The Education Program at the
New Jersey Sea Grant Consortium
22 Magruder Road Fort Hancock, NJ 07732 732-872-1300 njseagrant.org

CLASSIFICATION AND IDENTIFICATION

OVERVIEW

During this set of activities, students explore diagrammatic and taxonomic keys and their application in the marine sciences.

OBJECTIVES

Following completion of this lesson, the students will be able to:

- Sort and classify objects and organisms based on visual attributes;
- Create their own diagrammatic key;
- Use a **taxonomic key** to identify objects and organisms.

GRADE LEVELS

4^{th} -12^{th} grades

NJCC STANDARDS

Science Indicators:
5.1: End of Grade 4: A2, B1, B2, End of Grade 8: A1, A2, B2;
5.3: End of Grade 4: A2, D1, End of Grade 8: A1;
5.5: End of Grade 2: A2, B1, End of Grade 4: A3, B1, B2,
End of Grade 6: C1, End of Grade 8: B1, B2, B3;
5.7: End of Grade 4: A1, A2; **5.10:** End of Grade 2: A1,
End of Grade 4: A1, End of Grade 6: Al
Mathematics Indicators:
4.1: 6A5, 6C3; **4.2:** 2A1, 2A2, 2A3, 2A4, 4A1, 4A2, 4A3, 4A5, 4B3, 4D5, 6A3, 6A4, 6B2, 8A5, 8A4, 8B3, 12A4; **4.3:** 2A1, 4A1, 6A1, 6B1, 6C1, 8A1, 8C2, 12B1, 12D3; **4.4:** 2A1, 2C1, 4A1, 4C1, 6A1, 6B1, 12A5; **4.5A:** 2, 3, 4, 5; **4.5B:** 2, 3, 4; **4.5C:** 1, 2, 3, 4; **4.5D:** 1, 2, 3, 4, 5, 6; **4.5E:** 1, 2, 3
Visual Arts Indicators:
1.3: 1; **1.4:** 1; **1.6:** 2

MATERIALS

- A bag for each student team (3-4 students each) containing ordinary household items (e.g. straw, coffee stir stick, rubber band,
- paper clip, screw, bolt, washer, button, eraser, plastic lid).
- A bag of seashells common to New Jersey

- Drawing paper, poster board. Glue Colored pencils and/or magic markers
- Four or five different kinds of local marine or estuarine fish
- A taxonomic key for the fish of the area such as the *Illustrated Guide to Hudson River Fishes*.

PROCEDURES

Activity 1: Give each student team a bag with ordinary household items. Instruct the students to divide their objects into two groups using any one observable characteristic. One group of objects will have that characteristic, while the other will not (e.g. hard vs. not hard). Have teams repeat this process until each object has its own group. Have the students draw diagrams of how they sorted their objects which will create a key (see Figure 1). Share and discuss keys. Ask the students to vote on which key is "most correct" and discuss the idea that different ways of grouping are acceptable if they can be justified. Introduce an additional household item unlike any in the original set and ask teams to classify it using their keys. For example using the above items, the button would be classified as a washer if using this key (Figure1). Discuss the need to modifying and expand keys to include different objects.
Activity 2: Have the students repeat this activity using seashells, and when their keys are complete, have them glue the seashells to poster board in the form of a **dichotomous** key.
Activity 3: Have students use the "Key to Common Shells of the Jersey Shore" included in this lesson plan to identify the seashells they have sorted.
Activity 3: Explain to the students that most keys are not pictorial like theirs and supply them with a key to local fish. The students will use these keys to identify actual whole fish obtained from the fish market. Have the students start with the first key characteristic and use the key to identify the name of the fish or Latin name (provide them with the common name, as well). Have the students write down the number of each step that they followed to identify their fish so that they can backtrack if they make a mistake.

BACKGROUND

Systematics is used to **classify** plants and animals into organized groups. This is usually done using physical characteristics, presuming that organisms that look similar are similar. Once organisms are classified and each organism is in a group by itself, organisms can be named, and a taxonomic key can be created. Usually keys are dichotomous, dividing organisms into groups of two at each step of the key. There are different levels of classification, and at each taxonomic level, organism groups are described on more specific and less general details until the species level is reached. This creates a hierarchical system of nomenclature and grouping organisms. Kingdom is the broadest category, and species is the narrowest category (see Figure 1).

VOCABULARY

Anterior canal – opening at the bottom-most part of the shell aperture.

Aperture – opening of a shell.

Apex – uppermost tip of a shell.

Axial – markings on a shell that cross the whorls, running from apex to anterior canal or umbo to lateral margin.

Beak - umbo

Bivalve – a two piece shell.

Body whorl – the large whorl, containing the aperture, in which the snail lives.

Classify - The arrangement of anything into groups or categories.

Concentric grooves – grooves which spread out from the umbo like ripples, following the shape of the shell.

Dichotomous - Anything divided into two parts.

Periostracum – outer layer or covering of a shell, sometimes rough.

Shoulder – the top surface of a whorl.

Spire - all the whorls of the shell above the body whorl and to the apex.

Suture – the grooves separating whorls.

Systematics - The classification and study of organisms with regard to their *presumed* natural relationships.

Taxonomy/Taxonomic Key- The system of nomenclature (naming) for plants and animals based on their orderly classification into groups. An aid to identification. An arrangement of the descriptive characters which define a group of objects, taxa, plants or animals and facilitate identification.

Umbilicus – a hollow core, opening at the base of the shell, around which the whorls coil.

Umbo – bump at apex of shell, above hinge in bivalves, also called beak.

Univalve – a one piece shell.

Valve – one shell of a bivalve.

Ventral margin – lower outer edge of a bivalve shell.

Whorl – an individual turn or coil of a shell.

REFERENCES

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Robins, C.R., G.C. Ray and J. Douglass. 1986. The Peterson Field Guide Series - A Field Guide to Atlantic Coast Fishes of North America. Houghton Mifflin Company, Boston. 354 pp.

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Rev. 11/11/10

Figure 1:

HIERARCHICAL SYSTEM OF CLASSIFICATION

KINGDOM

PHYLUM

CLASS

ORDER

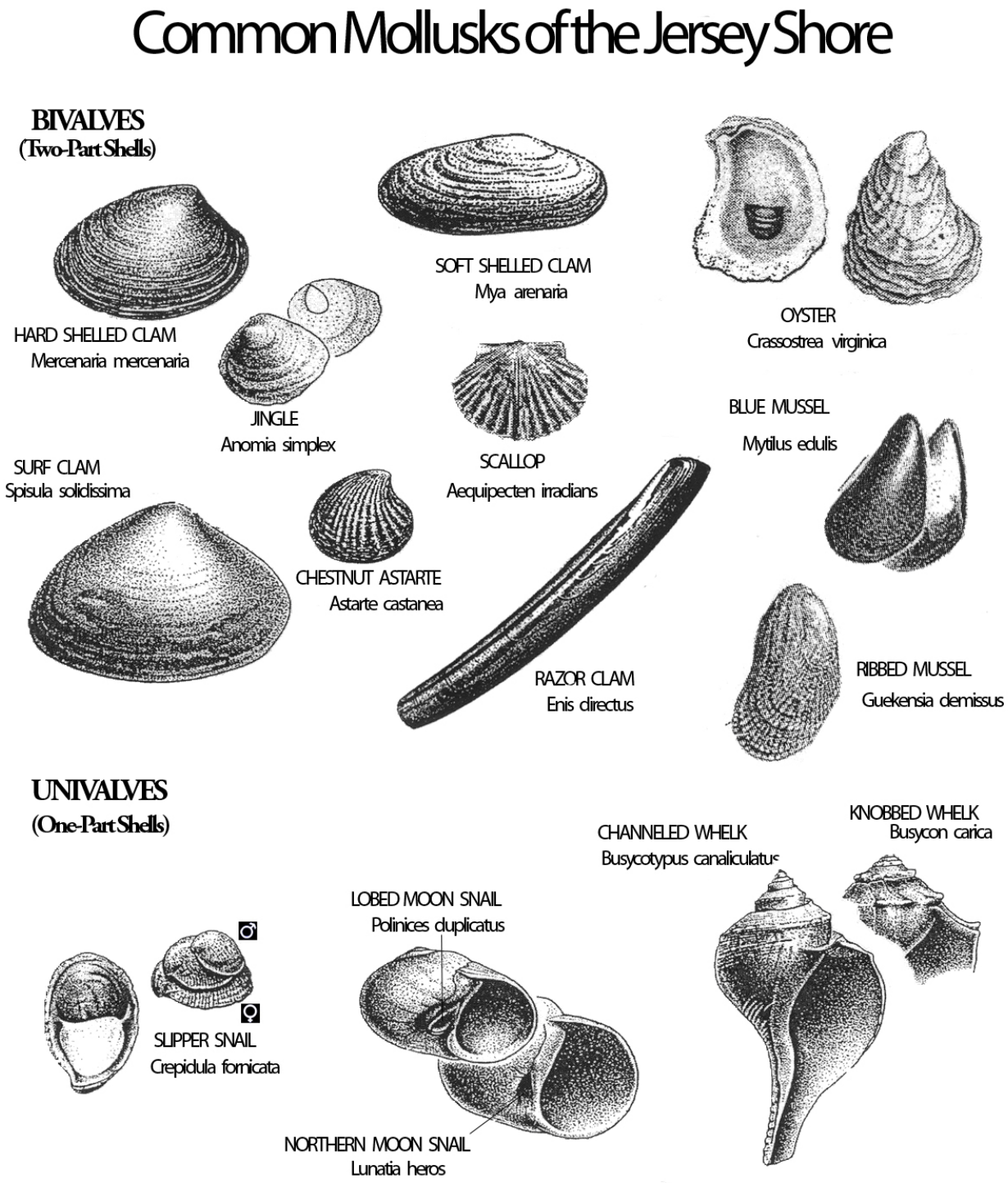
FAMILY

GENUS

SPECIES

Other taxonomic levels include subphylum, subclass, superorder, suborder, superfamily, subfamily, and strain (within a species), but these are not used for most organisms. In plant taxonomy, the term *division* is uses in place of phylum.

Figure 2:



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Key To The Common Shells
Of The Jersey Shore

HOW TO USE A TAXONOMIC KEY:

1) Many keys will provide pictures and diagrams to illustrate descriptions and indicate external features that one must recognize to be able to use the key. Study diagrams of anatomy first to become familiar with the terminology, and refer back to the diagram as necessary.

2) Start with the first couplet of the key and decide which set of characters describes the organism being identified (a or b).

3) Move to the next couplet as indicated at the end of the set of characters chosen, and repeat these steps until the organism has been identified.

1. a. **Univalve** – (1 shell)……..2
   b. **Bivalve** – (2 shells)……12

2. a. Shell body not spiral or twisted……3
   b. Shell body spiral or partly spiral……..4

3. a. Shell cone shaped with **apex** slightly off center and **aperture** oval……LIMPET
   Acmaea testudinalis
   b. Shell dome shaped, **aperture** oval with a thin internal plate covering half.….SLIPPER SNAIL
   Crepidula fornicata

4. a. **Spire** almost flat, **aperture** wide……5
   b. **Spire** short to medium in length……..6
   c. **Spire** elongated…….10

5. a. Shell smooth, few **whorls**, large **umbilicus** extending to **apex**.…NORTHERN MOON SNAIL
   Lunatia heros
   b. Shell smooth, few **whorls**, large **umbilicus** partially covered by a thick brown lobe……..……LOBED MOON SHELL or SHARK EYE
   Polinices duplicatus

6. a. Shell wider than it is long……..……7
   b. Shell longer than it is wide……..8

7. a. **Aperture** circular, lip simple, few whorls, shell dark ……SMOOTH PERIWINKLE
   Littorina obtusata
   b. **Aperture** oval or circular, lip simple, few whorls, light color with brown spiral stripes…… .…….COMMON PERIWINKLE
   Littorina littorea

8. a. Shell spirals to the right (with **aperture** facing you and **apex** pointing up, aperture is to the right)……..9

b. Shell spirals to the left, small knobs on **shoulders**, **axial** brown streaks.....LIGHTING WHELK
Busycon contrarium

9. a. **Aperture** cream to red in color, knobs on **shoulders**, **sutures** not channeled……..KNOBBED WHELK
Busycon carica

b. **Aperture** yellowish-brown deep channel in **suture**, **shoulders** look like terraces……CHANNELED WHELK
Busycon canaliculatum

10.a. **Spire** usually badly eroded, dark brown shell, to 1 inch long……MUD SNAIL
Nassarius obsoletus

b. **Spire** not eroded ……..11

11.a. **Suture** channeled, **whorls** finely beaded to ¾ inch long……..BASKET WHELK or NEW ENGLAND DOG WHELK
Nassarius trivitattus

b. **Suture** not channeled, ridges on outer lip ribbed from **apex** to anterior canal…….OYSTER DRILL
Urosalpinx cinarea

12.a. Shell longer from **umbo** to **ventral margin** than wide……..13

b. Shell approximately equal in length or shorter from **umbo** to ventral margin than wide……15

13.a. Shell thin…… ……..14

b. Shell thick, rough unequal shape and grayish in color……..COMMON OYSTER
Crassostrea virginica

14.a. **Beak** at **apex** of shell, shell smooth and bluish in color…….BLUE MUSSEL
Mytilus edulis

b. **Axial** ribbing present, brownish shell……..RIBBED MUSSEL
Modiolus demissus

15.a. **Axial** ribbing present……BAY SCALLOP
Aequipecten irradians

b. **Axial** ribbing absent……16

16.a. Shell strong and thick……..17

b. Shell thin and /or brittle……..19

17.a. Shell small, triangular, some have concentric grooves…….CHESTNUT ASTARTE
Astarte castanea

b. Shell large or not triangular……18

18.a. Shell approximately as long as it is wide, outer shell grayish/white, inner surface white with purple along **lateral margin**.....QUAHOG or HARD SHELL CLAM
Mercenaria mercenaria

b. Shell wider than it is long, large, hinged with two teeth, usually white…….SURF CLAM
Spisula solidissima

19.a. Shell rounded and warped, very thin, bright and pearly, black, cream, or orange……JINGLE SHELL
Anomia simplex

b. Shell long or oval shaped……..20

20.a. Shell oval in shape, with a spoon-shaped shelf in the hinge……..SOFT SHELL CLAM
Mya arenaria

b. Shell much longer than wide, valves sharp, shell curved and covered with a thin, brownish or olive colored **periostracum**……RAZOR CLAM
Ensis directus

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CLASSIFICATION AND IDENTIFICATION ACTIVITY

Please fill in the blank with the name of the shell when you find it.

Common Name Scientific Name

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____