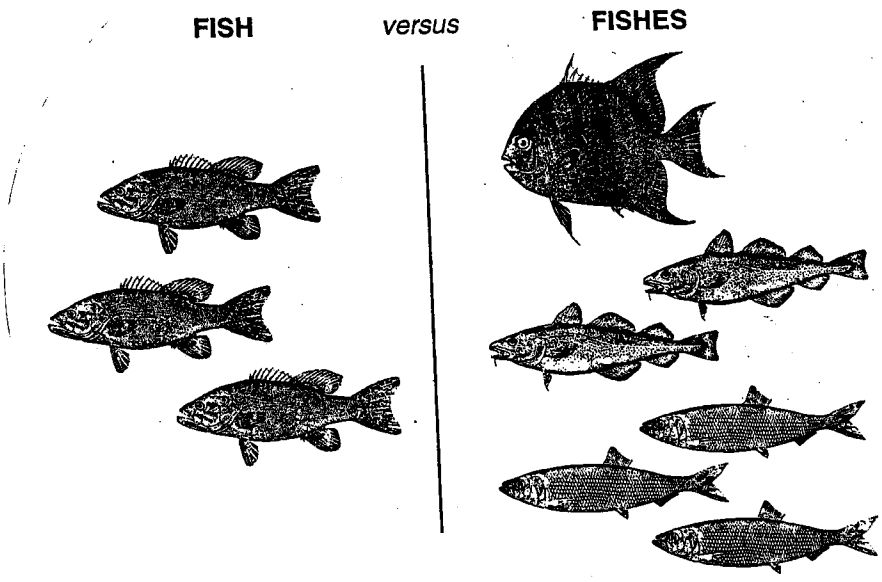
1. Molecular ecology
2. Ecotoxicology
3. Ecology of individuals (includes behavioral ecology)
4. Population ecology
5. Community ecology
6. Ecosystem ecology
7. Landscape ecology

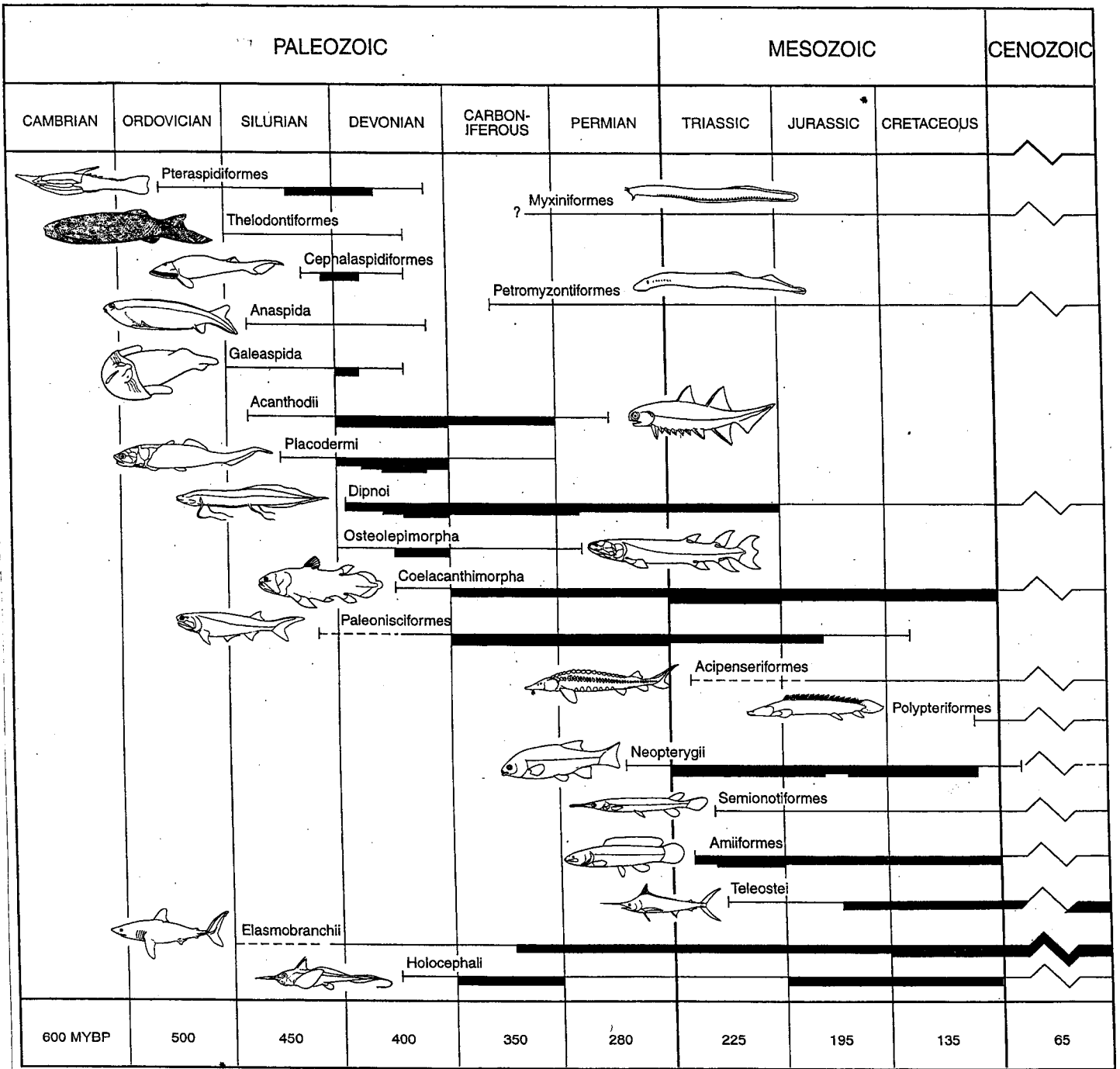
C. Contrasts with other disciplines

1. Ichthyology (zoology, natural history)
2. Fish biology (nutrition and health, toxicology, physiology)
3. Environmental science
4. Fisheries management



Basic body plan of most Teleostean fishes



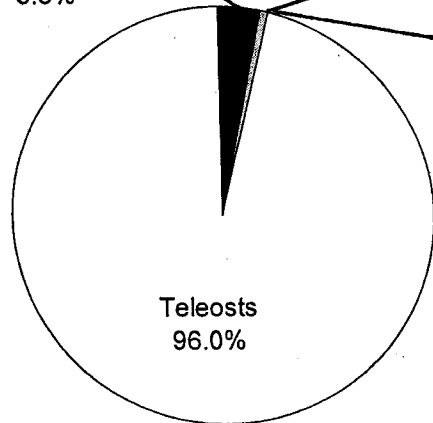


↑
 Evolutionary history
 of major fish
 lineages. Line
 thickness denotes
 species diversity.

Sharks, rays, and
 chimaeras
 3.3%

Jawless fishes
 0.4%

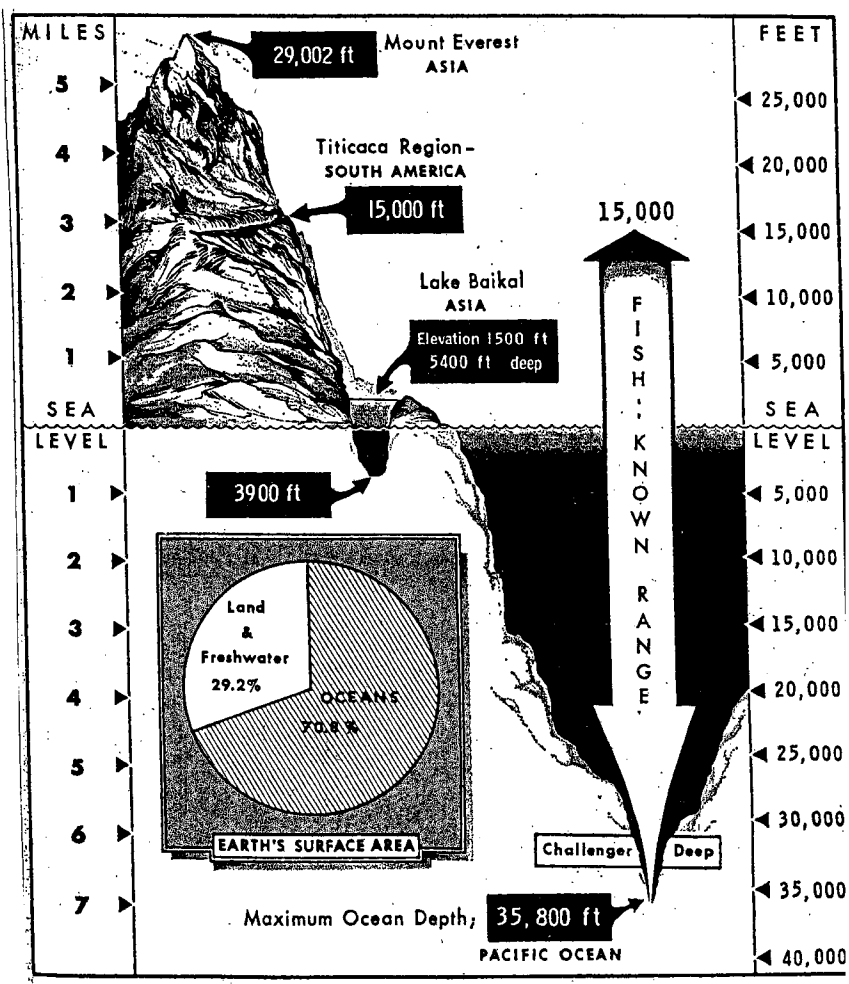
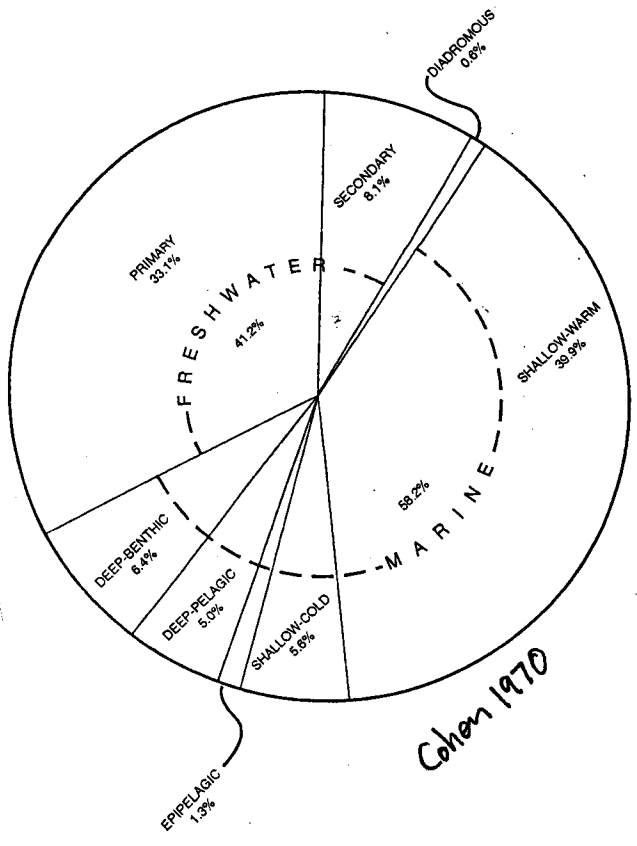
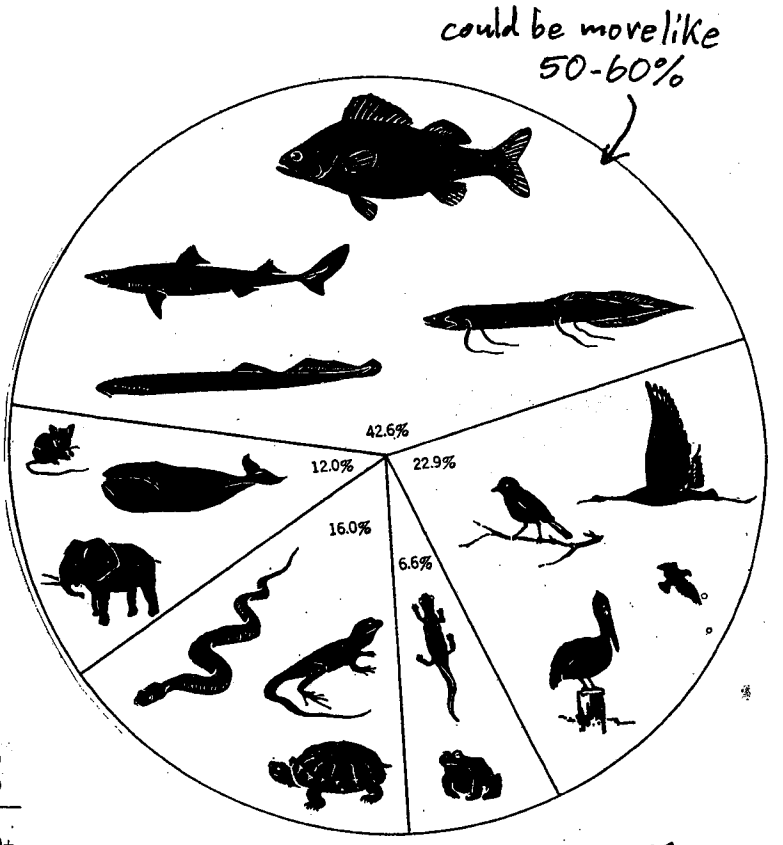
Primitive freshwater
 fishes
 0.2%

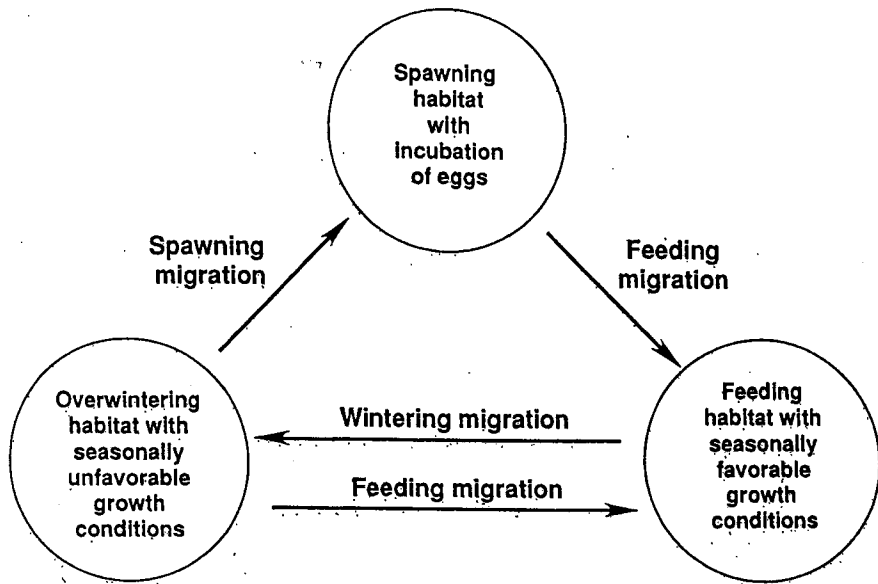


Fish diversity
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 nowadays

Order and Order ^d	Typical Freshwater Examples	Number Freshwater Species
Acipenseriformes	<i>Arapaima, Arawana</i> , mooneyes, knifefishes, mormyrids	217
Cypriniformes	Ladyfishes, tarpons	7
Gobiiformes	Freshwater eels (in part)	26
Clupeiformes	Shads, herrings	80
Mormyridiformes	Milkfish, Kneriidae	29
Cyprinodontiformes	Minnnows, suckers, loaches	2,662
Characiformes	Characins, pike-characids, hatchet-fishes	1,343
Catfishiformes	Catfishes (of 34 families)	2,287
Eleotridiformes	Knifefishes, weakly electric fishes	62
Eelacanthiformes	Pikes, pickerels, mudminnows	10
Salmoniformes	Freshwater smelts, galaxiids, lepidogalaxiids	71
Salmoniformes	Trouts, salmon, whitefish, charrs, graylings	66
Salmoniformes	Troutperch, pirateperch, cavefish	9
Salmoniformes	Burbot	2
Salmoniformes	Mullet	7
Salmoniformes	Medakas, ricefishes, needlefishes, halfbeaks	56
Salmoniformes	Rivulines, killifish, topminnows, poeciliids, goodeids, pupfishes	805
Salmoniformes	Sticklebacks, pipefishes	41
Salmoniformes	Swamp eels, spiny eels	87
Salmoniformes	Sculpins, Baikal oilfishes	62
Salmoniformes	Temperate bass, sunfish, black bass, darters, luciopercinids, perch, drums, cichlids, gobies, anabantoids, many others	2,185
Salmoniformes	Soles, some flounders	20
Salmoniformes	Some puffers	20
Total freshwater fish species		10,000+

Note: Several orders with only a few species that wander into freshwater have been omitted.
 Order number follows the assignment by Nelson (1994).
 Source: Modified from Nelson (1994).





Conceptual model or framework ↗

Mathematical models ↗

