

Lesson C3–4

Identifying Fish Digestion and Feeding

Unit C. Animal Wildlife Management

Problem Area 3. Fish Management

Lesson 4. Identifying Fish Digestion and Feeding

New Mexico Content Standard:

Pathway Strand: Natural Resources and Environmental Systems

Standard: III: Apply scientific principles to natural resource management activities.

Benchmark: III-B: Examine biological and physical characteristics to identify and classify natural resources.

Performance Standard: 4. Identify fish species.

Student Learning Objectives. Instruction in this lesson should result in students achieving the following objectives:

1. Describe the fish digestive system
2. Describe common methods of feeding fish
3. Understand how to interpret a feed label

List of Resources. The following resources may be useful in teaching this lesson:

Recommended Resources. One of the following resources should be selected to accompany the lesson:

Gillespie, J.R. (1987). *Animal Nutrition and Feeding*. Albany, NY: Delmar Publishing. (Chapter 8)

Lee, J.S. & Newman, M.E. *Aquaculture—An Introduction* 2nd Edition. Danville, Illinois: Interstate Publishers, Inc., 1997. (Chapters 3 & 8)

Selness, D. *Exploration Activities in Aquaculture*. Danville, Illinois: Interstate Publishers, Inc., 1997.

Other Resources. The following resources will be useful to students and teachers:

Lee, Jasper S., et al. *Introduction to Livestock and Companion Animals*. 3rd Edition. Upper Saddle River, New Jersey: Prentice Hall Interstate, 2004. (Textbook, Chapter 13)

Huet, M. (1986). *Textbook of Fish Culture: Breeding and Cultivation of Fish* 2nd Edition. Surrency, England: Fishing New Books, Ltd. (Chapter 2)

List of Equipment, Tools, Supplies, and Facilities

Writing surface
Overhead projector
Transparencies from attached masters

Terms. The following terms are presented in this lesson (shown in bold italics):

Anus
Auger feeding system
Automated feeding systems
Blowers
Branchiospines
Carnivores
Demand feeders
Esophagus
Hand feeding
Intestines
Mouth
Prepared feed
Stomach

Interest Approach. Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

Have each student make a list of every thing they have eaten over the last 24 hours. Now have them list where they ate the food and how it was served (i.e. on a plate, in a wrapper, in a can, etc.). Have a few students share their lists with the class. Next, as a class, develop a list of what the foods provided nutritionally. Finally, ask the class how the body is able to digest and utilize the food consumed. Allow this to lead into discussion of the content of this lesson.

Summary of Content and Teaching Strategies

Objective I: Describe the fish digestive system

Anticipated Problem: What are the parts of the fish digestive system?

- I. The digestive system of fish is similar to most other animals. The size and shape of each component of the digestive system will vary with the type of fish, depending on its primary diet. For example, **carnivores**, fish that eat meat, have a large stomach and short intestines. The digestive system of fish contains the mouth, esophagus, stomach, intestines, and anus.
 - A. The **mouth** is the entry point for the digestive system. Mouth structures that help with digestion include teeth, the tongue, and branchiospines. The size of the mouth and these structures within the mouth vary depending on the diet of the fish. Carnivorous fish usually have many teeth that point inwards. These teeth are not used much for chewing, rather they are used to capture and hold prey. Other fish have few or no teeth. The tongue helps move food around in the mouth. The branchiospines are part of the gill structures that help fish breathe. The **branchiospines** act as filters to capture small food from water as the fish swim. The food is moved to the esophagus. The size of the filter depends on the diet of the fish.
 - B. The **esophagus** is the short tube that connects the mouth to the stomach of the fish.
 - C. The **stomach** is the organ where digestion begins. The size of the stomach varies by species of fish. Some fish have a stomach that will expand greatly to allow them to eat large quantities of food. Others have a small stomach that will accommodate only small amounts of food at a time. Some fish species have almost no stomach. The esophagus connects directly to the intestines.
 - D. The **intestines** are the site of food digestion and nutrient absorption. The length and size of the intestines vary depending on fish species.
 - E. The **anus** is the exterior opening of the digestive system where unused food and wasted material is exited.

There are many techniques that can be used to assist students in mastering this material. Students need text material to aid in describing the fish digestive system. Chapter 3 in Aquaculture—An Introduction 2nd Edition text is recommended. Use TM: C3–4A and TM: C3–4B to aid in discussion on this topic.

Objective 2: Describe common methods of feeding fish

Anticipated Problem: What are some common methods of feeding fish?

- II. Feeding fish is a very important part of a fish farming operation. Not only are fish provided the appropriate nutrition, feeding also provides the opportunity to observe fish for any abnormal signs. The method of feeding fish depends on the size of the aquaculture system.
 - A. In small operations, hand feeding is the most common method. In **hand feeding**, the feed is distributed by using hands, shovels, or other non-automated means. Feeds that are not suited for automated systems, such as meat scraps, are also hand fed, regardless of the size of the operation.
 - B. Large operations utilize automated feeding systems. **Automated feeding systems** utilize machinery to distribute feed to the fish. These systems can vary from relatively simple machines to very complicated, computer-controlled systems. Three common types include blowers, demand feeders, and auger systems.
 1. Blowers are machines attached to trucks or tractors. **Blowers** drive along the side of the ponds and blow feed out into the pond. They are very common in levee pond and watershed pond operations
 2. Demand feeders consist of a hopper where feed is stored. **Demand feeders** allow fish to bump a rod and release feed when they are hungry. This method is commonly used in raceway pond facilities. When first installing demand feeders, fish must be trained how to use them.
 3. An **auger feeding system** is very similar to feeding systems used by swine and poultry farmers. Feed is stored in large tanks and then moved by augers that drop feed in each pond. They are common in facilities that use tanks and raceways.

There are many techniques that can be used to assist students in mastering this material. Students need text material to aid in describing common methods of feeding fish. Chapter 8 in Aquaculture—An Introduction 2nd Edition text is recommended. Use TM: C3–4C to aid in discussion on this topic.

Objective 3: Understand how to interpret a feed label

Anticipated Problem: What does a feed label tell us?

- III. As with other animal agriculture operations, fish farming utilizes prepared feeds. A **prepared feed** is a feed that is produce by a feed mill and then sold in bags or in bulk. These feeds are required to have a label that contains the net weight, product and brand name, guaranteed analysis, and any drug additives.

- A. The guaranteed analysis section of the feed label contains the minimum percentage of crude protein, maximum and minimum percentage of protein from non-protein nitrogen, minimum percentage of crude fat, maximum percentage of crude fiber, minimum and maximum percentages of salt and calcium, minimum percentages of phosphorus, other minerals, and vitamin content.
- B. If a feed contains drugs, the word medicated must be used on the label, the purpose of the medication must be stated, the directions and precautions for the medication must be given, and a list of all active drug ingredients must be given.

*There are many techniques that can be used to assist students in mastering this material. Students need text material to aid in understanding how to interpret a feed label. Chapter 8 in *Animal Nutrition and Feeding* text is recommended. Use TM: C3–4D to aid in discussion on this topic.*

Review/Summary. Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. Questions at end of chapters in the textbook may also be used in the review/summary.

Application. Several opportunities for application are listed in the “Exploring” section at the end of Chapters 3 and 8 in the *Aquaculture—An Introduction 2nd Edition* text. Laboratory Activity 28 in: *Exploration Activities in Aquaculture 2nd Edition* is appropriate for this lesson.

Evaluation.

Answers to Sample Test:

Part One: Matching

1 = g, 2 = a, 3 = j, 4 = b, 5 = d, 6 = k, 7 = c, 8 = f, 9 = e, 10 = h

Part Two: Completion

- 1. prepared feed
- 2. medicated
- 3. guaranteed analysis
- 4. teeth
- 5. carnivores

Part Three: Short Answer

- 1. Mouth, esophagus, stomach, intestines, and anus.
- 2. Provide proper nutrition to fish and observe fish for unusual signs.

Test

Lesson C3–4: Identifying Fish Digestion and Feeding

Part One: Matching

Instructions. Match the term with the correct response. Write the letter of the term by the definition.

- | | |
|-------------------------|-----------------|
| a. Anus | f. Esophagus |
| b. Auger feeding system | g. Hand feeding |
| c. Blowers | h. Intestines |
| d. Branchiospines | j. Mouth |
| e. Demand feeders | k. Stomach |

- _____ 1. Feed is distributed by using hands, shovels, or other non-automated means.
- _____ 2. The exterior opening of the digestive system where unused food and wasted material is exited.
- _____ 3. The entry point for the digestive system.
- _____ 4. Feed is stored in large tanks and then moved by augers that drop feed in each pond.
- _____ 5. Act as filters to capture small food from water as the fish swim.
- _____ 6. The organ where digestion begins.
- _____ 7. Drive along the side of the ponds and blow feed out into the pond.
- _____ 8. The short tube that connects the mouth to the stomach.
- _____ 9. Allow fish to bump a rod and release feed when they are hungry.
- _____ 10. The site of food digestion and nutrient absorption.

Part Two: Completion

Instructions. Provide the word or words to complete the following statements.

1. A _____ is a feed that is produce by a feed mill and then sold in bags or in bulk.
2. If a feed contains drugs, the word _____ must be used on the label.
3. The _____ section of the feed label contains the minimum percentage of crude protein.
4. Mouth structures that help with digestion include _____, the tongue, and branchiospines.

5. _____ are fish that eat meat.

Part Three: Short Answer

Instructions. Provide information to answer the following questions.

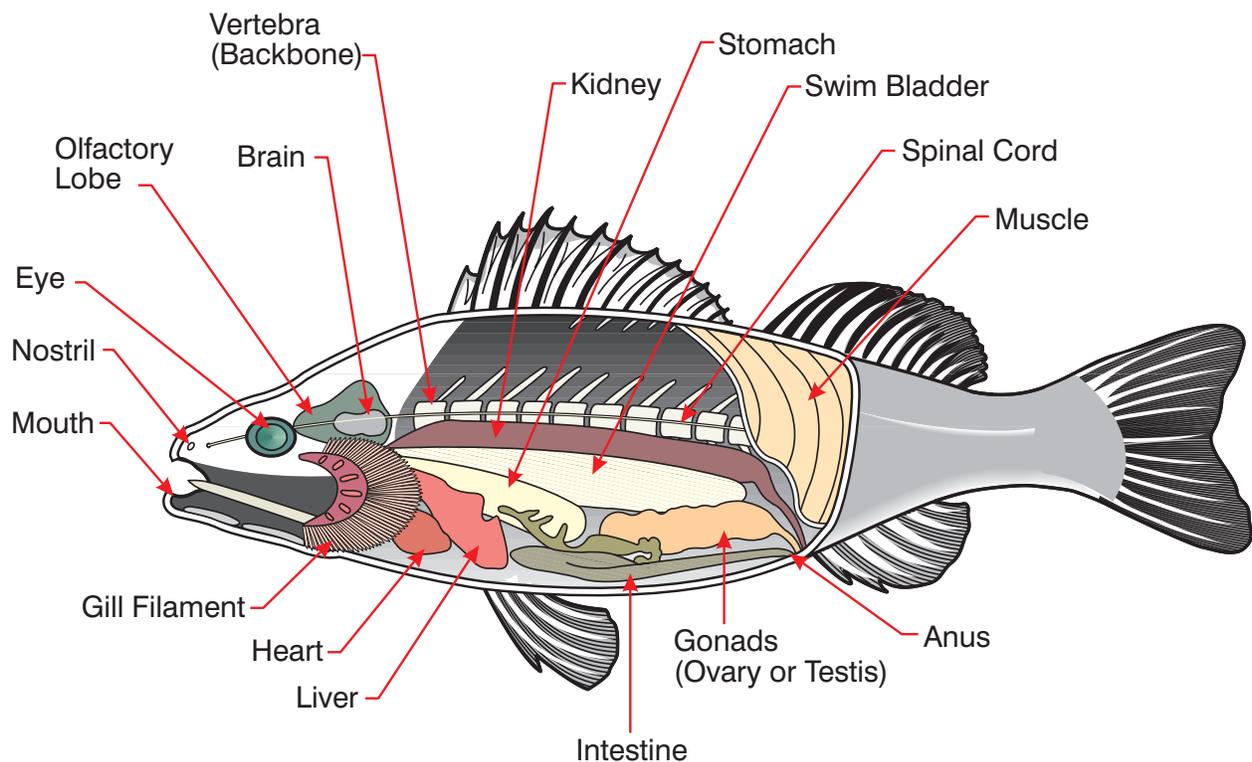
1. What are the five components of the fish digestive system?

2. Why is feeding time important to a fish farming operation?

FISH DIGESTIVE SYSTEM

- ◆ **Mouth – entry point of food**
- ◆ **Esophagus – connects mouth to the stomach**
- ◆ **Stomach – starts digestion**
- ◆ **Intestines – continues digestion and absorbs nutrients**
- ◆ **Anus – allows waste to exit.**

MAJOR INTERNAL PARTS OF A FISH



(Courtesy, Interstate Publishers, Inc.)

METHODS OF FEEDING FISH

- ◆ **Hand Feeding—hands, shovels, or other non-automated methods**
- ◆ **Automated Feeding—machinery is used**
 - ➔ **Blowers—blow feed into the ponds**
 - ➔ **Demand Feeders—allow fish to release feed**
 - ➔ **Augers—move feed from tanks into ponds**

FEED LABEL

1. Net Weight

2. Product & Brand Name

3. Guaranteed Analysis

- Crude Protein
- Equivalent Protein from non-protein nitrogen
- Crude Fat
- Crude Fiber
- Calcium & Salt
- Phosphorus
- Minerals
- Vitamins



4. Drug Additives

- “Medicated” must be on label
- Purpose of medication
- Direction & Precautions
- List of active drug ingredients