Module Four Review Guide

Interpreting Graphs

Practice interpreting and collecting data from each of the items listed below. Click on the blue and underlined text to view practice exercises and additional explanations.

- Types of graphs: **Brief explanation**
- Two-way frequency tables: **Online article and practice exercises**
- Line graphs: **Practice exercise 1** and **practice exercise 2**
- Bar graphs: **Video tutorial** and **practice exercise**
- Pie charts: **Practice exercise**
- Stacked bar graphs: **Practice exercise**
- Scatter plots: **Video tutorial**
- Dot plots: **Video tutorial** and **practice exercises**
- Stacked area charts: **Online article**

Lesson 04.01: Marine Biodiversity

1. What is an **adaptation**? (Lesson 04.01, page 1)

2. How does a favorable trait (adaptation) become present in a population? (Lesson 04.01, page 1)

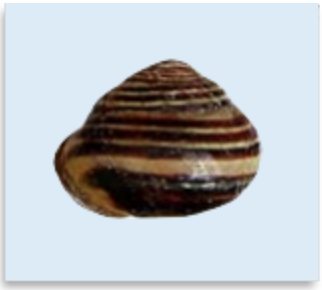
3. What is **natural selection**? (Lesson 04.01, page 1, and lesson 04.05, pages 1 and 3)

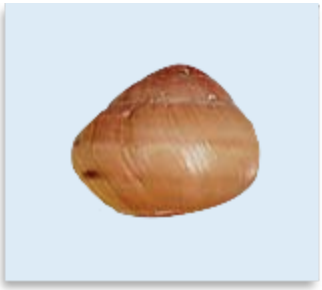
4. How does natural selection lead to evolution? (Lesson 04.01, page 4)

5. **Selective pressures** are factors in the environment that change the traits of a population. Examples of selective pressures include predation, pollutants, pathogens, etc. How do selective pressures influence the evolution of a species? (Lesson 04.01, page 2)

6. Today, many species of snails exist. Snails are distinguished, in part, by their shell characteristics. Recently, scientists have been studying two snail species: one with a striped shell and another with a solid colored shell (as seen in the pictures below). Striped snails make up 47 % of the snails documented by scientists. Currently, scientists have observed that birds, snails' major predator, eat snails with striped shells 56 % of the time. Answer questions A, B, C, and D, which are found below.

Snails with Two Shell Patterns





A. Which snail species seems to have a greater population size: striped or solid colored?

B. Have the numbers of solid colored snails decreased significantly due to bird predation? Explain your answer.

C. Do you infer that one type of shell pattern might be more advantageous? Why would one shell type be more efficient than the other? Explain your answers.

D. In 1,000 years, do you think both striped and solid colored snails will exist in nature, if birds continue to exist as their predators? Why or why not?

Lesson 04.02 Honors: Marine Biodiversity and Biotechnology (Only for Honors Students)

1. What is **biotechnology**? (Lesson 04.02 Honors, page 1)

2. How can marine organisms be used to improve human health? (Lesson 04.02 Honors, page 1)

3. How can marine microorganisms be used to clean oil spills? Mention **biodegradation** in your answer. (Lesson 04.02 Honors, page 1, and **online article**)

4. How has biotechnology been used in **aquaculture** to improve the quality of seafood? (Lesson 04.02 Honors, pages 1 and 3)

5. How could marine organisms be used to treat infectious diseases and antibiotic-resistant bacteria? (Lesson 04.02 Honors, page 2)

6. Explain the method used by scientists to extract chemicals from corals. (Lesson 04.02 Honors, page 2)

7. What is a **transgenic organism**? (Lesson 04.02 Honors, page 3)

8. Could genetically modified organisms threaten marine ecosystems? Why or why not? (Lesson 04.02 Honors, page 3)

Lesson 04.03: Ocean Health

1. Why are people notified when there is a **harmful algal bloom (HAB)** in their area? (Lesson 04.03, pages 1 and 2)

2. Define the following terms:
    a. **Abiotic Factor** (Lesson 04.03, page 2):
    b. **Biotic Factor** (Lesson 04.03, page 2):
    c. **Mutation** (Lesson 04.03, page 3):
    d. **Genetic Factor** (Lesson 04.03, page 3):
    e. **Pathogen** (Lesson 04.03, page 3):
    f. **Gene Expression** (Lesson 04.03, page 4):

g. **Phenotype** (Lesson 04.03, page 4):

h. **Anthropogenic** (Lesson 04.03, page 5):

i. **Biomagnification** (Lesson 04.03, page 5):

3. The concentration of methylmercury in the ocean has reached toxic levels, due to human activity. Why would apex predators, at the top of marine food webs, contain larger amounts of methylmercury in their bodies, when compared to organisms at lower trophic levels? (Lesson 04.03, page 5)

4. Briefly discuss the effects that **mutations** have upon the survival of a species. (Lesson 04.03, page 3)

5. What pathogens can be found at a beach? How can these pathogens affect human health? (Lesson 04.03, page 3)

6. How does the environment influence what **phenotypes** are expressed in an organism? (Lesson 04.03, page 4)

7. The health of a marine organism is influenced by factors within its environment. We can classify these **health factors** into 3 categories: **environmental**, **pathogenic**, and **genetic**. Each health factor has a different effect on marine populations and can impact human health, as well. Mention and describe one example of an environmental factor, pathogenic factor, and genetic factor. (Lesson 04.03, page 5)

    a. Example of an environmental factor (address **biomagnification** in your example):

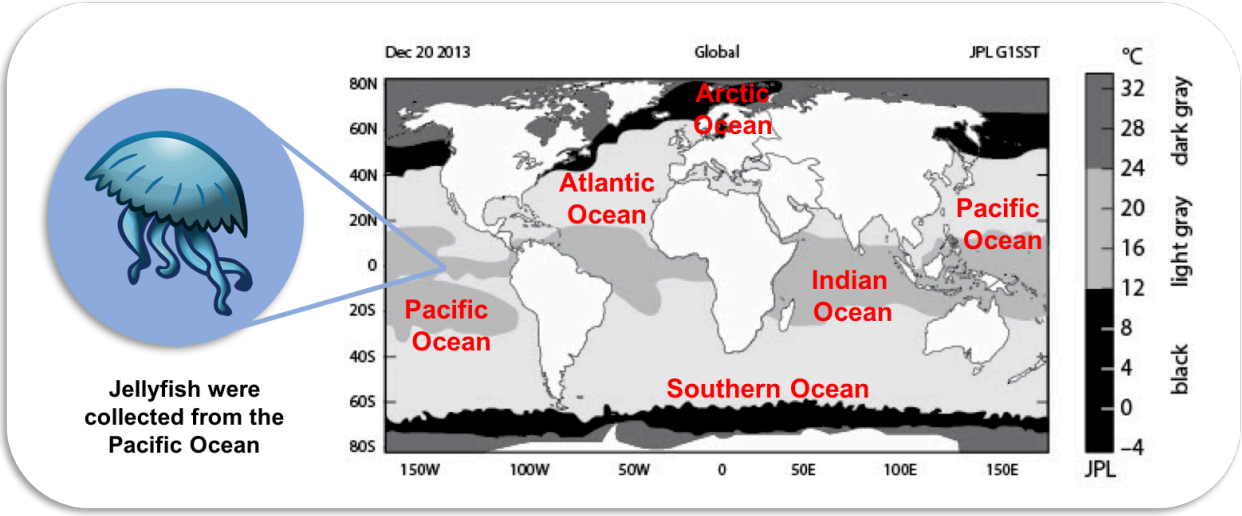
    b. Example of a pathogenic factor:

    c. Example of a genetic factor:

7. How is a toxin spread throughout a food web? (Lesson 04.03, page 5)

8. Researchers collected jellyfish from low, middle, and high latitudes in the Pacific Ocean. Each latitude corresponds to a specific temperature range, as seen in the map below. The specimens were placed in an aquarium, with a water temperature of 28 ^{o}C, for further investigation. Scientists noticed that 67% of the jellyfish died, after several days. Answer questions A and B, which are found below. (Lesson 04.03, pages 2 and 3)

Temperature Ranges (ºC) of Ocean Waters



A. Why do you think so many jellyfish died? Explain your answer using your knowledge of adaptations.

B. What temperature range did the surviving jellyfish most likely favor? Use the map to explain your answer.

Lesson 04.04: Marine Populations

1. How can **harmful algal blooms (HABs)** affect the health of marine organisms? (Lesson 04.04, page 2)

2. A harmful algal bloom has occurred along a shoreline where sea lions hunt for fish. If sea lions become sick due to the toxic algae, how would the density of fish in this area be affected? (Lesson 04.04, page 5)

3. What is a population's **carrying capacity**? (Lesson 04.04, page 2)

4. What factors affect a population's carrying capacity? (Lesson 04.04, page 2)

5. In a coral reef ecosystem, would clownfish or dolphins have a higher carrying capacity? Explain your answer. (Lesson 04.04, page 2)

6. The following factors affect the size of a population. Define each term. (Lesson 04.04, page 3)

    a. **Distribution**:

    b. **Composition**:

    c. **Dynamics**:

    d. **Migration**:

7. Generally, populations grow in size following one of two patterns: **r-selection** or **K-selection**. Describe these growth patterns, and provide examples of r-selected and K-selected species. (Lesson 04.04, page 3)

    a. **r-selection**:

    b. **K-selection**:

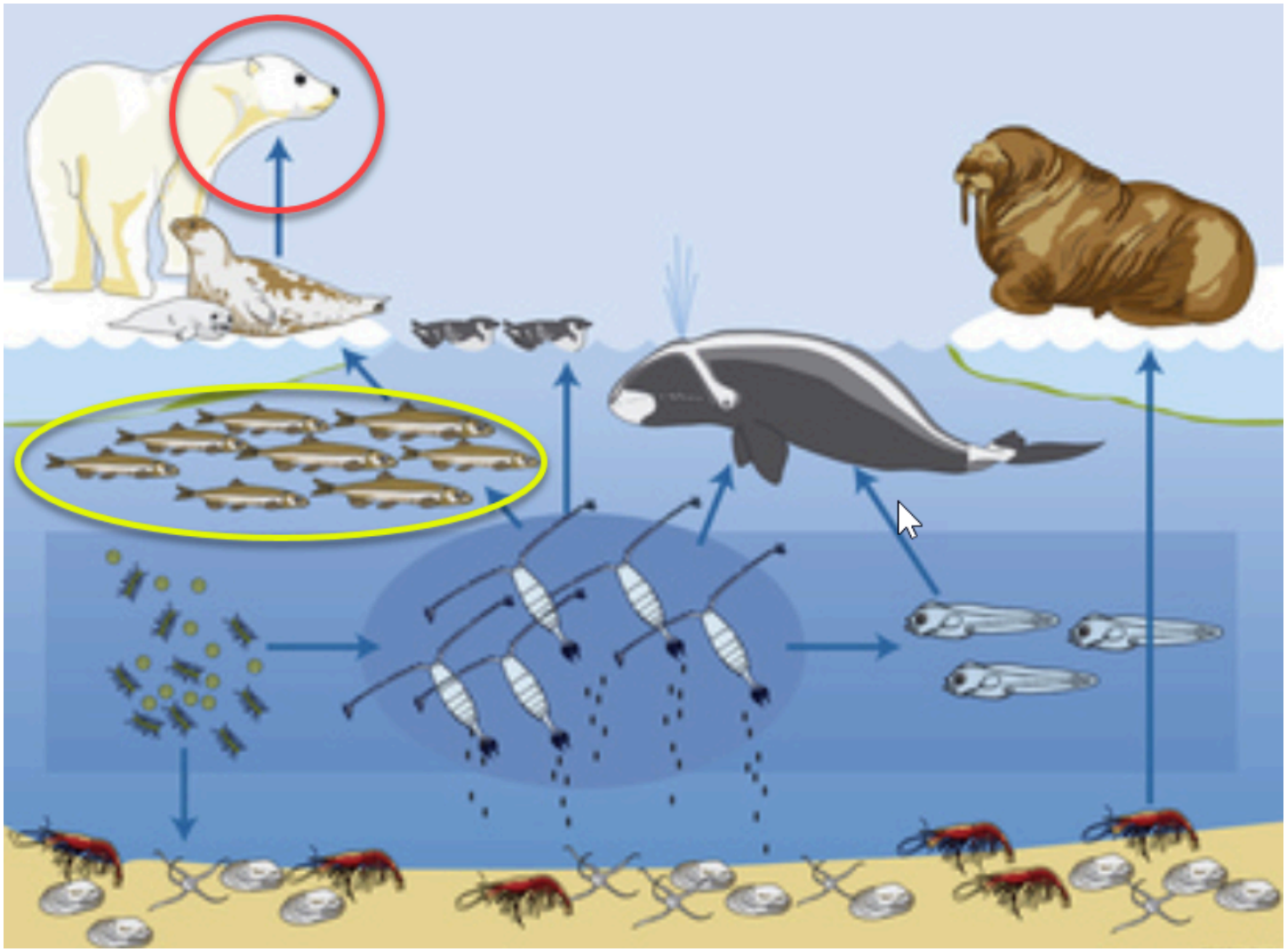
8. Estuaries are homes to juvenile fish and many other organisms. If an estuary becomes polluted, how would the age distribution of organisms in the estuary change? Explain your answer. (Lesson 04.04, page 5)

9. How can plastics in the ocean affect human health? **Read this online article to find your answer**.

10. How do shellfish clean the water? **Watch this video to find your answer**.

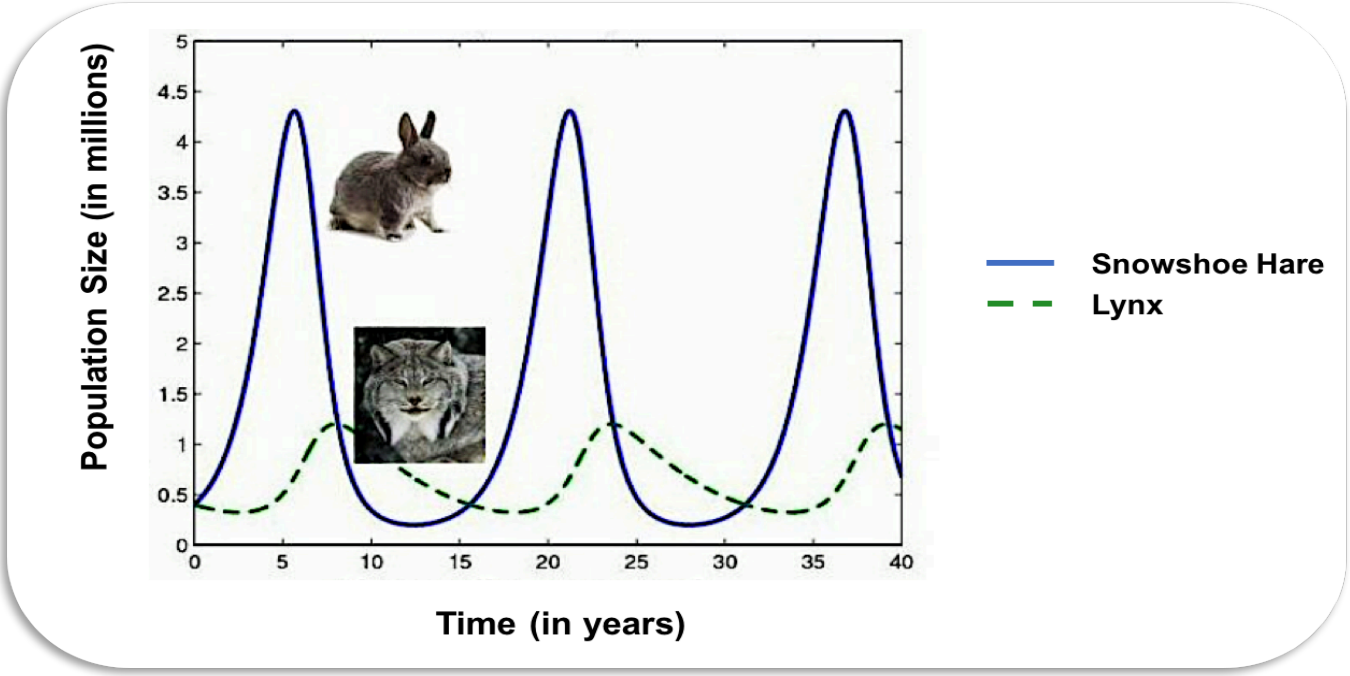
11. Study the food web below. If fish numbers decreased due to overfishing, how would the population of polar bears be affected? The fish are circled in yellow. The polar bear is circled in red.

Arctic Tundra Food Web



12. A **population growth model (predator-prey model)** is used to show the fluctuation (change) in population density (population size in an area) of a predator and its prey, as time passes. This type of model can be used to study predator-prey interactions and can provide scientists with a glimpse of the predator-prey balance within an environment. The graph below shows a predator-prey model for the snowshoe hare and lynx, over a period of 40 years. The snowshoe hare is a rabbit commonly preyed upon by the lynx, a wildcat. Answer questions A and B, found below. (Lesson 04.04, page 4)

Predator-Prey Model for the Snowshoe Hare and Lynx



A. According to the shape of the graph above, what pattern exists in this predator-prey relationship? In your answer, mention how the lynx population grows in relation to the snowshoe hare population, over 40 years.

B. What happens to the size of the lynx population every 15 years? Why would this occur?

Lesson 04.05: Animal Adaptations

1. Explain what **overproduction** refers to, in the context of natural selection. (Lesson 04.05, pages 1 and 3)

2. How does overproduction contribute to the survival of a species? (Lesson 04.05, page 1)

3. How does parental care help the survival of the blue whale species? (Lesson 04.05, page 1)

4. What is **genetic variation**? (Lesson 04.05, page 1)

5. How can genetic variation affect the size and survival of a population? (Lesson 04.05, pages 1 and 3)

6. What are the five (5) conditions required for natural selection? (Lesson 04.05, page 3)

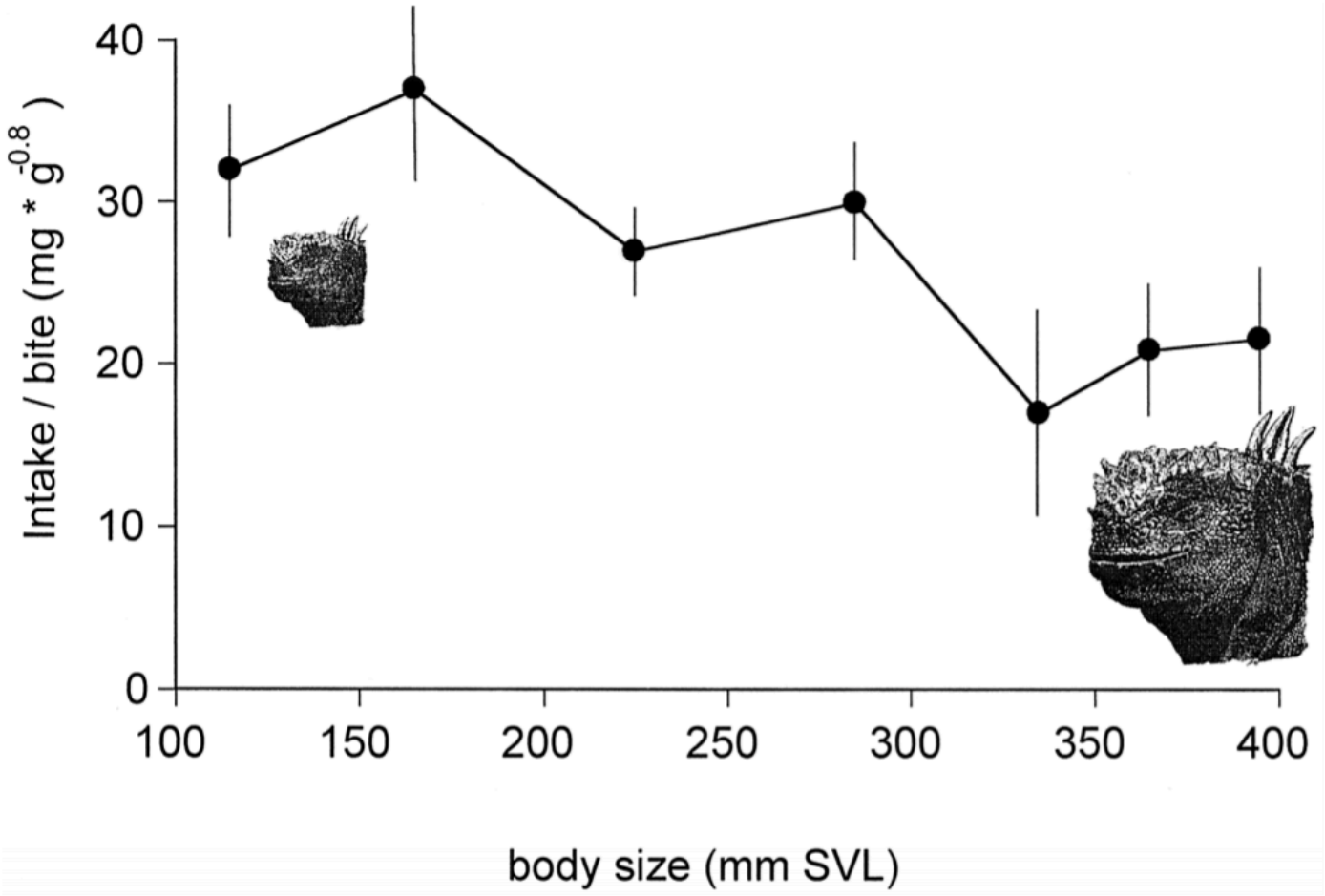
7. Define the following terms (Lesson 04.05, page 3):
    a. **Differential Reproduction** (use the glossary to find this answer):

    b. **Descent with Modification**:

8. How does a change in an organism, acquired over its lifetime, become **heritable**? (Lesson 4.05, Page 3)

9. The graph below displays data on the foraging (feeding) efficiency of marine iguanas, according to their body size. Use the graph to answer questions A and B, found below. (Lesson 04.05, page 1)

Foraging Efficiency of Marine Iguanas Per Body Size



A. What relationship exists between the body size and foraging (feeding) efficiency of marine iguanas?

B. Given the data in the graph above, would you expect smaller or larger marine iguanas to thrive in this environment? Please explain your answer using your knowledge of genetic variation.

10. What is the difference between correlation and causality? **Read this online article to find your answer.**

11. What is artificial selection? (Lesson 04.05, page 5)

12. Scientists studied a fish species that has individuals of different body sizes (large and small). Fishermen usually catch most of the large fish, while most of the small-bodied fish remain in the population. Scientists observed the next generation of this species and found that the average body size of fish was smaller than in the previous generation. How have human beings influenced the evolution of this fish species? (Lesson 04.05, page 5)

Lesson 04.06: Marine Habitats

1. What is a **population**? (Lesson 04.06, page 1)

2. Describe how estuaries, salt marshes, and mangroves are highly productive and important coastal ecosystems. (Lesson 04.06, page 4)

3. How would a decrease in zooplankton affect coral polyps? (Lesson 04.06, page 4)

4. What are biotic and abiotic factors? Define and know examples of each. (Lesson 04.06, page 3)

5. How does the symbiotic relationship that corals have with zooxanthellae limit where coral reefs are found on the planet? (Lesson 04.06, page 4)

6. The red dots on the map below indicate the location of orca sightings in the Northern Hemisphere during 2012. Why do you think these sightings occurred along coastlines? (**Online article 1** and **online article 2**)

Killer Whale Sightings in Northern Hemisphere During 2012