SUPERCLASS PISCES (Ch. 27)

1. INTRODUCTION

4 classes - the oldest vertebrates

ecology - dominant marine vertebrates
- also freshwater & estuarine

evolution - not in decline
- from tunicates (free-swimming larva)
- ostracoderm (500 mybp, jawless fish)
- placoderm (400 mybp, jawed fish)

2. CLASSES

1. Agnatha - jawless fishes, two classes with 70 species
   - cartilaginous skeleton, no paired fins
   - hagfish (marine predators)
   - lampreys (exoparasites on blood)

2. Chondrichthyes - 'cartilaginous' fishes, 800 species
   - marine, 2 pairs of fins (pectoral & pelvic)
   - sharks (body fusiform)
   - rays (flat, plated teeth, tail spine)
   - skates (flat, sharp teeth)
   - ratfish (aberrant, dorsal spine)

3. Osteichthyes - bony fishes, marine & freshwater
   - 30k species, most diverse & abundant class
   - coelacanth - pair of lungs, muscular fins
     - led to evolution of amphibians
   - lungfish - single lung, fleshy fins
   - ray-finned fishes - all other fishes
     - swim bladder, membranous fins

3. INTEGUMENT

scales - dermal, covered by epidermis in bony
- never molted, exhibit growth rings
- absent in jawless

mucous glands - to reduce friction

4. ENDOSKELETON

jawless - cartilage (light & flexible)
    - indistinct skull, notochord retained

cart - cartilage reinforced with calcium

bony - true bone ($CaCO_3$ or $CaPO_4$)
    - many bones (esp. jaw, ribs, vertebrae)
    - fin rays support membrane in fins

5. LOCOMOTION

swimming - most efficient mode of locomotion
    - undulates laterally (to push against water)

jawless - no paired fins (medial fin only)

cart - sink or swim, store oil for buoyancy
    - heterocercal tail (dorsal lobe larger)

bony - homocercal tail (lobes equal)
    - swim bladder (gas-filled, evolved into lung)

6. NUTRITION

jawless - suffocate prey with mucus
    - suck blood or tissue (esp. ill)

cart - teeth enameled & replaced in rows
    - spiral valve increases surface of intestine

bony - some electrical to stun prey

7. NERVOUS SYSTEM

jawless - photophores or 1 pair of eyes

cart - sensory crypts (olfaction in skin)
    - ampullae of Lorenzini (pits detect electricity)

bony - lateral line (senses pressure & salinity)

8. RESPIRATION

internal gills - evaginated exchange membrane

jawless - pump water in & out of 7 pairs gill pouches

cart - water enters mouth & pair of spiracles,
exits 5-7 pairs of gill slits

bony - water enters mouth, passes thru 4-5 pairs gills,
exits operculum

9. REPRODUCTION

jawless - monecious (use only 1 set of gonads)
- external fertilization, oviparous

cart - dioecious, internal fert (claspers on pelvic fins)
- most ovoviviparous (retain eggs in body)
- some oviparous or viviparous

bony - dioecious, external fertilization, oviparous

migration - return to hatch site to spawn
- navigation uses chemicals or sun
- catadromy (lampreys return to sea)
- anadromy (salmons return to freshwater)

10. OTHER SYSTEMS

circulatory system
- closed (except open sinus in jawless)
- 2-chambered heart (single pathway)

excretion - pair of kidneys
- ammonia (toxic but dilute)

temperature regulation - ectothermic (match water temp)
- some ‘hot-blooded’ (higher core temp)