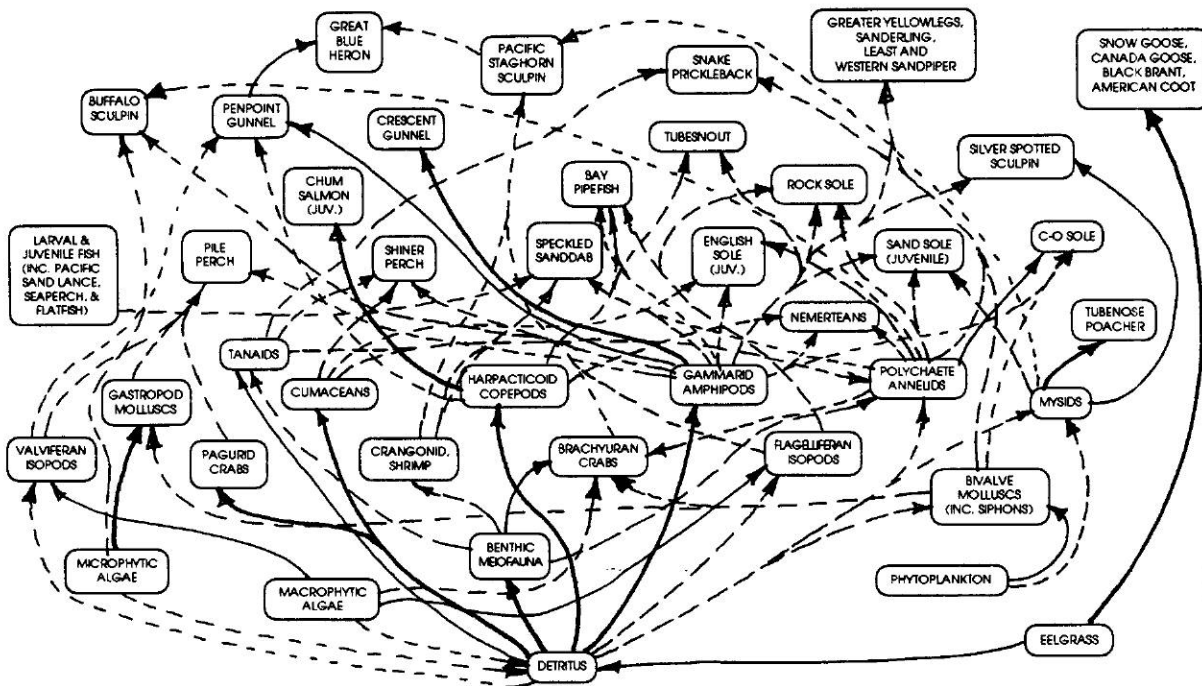


## Teacher Background

# A Tangled Web

The simple food chains we have discussed up until now depict only a small part of a far more complex picture that also includes other foods eaten by each of these animals, as well as the predators which feed on each of them. The tangle of interconnections between animals which feed on one another is known as a food web. Estuary food webs can be terribly complex, as you can see from the example below:



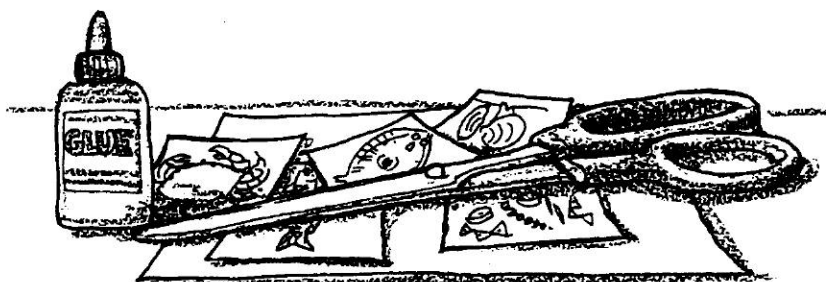
EELGRASS FOOD WEB

- Charles Simenstad, Fisheries Research Institute, UW

But as confusing as a picture like this may seem, is essentially the same food chain discussed in the last two lessons. It just includes a few more organisms!

In A TANGLED WEB, your students will reconstruct a slightly simplified version of this food web and identify the organisms playing the parts of producer, first order, second order, and third order consumer.





## Lesson Plan

# A Tangled Web

### Student Objectives:

- The students will build a model of an estuary food web using a set of cards which describe some important estuary organisms and what they eat.
- They will identify the trophic level of each organism in this food web.

### Materials:

- One set, ESTUARY ANIMAL PAGES per pair of students
- Scissors, one pair per student
- Glue or glue sticks, one per pair of students
- Large sheets of butcher paper, one per pair of students
- One copy per student, A TANGLED WEB

### Procedure:

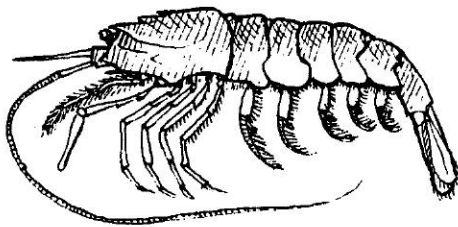
1. Review with your students the terms Producer, 1st Order Consumer, 2nd Order Consumer, and 3rd Order Consumer before having them begin A TANGLED WEB.
2. Have students work in pairs for this activity. Give each pair of students a large piece of butcher paper for their food web chart. After they have read the directions on the student hand-out, they will make vertical columns on their chart and label them as shown below. They will then cut apart the set of 30 Estuary Critter cards. Have the students arrange the cards on the paper in a pattern which represents who eats whom, by placing each organism to the right of the animal or plant it feeds on. The students will find it easiest if they begin by placing the sun at the far left and gradually work to the right, positioning cards under the labels Producers, First Order Consumers, Second Order Consumers, and so forth. When all organisms are positioned adjacent to both their food and their predator, and cards are in the right columns, have the students draw arrows connecting prey to predator, and finally, have them glue down the cards. Then they should then be able to answer the text questions.

### Answer Key:

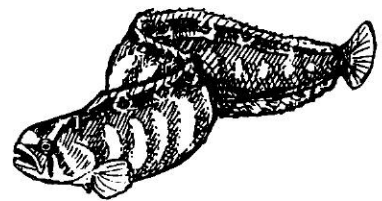
1. The sun will be in the column labeled Energy Source.
2. Plants use sunlight or solar energy to make food.

## LESSON PLAN

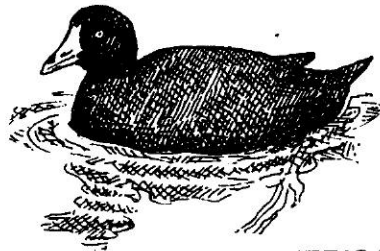
- 3. Producers include phytoplankton and the two eelgrass cards, living eelgrass and dead eelgrass (detritus).**
- 4. 1st order consumers include the black brandt, Canada goose, American coot, shrimp, amphipod, isopod, copepod, segmented worm, little neck clam, and hermit crab.**
- 5. 2nd order consumers include the crescent gunnel, bay pipefish, shiner perch, salmon smolt, tubesnout, C-O sole, English sole, sanddab, moon snail, and sandpiper.**
- 6. Third order consumers include the great blue heron, kingfisher, and sea lion.**
- 7. Eelgrass is eaten by more animals, and plays a more important role in estuary food webs when it is dead.**



SHRIMP  
EATS SMALL MUD FAUNA



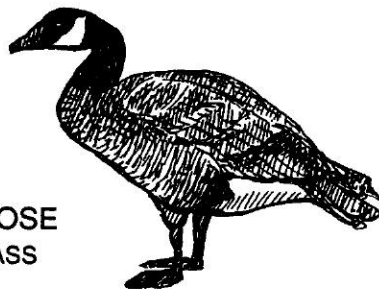
CRESCENT GUNNEL  
EATS AMPHIPODS



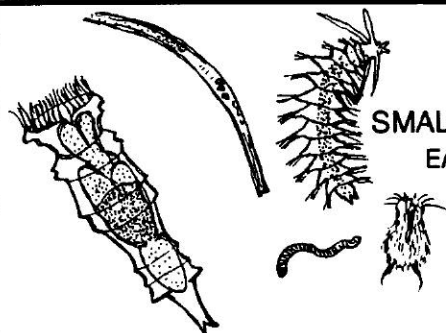
AMERICAN COOT  
EATS EELGRASS



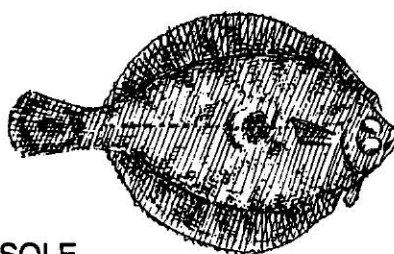
PHYTOPLANKTON  
MAKES ITS OWN FOOD USING SUNLIGHT



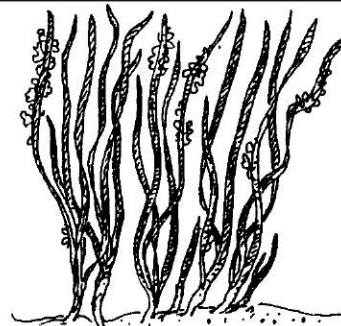
CANADA GOOSE  
EATS EELGRASS



SMALL MUD FAUNA  
EAT DETRITUS



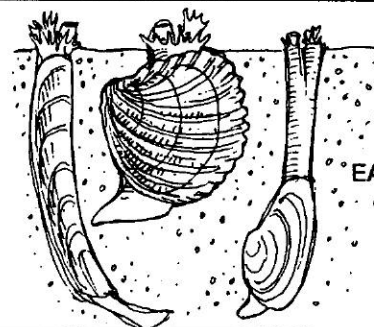
C-O SOLE  
EATS SEGMENTED WORMS



EELGRASS  
MAKES ITS OWN  
FOOD USING  
SUNLIGHT

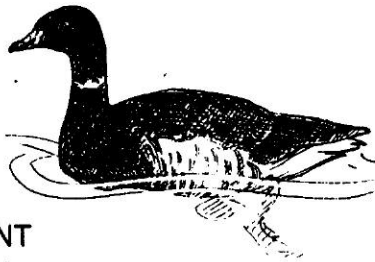


TUBESNOUT  
EATS COPEPODS

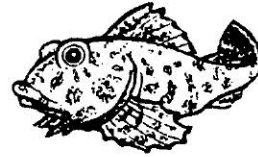


CLAMS  
EAT PHYTOPLANKTON

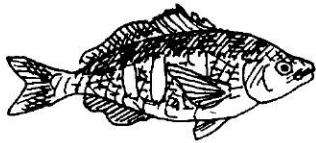




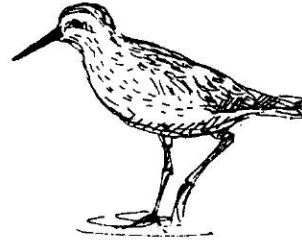
BLACK BRANT  
EATS EELGRASS



SCULPIN  
EATS SHRIMP



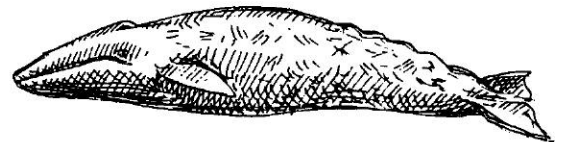
SHINER PERCH  
EATS AMPHIPODS



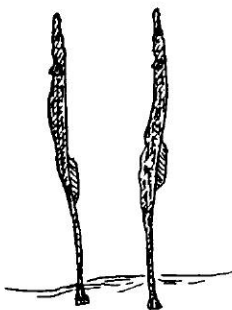
SANDPIPER  
EATS SEGMENTED WORMS



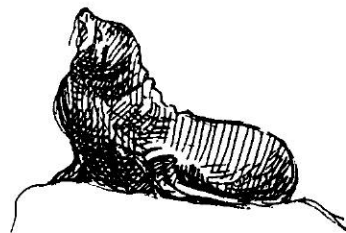
KINGFISHER  
EATS SALMON



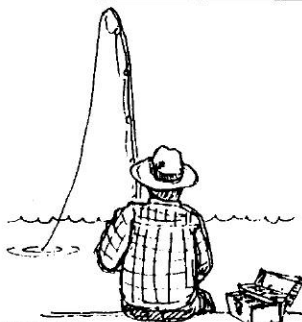
GREY WHALE  
EATS AMPHIPODS



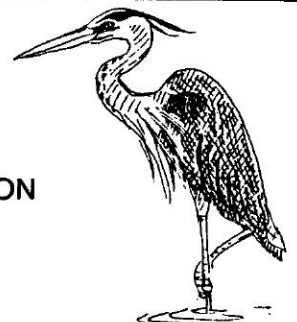
BAY PIPEFISH  
EATS COPEPODS



SEA LION  
EATS SALMON



HUMAN  
EATS SALMON

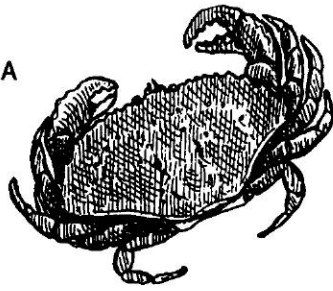


GREAT BLUE HERON  
EATS SALMON





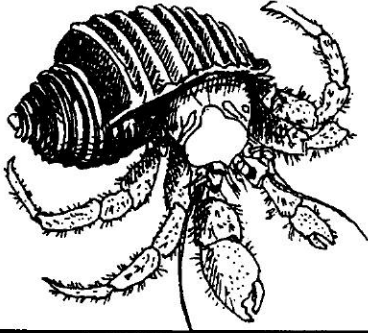
CRAB  
EATS SMALL MUD FAUNA



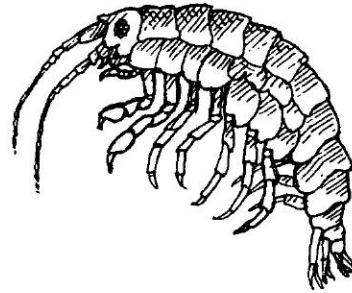
SAND DAB  
EATS SHRIMP



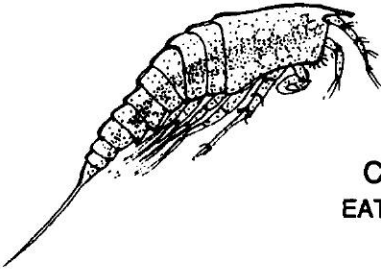
HERMIT CRAB  
EATS DETRITUS



AMPHIPOD  
EATS DETRITUS

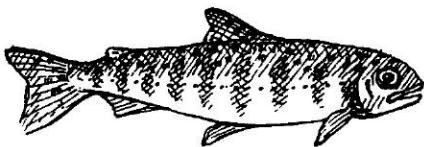


COPEPOD  
EATS DETRITUS

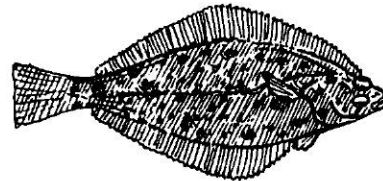


DETRITUS  
(DECAYING EELGRASS)

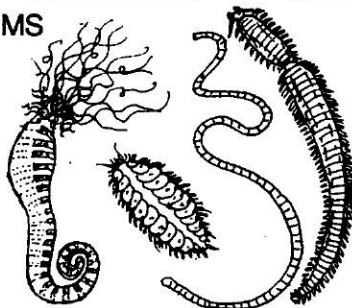
SALMON  
EATS COPEPODS



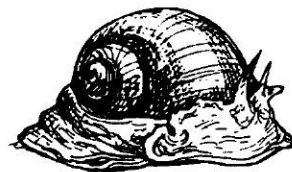
ENGLISH SOLE  
EATS AMPHIPODS



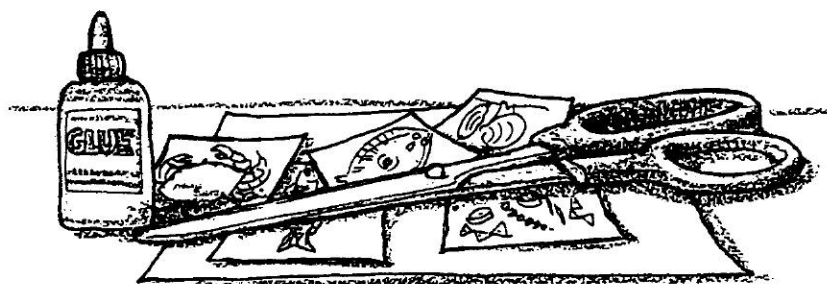
SEGMENTED WORMS  
EATS DETRITUS



MOONSNAIL  
EATS CLAMS







## A Tangled Web

Now that you have become an old hand at working with food chains, its time to take a look at the bigger picture. The bigger picture will take you beyond just the copepods, salmon and herons in an estuary. You will now pull in many other "estuary critters" and build this simple food chain into a complex food web.

### Directions:

- Use a large sheet of paper for your food web chart. Divide your paper into 6 vertical columns by drawing 5 straight lines from top to bottom. The lines should divide your paper into six even rectangles.

*(Hint: Sketch the lines lightly in pencil before making them dark.)*

- Label the columns like this:

Energy Source	Producers	1st Order Consumers	2nd Order Consumers	3rd Order Consumers	4th Order Consumers

- Cut the pages of animal pictures into individual cards.
- Notice that each card tells you what the animal eats. Use this information to arrange your cards on the chart. Place each animal to the right of the plant or animal it eats.

*(Hint: Begin with the far left-hand column, which you have labeled ENERGY SOURCE. Next, look for the cards which belong in the second column, PRODUCERS. Continue working to the right, placing the card of each predator to the right of its prey.)*

Here is an example of just a part of your food web. From the cards, you can see that English sole eat amphipods, and that amphipods eat dead eelgrass, or detritus. You would therefore arrange them like this:

Energy Source	Producer	1st Order Consumer	2nd Order Consumer
sun	detritus (dead eelgrass)	amphipod	English sole

But many other animals also eat detritus. You already know that copepods do. You must add all of these animals to the picture too. Of course you must also add the animals that eat amphipods and the animals that eat copepods. You probably already suspect that this picture could get complicated! It will! For that reason, be sure to take your time carefully planning the arrangement before gluing down any of the cards.

When you are finished, answer these questions:

1. What will go into the column labeled Energy Source?
2. You know a plant doesn't actually "eat" sunlight. What does a plant get from the sun?
3. Which cards did you label as Producers?
4. Which cards did you label as 1st Order Consumers?
5. Which did you label as 2nd Order Consumers?

**6. Which did you label as 3rd Order Consumers?**

**7. Which did you label as 4th Order Consumers?**

**8. In what condition is eelgrass eaten by more animals, when it is alive or when it is dead?**