

Teaching Plan:

Module: Carp - Section C

Problem Area: Explaining Principles of Reproduction of Carp

Goal: The goal of this problem area is to explain the basic principles of reproduction of the common Carp.

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

explain what environmental factors affect eggs and sperm
explain how environmental factors affect gonadotropic hormones
discuss the Carp's spawning cycle
explain the development of the larval stage.

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

Essential:

Common Carp 1: Mass Production of Eggs & Early Fry, Food and Agriculture Organization of the United Nations, FAO Training Series, Rome, 1985.

Accompanying film strip, projector, and screen.

Additional:

Aquaculture: The Farming and Husbandry of Freshwater and Marine Organisms, by Bardach, J.E., Ryther, J.H. & McLarney, W.O. Wiley-Interscience, NY, 1972.

Content and Procedures

Preparation (Interest Approach):

To develop student interest in this module, ask the students what experience they have had with breeding farm animals and pets. Ask them to speculate on how breeding activity in natural surroundings differs from that of domesticated animals. Have them compare and contrast natural and cultured fish breeding as it relates to the breeding of other animals. Ask the students if they think that human behavior might affect natural fish breeding. Ask them to suggest ways to insure that some natural breeding areas will be preserved, both in the United States and throughout the world.

Presentation:

A. How does the reproduction cycle start in gonads?

Show TM C1 and lead a discussion about the environmental factors that affect eggs and sperms.

1. Females have ovaries, which produce eggs.
2. Males have testes, which produce sperm (milt).
3. Development of eggs and sperm directly affected by:
 - a. Water temperature.
 - b. Availability of food.
 - c. Amount of dissolved oxygen (DO).
 - d. Photoperiod or increasing length of day.

B. How do development and environmental conditions affect hormonal action?

Show TM C2 and discuss how development and environmental conditions affect the hormone gonadotropin.

1. Final ripening of eggs dependent on release of gonadotropin hormones. These are activated by the pituitary gland and stimulate the gonads.
2. Dependent on following environmental conditions: light, temperature, presence of male Carp, and vegetation

C. When do Carp spawn?

Show TM C3 and discuss the spawning of Carp.

1. In temperate zones, spawning normally happens in the spring.
2. If food is scarce, fish will progressively spawn, i.e., a few eggs at a time.
3. In tropical regions, Carp may spawn more than once. The individual spawns usually one time, but the population may spawn over the entire season.

D. When are Carp mature for spawning?

Show TM C4 and discuss the larval stage of Carp.

In temperate zones, maturity usually takes place within 2 years.

E. How do Carp spawn?

1. Male and female Carp spawn by swimming side by side.
2. When eggs are extruded into water, they are surrounded by milt.
 - a. Milt is usually released onto vegetation in shallow water.
 - b. High motility of sperm only lasts for 30-60 seconds.
 - c. Usually, one sperm enters the micropyle, fertilizing the egg.
 - d. The micropyle closes, the egg absorbs water and enlarges, then the egg becomes sticky.

F. How does the Carp larval stage develop?

1. Larvae are nourished from yolk sac.
2. At optimum water temperature of 20-24°C, at about 4 days.
 - a. Mouth forms.
 - b. Swim bladder is inflated.
 - c. Exogenic feeding starts.
 - d. Fish enters fry stage.

Review:

Review by having students demonstrate their knowledge and understanding of the objectives for this problem area. Lead a discussion with students by asking them questions that cause them to explain the content that goes with each objective.

Evaluation:

Evaluation should focus on the extent to which students achieved the objectives of the problem area. Examples include class participation, quizzes, and a final exam. Example exam questions are attached.

TM C1

Reproduction Cycle

- Starts in gonads
- Females have ovaries, produce eggs
- Males have testes, produce sperm
- Development of eggs and sperm affected by:
 - Water temperature
 - Quality and quantity of food
 - Amount of DO
 - Length of daylight

TM C2

Hormonal Action

- Ripening of eggs dependent on release of gonadotropic hormones
- Release of hormones dependent on:
 - Light
 - Temperature
 - Atmospheric pressure
 - Presence of male Carp
 - Vegetation

Time of Spawning

- Temperate climates - happens in spring
- Tropical regions
- Carp may spawn more than once a year

TM C4

Larval Development

- Newly hatched larvae nourished by yolk sac
- Take 4 days with water temperature of 20-24°C
- Fish now enter fry stage

Aquaculture Curriculum Guide

Quiz for Section C

Name:

Date:

Quiz on Explaining Principles of Reproduction of Carp

Circle T for True statements or F for False statements.

1. T F The development of eggs and sperm are affected by the increasing amount of daylight they receive.
2. T F Gonadotropic hormones are activated by the adrenal gland.
3. T F The spawning cycle in temperate regions is different than in tropical regions.
4. T F Male and female Carp spawn by swimming side by side.
5. T F The micropyle on the Carp egg stays open when the egg becomes sticky.
6. T F The larvae is nourished from the yolk sac.

Key for Quiz - Section C

1. T The development of eggs and sperm are directly affected by the amount of light they receive.
2. F Gonadotropic hormones are activated by the pituitary gland.
3. T The spawning cycle in temperate regions is different that in tropical regions.
4. T Male and female Carp spawn by swimming side by side.
5. F The micropyle on the Carp egg closes when the egg becomes sticky.
6. T The larvae are nourished from the yolk sac.