7/8

DepED
DEPARTMENT OF EDUCATION

AQUACULTURE

EXPLORATORY COURSE

Module 6: DRAW AND LAYOUT FOR PENS AND CAGES

ALTERNATIVE DELIVERY MODE
ADM

AQUACULTURE – Grade 7 and Grade 8
Alternative Delivery Mode
Module 6: DRAW AND LAYOUT FOR PENS AND CAGES

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AQUACULTURE EXPLORATORY COURSE

EXPLORATORY COURSE

GRADE 7 and GRADE 8

Module 6: DRAW AND LAYOUT FOR PENS AND CAGES

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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

DRAW LAYOUT PLANS FOR PENS AND CAGES

What I Need to Know

This module covers the knowledge, skills and aptitude required in drawing a lay-out plan for pens and cages.

After going through this module, you are expected to:

1. identify the different life support systems for pens and cages;
2. use signs and symbols of plan according to fishpond engineering standards; and
3. draw layouts of different pens and cages designs according to established procedures.

What I Know

Directions: Choose the letter of the correct answer of each question. Encircle your answer.

1. What factor usually determines the depth of fish cages?

   a. capability of the owner

   b. natural productivity of the water

   c. the mooring system

   d. the specie of fish to be cultivated

2. What is the smallest unit of a net?

   a. mesh

   b. mesh size

   c. knots

   d. twine

3. In order to make the fish cage float on the water, the cage must be equipped with _____.

a. mooring system

b. netting system

c. framework

d. floatation system

4. As a general rule, what is the length of the mooring lines?

a. two times of the depth of water

b. three times of the length of the cage

c. three times of the depth of the water

d. two meters allowance during high tide

5. Which of the following keeps the whole cage in a certain location and prevents the cage from drifting along the water current?

a. mooring

b. floater

c. framework

d. barrier

6. Part of the cage that serves as the walkways for working, feeding and monitoring?

a. frames

b. floaters

c. mooring

d. nets

7. What type of net cage fabrication refers to a ¼ inch mesh?

a. CC-net

b. DD-net

c. B-net

d. knotless NET

8. What aquaculture facility is usually supported by a fixed rigid framework of bamboo poles, palm tree poles and wood poles?

a. floating fish cage

b. fish pen

c. fixed fish cage

d. happa

9. Generally, they are the most suitable in relatively large bodies of water and along

protected coastal areas where level ranges only from 2.0 meters to a maximum of 7.0meters.

a. floating fish cage

b. fish pen

c. fixed fish cage

d. fishpond

10 In general, which aquaculture facility has the biggest area?

a. fixed fish cage

b. floating fish cage

c. happa

d. fish pen

What's In

Good Job! Have you taken note of the items that you were not able to answer correctly? If yes, let's look for the answers as you go through this lesson. Let's get this started. Enjoy learning!

What's New

FISH PENS AND CAGES LAYOUT AND DESIGN

Fish cage is a structure fully enclosed by nets on all sides and bottom supported either by a fix rigid frame or by floats which rise and fall with the water level or tide.

Fish pen is an area enclosed by nets on all sides and utilizes the lake bed and other bodies of water as the bottom enclosure. Before making the layout of the cage/pen, the size, depth and shape must be considered which is dependent mainly on the ability of the owner as far as operation and maintenance is concerned. The biology and behavior of the target specie and the characteristics of the project site should be considered as well. The design must be simple but durable, easy to construct, and economical.

Determining The Size, Depth and Shapes of Facilities and Target Species of Fish.

In Laguna Lake, Philippines, size of pens range from less than one hectare to more than 100 hectares. The shape of the enclosure is influenced by the characteristics of the cultured fish. For milkfish and tilapia, square and rectangular pens are commonly used.

Circular enclosures are recommended for big head carp. Generally, the most economical shape of the pen is one that has the least perimeter. Circular shape require the least materials per unit area but relatively hard to construct. Generally, fish pens are most suitable in relatively large bodies of water and along coastal protected areas where the water level ranges only from 2.0 meters to a maximum of 7.0 meters. On the other hand, the depth of the cage is usually determined by the natural productivity of the water. Since natural food production is relatively higher in the surface, sunlight penetration is usually employed as the basis for depth.

TYPES OF CAGE

A. Fixed type

The fixed types of fish cages are suitable for relatively shallow areas. They are usually

installed near shore or in shallow lakes like Laguna de Bay where water depth is less

than five meters. In fixed type cages, synthetic net cages are attached to bamboo poles

staked to the bottom for support. Size of cages range from 5m x 15m with net mesh

sizes of 5-15 mm.

Figure 1. Fixed Type Cage

(This photo was taken at Baganga, Davao Oriental)

B. Floating type

Figure 2. Floating Type Cage

(This photo was taken at Kawas, Alabel, Sarangani Province)

The floating types of fish cages are suitable for depths exceeding five meters. Floating net cages are typically suspended from bamboo raft with or without plastic drums or any other floating materials to float. Cages have a net mesh size of 15 mm andvary in size from 15 x 10m to 20m x 15 m with a depth of 5-6 m.

GENERAL DESIGNS OF CAGES

Figure 3. Circular Cage

(This photo was taken at Ladol, Alabel, Sarangani Province)

Figure 4. Rectangular Cage

("Fish Cages at Lake Sebu" by I Travel Philippines in licensed under CC BY 2.0)

Materials and types of nets

A. Fish Pen

1. Framework/structure

a. bamboo- most common
b. wooden poles
c. anahaw (palm tree) logs
d. creosoted pole- pole treated with creosote (wood preservatives)
e. steel/ G.I. pipe

Figure 5. Bamboo Poles

Figure 6. Anahaw

("Bamboo Poles Reaching" by rumpleteaser is licensed under CC BY 2.0)
("File:D3239ArecaceaeAnahaw 01.jpg" by Judgefloro is marked with CC0 1.0)

2. Enclosure and Barrier nets

a. polyethylene nets
b. polypropylene nets
c. nylon nets
d. woven bamboo splits

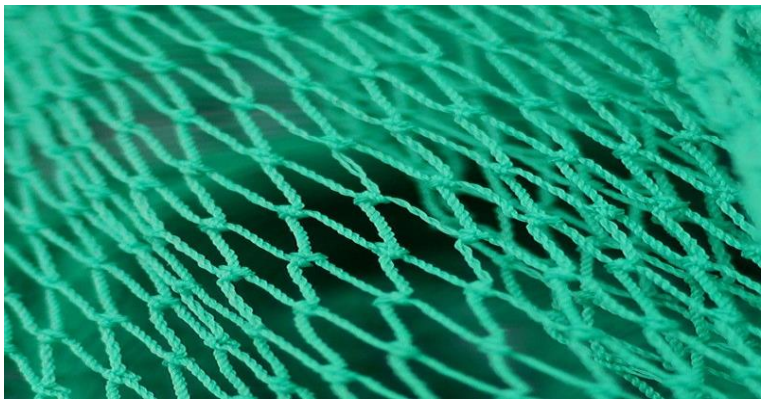


Figure 7. Polyethylene nets
(Afzal H Sobhani, CC BY-SA 4.0 <https://creativecommons.org/licenses/by-sa/4.0>, via Wikimedia Commons)

Figure 8. Polypropylene nets

(Ardfern, CC BY-SA 3.0 <https://creativecommons.org/licenses/by-sa/3.0>, via Wikimedia Commons)

Figure 9. Nylon nets

(https://commons.wikimedia.org/wiki/File:Filet_de_p%C3%AAche_DSC00632.JPG

3. Tying and Braiding nets

a. polyethylene rope and twine
b. polypropylene rope
c. nylon threads
d. nylon cord (monofilament)
e. rubber tire strips

Figure 10. Tying and Braiding Nets

(Source: K to 12 Basic Education Curriculum Technology and Livelihood Education Learning Module-Aquaculture-Exploratory Course)

B. Fish Cage

1. Framework/ structure

a. bamboo- most common
b. wooden poles
c. anahaw (palm tree) logs
d. creosoted pole
e. steel/ G.I. pipe

2. Enclosure and Barrier nets

a. polyethylene nets
b. polypropylene nets
c. nylon nets
d. woven bamboo splits

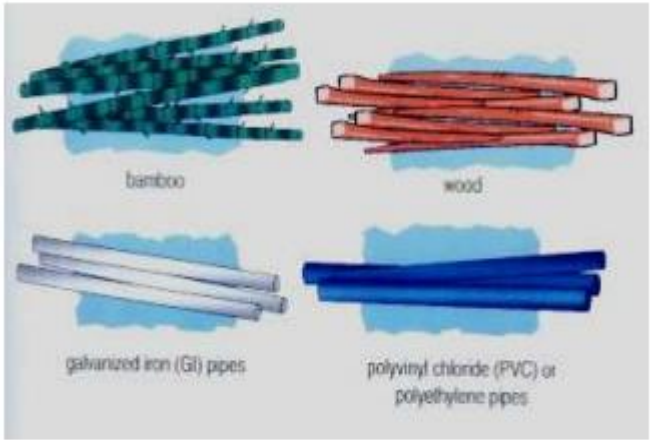


Fig. 11. Materials can be used for frame (Source: K to 12 Basic Education Curriculum Technology and Livelihood Education Learning Module-Aquaculture-Exploratory Course)

3. Tying and Braiding
    a. polyethylene rope and twine
    b. polypropylene rope
    c. nylon threads
    d. nylon cord (monofilament)
    e. rubber tire strips

4. Floats

    a. bamboo
    b. steel drum/ barrel
    c. Styrofoam
    d. plastic container
    e. aluminum cylinder
    f. PVC pipes
    g. Rubber tires



Barrel Styrofoam Plastic Container

Fig. 12. Commonly used materials for floaters.

"Styrofoam Block" by johnlaudun is licensed with CC BY-NC-SA 2.0.

“Plastic Container” by Jerrycan is licensed with Creative Commons 4.0 BY-NC

5. Sinkers

    a. stone
    b. concrete slabs
    c. bamboo and wooden pegs

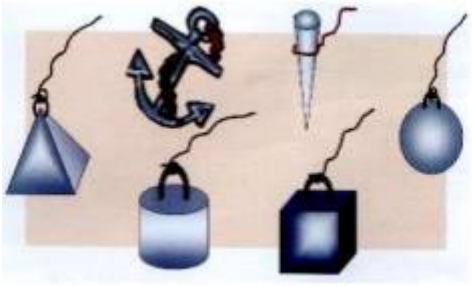


Figure 13. Materials used for sinkers.

(Source: K to 12 Basic Education Curriculum Technology and Livelihood Education Learning Module-Aquaculture-Exploratory Course)

Types of Nets and Mesh Sizes Suitable for Fish Pen and Fish Cage

Generally, the most suitable nets should be flexible or adaptable for easy handling, resistant to fouling growth, heat, and ultraviolet rays. The mesh size to be used must be small enough to prevent the escape of fish and entry of predators. For hatchery operations of tilapia, the most common sizes of mesh used are 0.5 mm (happa) for breeding, 10 mm for nursery and 20 mm for grow out. However, as long as the escape of the fish does not permit, large meshes are recommended since they provide large passageway for water circulation, slower rate of fouling, easier to handle and less expensive per unit area.

Type Of Nets For Cage Fabrication

B-NET (1/4" mesh)
DD-NET (3/8" mesh)

There are many kinds of nets that could be used for fabrication. The most common are the B-net (1/4‖ mesh), DD-net (3/8‖ mesh), and CC-net (1/2‖). However, the most popular is the B-net because smaller fingerlings do not need a nursery cage. It is cheaper per unit area because it is wider (108 inches) than the other nets, hence, labor cost in fabricating cages is much lower, and tearing of one or two mesh do not easily provide an escape route for bigger fish.

Floating System (Floating Fish Cage)

The floats to be used in floating cages must have the following:

a. High buoyancy

b. resistant to fouling

c. can withstand forces of the wind and waves

For longer life and less fouling attachment, floats used may be covered with protective materials such as rubberized canvass.

Mooring System

Mooring lines should be light and strong, flexible, highly resistant to fatigue, impact, abrasion, stretch and twisting. As a general guide, the length of the mooring lines should be three times the depth of water.

Materials commonly used in the fabrication of synthetic fiber ropes are:

a. nylon (polyamide)

b. Dacron (polyester)

c. Polypropylene

d. Polyethylene

Nylon is recommended for the high strength and high shock absorption requirements.

Anchor (floating Fish Cage)

An ideal anchor must provide enough holding power with reasonable weight size.

The type of anchor to use in the mooring system depends on the depth of water, nature of bottom, and current. The three types of anchors are:

1. Dead weight anchors- they are recommended for mooring involving essentially vertical tension. A typical example is a concrete block.

Figure 14. Dead weight anchors

(Source: K to 12 Basic Education Curriculum Technology and Livelihood Education Learning Module-Aquaculture-Exploratory Course)

2. Embedment anchors- are designed to dig into the bottom as they are being pulled by a horizontal force. It is recommended for sandy and muddy bottom.

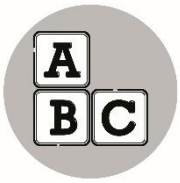
Figure 15. Embedment anchors

("Anchor" by Plbmak is licensed with CC BY-NC-ND 2.0.)

3. Special anchors- are combinations of deadweight and embedment anchors. They are designed to resist vertical and horizontal components of tension.

What is It

The lesson briefly discussed about the various fish pens and cages layout and design. We were taught on different types of pens and cages, designs and its materials.



What's More

Fill in the blanks. Complete the following statements by writing the appropriate terms in the blanks.

1. _____ is a structure fully enclosed by nets on all sides and bottom supported either by a fix rigid frame or by floats which rise and fall with the water level or tide.

2. The fixed types of fish cages are suitable for relatively _____ areas.

3. _____ is an area enclosed by nets on all sides and utilizes the lake bed and other bodies of water as the bottom enclosure.

4. The floating types of fish cages are suitable for depths exceeding _____ meters.

5. Generally, the most suitable nets should be _____ or adaptable for easy handling, resistant to fouling growth, heat, and ultraviolet rays

What I Have Learned

ACTIVITY 1

Identify the following. Choose your answer in the box and write it on the blanks.

Mooring	**Mesh size**
Fish Cage	**Net**
Framework	**Anchor**
Fish Pen	**Knot**
Fouling	**Mesh**

_____ 1.is a structure fully enclosed by nets on all sides and bottom supported either by a fix rigid frame or by floats which rise and fall with the water level or tide.

_____ 2. Is an area enclosed by nets on all sides and utilizes the lake bed and other bodies of water as the bottom enclosure.

_____ 3. Is a heavy object, usually a shaped iron weight with flukes, lowered by a cable or chain to the bottom of a body of water to keep a vessel from drifting.

_____ 4. Is the smallest unit of a net.

_____ 5. Is a structure, usually rigid, serving to hold the parts of something together or to support something constructed.

_____ 6. Is a lump made by intertwining the thread in which one free end is passed through a loop and drawn tightly.

_____ 7. Is the distance between the centers of the opposite knots in the same mesh when it is fully extended at the right angles to the continuing direction of the twines.

_____ 8. Is a fabric of thread, cord, rope or twine woven or knotted to form an open pattern or mesh used to catch fish.

_____ 9. Is the process by which an object or materials get extremely dirty or impure, disgustingly filthy, so offensive to the senses,

_____ 10. Are the lines, cables, etc. by which water craft or any floating objects or moored or held in place.

What can I do

Pens/Cages Layout and Design

Procedures:

1. Prepare the following for this activity:

   - Bond paper
   - Pencils
   - Ruler

2. Using the materials above, draw the layout of a 5m x 5m x 3m floating fish cage.

3. Include in your drawing the anchors used which are attached to the mooring lines.

4. Label its parts.

Assessment

Assess what you have learned.

Find out by accomplishing the Performance Criteria Checklist honestly and sincerely. Remember it is your learning at stake!

Performance Criteria Checklist

Do the student/s...	YES	NO	N/A
1. identified different life support system for pens/cages?			
2. Used engineering standards signs and symbols of fishpond plan?			
3. Drawn lay-out of different pens/cages designs in line with established procedures?			
4. Drawn the layout of a floating fish cage?			
5. Included the anchors used in your drawing			
6. Labelled the parts of a floating fish cage			

Student's Name: _____ Date: _____

Answer Key

What I Have Learned

1. Fish cage
2. Fish pen
3. Anchor
4. Mesh
5. Framework
6. Knot
7. Mesh size
8. Net
9. Fouling
10. Mooring

What's More 1. B

1. Fish cage
2. Shallow
3. Fish pen
4. Five
5. Flexible

What I Know

1. B
2. A
3. D
4. C
5. A
6. A
7. C
8. B
9. B
10. D

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