

# ***Training on Carp brood management & hatchery operation for quality seed production***



**Facilitated by:  
Mohammad Shawquat Ali  
WorldFish Bangladesh  
11<sup>th</sup> May 2020**

# ***Objectives of the training***

- **Commercial carp hatchery operation through proper brood fish management useful for business better**
- **Improve breeding performance & seed quality**
- **More survivability & suitable growth performance at nursing & grow-out.**

# ***Why Brood stock management is Important?***

## **Good Brood Management useful for business better ---**

- **Seed quality largely depends on brood quality**
- **Better breeding performance**
- **Suitable growth performance**
- **More Survivability**
- **Gonadal development at proper time**
- **Larval development as expected**



# ***What will happened if improperly managed?***

## **❖ Features of improper brood management ----**

- High mortality of brood & Spawn – Economic loss
- Reared with many species – Late maturity
- Temporary management – Unknown traceability
- Other pond fish dumped- Late breeding Period

## **❖ Results:**

- Spawn produce less than 1kg from 10-15 kg brood (**3 times more than usual**)
- High mortality at nursing & grow-out
- Low quality spawn
- Low price due to less market demand

# ***Brood stock management***

- ❖ Selection of brood fish
- ❖ Preparation of brood pond
- ❖ Stocking management of brood fish
- ❖ Feeding management of brood fish
- ❖ Water quality of brood pond
- ❖ Spawning of fish
- ❖ Multiple spawning technology
- ❖ Conditioning of Spent fish

# ***Selection of brood fish***

- Preferably big size, healthy, good looking and matured males and females should be collected from **the natural sources** (rivers, lakes, reservoirs) as brood stock.
- Brood collected from culture ponds might be of the same sized, matured and healthy and **from known origin.**
- For the exotic species, the **culture ponds or brood banks** are the only source of brood stock.

# ***Preparation of brood pond***

- Deep pond preferably 2 meter depth & bottom with less than 6 inch mud is preferable.
- Remove bushy plants those are shading the pond water
- Fence the pond dike with fine mesh filter net to prevent unwanted entrance.
- Ensure one entry point having footbath & gate
- Filled the pond with un-contaminated water
- Prepare brood pond with lime (1.0 to 1.5kg for 0.01 acre) & fertilizers (Urea-150g, TSP-150g & Compost- 5kg per 0.01acre)

# ***Stocking management of brood fish-1***

- Brood fish should be **stocked @12-15kg/0.01acre** water area.
- Better to use separate pond for holding male & female fish
- Stocking with **2 to 3 species in one pond** is preferable
- Catla required special care & feeding, stocking with bottom feeder is better for intime breeding.
- Rohu with Grass carp and Mrigel or common carp is suitable for intime breeding



# ***Stocking management of brood fish-2***

## **Brood stocking Models:**

<b>Species</b>	<b>Model-1 (kg/0.01acre)</b>	<b>Model-2 (kg/0.01acre)</b>	<b>Model-3 (kg/0.01acre)</b>
<b>Catla / Silver carp</b>	<b>5-8</b>	<b>4-5</b>	<b>0</b>
<b>Rohu</b>	<b>0</b>	<b>0</b>	<b>3-5</b>
<b>Mrigel / Kalbashu / Common. carp</b>	<b>7</b>	<b>4- 6</b>	<b>4-5</b>
<b>Others species</b>	<b>0</b>	<b>4</b>	<b>5</b>
<b>Total stocking</b>	<b>12-15</b>	<b>12-15</b>	<b>12-15</b>

# ***Feeding management of brood fish -1***

## **Brood fish Feeding Models:**

<b>Model-wise feeding of brood fish</b>			
<b>Ingredients</b>	<b>Model-1 (g)</b>	<b>Model-2 (g)</b>	<b>Model-3 (g)</b>
Rice polish	150	0	150
Wheat Bran	100	420	160
Mustard oil cake	420	300	225
Soybean/ peanut oil cake	0	0	120
Flour/ Cassava pod.	50	30	70
Molasses	0	25	0
Fish Meal	205	150	200
Vitamin Premix	45	45	45
Salt (Commercial)	30	30	30
Total	1000	1000	1000
<b><i>Crude Protein (%)</i></b>	<b>28</b>	<b>25</b>	<b>30</b>

# ***Feeding management of brood fish -2***

## **Images of good quality feed Ingredients**



# ***Feeding management of brood fish-3***

***Carp breeder fish required 2.5% to 1.5% feed, based on fish body-wt. & maturity (every day in two times feeding).***

***Crude Protein must be 28 to 30 % in feed as showed in models***

**Few considerations:**

- Stopped feeding in cloudy days.
- Supplementary foods with vegetative matter such as Hydrilla, Vallisneria, Nanjas, Utricularia, and soft young leaves of other plants are given some times as food for better breeding result.
- The feeding rates should be lowered with the maturity of gonads of breeder.
- Better to stopped feeding before a week of breeding.
- Better follow the feed formulation 1 or 3 model for breeder feed preparation

# ***Water quality of brood fish pond -1***

Fish perform all bodily functions in water which includes-

- eating
- breathing
- Excreting wastes
- reproducing
- taking in or removing salts

Water quality is divided into different characteristics, Like ----

- physical
- biological
- chemical

# ***Water quality of brood fish pond-2***

## **Physical parameters of water:**

<b>Parameters</b>	<b>Recommended Limits</b>
<b>Temperature</b>	<b>28- 32degree C</b>
<b>Turbidity</b>	<b>&lt;1000mg/L</b>
<b>Total dissolve solids</b>	<b>&lt;200mg/L</b>
<b>Total suspended solids</b>	<b>&lt;80mg/L</b>
<b>Water color</b>	<b>Yellowish green</b>



# ***Water quality of brood fish pond -3***

## **Biological parameters of pond water:**

- Phytoplankton, diatom, dinoflagellate
- Zooplankton
- Benthos
- Water plants/insects
- Protozoa
- Bacteria (e.g. nitrifying bacteria)
- Fungi

# Water quality of brood fish pond - 4

## Zooplankton



*Daphnia longispina*



*Molna micrura*



*Simocephalus vetulus*



*Rotifer*

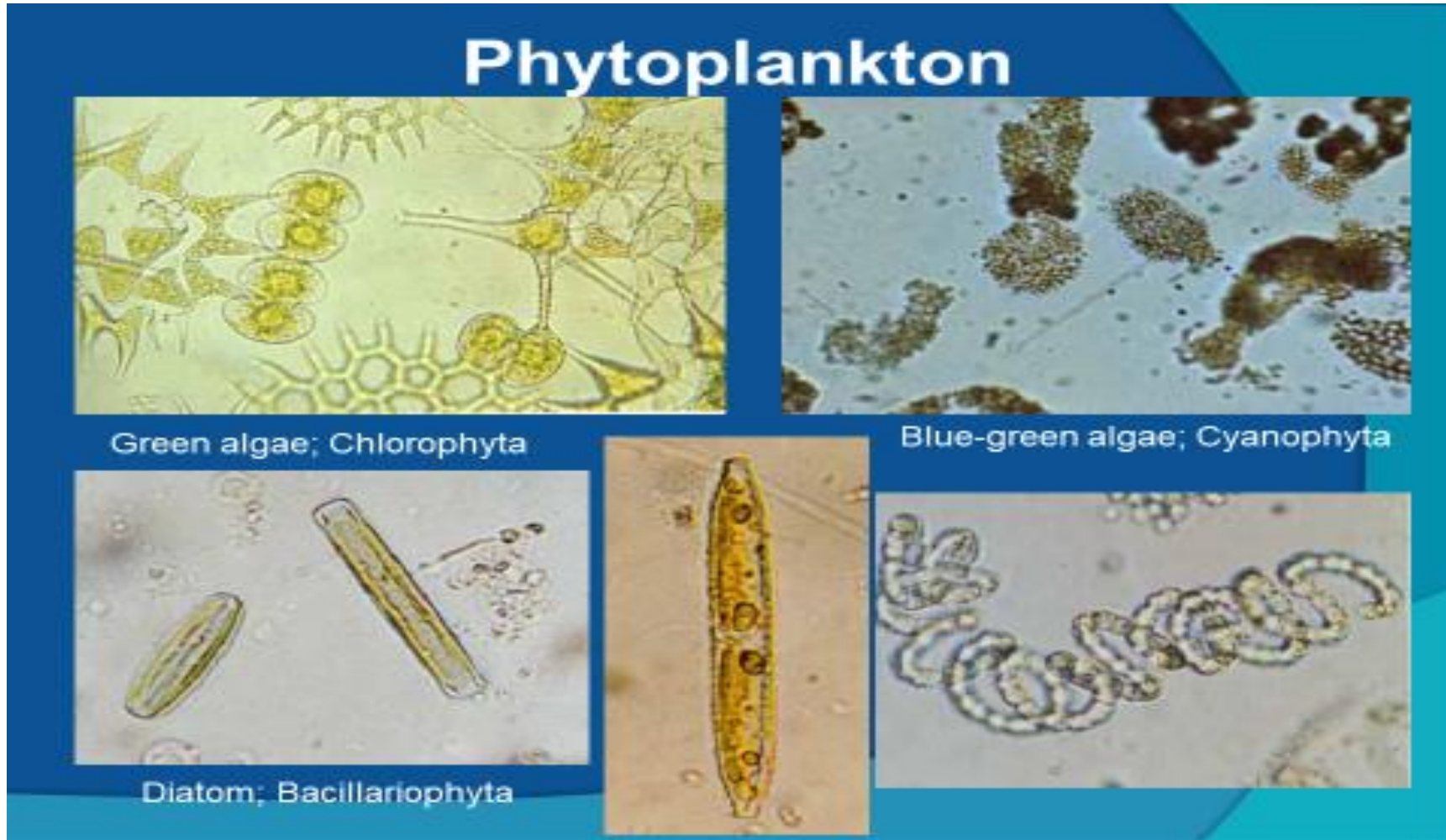


*Bosmina fatalis*



*Copepoda*

# Water quality of brood fish pond - 5



# ***Water quality of brood fish pond - 6***

## **Chemical parameters of water:**

<b>Parameters</b>	<b>Optimum Range</b>
<b>Dissolve Oxygen</b>	<b>&gt; 5ppm</b>
<b>PH</b>	<b>6.5-8.5</b>
<b>Alkalinity</b>	<b>&gt;20mg/L (as Caco3)</b>
<b>Ammonia (Un-ionized)</b>	<b>&lt;0.02mg/L</b>
<b>Nitrite</b>	<b>0.1mg/L</b>
<b>Nitrate</b>	<b>1.0mg/L</b>
<b>Chlorine / Hydrogen sulfide</b>	<b>&lt;0.003mg/L</b>
<b>Salinity</b>	<b>&lt;0.5ppt</b>

# ***Spawning of brood fish -1***

## **Why induced breeding is necessary?**

**Induced breeding gives very promising result in fishery point of view due to –**

- It ensure pure spawn of certain species of fishes.**
- It gives same age group spawn for nursing & grow-out**
- It assures timely available of seed, where as in nature the availability of seed is quite uncertain.**
- It can fulfill any quantity of demand in any time of breeding season**
- The cost of expenditure is very low than the natural collections of spawns.**

# ***Spawning of brood fish-2***

## **Factors that are affecting Induced breeding**

- Climate - 24°C to 31°C with cloudy days and rainy periods. Light drizzling following heavy rains is ideal. In absence of rain artificial showers may used.
- Water : Running water is preferred.
- Turbidity : 100ppm - 1000ppm.
- Light – It is known to bring that light may help in early maturation and spawning of fish.



# ***Spawning of brood fish -3***

## **Induced breeding technique:**

- ❖ **Selection of breeders with recommended age**
- ❖ **Conditioning of breeders**
- ❖ **Induced hormone preparation**
- ❖ **Doses of Injecting breeders with hormone**
- ❖ **Egg collection & fertilization**
- ❖ **Egg incubation & hatching of eggs**
- ❖ **Spawn rearing & feeding at tank**

# ***Induced breeding technique -1***

## **Selection & Identification of breeders:**

- Selected breeders should be healthy, fully ripen and of medium size.
- The male shows roughness on pectoral fins when belly pressed milt freely comes out.
- The ripe female shows relatively smooth pectoral fins and operculum.
- The eggs are released when the belly is pressed smoothly in female.
- The belly of ripe female is generally soft and rounded.
- The vent is swollen and pinkish in color.

# ***Induced breeding technique -2***

## **Minimum age of breeders for breeding:**

<b>Sl No</b>	<b>Species</b>	<b>Approx. Weight (kg)</b>	<b>Minimum Age (yr)</b>
<b>1</b>	<b>Rohu</b>	<b>1.5</b>	<b>2+</b>
<b>2</b>	<b>Mrigel</b>	<b>1.5</b>	<b>2+</b>
<b>3</b>	<b>Silver Carp</b>	<b>2+</b>	<b>2</b>
<b>4</b>	<b>Silver barb</b>	<b>0.25</b>	<b>1</b>
<b>5</b>	<b>Grass Carp</b>	<b>2.5</b>	<b>3+</b>
<b>6</b>	<b>Catla</b>	<b>3+</b>	<b>3+</b>
<b>7</b>	<b>Bata</b>	<b>0.2</b>	<b>1</b>
<b>8</b>	<b>Common Carp</b>	<b>1.5+</b>	<b>1</b>
<b>9</b>	<b>Pangas</b>	<b>3</b>	<b>3+</b>
<b>10</b>	<b>Big Head Carp</b>	<b>2</b>	<b>2+</b>
<b>11</b>	<b>Gonia</b>	<b>1.5+</b>	<b>2</b>

# ***Selection & Identification of breeders***



**Matured Female**



# ***Conditioning of breeders***

Conditioning means a short rest of breeders, before breeding. Usually 7 to 8 hours before breeding, harvested brood are kept separately (male & female) into two tanks or hapas for resting. Allowing them vigorous showering till next step for injecting hormone. This procedure helps to increase breeding performance. Showering should be continued till egg collection. Improper resting sometimes leads the procedure to failure ends.

# ***Induced hormones & preparation***

**For Carps breeding below hormones & chemicals are used:**

- 1. Pituitary gland**
- 2. Ovulin / ovitide/ ovaprim/ Flash**
- 3. Motilium 10mg (Domperidon maleate)**
- 4. Suprifect -F**

**Among those Pituitary gland is natural hormone & collected from fish brain. No doubt use of PG, also safe for fish in Induced breeding.**

- ✓ Required quantity of PG diluted with required amount of water for injecting. After that centrifuge the solution & collect the clear part to inject fish.**
- ✓ For Motilium & Suprifect solution preparation, Smash motilium tablet & diluted with required quantity of distilled or rain water and mixed with required quantity of suprifect.**



# Few Images of *Induced hormone*



# ***Doses to Injecting breeders with hormone-1***

## **Table-1: Pituitary Hormone application**

Sl. No	Species	Sex	1 <sup>st</sup> Doze (mg/kg-wt.)	Interval (hrs.)	2 <sup>nd</sup> doze (mg/kg-wt.)	Stripping (hrs)
1	Rohu	Female	1.5 - 2.0	6	4.5- 6.0	5 - 6
		Male	0		2.0	
2	Com. Carp	Female	0.5 – 1.0	6	4.0 – 5.0	5 -7
		Male	0		2.0 -3.0	
3	Catla	Female	1.5 - 2.0	6	4.5- 6.0	5 - 6
		Male	0		2.0	
4	Mrigel	Female	1.5 - 2.0	6	4.5- 5.5	5 - 6
		Male	0		2.0	
5	Grass carp	Female	1.0 – 1.5	6	4.0 – 5.0	5 - 7
		Male	0		2.0 – 3.0	
6	Bata	Female	1.0	6	4.0-5.0	5 - 7
		Male	0		2.0	
7	Silver barb	Female	4.5 - 6.0		No	6 – 7 (natural release)
		Male	2.0		No	

# ***Doses to Injecting breeders with hormone-2***

## **Table-2: Flash/Ovupin/Ovulin application**

Sl. No	Species	Sex	Single doze (ml/kg-wt.)	Stripping (hrs)
1	Rohu	Female	0.30 - 0.50	After 10 - 12
		Male	0.10 – 0.30	
2	Com. Carp	Female	0.40 – 0.60	After 10 -14
		Male	0.10 – 0.30	
3	Catla	Female	0.30 - 0.50	After 10 - 12
		Male	0.10 – 0.30	
4	Mrigel	Female	0.30 - 0.50	After 10 - 12
		Male	0.10 – 0.30	
5	Grass carp	Female	0.40 – 0.60	After 12 -14
		Male	0.10 – 0.30	
6	Bata	Female	0.16 – 0.25	After 10 - 12
		Male	0.10 – 0.12	
7	Silver barb	Female	0.16 - 0.20	After 10 - 12
		Male	0.10 – 0.12	



# ***Doses to Injecting breeders with hormone-1***



**Weighing of brood**



**Injecting at dorsal region**

25/1803



**Injecting fish at Pectoral region**

# ***Doses to Injecting breeders with hormone-3***

## **Table-3: Application of Suprifect & Motilium**

SI No	Species	Sex	Suprifect doses	Motilium doses
1	Rohu	Female	10µg /1kg-bw	5mg/1kg-bw
		Male	5µg /1kg-bw	2.5mg/1kg-bw
2	Common Carp	Female	10µg /1kg-bw	5mg/1kg-bw
		Male	5µg /1kg-bw	2.5mg/1kg-bw
3	Silver Carp	Female	25µg /1kg-bw	5mg/1kg-bw
		Male	12µg /1kg-bw	2.5mg/1kg-bw
4	Grass Carp	Female	25µg /1kg-bw	5mg/1kg-bw
		Male	12µg /1kg-bw	2.5mg/1kg-bw
5	Silver barb	Female	10µg /1kg-bw	5mg/1kg-bw
		Male	5µg /1kg-bw	2.5mg/1kg-bw

# ***Doses to Injecting breeders with hormone-4***

## **Table-4: Application of Suprifect & Motilium**

Sl No	Species	Sex of fish	1 <sup>st</sup> dose Injection		Interval	2 <sup>nd</sup> dose Injection	
			Suprifect	Motilium		Suprifect	Motilium
1	Pangasius	Female	30 µg/1kg-bw	5mg/1kg-bw	12Hrs	15 µg/1kg-bw	5mg/1kg-bw
		Male	0	0		15 µg/1kg-bw	2.5mg/1kg-bw

**Note:** Required amount of Motilium need to smash first, mixed with distilled or rain water & than mixed-up with Suprifect as required doses.



# ***Eggs collection & fertilization-1***

Rohu, Catla, Mrigel, Grass carp, Gonia, Silver/BHC eggs are wash-out several times with 8.5% normal salt solution (if 8.5g salt mixed with 1 lit water, solution will be 8.5%). After that leave eggs for Incubation at Jar for hatching.

But for Common carp or Mirror Carp (eggs of these fishes are sticky & not easy to separate) the procedure is different as below:

- Add 5g Tannic acid powder with 1 lit water & prepare a stock solution of 10 lit.
- Add 30 g Urea with 1 lit water & prepare a stock of 20 lit
- Take few from tannic acid stock solution, mixed with eggs & stirs for 15 seconds to wash eggs
- After that again wash the eggs with Urea stock solution for several times till the eggs detached from each
- Finally wash with normal water & leave eggs at jar for incubation and wait for hatching.

# Egg collection & fertilization-2



# ***Egg Incubation & hatching of eggs***

After washing, eggs are released to Jar for hatching.  
Depending on Jar size 2kg to 5 kg eggs can kept in one jar for incubation & hatching process.

Sl No	Species	Hatching time (Hrs.)	Comments
1	Rohu	18 - 24	<b>Actually hatching time depends on temperature. If it is rainy days time might be increase a little bit.</b>
2	Com. Carp	48 - 72	
3	Catla	18 - 24	
4	Mrigel	18 - 24	
5	Grass carp	18 - 24	
6	Bata	16 - 20	
7	Silver barb	12 - 15	



# ***Egg Incubation & hatching of eggs***



# ***Spawn rearing at Tank -1***

After the successful spawning, spawn are reared at hatchery tank with special care for next 4 to 5 days. Care should be given as stated-----

- Every day at least two times 50% water exchange of the tank
- Siphoning to clean waste & dead fry of the tank bottom 2 -3 times a day
- Aeration is required if spawn density is high
- Continuous showering is necessary
- **After hatching till 60hrs Spawn do not required any feed**
- Boiled egg yolk/Milk powder are supplied as food. Boiled egg yolk diluted with water & apply @1 yolk for 1kg spawn for 5 times feeding in a day.



# ***Spawn rearing at Tank -2***



# ***Multiple Spawning technology-1***

Multiple breeding means more than two times breeding in one breeding season (March to September). Breeder of such breeding technology known as Professional breeders.

## **Principle of Multiple Spawning:**

- Multiple spawning is the timely harvesting of mature gametes
- The fishes are bred by adopting routine management technique, need more special management for the purpose.
- Required Special nursing 2 to 3 month before (November –December) of breeding starting.
- For better breeding performance Separate brood pond for male & female is required for holding brood.



# ***Multiple Spawning technology -2***

## **Care of Multiple Breeding:**

***Spent brood management program is an important aspect for better survival and recovery of the spent brood, more care is suggested at every stage for handling as follows:-***

- Breeders/Spent fishes should be transported in the canvas bags along with water
- Less stress the breeder during injecting, handling & at the breeding pool.
- Spent brooders should be removed from breeding pool ASAP, and treated with **potassium permanganate solution (5 ppm) & Salt solution (8.5%)** to minimize secondary infection.
- Must release spent breeder in a separate pond for proper nursing
- Feeding (2%bd-wt) and water management(changing, splashing) practices should be followed accurately for intime maturity.

# ***Conditioning of brood***

**Conditioning** means a short rest of breeders after each breeding. Care should be taken as follows -

- ❖ Required separate pond for male & female fish holding
- ❖ Better quality adequate feeding is mandatory
- ❖ Maintain the fish stock @12-15kg/0.01acre water area
- ❖ Frequent water splashing and water exchange
- ❖ Daily feeding with Vitamin-C, Premix & Selenium
- ❖ Need to apply few green vegetation for quick recovery
- ❖ Fertilized pond as routine basis to keep it with natural feed
- ❖ No breeder should be harvested for breeding before 45 days.
- ❖ Not to keep many species (max.3) in one pond

# Present status of carp breeding-1

- Untraceable brood utilization
- Own brood stock development
- Low quality feed application
- Less number of brood utilization in breeding
- Lack of replacing brood
- Immature brood utilization in breeding
- Inbreeding



# Present status of carp breeding -2

## Inbreeding?

Inbreeding happens when brother-sister or closely related breeders are used for reproduction.

### When it occurs

- No breeding program
- Unplanned breeding
- Uncontrolled breeding
- No traceability of breeder

### What happen there ?

- Low fecundity
- Low quality spawn
- Slow growth rate
- Less survival rate

# Present status of carp breeding-3

## Negative selection:

- When it occurs ?

- Develop brood from own Source
- Select low quality fish as brood

- What happens there?

- Low fecundity
- Low quality off-spring
- Less survival rate
- Slow growth rate

# Present status of carp breeding-4

## Hybridization

- When it occurs?

- Few of our hatchery owners cross fishes with other species, like Catla with Rohu, Rohu with Mrigel etc.

- What happens there?

- Impurity occurs
- Extinction of Species
- Changes of feeding behavior & niche

# Present status of carp breeding-5

## Breeding with Immature Stock

- When it occurs?

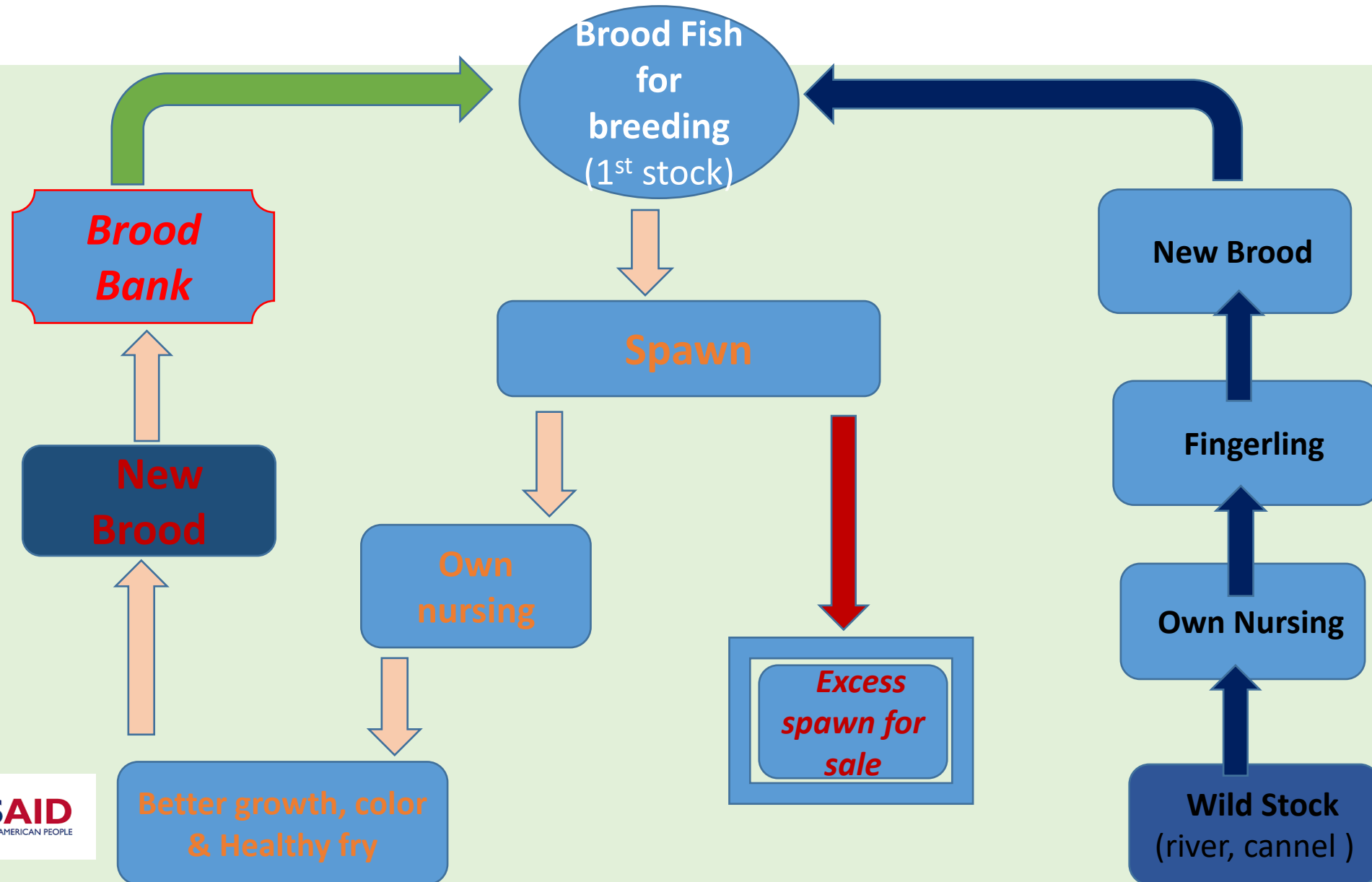
- Tendency for more spawn production
- When Spawn market demand is high
- Social problem to rearing big brood

- What happen there?

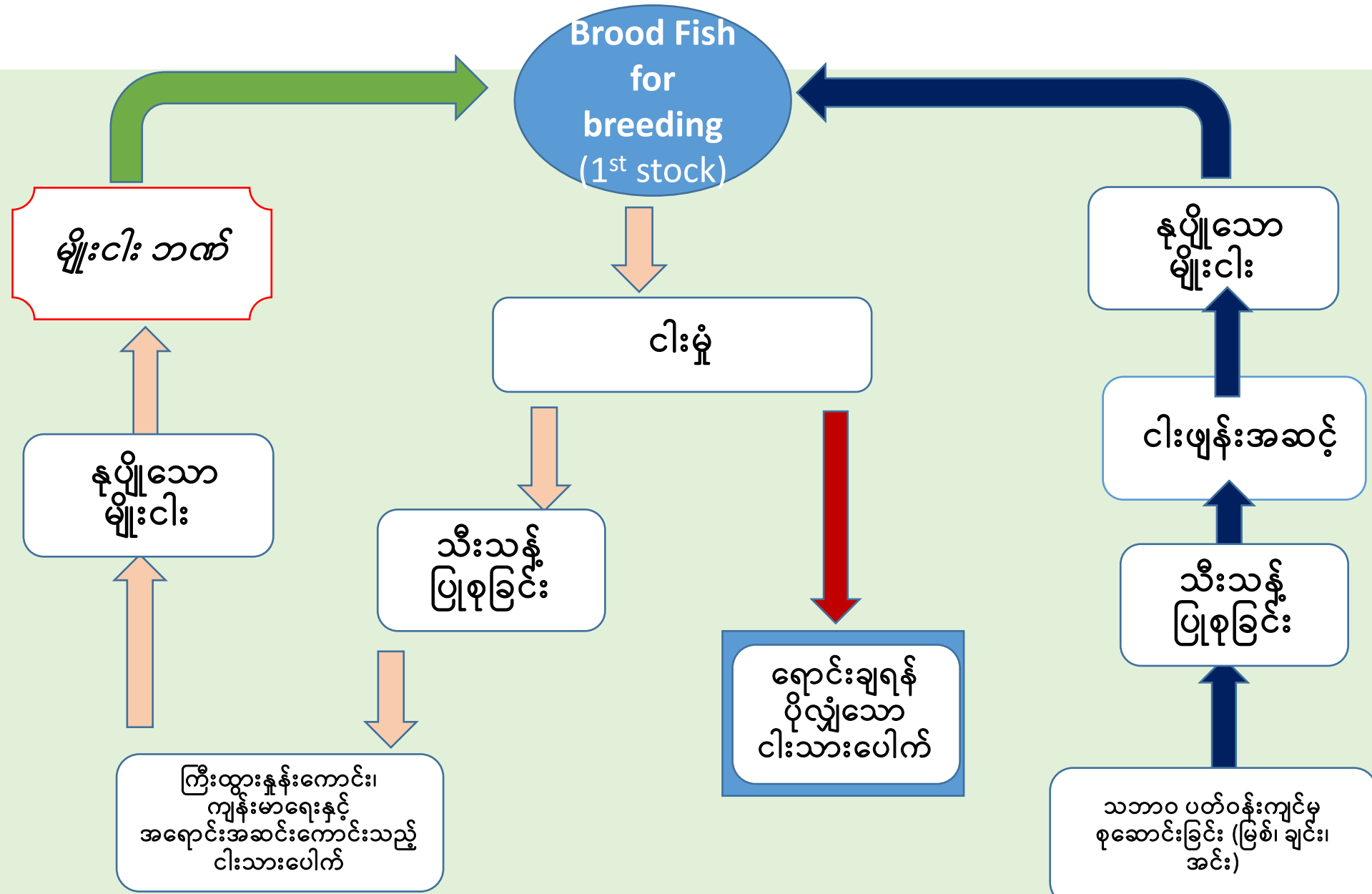
- Low grade Spawn
- Less growth rate
- Low survival rate



# Carp brood development process



# Carp brood development process



# Hatchery biosecurity

- **What is biosecurity?**

The measures and methods adopted to secure a disease free environment in all phases of aquaculture practices (i.e. hatcheries, nurseries, grow-out farms) for improved profitability. Biosecurity protocols are intended to maintain the "security" of a facility (i.e., prevent entry of, or reduce overall numbers prior to entry) with respect to certain disease causing organisms (parasites, bacteria, viruses and fungi) that may not be present in a particular system.

- **Importance of biosecurity**

A good biosecurity level helps to lower the risk of pathogens being transferred from farms to farms, from hatchery to hatchery and also from hatchery to farms.

# Hatchery biosecurity

## □ Benefits of biosecurity

**Biosecurity allow us to minimizing the risk of the following:-**

- **The ability to manage pests and diseases should outbreaks**
- **High fish mortality**
- **High financial losses from the loss of fish/animals**
- **A setback caused by the disruption of production**
- **Reduce the costs of pests and diseases control to productivity and ongoing management**
- **Project failure**
- **Loss of clients, who will no longer trust the quality of products.**

# Biosecurity sensitive Issues not to be followed





# Positive Biosecurity Issues to be followed







***Thanks***