

LESSON 12

Title: The Chain of Command (Food Chain and Food Web)

Content Area Subjects: English Language Arts, Science, Math, Visual and Performing Arts

Grade level(s): Grades 3-12+

Standard(s):

Maine Learning Results

- Career and Educational Development. Interpersonal Skills (A3.pre-k to diploma.a,c)
- ELA. Informational texts (A3.3.c); (A3.3.e); (A3.6.e); A3.9-diploma.b); Research (C1.3-5.a,c,d)(C1.6-8.g); (C1.9-diploma.a,c); Listening (E1.3-diploma.c); (E1. 9-diploma.a); Speaking (E2.3-8.d); (E2. 9-diploma.a)
- Health and Physical Education. Cooperative Skills (I1.pre-k to diploma.a-d); Responsible Behavior (I2.pre-k to diploma)
- Math. Data (B1.4-8.a,b); (B1.9-diploma); Measurement and Approximation (B1.4-diploma.a,b); (B1.9-diploma.a,b,c); (B2.3-6); (B2.7.1a, 1b); (B2.8-diploma.3)
- Science. Scientific Inquiry and Technological Design (B1.3-diploma.a); (B1.3-diploma.b); (B1.3-diploma.c); (B1.3-diploma.d); (C1.3-diploma.a)
- Social Studies. Taking Action Using Social Studies Knowledge and skills (A3.3-diploma)

Common Core:

- ELA. (V.3-12.6); (SL.3-12.1c); (SL.3-5.1); (L.3.5b);(L.3.5b)
- Science and Technology. (R.6-12.4); (R.7-12.4)

STEM Skills

Brief Description: The importance of the food web/chain is a concept that should be introduced as early as students can understand it. Its concepts can be explained as simply or as in as much detail as the students can comprehend. This lesson will give an overview of the food chain/web as it relates to marine life in the state of Maine, using the species listed on the Department of Marine Resources of Maine at www.maine.gov/dmr at the link "Species Info" and Downeast Institute as resources.

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Students will make species cards, and then use those cards in a food chain/web class demonstration.

Adaptations for different age level/abilities:

This lesson can be adapted for the age of the students. The lesson for the younger students would be simple food chains, whereas the older students could work with more complex food webs.

Objectives/Goals: After completing this lesson, the students will be able to:

realize that the food chain/web is a very complex system that continually changes

recognize the importance of the food chain/web to all living creatures

understand that each level of the food chain/web is important and that all marine species are dependent on each other for food

identify local marine species and place them at a level on the food chain/web

realize that humans depend on the food chain/web, play an important part in its preservation, and have the ability to destroy or alter the food chain/web if they are not good stewards of the environment

Time needed: Approximately one hour to research and make the species cards and one half hour to do the chain/web class activity

Keywords:

Apex predator – a top predator in a food chain

Consumer - an organism that gets food from eating other organisms

Food Chain - the transfer of food energy from one organism to other organisms

Food Web – A complex system of interconnected food chains

Organism – A living system such as a plant, animal, fungus, or microorganism

Omnivore – a species that eats both plants and animals

Plankton, (Phyto and Zoo) - microscopic plants (phytoplankton) and animals (zooplankton) that are free floating drifters with their movements controlled by ocean tides and currents; an important food source in the marine food web.

Predator - an animal that hunts and captures other animals for food

Primary Consumer – a species that eats plants; a herbivore

Primary Producer - an organism that makes its own food from the energy of the sun, such as phytoplankton and algae-Producers form the base of the food web.

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Secondary Consumer – a carnivore; a species that eats herbivores

Tertiary Consumer – a carnivore that eats another carnivore

Trophic levels – the feeding levels in a food chain/web

Key Questions:

What is a food chain?

How is it different from a food web?

How is plankton important to the food web/chain?

What is the difference between phytoplankton and zooplankton?

What is the difference between a consumer and a producer in a food chain?

How could a natural disaster, environmental disaster, or some other action/event upset the balance of the food web/chain?

What does the regulation of a fishery attempt to do for a food chain?

How can we as individuals help to keep a food chain in balance?

Where else do you observe food chains in your natural environment?

Materials Needed:

- A large ball of string, twine, or yarn. (100+ feet)
- Master species list (enough for all students, depending on their age)
- Master vocabulary definition list (for instructor)
- Species list from Department of Marine Resources website and DEI
- Pictures of various plants and animals which could be posted throughout the classroom area (DMR allows printing of its cards with a courtesy statement)
- Drawing pencils, colored pencils or markers, crayons (enough for the class)
- Blank index cards for species. (A suggestion would be to use the species list to involve as many of the species observed locally, and then later expand it to include other Atlantic Ocean species)(A suggestion would be to produce student made species cards and laminate them for later uses-such as a classroom food chain/web or later repeats of the web activity)
- A worksheet titled “Species List for Lesson 12
- A worksheet titled “Information Needed for Species Cards” that lists some local species, the information needed for each card (common name, binomial name, adult length and weight of species, what it preys on, what preys on it, 2 more facts about the species) or this information can be written on the blackboard, whiteboard, or chart for all students to see
- Paper clips or scotch tape
- Worksheet “My Research Notes about” for an extension activity

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The Procedure:

Introduction:

The Instructor will say, “Today we are going to learn more about the food chain/web that occurs in the natural environment. We are going to focus on the marine food chain/web that exists in the Northeast Coast of the United States, particularly Maine. There are many species of plants and animals, and our food chain/web will touch just a very small portion of the complex food web that occurs in our world”.

The Instructor can print and hang up various pictures of species from each level of the food chain/web in the classroom for students to see. Plankton is at the base of the marine and estuarine food web.

The Instructor can explain the interdependence of living things on each other. Food is consumed throughout the food chain, and the energy created by the producers keeps other species alive and functioning. The Instructor can explain that a Food Web is made up of various interconnected Food Chains. The Instructor will explain the importance of the sun to plants, such as phytoplankton, which are at the base of the marine food chain/web. Phytoplankton, called primary producers, use the sun's energy as food, and produce food for many other organisms that can be called consumers. The amount of energy that is available depends on the plankton base. A very small consumer, zooplankton, eats phytoplankton and the cycle begins. The Instructor will explain the basic pattern that occurs in a food chain and introduce an organism from each level.

- At the 1st trophic or feeding level, primary producers or phytoplankton use the sun's energy to produce its own food; this feeding level occurs in the water where photosynthesis can take place
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- At the 2nd trophic or feeding level, phytoplankton are eaten by primary consumers/herbivores such as zooplankton;
- at the 3rd trophic or feeding level, the primary consumers/herbivores are eaten by secondary consumers/carnivores;
- **note:** some sources will group 3-5 as one trophic feeding level; others will separate the levels as shown below:
- at the 4th trophic or feeding level, carnivores are eaten by other carnivores; secondary consumers are eaten by tertiary consumers;

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- Depending on the source consulted, a 5th trophic or feeding level may be included, in this level are the carnivores or omnivores which have no predator (humans); some sources call these carnivores or omnivores apex predators

Depending on the student age, the discussion can continue to cover species interdependence, increasing amount of food consumed in relation to the size of a species as it develops to maturity, and the concept of multiple food chains within a single food web.

The extension activities at the end of this lesson will provide some information for the Instructor who wishes to continue to pursue more in-depth study of the food chain/food web.

Main Activity

Once the students understand the basic concept of the Food Chain/Web, have the students sketch some species card pictures, using the pictures the instructor has provided, Or depending on the students' age, have them research other books and web sites for information and pictures to sketch.

Students will sketch the organism for one species card, print its name and binomial name on the same side as the sketch and print the other information about the species on the flip side of the card – such as what it eats, and its average weight and length as listed in the worksheet “Information Needed for Species Cards” (The Instructor can print this other information on the cards or have older students help, if the students are too young to do so)

If there is time or the instructor wishes to further develop the Food Chain concept, the students could do one card from each general category, (sun, plankton, fish, bigger fish, mammals). The Instructor could supply the sun or have one student draw the sun card. (Suggestion - The sketching of the species cards could be accomplished prior to the actual lesson)

After the cards are complete, have the students form a circle and randomly select a species card. (Prior to having the students start to select cards, the Instructor should make sure that cards from each category in the food chain are included and in the ratio suggested: 4 phytoplankton cards and 4 zooplankton cards to each other predator card. This will ensure a more complete and realistic chain/web. A suggested list of cards to use for a game is included with this lesson. The ratio of organisms up the chain is more realistic to marine life in coastal Maine if the list is followed.)

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In the event that the class is too small, the Instructor could arrange for another class to join in for this activity or have the students hold more than one card.

The students would be more apt to choose top predators than organisms lower on the food chain, so it is important to get the appropriate cards out for the demonstration. The Instructor can sit in the center and be the “sun” or have a student sit in the center, as the instructor reminds the class of the importance of the sun to the start of the chain by providing what the phytoplankton needs to start the process. The Instructor or student “sun” holds the start of the twine or yarn ball. (As a suggestion, if the students are very young, it might be helpful for the instructor to be outside the circle in case a student accidentally drops the twine. It might be helpful as well to have the species cards attached to the students’ clothing to allow their hands to be free—a paperclip could work for this purpose or scotch tape)

From the center “sun”, the Instructor asks, “Who has a card depicting an organism that gets its energy from the sun?” Once an organism is identified correctly (phytoplankton), the instructor points out the information about the species - its common name, its binomial name (review “binomial” if necessary), what organisms it preys upon, and what preys upon it. Remind students that phytoplankton is a producer. As the Instructor gives information, have the twine ball pass from the “sun” to “phytoplankton”, making sure each hangs on to the twine at the same time.

Have the students look at their cards again to see who is holding a card depicting an organism that depends on phytoplankton (zooplankton) and the ball of twine is handed to that student. The passing of the twine will continue in this manner using questions, “What depends on zooplankton for energy?” Have students identify the next species—give its name, and information, etc., until the students reach a top predator, then the “chain” can reverse with the question, “What does this predator (give its name) eat/prey upon?” The ball of twine will pass down the food chain until phytoplankton is reached again, and then the activity can reverse back up to a top predator. All the while, the students hold their “ends” and the web of twine gets more interconnected and intricate.

When all cards have been used or the instructor believes the concept has been adequately presented, and all students have had a chance to share information from at least one card (depending on the class size) have students hold their web above their heads and then look up, so they can gaze at the intricacy of their web as they ponder the interrelationships of species vying for food.

The Instructor could have one student gently tug on the web and discuss how this tug represents the species’ interdependence and connection to each other as important to the survival of each species

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To further illustrate the web concept, for the older students, while students are still holding their web strands as they are seated, have some students pretend they are the phytoplankton and zooplankton and carefully move to a seated-on-the-floor position. **The Instructor might have to help the students roll out a bit more twine so the web doesn't become too tight to hold.** Have some students represent smaller predators by assuming a kneeling position. Have some students remain seated, and some stand to illustrate the top level of predators. (If students are not physically able to move out of their seats, this would be fine as staying in one place further illustrates what species do as they move up and down through the depths of water for food in this 3-dimensional concept, known as “trophic levels” of the food web and the movement of the species.)

Once the 3-dimensional web is completed, discuss what might happen if an event occurred to disrupt the food web, for example if all of the alewives died (student holding Alewife card(s) drops his/her portion of the twine) as a result of a disease or over fishing with no regulation of the resource. What would happen to the food web when just one species is entirely removed? (eventually that chain/web would break down)

Conclusion:

The instructor can conclude the lesson by reviewing the concepts that have been developed, by using the key questions for that review.

Assessment/Extension Activities/Closure/Follow up:

One or more of the following activities could extend the concepts introduced in this lesson:

- Younger students could visit the website www.ecokids.ca ; click on “Wildlife” then “Chain reaction” to play a food chain game that will reinforce concepts. Allow some extra time if students go to this site which is an excellent resource for classroom use.
- Older students could visit Jean Michel’s website “Ocean Adventures” at www.pbs.org/kqed/oceanadventures and click on “Fun & Games”. There are interactive games such as “Predator-Protector” and various other activities.
- All students would have fun with an indoor or outdoor game called “Marsh Munchies” which can be found on the New Jersey Sea Grant website at

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www.njms.org/education/lesson_plans/Marsh_Munchies.pdf which reinforces for them what it would be like to be searching for food in our natural environment

- Have students think about and make a list of events and actions that have had or could have an effect on food chains/webs, then research these events/actions.
- Have students use some of their food chain/web cards and make a classroom display of a food chain. Use the twine to interconnect the species to create the 3-dimensional affect. (The depth of the ocean could be shown in this classroom display if a small portion of the classroom area is used and the ceiling becomes the surface of the ocean with the predators/prey hanging down at different depths.) A bulletin board area is adequate as well.
- Have students draw a food web/chain, using math skills and scale to represent the size of the species.
- For the older student, the food chain sketch could be another more involved marine life food chain/web or the sketch could include other species of plants and animals discovered through individual research of a species to find out similar types of information as was required on the marine life species cards.
- Older students might benefit from more work with “Trophic levels” in a food web. The instructor could let the students explore this concept on their own in an almost “discovery” or “Let’s Find Out” fashion or use the supplied “My Research Notes about” worksheet. Have them find out which trophic level species are at different life stages. After selecting one species of marine animal, have them find out what food it eats, the amount it eats, and the variety it eats at different life stages.