

# Crawfish Farming

## AQUACULTURE CURRICULUM GUIDE

### YEAR TWO SPECIES MODULE

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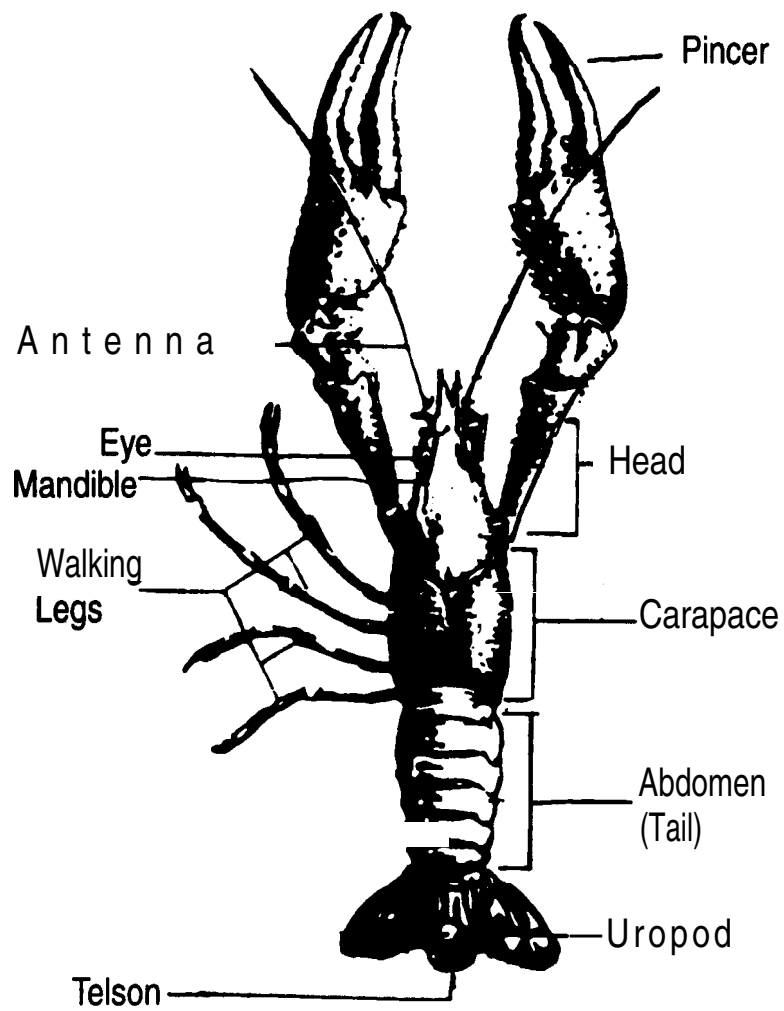
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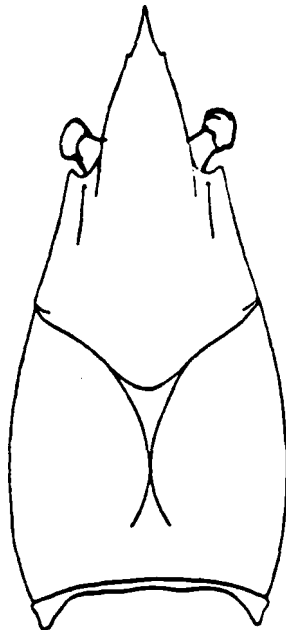
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## External Parts of a Crawfish

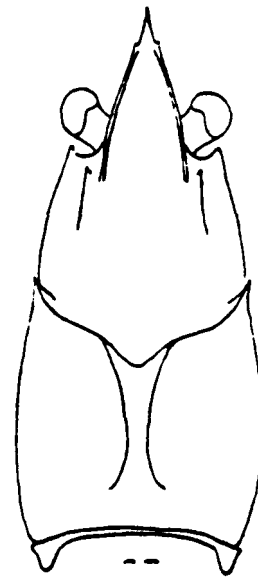


## Distinction Between Red and White River Crawfish

Red Swamp Crawfish

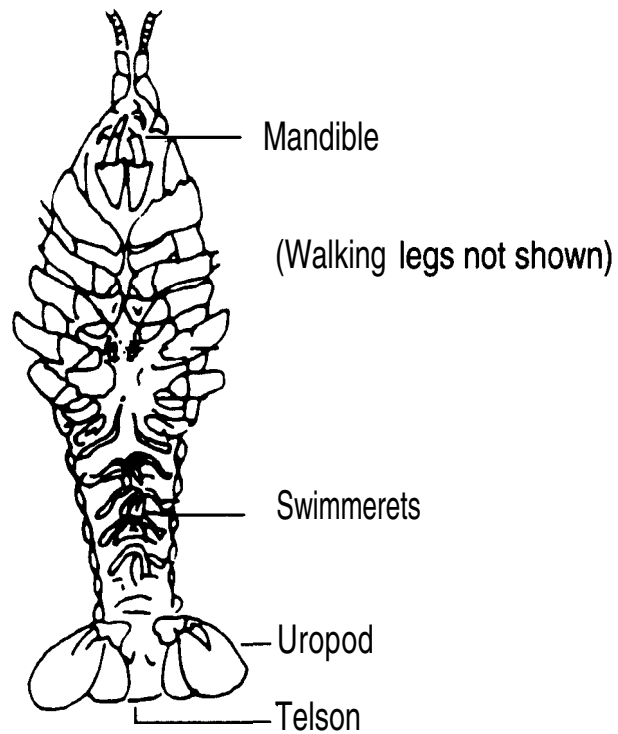


White River Crawfish

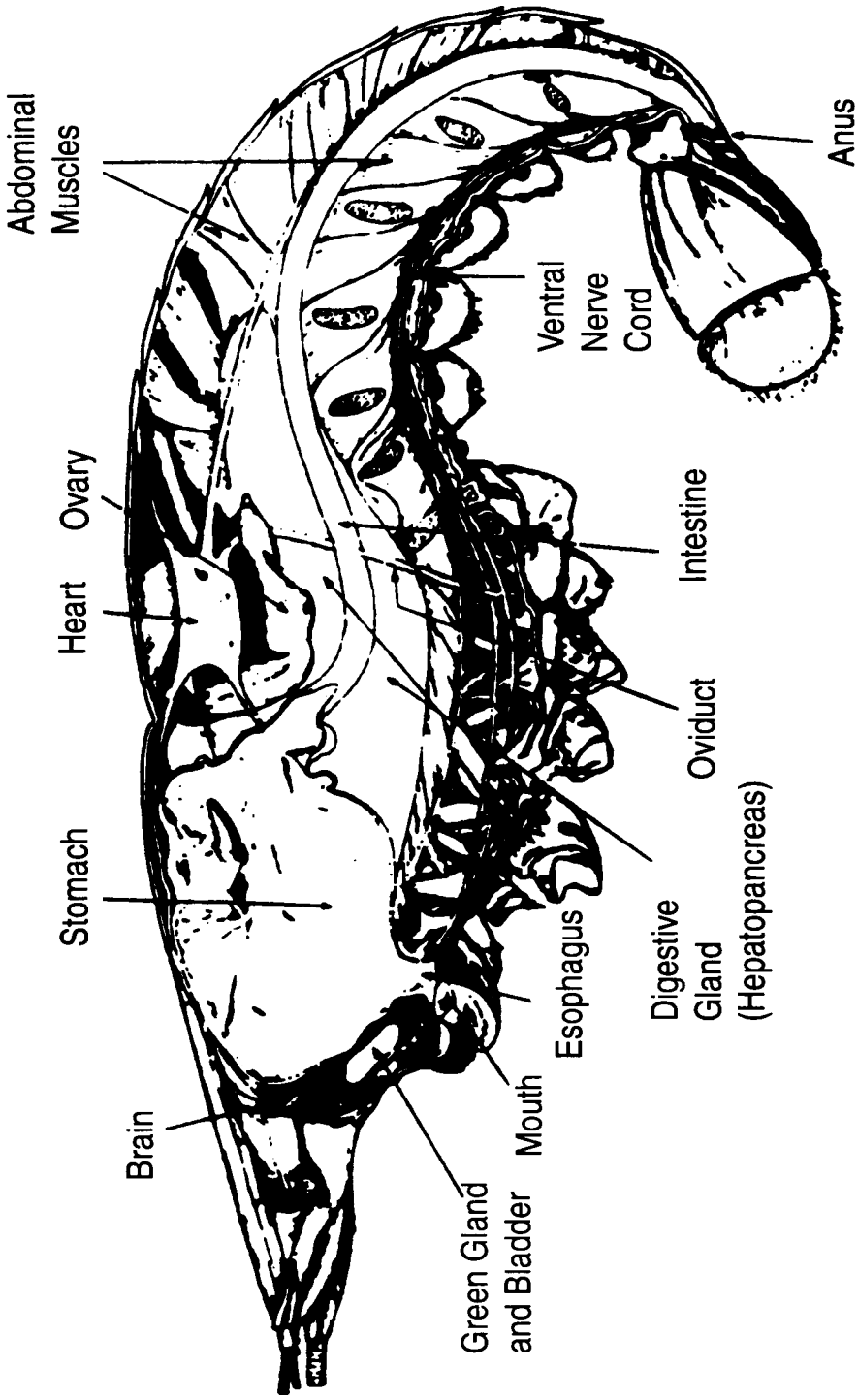


Note separation between halves of the carapace

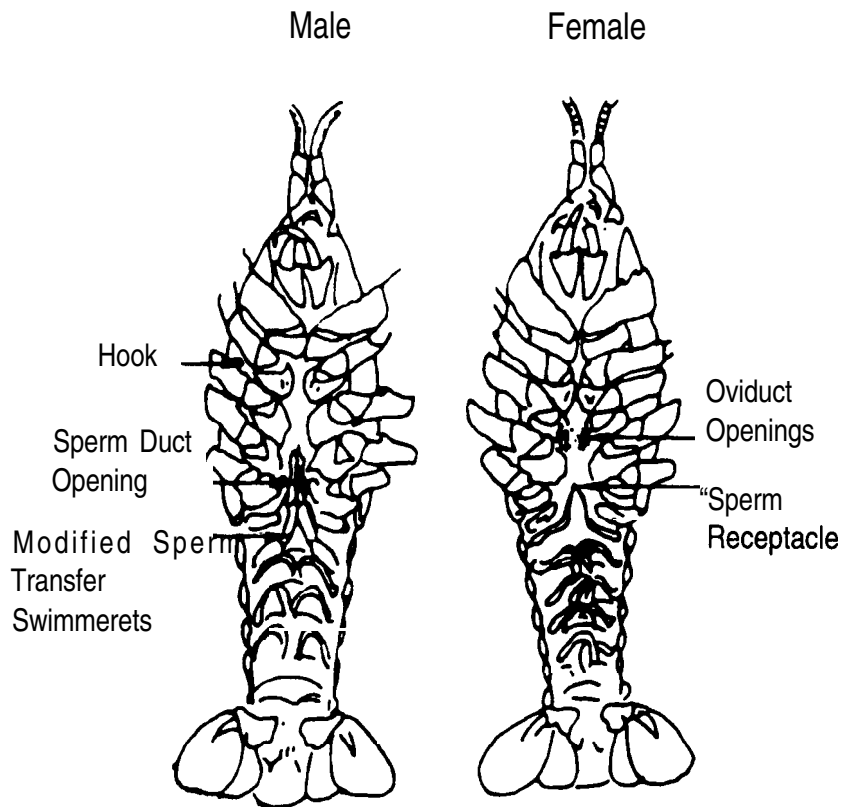
## Bottom View of a Crawfish



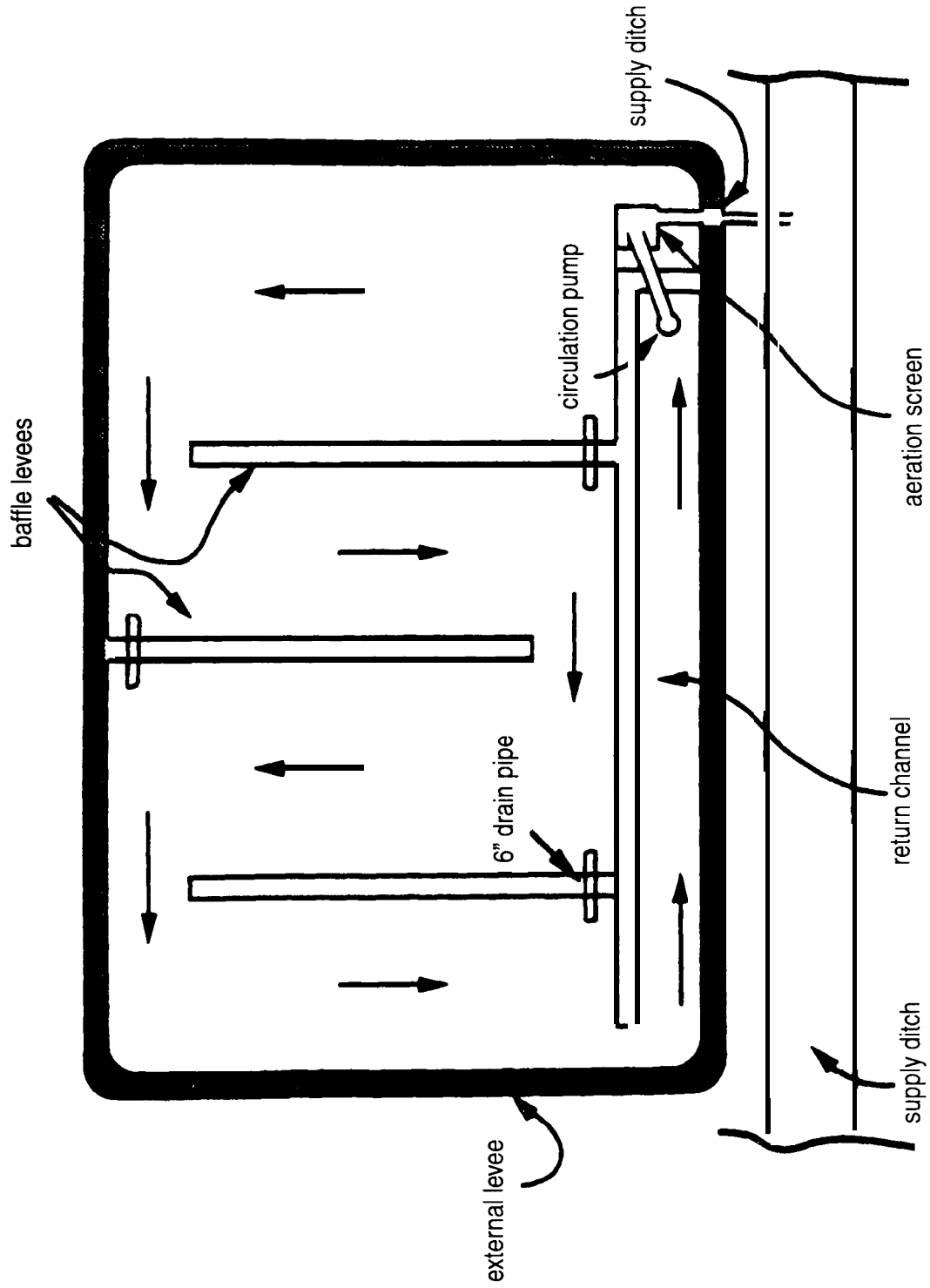
# Internal Structure of a Crawfish



## External Sexual Difference in Crawfish



# Levee Arrangement in a Crawfish Pond



**Description:** The module consists of the following four problem areas;

**Module:** Crawfish Farming

**Problem Areas:** Determining the Nature of Crawfish Farming  
Establishing and Using Growing Facilities for Crawfish  
Reproducing and Rearing Crawfish  
Harvesting and Marketing Crawfish

**Objectives:** The objectives for each problem area are given below:

- A. Determining the Nature of Crawfish Farming
  - explain the scope of crawfish farming in the United States
  - describe characteristics of crawfish
  - explain the nature of crawfish farming
  - list and describe factors in deciding whether to produce crawfish
  - describe production systems used in crawfish farming
  - describe the kinds of crawfish produced
- B. Establishing and Using Growing Facilities
  - describe facilities needed to raise crawfish
  - explain design considerations with crawfish ponds
  - describe water requirements for crawfish farming
- C. Reproducing and Rearing Crawfish
  - describe management practices to encourage crawfish reproduction
  - describe how feed is provided for crawfish
  - describe how to keep crawfish healthy
  - describe special considerations with soft-shell crawfish
- D. Harvesting and Marketing Crawfish
  - explain harvesting
  - describe efficient harvesting procedures
  - explain crawfish grading
  - explain functions in marketing crawfish
  - describe approaches in marketing crawfish

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Teaching Plan:

**Module:** Crawfish Farming - Section A

**Problem Area:** Determining the Nature of Crawfish Farming

**Estimated Time:** 6-9 hours

**Goal:** The goal of this problem area is to understand the nature of crawfish farming, to consider areas for producing crawfish, and to determine the scope of crawfish aquaculture in the United States.

**Learning Objectives:** Upon completing this problem area, students will be able to:

- explain the scope of crawfish farming in the United States
- describe the characteristics of crawfish
- explain the nature of crawfish farming
- list and describe factors in deciding whether to produce crawfish
- describe production systems used in crawfish farming
- describe the kinds of crawfish produced

**Resources:** The following instructional resources are needed to complete this problem area:

**Essential:**

**Transparencies.**

**Additional:**

**Crawfish Culture** (SRAC Publication No. 240).

**Crawfish Production Systems** (SRAC Publication No. 241).

**Crawfish Production: Harvesting, Marketing and Economics** (SRAC Publication No. 242).

The videotape "Crawfish Aquaculture in the South," produced by the Southern Regional Aquaculture Center and available through the Cooperative Extension Service in each state.

Any books, bulletins, or other materials on crawfish aquaculture. Examples include the following:

**Introduction to Aquaculture**, by Landau, Matthew, John Wiley & Sons, Inc., NY, 1992.

**Crustacean Farming**, by Lee, Daniel O.C. & Wickins, John F., John Wiley & Sons, Inc., NY, 1992.

**Aquaculture: An Introduction**, by Lee, Jasper S. & Newman, Michael E., Danville, IL, Interstate Publishers, Inc., 1992.

Journals, magazines, and other periodicals on aquaculture, especially those with articles on crawfish aquaculture.

## Content and Procedures

### Preparation (Interest Approach):

To develop student interest in this module, have students describe crawfish farming by asking what is crawfish farming. Make a list of the major descriptive terms on the chalkboard. Allow students the flexibility of offering suggestions about how crawfish farming is carried out.

Note any trends or similarities in the statements on the chalkboard with other aquaculture enterprises. Conclude the interest approach by indicating that crawfish aquaculture is similar to other aquaculture and production agriculture. Also indicate that it is different because the nature and needs of the crawfish vary from other animals.

### Presentation:

#### A. What is the scope of crawfish farming in the United States?

Use TM A1 to present the objectives for the problem area.

1. More crawfish are grown in the U.S. than any other crustacean.
2. An estimated 150,000 acres of land are used for crawfish farming in the U.S.

Use a map of the United States to show the locations of where crawfish are grown. Ask students if they have visited a crawfish farm. If so, ask them to describe what they saw.

- a. Louisiana is the leading state with 125,000 acres in crawfish farming.
- b. Other states and acreages are Texas, 5,000; Florida, 2,500; South Carolina, 1,000; Arkansas, 500; Mississippi, 250; and Alabama, Georgia, Maryland, and North Carolina with fewer than 100 acres each. Some crawfish are also grown in California, Wisconsin, Oregon, and Washington.
3. The total annual harvest weighs over 100 million pounds.

Have students calculate the total value of crawfish at \$.50/lb if 100 million lbs are produced.

4. Most crawfish are used for human food.

#### B. What is a crawfish?

Use a live specimen to show why the crawfish is a decapod or use TM A2 to illustrate its 10 legs. (Note that the pincers are considered to be legs. The drawing only shows one side of the crawfish.)

1. A crawfish is a 10-legged crustacean.
  - a. Animals with 10 legs are known as decapods.
  - b. Crustaceans are animals with outer skeletons that encase the body.
2. The desirable part of the crawfish for human food is the muscular part commonly called the tail. (A study of crawfish anatomy indicates that it is the end of the abdomen.)

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3. Crawfish are also known as crayfish, crawdads, and mud bugs. The preferred spelling is crawfish.
4. Mature crawfish weigh about 2 oz and may be 5 or so inches long.
  - a. Crawfish used for food should weigh about 1 oz or more, but some are eaten when they weigh only .5 oz.
  - b. Some wild species of crawfish, known as dwarf crawfish, may be mistaken for young of the desired species.

### C. What are the common species of crawfish?

Use TM A3 to list the common and scientific names of the species most commonly grown. Remind students that scientific names are written in italics. Bring examples of species to class and have students use reference materials to identify them.

1. Over 300 species of crawfish are found in the United States. Australia has about 100 species, while Europe has 10 and western Asia has 1.
2. Two species of crawfish have been widely grown in the United States:
  - a. The red crawfish, sometimes known as the red swamp crawfish, is most widely grown in the U.S. Its scientific name is *Procambarus clarkii*.
  - b. The white crawfish is also cultured in the U.S. and has a lighter color than the red crawfish. It is more likely to be grown in northern areas of the U.S. Its scientific name is *Procambarus blandingi acutus*.
  - c. A third species that has recently been farmed is the deep water crawfish, also known as the white river crawfish. Its scientific name is *Procambarus zonangulus*.

### D. What is the preferred habitat for crawfish?

Make a field trip to observe a crawfish farm. Study the kind of soil and other features of the land. Test the water in the crawfish pond to determine its pH. Use a meter or other test to determine the oxygen level in the water. Observe the vegetation available to the crawfish and find out if the farmer uses supplemental feed.

1. Crawfish naturally grow in shallow, weedy swamps and ponds.
2. Soils high in clay are preferred because of their ability to hold water.
  - a. The water should be free of pollution from industries and pesticides.
  - b. Some salt in the water is not detrimental.
  - c. A pH of 5.8-8.2 is satisfactory.
  - d. Crawfish must have water with oxygen level of 3.0 ppm or higher.
  - e. Crawfish eat vegetation and tiny plants and animals that live in the water.
3. Crawfish respond to different temperatures.

Locate the opening to a burrow in an area where the water supply has dried up. Note how the burrow is closed to retain water and protect the crawfish.

- a. Crawfish prefer water at 65-85°F.
- b. Crawfish go dormant when the water temperature drops below 45°F.

- c. Crawfish burrow into the earth if the water temperature goes above 88°F.
- 4. In a natural habitat, crawfish reproduce in the spring and grow through the summer and fall toward maturity. Some reach sufficient size for harvest by November.

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### E. What are the major external parts of a crawfish?

Show TM A2 again to locate the 3 sections of a crawfish. Locate the eyes, antennae, and structure of the mandibles

1. The body of crawfish is divided into 3 sections: head, carapace and abdomen. These sections are divided into 19 segments (known as somites) with 19 pairs of jointed appendages.
2. The head has the eyes, antennae, and mandibles.
  - a. The compound eyes provide good vision for the crawfish.
  - b. The antennae send and receive information from the environment.
  - c. The mandibles bite and tear food.
  - d. The head is fused with the carapace, which means that there is no movable joint between the two.
3. The carapace is similar to the thorax of insects.

Using a specimen or TM A2, study the arrangement of the carapace. Identify the appendages. Use TM A4 to show how the carapace of red and white river crawfish vary. (The white river crawfish has a space between the 2 halves of the carapace.)

- a. The 10 pair of appendages are attached to the carapace. These include the maxillae and millipeds, which are used in feeding, and 5 pairs of walking legs, known as pereopods.
  - b. The first pair of walking legs forms the strong pincer claws, known as chelae. They are used to grasp food and for protection.
  - c. The structure of the carapace provides for accurate identification of the red and white river crawfish. All crawfish have a carapace that is divided into halves. The white river crawfish has a space between the two halves of the carapace.
4. The abdomen is the thick muscular part of the crawfish that is used for food. It has 5 pairs of swimmerets and one pair of uropods.

Using a crawfish specimen or TM A5, locate the swimmerets, uropods, mandible, and telson. Observe how a crawfish in an aquarium or other water source uses the telson to move backward quickly .

- a. The telson is located between the uropods at the tip of the abdomen.
  - b. The telson and uropods form a fan that is used to swim backwards.
5. Hard exoskeleton: made of calcium and a mixture of chitin and modified protein.

Examine the exoskeleton of a crawfish. A molted skeleton might work well for this. Observe crawfish in an aquarium or other facility to determine stages of growth as related to molting. Examine a soft-shelled crawfish. Ask students why a grown crawfish no longer molts.

- a. Growing crawfish molt. Molting is the process of shedding the shell and forming a new one. Molting is necessary for the crawfish to increase in size.
  - b. A full-size crawfish no longer molts.

- c. After the shell has been shed, the crawfish remains without a shell for about 12 hours. It may double in size during this time. A new shell forms and hardens. Crawfish without shells are known as soft-shell crawfish.
- d. Crawfish molt about 11 times before they reach maturity.

6. Crawfish can regenerate lost body parts.

Note any crawfish in the lab that has lost an appendage. Observe each day for regeneration.

- a. Regeneration is the process of growing new parts if they are broken off.
- b. Pincers and other parts are likely to be lost after molting.

7. Crawfish vary in color, depending on the species.

Describe the colors of various crawfish found in the water of local streams. Observe young crawfish in an aquarium or other facility over a period of time. Note changes in color as well as the molting process.

- a. The coloring, known as pigment, is in the epidermis (outer skin) beneath the shell.
- b. Crawfish have colors that allow them to blend into their water environment.
- c. Juveniles (young crawfish) turn darker just before molting, which is one of the signs that molting is near.
- d. All crawfish tend to be the same color when cooked. Boiled crawfish are reddish orange regardless of their color before cooking.

F. What are the major internal parts of a crawfish?

Use TM A6 or the chalkboard to present the body systems of crawfish. Use TM A7 to show the internal structure of a crawfish. Dissect a crawfish to observe the parts of the digestive system. Determine the food items present in the system.

The internal parts form systems, much as in other animals. Crawfish have 7 body systems:

1. The digestive system changes food into simpler forms that the body can absorb. The digestive system has four major parts:
  - a. A two-chambered stomach grinds and crushes the food (found behind the eyes).
  - b. A midgut secretes enzymes that begin digestion.
  - c. The hepatopancreas is the major digestive organ and is called fat by some crawfish eaters.
  - d. The intestine extends through the abdomen and moves undigested food particles to the anus for excretion by the crawfish.
2. The circulatory system consists of a heart, arteries that carry blood to the vital organs and channels that carry the blood back to the heart.

Use dissection to observe the parts of the circulatory system of a crawfish.

- a. The crawfish has no veins.
  - b. Oxygen is absorbed by the blood from the gills.
3. The nervous system consists of a brain with 3 sets of nerve cells, known as ganglia.

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Locate the external sensory organ on a crawfish. These include the eyes, antennae, setae.

- a. Two nerve cords run the length of the abdomen.
- b. The compound eyes provide excellent color vision for the crawfish.
- c. Numerous setae (hairs) on the body provide balance and touch for the crawfish.

4. The respiratory system provides oxygen to the cells of the body through circulating blood.

Examine a crawfish specimen to locate the gills. View the gill structure using magnification.

- a. Gills are the organs responsible for taking in oxygen and giving off carbon dioxide.
- b. They are located outside the body under the carapace and are designed so that they can get oxygen from the air if the crawfish is out of the water. The gills must be moist in order to do so.

5. The excretory system rids the body of wastes.

Dissect a crawfish to observe the organs in the excretory system.

- a. A pair of kidney-like organs, known as green glands, located above the mouth, produce urine which is stored in a bladder and then excreted from the body.
- b. Wastes are also excreted through the gills in the form of ammonia.

6. The muscular system includes powerful abdominal muscles that make it possible to swim backward rapidly and muscles in other parts of the body, such as in the pincers, walking legs, mandibles, and stomach.

7. The reproductive system varies with the sex of the crawfish.

Use TM A8 to describe the sexual distinction between male and female crawfish. Determine the sex of several specimens of crawfish. Observe a female crawfish with eggs or young attached. Observe a newly hatched crawfish on a female. (A magnifying glass may be needed.)

- a. Female crawfish have ovaries located in the head beneath the heart. Oviducts lead from the ovaries to openings at the 3rd pair of walking legs.
- b. In mating, sperm are transferred from the male to a receptacle on the female's abdomen.
- c. After mating, the female goes into an underground burrow to lay 100 to 500 eggs.
- d. The eggs are fertilized after they are laid and are attached to the female's body with a substance known as glair. The eggs incubate on the female and the young remain attached to the female through 2 molts. They leave the female when they are able to care for themselves.
- e. Male crawfish have testes located in the head near the heart. The testes produce sperm. Paired sperm ducts lead to openings at the bases of the 5th pair of walking legs. The male assumes no responsibility for the care of the young crawfish.
- f. Crawfish eggs hatch in 2-4 weeks after fertilization.

G. What is the nature of crawfish farming?

Ask students to explain why it is important to grow crawfish at other times of the year. Use TM A9 to list the components of the cycle used in raising crawfish. Arrange for a crawfish farmer to serve as a resource person in class and explain the process used on his/her farm.

1. Crawfish farming is the culture of crawfish.
  - a. In the wild, crawfish are available during only part of the year.
  - b. Culturing crawfish makes them available at other times of the year.
  - c. Culturing crawfish also insure the consumer of a wholesome food that is not contaminated with dangerous substances.
2. Crawfish grow in a cycle that typically begins in the spring and ends in the late fall and winter when harvest is underway.
  - a. Adult crawfish are stocked in growing facilities (often rice fields) in the spring.
  - b. Crawfish prefer water that is about 8 inches deep. The water is drained off after a few weeks from June to August.
  - c. As the ground dries, the crawfish burrow into the earth and reproduce.
  - d. The field is reflooded in October and the crawfish emerge from the burrows.
  - e. The crawfish feed on the vegetation that has been grown on the field and grow rapidly.
  - f. Selective harvesting may begin in November and run through the following March, depending on the size of the crawfish.
3. The work in crawfish farming involves a variety of tasks:

Develop this list using TM A10 and/or input from students.

- a. Establishing and stocking the ponds.
- b. Growing vegetation for the crawfish to eat.
- c. regulating water levels.
- d. Supplementing the food available to the crawfish.
- e. Harvesting those that have reached adequate size. Harvesting is a major activity requiring labor and equipment.

### H. What factors should be considered in determining whether to produce crawfish?

Ask students to explain why starting a crawfish farm is a long-term commitment. (Land must be acquired, pond must be built, wells dug, etc.) Ask them to explain each consideration and describe the major points to study associated with each.

1. Careful consideration should be given to several factors before going into crawfish farming because of the financial investment that is required. The decision to raise crawfish is a long-term commitment of resources.
2. Good information should be obtained and the likelihood of success should be studied. Consider the following 8 factors and formulate an answer for each of them:
  - a. Education and training in how to raise crawfish are essential. Will people (labor) with the needed education and training be available?
  - b. Land capability should be studied. Land should be put to its best use. Will crawfish farming be the best use for the land?
  - c. Water facilities will be needed. Ponds may need to be constructed, wells dug, pumps and pipes installed and drainage systems put in place. Will adequate water facilities be available?
  - d. Adequate water must be available. The water must be of quality suitable for crawfish farming. Will plenty of quality water be available at an economical cost?

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Explain that some authorities suggest that water supply may be one of the biggest limitations in crawfish farming: 70-100 gallons/minute for each acre of pond will be needed.

- e. Equipment to raise the crawfish will be needed. This includes tractors, boats, traps, feeders and other equipment. Will the equipment be available?

Have students construct a bulletin board or poster that depicts the equipment needed for crawfish farming.

- f. Finances will be needed. Money will be needed for building ponds, providing water, buying adult brood crawfish, providing feed, harvesting, hauling, paying labor and other costs. Will adequate finances be available?

Invite a local banker to discuss financing a crawfish farm. Determine the current interest rate and project this to the cost of establishing and operating a crawfish farm.

- g. Harvested crawfish must be marketed. Without marketing, the farmer gets no return. Will a market be available?
- h. Crawfish producers must like the nature of the work. Will I like crawfish farming?

Ask students to explain why it is important for people to like their work.

### I. What crawfish production systems are used?

Ask students to explain what is meant by manipulating the life cycle of a crawfish.

1. The life cycle of crawfish can be manipulated to fit into the production of other crops on a farm.
  - a. Some of the crops provide forage for crawfish.
  - b. The other crops must be adapted to the soil and land used for crawfish farming.
2. The production systems used for crawfish culture involve natural or artificial systems.

Use TM A12 to outline the production systems used in crawfish farming. Take a field trip to study a marsh that is used for crawfish farming. If not used, study the marsh to determine the presence of crawfish and other aquatic life.

- a. The natural systems involve using marshes and other low areas that naturally collect water and provide a satisfactory environment.
  - b. Trees and other obstacles sometimes impair harvesting in natural areas.
  - c. Water control may be difficult, with flooding from creeks occurring during rainy seasons and complete drying out occurring during dry seasons of the year.
  - d. Providing good forage may be difficult.
3. Three kinds of artificial systems are used:
    - a. Natural marshes may be dammed up to form ponds.
    - b. Permanent ponds may be used strictly for crawfish growing.
    - c. Rotation ponds with rice and other crops may be used with crawfish. These typically involve using facilities designed with the culture of rice as first priority. Soybeans are sometimes included in the rotation.

Have a resource person from the local ASCS office discuss regulations that apply to using land for crawfish farming.

4. The production system that is used must consider the programs of the U.S. government and requirements of various agencies, such as the use of wetlands.

J. What kinds of crawfish are grown based on use?

Use TM A14 to outline the major uses made of crawfish. Have students visit a local bait shop for information on recreational crawfish, including price.

1. Demand varies for different crawfish products. Some farmers cater to small, niche markets.
2. Four major kinds of crawfish are grown based on their use:
  - a. Brood crawfish. These are sexually mature male and female crawfish that are used to stock growing ponds.
  - b. Hard-shell food crawfish. These are grown for human food and represent the largest share of the market.
  - c. Recreational crawfish. These crawfish are grown and used for bait to catch other fish.
  - d. Soft-shell crawfish. These crawfish are produced for marketing while molting and they don't have a shell.

**Review:**

Review by having students demonstrate their knowledge and understanding of the objectives of the problem area. Lead a discussion with students by asking them questions that cause them to explain the content related to each objective. Observe how students use the content in their supervised practice, and observe how students apply the content in the school's aquaculture laboratory.

**Application Activities:**

Application can be addressed in several ways by involving the students using the content of the problem area in their supervised experience program, in the school laboratory or as they enter crawfish farming.

**Evaluation:**

Evaluation should focus on the extent to which students achieved the objectives of the problem area. Student achievement of the objectives can be assessed during review and application as well as through specific evaluation. Example exam questions are attached.

## Objectives

- Explain the scope of crawfish farming
- Describe the characteristics of crawfish
- Explain the nature of crawfish farming
- Describe considerations in deciding to produce crawfish
- Describe production systems
- Describe the kinds of crawfish produced

TM A2

TM A3

## Common and Scientific Names of Cultured Crawfish Species

- Red crawfish:  
*Procambarus clarkii*  
(Also known as red swamp crawfish)
- White crawfish:  
*Procambarus blanding acutus*  
(Also known as white river crawfish)
- Deep water white:  
*Procambarus zonangulus crawfish*

TM A4

TM A5

TM A6

## Body Systems of Crawfish

- Digestive
- Circulatory
- Nervous
- Respiratory
- Excretory
- Muscular
- Reproductive

TM A7

TM A8

TM A9

## Crawfish Production Cycle

- Ponds stocked with adult broodfish in spring
- Water drained off in June to August
- Crawfish go into burrows where females lay eggs
- Pond is reflooded in October
- Crawfish come out of burrows
- Crawfish feed on forage and grow
- Selective harvesting begins in late November
- Harvesting continues until following spring

TM A10

## Functions in Crawfish Farming

- Establishing ponds
- Stocking ponds with brood crawfish
- Growing vegetation for crawfish to eat
- Regulating water
- Feeding (supplemental to vegetation)
- Harvesting

TM A11

## Factors to Consider With Crawfish Farming

- Labor supply - appropriate education
- Land capability
- Water facilities
- Water supply
- Equipment
- Finances - construct and operate
- Market availability
- Nature of the work

TM A12

## Production Systems Used With Crawfish

- Natural:  
Marshes & low areas that collect water  
Water control is difficult  
Trees & other obstacles present problems  
Economical to use
- Artificial:  
Constructed to raise crawfish  
Expensive to build  
Designed especially for crawfish farming

TM A13

## Kinds of Artificial Crawfish Systems

- Natural marshes that are dammed
- Permanent ponds used only for crawfish farming
- Rotation ponds used with rice and other crops

TM A14

## Major Kinds of Crawfish Grown Based on Use

- Brood crawfish
- Hard-shell food crawfish
- Recreational crawfish
- Soft-shell food crawfish

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Quiz for Section A

Name:

Date:

Quiz on Determining the Nature of Crawfish Farming

Directions: Answer the following questions in the space provided. Be sure to spell correctly and provide the most complete information you can.

1. What is the scope of crawfish farming in the U.S.?
2. What is a crawfish?
3. What species of crawfish are farmed? (List common and scientific names.)
4. What is the preferred natural habitat of crawfish?
5. Draw a crawfish and label the 3 segments, uropod, telson, pincers eyes, antennae and walking legs.
6. What are the major body systems of crawfish? Describe the functions of each.
7. What cycle is involved in the production of crawfish? When does it begin and end? What functions occur in the cycle?
8. What factors should be considered in determining whether to go crawfish farming?
9. What 3 artificial systems are used to raise crawfish?
10. What kinds of crawfish are grown based on use?
11. What is molting?
12. What is regeneration?

### Key for Section A

1. Crawfish farming involves 150,000 acres in the U.S. Much of farming is in Louisiana. Other states include Texas, Florida, South Carolina, and Arkansas.
2. A crawfish is a decapod crustacean.
3. The predominant farmed species is the red crawfish (*Procambarus cambarus clarkii*). Two white species are farmed: white and red crawfish (*Procambarus blanding acutus*) and deep water (*Procambarus zonangulus*).
4. The preferred natural habitat of crawfish is shallow, weedy swamps and ponds. The water should have a pH of 5.8-8.2, with 3.0 ppm oxygen or higher. In addition, crawfish prefer water that is 65- 85°F.
5. The drawing should show 3 body segments as well as major appendages on each. The segments and appendages should be labeled.
6. The major body systems of crawfish are digestive system (changes food into forms the body can use); circulatory system (carries blood with oxygen to all parts of the body); nervous system (provides sensation with environment and for body balance); respiratory system (provides oxygen to the cells of the body); excretory system (rids the body of wastes); muscular system (provides for body movement); reproductive system (varies by sex of crawfish, but produces young).
7. The crawfish production cycle begins in the spring when adult and female crawfish are stocked in growing ponds. The water level is lowered to get the crawfish to burrow and reproduce. Water level is raised to get them to come out of the burrows grow. By late fall, some of the young crawfish have grown sufficiently for harvest to begin. Most harvesting is complete by late spring and the cycle starts over again.
8. The factors to consider in determining whether to go into crawfish farming are the following: education and training of manager and labor; land capability; water facilities; water supply; equipment; finances; market availability; and preferences about the nature of the work by the farmer.
9. The 3 artificial systems used to raise crawfish are natural marshes dammed to form ponds; permanent ponds used solely for crawfish farming; and rotation ponds used with other crops.
10. The kinds of crawfish grown based on use are brood crawfish, hard-shell food crawfish, recreational (bait) crawfish, and soft-shell crawfish.
11. Molting is the shedding of the exoskeleton as the crawfish grows.
12. Regeneration is regrowing a part that may be broken off, such as a pincer (claw).

Teaching Plan:

**Module:** Crawfish Farming - Section B

**Problem Area:** Establishing and Using Growing Facilities

**Estimated Time:** 4-6 hours

**Goal:** The goal of problem area is understand the facilities that are needed to raise crawfish, with emphasis is on pond design and construction and water.

**Learning Objectives:** Upon completion of this problem area, students will be able to:

describe the facilities needed to raise crawfish  
explain design considerations with crawfish ponds  
describe water requirements for crawfish farming

**Resources:** The following instructional resources are needed to complete this problem area:

**Essential:**

Transparencies.

**Additional:**

**Crawfish Culture: Site Selection, Pond Construction and Water Quality** (SRAC Publication No. 240) available from the Cooperative Extension Service in each state.

**Third Report to the Fish Farmers**, by Dupree, Harry K. & Huner, Jay V., Washington: U.S. Department of the Interior, Fish and Wildlife Service, 1984.

**Introduction to Aquaculture**, by Landau, Matthew, John Wiley & Sons, Inc., NY, 1992.

**Crustacean Farming**, by Lee, Daniel O.C. & Wickins, John F., John Wiley & Sons, Inc., NY, 1992.

**Aquaculture: An Introduction**, by Lee, Jasper S. & Newman, Michael E., Danville, IL, Interstate Publishers, Inc., 1992.

Journals that include articles on crawfish farming, such as the **Water Farming Journal**, published by Carroll Trosclair and Associates, Inc., 3400 Neyrey Drive, Metairie, LA 70002.

# Aquaculture Curriculum Guide

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## Content and Procedures

### Preparation (Interest Approach):

To develop student interest in this module, ask students to describe the environment needed to produce different crops, such as chickens, wheat, corn, and beef cattle. Ask them to compare their suggestions to the environment needed by crawfish.

Conclude by asking students to name the major factors in the environment that influence crawfish growth. (These were covered in Section A - Determining the Nature of Crawfish Farming.) List the major points the students name on the chalkboard. These should include quality water that is free of harmful substances, proper water pH, right water temperature, as well as facilities to hold the water.

### Presentation:

#### A. What facilities are needed to raise crawfish?

Show TM B1 to present the objectives for the problem area. Use TM B2 to outline the 5 major areas of facility needs. Tour a crawfish farm to observe the facilities. Have students prepare a bulletin board or poster that describes the 5 areas of facility needs. Ask students to list factors that determine the size of ponds, such as natural lay of the land and overall size of farm. Make a field trip to observe harvesting, if available in the community

General facility needs relate to the production functions that must be carried out. Facilities are needed in 5 major areas:

1. Water supply and regulation facilities: May be from wells and other sources that provide quality water.
  - a. Facilities must be available to remove water from ponds and add oxygen to water in ponds.
  - b. Crawfish ponds require a high volume of water.
  - c. The water source and pump capacity must provide for 70-100 gallons of water/minute/surface acre of crawfish pond.
2. Water impoundments: Include structures that will hold water and allow its proper regulation, e.g., ponds and rice fields.
  - a. Ponds are typically 40-60 acres, though smaller and larger sizes can be used.
  - b. Amount and lay of land influence size. Rotation ponds with rice and other crops are the size of the field.
3. Feeding facilities: In addition to vegetation that is grown for forage, crawfish are often fed supplemental feed.
4. Harvesting facilities: Requires traps to catch the crawfish and boats with the proper containers to collect the crawfish from the traps.
5. Grading and storing facilities: Equipment is needed to grade crawfish, transport, and store crawfish.

#### B. What design considerations are important with crawfish ponds?

Use TM B3 to outline factors to consider in selecting a site for a crawfish pond. Arrange for students to view various locations in the community and assess their potential for crawfish ponds.

Have students examine soil to determine clay content. Have students assess the water supply locally to determine the best sources.

1. Crawfish ponds are often known as water impoundments. They must be capable of holding water and also allow it to be drained off, as needed in the production cycle of the crawfish.
2. Selecting a site for crawfish ponds requires attention to several factors:
  - a. Flat and open land: Allows better water management and even distribution of water over the pond area. Land with trees and other obstacles is more difficult to harvest and manage.
  - b. Heavy clay soil: Crawfish ponds should be located on heavy clay soil. This type of soil holds water well and allows the crawfish to dig the essential burrows. Sandy soils are not recommended for crawfish ponds even if they hold water.
  - c. Proximity to water source and disposal: Ponds should be located close to sources of water and places where water can be run when no longer needed.
  - d. Convenient and accessible: Ponds must be easy to reach in all kinds of weather.
3. Ponds should be constructed to allow for good management of the crawfish pond.

Show TM B4 to outline factors in pond construction. Use TM B5 to illustrate levee arrangement and overall pond layout. Use TM B6 to outline major points in levee construction. Have students review related literature on levee construction and determine the slope and volume needed to construct levees of varying lengths. Ask a student to explain the meaning of 3 to 1 slope [4c below]. (Base of levee extends outward 3 feet on each side for every foot of height.)

- a. Use levee-type ponds: They have a levee built around them above the level of the surrounding land.
  - b. Levee layout. The levee around a crawfish pond is known as a perimeter levee. Baffle levees are built into larger ponds to insure good water flow.
  - c. Perimeter levees are located around the pond and keep water in as well as flood water from nearby creeks out.
  - d. Baffle levees are built 150-300 feet apart inside of the perimeter levee to help enhance water movement throughout the pond.
4. Construct levees properly. Good levees require attention to important details:
  - a. Levees should have a core of clay to prevent water seepage.
  - b. The levees should be about 3 feet high to allow water 18 to 22 inches deep. This will leave a freeboard (distance between level of water and top of levee) of 14-18 inches.
  - c. A slope of 3 to 1 is frequently used in constructing both sides of levees.
  - d. Levees are usually planted with grass or other vegetation to prevent erosion.
  - e. Design should allow motor vehicles to move on the levees, such a tractor-powered mower to cut weeds and grass.
  - f. Both perimeter and baffle levees have the same specifications.
5. Form the bottom of ponds: Should slope no more than 6 inches between levees. Some land forming may be needed if the land is not level.

Ask students to explain why farmers want the bottom of crawfish ponds to be level. (Ponds with level bottoms are easier to manage in harvesting, water control, and vegetation production.)

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6. Economize water use: Crawfish ponds require a lot of water.
  - a. A recirculation canal can be built outside the perimeter levee to allow reuse of water.
  - b. A return channel can be constructed inside the pond for reusing water before it is disposed of.
7. Have proper drains. They should be matched to the capacity of the pond.

Make a field trip to observe the drainage system on a crawfish or another aquaculture farm. Arrange for a technician from the Soil Conservation Service to act as a resource and discuss the design of crawfish ponds.

- a. Drains should be adequate to handle all water added to the pond.
  - b. Drains should be able to handle rainfall plus the growing water.
8. Use aerators: Aeration screen and circulation pumps are needed to insure good quality water.
  - a. Crawfish need water with an oxygen level of at least 3.0 ppm.
  - b. Adequate pumps and power to operate the pumps will be needed.

### C. What types of crawfish ponds are used?

1. Three main types of ponds are used: wooded, semi-wooded, and open. Wooded ponds are in forested areas and are constructed by building levees around the desired area. They typically involve less intensive crawfish production and produce 200-800 lbs of crawfish per acre a year.
2. Semi-wooded ponds typically develop after a wooded pond has been used for several years.

Ask students to explain why standing water may kill trees that don't naturally grow in water. (They should mention oxygen in the soil for the roots of the tree.)

- a. The trees in the pond are killed by excessive water.
  - b. Various vegetation may grow in the pond.
  - c. Semi-wooded ponds produce 230-1,000 lbs of crawfish a year, depending on the rate of stocking and extent of management.
3. Open ponds are most widely used by commercial crawfish farmers. Tree-free lanes are needed so that boats can move about to manage and harvest the crawfish.

Have students construct a bulletin board or poster that contrasts the types of crawfish ponds.

- a. These ponds have been cleared of all trees and other obstacles.
  - b. Three types are typically used: permanent crawfish ponds, crop rotation ponds, and dammed marshes.
  - c. Permanent ponds are used only for crawfish farming, with a yield of 1,000-3,000 lbs a year with good management.
  - d. Crop rotation ponds typically involve rice farming along with the crawfish, with crawfish yields of 1,000-2,500 lbs per acre a year with good management.
  - e. Dammed marshes are constructed by damming natural marshes. They are less productive than other types of ponds.

### D. How much water is needed for crawfish farming?

Have students calculate the amount of water needed to fill a 40-acre pond 12 inches deep. (One acre-foot contains 325,851 gallons of water; therefore, multiply the number of acres by the gallons in an acre-foot to determine the amount of water in a pond. A 40-acre pond with water 12 inches deep contains 13,034,040 gallons of water. Note: An acre-foot is an acre of water that is 1 foot deep.)

1. The amount of water needed depends on the production system that is being used and the size of the crawfish farm.
2. Sufficient water must be available to allow the complete exchange of water in a crawfish pond in a period of 4-5 days.
  - a. Water is typically exchanged 9 times during a growing cycle.
  - b. The water level in the spring may be higher than in the fall, with 18-22 inches in the spring and 8-10 inches being sufficient in the fall.
3. Pumping capacity should be 70-100 gallons per minute (gpm) per surface acre of pond.

With the above example of 13,034,040 gallons of water in a pond, how long would it take to replace the water in the pond if four 1,000 gpm pumps were used? (Divide 13,034,040 by 4,000 [capacity of 4 pumps] and then divide by 60 [minutes in an hour] to get the number of hours: 54.31 minutes needed to fill the pond.

- a. Large ponds may require several pumps.
- b. Water volume can be calculated by multiplying acres in the pond by 70 (the minimum rate). For example, a 50-acre pond would need a minimum of 3,500 gallons per minute total pumping capacity.
4. Recirculation can reduce the volume of new water that is needed.
5. Water for crawfish ponds can be obtained from wells or surface sources, such as streams and lakes.
  - a. Surface water may contain trash fish and bring diseases to the crawfish ponds. In some cases, surface water can introduce pesticides and other hazardous materials.
  - b. Well water may be low in oxygen and have harmful minerals, such as iron and sulfur.

### E. What kind of water is needed for crawfish farming?

Use TM B9 to outline the importance of dissolved oxygen in the water.

1. Crawfish require quality water that has sufficient dissolved oxygen (DO).
  - a. DO should be a minimum of 3.0 ppm for crawfish.
  - b. Crawfish die when the oxygen gets too low.
  - c. Significant numbers of crawfish will die if the water DO reaches 1.0 ppm.
2. Oxygen deficiency is typically corrected in two ways: replacement and aeration.
  - a. Water low in oxygen may be replaced with water that is high in oxygen. (This requires more water!)
  - b. Water may be aerated and recirculated in the pond.

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### 3. Crawfish are also subject to other water problems.

Have students test various water samples for hardness, alkalinity, and other qualities.

- a. The preferred pH for water in crawfish ponds is 6.5 to 7.5.
- b. Total hardness and total alkalinity should range between 50 and 250 ppm of  $\text{CaCO}_3$ .
- c. Agricultural lime can be mixed into the pond bottom to raise pH when the pond is dry.
- d. Ammonia, nitrite, iron, and hydrogen sulfide content can also make water unfit, but these problems are not likely to occur in crawfish ponds. Increased levels of stocking could result in these problems occurring.

### 4. Crawfish prefer water with a temperature of 65-85°F.

Ask students to explain what they would do to warm cold well water before dumping it into a crawfish pond. (Some farmers pump it into a holding reservoir for the sun to warm it before it is used.)

- a. Too much cold well water can lower the temperature below the optimal level.
- b. Thermal heated water and water exposed to the sun in warm climates could be too warm.

#### **Review:**

Review the problem area by having students explain the objectives. Call on various students to explain the content related to each objective. The problem area can also be reviewed by asking questions about the content and by observing how students carry out their laboratory or supervised practice activities.

#### **Application Activities:**

Application can occur in supervised practice, in the school laboratory, or later as a crawfish farmer.

#### **Evaluation:**

Evaluation should focus on the extent to which students have achieved the objectives of the problem area. Written and oral tests can be used. Example exam questions are attached.

TM B1

## Objectives

- Describe facilities needed to raise crawfish
- Explain design considerations with crawfish ponds
- Describe water requirements for crawfish farming

TM B2

## 5 Areas of Facility Needs in Crawfish Farming

- Water supply and regulation facilities
- Water impoundments
- Feeding facilities
- Harvesting facilities
- Grading and storing facilities

TM B3

## Factors to Consider in Selecting Site for Crawfish Pond

- Flat and open land
- Heavy clay soil
- Proximity to water source
- Convenient and accessible

TM B4

## Factors in Crawfish Pond Construction

- Use levee-type ponds
- Properly layout levees
- Construct levees properly
- Form the pond bottom
- Consider economy of water use
- Provide proper drains
- Plan for aeration of water

TM B5

TM B6

## Major Factors in Levee Construction

- Use clay core to prevent seepage
- Construct levee 3 feet high
- Use 3:1 slope on both sides
- Ease of operation of motor vehicles
- Protect with ground vegetation cover

TM B7

## Types of Crawfish Ponds

- Wooded
- Semi-wooded
- Open:
  - Permanent
  - Crop rotation
  - Enclosed marshes

TM B8

## Sources of Water for Crawfish Ponds

- Wells (Aquifers):  
Deep in the earth  
Expensive to pump  
Usually best quality  
More dependable on a year-round basis
- Surface (From Streams or Lakes):  
May contain pollution  
May dry up at some times of the year

TM B9

## Crawfish Dissolved Oxygen Responses

- Crawfish prefer DO level of 3.0 ppm
- Crawfish will die at DO level of 1.0 ppm
- Insure Adequate DO:  
Replace pond water with water high in DO  
Aerate water in the pond

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Quiz for Section B

Name:

Date:

Quiz on Establishing and Using Growing Facilities for Crawfish

Directions: Answer the following questions in the space provided. Be sure to spell correctly and provide the most complete information you can.

1. Name the 5 major areas of facilities needed to raise crawfish.
2. What major factors should be considered in selecting a site for a crawfish pond?
3. Why should crawfish ponds be located on flat and open land?
4. What is a levee-type pond? Why are they used?
5. Draw a sample layout of a crawfish pond showing perimeter and baffle levees.
6. Explain the following major factors in constructing levees on crawfish ponds.

Preventing seepage:

Levee height:

Levee slope:

7. Name and distinguish between the types of crawfish ponds.
8. Describe the following as related to water in a crawfish pond.

Complete exchange:

Water depth (fall through spring):

Needed pumping capacity:

Desired level of DO for crawfish:

Level of DO that will cause crawfish mortality:

Preferred water temperature range for crawfish:

9. What are the ways of correcting oxygen deficiency?
  
10. How many gallons of water are in a 30-acre pond when the water is 18 inches deep?

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### Key for Quiz - Section B

1. The major areas of facilities needed to raise crawfish are the following: water supply and regulation facilities, water impoundments, feeding facilities, harvesting facilities, grading and storing facilities
2. The major factors that should be considered in selecting a site for a crawfish pond are as follows:  
Flat and open land.  
Heavy clay soil.  
Proximity to water source and disposal. Convenient and assessable.
3. Crawfish ponds should be located on flat and open land because they are easier to manage. The water is more evenly distributed. Trees do not provide obstacles in the work.
4. A levee-type pond is one that is built above the ground with a levee on all sides. This method of construction makes it easier to remove the water from the pond.
5. The drawing should be similar to that in TM B5.
6. Preventing seepage involves constructing pond levees with a clay core in the center. Levees for crawfish ponds are usually about 3 feet high. The slope is often 3 to 1 on both sides.
7. The types of crawfish ponds are as follows:  
Wooded: located in forested areas, constructed by building a levee around the forest).  
Semi-wooded: fewer trees than a wooded pond, usually develop in wooded ponds after several years of use (trees are killed by water).  
Open: No trees and may be of 3 types: permanent, crop rotation and dammed marshes.
8. The following are described as related to water in a crawfish pond:  
Complete exchange: removing old and adding new water so that it is complete in 4 to 5 days.  
Water depth: Water ranges from about 8 inches in the fall to 22 inches in the spring in crawfish ponds.  
Needed pumping capacity: Pumps should provide 70-100 gallons/minute/surface acre of crawfish ponds.  
Desired level of DO for crawfish: 3.0 ppm.  
Level of DO that will cause crawfish mortality: 1.0 ppm.  
Preferred water temperature range for crawfish: 65-85°F.
9. Oxygen deficiency can be corrected by aerating the water in the pond or adding new water that is high in oxygen.
10. A 30-acre pond that has water 18 inches deep will contain 14,663,295 gallons. (Calculations:  $1.5 \times 325,851$  gives gallons per acre, or 488,776.5 gallons; amount for pond is  $30 \times 488,776.5 = 14,663,295$ .)



Teaching Plan:

**Module:** Crawfish Farming - Section C

**Problem Area:** Reproducing and Rearing Crawfish

**Estimated Time:** 8-12 hours

**Goal:** The goal of this problem area is to develop skills in the overall production of crawfish, with emphasis on reproducing crawfish, feeding crawfish and keeping crawfish healthy

**Learning Objectives:** Upon completion of this problem area, students will be able to:

describe management practices to encourage crawfish reproduction  
explain how feed is provided for crawfish  
describe how to keep crawfish healthy  
describe special considerations with soft-shell crawfish

**Resources:** The following instructional resources are needed to complete this problem area:

**Essential:**

Transparencies.

**Additional:**

**Crawfish Production Systems** (SRAC Publication No. 241).

**Crawfish Culture** (SRAC Publication No. 241).

Any books, bulletins, or other materials on crawfish aquaculture A few examples are listed here:

**Aquaculture: The Farming and Husbandry of Freshwater and Marine Organisms**, by Bardach, John E ., Ryther, John H. & McLarney, William O. John Wiley & Sons, Inc., NY, 1972.

**Third Report to the Fish Farmers**, by Dupree, Harry K. & Huner, Jay V., Washington: U.S. Department of the Interior, Fish and Wildlife Service, 1984.

**Introduction to Aquaculture**, by Landau, Matthew, John Wiley & Sons, Inc., NY, 1972.

**Crustacean Farming**, by Lee, Daniel O.C. & Wicking, John F, John Wily & Sons, Inc., NY, 1992.

**Aquaculture: An Introduction**, by Lee, Jasper S. & Newsman, Michael E ., Danielle, IL, Interstate Publishers, Inc., 1992.

Journals that include articles on crawfish farming, such as the **Water Farming Journal**, published by Carol and Associates, Inc., 3400 Neyrey Drive, Metairie, LA 70002

## Content and Procedures

### Preparation (Interest Approach):

To develop student interest in this module, ask students to describe what producers of cattle are most concerned with. Develop a list of these concerns on the chalkboard. Have students explain why these concerns are important. (Possible concerns include getting the cattle to produce babies, providing the right feed for the cattle, and keeping the cattle from getting disease.) Ask students why these are important. (They insure that the cattle will successfully grow.)

Ask students if they feel that there is a parallel between raising cattle and crawfish. Have them to offer comments on how cattle and crawfish may be alike and different. (One major difference is that crawfish grow in water and cattle don't.)

### Presentation:

#### A. What management practices are used to encourage crawfish to reproduce?

Use TM C1 to presents objectives for the problem area. Use TM C2 to outline sequence of events in managing crawfish to encourage reproduction. Ask students to describe how this sequence of events could vary with climate. (Most crawfish production occurs in southern states that have mild winters and long summers.)

1. Most crawfish farmers take advantage of the natural reproduction processes of crawfish.
  - a. The cyclical nature of the process is best illustrated with the permanent pond production of crawfish.
  - b. Stock ponds in April and May.
  - c. Drain pond over a period of 2-4 weeks in May and June.
  - d. Plant vegetation in June through August.
  - e. Reflood the pond in October.
  - f. Harvest crawfish from November through late May or June.
  - g. Drain pond and repeat the cycle in May and June. (It may not be necessary to add brood crawfish.)
2. Male and female crawfish mate during all months but the peak is reached in the spring.

Use TM C3 to outline how lowering the water level is important in crawfish reproduction.

- a. The female stores sperm until eggs are laid. (Female crawfish have been observed to store sperm as long as 6 months.)
  - b. The eggs are fertilized at the time they are laid by the female.
  - c. Females usually lay eggs in burrows in the late summer or early fall.
  - d. Lowering the water level in a crawfish pond in the early summer encourages females to lay eggs.
3. Crawfish build 2 kinds of burrows based on location: levee and bottom. (Levee burrows are built in the levee of the pond, while bottom burrows are built in the pond bottom.)

Locate examples of the 2 kinds of crawfish burrows. Note any differences that appear on the outside. Observe a female with young attached. (These can be obtained from recently reflooded crawfish ponds.)

- a. Burrows are important because crawfish live in them for 2-4 months, depending on the flooding schedule used by the farmer.
  - b. In some cases, only fertilized females go into burrows, while in others male crawfish may also go into the burrow with the female.
  - c. The burrows are built near the water but not below the water level. The top is sealed to hold moisture in and provide a good place for the eggs to incubate. Burrows may be 4 feet deep to insure water during dry weather.
4. Incubation is the period of time between when an egg is fertilized and it hatches.

Determine the number of young the females stocked in a pond could produce at 300 per female. (At 10 brood crawfish per pound, half would be female. The total number of young produced per acre is calculated by multiplying the numbers of females in a pound by the number of pounds stocked on an acre. This is then multiplied by 300. In this example, 5 times 50 pounds equals 250 female crawfish in an acre. The number of young is 250 multiplied by 300, or 75,000 young crawfish. This number should produce about 2,300 lbs of .5 oz crawfish. Divide 75,000 by 32 [the number of crawfish in a pound at the weight of .5 oz].)

- a. The eggs adhere to the females body through incubation.
  - b. The female regularly moistens the eggs with the water in the burrow during the incubation period of 2 to 4 weeks. (The red crawfish incubation is shorter than that of the white river crawfish.)
  - c. The newly hatched crawfish cling to the body for a while, usually long enough to molt twice and be able to fend for themselves.
  - d. Water should be added back to the pond at hatching to insure sufficient habitat for the young.
  - e. The female typically dies after the young are on their own.
  - f. A female will produce several hundred baby crawfish.
  - g. The maximum number of eggs observed on a crawfish has been 700.
  - h. Typical females in a crawfish pond produce 300 or so eggs.
5. Young crawfish may be lost to predation by fish, cannibalism while molting, and poor quality water.
6. Four important management practices are followed in reproducing crawfish:
- a. Stock enough mature male and female crawfish in a pond in spring before water is lowered. New ponds are stocked with 50-60 lbs of brood crawfish, half of each sex. Ponds in construction will have enough crawfish left from previous year. Broodfish should be captured from source and moved to pond within 2-3 hours. Do not refrigerate or expose them to wind or sun in transport.
  - b. Gradually lower water for about 4 weeks. This will encourage females to burrow. Quickly lowering water is impractical, requires increased pump capacity, and is expensive. Gradually lowering water helps prepare crawfish for burrowing. Plant forage crops while pond is dry.
  - c. Reflood pond in early fall. This is done to coincide with the peak spawning of females in burrows. After reflooding and young emerge from burrows. If a crop is grown on field, reflooding is after crop is harvested.
  - d. Regulate harvesting schedule to allow maximum crop. Since some crawfish don't spawn until late fall or early winter, intensive harvesting should be delayed until winter.
7. Stock an adequate number of mature male and female crawfish in a pond in the spring before the water is lowered.

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Ask students to explain why brood crawfish should be protected when being moved to a pond (reduces mortality).

- a. New ponds are typically stocked with 50-60 pounds of brood crawfish, with half being of each sex.
- b. Ponds that have been in production will likely have enough crawfish left from the previous year.
- c. Brood crawfish should be captured from their source and moved to the pond within 2 or 3 hours. They should not be refrigerated or exposed to wind or sun while being transported.

8. Gradually lower the water over a period of about 4 weeks.

Make a field trip to observe the reflooding of a crawfish pond.

- a. Lowering the water will encourage the females to burrow.
- b. Quickly lowering the water is impractical and requires increased pump capacity and is expensive.
- c. Gradually lowering the water helps prepare the crawfish for burrowing.
- d. Plant forage crops while the pond is dry.

9. Reflood the pond in early fall.

- a. Reflooding is done to coincide with the peak spawning of females in the burrows.
- b. After reflooding the females and young emerge from the burrows.
- c. If a crop is grown on the field, reflooding is after the crop has been harvested.

10. Regulate the harvesting schedule to allow a maximum crop.

- a. Since some crawfish don't spawn until late fall or early winter, intensive harvesting should be delayed until winter.
- b. Harvesting should usually be completed by mid-spring.

B. How is food provided for crawfish?

Use TM C4 to outline the food needs of crawfish. Tour a crawfish farm to observe the kinds of vegetation growing in the farm.

1. Crawfish eat small plants and animals that live in the water as well as decaying organic matter.
  - a. Detritus is the decaying plant and animal material in the water.
  - b. Crawfish ponds will naturally grow small amounts of vegetation.
  - c. Most ponds do not have sufficient natural vegetation to support a large population of crawfish.
2. Rotations with certain agronomic crops are particularly beneficial, especially with rice.
  - a. Millet, soybeans, and hybrid sorghum are sometimes planted for crawfish.
  - b. Millet is not usually recommended for crawfish.
3. Rice is the preferred crop for crawfish.

Tour a farm that uses rice fields to produce crawfish. Have the owner describe important practices that are used to insure the best possible rice and crawfish crops.

- a. It can be planted for crawfish food or as a grain crop to be harvested.
- b. If harvested, the stubble and straw residue left in the field are good forage for crawfish.
- c. For crawfish, rice is planted through August at the rate of 90 to 120 lbs/acre.

- d. Pesticides should not be used to control insects in the rice. (Crawfish are very sensitive to pesticide residues. In some cases, rice can be treated when the crawfish are in burrows.)
4. Crawfish will need forage the winter and spring.

Examine crawfish from ponds with an abundance of vegetation and those from ponds with little vegetation. Compare the development of the crawfish, especially the tail muscle inside the exoskeleton.

- a. Sufficient forage must be available or the crawfish will not get enough to eat.
  - b. Crawfish may become stunted or have hollow tails due to a lack of food.
5. Most vegetation crops will need fertilizer and lime.
    - a. Fertilizer and lime should be added based on soil analysis.
    - b. Fertilizer and lime should be applied at the time the crops are planted.
  6. Crawfish are not usually fed commercially manufactured feed.

Indicate that crawfish nutrition is fairly well unknown. Much research is needed to determine the exact nutritional needs of crawfish.

- a. Supplemental feed may be beneficial if the forage has been consumed.
- b. Some producers use range pellets when the supply of forage has been eaten. (These are the pellets fed to cattle.)
- c. The amount of feed put into a pond depends on the population density and size of the crawfish.
- d. Research is continuing on the use of various feeds, such as catfish feed.
- e. Authorities suggest that the development of crawfish feeds may extend the production season later into the year.

### C. What procedures should be followed to keep crawfish healthy?

Show TM C5 and discuss disease problems. Ask students to describe a healthy crawfish. (It is active, reproduces, grows, has all body parts, has a shell in good condition, and doesn't have external parasites attached to it.)

1. Healthy crawfish grow and reproduce more efficiently.
2. Research has been made in only a few areas of crawfish health.
3. Producers are much aware of the importance of providing a good environment for crawfish.
4. Crawfish are subject to several kinds of disease.
  - a. Environmental diseases cause more losses than other diseases.
  - b. Oxygen depletion can result in the loss of large numbers of crawfish.
  - c. Pollution in the water can cause the death of crawfish.
5. Nutritional diseases develop when crawfish do not have sufficient food.
  - a. Providing plenty of good forage can prevent many nutritional disease problems.
  - b. Any supplemental feeds should be free of contamination that would injure crawfish.

6. Crawfish are attacked by some parasites.

Ask students to explain "pathogenic disease" (a disease caused when an organism invades the body).

- a. These are living organisms that live in or on the crawfish.
  - b. The water boatman insect may lay hundreds of eggs on a crawfish giving the crawfish a fuzzy appearance. (Though unsightly, they do not apparently cause many problems.)
  - c. Crawfish may be subject to pathogenic diseases, but the occurrence of these is uncertain.
  - d. *Psorospermium haeckeli* has been found in some crawfish. (This is an organism of uncertain status.)
  - e. Additional diseases are likely to be diagnosed as crawfish increase in intensity of production.
7. Predation can cause considerable loss on a crawfish farm.

Use TM C6 to outline predation and list example of predators. Use TM C7 to outline predator control methods. Have an aquafarmer describe the kinds of predation problems on local aquafarms. Have students prepare a bulletin board or poster that illustrates the use of frightening devices to keep predators away.

- a. Predators are animals that eat other animals.
  - b. The major predators are: fish, birds, raccoons, bullfrogs, snakes, turtles, and large water beetles.
  - c. Filtering surface water to remove trash fish can help reduce some of the predation problem.
  - d. Some growers use devices that frighten predators away, such as loud noises to drive birds off.
  - e. Other approaches include trapping, destroying, and placing small mesh wire fences around ponds.
8. Crawfish are kept healthy by creating a good environment for their growth.
- a. The pond is managed so that conditions that lead to disease don't develop.
  - b. It is far easier to prevent than to try to treat diseases.
9. Cannibalism can cause losses among crawfish at certain times of the growth cycle, especially just after molting.

Ask students to explain cannibalism. (It occurs when crawfish kill and eat other crawfish.)

### D. What special considerations are followed with soft-shell crawfish?

Observe a soft-shelled crawfish to note differences in the hard-shell and soft-shell forms. Use TM C8 to outline procedures in soft-shell crawfish production. Tour a soft-shell producer and observe how the crawfish are acclimated to the trays.

1. Soft-shell crawfish are fed in trays kept inside buildings at high stocking density until they molt.
2. Molting is frequent with young crawfish in warm water.
  - a. Young crawfish are selected from ponds used to grow hard-shell crawfish.
  - b. The young crawfish are hand selected when 2 inches long or larger.
  - c. They are moved from the pond to trays in a growing facility, usually a covered building.
3. Acclimating crawfish to the trays is important.

Tour a soft-shell producer and observe how the crawfish are acclimated to the trays.

- a. Moving crawfish from a pond can result in high mortality unless carefully handled.
  - b. Procedures should be followed to get the crawfish to gradually adjust to the trays.
  - c. The bottom of the tray is covered with shallow water.
  - d. Trays are about 3 feet wide, 8 feet long, and 4 or 5 inches deep.
  - e. Stocking rate in the trays varies but is 20 to 35 crawfish per square foot, depending on the size of the crawfish.
4. Crawfish are fed daily.
- a. A commercially prepared crustacean feed should be used.
  - b. Feeding should begin after acclimation at the rate of 3-5% body weight, and reduce this to 2% in a few days.

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5. Remove crawfish that indicate that molting will soon occur.

Observe crawfish to note differences in color related to potential molting that may soon occur.

- a. The color of the carapace will become distinctly darker just prior to molting.
- b. The crawfish should be placed in a molting tray.
- c. Crawfish that remain in the tray and molt will be attacked by the other crawfish and destroyed.

6. Molted crawfish should be immediately removed from the molting tray and processed.

Visit a local supermarket to determine if soft-shell crawfish are available. Determine the kinds of packaging and how they are prepared.

- a. Processing should occur the same day so that the shell does not return prior to marketing.
- b. Most crawfish are frozen in bags of water because the water protects the crawfish and prevents parts from being broken off.
- c. Vacuum and shrink-wrap packaging are also being used.

### **Review:**

Review by having students demonstrate their understanding and knowledge of the objectives for this problem area. Call on various individuals to explain parts of the objectives. The problem area can also be reviewed by asking questions about the content, during supervised practice, and during laboratory activities in crawfish aquaculture.

### **Application Activities:**

Application can occur in the laboratory, during supervised practice, and later during work in crawfish farming.

### **Evaluation:**

Evaluation should focus on the extent to which students have achieved the objectives for the problem area. Observations of the students during review can be most helpful. Using written and oral tests will also be helpful. Example exam questions are attached.



## Objectives

- Describe management practices that encourage crawfish reproduction
- Explain how feed is provided for crawfish
- Describe how to keep crawfish healthy
- Describe special considerations with soft-shell crawfish



## Crawfish Production Cycle With Permanent Ponds

- April-May:  
Stock 50-60 lbs of brood crawfish per acre
- May-June:  
Drain water from pond for 4 weeks
- June-August:  
Plant vegetation
- October:  
Reflood pond
- November:  
Harvest crawfish May or June
- May-June:  
Drain pond and repeat cycle



## How Lowering Water Level Promotes Reproduction

- Female stores sperm from mating
- Lowering water causes burrowing
- Eggs are laid and fertilized in burrow
- Eggs are incubated in burrow



## Crawfish Foods

- Small plants and animals that live in the water
- Dead plants and animals that may or may not float in the water, known as detritus
- Vegetation:  
Rice is preferred  
Sorghum, millet, and soybeans  
Wild, native vegetation sometimes used



## Disease Problems With Crawfish

- Environmental disease
- Nutritional disease
- Parasites
- Pathogenic disease



## Crawfish Predators

- Predators attack and eat crawfish
- Common predators:
  - Trash fish
  - Birds
  - Raccoons
  - Bullfrogs
  - Snakes
  - Turtles
  - Large water insects, such as beetles



## Predators Control Methods

- Filter water to remove trash fish
- Use frightening devices
- Destroy predators
- Trap and move predators
- Place small mesh wire fences around ponds



## General Procedures With Soft-Shell Crawfish

- Young crawfish are removed from pond at a length of about 2 inches
- Crawfish are placed in large trays with shallow water on the bottom
- Acclimation process is needed
- Fed at the rate of 2-4%, depending on how much is eaten
- Monitored daily, with those near molting removed to a molting tray
- Molted crawfish are processed immediately



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### Quiz for Section C

Name:

Date:

### Quiz on Reproducing and Rearing Crawfish

Directions: Answer the following questions in the space provided. Be sure to spell correctly and provide the most complete information you can.

1. What are the 6 steps in the cycle of crawfish farming that take advantage of natural reproduction?
2. Provide the following information related to the reproduction of crawfish:  
Time of mating:  
  
When eggs are fertilized:  
  
When females lay eggs :
3. What is the role of burrowing in reproduction?
4. How are burrows constructed? Why is this arrangement important?
5. What is incubation? What does the female do during incubation?
6. What are 4 important management practices in reproducing crawfish?
7. What do crawfish eat?
8. What can the farmer do to help insure that crawfish have plenty to eat?
9. What general kinds of disease may afflict crawfish? How are these related to keeping crawfish healthy?
10. What is a predator? What are the major predators of crawfish?

11. What special considerations are needed to produce soft-shell crawfish?

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### Key for Quiz - Section C

1. The 6 steps in the cycle of crawfish farming that take advantage of natural reproduction are as follows:  
Stock ponds in April or May.  
Drain ponds over a period of 2 to 4 weeks in May and June.  
Plant vegetation in the pond in June through August.  
Reflood the pond in October.  
Harvest the crawfish from November through May or June.
2. Time of mating: year-round but mostly in the spring.  
When eggs are fertilized: when laid.  
When females lay eggs: in burrows in late summer or early fall.
3. Burrowing provides a place for the female to lay eggs. Burrows protect the female and incubate the eggs.
4. Burrows are constructed on levees or pond bottoms. They are 3-4 feet deep and are sealed with mud.
5. Incubation is the time between the fertilization of an egg and when it hatches into a baby crawfish. The female keeps the eggs moist and provides a good environment for incubation.
6. Four important management practices in reproducing crawfish are as follows: Stock an adequate number of male and female brood crawfish in a pond in the spring. Gradually lower the water over a period of 4 weeks. Reflood the pond in the fall. Regulate harvesting to allow a maximum crop.
7. Crawfish eat small plants and animals that live in the water. They also eat dead plant and animal material that sometimes floats, known as detritus material.
8. The crawfish farmer can use management practices to produce forage. Vegetation can be planted in the pond when it has been drained. Feeding commercially manufactured feeds hasn't been fully tested with research.
9. The general kinds of disease that may afflict crawfish are as follows: environmental, nutritional, parasites, and pathogenic diseases. Providing an environment where these aren't problems helps keep crawfish healthy.
10. A predator is an animal that attacks and destroys other animals. The predator may use the animal for food. The common predators of crawfish are fish, birds, raccoons, bullfrogs, snakes, turtles, and large water beetles.
11. Soft-shell crawfish are young crawfish selected from ponds and grown in trays. They must be acclimated to the trays, fed and carefully monitored to remove any that are about to molt. Once molting has occurred, the crawfish should be quickly processed so that the shell doesn't return.

Teaching Plan:

**Module:** Crawfish Farming - Section D

**Problem Area:** Harvesting and Marketing Crawfish

**Estimated Time:** 4-6 hours

**Goal:** The goal of this problem area is to develop skills in harvesting and marketing crawfish, with emphasis on when and how to harvest and the development of markets for crawfish.

**Learning Objectives:** Upon completion of this problem area, students will be able to:

- explain harvesting
- describe efficient harvesting procedures
- explain crawfish grading
- explain functions in marketing crawfish
- describe approaches in marketing crawfish

**Resources:** The following instructional resources are needed to complete this problem area:

**Essential:**

Transparencies.

**Additional:**

**Small-Scale Marketing of Aquaculture Products** (SRAC Publication No. 350).

**Crawfish Production: Harvesting, Marketing and Economics** (SRAC Publication No. 242).

The videotape "Crawfish Aquaculture in the South" (produced by the Southern Regional Aquaculture Center and available through the Cooperative Extension Service in each state).

Any books, bulletins or other materials on crawfish aquaculture. Examples include the following:

**Direct Marketing of Fish and Shellfish**, by Davis, James T. (n.d.), College Station, Texas Agricultural Extension Service.

**Introduction to Aquaculture**, by Landau, Matthew, John Wiley & Sons, Inc., NY, 1992.

**Aquaculture: An Introduction**, by Lee, Jasper S. & Newman, Michael E., Danville, IL, Interstate Publishers, Inc., 1992.

**Enjoying Louisiana Crawfish**, by Patrick, Ruth M. & Moody, Michael W., Baton Rouge, LA Cooperative Extension Service, 1992.

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Journals, magazines, and other periodicals on aquaculture, especially those with articles on harvesting and marketing crawfish. One example is the **Water Farming Journal** published by Carroll Trosclair and Associates, Inc., 3400 Neyrey Drive, Metairie, LA 70002.

## Content and Procedures

### Preparation (Interest Approach):

To develop student interest in this module, have students name various clothing and food products they frequently use. An example is a hamburger. Ask students to trace the product from the farm to them. Name where the ingredients are produced and the steps that the products pass through before they get them. With the hamburger, many steps are involved because of the large number of different ingredients that go into a hamburger.

Ask students if they feel that crawfish go through some of the same steps. Invite the students to name how they might get the crawfish they eat. (In many cases, the marketing of crawfish is far less elaborate than the hamburger.)

Indicate that understanding the marketing process is essential for financial success in crawfish farming.

### Presentation:

#### A. What is harvesting?

Use TM D1 to present the objectives for the problem area. Use TM D2 to describe harvesting. Tour a crawfish farm during harvest.

1. Harvesting is the process of capturing the crawfish that have been produced.
  - a. Harvesting accounts for 60-80% of the labor in crawfish farming.
  - b. Crawfish are harvested for 120-150 days a year, beginning in November and ending in June.
  - c. The volume harvested may be balanced throughout the harvesting season.
2. Crawfish harvest may be cyclic based on a number of environment h factors, such as temperature, weather, water quality, and forage.
3. Several procedures are important in having a successful crawfish harvest.

Use TM D3 to outline the procedures to follow to insure a successful harvest. Determine the design of the traps used in harvesting.

1. Traps must be designed properly.
  - a. Most traps are made of 3/4-inch meshed wire.
  - b. Trap design includes 2 or 3 entrance funnels.
  - c. Traps should have a collar to minimize crawfish escape.
2. An adequate number of traps should be used.
  - a. The number of traps depends on the density of the crawfish and the rate at which they are to be harvested.
  - b. The general rule is that 20-40 traps are used for each acre of pond.
3. Traps should be properly baited.

Determine the bait used in traps and how the farmer assess the advantages of the different baits.

- a. Many growers use 1/4 to 1/3 lb of scrap fish, such as shad, or fish heads per trap.
- b. Some growers use artificial bait or a combination of fish and artificial bait.

4. Traps should be tended daily.

Ask students how many traps a person should work in an hour. (The number varies depending on the use of equipment. A person wading in a pond can harvest 200-250 a day. Someone in a boat can do that many in an hour!)

- a. In small ponds, people may wade around the water.
- b. With large ponds, specially made boats with powered wheels on the front and rear may be used.
- c. Regardless, individuals must be to move rapidly from one trap to another.

5. Traps are quickly emptied and rebaited.

Emphasize the importance of people developing good speed in emptying and rebaiting traps.

- a. Crawfish are dumped from the trap into the boat.
- b. Harvested crawfish are stored in mesh bags on the boat and protected from damaging sun and other weather conditions.
- c. Bags usually hold 40-50 lbs of crawfish.

6. Harvested crawfish are cleaned of debris and other foreign matter before bagging.
  - a. Trash, such as vegetation, should be removed from crawfish before bagging.
  - b. Any bait residue must also be removed before bagging.

7. Harvested crawfish must be properly stored in live form.

Ask students to describe what can happen if live crawfish aren't sorted properly (die, spoil, and lose value).

- a. Within 2 or 3 hours of harvest, crawfish should be moved to a high humidity cooler for storage.
- b. Crawfish can be stored at 46-48°F for several days before being resold or processed.

8. The quality of crawfish varies with the time of the year.
  - a. The first crawfish harvested in November are typically the older and surviving brood crawfish that were stocked in the spring.
  - b. Growers are cautioned to watch for hollow tails and dark colors.
  - c. Dark-colored crawfish may have hollow tails.
  - d. As the season progresses, younger crawfish grow and are harvested.

### B. What is grading?

Show TM D4. Inspect samples of crawfish for damage or other materials that should be graded out. Weigh individual crawfish to assess grade. Use TM D5 to outline common grades of crawfish.

1. Grading involves sorting crawfish for uniform size and quality.
2. Damaged, dead, diseased, or off-color crawfish are removed.
3. Crawfish are grouped on the basis of weight.

- a. Mechanical graders are sometimes used.
  - b. Hand sorting is labor intensive and requires a lot of time.
4. Crawfish grades are uniformly established and are based on the number of whole crawfish required to weigh a pound.
  5. The common grades are as follows:
    - a. Large or No. 1: 15 or fewer in a pound (weigh 1 oz or more each).
    - b. Medium or No. 2: 16 -25 in a pound (weight .5 to 1 oz each).
    - c. Small or No. 3: more than 25 in a pound (weigh less than .5 oz each).
  6. The preferred size for crawfish is 1-1.5 oz, or the No. 1 grade.

### C. What is marketing?

Use TM C6 to define crawfish marketing.

1. Marketing involves connecting the producer of the crawfish with the consumer.
2. Marketing includes providing the product to the consumer in the desired form when it is wanted.
3. Many growers view that marketing has been completed when the crawfish have been sold.
4. Repeat business depends on a quality, uniform product.
5. Markets for crawfish tend to be local or regional.
  - a. Some crawfish buyers may haul crawfish several hundred miles for resale.
  - b. A few crawfish go into processing plants for the production of food products.
6. Different marketing functions may be needed to make the crawfish appealing to customers.

Use TM D7 to outline the functions in marketing crawfish.

- a. Several functions are involved in marketing crawfish:
- b. Grading: to insure uniform quality of the crawfish.
- c. Bagging: makes it easy to handle crawfish.
- d. Storing: is under refrigeration to keep the crawfish of good quality.
- e. Hauling: involves moving the crawfish to places where there is a demand.
- f. Pricing: is establishing a price for the crawfish.
- g. The functions vary, depending on what is needed to satisfy consumer demands.

### D. What forms of crawfish are marketed?

Use TM D8 to outline the 4 forms in which crawfish are marketed.

1. Crawfish may be marketed in several forms:
  - a. Hard-shell for human food.
  - b. Hard-shell for recreational bait.
  - c. Soft-shell for human food.

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- d. Hard-shell for brood crawfish (used to stock growing ponds).
2. Growers often use one or more approaches in marketing.
    - a. Soft-shell crawfish tend to have a different marketing appeal from hard-shell crawfish.
    - b. Growers may have various combinations of marketing alternatives for their crawfish.

### E. How are crawfish marketed?

Use TM D9 to outline approaches available in marketing crawfish. Ask students to explain why a retail store may be considered a bother to farmers.

1. Crawfish tend to be marketed by growers.
  - a. A sophisticated marketing structure as with some agricultural commodities, such as corn and beef cattle, does not exist.
  - b. Many crawfish producers use small, niche markets.
  - c. Crawfish marketing tends to be seasonal.
2. Several approaches are available to crawfish growers:
  - a. On-farm sales: Growers can sell the crawfish they produce on their farms to consumers or buyers who haul them to other places for resale.
  - b. Retail markets: Growers can operate retail markets in nearby towns or market through established fish markets.
  - c. In some cases, retail markets are little more than a parked pickup truck with the back filled with crawfish and a weighing scale at hand.
  - d. Retail sales may be a bother to some farmers and they prefer to let other people deal with the public.
3. Sales to processors.
  - a. Some crawfish can be marketed through medium to large processors.
  - b. The crawfish may be cooked into a prepared food.
  - c. A few processors prepare special orders for restaurants.
4. Cook and sell. This marketing involves the grower in cooking the crawfish and selling it to the public.

Ask if any students have eaten crawfish cooked by a grower. Have them describe how the business was operated.

5. Wholesalers. This involves selling the crawfish to people who will sell to a supermarket or restaurant.
6. Recreational stores.
  - a. Some crawfish farmers sell crawfish to bait shops for resale to sport fishers.
  - b. The farmer may make the delivery to the shop or a wholesaler with a delivery route may provide crawfish for a number of bait shops.

### F. What principles are important for success in marketing?

Use TM D10 to list the principles for success in farmer marketing of crawfish. Ask students to explain why the principles are important for long-term success.

(The following is a list of principles for success in direct marketing crawfish from farm to consumer adapted from Direct Marketing of Fish and Shellfish by James T. Davis, Texas A&M University):

1. Always sell a good product.
2. Prepare crawfish the way customers want them.
3. Maintain a mailing list of potential customers.
4. Advertise in the newspaper and on the radio. (Don't overadvertise.)
5. Establish regular hours for making sales and post the times.
6. Use signs to identify that crawfish are for sale.
7. Have a convenient location.
8. Treat customers with respect.
9. Always evaluate marketing success to determine what worked and returned a profit.

### **Review:**

Review the problem area by having students explain the objectives. Call on various members of the class to explain the content of each objective. The problem area can also be reviewed by asking students questions about the harvesting and marketing. The performance of students in the laboratory and in their supervised practice can help make review of the content relevant to students.

### **Application Activities:**

Application can occur as a part of the review process or separately of review. Application can be in laboratory activities or in supervised practice.

### **Evaluation:**

Evaluations should focus on the extent to which students achieved the objectives for the problem area. This will include the performance of the students on the review and application as well as written or oral tests. Example exam questions are attached.

TM D1

## Objectives

- Explain harvesting
- Describe efficient harvesting procedures
- Explain crawfish grading
- Explain functions in marketing crawfish
- Describe general approaches in marketing crawfish

TM D2

## Harvesting

- Harvesting is the process of capturing the crawfish that have been produced.
- Most crawfish are captured with traps.
- The harvest season begins in November and ends in June.

TM D3

## General Harvesting Procedures to Insure Success

- Use properly designed traps
- Use an adequate number of traps
- Properly bait traps
- Tend traps on a daily basis
- Quickly empty and traps
- Remove debris from harvested crawfish;  
store properly

TM D4

## Grading

- Grading is sorting crawfish for uniform size and quality
- Damaged, dead and off-color crawfish are removed
- Group on basis of size

TM D5

## Grades of Crawfish

- No. 1 (Large):  
15 or fewer in a pound  
Each crawfish weighs at least 1 oz
- No. 2 (Medium):  
16-25 in a pound  
Each crawfish weighs .5-1 oz
- No. 3 (Small):  
More than 25 in a pound  
Each crawfish weighs less than .5 oz

TM D6

## Crawfish Marketing

- Connecting producer with consumer
- Producer provides what consumer desires

TM D7

## Functions in Marketing Crawfish

- Grading
- Bagging
- Storing
- Hauling
- Pricing

TM D8

## Forms in Which Crawfish Are Marketed

- Hard-shell for human food
- Hard-shell for recreation (bait)
- Soft-shell for human food
- Brood crawfish

TM D9

## Approaches in Marketing Crawfish

- On-farm sales
- Retail markets
- Sales to processors
- Cook and sell
- Wholesalers
- Recreational stores

TM D10

## Principles for Success in Marketing Crawfish

- Always sell a good product
- Prepare crawfish the way customers want them
- Maintain a mailing list
- Advertise
- Establish and post regular sales hours
- Use signs
- Have convenient location
- Treat customers with respect
- Evaluate marketing success

Quiz for Section D

Name:

Date:

Quiz on Harvesting and Marketing Crawfish

Directions: Answer the following questions in the space provided. Be sure to spell correctly and provide the most complete information you can.

1. What is harvesting?
  
2. What procedures are important in order to have a successful harvest?
  
3. When are crawfish harvested?
  
4. What is grading?
  
5. What are the common grades of crawfish? Describe each.
  
6. What is marketing?
  
7. What functions are involved in marketing crawfish?
  
8. What crawfish forms are marketed by producers?
  
9. What marketing approaches are used by crawfish producers?
  
10. What important principles should be observed for success in marketing crawfish?

### Key for Quiz - Section D

1. Harvesting is the process of capturing the crawfish that have been produced. Traps are often used for this purpose.
2. The following are needed in order to have a successful harvest: Traps must be designed properly. An adequate number of traps should be used. Traps should be properly baited. Traps should be tended on a daily basis. Traps should be quickly emptied and rebaited. Harvested crawfish are cleaned and bagged. Harvested crawfish should be properly stored in live form.
3. Crawfish are harvested when they are large enough, usually November through June.
4. Grading is the process of sorting crawfish for uniform size and quality.
5. The common grades of crawfish are as follows:  
  
No. 1 - large: 15 or fewer per pound.  
No. 2 - medium: 16 to 25 in a pound.  
No. 3 - small: more than 25 in a pound.
6. Marketing is connecting the producer with the consumer. The product is provided in the desired form when it is wanted.
7. Marketing functions are grading, bagging, storing, hauling, and pricing.
8. The forms of crawfish are hard-shell for human food, hard-shell for recreational bait, and soft-shell for human food brood crawfish.
9. The following marketing approaches are used with crawfish: on-farm sales, retail markets, sales to processors, cook and sell, sales to wholesalers, and sales to recreational stores.
10. The important principles to observe in marketing crawfish are the following:  
  
Always sell a good product.  
Prepare crawfish the way customers want them. Maintain a mailing list of potential buyers. Advertise.  
Have and post regular business hours.  
Use signs to promote the crawfish sales.  
Have a convenient location.  
Treat customers with respect.  
Always evaluate marketing success.