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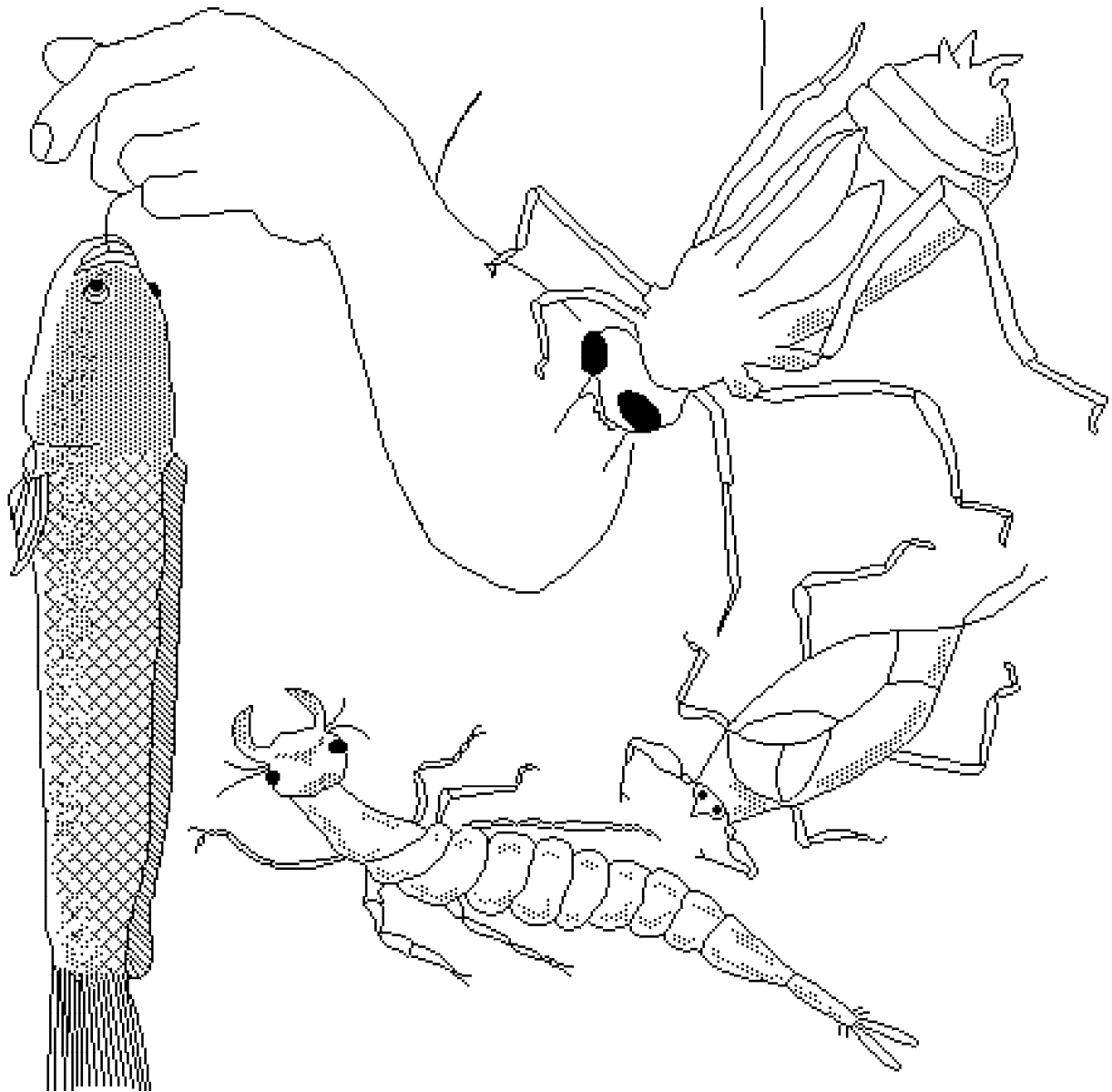
WATER HARVESTING AND AQUACULTURE  
FOR RURAL DEVELOPMENT

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ELIMINATING UNWANTED FISH AND  
HARMFUL INSECTS FROM FISH PONDS

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INTERNATIONAL CENTER FOR AQUACULTURE  
AND AQUATIC ENVIRONMENTS  
AUBURN UNIVERSITY

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## INTRODUCTION

Poisons or "toxicants" are used to eliminate unwanted fish, insects and other harmful organisms from a pond. A wide variety of poisons is available. This manual describes some which are commonly used.

## ELIMINATING UNWANTED FISH

Unwanted or "wild" fish may enter a pond through the water supply system. These fish may be predators which eat newly stocked fingerlings, or they may compete with fingerlings for food. In either case, they create problems for the fish pond manager. Unwanted fish can be eliminated at harvest when a pond is drained and dried. Poisons are effective in ponds which cannot be completely drained and dried. Poisoning should be done with caution to avoid harmful effects to humans, livestock, and the surrounding environment. Numerous poisons are used. Some may be purchased in stores. Others can be found growing near the farm.

Suitable fish poisons: 1) are effective in killing unwanted species at low doses; 2) detoxify quickly in water and are not injurious to cattle and people who may use the water; 3) leave no cumulative adverse residues; 4) are readily available and 5) are economical to use. Table 1 describes poisons and their application rates which may be used safely to kill fish. In Table 1, only fish killed by (*Derris* root) rotenone are known to be safe for human consumption. Insufficient information is available on the other poisons listed to make recommendations on the safety of eating fish killed by them. DO NOT use chlorinated hydrocarbon insecticides like endrin, dieldrin and DDT. They can make animals and people very sick.

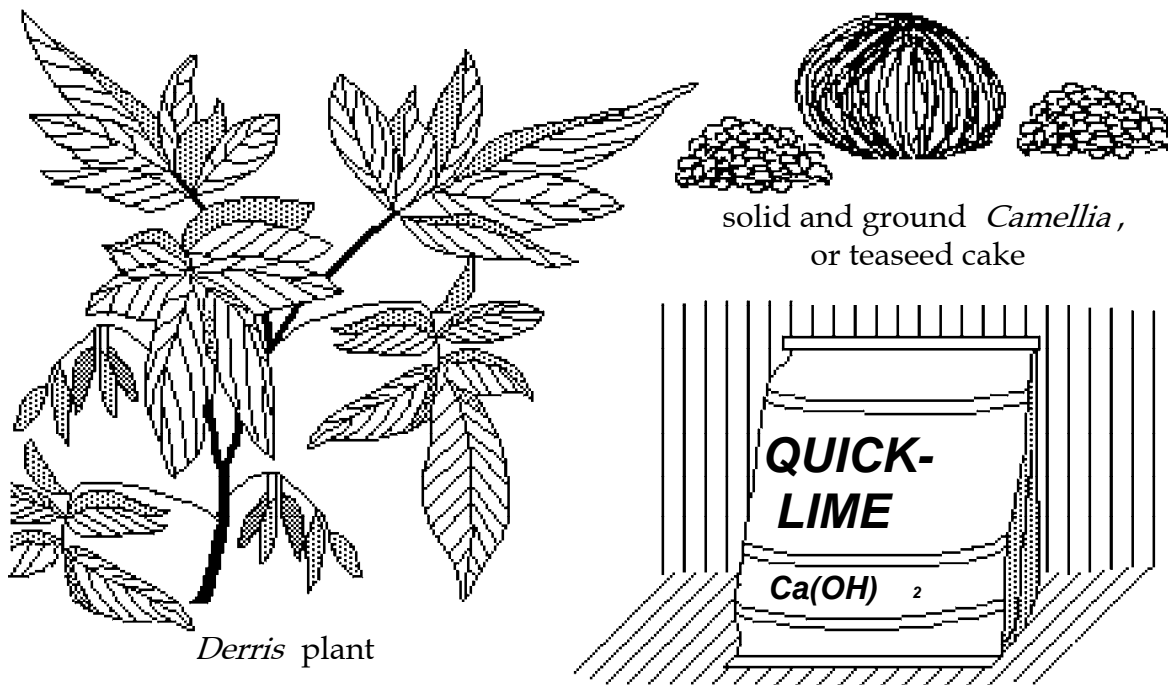


Figure 1: Some common fish poisons.

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Table 1: Various fish poisons and their application rates in ponds.\* Common names and comments have been supplied where possible.

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### Organic Methods

#### **1. *Derris* root or powder**

- a) 10 to 20 kg of commercial powder containing 5% to 8% rotenone is applied per hectare of water. Use the higher amount if water is greater than 15 cm deep. Mix the powder in pails of water and splash the liquid over the pond surface.
- b) 0.25 kg of dried root/100 m<sup>2</sup> of pond surface area covered with 5 to 10 cm of water. This equals 2.5 g of dried root/m<sup>2</sup>.
- c) 1.0 kg of dried root/100 m<sup>2</sup> in ponds greater than 10 cm deep.

Comments:

- 1) Rotenone is a white odorless substance in *Derris* root which inhibits respiration in fish.
- 2) Poisonous effects may last from 4 to 12 days depending on the dosage used.
- 3) Figure 2 shows how the root is processed.

#### **2. *Bassia latifolia* (or mahua in India)**

The cake remaining after oil extraction is ground up. Powder can be thrown into puddles or broadcast over the water surface. Ground cake can also be soaked in water overnight and spread over the pond surface with the water it was soaked in. Apply 200 to 250 g of oil cake made from the plant/m<sup>3</sup> of pond water 2 weeks prior to stocking.

Comments:

- 1) Poisonous effects may last from 2 to 8 days depending on dosage used.
- 2) Mahua oil cake contains a water soluble substance called saponin, which destroys red blood cells of the fish.

#### **3. *Croton tiglium* seed (croton seed)**

3 to 5 g of powdered seed/m<sup>3</sup> of pond water. Mix the powder in pails of water and splash it on the pond surface.

#### **4. *Milletia pachycarpa***

2 to 6 g of powdered root/m<sup>3</sup> of pond water. Mix the powder in pails of water and splash over the pond surface.

#### **5. *Barringtonia acutangula***

20 g of powdered seed/m<sup>3</sup> of pond water. Mix the powder in pails of water and splash over the pond surface.

Comments:

Poisonous effects last about 2 days.

#### **6. *Randia dumetorum***

12 g of powdered unripe fruit/m<sup>3</sup> of pond water. Mix the powder in pails of water and splash over the pond surface.

#### **7. *Walsura piscidia* (soap bark)**

10 g of powdered bark/m<sup>3</sup> of pond water. Mix the powder in pails of water and splash over the pond surface.

#### **8. Tobacco waste**

1.5 to 2.0 kg of waste/10 m<sup>3</sup> of water. Tobacco waste is best applied when water is 5 to 10 cm deep. Soak the waste overnight in water and broadcast the waste over the pond bottom as evenly as possible.

Comments:

Tobacco waste includes the dust, shavings, stalks and other waste materials from cigar and cigarette factories. Nicotine is the agent which affects fish. After decomposition, tobacco waste also serves as an organic fertilizer.

#### **9. *Camellia* seed cake (teaseed cake)**

1.5 to 2.0 kg of ground cake/10 m<sup>3</sup> of water. Apply when water is 5 to 10 cm deep. The required amount of cake is first crushed into small pieces and soaked in a tub or vat of water for about 24 hours. This mixture is then broadcast evenly over the pond surface. In large ponds, the poison may be soaked overnight in the bottom of a boat and broadcast over the pond the next morning.

Comments:

Teaseed cake is a residue remaining after the oil has been extracted from the seeds of certain plants in the *Camellia* family such as *Camellia sasangua* or *C. semiserrata*. It is compressed into a round shape and contains saponin (a toxin reacting in the blood).

#### **10. Saponin (an extract of teaseed and mahua cake)**

0.5 g/m<sup>3</sup> of pond water.

### **Combined Organic and Chemical Methods**

#### **11. Teaseed cake + Quicklime (Method 1):**

- a) First apply 5.25 to 6.75 kg of prepared teaseed cake/100 m<sup>3</sup> of pond water averaging 1 m deep.
- b) Next, apply 1.5 kg of quicklime/100 m<sup>3</sup> of pond water.

Comments:

Quicklime is calcium oxide (CaO) and must be used cautiously. It can burn the skin or lungs if inhaled. Wear gloves and a mask when using it.

#### **12. Teaseed cake + Quicklime (Method 2):**

- a) First apply 15.75 to 22.50 kg of quicklime/100 m<sup>3</sup> of pond with an average depth of 1 m.
- b) Next apply 5.25 to 6.75 kg of teaseed cake/100 m<sup>3</sup> of pond water.
- c) Add 1.5 kg of quicklime/100 m<sup>3</sup> a week later.

### **Chemical Methods**

#### **13. Quicklime alone**

- a) 9 to 10.5 kg/10 m<sup>3</sup> of water in a pond 5 to 10 cm deep. Broadcast the lime over the pond surface.
- b) 15.75 to 22.5 kg/100 m<sup>3</sup> of water averaging 1 m deep.

#### **14. Hydrated lime (Ca(OH)<sub>2</sub>)**

- a) 55 kg/10 m<sup>3</sup> of water in a pond that is 5 to 10 cm deep. Broadcast the lime over the pond surface.
- b) 100 kg/100 m<sup>3</sup> water in a pond 1 m deep.

#### **15. Sodium hypochlorite (liquid bleach)**

20 liters of bleaching solution per hectare in water 2 cm deep.

Comments:

Chlorine is the fish killing agent.

#### **16) Calcium hypochlorite (swimming pool chlorine)**

- a) As a "rule of thumb" apply sufficient chlorine for the fish to start dying.

b) 1.5 kg of powder per hectare in water 2 cm deep. First dissolve the powder in water and then broadcast over the pond surface.

Comment:

Calcium hypochlorite is a solid powder. It can burn the lungs if inhaled. A filter mask should be worn or breath held until the powder is safely in water.

### 17) Ammonium sulfate (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>

- a) 10 to 20 g/m<sup>2</sup> to standing puddle areas.
- b) 100 to 200 kg/ha to entire ponds containing water 10 cm deep.

Comments:

Ammonia is the agent affecting fish. Increasing water pH by adding 50 to 100 g/m<sup>2</sup> of quicklime just before adding ammonium sulfate increases its effect.

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\* information in this table came from:

1) Florentino, A., J.H. Primevera and P.L. Torres, Jr. 1983. Farming of prawns and shrimps. Extension Manual No. 5. August, 1983. Aquaculture Department, Southeast Asian Fisheries Development Center, Tigbauan, Iloilo, Philippines.

2) Jhingran, V.G., 1975. Fish and Fisheries of India. Hindustan Publishing Corporation, Delhi, India.

3) V.G. Jhingran and R.S.V. Pullin, 1985. A hatchery manual for the common, Chinese and Indian major carps. ICLARM Studies and Reviews 11, 191 p. Asian Development Bank, Manila, Philippines and International Center for Living Aquatic Resources Management, Manila, Philippines.

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Other plants useful in eliminating unwanted fish from ponds are listed below. This list comes from Jhingran, 1975. Processing methods, dosage rates and application procedures are not given.

#### Indian Name

#### Scientific Name

safed siris	<i>Albizzia procera</i>
nogdona tithwan	<i>Artemisia vulgaris</i>
dar-hald	<i>Berberis aristata</i>
banalu	<i>Dioscorea</i> spp.
chaulmugra	<i>Hydnocarpus hurzee</i>
akhrot	<i>Juglans regia</i>
hazarmani	<i>Phyllanthus urinaria</i>
kuchla	<i>Strychnos nuxvomica</i>
sarphonka	<i>Tephrosia purpurea</i>
ban tambaku or gidar tambaku	<i>Verbasum thapsus</i>

### PROCESSING PLANT POISONS

Plant poisons are usually processed in some way to increase their potency. Derris root is a good example. First it is dried; then soaked in water overnight; then pounded flat. The

flattened fibers are dipped and squeezed into a pail of water until the water becomes milky (Figure 2). The milky liquid is broadcast over the pond surface (Figure 3).



Soak the root overnight in water, then pound it flat. Next, squeeze the root into a bucket of water until the water turns milky. Prevent any liquid from getting into the eyes as it may burn.

Figure 2: Processing *Derris* root.

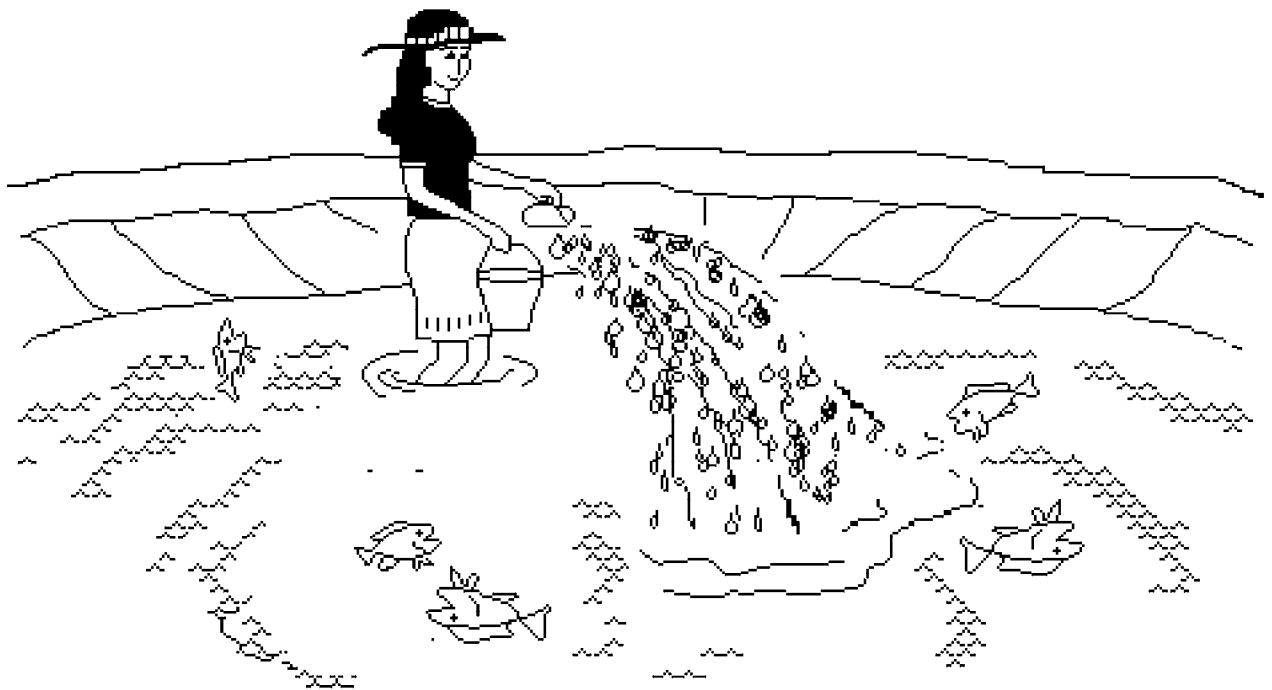


Figure 3: Broadcast the "milky" water over the pond surface.

## CALCULATING HOW MUCH POISON TO USE

Several factors influence the amount of poison necessary to kill fish and the length of time the poison remains active in the pond. The most important are water temperature, volume of water in the pond, and the amount of decaying organic matter in the water. In general, deep, cool water with abundant decaying matter requires more poison. Therefore, poisoning is done in the afternoon when the water is warm. It is best to drain most of the water from the pond before applying poison so that less will be needed. In the case of quicklime, acidity in the pond soil affects the amount used. For acid soils, use the high dose rate mentioned in Table 1.

A general rule to follow when poisoning puddles is to add poison until fish start to die. For example, one puddle may require a cup of quicklime, a cup of chlorine or a handful of mahua powder. Experience can tell a farmer how much is required. Calculations should be made for larger volumes of water. The following are example calculations for determining the amount of poison to use. Refer to Table 1 for help with these problems.

### Example 1:

A farmer needs to poison his pond. He plans to stock it with fish in 3 weeks. The pond is drained but several puddles containing fish remain on the bottom. The farmer estimates that 200 m<sup>2</sup> of water with an average depth of 10 cm remains. The farmer has derris root. How much root should he use if the recommendation (Table 1) is 0.25 kg of dried root per 100 m<sup>2</sup> of water.?

#### Calculation:

$$200 \text{ m}^2 \text{ of water} \times 0.25 \text{ kg of dried root}/100 \text{ m}^2 \text{ of water} = 0.5 \text{ kg of dried root}$$

### Example 2:

A rural village has a rectangular pond. The water surface is about 48 m long and 35 m wide. The total water surface area (length X width) is 1680 m<sup>2</sup>. The average pond depth is 1 m. Total water volume (area x depth) is 1,680 m<sup>3</sup>. The pond has been harvested with a net, but has no drain. Villagers want to restock the pond with new fingerlings, and want to kill the remaining fish in the pond before restocking. Enough teaseed cake and quicklime are available to use method 1 under item 10 in Table 1. How much of each poison should the village use?

#### Calculation

A. Teaseed cake:

$$1,680 \text{ m}^3 \text{ of water} \times 6.0 \text{ kg teaseed cake}/100 \text{ m}^3 \text{ of full pond} = 101 \text{ kg teaseed cake}$$

B. Quicklime:

$$1,680 \text{ m}^3 \text{ of water} \times 1.5 \text{ kg quicklime}/100 \text{ m}^3 \text{ of full pond} = 25.2 \text{ kg quicklime}$$

### Example 3:

A farmer has an irregularly shaped pond which he can not drain completely. Remaining water is an average of 10 cm (or 0.1 m) deep with an estimated area of 300 m<sup>2</sup>. He wants to poison the pond with powdered croton seed. How much should he use?

#### Calculation

1. Estimate the volume of water in the pond.

a.) 0.1 m deep X 300 m<sup>2</sup> area = 30 m<sup>3</sup> of water.

2. From Table 1, apply 5 g of powdered seed/m<sup>3</sup> of water.

a.) 30 m<sup>3</sup> of water X 5 g croton seed/m<sup>3</sup> of water = 150 g of seed needed

After poisoning a pond, take precautions to prevent wild fish from entering the pond through the water inlet. Screening or prefiltration devices are commonly used for this purpose (Figures 4, 5 and 6). Screens are typically of fine mesh (1mm square) and are reinforced with hardware cloth for added strength.

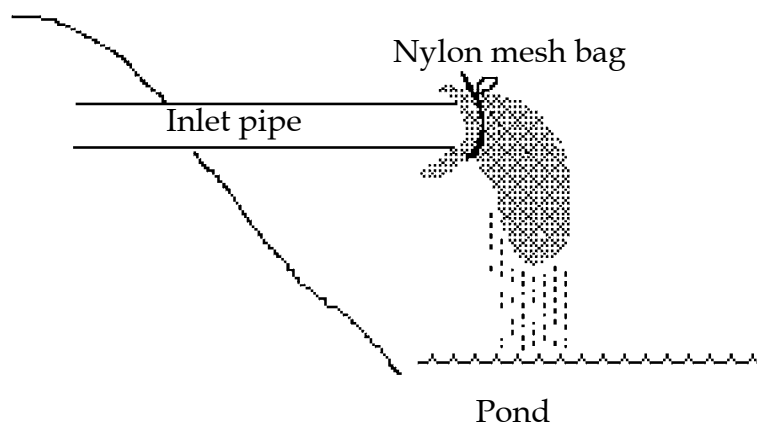
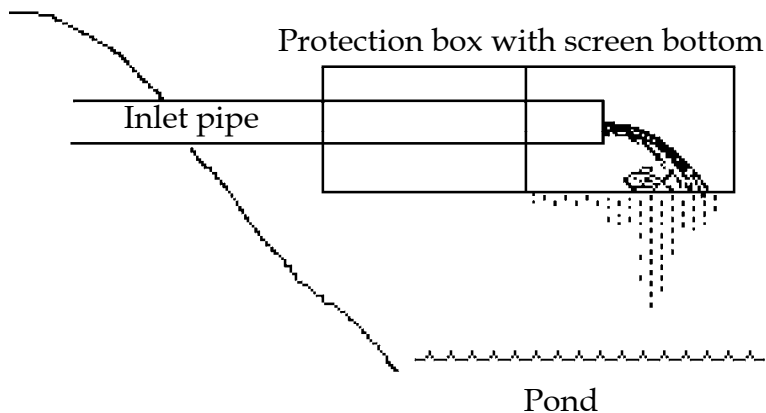


Figure 4: Screen box and nylon mesh bag used for filtering pond inlet water.

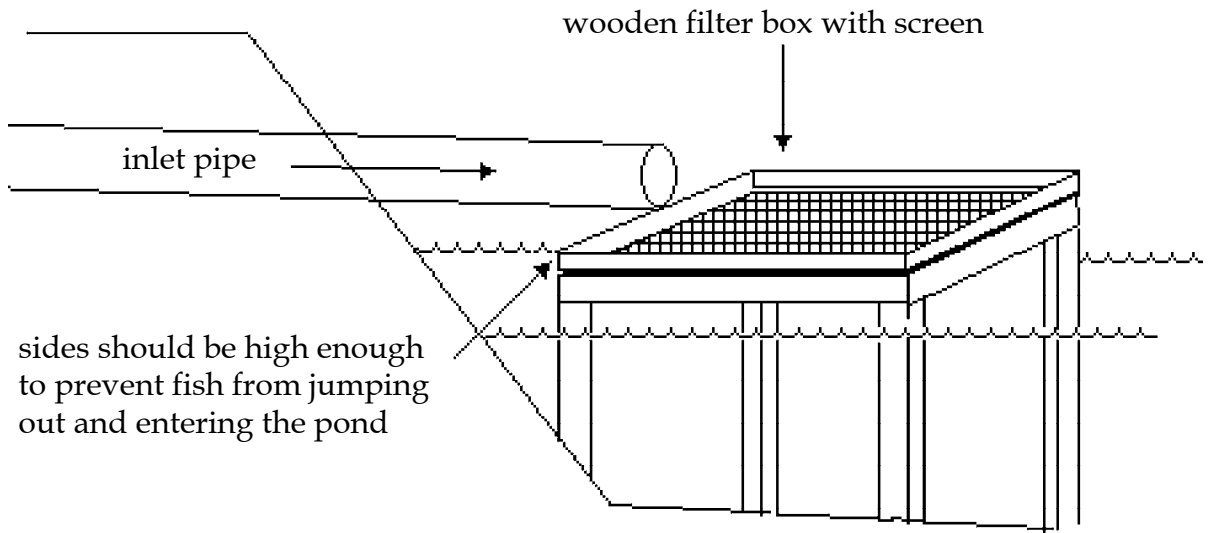


Figure 5: Water screening device.

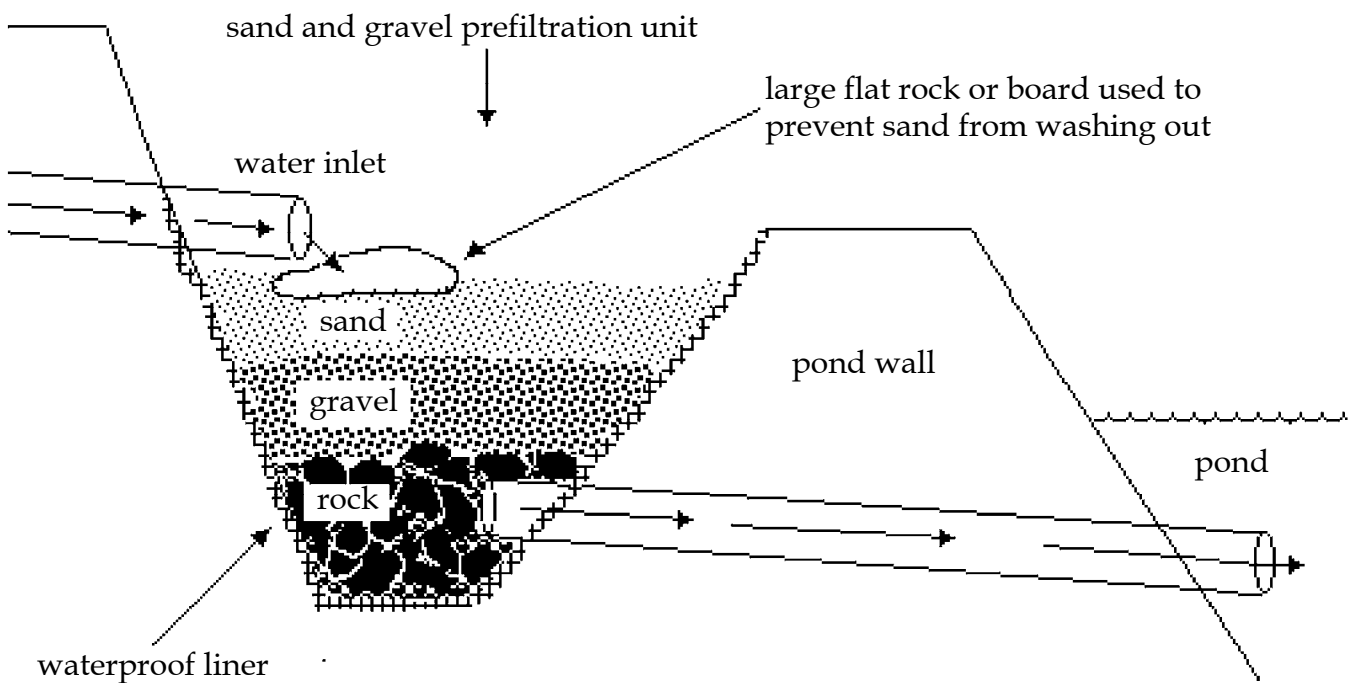


Figure 6: Prefiltration method for removing unwanted fish.

### TESTING TO SEE IF WATER IS SAFE FOR STOCKING NEW FISH

A simple procedure is used to determine if a previously poisoned pond is safe for stocking with new fingerlings (Figure 7).

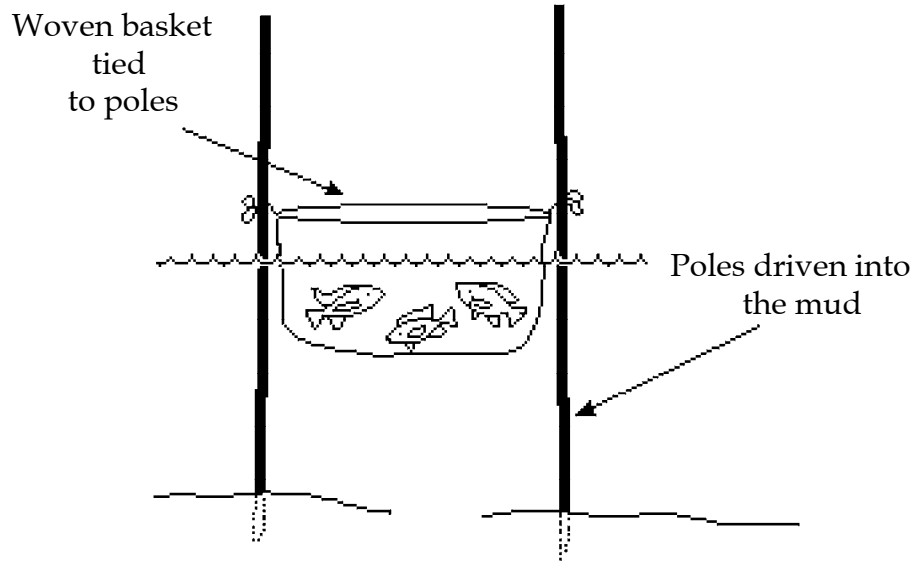


Figure 7: Tie a basket to poles driven into the mud. The basket should have a weave loose enough to let water enter but to keep fish inside, and should be at least half submerged. Early in the morning, add about five fingerlings and let the basket sit undisturbed. The basket can be covered to prevent fish from jumping out.

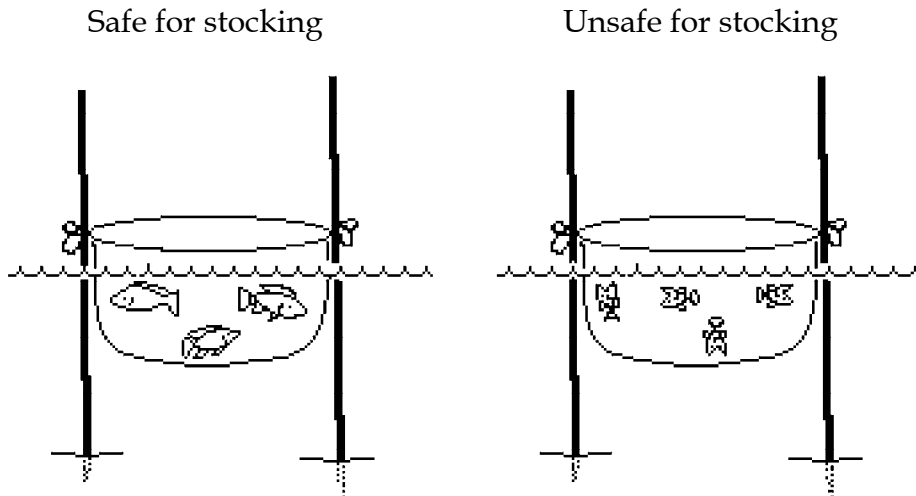


Figure 8: Check the basket in several hours. If the fish are still alive, the water is safe to stock. If the fish are dead, wait a few days and test the water again with new fingerlings.

### METHODS TO ELIMINATE PREDATORY INSECTS

Young fry and small fingerlings are especially vulnerable to predation by certain aquatic insects which inhabit ponds virtually year-round. Ideal insecticides kill insects without harming beneficial plankton, other natural food organisms or fish. The safest insecticides are oil based. Oil clogs the air intake of insects which breath at the water surface and cause them to suffocate. Other chemical poisons containing toxic substances which affect respiration are sometimes used. However, they may also kill beneficial food organisms or fish and are used

mostly under research conditions. A competent fisheries agent should be consulted if such poisons are being considered for use.

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Table 2: Recommendations for elimination of aquatic insects from ponds.

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### OIL BASED SPRAYS

1) Spray an emulsion of 56 kg of mustard or coconut oil and 18 kg of washing soap per hectare, 12 to 24 hours before stocking fry.

2) Apply 0.75 l of diesel fuel per 100 m<sup>2</sup> of pond surface area.

#### Comments:

Mild wind will push the oil into a small area of the pond causing the treatment to be ineffective. Thus, oil based poisons work best when it is not windy.

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Recommendation 1 (Table 2) was obtained from: V.G. Jhingran and R.S.V. Pullin, 1985. A hatchery manual for the common, Chinese and Indian major carps. ICLARM Studies and Reviews 11, 191 p. Asian Development Bank, Manila, Philippines and International Center for Living Aquatic Resources Management, Manila, Philippines.

### EDITOR'S COMMENT

Many different fish poisons used throughout the world are not mentioned here. Readers are encouraged to submit their methods and comments regarding locally used poisons for inclusion in the next edition of this manual. Details regarding common and scientific names as well as other information on finding, collecting and processing the poisons should be included as available. Pictures would be helpful. The following example was received from Habitat for Humanity in Zaire, West Africa. Please follow this format when submitting information.

**Nature of Poison:** A plant used to kill unwanted fish.

**Scientific Name:** *Tephrosia vagelli*

**Common Name:** information not provided

**Description of Plant (tree, vine, bush, etc.):** information not provided

**Method of Processing:** Fresh leaves and stems were pounded

**Application to Ponds:** Pounded fresh leaves and stems were spread over the pond bottom at a rate approximately equal to 30 to 60 heaping wheel barrows full per hectare (1 to 2 barrows per 350 m<sup>2</sup> pond) and left for at least 3 days. Water depth in the ponds was about 3 cm.

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#### Comments:

1) Fish and tadpoles were said to die within 2 days.

2) The poison is believed to prevent oxygen uptake.

3) Ponds were filled and restocked with fish 1 week after poisoning.

4) Plant leaves are oval in shape and have short, fine, erect, white hairs, as do the seed pods. Leaves are 2 to 3 cm long and seed pods are about 5 cm long and flat.

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## GLOSSARY OF TERMS

emulsion - oil suspended in a watery liquid.

fish poison/toxicant - a substance or material applied to ponds which kills fish or insects.

fingerling - a fish weighing from 1 to 25 g or measuring longer than 2.5 cm.

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

insecticide - a substance used to kill insects.

plankton - the mostly microscopic organisms (plants and animals) suspended in the water column that serve as food for larger aquatic animals.

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