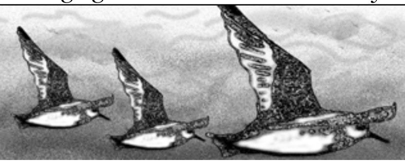


Avian Olympics

Teacher

Background

Shorebirds are one of the most migratory groups of animals on the planet. Of 51 species that breed in northern North America, substantial portions of the populations of 40 species (78%) spend the winter in countries other than the United States or Canada. In addition to Latin America and Caribbean destination, shorebirds breeding in northern North American can be found wintering in Asia, Australia, Polynesia, and northern Europe.

In general, shorebirds spend up to a third of each year migrating from wintering grounds to breeding grounds and back again. While some bird species stop and feed during migration, many build up huge fat reserves in preparation for migration and make the trip without stopping. To fully appreciate what these migrants accomplish, consider the amount of energy reserves a bird must build up (fat-loading) in preparation for migration, the distance a bird must travel, and how fast it must fly. Western sandpipers will fly 200 to 300 miles each day between stopover habitat to rest and refuel. Leaving Ecuador, this world-traveling sandpiper will likely take pit-stops in Panama, Honduras, California, British Columbia, and South Central Alaska before it reaches its breeding grounds in western Alaska.

Many natural and human-made obstacles cause problems for birds during migration. Hazardous storms and strong winds can blow birds off course or provide headwinds that slow progress. Drought and floods can also change the habitat and the ability of the birds to use it. Loss of stopover habitat such as wetlands, grasslands, shorelines, and prairie pot-holes, can decrease shorebirds ability to get needed food and rest along the migration route, thus decreasing their likely success to make it back and forth from their breeding and wintering habitat.

This activity is adapted from the Shorebird Sister Schools Arctic Nesting Curriculum.

Description

By competing in math/science and physical activities, student will learn that shorebirds have incredible physical abilities.

Objectives

Students will be able to:

1. Name 2 characteristics birds have to successfully migrate long distances
2. Calculate the distance some shorebird migrate
3. Calculate the amount of energy they need to migrate
4. Discuss some reason why some birds may not survive migration

Time Required

Teacher Prep: 15 minutes
Activity: One to three 40-minute class periods
(Activity can be continued for short periods on several days if desired)

Subject

Environmental Science, Math, Physcial Education

Skills

Comparing, Cooperative learning, Discussing, Developing psychomotor skills, Applying information, Analysis, Problem solving

National Science Standards

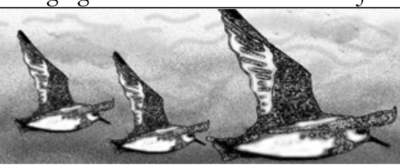
5-8: Life Science
- Regulation and behavior
- Diversity and Adaptations of Organisms

Materials

Student worksheets
Triple-beam balance or other scale
Clock with second hand visible to entire room or one stopwatch per group
World map with kilometer scale
50 meter track or running area

Preparation

Gather materials and make 1 copy of the student worksheet for each group of 3-6.



Avian Olympics

Teacher

Procedure

1. Form Teams

a. Divide the class into cooperative groups of 3 to 6 students. Groups will compete against each other in problem-solving, math skills, speed, and endurance. Each team selects a mascot migratory shorebird group, such as plovers, oystercatchers, sandpipers, curlews, turnstones, godwits, and phalaropes. The object of each team is to get the most possible points. You may wish to shorten or lengthen the lesson by awarding points to only certain answers, and doing the other calculations as a class.

b. Hand out a copy of the student worksheet to each group.

2. Weigh-In

a. The average middle school student's weight is 100 lbs or 45 kg. Ask students how many grams are in 45 kg.
Answer: 45,000 g

b. Compare that weight to the weight of the Western Sandpiper which weighs about 25 grams (less than 1 oz). Have the teams try to find an object in the classroom that weighs 25 grams. Test their entries with a triple-beam balance. If no team is close, give them all a second chance to see how close they can get grams (less than with different objects. The team that is closest earns one point.

c. Have each team, working together, calculate how many Western Sandpipers (at 25 grams) it would take to equal the weight of an average middle school student (at 45 kg). The group that does this the fastest earns one point.
Answer: 45,000 g ÷ 25 g = 1,800 Western Sandpipers

3. Eating Like a Shorebird (Fat-Loading)

This is a math contest, and all students on each team should work as a cooperative group to find the answers. Tell the class that when a team gets the answer (to "b", "c", and "d"), they should raise their hands. Ensure communication among the team members by telling them that the teacher will call on any member of the team that s/he chooses for the answer.

a. One quarter-pound hamburger and fries is an average-sized meal for a student of this size. Two or three burgers would be a huge meal. What's the largest number of quarter-pound hamburgers any of the students has ever eaten in a single meal?

b. What percentage of the average weight of a middle school student is this? (Assume a quarter-pound hamburger = 114 grams.) The first group with the correct answer gets one point.
Example answer: If 3 is the number of quarter-pounders:
3 burgers x 114 g (burger weight) = 342 g
342 g ÷ 45,000 g (student weight) = 0.76%, or less than 1%

Teacher

3c. Compare this with the Golden Plover, which gains enough fat to increase its body weight by almost 30% for its migration from Hawaii to Alaska. If an average student weighing 45 kg were going to increase his/her body weight by 30%, how much weight would s/he gain? The first group with the correct answer gets one point.
Answer: 45 kg (student wt) x .30 = 13.50 kg or 13,500g

d. How many quarter-pound hamburgers is this equal to?
Answer: 13,500 g ÷ 114 g (hamburger wt) = 118 burgers

4. **Fast Travel**

a. With each team entering its fastest runner, have a 50-meter dash to determine how long it takes a student to sprint 50 meters. The group with the fastest sprinter gets a point.

b. Calculate how long it would take this runner to cover 1 km.
Example answer: If a student runs 50 meters in 15 seconds,

$$\frac{15 \text{ seconds}}{50 \text{ meters}} \times \frac{X \text{ seconds}}{1{,}000 \text{ meters}}$$

$$15{,}000 = 50X$$

$$\frac{15{,}000}{50} = X \text{ seconds} = 300 \text{ seconds}$$

300 seconds ÷ 60 = 5 minutes to cover 1,000 meters

c. Then, using a map of the world, have students estimate the distance in kilometers from their school to Lima, Peru. Using the two measurements, have students calculate how long it would take the fastest student to sprint directly to Lima, assuming s/he could run in a straight line without stopping. Give a point to the team with the first correct answer.
Example answer: 60 minutes ÷ 5 min/km = 12 km/hour
7,500 km ÷ 12 km/hour = 625 hours, or
625 hours ÷ 24 hours/day = 26 days

d. Compare these results with Sanderlings, which are able to migrate 7,500 km (4,650 miles) between Oregon and Peru in 230 hours, or about 10 days.

5. **Wing-Flapping**

Have each team select a representative. Using a clock with a second hand, each team determines the highest number of arm flaps possible in 10 seconds.

a. Give a point to the group whose representative flapped the fastest (=most times per 10 seconds).

Teacher

5b. Using the time from the Fast travel event "4c" above, calculate how many arm flaps a student would make in a "flight" to Peru.

Example answer: For 11 flaps in 10 seconds,

$$\frac{11 \text{ flaps}}{10 \text{ seconds}} = 1.1 \text{ flaps per second}$$

$$\frac{1.1 \text{ flaps}}{1 \text{ second}} \times \frac{60 \text{ seconds}}{1 \text{ minute}} \times \frac{60 \text{ minutes}}{1 \text{ hour}} \times \frac{24 \text{ hours}}{1 \text{ day}} = 95{,}040 \text{ flaps per day}$$

95,040 flaps x 26 days = 2,471,040 flaps

c. *Advanced work:* Ask students what assumptions we are making to get answer "5b", and discuss why the answer might not be accurate. Students may suggest that we are comparing "flaps" (flying) with a running time. They may also note that we are (probably) using two different students, the one who ran fastest in the class and the one who flapped for each group. To do the calculations in "5b," we are assuming that whether students flap or run, they will cover the distance in the same amount of time. We are also assuming that all students will cover the distance in the same amount of time, or that differences between individuals of the same species are negligible. In science, it is important not to "compare apples to oranges," and to be aware of all assumptions made.

6. Non-Stop Travel

a. Which student can continue flapping his/her arms the longest? Give that student's team a point. How does this feat compare with the American Golden Plover which flies non-stop for 48 hours as it migrates from Nova Scotia to South America? The Pacific Golden Plover and some curlews and tattlers fly non-stop for 2 to 3 days from Hawaii and other Pacific Islands to Alaska.

b. Discuss how far the class thinks the best runner of middle school age can run without stopping. How does this compare with some plovers, curlews and tattlers which fly non-stop from Hawaii and other Pacific Islands to Alaska, a distance of over 3,500 miles? The little Western Sandpiper flies over 250 miles per day between stop-over points along the Pacific coast flyway to Alaska.

7. Long-Distance Travel

Have each team identify which of its members has lived farthest from his/her current home. Figure out how many kilometers away that is on a map. The group with a representative from the farthest away gets a point. Give another point to the group that calculates the kilometer distance for its representative the quickest. How does this compare with Sanderlings that fly over 11,000 km twice a year from their high-Arctic breeding grounds to wintering grounds in Peru?

Teacher

8. **Fuel-Efficiency**

   a. Humans burn about 60 calories by running one kilometer. At this rate, how many calories would a student need to run from here to Peru? A point goes to the group that makes the correct calculation first.
   Answer: Use a map to determine how many kilometers from your town to Lima, Peru, and multiply this number by 60 calories.
   Example: 60 calories x 7,500 km = 450,000 calories

   b. If one gram of fat yields 9 calories of heat, how many kilograms of fat would this student need to eat before making the trip?
   Example answer: 450,000 calories ÷ 9 calories/g = 50,000 g
   50,000 g ÷ 1,000 = 50 kg

   c. Compare this with the Golden Plover, which can travel 3,900 kilometers (2,400 miles) in 48 continuous hours of flying using less than 60 grams (2.1 oz) of body fat. Does this bird burn a lot of calories per kilometer or few calories per kilometer?

9. **Award Points**

   Provide a reward to the team with the most points.

10. **Discuss Migration**

   Discuss these amazing migration feats that can be performed by birds, but not humans. Discuss how migration can sometimes be difficult for birds despite their abilities. What natural obstacles can make migration difficult? What man-made obstacles can make migration difficult? Discuss the impact of wetland loss along the migratory route for shorebirds. If shorebirds have stopped for generations at a particular wetland to rest and get food, what could happen to those birds if all or part of that wetland is lost to flooding or drought or some human use? How can we help shorebirds migrate successfully?