

# Chapter 10: Crustaceans

Lobsters, Crab and Shrimp

# Crustaceans

- Phylum: Arthropoda (“jointed feet”)
  - Invertebrate
  - Exoskeleton (made of chitin)
    - protects body and provides a place for muscles to attach to.
  - Segmented body
  - Jointed appendages

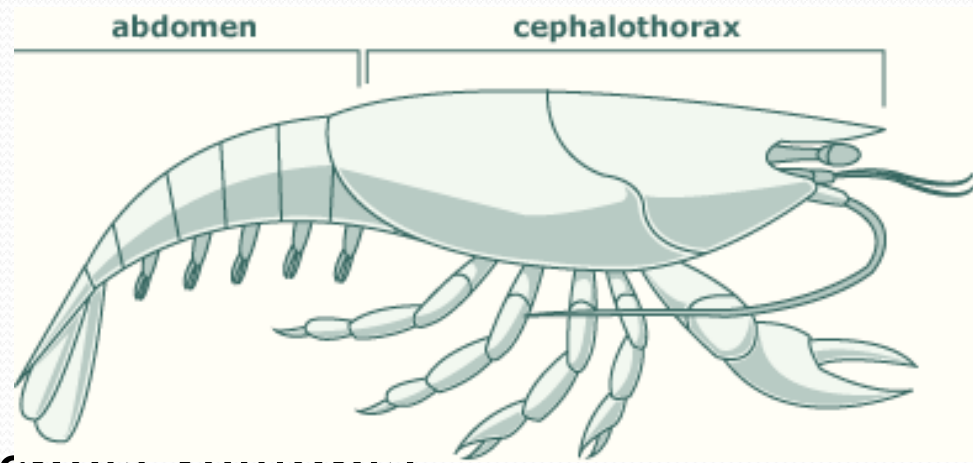
# Crustaceans

- Sub-phylum: Crustacea

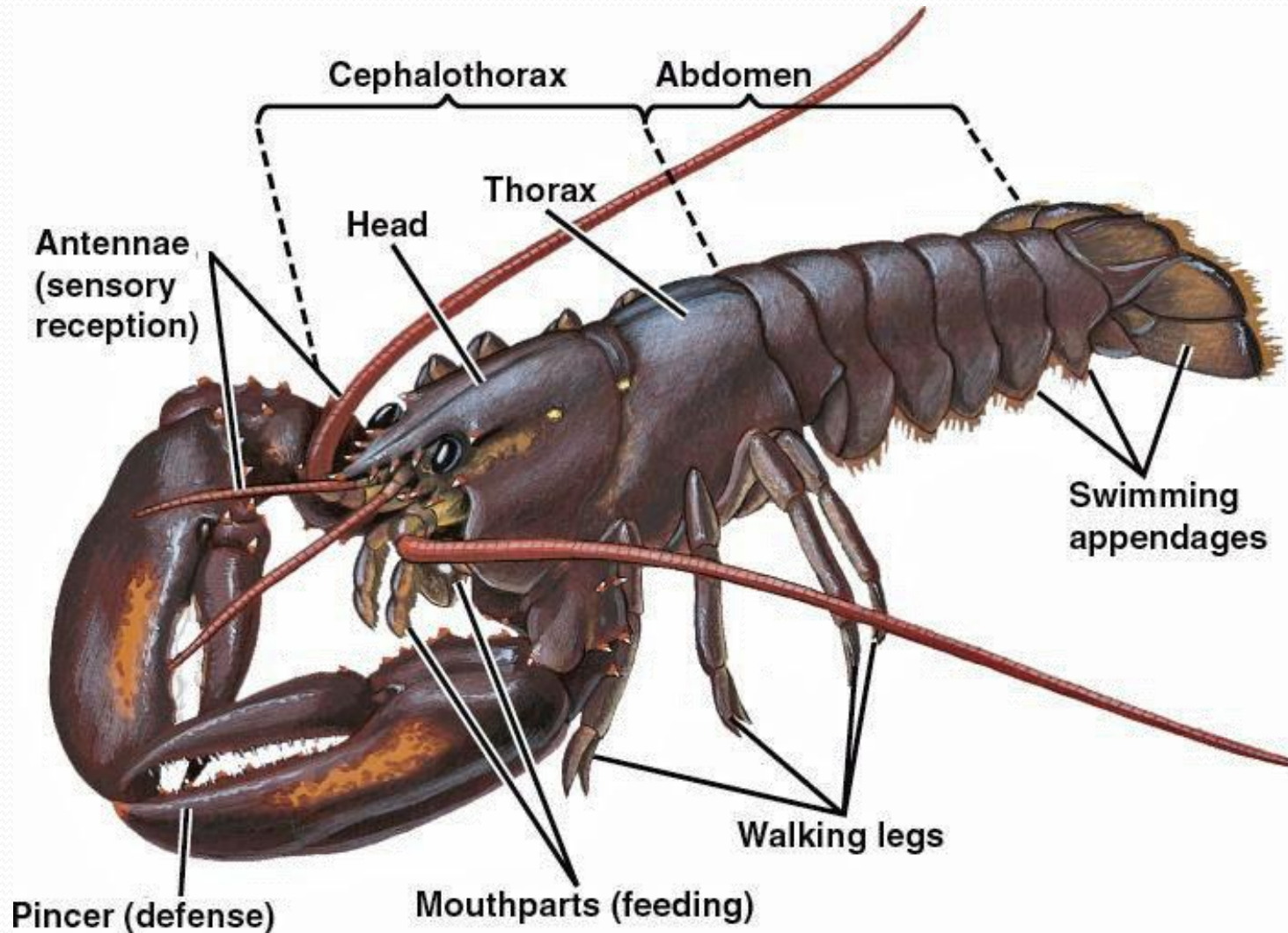
- ~30,000 species
- mostly marine, some freshwater.
- 2 pairs of antennae
- a pair of compound eyes (usually on stalks)
- a pair of appendages on each body segment (crustacean bodies usually are made up of head, thorax, and abdomen)

# Crustaceans - morphology

- Hard outer covering.
- Bilateral symmetry.
- 2 main body segments:
  - Cephalothorax (head and chest regions)
  - Abdomen (including tail)
- Carapace: covers head and chest regions



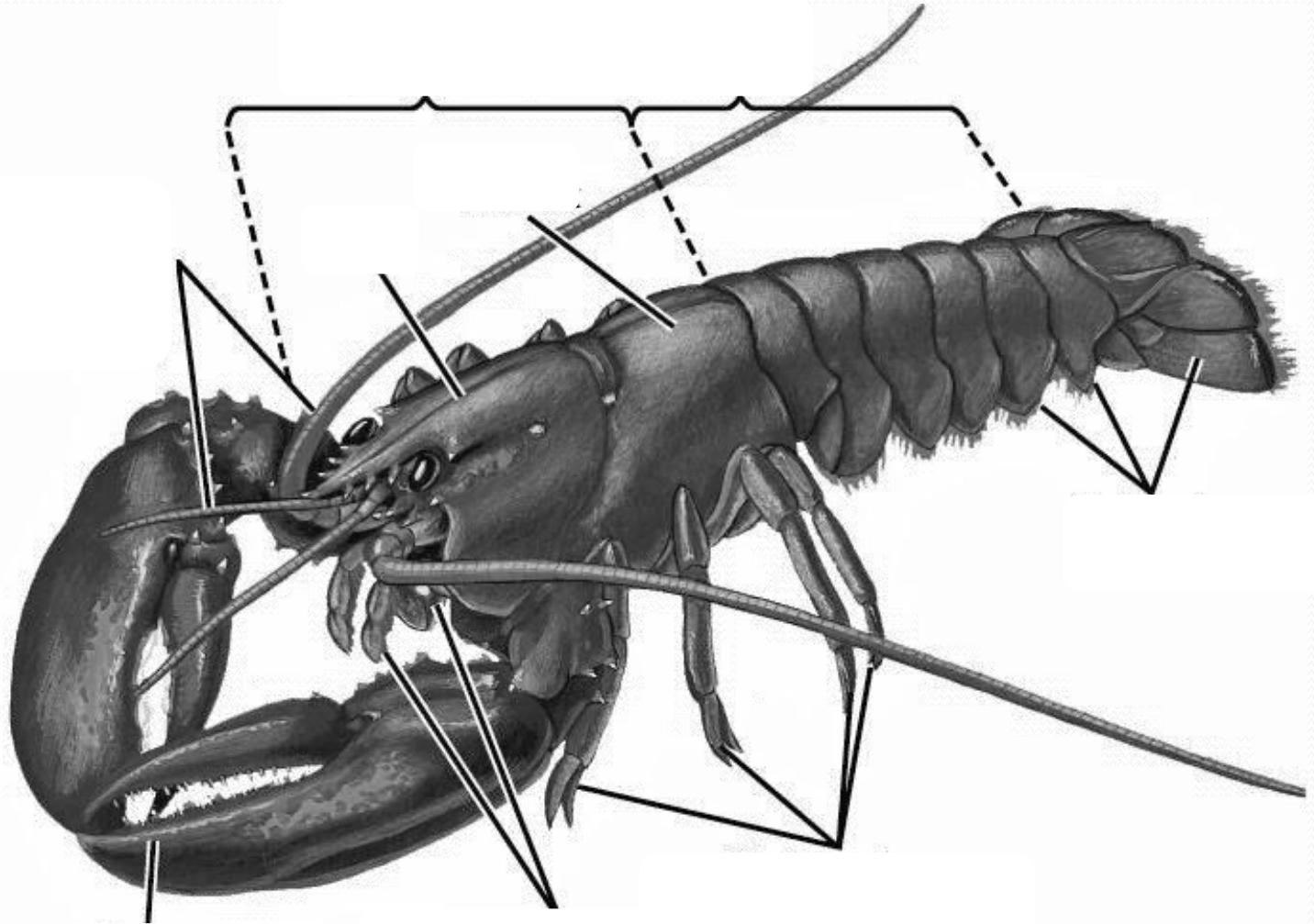
# Lobster External Anatomy



# Lobster External Anatomy

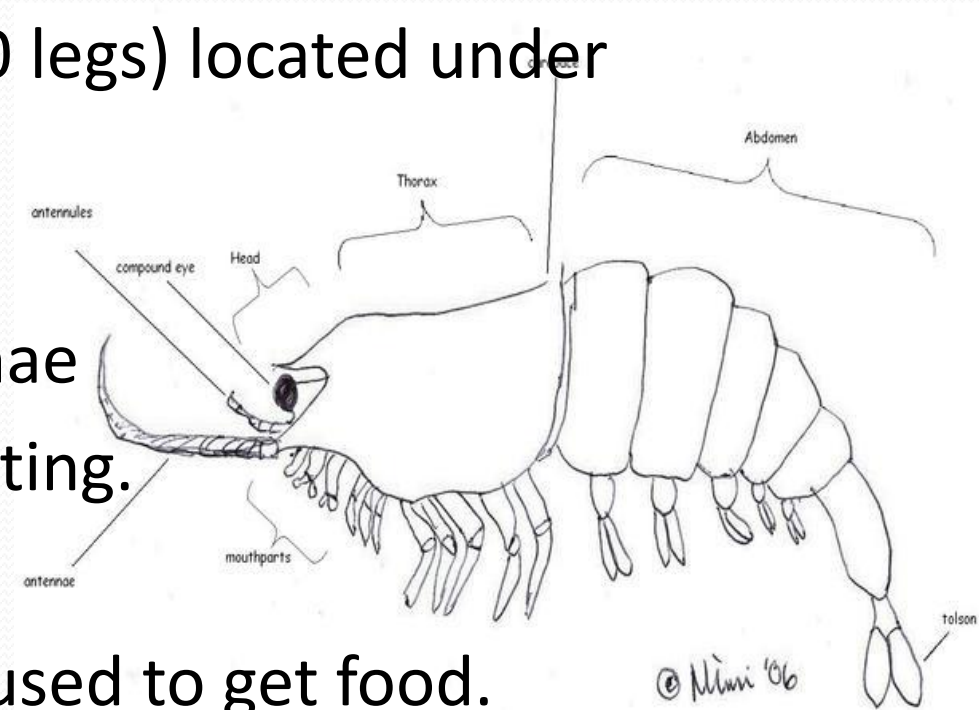
Label the lobster:

- Head
- Thorax
- Cephalothorax
- Abdomen
- Swimmerets
- Antennae
- Walking legs
- Mouthparts
- Claws (pincers)



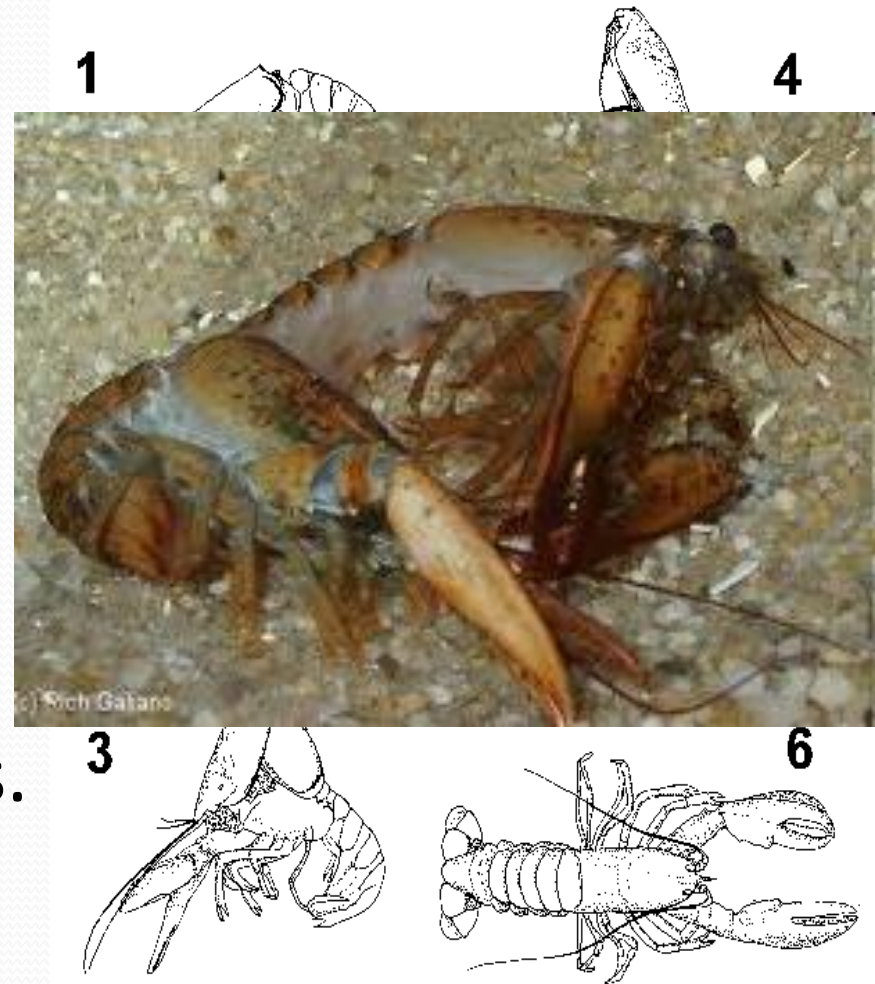
# Crustaceans - morphology

- Decapods: **5 pairs** of legs (10 legs) located under carapace.
- Head:
  - 2 eyes & two pairs antennae
  - Special mouthparts for eating.
- Thorax:
  - Claws (first pair of legs) - used to get food.
  - Four remaining pairs of legs - used for walking.
- Swimmerets: paddle-like appendages, used to **glide along the sea bottom**.



# Crustaceans - growth

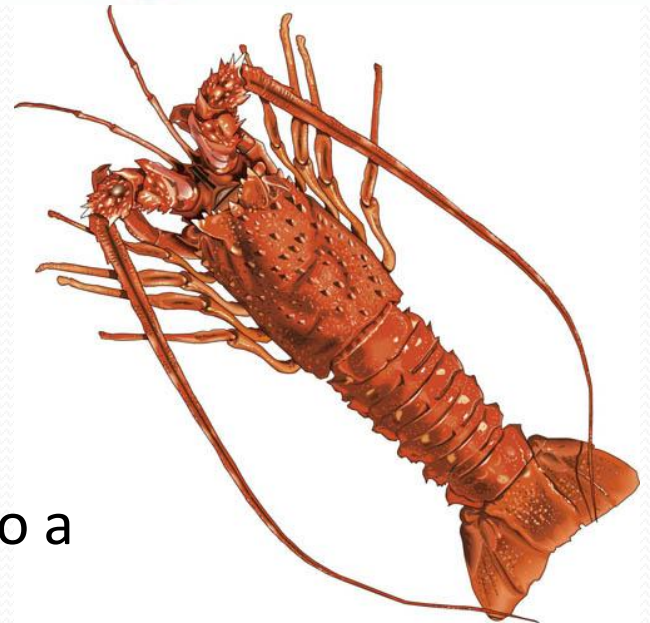
- Exoskeleton gets **shed at least once a year (molting)** as crustacean grows.
- **New exoskeleton is secreted** inside the old one; old one splits and is shed
  - is soft and slowly hardens.





# Lobsters

- 2 common lobster species:
  1. **Northern lobster** (*Homarus americanus*)
    - also called Maine Lobster
    - 2 large claws
    - rocky, subtidal zone from Labrador to Virginia
  2. **Spiny lobster** (*Panulirus argus*)
    - also called Rock Lobster
    - no large claws
    - Florida, Gulf of Mexico, California (also a European species)



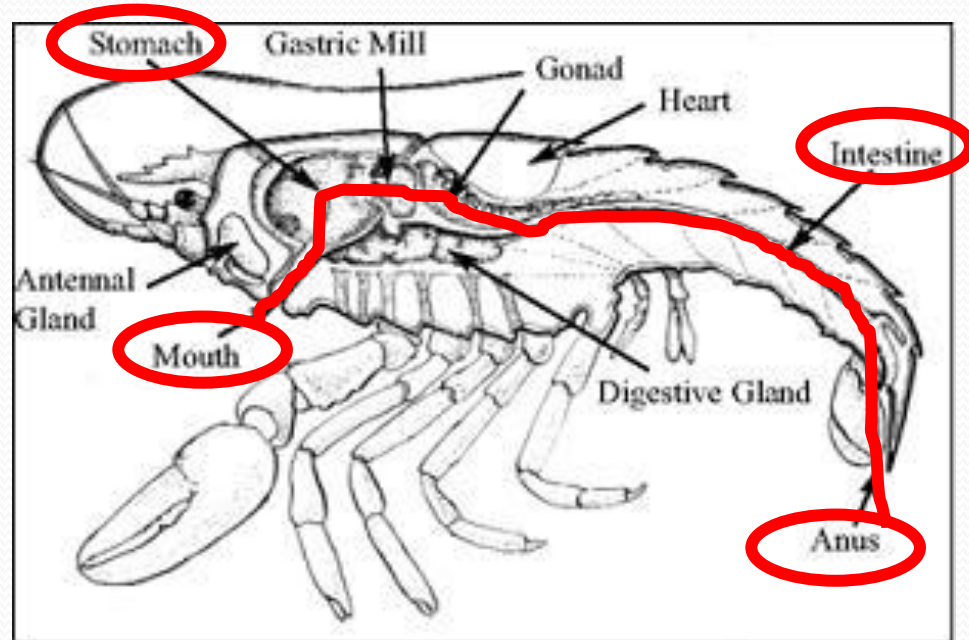
# Lobsters

- Aggressive animals
  - Arm can be released from its socket to escape from a fight.
  - Sacrificing a body limb = adaptation for survival
  - Arm will grow back (regeneration of appendages)



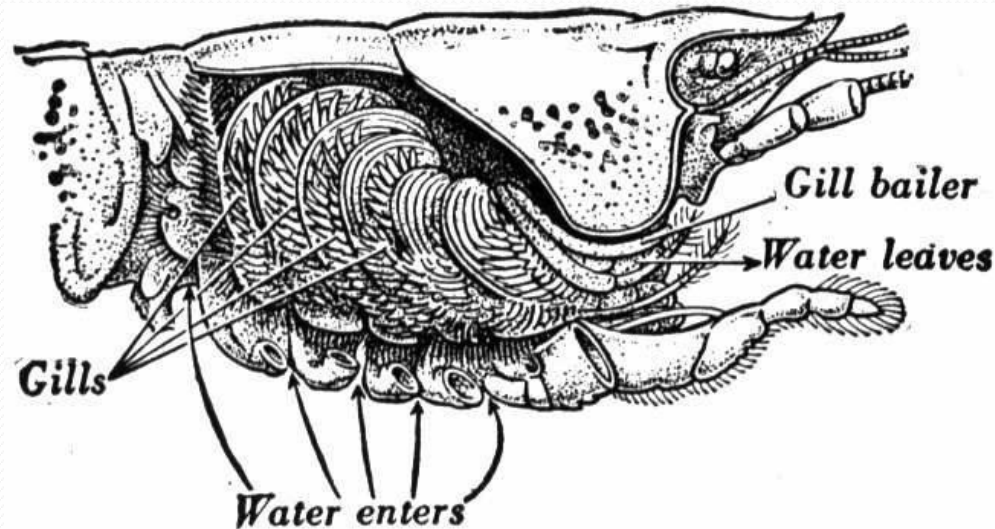
# Lobsters: life activities

- Feeding:
  - Predatory (feed on other invertebrates)
  - Scavengers, too.
  - One-way digestive tract (mouth, esophagus, stomach, intestines, and anus)



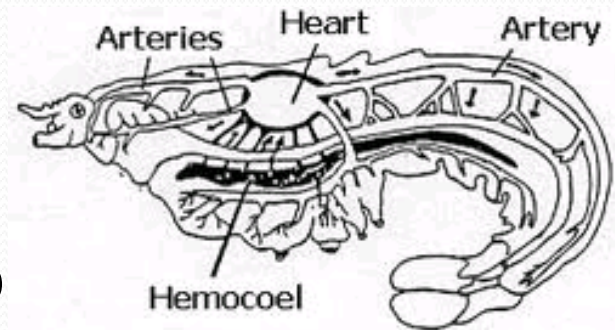
# Lobsters: life activities

- Respiration (breathing):
  - Gills: feathery structures in a water-filled chamber in the carapace.
  - Each gill is attached to a walking leg (movement of legs sends water over the gills)



# Lobsters: life activities

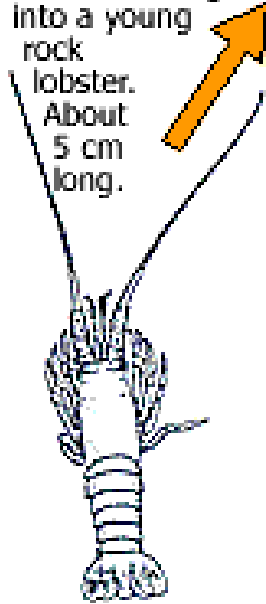
- Circulation:
  - Blood is pumped through the body of the lobster by a one-chambered heart.
  - Blue blood because of the pigment **hemocyanin** (contains copper) which binds to oxygen.
  - **No capillaries** to connect arteries & veins – blood is pumped directly into tissue (open circulatory system)



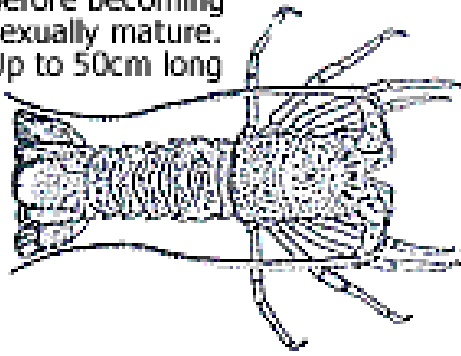
# Lobs

- Reprod
- Sexual
- Interna  
develop
- Male d  
female a  
stored in
- Female  
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before t

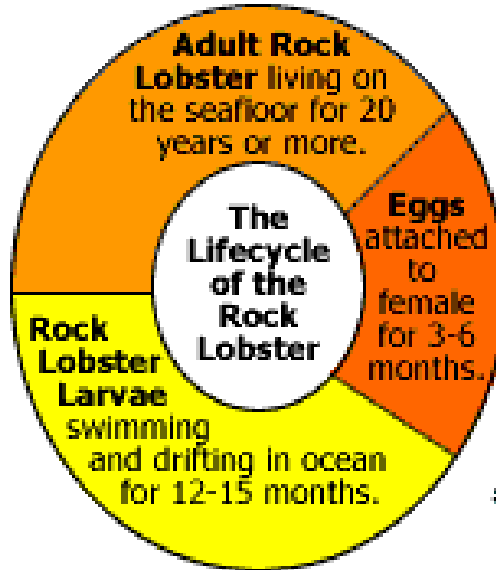
**Perulus Larvae** spends most of it's time swimming in the ocean before settling onto rocky sea floor and turning into a young rock lobster. About 5 cm long.



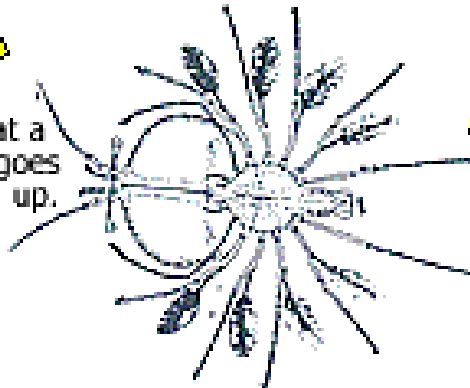
**Adult Rock Lobsters** grow for 7 to 10 years before becoming sexually mature. Up to 50cm long



**Eggs** Up to 1,000,000 eggs develop on the tail of each female rock lobster before being released into



The last of 11 different stages that a larval rock lobster goes through in growing up. About 4cm long



Early larval stage of rock lobster. About 2mm across

# Crustaceans – mini group project

- You will be researching an assigned crustacean species.
- Working in pairs/threes (2-3 ppl; you can group yourselves); use textbook and computers around the room (no phones!)
- Gather basic information on your species and present it.
- Information **MUST** include:
  - Name & scientific name of crustacean
  - Diagram of crustacean and description of main characteristics (where it is **found**, how it **looks**, how it **moves**, how it **feeds**)

**Your group will come up to the front and present the information – everyone will be responsible for copying the information into their notes!!!**

# Crustaceans – mini group project

8 groups TOTAL:

1. Mole crab (p241)
2. Fiddler crab (p240-241)
3. Hermit crab (p241)
4. Spider crab (p241)
5. Pink Gulf shrimp (p243)
6. Mantis shrimp (p244)
7. Copepod (p244)
8. Barnacle (p247,249)

**Your group will come up to the front and present the information – everyone will be responsible for copying the information into their notes!!!**

**PRESENTATIONS WILL BE**  
**NEXT CLASS!!!**



# Crabs

- VERY diverse group.
- Crab species are well adapted to many different environments.
  - Live on land and in the sea.
  - Found in shallow and very deep waters.

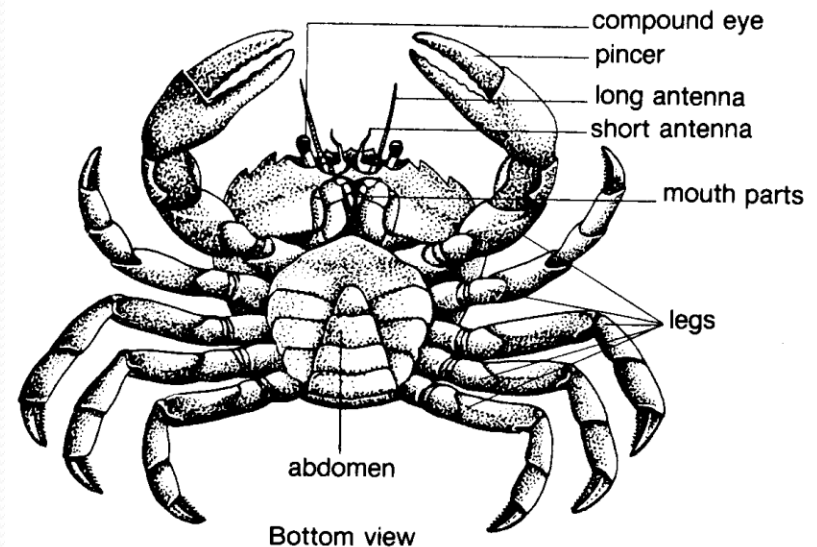
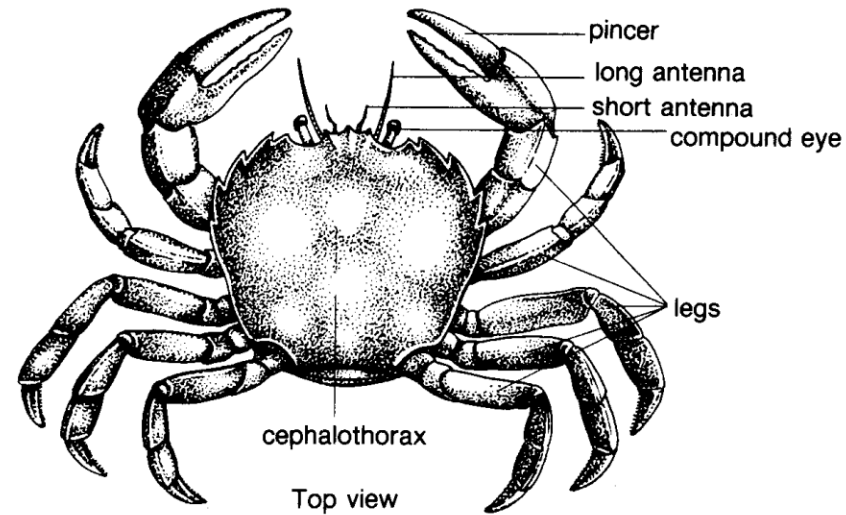
# Crabs: structures

- Body is divided into 2 main segments:
  1. cephalothorax
  2. abdomen.
- Females have a “U” shaped abdomen; males have a “V” shaped abdomen.
- 2 claws; 6 walking legs; 2 swimming legs.



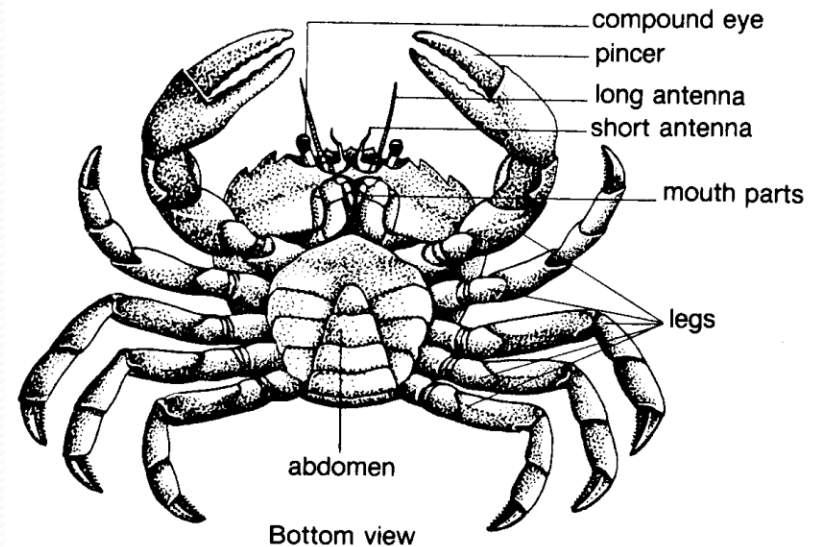
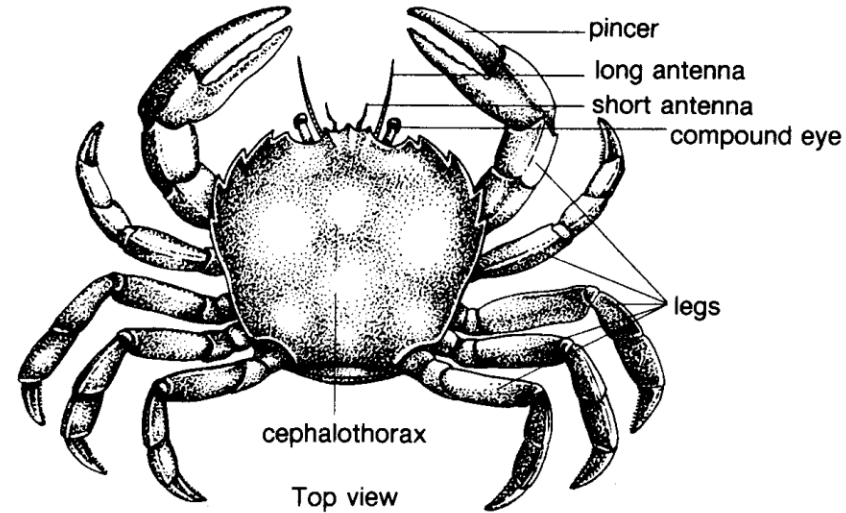
# Crabs: structures

- Breathe using gills
- Nutrients and oxygen are transported using an open circulatory system (directly into tissue).
- 2 eyes on stalks
- Antennae for sensory and well-developed nervous system (respond well to stimuli and control muscles)



# Crabs: feeding

- Mainly eat dead plant and animal matter (detritivores)
- Some are predatory
- Claws tear and shred, pass food to mouth
- Mouthparts cut food up
- One-way digestive tract (mouth, esophagus, stomach, intestines, anus)



# Crabs: reproduction

- Internal fertilization, external development.
- Females carry an egg mass between the abdomen and thorax.
- Crabs produce many eggs; a lot are eaten while part of the plankton population.



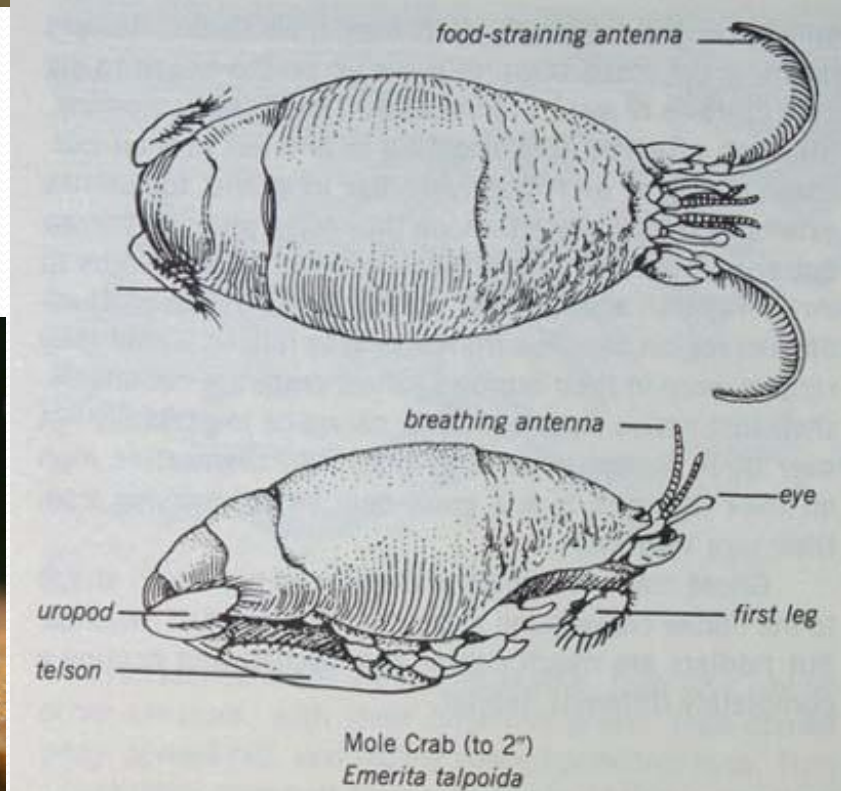
# Fiddler Crab

- Found in bays/inlets
- Dig holes, which they hide in during high tide.
- The males have one large claw, which looks like a fiddle.



# Mole Crab

- Found in the surf zone.
- Has a smooth/streamline body which allows it to move through swirling sand and water.
- They capture small food with their feathery antennae.



# Hermit Crab

- They have a soft abdomen, with no exoskeleton.
- They scavenge for food in shallow coastal waters.
- They live inside of empty snail shells, and have to find new shells as they grow in size.





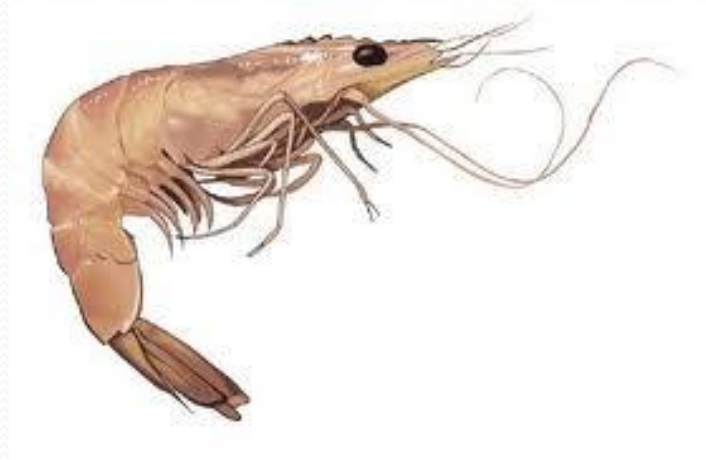
# Spider Crab

- They have eight long legs for crawling.
- Because they walk slowly, algae and barnacles have time to attach and grow on their backs.



# Shrimp

- The shrimp looks like a smaller version of the lobster.
- The pink Gulf shrimp can be 17cm long and is caught for the seafood industry.



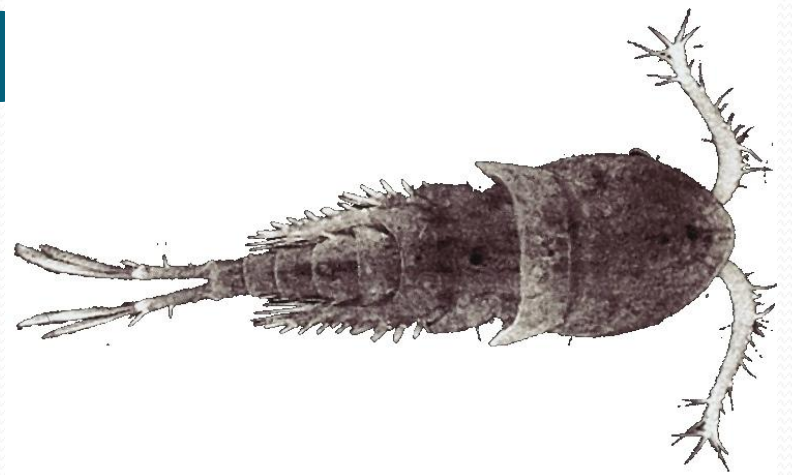
# The Shrimp

- The common shore shrimp lives in salt marshes and scavenges on dead plant material.
- The cleaning shrimp lives in coral reefs and eats parasites which are found on the skin of reef fish.
- The mantis shrimp is 25cm in length. They burrow themselves in the sand and prey upon worms and small fish.



# Copepods and Krill

- The copepod is  $\frac{1}{2}$  a cm long and mainly eats diatoms. They reproduce sexually, the developing larvae undergo numerous molts before maturity.
- Krill has more than ten legs, it is planktonic and mostly eats diatoms.



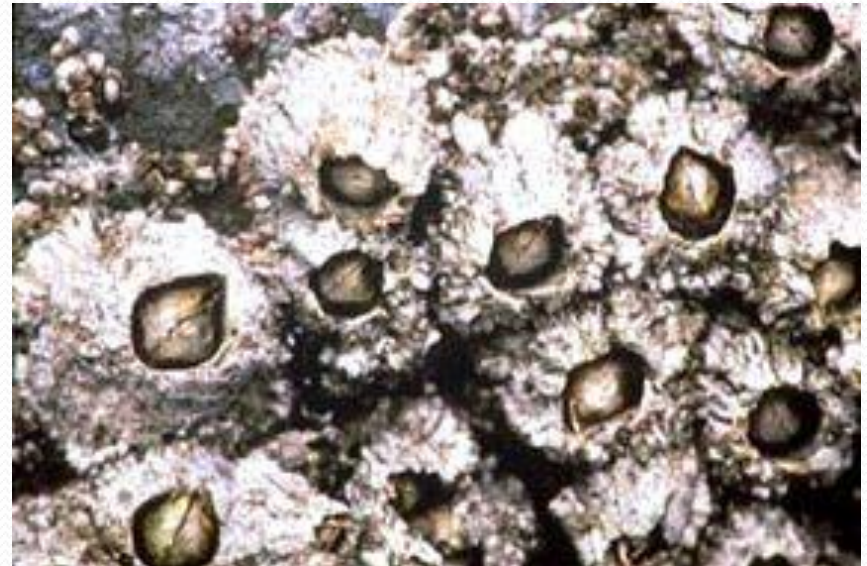
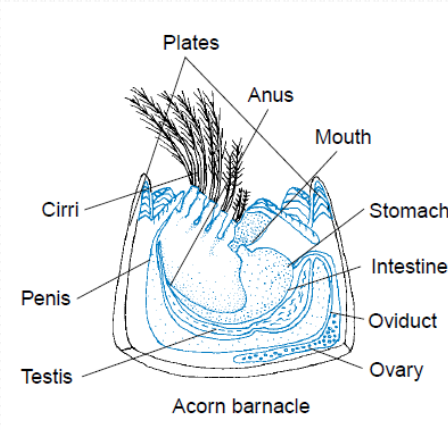
# Amphipods and Isopods

- Live attached to substrates (floating seaweed).
- **Amphipods**, like the scud and the beach flea look like tiny shrimps with flattened sides.
- **Isopods**, like the sea roach have flattened bodies and seven pairs of legs.



# Barnacles

- Found in the upper intertidal zone
- Covered with calcium carbonate plates
- Glue themselves onto substrates (ranging from rocks to boats to whales).



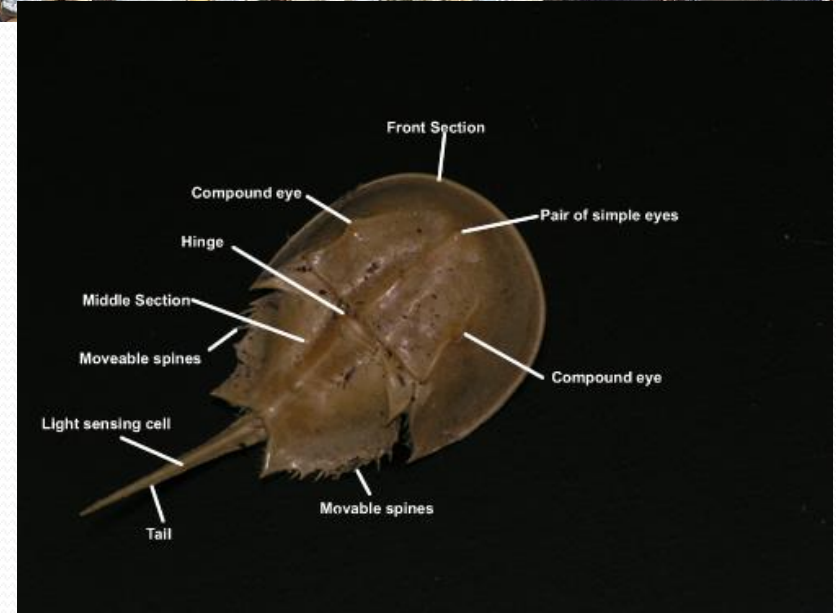
# Barnacles: feeding

- When submerged by tide (underwater), 6 pairs of feathery appendages (cirri) extend out to capture small food particles.



# Horseshoe Crab

- Different from a crab:
  - No antennae or mouthparts.
  - 6 pairs of legs.
  - Class **Merostomata** (*not Crustacea*)
  - 4 eyes: 2 simple eyes and 2 compound eyes.





# Horseshoe Crab

- The body and legs are covered by a domed carapace and a long spiny tail (telson).
- Telson is used for locomotion (movement).
- Book gills located behind the legs.



# Horseshoe crab

- Molt many times before they reach sexual maturity at age 8.
- Can live as long as 20 years
- Have not changed much in 400 million year history on the planet.



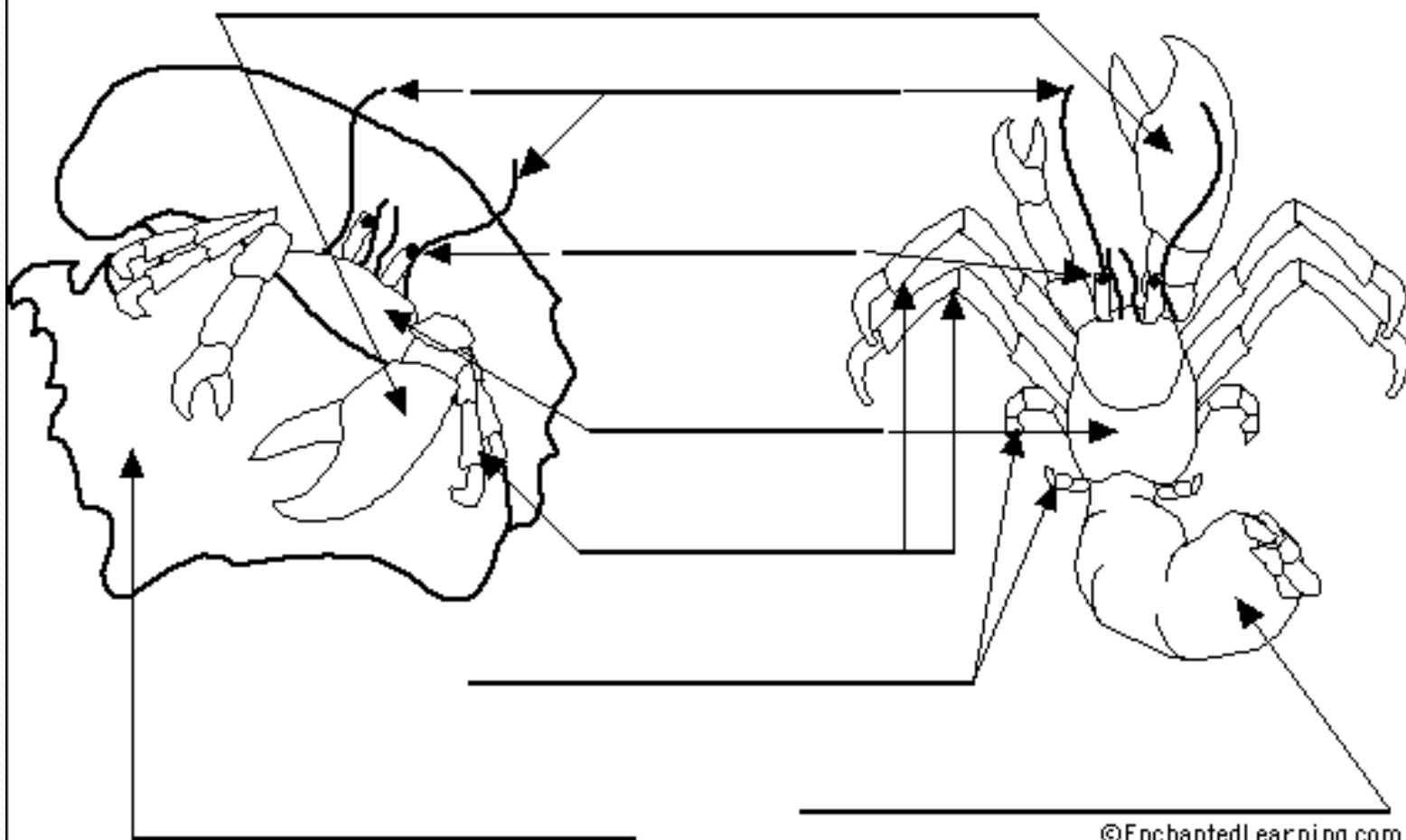
# Marine Insects

- Found in estuaries; salt marsh, mud flats.
- They have a chitinous exoskeleton, 3 pairs of legs, and 3 body segments (head, thorax, abdomen)
- Examples include the marsh mosquito, the greenhead fly, and the sand fly.



Hermit Crab in the Shell

Hermit Crab out of the Shell



# Climate Change and The American Lobster

- The American Lobster is found from off the coasts of North Carolina, to the Labrador province in Canada.
- They are abundant in rocky coastal regions where there is cooler water and shelter is available.

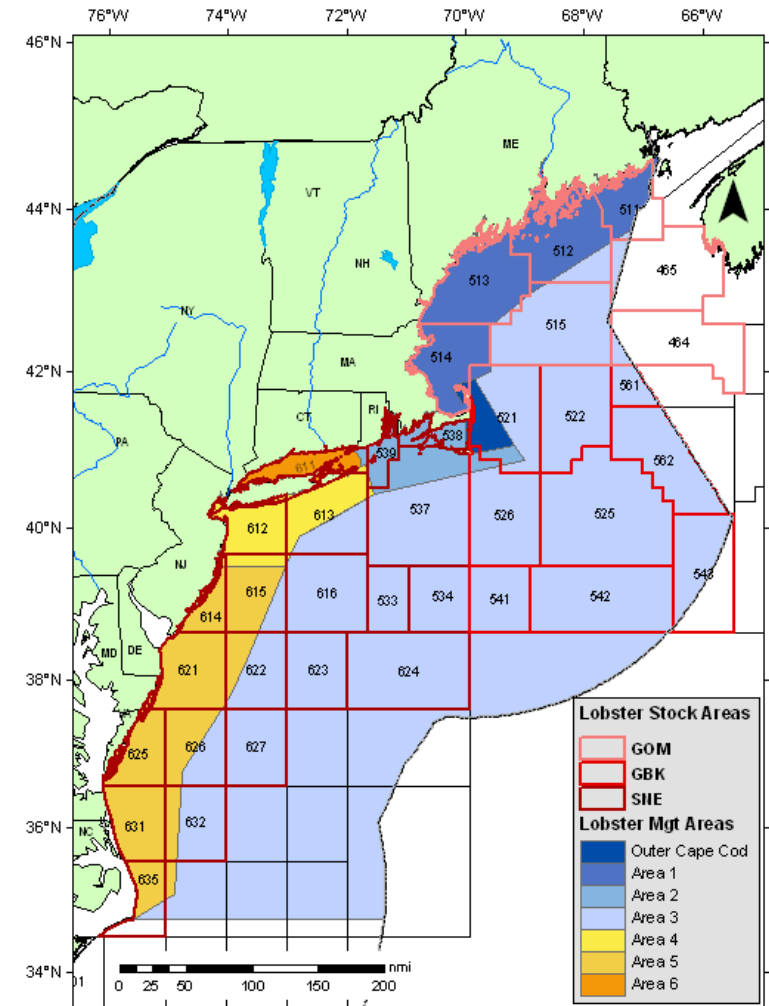
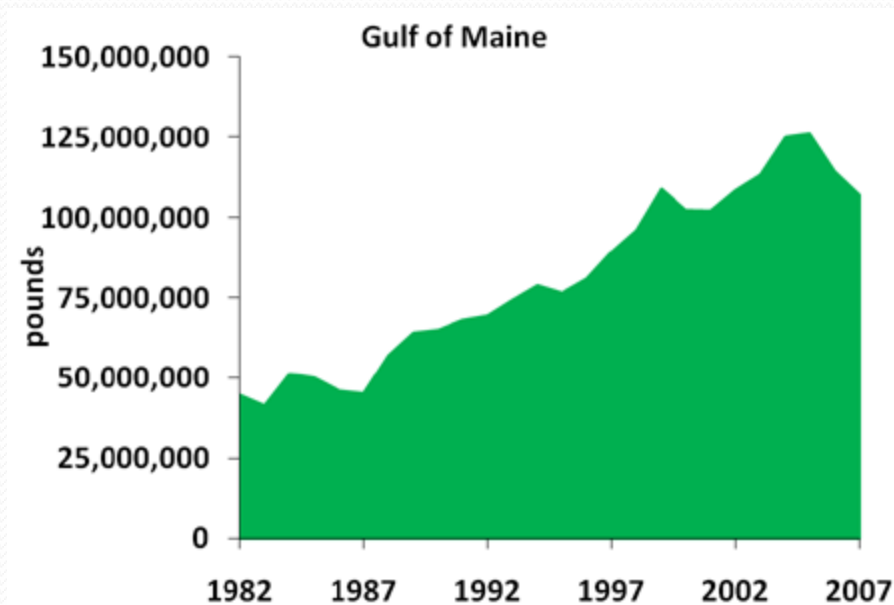


Figure 32.1. Statistical Areas used to define American Lobster Gulf of Maine, Georges Bank and Southern New England Stocks and Regions defining 7 ASMFC Management Areas.

# Geographic Range

- The American Lobster grows best within a temperature range of 36 to 68 degrees Fahrenheit. Since the late 90's an increase in Ocean temperature has caused American Lobster populations to migrate north to colder environments.



# How are warmer conditions harmful?

- As Carbon dioxide levels in the ocean rise, the ocean becomes more acidic. This higher acidity makes it harder for the lobster to get the calcium they need to grow their hard outer shell.
- Warmer temperatures increase a lobsters stress levels and make them more vulnerable to shell disease. Bacteria will settle on the lobsters shell and eat it.

