



Sea Duck Survival

Objective:

To learn about the special adaptations sea ducks have that distinguish them from other types of sea birds and ducks.

Concept:

Northern environments present special challenges for waterfowl. Sea ducks have unique adaptations for surviving in arctic and subarctic waters.

You Will Need:

◆ see next page

What to Do:

Introductions:

If time permits: present a Sea Duck Slide Show to familiarize your students with the birds that are considered to be sea ducks and some general characteristics of sea ducks. A slide show and script is provided with the Sea Duck Teaching Kit. Included in the slide show are pictures of other common birds that can be used to generate discussion on pre-knowledge of birds and general differences and similarities. If you do not have access to this kit, you can put your own slide show together or gather magazines and books with photos for the students to look at to stimulate discussion.

Procedures:

Make a copy of the Sea Duck Discovery Passport for each student. Divide the class into 4 equal groups that will rotate between stations. Exploration at the stations can be as involved as you want to make it. This activity can be done in a 50 minute class period with students rotating every 10 minutes, but students will get more out of each station if you can arrange for at least 15 minutes of exploration at each station. Students should explore the station and record their

"findings" in their passport. Wrap up the activity by discussing the various findings of the groups and sharing drawings. The extension activities Sea Duck Wall Hanging and Sea Duck Serenade are excellent whole group wrap-up activities.

Discovery Stations:

Station 1: Fabulous Feathers

- Investigations with a microscope
- Compare and contrast flight feather & downy feather
- Feather race
- Oil and water on feathers

Station 2: Why Don't Sea Ducks Freeze?

- Crisco mitt
- Shredded paper mitt
- Feather mitt

Station 3: Best Beaks

- Mussels on a rock
- Invertebrates in the water
- Fish in the water
- Debris on the beach

Station 4: Colorful Camouflage

- Male breeding plumage
- Female camouflage plumage
- Molting

Activities included in Sea Duck Survival were adapted from **Giving Back to the Earth: A Teacher's Guide to Project Puffin and Other Seabird Studies**, by Pete Salmansohn, and S. W. Kress, Tilbury Press, Maine, 1997.





Sea Duck Survival continued...

Materials Needed for each station:

Station 1: Fabulous Feathers

Collection of feathers (*see Resources*)
(flight, contour and down)
Hand lenses
Microscope
Large or small bowls
Water
Cooking oil (colored black)
Spoons or droppers
Dishwashing detergent
(Dawn if available)
Plenty of paper towels!

Station 2: Why Don't Sea Ducks Freeze?

Large bowl or tub
Ice
Water
Insulation Mitts (*see Instructions*)
Mitts with no insulation (enough for
one each if possible)
Mitts filled with Crisco (2 minimum)
Mitts filled with shredded paper
(2 minimum)
Mitts filled with downy feathers
(if enough feathers are available,
otherwise the shredded paper
mitts can serve as an example
of insulation that traps air)

Station 3: Best Beaks

Fish:

Spoon
Chopsticks
Serrated pliers
Bowl
Soap shavings

Mussels:

Spoon
Chopsticks
Serrated pliers
Modeling clay
Walnuts (whole, in shells)

Macroplankton:

Tweezers
Chopsticks
Toothpicks
Bowl
Rice crispies

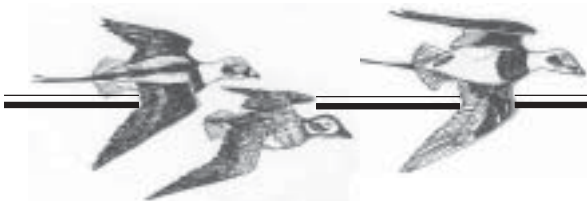
Beach debris:

Strainer
Chopsticks
Serrated pliers
Dry macaroni
Handful of kidney beans

Station 4: Colorful Camouflage

Pictures of sea ducks in various
plumages and poses
(Use Species ID cards)
Markers, colored pencils or
fabric crayons
Outlines of sea ducks
Color by number plumage page
(see page 16)





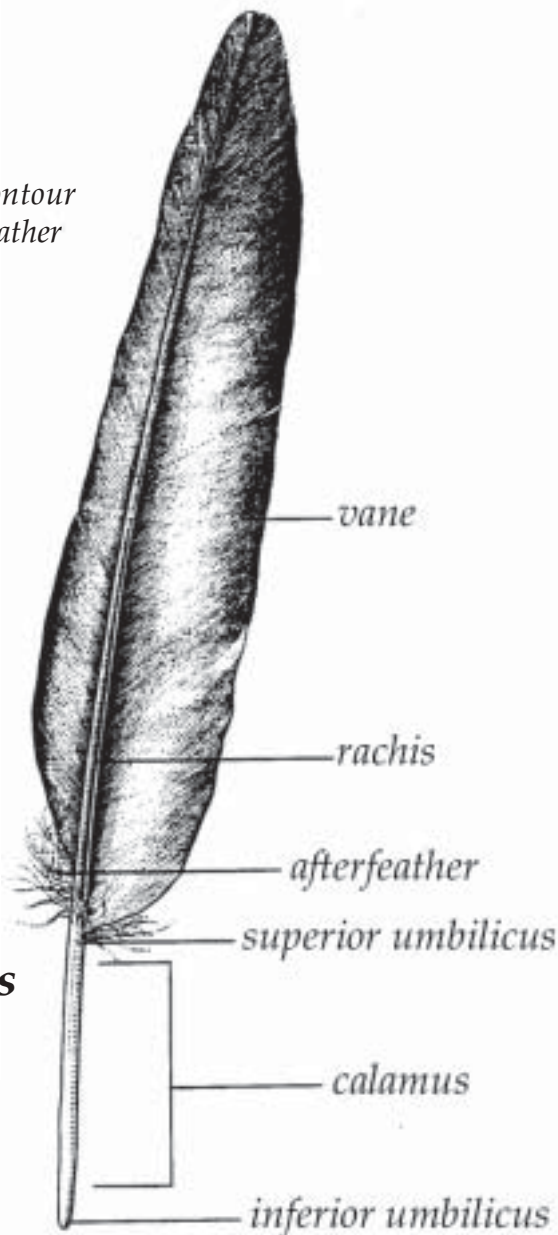
Sea Duck Survival continued...

Instructions for each station:

Station 1: Fabulous Feathers

Students will investigate the properties of feathers. They will be comparing the structure of flight, contour and down feathers and recording their observations. They will be investigating feather structure under a microscope and hand lens. They will also be investigating the waterproof qualities of feathers by experimenting with oil and water and feathers. Students will investigate the dangers of crude oil on feathers (as in the case of an oil spill) and experiment with cleaning the oiled feathers with dishwashing detergent - a common method used in oil spill clean-up of damaged sea mammals and waterfowl. Encourage the students to discuss the benefits of a duck's oil gland for protection and the dangers of toxic oils that can destroy their waterproof coating and can also sicken a bird through ingestion during preening. Cleaning and drying the feathers will also help ready the station for the next group - so be sure the students complete this step!

Contour Feather



Types of Feathers



Sea Duck Survival continued...

Instructions for each station:

Station 2: Why Don't Sea Ducks Freeze?

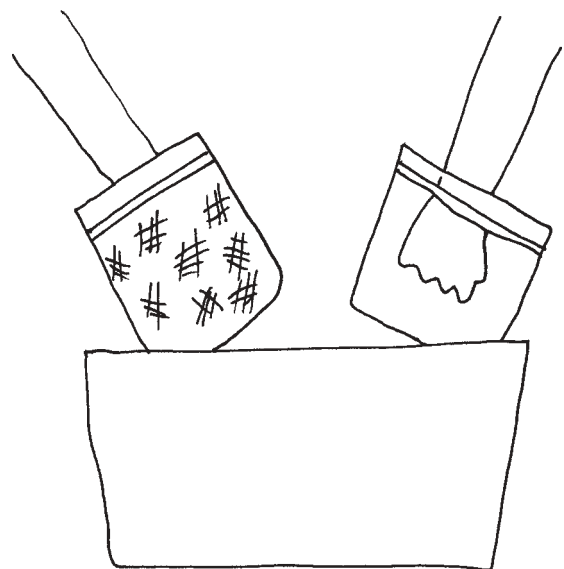
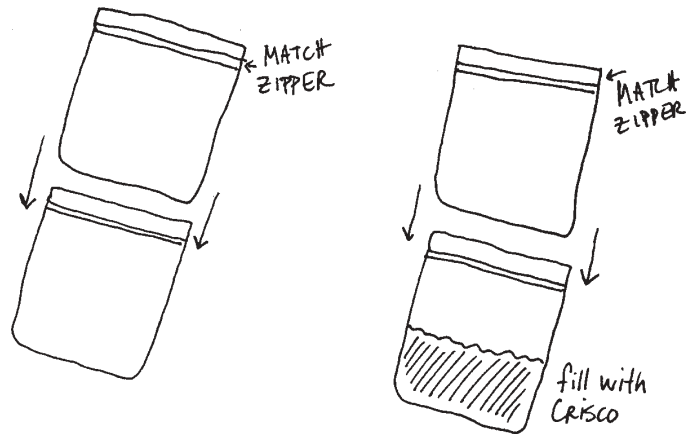
Students will investigate the general insulating properties of various materials and compare them to sea duck adaptations, which allow them to spend the winters in northern arctic and subarctic coastal waters. Students will plunge their hands into the ice cold water with one covered with a noninsulated mitt and the other covered with one of the insulated mitts to compare and contrast the insulating properties. If time permits you can have various materials available to the students for experimenting with making their own mitts and testing insulating properties.

Directions for making mitts:

Uninsulated mitt: Using two quart size Ziploc freezer bags (you can use regular Ziploc bags if freezer bags are not available, they just may not last as long), make a mitt by turning one bag inside out and placing it inside the other bag, matching the blue and red zipper strip at the top. Zip the bags together. Seal the bags with duct tape around the upper edge.

Insulated mitt: Using two quart size Ziploc freezer bags (you can use regular Ziploc bags if freezer bags are not available, they just may not last as long), fill one bag with approximately 3 cups of insulating material. Turn the second bag inside out and place it inside the first bag, matching the blue and red zipper band. Zip the bags closed and seal with duct tape. Using your hands, evenly distribute the insulating material.

Make enough uninsulated mitts so that each student at the station has one uninsulated mitt. Make at least two each of the insulated mitts to experiment with.



Sea Duck Survival continued...

Instructions for each station:

Station 3: Best Beaks

Instructions for each beak station:

Fish in the Water: Add small pieces of soap that float into the bowl of water simulating slippery fish in the ocean. (If you can use an aquarium with an air bubbler to move the "fish" around, the experiment will be more realistic.) Tools: chopsticks, a teaspoon and serrated pliers. Sea ducks that eat small fish are Mergansers; other birds that eat small fish include Puffins, Terns, Murres and Guillemots.

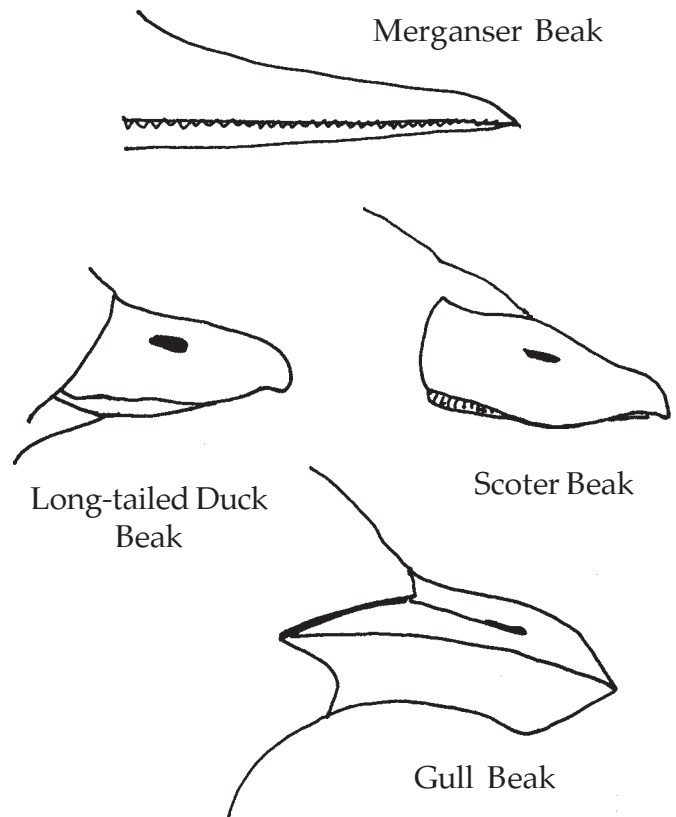
Mussels on a Rock: Make a large rock out of the modeling clay. Stick walnuts into the clay mound to represent mussels clinging to the rocky shore. Tools: a spoon, chopsticks and serrated pliers. Sea ducks that pull mussels off rocks include Eiders and Scoters.

Invertebrates in the Water: Add rice crispies to float in a bowl of water to simulate macroplankton such as crustaceans and animal larvae floating on the surface of the ocean and fish eggs. Tools: tweezers, chopsticks, sharp toothpicks. Sea ducks who eat crustaceans and fish eggs include Eiders, Harlequin ducks and Long-tailed Ducks. Another sea bird that eats macroplankton from the surface of the ocean is the Storm Petrel.

Debris on the Beach: Add dry, hard macaroni shells to a bowl to simulate beach pebbles and rocks. A few red kidney beans are mixed in with the macaroni to simulate bits of washed up food on the beach such as dead crabs, fish, urchins, and garbage. Tools: small strainer, chopsticks, pliers. Birds that eat this: Gulls. (Use this station as a comparison to sea duck diet and also as an informative experiment on a very common bird that all students will be aware of).

Method: Each member of the group tries one tool at each station to remove the "food." When time is up, students work together to fill in the chart in their passport. Share results with the group during wrap up. If time is a factor, have each member choose a tool, then time the group for 30 seconds (or 1 minute) depending on your constraints. After recording results and sharing with each other, move onto the next station. An easy-to-use timer that students can move from station to station would be handy.

Remind students that they cannot use hands, fingers or anything else to make their job easier and they should use the tools as they were intended to be used.



Sea Duck Survival continued...

Instructions for each station:

Station 4: Colorful Camouflage

Students will use the power of observation to carefully draw a replica of one of the sea duck photos or mounts provided. This station can have several options depending on your desired results. Students should first color the molting plumage comparison provided on Page 16, paying careful attention to color details.

Students should then freehand draw a copy of a sea duck picture paying close attention to body shape, bill shape, coloration and size.

Students can draw and color with fabric crayons, which can then be applied to fabric pieces and made into a class sea duck wall hanging (see Extension Activities).

The emphasis should be on paying attention to details, using coloration (especially of males in breeding plumage) for identification and using bill shape and body size for identification during non-breeding season.

Follow up and Extensions:

Group Discussions:

Discuss results of the experiments as a class. Try to encourage students to make comparisons between sea duck characteristics and characteristics of other types of birds that they may be familiar with.

Sea Duck Wall Hanging:

Make a mural or a sea duck wall hanging with the drawings from Station 4. Follow the manufacturer's directions for using fabric crayons and transfer pictures onto a large piece of fabric or onto individual

fabric blocks which can then be sewn together for a fantastic classroom display!

Sea Duck Model:

Make a sea duck model using a plastic milk jug and paper machè. Ducks can then float and be part of a display for other classes or parents. Duck models can also be used to discuss the benefits of a common coloration of many sea birds: dark on top, light on bottom. See Appendix 1 for specific instructions for making a model. Give yourself at least 2 class periods to complete this project.

Sea Duck Serenade:

Listen to a tape of sea duck calls. Make two sets of cards that have the names of the sea ducks you will be listening to on them. Pass them out to the group (if you have a large class you can have a flock of birds rather than a pair). After listening to the tape and practicing the calls as a class, each student will try to find their partner by calling for each other. Challenge the students to describe or write their sea duck sound.

Survival is the Name of the Game Activity:

See the list of resources for information on how to obtain a copy of this great game that looks at adaptations of animals for survival in their unique habitats.

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PASSPORT TO SEA DUCK DISCOVERY



Station 2 Best Beaks

Each team member selects one tool to experiment with. Make a prediction as to which tool will be most effective at collecting the particular food item. At the signal, each member tries to extract as many food items as possible. Stop collecting at the signal. Record the team's data below.

Station 1: Fish	How many food items did your group capture in the time period?	Total number captured for the class
Spoon		
Chopsticks		
Serrated Pliers		

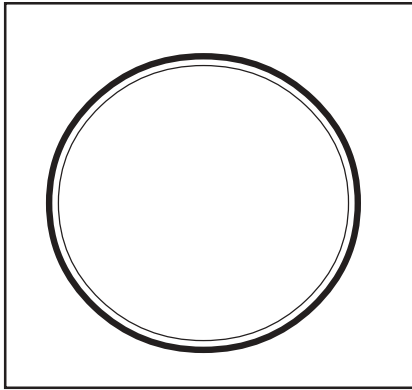
Station 2: Mussels	How many food items did your group capture in the time period?	Total number captured for the class
Spoon		
Chopsticks		
Serrated Pliers		

Station 3: Macroplankton	How many food items did your group capture in the time period?	Total number captured for the class
Tweezers		
Chopsticks		
Toothpicks		

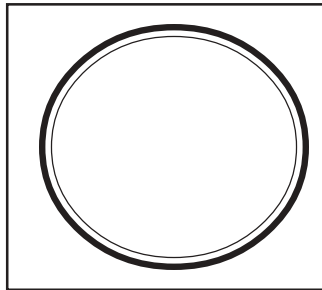
Station 4: Beach Debris	How many food items did your group capture in the time period?	Total number captured for the class
Strainer		
Chopsticks		
Pliers		

Station 1 - Fabulous Feathers!

1. Examine a large feather using a hand lens and then a microscope. Can you see the zipper? Draw what you see. Be as detailed as you can!



2. Now examine a downy feather with a hand lens and a microscope. Where is the zipper? Draw what you see.



3. Now, let your feather float on top of the water. Spoon water onto the feather. Does it soak in? _____ Does it get wet? _____ Take a second feather and put 2 drops of oil on it and rub it in. Now let it float on the water. Spoon water onto the feather. Does it get wet? _____ Does the water form little pools on the feather? _____ Why? _____

4. If there was an oil spill how could you clean a bird's feathers and clean up the oil in the water?

Take your feather out of the water and place two drops of detergent into the bowl. What happened? _____

Using the dishwashing detergent, clean your feather for the next group to use.

Station 3: Why Don't Sea Ducks Freeze?

Each team member will compare and contrast an uninsulated mitt with an insulated mitt. You will also compare the various types of insulation and speculate on their ability to keep a sea duck warm in the arctic and subarctic waters.

1. Place one hand in an empty mitt and plunge it into the ice cold water. How does the water feel?

2. Now keep one hand covered with an empty mitt and put a mitt with insulation on the other hand. Plunge both hands in the tub of ice cold water. Which hand feels warmer? _____
Which type of insulation did you experiment with? _____
3. Repeat the above experiment with a different insulation mitt. Which hand feels warmer? _____ Which type of insulation did you experiment with? _____
4. Now compare the two insulated mitts with each other. Which one makes your hand feel warmer? _____ Why do you think one type of insulation is better than the other? _____

How could feathers and/or extra fat help keep the sea duck from freezing? _____
Can you think of any other animals that benefit from extra layers of fat or feather insulation?

Station 4: Draw a Sea Duck

Carefully observe the pictures of the eight different species of sea ducks. Make a note of the general body shape of the bird, its bill shape and any other distinguishing marks that might help someone identify this bird out in the wild.

Draw a detailed picture of your favorite sea duck on the blank page at the end of your book. Use the space below to make "field sketches" of special features you have observed.

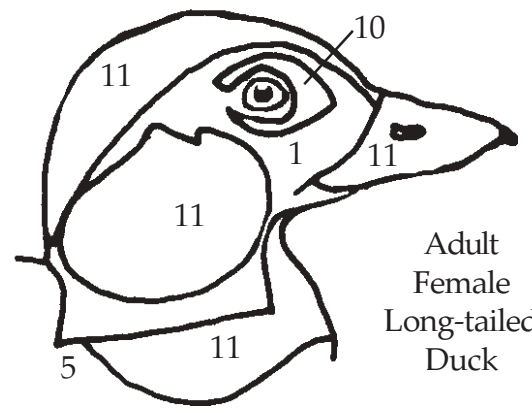
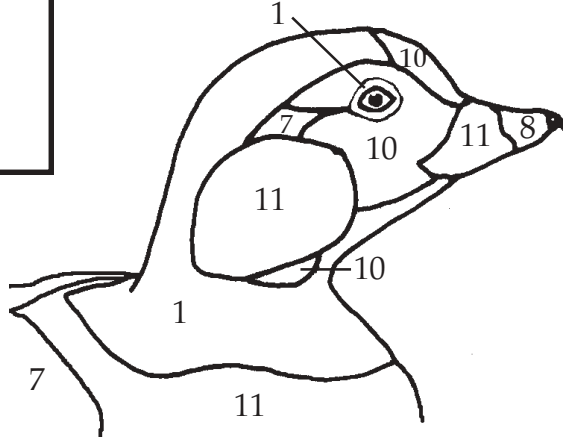
Use pencil, crayons, markers or fabric crayons to make a transferable sea duck for a wall hanging or pillow.

Draw a complete picture of a Sea Duck here

Plumage Color Key

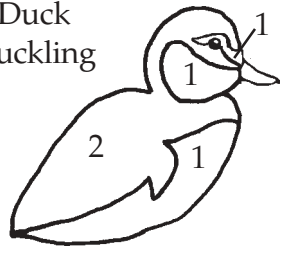
- 1. White
- 2. Reddish Brown
- 3. Dark Blue
- 4. Light Blue
- 5. Brown
- 6. Yellow
- 7. Grey
- 8. Pink
- 10. Tan
- 11. Black

Adult Male Long-tailed Duck
Breeding Plumage

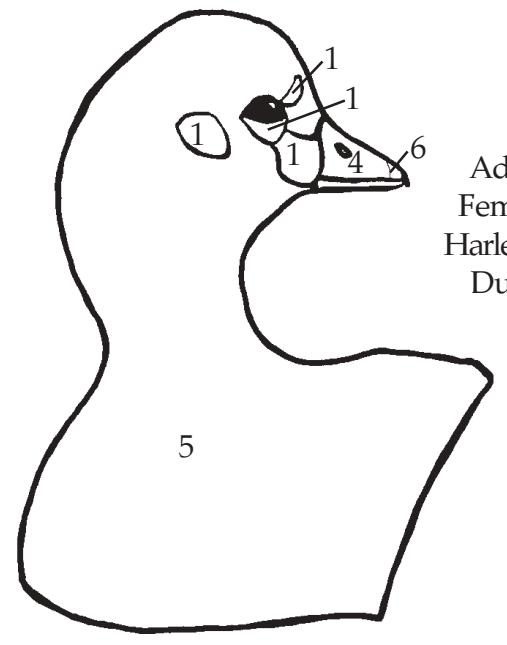


Adult Female
Long-tailed
Duck

Long-tailed
Duck
Duckling

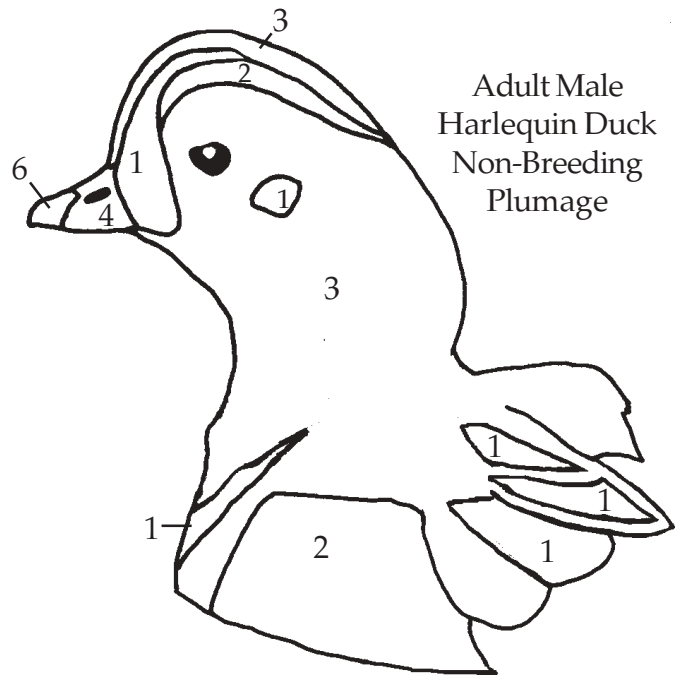


Harlequin
Duckling

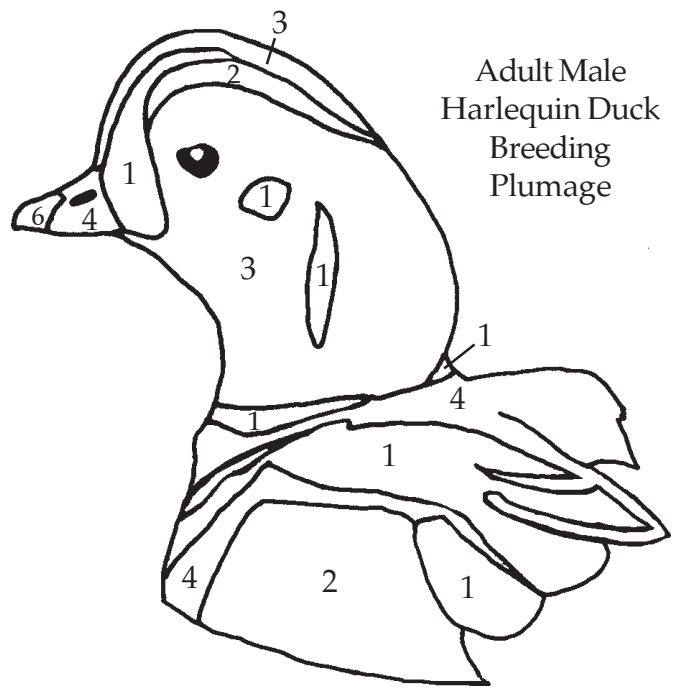


Adult Female
Harlequin
Duck

Adult Male
Harlequin Duck
Non-Breeding
Plumage



Adult Male
Harlequin Duck
Breeding
Plumage



Sea Duck Survival continued...

Explanation of Stations

Station 1 - Fabulous Feathers:

Adaptation - Feathers: Students should be able to see a distinct difference between the contour feathers and the down feathers. Unless you are able to use a microscope, it may be difficult to see the "zipper" effect of the barbs and barbules. Have students be as detailed as possible in their drawings of the contour feathers explaining that these hooks, or velcro-like features, help the feather to lay flat and stiff and allows it to be water repellent. When covered with the ducks natural oil it stays dry and able to float. The downy feathers are much "springier." Explain to the students that this helps the feather trap air - making it a super insulator for the duck.

The oil experiment is a very simplified way of looking at how oil can affect waterfowl in the event of an oil spill. The best experiment would be to use motor oil, but the toxic nature of motor oil makes it impractical for use with students. Apply a few drops of black food coloring or ink to cooking oil and rub it onto the feathers. Experimenting with both the contour and the downy feathers should produce different results. The use of dishwashing detergent (Dawn brand) to clean both the water and the feathers is an example of a very effective method of oil spill cleanup that actually takes place. Get creative with this experiment by providing different materials to use as "scrubbing agents" such as cotton balls, sponges, spoons, etc.

In the event of an oil spill, oiled birds can die from a number of factors. They can get hypothermia because the insulating properties of the downy feathers has been destroyed and they can get poisoned by ingesting the toxic oil while preening their feathers in an attempt to get them functioning correctly.

Station 2 - Best Beaks:

Adaptation - Beaks: The beaks of sea ducks are specialized to capitalize on the local food source. An

eider's bill is short and stout for pulling mussels off the intertidal rocks. The merganser's bill is long and narrow with serrated edges excellent for catching slippery fish.

Station 3 - Why Don't Sea Ducks Freeze?

Adaptation - Insulation: The students will discover the air trapping quality of the downy feather at station 1. At the insulation station they will feel how well the feathers insulate and keep them warm, as compared to no insulation and "blubber" (Crisco). The downy feathers of the eider duck have long been used commercially for insulation in duvets and arctic and climbing clothing. Eiders line their nests with large quantities of down and there are places where eider "farmers" gather the nest linings to sell. Some sea birds, such as the puffin, have extra fat to keep them warm in the northern waters, much the same as the marine mammals.

Station 4 - Colorful Camouflage

Adaptation - Plumage: All birds molt their worn feathers on a regular cycle. Since it requires so much energy to grow new feathers, male sea ducks typically molt flight feathers in late summer after the breeding season, when food is plentiful. Molting of primary and secondary feathers leaves them flightless and therefore vulnerable to predators and disturbances. Sea ducks have a drab plumage in the fall, and most males resemble females making identification difficult. They go through a second molt, which does not include primaries and secondaries, prior to breeding season and the males replace their drab feathers with bright body breeding plumage. Molts which only replace some of the feathers are called partial molts. Sea ducks usually have 2 partial molts a year. The Long-tailed duck has 4 partial molts in a year, the most complicated molting pattern of all the sea ducks.