



**NMEA Anchorage, Alaska
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Creature Features

Creating a Complex Invertebrate Creature

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Grade level: 1st – 12th (can be adapted for all ages)

Time Required: 2 class periods

I. Course of Study Alabama Course of Study (ALCOS):

1st Grade, Life Science, Content Standard 4

Describe survival traits of living things, including color, shape, size, texture, and covering.

2nd Grade, Life Science, Content Standard 6

Identify characteristics of animals, including behavior, size, and body covering.

3rd Grade, Life Science, Content Standard 8

Identify how organisms are classified in the Animalia and Plantae kingdoms

4th Grade, Life Science, Content Standard 6

Classify animals as vertebrates or invertebrates and as endotherms or ectotherms.

7th Grade, Life Science, Content Standard 1

Describe characteristics common to living things, including growth and development, reproduction, cellular organization, use of energy, exchange of gases, and response to the environment.

7th Grade, Life Science, Content Standard 4

Describe organisms in the six-kingdom classification system by their characteristics.

7th Grade, Life Science, Content Standard 5

Identify major differences between plants and animals, including internal structures, external structures, methods of locomotion, methods of reproduction, and stages of development.

7th Grade, Life Science, Content Standard 7

Describe biotic and abiotic factors in the environment.

9th – 12th Grade, Anatomy and Physiology Elective, Content Standard 1

Use appropriate anatomical terminology.

9th – 12th Grade, Biology Core, Content Standard 5

Identify cells, tissues, organs, organ systems, organisms, populations, communities, and ecosystems as levels of organization in the biosphere.

9th – 12th Grade, Biology Core, Content Standard 11

Classify animals according to type of skeletal structure, method of fertilization and reproduction, body symmetry, body coverings, and locomotion.

9th – 12th Grade, Biology Core, Content Standard 12

Describe protective adaptations of animals, including mimicry, camouflage, beak type, migration, and hibernation

9th – 12th Grade, Biology Core, Content Standard 16

Identify density-dependent and density-independent limiting factors that affect populations in an ecosystem.

9th – 12th Grade, Marine Science Elective Core, Content Standard 6

Describe components of major marine ecosystems, including estuaries, coral reefs, benthic communities, and open-ocean communities.





9th – 12th Grade, Marine Science Elective Core, Content Standard 7

Identify patterns and interrelationships among producers, consumers, scavengers, and decomposers in a marine ecosystem.

9th – 12th Grade, Marine Science Elective Core, Content Standard 10

Describe the anatomy and physiology of representative aquatic organisms.

9th – 12th Grade, Zoology Elective Core, Content Standard 1

Define basic anatomical terminology associated with the study of animals.

9th – 12th Grade, Zoology Elective Core, Content Standard 3

Identify the body symmetry of animals as radial, bilateral, or asymmetrical.

9th – 12th Grade, Zoology Elective Core, Content Standard 4

Use taxonomic groupings to differentiate the structure and physiology of invertebrates with dichotomous keys

9th – 12th Grade, Zoology Elective Core, Content Standard 6

Identify factors used to distinguish species, including behavioral differences and reproductive isolation.

9th – 12th Grade, Zoology Elective Core, Content Standard 7

Explain how species adapt to changing environments to enhance survival and reproductive success, including changes in structure, behavior, or physiology.

National Science Education Standards:

Life Science E.C.1 Characteristics of Organisms

Life Science E.C.2 Life Cycles of Organisms

Life Science M.C.2 Reproduction and Heredity

Life Science M.C.5 Diversity and adaptations of organisms

Life Science H.C.6 Behavior of organisms

Ocean Literacy Standards

Essential Principle 5 *The ocean supports a great diversity of life and ecosystems.*

II. Concepts

Invertebrate definition: animals without a backbone. Unfortunately this doesn't tell us much about what Invertebrates are, only what they lack. Lumping all Invertebrates together just by saying they don't have one thing is misleading, because Invertebrates are so amazingly different from one another.

This group accounts for 97% of all animal species. They range from the super simple sea sponges to the complex camouflaging octopus. Animals are classified into taxonomic categories based on common characteristics. From largest to smallest they are Kingdom, Phylum, Class, Order, Family, Genus and species. There are about 30





Phyla of Invertebrates, but some of the main ones are Porifera, Cnidaria, Mollusca, Annelida, Arthropoda, Bryozoa, Chaetognatha and Echinodermata.

This activity can be used as a culmination or a creative extension after studying each of the Invertebrate Phyla and Classes. Students will need to have extensive knowledge about each of the Phyla and know the main characteristics (style of locomotion, feeding and defense mechanisms, method of reproduction, habitat, etc.).

III. Behavioral Objectives:

TSWBAT:

1. Describe characteristics common to each of the Invertebrate Phyla studied in this lesson.
2. Work in teams to create a new Invertebrate creature with one characteristic from each Phyla studied in this lesson.

IV. Materials

PowerPoint/Computer

Craft objects: an assortment of items you might have on-hand (construction paper, toilet paper tubes, plastic water bottles, aluminum foil, plastic beads, toothpicks, googly-eyes, pipe cleaners, paper clips, glue, tape, etc.)

V. Teaching/Learning Procedures/Instructional Procedures

A discussion or lecture about each of the Marine Invertebrate Phyla is necessary for the students to create this new amazing creature! Once a thorough understanding of the diversity of the Invertebrate group is achieved, students will be divided into small groups. They will be tasked with the challenge of creating a new Invertebrate creature having one (and only one) characteristic from each of the Phyla studied in class. Details about this new creature will be recorded on

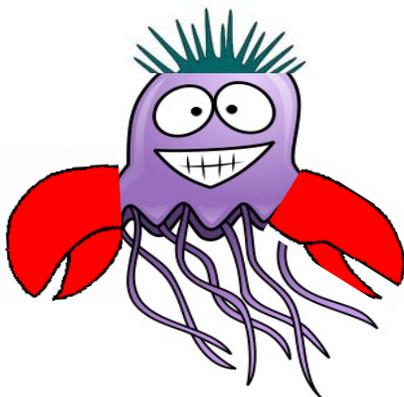




the handout (below), such as name of creature, locomotion, habitat, predators, prey, and method of defense. An animal will be created with the craft items the teacher provides (with any limitations or requests being set by the teacher). A story or a scientific report needs to be developed about the new animal species created. Be thorough in describing this new species. The story/scientific report can be read aloud to the class as the students show off their new creature. A poll can be taken at the end to see which of the new creatures would dominate in the ocean and which of the new creatures would be eaten by another new creature created.



Names of group members: _____



Creature Features

Your mission: to create a new Invertebrate species that has **one** (and only one) characteristic of each Marine Invertebrate Phyla studied in this lesson.

Things to determine: where this animal lives, its mode of locomotion, food preferences, predators, and defense mechanisms.

Create it: make your animal out of “stuff” that is offered to you (newspaper, toothpicks, duct tape, beads, saran wrap, cups, etc.).

Write about it: come up with a descriptive “story”/scientific report about your animal, along with a name for this new species (on a separate piece of paper).

Name of species: _____

Habitat: _____

Locomotion: _____

Prey: _____

Predators: _____

Defense mechanisms: _____

Anything else specific to your new species: _____

INVERTEBRATE FACT SHEET:

*PHYLUM PORIFERA – “pore-bearing” SPONGES

Distinguishing characteristics:

- ~Lack true tissue – most primitive of multi-cellular animals
- ~No organs, cells loosely organized into layers
- ~Most have no definite shape – depends on substrate & environmental factors
- ~Body covered with series of holes – pores



Skeleton: composed of calcareous spicules, siliceous spicules, protein spongin fibers, or a combo of the latter two

Symmetry: some are radially symmetrical, but most are irregular and exhibit erect, encrusting, or branching growth patterns

Lifestyle: sessile

Feeding mechanism: filter feeder, dependent on movement of water through body

Defense strategy: release of toxic chemicals - to prevent fouling organisms from attaching; to prevent overcrowding on the reef

*PHYLUM CNIDARIA – “knife-bearing” HYDRAS, JELLIES, ANEMONES, & CORAL

Distinguishing characteristics:

- ~Cnidocytes – (unique to phylum) specialized cells that contain Cnidae – tiny capsules that contain a coiled tubule and venom. 2 types of cnidae: Nematocysts (toxic) & Spirocysts (sticky)
- ~Gut cavity –incomplete – eat and “poo” through same hole
- ~Limited organ development, nerve net (mouth), no eyes, no brain



Symmetry & Lifestyle: Radial symmetry, hydrostatic skeleton, body forms: polyps = sessile, medusa = free – swimming

*PHYLUM PLATYHELMINTHES: FLATWORMS

Distinguishing characteristics:

- ~Central nervous system – 1st animal with a brain
- ~Eyes sense intensity & direction of light
- ~Muscles with cilia move over a slime layer
- ~Mouth only, no anus



Symmetry: bilateral

Lifestyle: free-living, parasitic

*PHYLUM ANNELIDA – SEGMENTED WORMS

Distinguishing characteristics:

- ~Segmented body
- ~Hydraulic skeleton – muscles change body shape to move



~Some have sensory antennae

Lifestyle: May be burrowers or tube dwellers

Feeding mechanism: carnivores, deposit feeders, suspension feeders

***PHYLUM MOLLUSCA:** “soft body” CLAMS, SNAILS, CHITONS, SQUID, OCTOPUS

Distinguishing characteristics:

- ~Muscular foot
- ~Calcereous shell secreted by mantle
- ~Feeding organ – radula
- ~2nd largest group of invertebrates, next to Arthropods



***CLASS GASTROPODA:** “stomach foot” SNAILS & SEA SLUGS

Distinguishing characteristics:

- 4 major changes from a generalized mollusk:
 - ~Development of a head
 - ~Dorsoventral elongation of the body
 - ~Conversion of shell from shield to deep protective retreat – asymmetrical spiral shell
 - ~Torsion – twisting of the body



Lifestyle: Mobile animals – foot (clam), arms (Octopus)

Feeding mechanism: radula - herbivores, carnivores, scavengers, deposit feeders, suspension feeders, parasites

***CLASS BIVALVIA:** “two valves” CLAMS, OYSTERS, MUSSELS, SCALLOPS

Distinguishing characteristics:

- ~Laterally compressed, foot is also laterally compressed
- ~2 shells completely enclose body
- ~Reduced head



Lifestyle: Benthic animals – burrow, bore, attach, or free-living (scallops swim to escape predators by clapping their shells together)

Feeding mechanism: filter feeders, use gills, radula absent

***CLASS CEPHALOPODA:** “head foot” NAUTILUS, CUTTLEFISH, SQUID, OCTOPUS

Distinguishing characteristics:

- ~Head projects into circle of prehensile tentacles (arms) – suction cups
- ~Largest of all invertebrates
- ~Most have reduced or no shell



Lifestyle: Pelagic and/or benthic, move by jet propulsion, crawl across bottom using arms

Feeding mechanism: beak, radula, cuttlefish and octopus have poison glands

Defense Strategies: chromatophores, ink gland, highly developed eyes

***PHYLUM ARTHROPODA:** “jointed feet” CRABS, SHRIMP, LOBSTERS, HORSESHOE CRABS

Distinguishing characteristics:

- ~Makes up 80% of all described animals species
- ~Jointed appendages – locomotion
- ~Segmented body
- ~Exoskeleton of chitin –molt, muscles attached to exoskeleton
- ~Most have eyes, vary greatly in complexity
- ~Sensory devices – hairs or bristles



***SUBPHYLUM CHELICERATA:** Horseshoe Crabs, Sea Spiders, Spiders, Scorpions

Distinguishing characteristics:

- ~Body divided into Cephalothorax (prosoma) and abdomen (opisthosoma)
- ~Lack antennae (only subphyla of Arthropods)
- ~Chelicerae – 1st pair of appendages, feeding
- ~Pedipalps – 2nd pair of appendages – function differently in each group
- ~Pedipalps followed by 4 pairs of legs
- ~Book lungs/gills
- ~Marine classes - Merostomata – horseshoe crabs, Pycnogonida – sea spiders
- ~Terrestrial class -Arachnida - spiders



***SUBPHYLUM CRUSTACEA:** copepods, barnacles, shrimps, lobsters & crabs

Distinguishing characteristics:

- ~Head bears 5 pairs of appendages
- ~2 pairs of antennae - distinguishing feature of Crustaceans
- ~3rd pair of appendages - mandibles
- ~2 pairs of accessory feeding appendages - 1st maxillae, 2nd maxillae
- ~Gills



Lifestyle: planktonic larvae, benthic

Feeding mechanisms: suspension feeders, filter feeders, predators

***PHYLUM ECHINODERMATA:** “spiny skin” Sea Stars, Sand Dollars, Sea Urchins, Sea Cucumbers

Distinguishing characteristics:

- ~Internal skeleton – calcareous ossicles, flexible joints – sea stars & brittle stars, rigid skeletal shell (test) – sea urchins & sand dollars
- ~Water vascular system – unique internal plumbing, tube feet
- ~Regeneration
- ~Mutable (catch) connective tissue - only animals that have this



Symmetry: Pentamerous radial symmetry – divide body into 5 equal parts

Lifestyle: planktonic larvae, benthic

Feeding mechanisms: carnivorous, herbivorous, omnivorous, scavengers, filter feeders, deposit feeders