
WATER HARVESTING AND AQUACULTURE
FOR RURAL DEVELOPMENT

PRODUCTION OF 1-GRAM, MIXED-SEX *OREOCHROMIS*
NILOTICUS FINGERLINGS IN EARTHEN PONDS

INTERNATIONAL CENTER FOR AQUACULTURE
AND AQUATIC ENVIRONMENTS
AUBURN UNIVERSITY

INTRODUCTION

Grow-out ponds stocked with mixed-sex tilapia fingerlings of different ages will yield large numbers of small tilapia at harvest because some of the stocked fish become sexually mature and reproduce soon after stocking. Stocking a grow-out pond with immature mixed-sex, same-age fingerlings will permit growth of both sexes to 80 to 150 g before females reach sexual maturity and produce offspring. Furthermore, immature, mixed-sex, same-age fingerlings can be stocked into nursery ponds at high densities, grown to 30 to 40 g, and the males separated from the females by visual examination of the genital papilla for transfer to grow-out ponds and subsequent culture to 200 to 400 g. Production of immature, mixed-sex, same-age fingerlings can be accomplished by frequent partial harvests of the reproduction pond, and will be the topic of this manual (Figure 1).

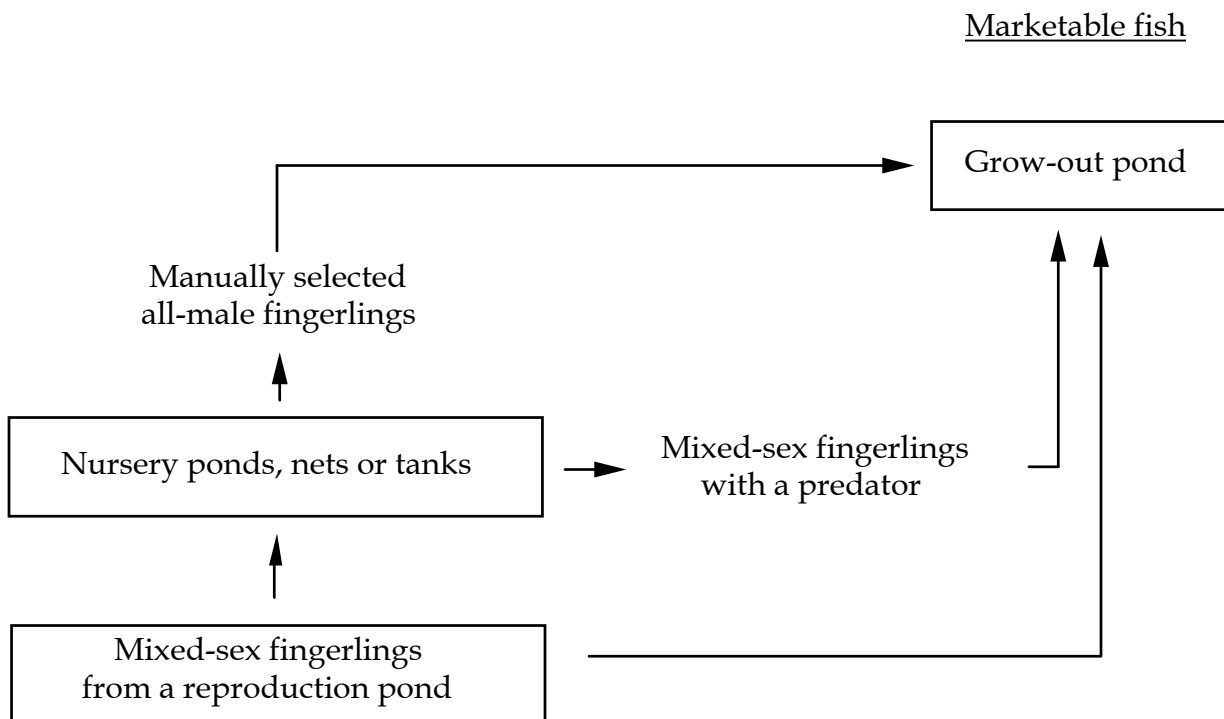


Figure 1: Flow chart depicting how mixed-sex tilapia fingerlings can be used to grow marketable fish.

HOW DOES PARTIAL HARVESTING WORK IN TILAPIA REPRODUCTION PONDS ?

Tilapia fingerlings obtained from ponds which are not specifically managed for reproduction are usually not the same age. The older, larger fingerlings prey on the younger, smaller fry and reduce the number of fingerlings suitable for stocking into grow-out or nursery ponds. Age variability can be controlled, and the number of marketable fingerlings produced can be greatly increased through frequent partial pond harvest using nets (Figure 2).

Fingerling production through partial pond harvest is suitable for small, medium or large-scale fingerling producers. One reproduction pond may supply adequate fingerlings for a small local market. More or larger ponds would be required for producers with very high fingerling demands. In tropical and subtropical countries, at least 1,000 1-g fingerlings per week have been produced per 100 m² of reproduction pond surface area by weekly partial harvesting with 6 to 12 mm mesh nets over a 3-to-6-month period (Figure 3).

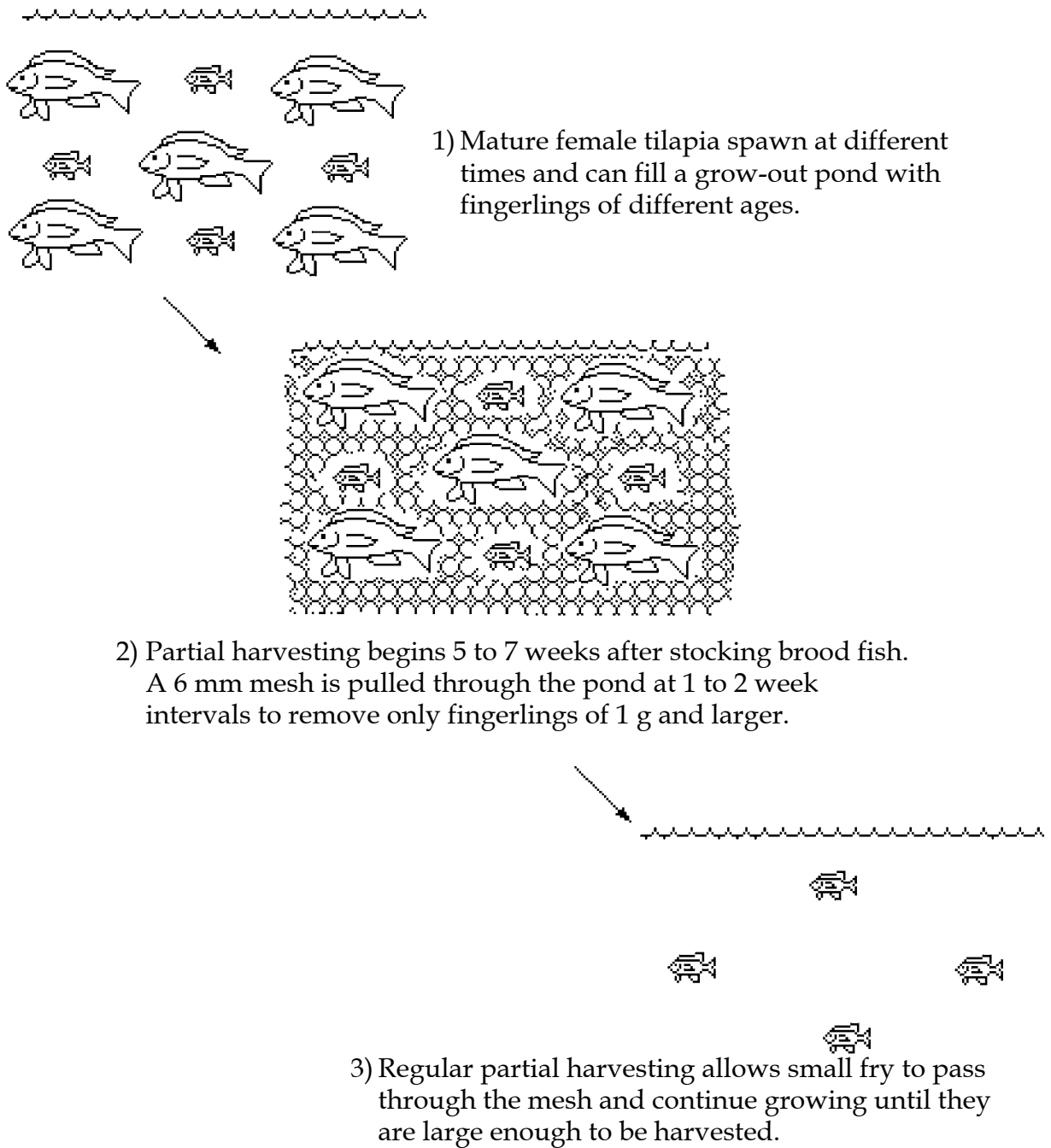


Figure 2: The principle of partial harvesting.

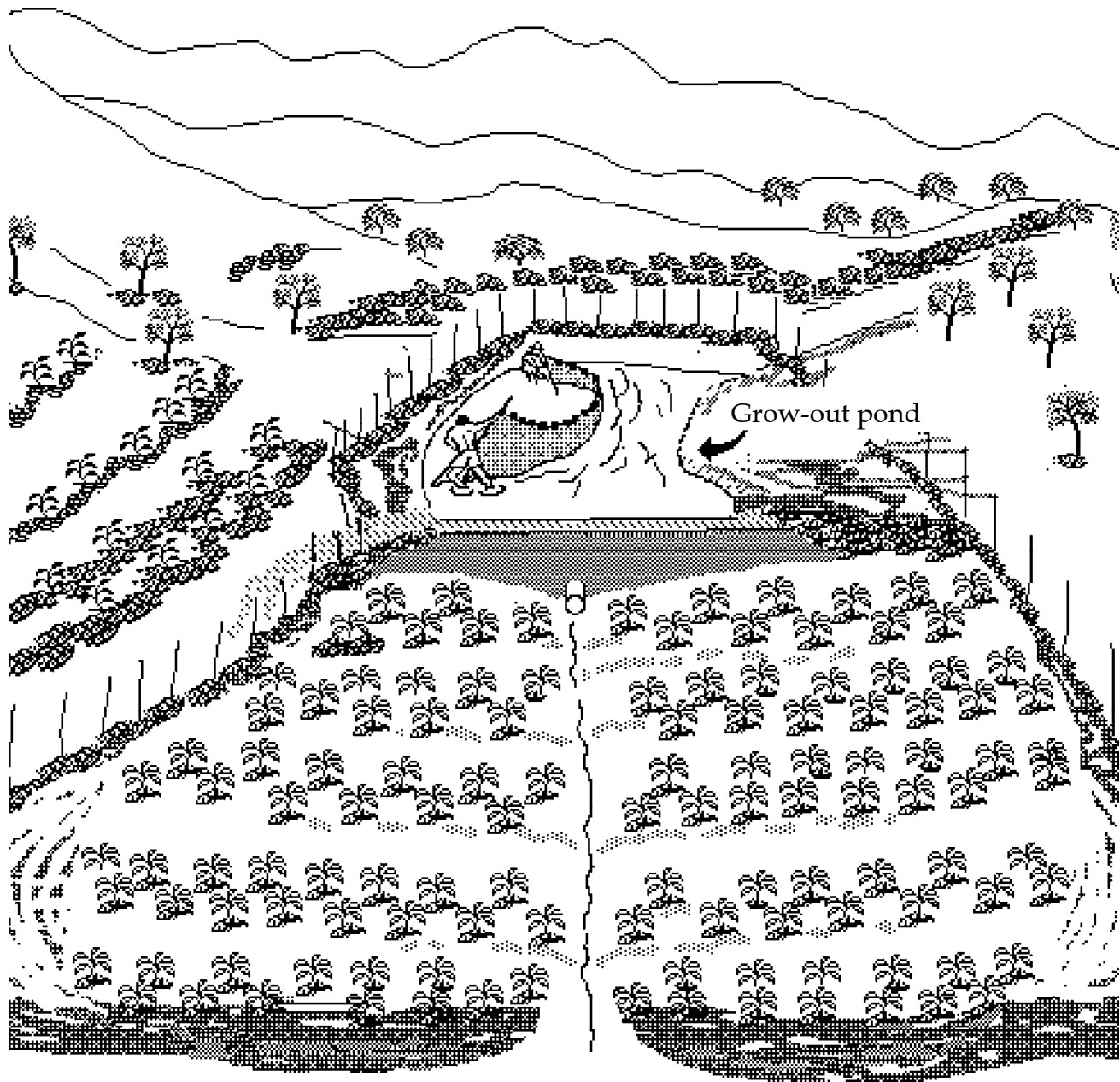


Figure 3: Farmers harvesting fingerlings from a reproduction pond with a seine net.

ESTIMATING FINGERLING NUMBERS

Calculations can be performed to determine the number of brood fish and pond area required to produce a given number of fingerlings. A set of example calculations follows.

Problem:

A small cooperative of fish farmers wants to buy 200 tilapia fingerlings per week from a producer. What are the pond surface area and number of brood fish needed to meet the fingerling demand?

Assumptions:

- 1) The system produces 1,000 1-g fingerlings/100 m²/week = (10 fingerlings/m²/week).
- 2) 1 brood fish is stocked per 1 m².
- 3) Brood fish are stocked at a ratio of 75% female to 25% male.

Calculation:

- 1) (200 fingerlings/week) X (1 week) X (1 m² /10 fingerlings) = 20 m² pond surface area
- 2) (20 m²) X (1 brood fish/m²) = 20 brood fish needed
- 3) (20 brood fish) X (75% female) = 15 female brood fish needed
- 4) (20 brood fish) X (25% males) = 5 male brood fish needed

These basic calculations make it possible to determine what inputs are needed to meet a production target. The actual number of fingerlings produced per 100 m² per week will depend on many different factors. Brood fish weighing 100 to 150 g are best. Smaller fish may not produce the number of fingerlings assumed above. A value of 1,000 fingerlings was selected as a reasonable estimate. In certain cases up to 1,300/m² have been achieved.

PROCEDURE FOR MANAGING A REPRODUCTION POND

- 1) Calculate the number of brood fish and pond area needed.
- 2) Prepare the reproduction pond for brood fish by drying, liming, refilling and fertilizing. Poisons may be used to eliminate fish if the pond cannot be completely drained. Information on fertilization, liming and poisons is available in other manuals in this series.
- 3) Apply chemical and/or organic fertilizers as needed to keep plankton density high. Secchi disk readings of 25 to 30 cm are desirable.
- 4) Stock the reproduction pond with 1 brood fish/m² of pond surface area within 2 weeks of filling.
- 5) Feed can be offered to brood fish at a rate equivalent to 1 to 2% of their body weight daily.
- 6) Partial harvesting of fingerlings should begin 5 to 7 weeks after stocking brood fish. A 6 mm (0.25 inch) mesh seine or dip net is pulled through the pond to capture fingerlings of 1 g or larger. Nets are operated by one or more people (Figures 4 and 5). Captured brood fish are returned to the pond. Partial harvesting should be done every 1 to 2 weeks thereafter.
- 7) Fingerlings may be graded through a screen or net to minimize size variation (Figure 6). Graded fingerlings are then transferred to prepared nursery or growout ponds.

8) Three months after the start of partial harvesting, or once the number of fry harvested becomes severely diminished, drain the reproduction pond, repeat step 2 above and start the cycle over. Ponds will produce adequate numbers of fry longer when frequent partial harvesting is done faithfully.

9) Brood fish that are not immediately restocked in a new reproduction pond should be separated by sex and held separately in small ponds, tanks, nets or cages until needed.

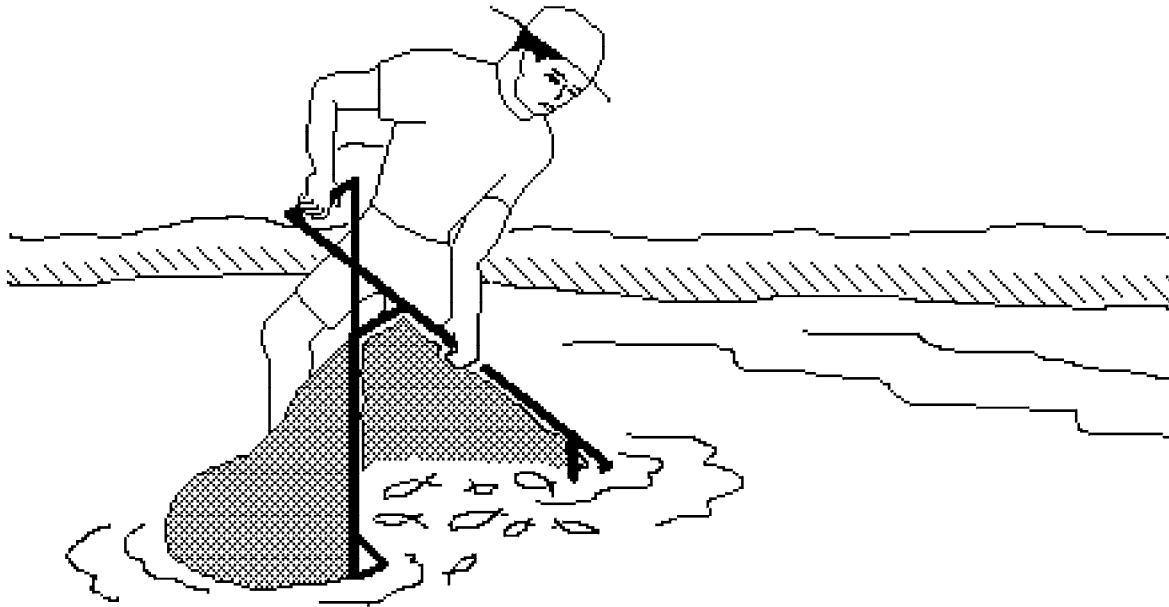


Figure 4: A dip net operated by one person.

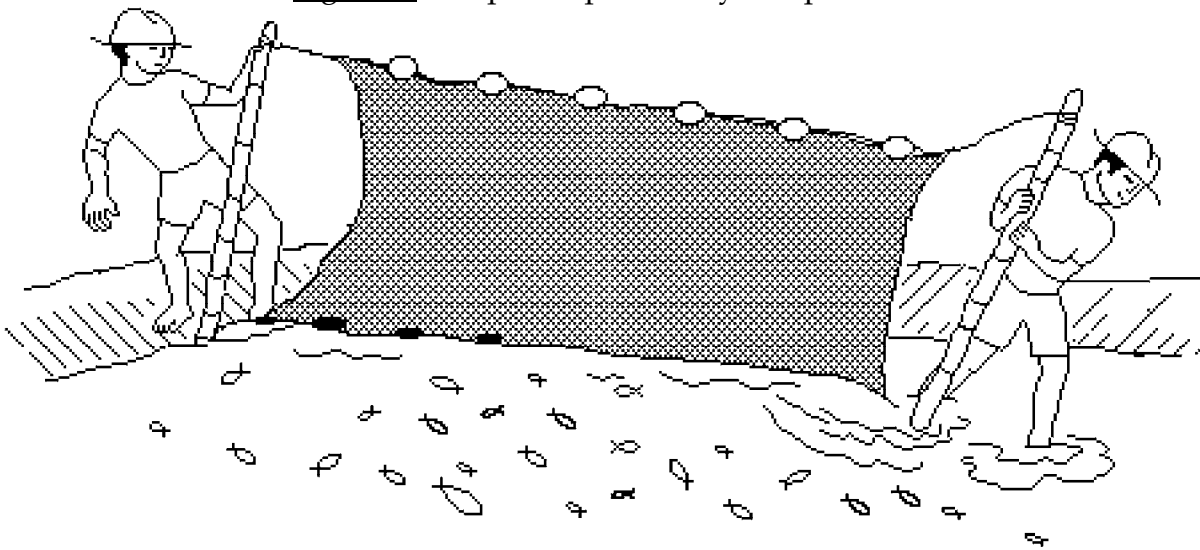
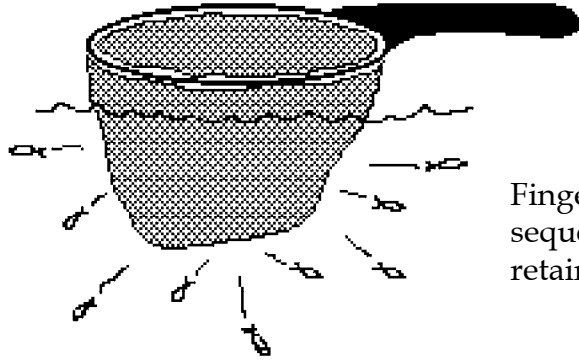


Figure 5: A small seine net operated by two people.

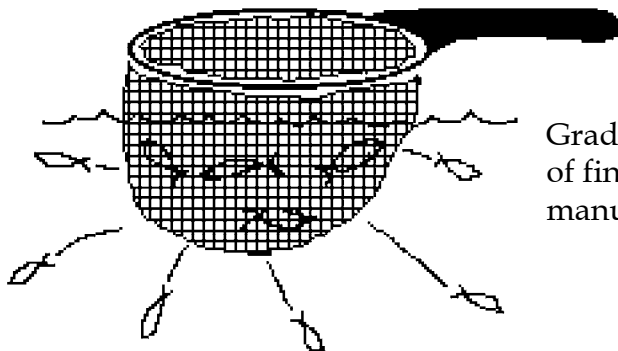
GRADING THE FINGERLINGS

Fingerlings harvested with a small mesh seine or dip net may not be of uniform size. They may be graded through nets of sequentially larger mesh to obtain uniform sizes (Figure 6). Fish passing through 6 mm mesh are considered too small for stocking and are returned to the pond from which they were harvested. Retained fish are transferred to a 12 mm mesh net. Fingerlings passing through this mesh size are considered suitable for stocking into nursery or growout ponds. Retained fingerlings are discarded or grown for brood fish.



Fingerlings are passed through graders with sequentially larger holes. Big fingerlings are retained and smaller fish pass through.

6 mm mesh allows fry to escape



Grading produces uniform size classes of fingerlings for sale, culture or for manual sexing

12 mm mesh allows 1 to 2 g fingerlings to escape.

Figure 6: Grading fingerlings through selective screen sizes to produce uniform size groups for stocking.

ADVANTAGES OF PARTIAL HARVESTING

- 1) Greater numbers of fingerlings suitable for stocking into grow-out ponds can be produced in comparison with a pond used for grow-out and reproduction.
- 2) Fingerlings of uniform age and size are produced.
- 3) Graded fingerlings should grow quickly when stocked into properly managed grow-out ponds.

DISADVANTAGES OF PARTIAL HARVESTING

- 1) Increased labor and facilities are required for partial harvesting.
- 2) Good nets of proper mesh size are needed and must be maintained.
- 3) Brood fish may be injured during partial harvesting. Excessive mortality can result from rough handling.
- 4) Water quality may degrade when nets are pulled through the reproduction pond during fingerling harvests. Fresh water must be available at this time and skillful management is needed.

GLOSSARY

brood fish - sexually mature fish selected for reproduction.

fingerling - a fish weighing from 1 to 15 g, or greater than 2.5 cm in total length.

fry - recently hatched fish weighing less than 1 g, or measuring less than 2.5 cm in total length.

grading - sorting fish by size.

grow-out pond/facility - a pond or other facility used to grow aquatic animals to marketable size.

partial harvesting - periodic harvesting of a portion of the fish from a culture facility during a culture cycle.

plankton - the various, mostly microscopic, aquatic organisms (plants and animals) that serve as food for larger aquatic animals and fish.

reproduction pond/facility - a pond or other facility used for fish breeding.

Secchi disk - a circular disk measuring approximately 20 cm in diameter which is used to measure the abundance of plankton in water.

seine net - a net, usually attached to two poles, which is pulled through a pond to harvest fish.

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Alex Bocek, Editor
International Center for Aquaculture and Aquatic Environments
Swingle Hall
Auburn University, Alabama 36849-5419 USA

Suzanne Gray, Illustrator

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