Name: _____ Date: 20 May 2013

BIOLOGY 2: THE DIVERSITY OF LIFE
QUESTIONS ON "THE REPEATER" BY OLIVIA JUDSON

1) Summarize the freshwater and marine habitat for sticklebacks.

Habitat is the place an organism lives
Marine habitat has normal levels of calcium stickleback predators are fish
Freshwater habitats have low levels of calcium and predators are insect larvae

2) Provide three examples of how species evolve in similar ways when the habitat is similar. (e.g. What characteristics do organisms that live in caves share?)

a. Animals that live in Caves – lose their pigment and eyesight
b. Birds that inhabit islands typically lose their ability to fly
c. Mammals that consume leaves cannot digest cellulose and have a gut fauna of bacteria that digests the plant material for them – cows, langurs, and a bird called the hoatzin
d. Males species with promiscuous females typically have large sperm counts and testes – examples are flies and chimpanzees

3) What are the examples of variation in sticklebacks? Is this variation related to the habitat that sticklebacks live in? What two genes are primarily responsible for variation in sticklebacks?

Body armor – gene is the *Ectodysplasin*:

a. Variation: fish can have a body that is completely armored with spines, to some armor, to very little body armor and reduced spines
   - The inheritance of this trait is similar to the heredity of pea traits studied by Gregor Mendal
   - **Selection pressure**: Predation
     - Marine:
       - **Fish predation** – body armor reduces predation risk – fish are more likely to spit out a fish if it has spines
     - Freshwater
       - **Insect predation** (dragonfly larvae) – body armor and spines can increase predation risk because spines can make it easier for the dragon fly to catch

Pelvis – gene is *Pitx1* – main gene responsible for pelvis reduction
- pelvis reduction is related to differential gene expression (i.e. the gene being switch on and off in certain parts of the body)

Selection Pressure: Abiotic and biotic – levels of calcium in the water and predation

Marine: Normal levels of calcium: Pitx1 gene is turned on in the pelvic region and the pelvis develops normally and spines are produced by the pelvis. Predators are fish, less likely to consume a fish if it has pelvic spines

Freshwater: Low levels of calcium: Pitx1 gene is usually turned off in freshwater sticklebacks and there is very reduce pelvic development and growth in these species – spiky pelvis trait does not increase the likelihood of growth, survival, or reproduction and it is **not advantageous** to have a well developed pelvis with spines

4) What factor would you propose is exerting the strongest selection pressure on the production or non-production of armor in sticklebacks in marine environments? In freshwater environments?

Predation:

a. Marine: **Fish predation**
b. Freshwater: **Lack of fish predation, but high incidence of dragonfly larvae predation**
    i. **Also different levels of calcium in marine and freshwater**