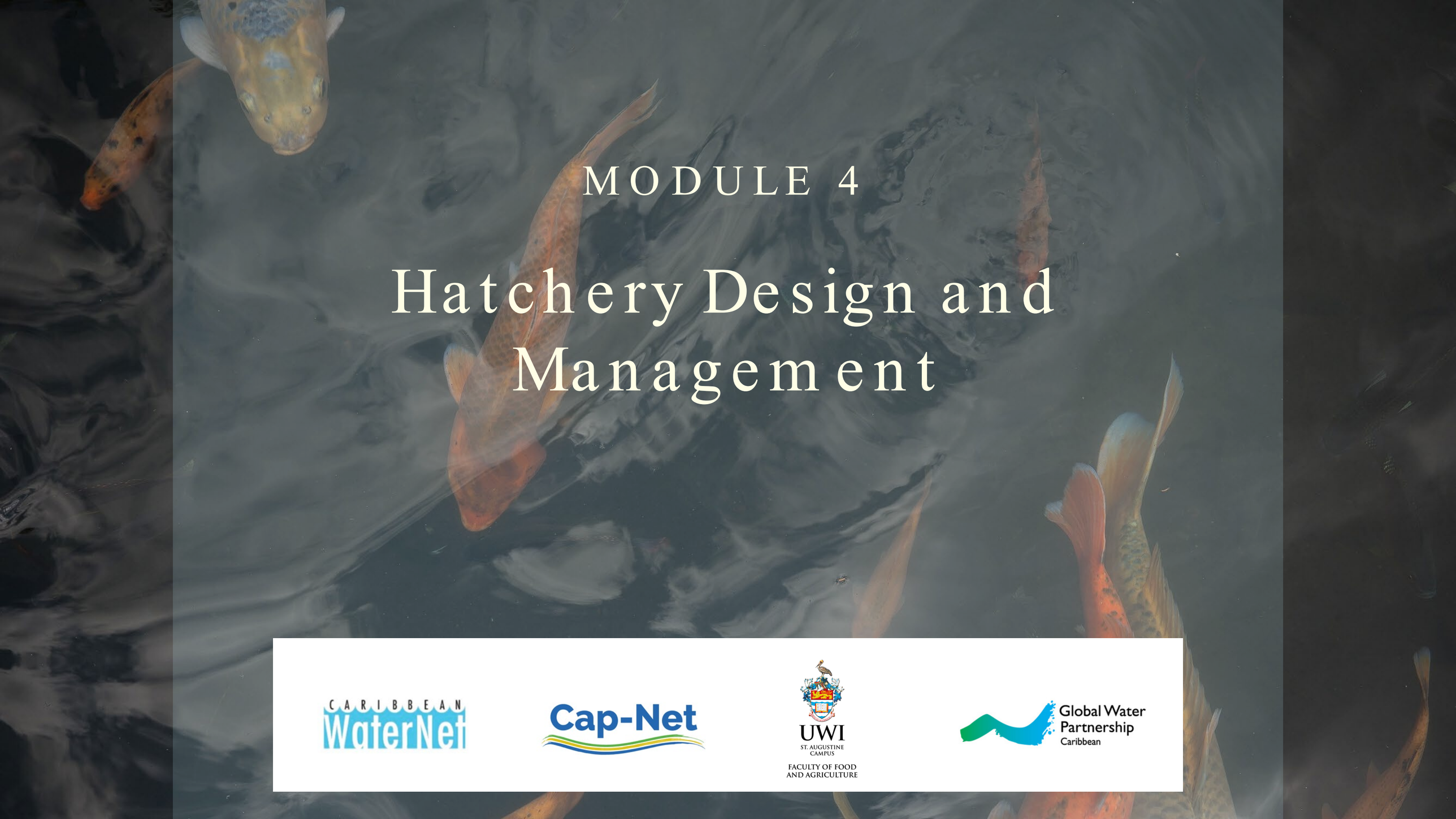


MODULE 4

Hatchery Design and Management

CARIBBEAN WaterNet

Cap-Net

UWI
ST. AUGUSTINE CAMPUS
FACULTY OF FOOD AND AGRICULTURE

Global Water Partnership Caribbean

Goals

- To inform trainees about hatchery design and management.
- Trainees to have a better understanding of hatchery infrastructure.

Learning Objectives

- Know the infrastructure needed for a general hatchery.
- Be able to manage brood stock and juvenile fish.

Introduction

- Hatchery design and operations can be a separate procedure within the aquaculture sector.
- For small establishments, hatchery services might be on the same compound.
- Aquaculture sector bottlenecked many times due to the lack of seed stock.
- Once overcome for a species, sector showed rapid growth.

Hatchery Design

- Hatcheries are usually designed with a particular species in mind.
- There are elements common to most hatcheries.
- Bio-security is also very important.
- Maintenance of phytosanitary systems using foot baths at the entrance of hatcheries.

Facilities and equipment for a hatchery include:

- Ponds or tanks for holding and rearing brood stocks
- Spawning pond, tanks or hapas
- Nursery pond, tanks or hapas
- Conditioning pond/tank
- Water supply system and storage tank
- Aeration system

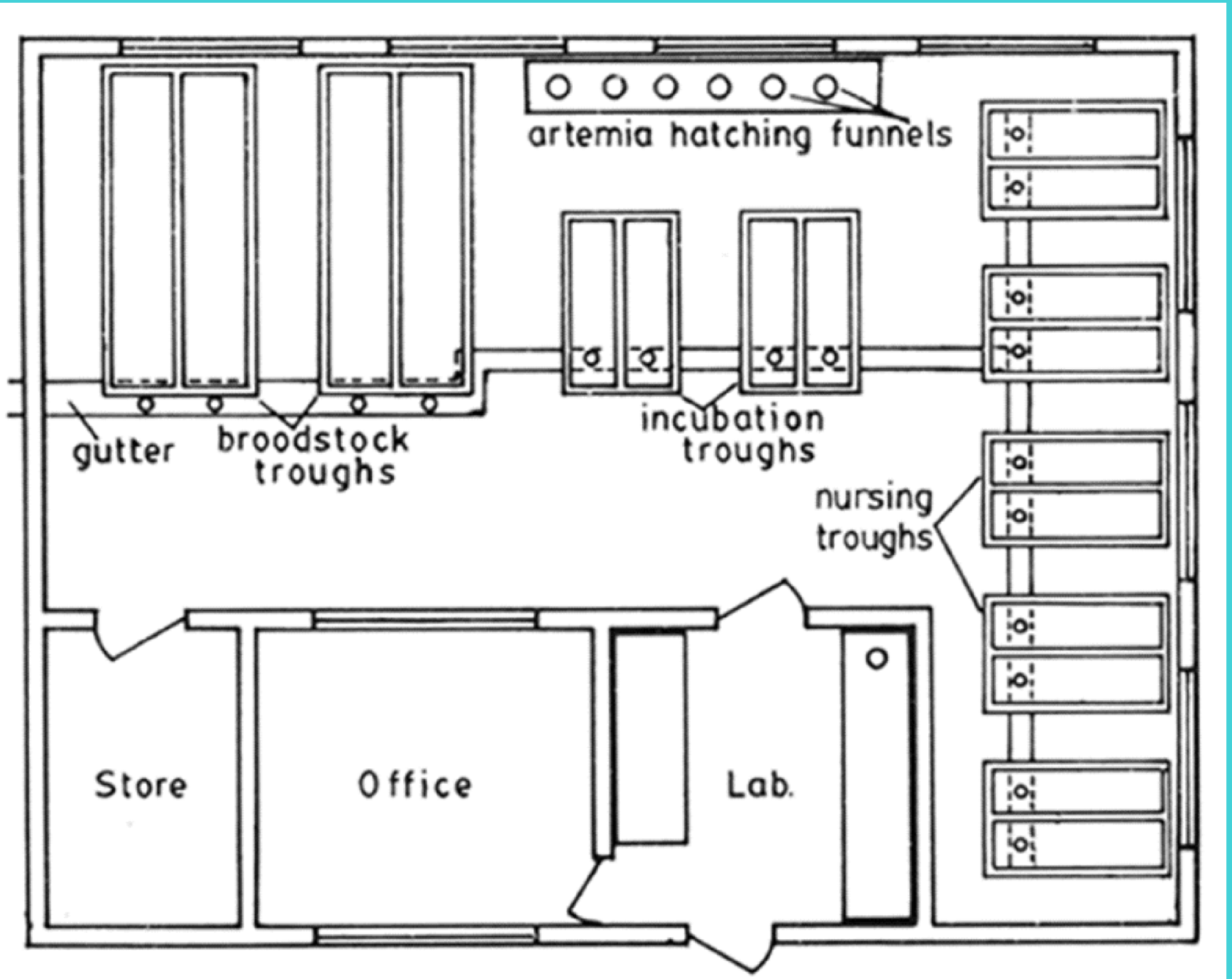
- Pumps (for recirculatory egg incubation system)
- Electricity supply and/or generator
- Basins, buckets, containers
- Seine nets, scoop nets, grading basket
- Sensitive scale for weighing fry and fingerlings
- Accessories for packing of fry and fingerlings

Hatchery Ponds

- Hatcheries consist of multiple pond types based on the size of fish to be housed and purpose.

These include:

- Nursery pond: for growing/nursing fry to fingerlings
- Brood stock pond: for rearing/holding the breeders for spawning
- Sex-reversal pond: for sex-reversal of newly hatched fry
- Conditioning pond: for holding fingerlings before transport
- Grow-out pond: for growing fingerlings till harvest (to table-size)
- Quarantine pond: for introducing new fish to the farm or for treatment purposes
- Reservoir pond: for storing inlet water before use in the hatchery and nursery


artemia hatching funnels
gutter
broodstock troughs
incubation troughs
nursing troughs
Store
Office
Lab.

Brood Stock Management

- Hatcheries supplying fish for culture -based fisheries (CBF) need to consistently provide good quality (fit and healthy) juveniles suitable for stocking.

- Poorly planned genetic management of brood stock and breeding can result in:

- declines in the quality of stock over a number generations
- reduced fecundity
- reduced hatch rates
- reduced growth rates
- increased in the incidence of abnormalities
- increased susceptibility to diseases

Brood Stock Management

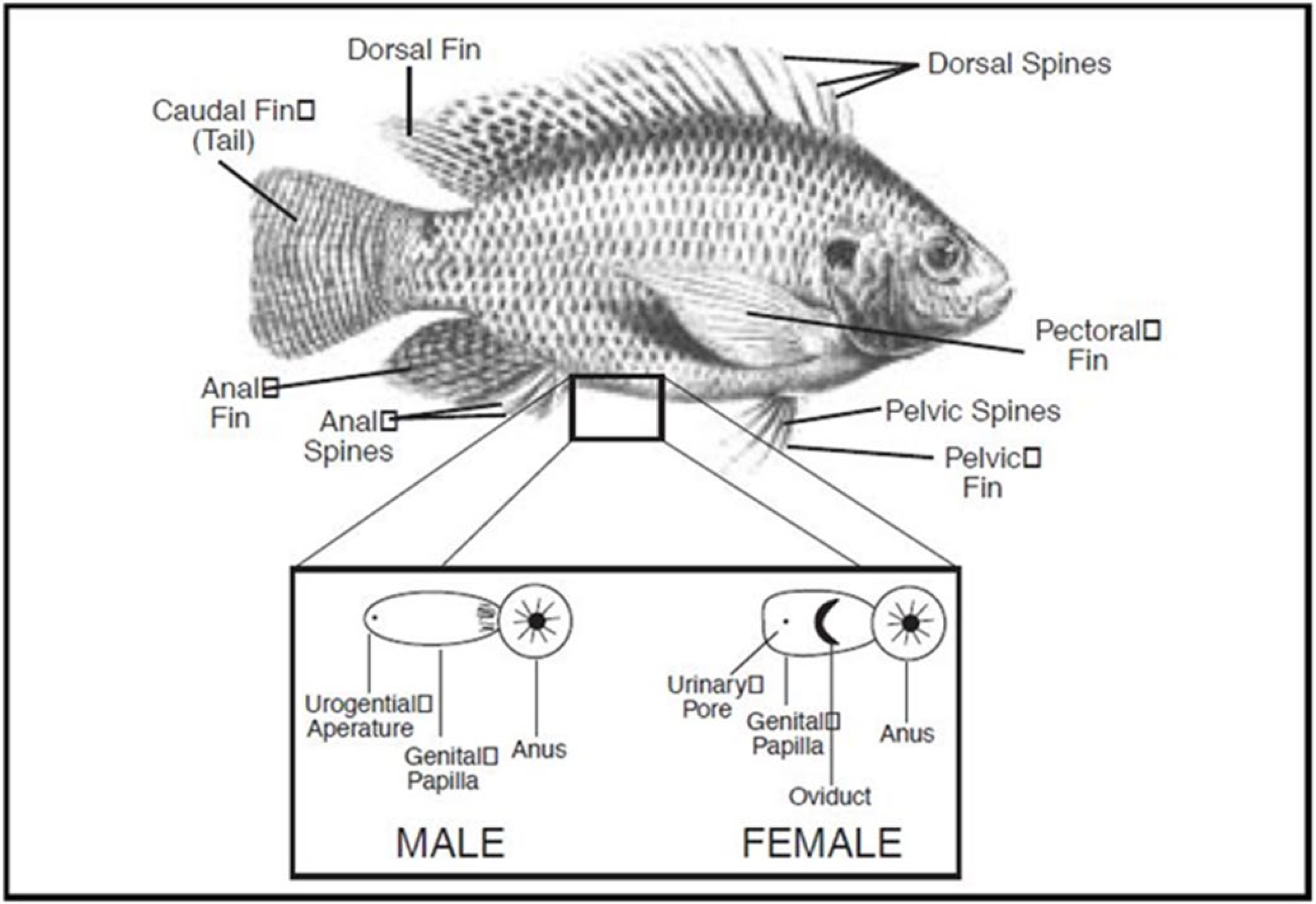
- Hatchery -bred fish sometime are genetically inferior.
- If interacting with wild stocks leading to a shift or loss of genetic diversity and reduction in genetic fitness.
- Pedigree records are therefore imperative, regardless of species.
- Managing genetic aspects is critical to ensuring the long term integrity and viability of a breeding program. -
- Important implications to the genetic integrity of receiving populations.
- Genetically sound management plans will vary according to the design of the breeding program and requires a good understanding of the genetic structure of the species being bred.

Brood Stock Management

- Management plans should aim to prevent loss of genetic diversity and minimize inbreeding within the population.

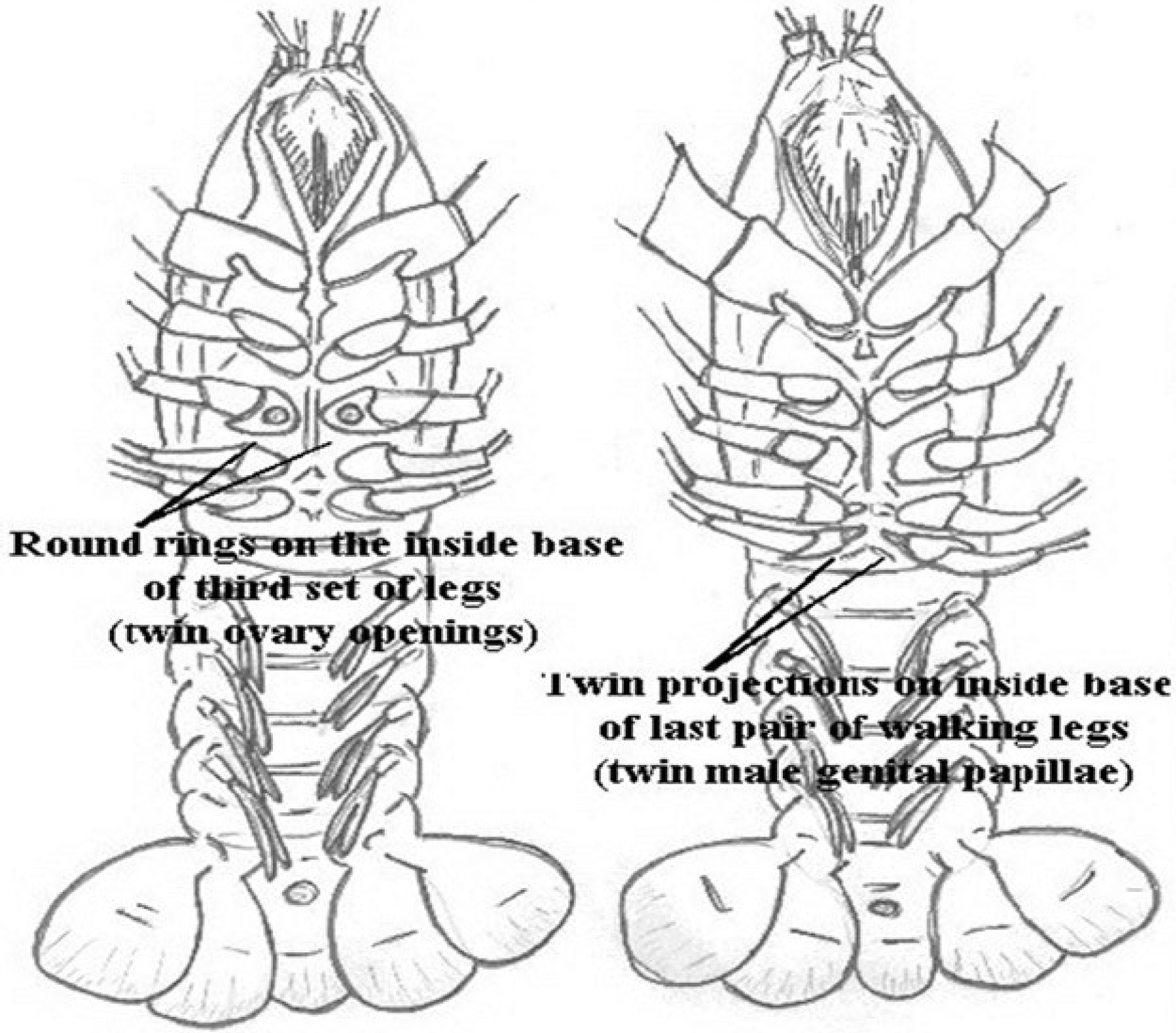
This can be achieved in each season by:

- spawning an equal number of female and male fish (1:1 sex ratio)
- undertaking many spawnings
- undertaking single-pair (one female and one male) matings only
- retaining equal numbers of progeny from each spawning (family) as potential future brood stock
- randomizing brood stock choice for spawning to avoid trait selection
- replacing at least 10% of the brood stock each year
- maintaining detailed and accurate breeding records


Dorsal Fin
Dorsal Spines
Caudal Fin
(Tail)
Pectoral
Fin
Anal
Fin
Anal
Spines
Pelvic Spines
Pelvic
Fin
Urogential
Aperature
Genital
Papilla
Anus
MALE
Urinary
Pore
Genital
Papilla
Anus
Oviduct
FEMALE

FEMALE

MALE



Brood Stock Management

- Other relevant factors for brood stock include the:

- source
- number
- size (age)
- appearance and health of brood stock.

- It is important to manage brood stock:

- nutrition and pre -spawning conditioning
- spawning and the immediate post -hatch stages (egg incubation, larviculture and post -larval husbandry).

- Brood stock nutrition and husbandry practices can affect gamete quality which, in turn, affect seedstock quality.

- A fish health and biosecurity plan is required to manage the health of not only brood stock, also larval and juvenile fish, which will eventually be released.

Brood Stock Management

- Adult brood stock fish take up a lot of space.
- The cost of feeding is high as these usually require feeds with higher protein concentrations.
- Brood stock management covers three particular aspects of the rearing process:

The selection of fish with desirable hereditary qualities typical of improved strains such as rapid growth potential:
- higher resistance to dissolved oxygen deficiency and adverse water quality
- strong appetite
- omnivorous feeding regime

- The selection of fish with well -developed sexual organs.
- The rearing of these selected fish to produce healthy potential spawners, with dormant eggs well developed in the females.

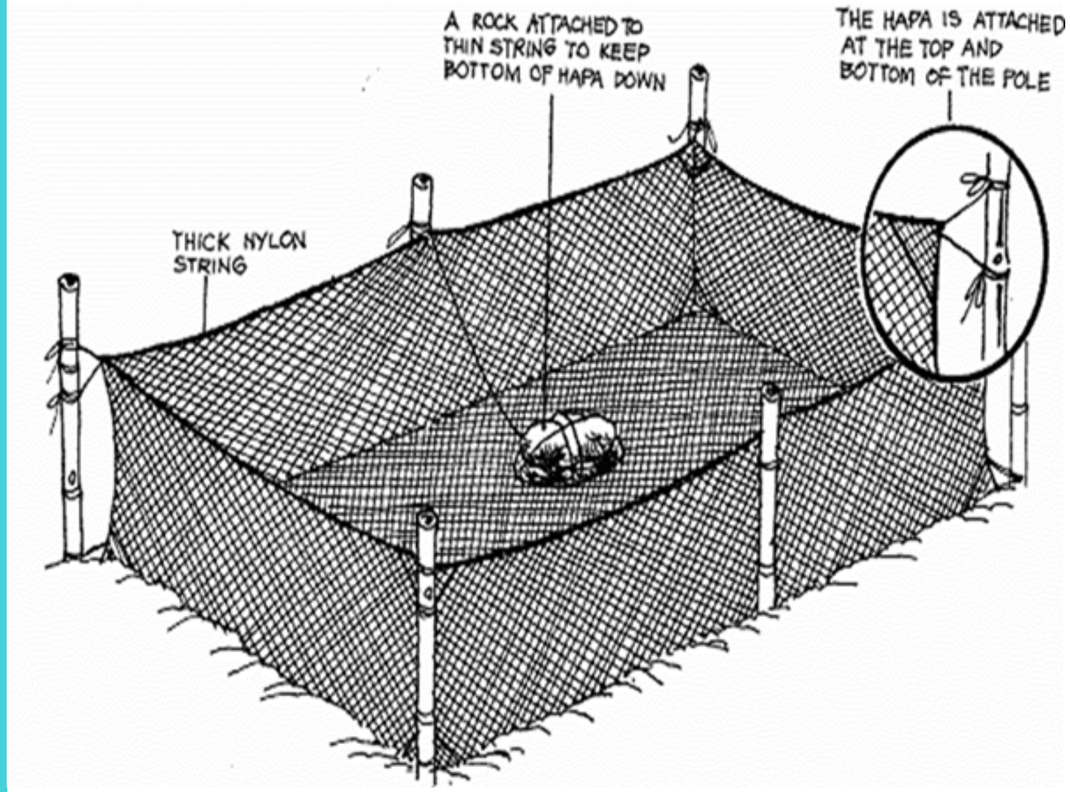
Selection of Brood Stock

The selected fish should be in good health:

- with no body wounds
- no parasites
- a typical scale distribution, and no fin or body deformation
- body should possess the required shape and proportions, being neither too fat, nor too thin

Important Tips for Transporting Fish

- Tank should be completely filled. This will avoid high turbulence slushing of water.
- Putting a hapa in the transport tank can help removal of the fish out without stress.
- Water should be the same temperature or slightly cooler than their pond or tank.
- Bubbling oxygen slowly through the water will avoid suffocation.
- If this is not possible, large plastic bags sealed with pressured oxygen inside will suffice.
- Do not overstock transport bags and enclosures.



Fry, Fingerling and Juvenile Production: Supermale Technology

- Supermale to 3 female.
- Fertilized eggs collected from females' mouths.
- Placed in a hatching jar.
- Fry housed in clear water tank for 1 to 2 days until the yolk sac is absorbed.
- Moved to green water tank and feed on high protein crumbled feed diet.

Fry, Fingerling and Juvenile Production:
Supermale Technology

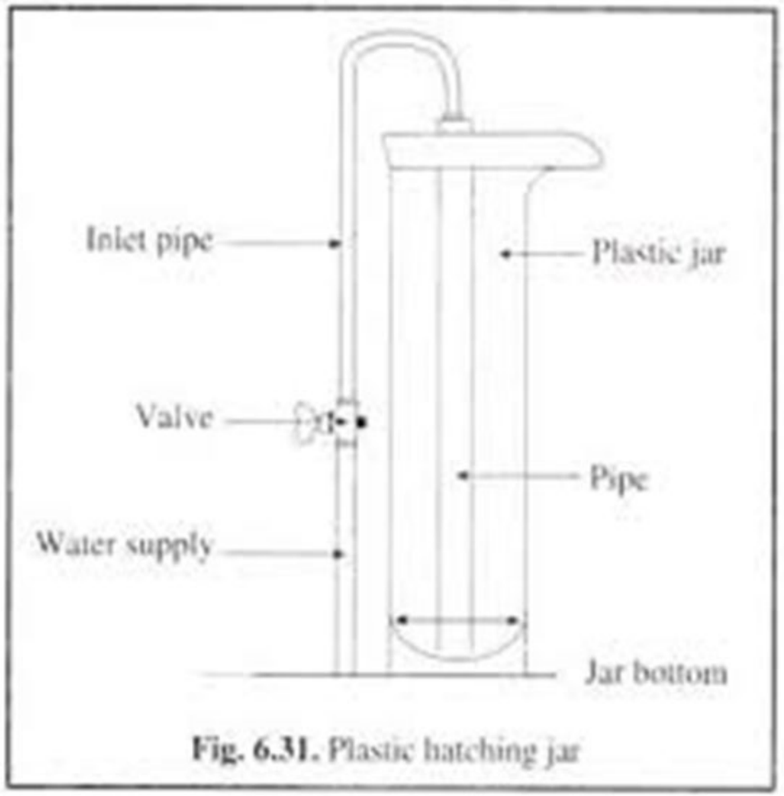


Fig. 6.31. Plastic hatching jar