

CLASSIFICATION OF LIVING ORGANISMS
CINNY WEST
BOWLING GREEN JR HIGH

MAJOR CONCEPT: Students will see how taxonomy provided information shows similarities regarding evolutionary relationships of organisms. Students will use and create dichotomous (classification) keys.

CONTENT & VOCABULARY: Characteristics of the 5 kingdoms, 7 categories of classification, binomial nomenclature, dichotomous, classification, taxonomy, genus, species, kingdom, Plant, Animal, Monera, Protists, Fungi

SKILLS: classification, looking for relationships, application, synthesis

CORE CONTENT: SC-M-3.1.1 Living systems at all levels of organization demonstrate the complementary nature of structure and function. Important levels of organization for structure and function include cells, tissues, organs, organ systems, organisms (e.g. bacteria, protists, fungi, plants, animals), and ecosystems.

CHALLENGE: Create your own dichotomous (classification) key from the list of living organisms provided.

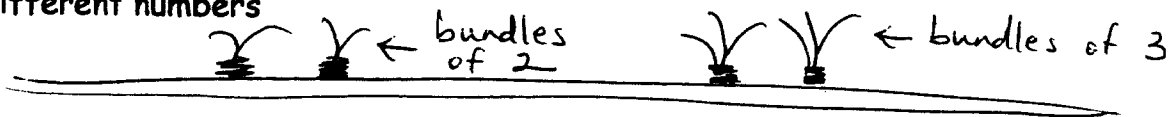
BACKGROUND: You probably will need to have already discussed the 5 kingdoms of life (Monera, Protista, Fungi, Plants, Animals) and the 7 categories of classification (kingdom, phylum, class, order, family, genus, species). From this students should know that living things are given their own unique scientific name based on their genus and species levels. The next question that the students will probably ask is how do scientists know what the name of an organism is if that organism is unrecognizable to the scientist. This is where the dichotomous or classification key is used. Scientists use these tools to decide whether or not an organism has been identified or if it is a brand new species that has never been discovered before.

TASK 1: Introduce students to a few simple dichotomous keys that are attached.

- A. Leaf Identification Key: Follow the directions on the page. I only copy a class set of 30 and make the students use their own paper.
- B. Insect Identification Key: Follow the directions. Again a class set will suffice.
- C. Homework-Pine Tree Key: To complete this key, the students need to know a little about pine trees. You will need to explain what the following words mean:

Bough- a tree branch

Bundle- different species of pine trees have their needles "bundled" in different numbers



Prickle- the claw shaped spines on a cone. Some species have prickles, some don't.

I tell the students that they have to read and follow the directions exactly, which includes answering all questions asked. I tell them that I am assessing whether or not they can work the key and whether or not they can read and follow directions.

TASK 2- Do a dichotomous key together in class. I like to do the "Shoe Kingdom". See example attached. Then I take the students to the computer lab to do a key on the web called the "Aquatic Critters Key". Web address is

www.dnr.state.wi.us, then click on
Kid stuff then click on
EEK then click on
Teacher page then click on
Teacher activities then click on
Critter search then click on
Water Critter Key

Can have 1st class save this on bookmark for the next classes.

TASK 3: Create a Candy Key for the Candy Kingdom

You will need 6 different types of candy. I used peppermint, butterscotch, tootsie roll, Dum dums, starburst and Hershey's kiss (I had the kids bring in the bags of candy for extra credit about a week before), flip chart or bulletin board paper, and markers. I put students in groups of 2 and give them a bag with 12 pieces of candy inside. Each person gets to have one piece of each kind at the end of the activity. Give each group a copy of the Candy Key directions. Have groups work out their key on their own paper first then transfer it onto the flip chart or bulletin board paper. Give groups time to present their keys.

TASK 4: Create your own dichotomous key.

First I take the list of organisms and cut them into strips and put them into a basket. I pass around the basket and have the students pick a group of organisms for which they will be creating a key (I have found if you do not make them pick out of a hat, you will get 30 Big Cat keys). You might want to save the Protist, Bacteria, Algae and Fungi for G.T. students because they are sort of hard to do because they are so unfamiliar.

Second, I pass out the directions "How to make a Dichotomous Key". I carefully go over the directions one more time referring to the Candy Key and pine tree samples and also the key I made on whales. Students must choose 6 organisms from their group. There will always have one less paired step then you will have organisms because the last step always identifies 2 organisms.

I then take the students to the computer lab or library to research their organisms. I also give the students the scoring rubric so they know exactly what is expected.

EVALUATION/ORQ:

Create a dichotomous key for the 5 kingdoms of life. The key should include 4 paired statements to identify the 5 kingdoms.

SAMPLE ANSWER

| | |
|---|----------|
| 1a One celled or many | go to 2 |
| 1b Multicelled only | go to 3 |
| 2a Has a nucleus in the cell | go to 4 |
| 2b Doesn't have a nucleus in the cell | Monera |
| 3a Can make its own food | Plants |
| 3b Cannot make its own food | Animals |
| 4a Some make their own food, some don't | Protists |
| 4b Cannot make their own food | Fungi |

Key must have:

All 5 kingdoms

4 paired statements

Correct description for each kingdom

PRETEST - CLASSIFICATION

1. How do you know when something is living or nonliving?
2. How do scientists put living things into groups?
3. From where does an organism get its name?
4. List the 5 kingdoms of Life on Earth and give an example of a member from each.
5. How do scientists go about identifying an unknown or new organism?

Classification of Leaves

Procedure: A classification system gives a name to every living thing. You can also use a classification system to name an organism. To do this, you must use a classification key. The key found below is one type. Start with Leaf A, shown in the picture on the back of this sheet. Begin with 1a in the key. If this describes the leaf you are looking at, go to step 5a. If it does not describe the leaf that you are looking at, then go to 1b. This should describe your leaf. Follow the steps again to identify every leaf. Every time you start on a new leaf, you must begin with 1a.

1a If the leaf has many smaller leaves on it called leaflets, go to 5a. If it does not, go to 1b.

1b If the leaf does not have any leaflets, go to 2a.

2a If the leaf is more round than it is long, go to 3a. If not, go to 2b.

2b If the leaf is more long than round, go to 4a.

3a If the leaf has large pointed edges, it is a maple. If not, go to 3b.

3b If the leaf has small pointed edges, it is an aspen.

4a If the leaf has large round edges, it is an oak. If not, go to 4b.

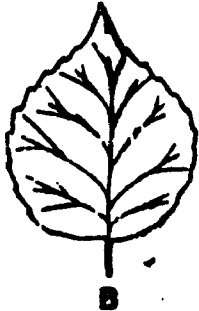
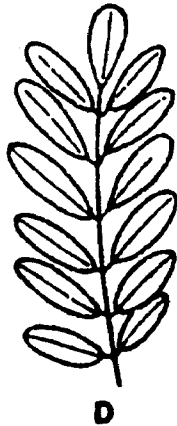
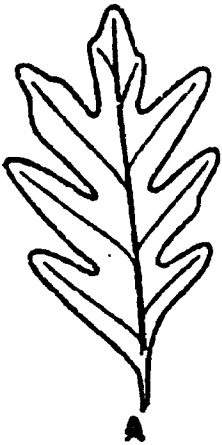
4b If the leaf has pointed edges, it is a chestnut.

5a If the leaf has small rounded leaflets, it is a locust. If it does not, go to 5b.

5b If the leaf has long leaflets with pointed edges, it is an ash.

What is the name of each leaf?

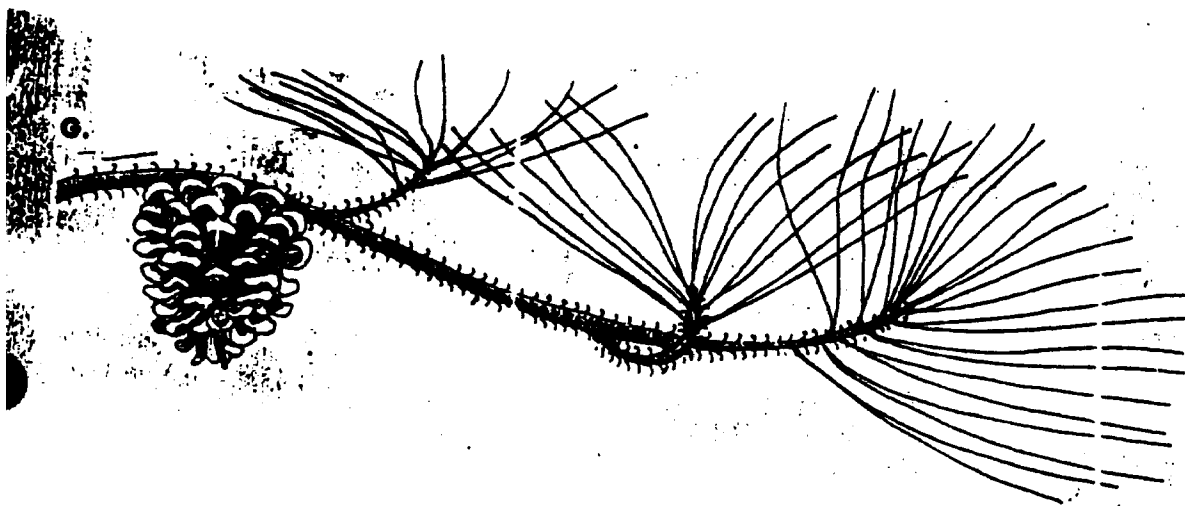
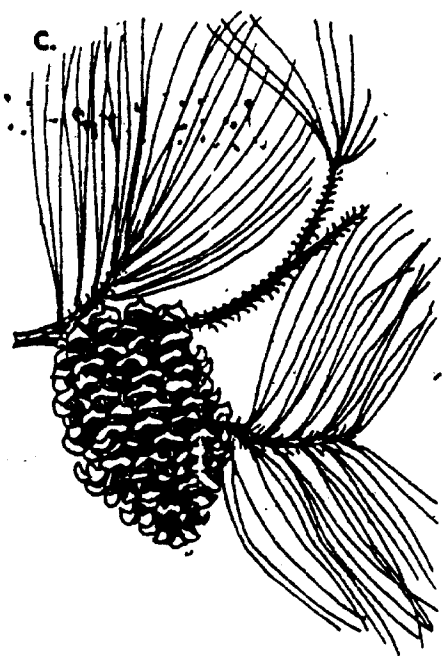
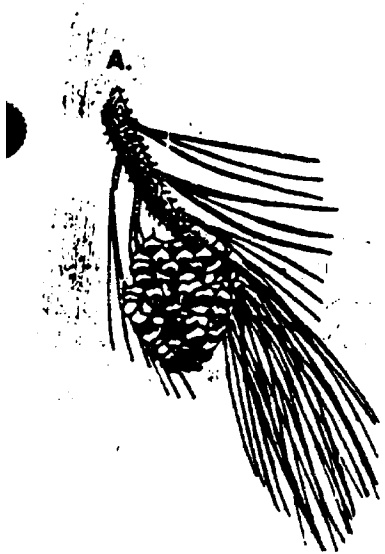
- A. _____
- B. _____
- C. _____
- D. _____
- E. _____
- F. _____



Extra Credit:

Find out the genus and species names for a horse, a house cat, an oak tree, and a human being.

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PINE TREE KEY

TREE A
pond pine
Pinus serotina

TREE B
lodge pole pine
Pinus contorta

TREE C
ponderosa pine
Pinus ponderosa

TREE D
white pine
Pinus strobus

TREE E
bristlecone pine
Pinus aristata

TREE F
jack pine
Pinus banksiana

TREE G
red pine
Pinus resinosa

Rubric

| | |
|-----------------|-----|
| own paper | - 5 |
| Tree A-F | - 5 |
| Common name | - 5 |
| Scientific name | - 5 |
| underline | - 5 |
| correct | - 5 |

PINE TREE KEY RUBRIC

| | | |
|-----------------|--------------|-------|
| Own paper | 5pts | _____ |
| Tree A – F | 5pts | _____ |
| Common name | 5pts | _____ |
| Scientific name | 5pts | _____ |
| Underlined | 5pts | _____ |
| Correct | 5pts | _____ |
| TOTAL | 30pts | _____ |

PINE TREE KEY RUBRIC

| | | |
|-----------------|--------------|-------|
| Own paper | 5pts | _____ |
| Tree A – F | 5pts | _____ |
| Common name | 5pts | _____ |
| Scientific name | 5pts | _____ |
| Underlined | 5pts | _____ |
| Correct | 5pts | _____ |
| TOTAL | 30pts | _____ |

PINE TREE KEY RUBRIC

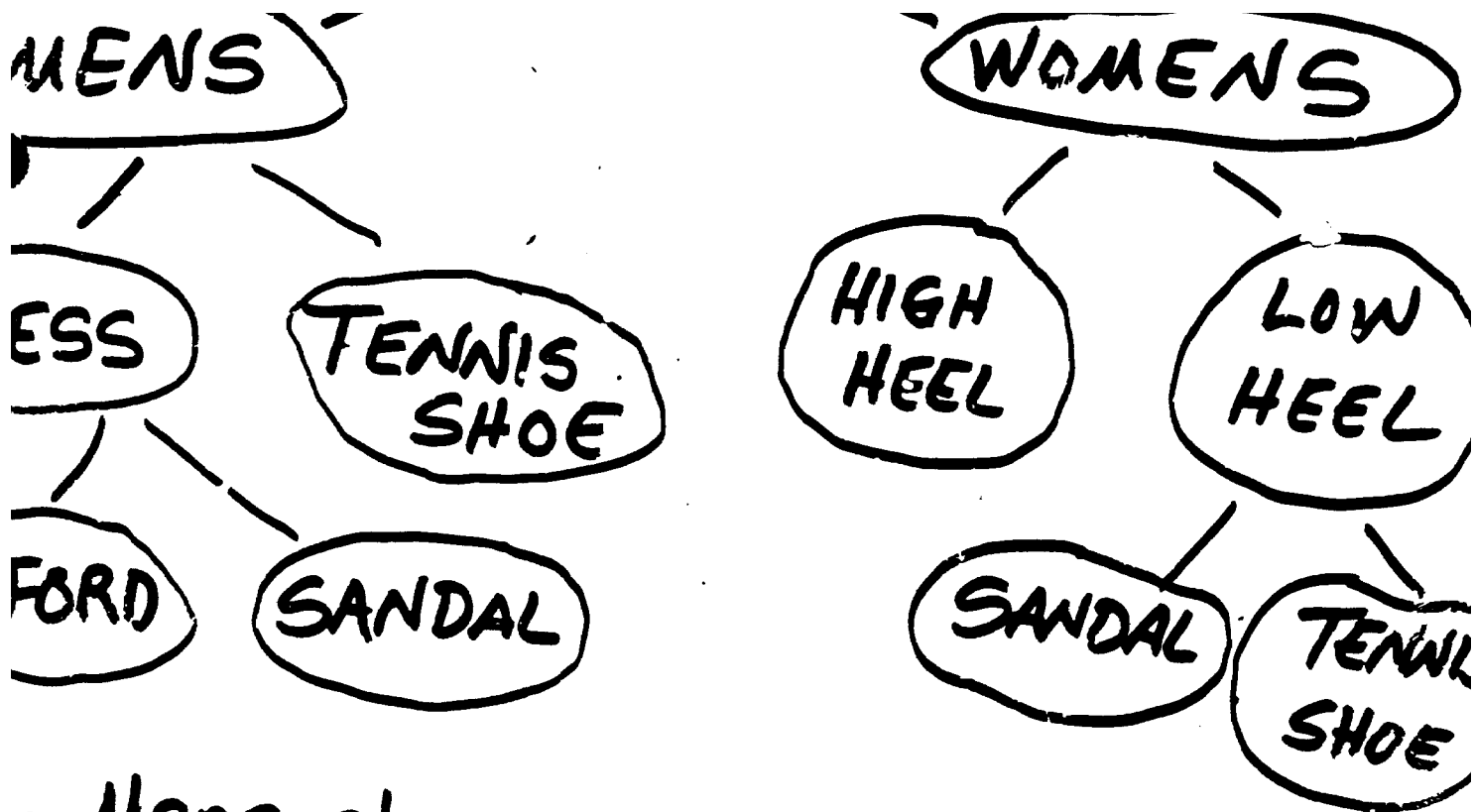
| | | |
|-----------------|--------------|-------|
| Own paper | 5pts | _____ |
| Tree A – F | 5pts | _____ |
| Common name | 5pts | _____ |
| Scientific name | 5pts | _____ |
| Underlined | 5pts | _____ |
| Correct | 5pts | _____ |
| TOTAL | 30pts | _____ |

PINE TREE KEY RUBRIC

| | | |
|-----------------|--------------|-------|
| Own paper | 5pts | _____ |
| Tree A – F | 5pts | _____ |
| Common name | 5pts | _____ |
| Scientific name | 5pts | _____ |
| Underlined | 5pts | _____ |
| Correct | 5pts | _____ |
| TOTAL | 30pts | _____ |

PINE TREE KEY RUBRIC

| | | |
|-----------------|--------------|-------|
| Own paper | 5pts | _____ |
| Tree A – F | 5pts | _____ |
| Common name | 5pts | _____ |
| Scientific name | 5pts | _____ |
| Underlined | 5pts | _____ |
| Correct | 5pts | _____ |
| TOTAL | 30pts | _____ |



- Mens shoe go to 2
- Womens shoe go to 3
- Dark leather go to 4
- White leather go to 4
- heel over one inch mens tennis shoe
- heel under one inch women's high heel
- dark leather; ties go to 5
- dark leather, straps men's oxford
- white leather, ties men's sandal
- leather, straps women's tennis shoe
- leather, straps woman's sandal

CANDY KEY FOR THE CANDY KINGDOM

OBJECTIVE: Constructing a dichotomous key for a bag of candy

PROCEDURE: Follow these directions to make the candy key!

PART A

1. Pour the candy out of the bag.
2. Look at the candy and divide it into 2 groups based on their similar characteristics. These characteristics should be your statements 1a and 1b.
3. Look at the candy in group 1a. Decide how you can divide this group into two more groups. These two groups will become your statements 2a and 2b. One candy should be identified in 2b.
4. Look at the candy from group 1b. Break this into 2 groups. This will become 3a and 3b. Another candy should be identified in 3b.
5. For statements 4 and 5 you should be able to identify the rest of the candy.
6. Work your key out on a piece of your own paper.

PART B

Now that you have made a key for your candy, you are to make up a scientific name for each type of candy and place them in your key. Remember scientific names are in Latin (use a "us" on the end of the name, remember Carolus Linneaus). Look in your notes if you do not remember how to write a scientific name.

***Use the pine tree key as an example of how to do this activity. It is due at the end of the period.

PART C

Write your key on the piece of chart paper and post it on the bulletin board.

HOW TO MAKE A DICHOTOMOUS KEY

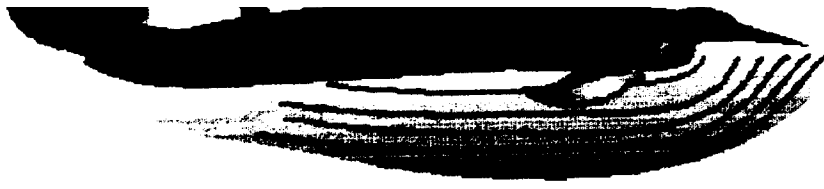
Making your own dichotomous key can be easily done for a group of living things that you want to organize by physical traits. This can be a good method for helping people make observations and understand some physical traits that are important for learning how to classify things. Follow these directions for making your very own dichotomous key!!!!!!

1. You have already been given the group of organisms for which you will be making a key. Do a little research on your group of organisms (especially if you have no idea what they are).
2. Pick at least 6 organisms from your group to make your key (if you want to do more than 6 it must be an even number). Copy, print or draw pictures of each organism.
3. Glue pictures on a separate page and number each. Leave enough room below each picture to write your descriptions.
4. Research each of the 6 different organisms and write down 3 or 4 specific characteristics under each picture (i.e. where it lives, what it eats, length, coloration, weight, special physical features, etc).
5. Use the most general traits that can be used to divide the organisms into two categories. These two categories will become 1a and 1b. Example
1a Go to 2
1b Go to 3
6. The second step (2a and 2b) needs to consist of a pair of statements that will allow for the identification of one organism (2b should ID one organism).
7. Every pair of statements after the second should allow for the identification of one or two organisms.
8. The last pair of statements (5a and 5b) should identify two organisms.

9. There should be one less step than the total number of organisms to be identified in your key (if you have 6 organisms, then you should write 5 paired statements to identify them all).
10. The more similarities the group of organisms has, the more difficult it is to develop the key. Choose organisms that are really different from one another and the key will be easier to make. Here's one that I did all by my little old self!!!!

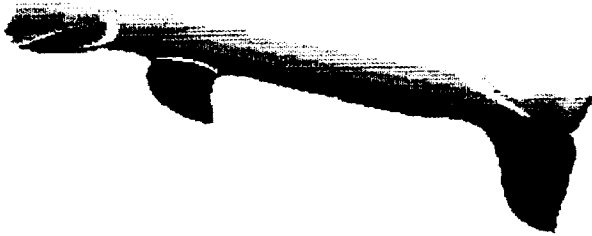
WHALE DICHOTOMOUS KEY

- | | | |
|-----|---|----------------|
| 1a. | If the whale has teeth & eats squid | go to 2 |
| 1b | If the whale doesn't have teeth & eats krill | go to 3 |
| 2a | If the whale has teeth on the upper and lower jaw | go to 4 |
| 2b | If the whale has a long tooth forming a tusk | Narwhal |
| 3a | If the whale is very large over 100 tons | Blue Whale |
| 3b | If the whale is under 100 tons | go to 5 |
| 4a | If the whale has an enormous box-like head, small fins | Sperm Whale |
| 4b | If the whale has a streamlined head, fins proportionate | go to 6 |
| 5a | If the whale has long fins over 3/4 length of body | Humpback Whale |
| 5b | If the whale's fins are proportionate to the body | go to 7 |
| 6a | If the whale's coloration in black and white | Killer Whale |
| 6b | If the whale is pure white | Beluga |
| 7a | If the whale is found in all oceans | Right Whale |
| 7b | If the whale is found only in Northern oceans | Grey Whale |



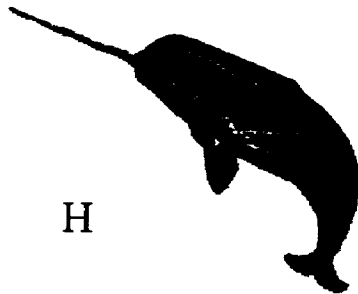
F

Name: *Balaenoptera musculus*
Diet: krill and other crustaceans, *baleen plates no teeth*
Habitat: offshore and inshore
Weight: 100-120 tons
Range: A patch distribution all over the world. Found mostly in cold water and open seas.



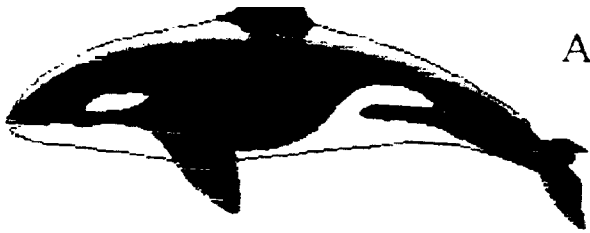
G

Name: *Delphinapterus leucas*
Diet: fish, and other crustaceans, squid or octopus, *teeth upper + lower*
Habitat: inshore and offshore
Weight: 0.4-1.5 tons
Range: Circumpolar distribution in seasonally ice-covered waters of the arctic and subarctic.



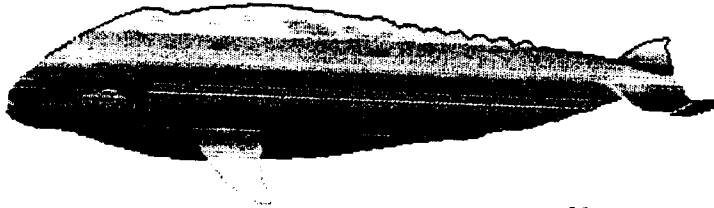
H

Name: *Monodon monoceros*
Diet: fish, squid or octopus, and other crustaceans *teeth upper only*
Habitat: inshore and offshore
Weight: 0.8-1.6 tons
Range: Circumpolar distribution in extreme northern latitudes in association with pack ice.



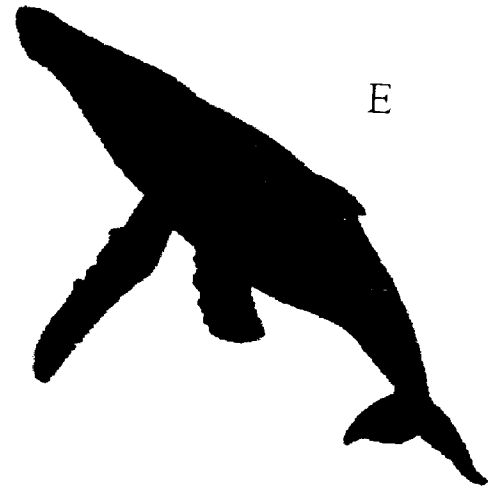
A

Name: (Orca), *Orcinus orca*
Diet: fish, other marine mammals such as seals and sea lions, squid or octopus, *teeth upper + lower*
Habitat: inshore and offshore
Weight: 2.6-9 tons
Range: All oceans, mostly in the polar regions.



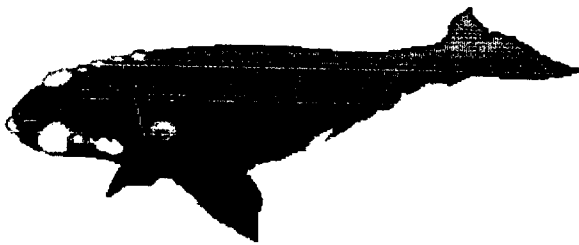
B

Name: *Eschrichtius robustus*
Diet: fish, krill and other crustaceans, *no teeth - baleen*
Habitat: inshore
Weight: 15-35 tons
Range: North Pacific and Arctic Oceans



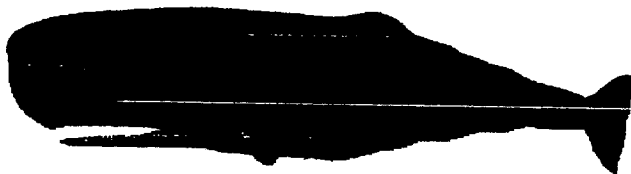
E

Name: *Megaptera novae*
Diet: fish, krill and other crustaceans, *baleen*
Habitat: inshore and offshore
Weight: 25-30 tons



C

Name: *Eubalaena glacialis*
Diet: krill and other crustaceans - *baleen*
Habitat: inshore and offshore
Weight: 30-80 tons
Range: Cold waters of temperate and subpolar regions in both hemispheres.



D

Name: *Physeter macrocephalus*
Diet: squid or octopus, sometimes fish - *teeth upper + lower*
Habitat: offshore and inshore
Weight: 20-50 tons
Range: All over the world in deep waters

ARACHNIDS

MARSUPIALS

INSECTS

PRIMATES

CRUSTACEANS

DOLPHINS

MOLLUSKS

CANINES

ECHINODERMS

BEARS

SHARKS AND RAYS

BIG CATS

BONY FISH

SEALS

BIRDS OF PREY

DEER

AMPHIBIANS

BATS

REPTILES

TREES

PROTISTS

FUNGI

FLOWERING PLANTS

ALGAES

BACTERIAL TYPES

WATER FOWL

SONG BIRDS

DICHOTOMOUS KEY RUBRIC

| | POINTS POSSIBLE | POINTS SCORED |
|------------------------|--------------------|------------------|
| AT LEAST 5 STATEMENTS | 20PTS | _____ |
| AT LEAST 6 PICTURES | 10PTS | _____ |
| DESCRIPTION UNDER EACH | 30PTS | _____ |
| NEAT AND PRESENTABLE | 20PTS | _____ |
| EASY TO FOLLOW | 20PTS | _____ |
| | TOTAL | _____ |