



## ***Aquatic Animal Nutrition:***



### ***What Makes a Good Fish Food?***

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**Grade Level:**  
9-12

**Subject Area:**  
Aquaculture, Nutrition

**Time:**  
45 minutes  
+ introduction/discussion time

#### **Student Performance Standards (Sunshine State Standards):**

*03.01* Employ scientific measurement skills (SC.912.E.7.8; SC.912.L.14.4; MA.912.S.3.1, 2; MA.912.S.4.2; MA.912.S.5.1, 2, 3, 4, 5)

*06.01* Explain the economic importance of animals and the products obtained from animals (LA.910.1.6.1, 2, 3, 4, 5; SC.912.L.17.11, 12, 13, 15, 16, 17, 18, 19; SC.912.L.17.18; SC.912.N.4.2, MA.912.D.4.1)

*11.07* Determine why aquatic crops may be more productive than terrestrial crops (LA.910.1.6.1, 2, 3, 4, 5; SC.7.L.10.2, 3; SC.7.L.11.2, SC.912.L.14.7).

*11.10* List and describe the major factors in the growth of aquatic fauna and flora (LA.910.1.6.1, 2, 3, 4, 5; SC.7.L.17.1, 2, 3)

*15.05* Determine feeding methods and feed aquaculture species (LA.910.1.6.1, 2, 3, 4, 5; MA.912.A.1.4).

**Objectives:** Student will be able to:

1. Summarize the importance of common ingredients in fish food.
2. Design their own custom fish food.
3. Measure water stability.
4. Relate water stability to fish nutrition, fish production, and the environment.
5. Compare and contrast key ingredients of two feeds.
6. Describe key ingredients to nutrient needs of aquatic animals and terrestrial animals.

## **Abstract:**

Aquatic Animal Nutrition: *What IS in that stuff? Understanding Feed Labels and the importance of fish ingredients.*

EVERYONE is health conscious today. Ever wondered what was in the food your companion animals ate? It might surprise you! What makes a good fish food?

In the class activity students will examine the **water stability** of fish food compared with other forms of diets. Alternatively, what makes a fish food economical? During this activity your students will learn the answers.

First, they will have an opportunity to **learn about the composition** of fish foods. They will be **challenged to explain** why the common ingredients in fish feed are important and what benefits and problems are associated with feeding fish.

By examining several real world examples of animal food from local sources (dog or cat food vs. fish food) student will use their abilities to **compare and contrast**.

Finally, they will use a list of ingredients and **design** a nutritional complete fish food. Then they will create one that is economical. This exercise will test students abilities to **think creatively**, understand fish feed design, and the need to be both effective and economical.

## **Interest Approach:**

Begin with day with any current story in the news, which involves **commercial fishing, declining fish populations** or **general fish nutrition**. There are always some! Review the storyline with your students discussing the importance of feeding people. Be sure to point out how fish food is also made of fish. The same fish, which we eat in some cases.

Following this point, make sure you discuss the fact that fish populations are declining and won't be able to feed all the people in the near future. Aquaculture production will help supply the need for fish to eat, but at what cost? If we use fish to feed fish, we gain nothing. To keep eating fish we need to grow them. To be successful we need to feed fish food, which isn't "fish." At this point introduce the foods that companion animals eat corn, soybeans, wheat, and other foods we don't think of as "fish food."

This will serve as an excellent segue into the diet making and fish feed composition activities.

## **Student Materials:**

1. Pencil
2. Paper
3. Calculator
4. PowerPoint handout

**Teacher Materials:**

<i>Material</i>	<i>Store</i>	<i>Estimated Cost</i>
Pencil	NA	NA
Paper	Office Depot, WalMart	\$1.99 and up
Calculator	Office Depot, WalMart	\$4.99 and up
Blackboard/whiteboard	NA	NA
PowerPoint handout		
Pictures/samples of feed from each animal (pellets, flakes, etc.)	NA	NA
Examples/pictures of larval and adult fish foods (algae, daphnia, feeds)	NA	NA
Scale	WalMart, Carolina Biological	\$20 and up
Weighing boats	Carolina Biological	\$16 and up
Fish meal (or canned sardines), Corn meal, Wheat flour, Soybean meal	NA	NA
Mixing bowl, sponge, soap, and water (clean-up)	Local grocery store	NA

**Student Instructions:**

1. Following the **FISH NUTRITION FEEDS OBJ 4 and 5** PowerPoint Presentation, examine an ingredient label from a commercially made fish feed.
2. Explain why the common ingredients in fish feed are important to local aquaculture production.
3. Compare/list the ingredients of a commercially made fish food and to those of cat food, or dog food.

**Teacher Instructions:****A. LABEL COMPARISON***Preparations:*

1. Begin a discussion by having students list common ingredients in their own food and then proceed to list ingredients in animal feeds. (Perhaps have them bring in a label from an animal food from home.)

*Activity:*

1. Provide students with a handout with a written description of a fish diet, or have them examine several feed ingredient labels for common fish feeds (obtainable at any pet store.)
2. As the students examine the labels, ensure that they compare the aspects of feeds.
3. Have the students explain why the ingredients might be used in a fish diet.
4. Have them respond with a paragraph describing how each ingredient is to be used in the fish feed. Have them list such things as:  
“Which ingredients are used as protein sources, carbohydrates, fats, vitamins, etc?”
5. Also, have them determine several alternatives for the ingredients they identify (This can be fun, since they can use anything as a substitute ingredient. Also, try to have students make up a diet using a list of alternative ingredients and then have the class vote if the fish would actually eat the diet. This gets very interesting!)
6. Collect the following day and grade on accuracy and effort.

*Post work/Clean-up:*

1. No clean up for this activity.

## **A. WATER STABILITY**

*Preparations:*

1. Obtain several samples of fish food live and commercially made. (If possible obtain a floating fish food and one that is polluted.)
2. Have students set up 4 beakers with water.
3. Follow procedure outlined in WATER STABILITY LAB SHEET (Teacher).

*Activity:*

1. During the lab activity the instructor should make sure that students are recording observations at fixed intervals.
2. Monitor student progress and ask questions related to the characteristics of each fish food.

*Post work/Clean-up:*

1. Wash all containers.
2. Store remaining bulk ingredients in the refrigerator.

### **Anticipated Results:**

Review out loud with students. Ask the following questions and call on students for their answers. Students should understand the following after the lesson:

After passing out the handout have students read over it. Answer all questions regarding the description of the diet profile. Use these questions to further review

and summarize the day's concepts:

1. Explain and emphasize why the common ingredients in fish feed are important.
2. Learn the diet composition of commercial feeds for aquatic animals.

These topics can be used when evaluating fish feed, whether for a home or agricultural use. Many economic decisions in an aquaculture operation are linked directly to fish feeds, costs, and dietary requirements

**Support Materials:**

1. FISH NUTRITION FEEDS PowerPoint
2. IFAS Publication VM 114 (Fish Nutrition), etc.  
<http://tal.ifas.ufl.edu/publications.htm>
3. FEED LABEL COMPARISON handout
4. WATER STABILITY LAB SHEET OBJ 4 and 5 TEACHER
5. WATER STABILITY LAB SHEET OBJ 4 and 5 STUDENT

**Explanation of Concepts:**

Math conversions

Animal nutrition



## *Support Materials*



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### *FEED LABEL COMPARISON ACTIVITY*

Name: \_\_\_\_\_

#### **Materials:**

1. Animal feed labels
  2. Feed samples of the same diets may be useful.
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**Answer each of the following questions concerning your fish feed.**

1. Provide a written description of each fish diet noting the ingredients, their amounts if given. If you are provided with real samples, then provide a physical description of the diet as well.

2. Compare and contrast the feed labels with respect to ingredients. What are the similarities, what are the differences?

3. Explain why the ingredients you listed were used in your diet. What do they provide in terms of nutrition? Are certain ingredients known for certain nutrient classes, i.e., which ingredients are used as protein sources, carbohydrates, fats, vitamins, etc?

4. Are any ingredients on the list present for flavor? Are some there to keep the diet from rotting?

5. Now that you have an understanding of fish feed ingredients, build a new fish diet using several alternatives. Try to make the diet good for fish, but inexpensive!

### **B. Design An Alternative Feed.**

As you may have already learned, designing a fish feed is challenging. Aquaculturists are also trying to make diets out of new ingredients that are cost effective. Now it's your turn!

1. Design an alternative fish feed using any ingredient that you wish.

2. List the ingredients (and their amounts) in a list.

3. Provide an explanation of the ingredient's use: protein source, taste, texture, etc.

4. Once you have designed your new feed, discuss with your classmates if fish would eat it. Why? or Why not?

## ***FISH FOOD WATER STABILITY TEST***

**Name:** \_\_\_\_\_

**Overview:** During this activity you will observe and record the water stability of fish feeds using live, or fresh, fish food and store bought fish food pellets.

### **Materials:**

1. Several samples of store bought fish food
2. Several live or fresh fish foods, such as tuna, sardines, worms, etc.
3. 250 ml beaker or similar sized plastic container
4. Water
5. Stop watch or clock

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### **Method:**

1. Obtain 4 feed samples from the instructor.
  2. Have students set up 4 beakers with water.
  3. Drop a small piece of eat food item into the water and record the immediate results.
  4. Continue to observe feed.
  5. Record results at 10-minute intervals until 30 minutes have elapsed.
  6. Record final observations.
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**FISH FOOD WATER STABILITY TEST: Data Sheet (Each section is worth 1 point, 25 total points)**

<b>BEAKER</b>	<b>SAMPLE DESCRIPTION</b>	<b>Time: Minutes</b>	<b>OBSERVATIONS</b>
<b>1.</b>		<b>0</b>	
		<b>10</b>	
		<b>20</b>	
		<b>30</b>	
		<b>Final</b>	
<b>BEAKER</b>	<b>SAMPLE DESCRIPTION</b>	<b>Time: Minutes</b>	<b>OBSERVATIONS</b>
<b>2.</b>		<b>0</b>	
		<b>10</b>	
		<b>20</b>	
		<b>30</b>	
		<b>Final</b>	
<b>BEAKER</b>	<b>SAMPLE DESCRIPTION</b>	<b>Time: Minutes</b>	<b>OBSERVATIONS</b>
<b>3.</b>		<b>0</b>	
		<b>10</b>	
		<b>20</b>	
		<b>30</b>	
		<b>Final</b>	
<b>BEAKER</b>	<b>SAMPLE DESCRIPTION</b>	<b>Time: Minutes</b>	<b>OBSERVATIONS</b>
<b>4.</b>		<b>0</b>	
		<b>10</b>	
		<b>20</b>	
		<b>30</b>	
		<b>Final</b>	

**Discussion Questions:**

Answer the discussion questions based on your observations of fish feeds and their apparent water stability. (Each question is worth 5 pts.)

1. Describe the characteristics of fish feeds used during this experiment.
  - A. Live (fresh) fish food:
  
  
  
  
  
  
  
  
  
  
  - B. Store bought food:
  
  
  
  
  
  
  
  
  
  
  - C. What happened to each fish food sample you tested at first?
  
  
  
  
  
  
  
  
  
  
  - D. What happened as the food sat in the water?
  
2. Based on your observations which feed sample (type) would be the best fish food for an aquaculture operation? Why?
  
  
  
  
  
  
  
  
  
  
3. What problems might arise if this food was not used (eaten) right away?
  
  
  
  
  
  
  
  
  
  
4. How does water stability of feeds relate to fish feeding practices?

Pros

*Nutrient rich for small fish*

*Small size often eliminates consumption problems*

*Complete nutrition for small fish*

*Technology associated with rearing of live foods is improving rapidly*

Cons

*Difficult to maintain stocks*

*Expensive*

Commercial fish food:

Pros

*Complete, uniform quality nutrition in each feed pellet*

*Easier to maintain a balanced diet*

*Sold dry or semi-moist (easy shipping) Semi-moist provides good texture, more like live foods*

*Pellets or flakes*

Cons

*Rapid sinking unless the pellet is extruded (made like breakfast cereals)*

*Ultra small pellet size may be impossible to manufacture for larval fish*

***FISH FOOD WATER STABILITY TEST***  
**Teacher Edition**

**Name:** \_\_\_\_\_

**Overview:** During this activity you will observe and record the water stability of fish feeds using live, or fresh, fish food and store bought fish food pellets.

**Materials:**

1. Several samples of store bought fish food
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3. 250 ml beaker or similar sized plastic container
4. Water
5. Stop watch or clock

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**Method:**

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  2. Have students set up 4 beakers with water.
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<b>1.</b>		<b>0</b>	
		<b>10</b>	
		<b>20</b>	
		<b>30</b>	
		<b>Final</b>	
<b>BEAKER</b>	<b>SAMPLE DESCRIPTION</b>	<b>Time: Minutes</b>	<b>OBSERVATIONS</b>
<b>2.</b>		<b>0</b>	
		<b>10</b>	
		<b>20</b>	
		<b>30</b>	
		<b>Final</b>	
<b>BEAKER</b>	<b>SAMPLE DESCRIPTION</b>	<b>Time: Minutes</b>	<b>OBSERVATIONS</b>
<b>3.</b>		<b>0</b>	
		<b>10</b>	
		<b>20</b>	
		<b>30</b>	
		<b>Final</b>	
<b>BEAKER</b>	<b>SAMPLE DESCRIPTION</b>	<b>Time: Minutes</b>	<b>OBSERVATIONS</b>
<b>4.</b>		<b>0</b>	
		<b>10</b>	
		<b>20</b>	
		<b>30</b>	
		<b>Final</b>	

## Discussion Questions:

Answer the discussion questions based on your observations of fish feeds and their apparent water stability. (Each question is worth 5 pts.)

1. Describe the characteristics of fish feeds used during this experiment.

A. Live (fresh) fish food:

Pros:

Nutrient rich  
Small size often eliminates consumption problems  
Complete nutrition for most fish  
Technology associated with rearing of live foods is improving rapidly

Cons:

Difficult to maintain stocks  
Expensive

B. Store bought food:

Pros:

Complete, uniform quality nutrition in each feed pellet  
Easier to maintain a balanced diet  
Sold dry or semi-moist (easy shipping, semi-moist provides good texture, more like live foods)  
Pellets or flakes

Cons:

Rapid sinking unless the pellet is extruded (made like breakfast cereals)  
Ultra small pellet size may be impossible to manufacture for larval fish

C. What happened to each fish food sample you tested at first?

Store bought pellets will usually hold together well, but may break after a short time. Live feed continually disintegrates.

D. What happened as the food sat in the water?

Longer water exposure degrades food.

2. Based on your observations which feed sample (type) would be the best fish food for an aquaculture operation? Why?

Depends on the operation. Fish often eat live foods or fresh foods better than pellets, but pellets are easier to disperse and store.

3. What problems might arise if this food was not used (eaten) right away?

Leaching and fouling of water quality. In large applications eutrophication of lakes and streams.

4. How does water stability of feeds relate to fish feeding practices?

Water stability is critical to fish feeding. Unstable pellets break up and leach nutrients into the environment.