Synopsis of Phylum Mollusca (Molluscs)

Identifying Characteristics of Phylum:

-second largest phylum of animals in terms of number of *known* species
-**most versatile body** plan of all animals
-**triploblastic** with true coelom (**eucoelomate**); **protostome**
-**bilateral symmetry**; some with secondary assymetry
-soft, usually unsegmented body consisting of ***head***, ***foot*** and ***visceral mass***
-body usually enclosed by thin fleshy ***mantle***
-mantle usually secretes hard external ***shell***
-**complete digestive tract**, many with a ***radula***, a rasping or scraping feeding organ, **stomach, digestive glands, crystalline style, intestine**
-respiratory system of **gills** in aquatic forms or **"lung"-like chamber** in terrestrial forms
-most with **open circulatory system**; body cavity (coelom) a **haemocoel** while cephalopods have a **closed circulatory system**
-CNS is a ring of **ganglia** in head area with paired **nerves** and **ganglia** extending to other parts of the body
-usually 1 pair of **nephridia** (=metanephridia) often called kidneys (not really true kidneys)
-marine forms with characteristic ***trochophore*** larva; freshwater bivalves with ***glochidia*** larva

Class: Polyplacophora (Chitons)

-fairly sedentary; may move short distances to feed
-head and cephalic sensory organs reduced
-**shell** contains 8 overlapping plates on dorsal surface; can roll up like pill bugs/armadillo
-most feed using **radula** to scrape algae from surface
-mantle forms a **girdle** around margins of plates
-broad ventral **foot** attaches firmly to substrate
-gills suspended in mantle cavity along sides of thick
-flat muscular foot

Class: Scaphopoda (Tusk Shells or Tooth Shells)

-single tubular shell open at both ends
-mantle wraps around viscera and fuses to form tube
-feeds mainly on detritus and protozoa caught by **cilia** on foot or using **captacula**
-**radula** carries food to **gizzard** for crushing

Class: Bivalvia (Clams)

-shell is laterally compressed; 2 valves (right & left); consists of 3 layers; **periostracum, prismatic layer, nacreous layer**
-"bulging" part of shell on dorsal side near hinge = **umbo**
-shell held together dorsally by **hinge** and **adductor muscles** extending between shells
-shell is secreted by **mantle;** their mantle can also produce "**pearls**"
-posterior portions of mantle come together to form **incurrent and excurrent siphons**
-**most** bivalves are **filter feeders: gills** are used to filter food out of water
-in stomach, food is sorted; a gelatinous rod (= **crystalline style**) spins slowly (by cilia) & dissolves to release digestive enzymes
-3 chambered **heart** wraps around intestine in **pericardial cavity** on dorsal side of body
-freshwater bivalves have **internal fertilization**; gills become brood chambers; produce bivalved **glochidia larvae**

Class: Gastropoda (Snails)

-means "belly foot"
-largest and most successful class of molluscs
-unlike clams, snails and slugs have a distinct **head** with brain, sense organs (ocelli, tentacles, chemoreceptors) and mouth
-mouth with **radula**
-elongated body with **foot** below for gliding
-**mantle** secretes a single **shell,** often with **operculum,** and forms dorsal surface of animal
-most shells show some degree of **coiling**; in addition to coiling, some animals also show **tortion**
- most gastropods are **herbivores**; use **radula** to scrap algae off of hard surfaces
-simple **gills** are variously modified in aquatic forms
-terrestrial snails have mantle cavity that serves as a "**lung**" with **pneumostome**
-many gastropods perform elaborate **courtship ceremonies**

Class: Cephalopoda (Octopi and Squid)

-means "head foot"
-most fossil forms had very large heavy shells kept buoyant by gas filled inner chambers; only a few today with large external shell; some have **internal shell** completely enclosed by mantle; some have completely lost shell and mantle encloses and protects animal
-in most cephalopods the **mantle** serves as the animals outer covering
-the surface of the mantle is covered by pigment cells called **chromatophores**
-the "head-foot" is elongated into 8 or 10 **tentacles** (up to 90 in nautilus) and 2 longer **arms**
-mouth at center of arms; contains chitinous **beak** or **jaws**
-all cephalopods are **predators**; use tentacles and arms to capture and handle prey
-**closed circulatory system**→ more efficient for gas exchange and transport
-largest **brain** of any invertebrate, generally considered the cleverest of all invertebrates and rival mammals in some ways
-most cephalopods have an **ink sac** for protection
-during mating, before copulation, males often make color displays to compete against rival males
-sperm encased in packets = **spermatophores**

Ecological Impacts of Molluscs

1. important in **food webs** in aquatic ecosystems and even in terrestrial ecosystems
2. snails are major source of calcium for birds
3. oysters are **keystone species** since they tend to form reefs nearshore
4. freshwater bivalves are now the most threatened group of invertebrates in the US
5. Bioinvasives

Human Impacts of Molluscs

1. tusk shells used as money (=wampum) by native Americans
2. as food: oysters, scallops, mussels, octopus, squid
3. precious "stones"
4. ink → sepia dye
5. cuttlebone from cuttle fish
6. Pharmaceuticals
7. shell collecting
8. pollution control
9. destructive species