Culture of Hybrid Striped Bass

Phase I Fingerling Production

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Recent Developments in the Production of Hybrid Striped Bass

In 2002, over 60 U.S. producers

2003 *Morone* spp. production was up 9% from 2002*

- Nearly 11.5 million pounds produced in 2003

Current outlook for aquaculture expansion is promising

- Consumption of seafood is rising, up 1 pound per capita from 1998**
- Feed costs are expected to decline through 2005***
- Due to increasing cost of imports, U.S. seafood exports are expected to be more competitive***
- Higher prices in 2004 will likely drive production expansion in 2005***

*NMFS Fisheries Statistics Division **USDA Aquaculture Outlook October 2004 ***USDA Aquaculture Outlook March 2005

Illinois Production

2003 Statistics

- > 260,000 pounds produced
- Market demands whole animal
- $2.05-$5.00 per pound
- Production cost ~ $1.20/lb

Increased demand for fingerlings

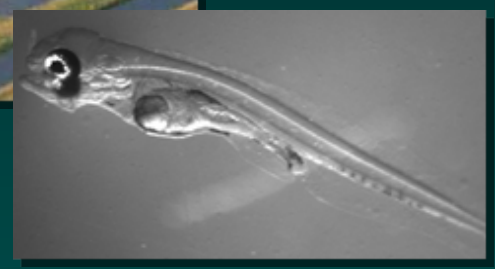
- Establish more producers
- Limit fluctuating availability

Phase I Pond Culture

General overview

HSB fry are stocked 4-5 days post-hatch

- ~ 3 mm in total length
- Small gape
- Obligate planktivores



Phase I is complete after 4-6 weeks

- Expect 1-2 inch fish

Phase I represents a critical period of growth and development for HSB, and survival is dependent on pond management

Phase I Pond Culture

General overview

Careful management of ponds required to provide proper conditions and food for rapid growth of fry

- Biotic and abiotic factors
- Inorganic and organic fertilizers
- Stimulate autotrophic and heterotrophic populations

Provision of initial prey base is paramount to successful Phase I culture

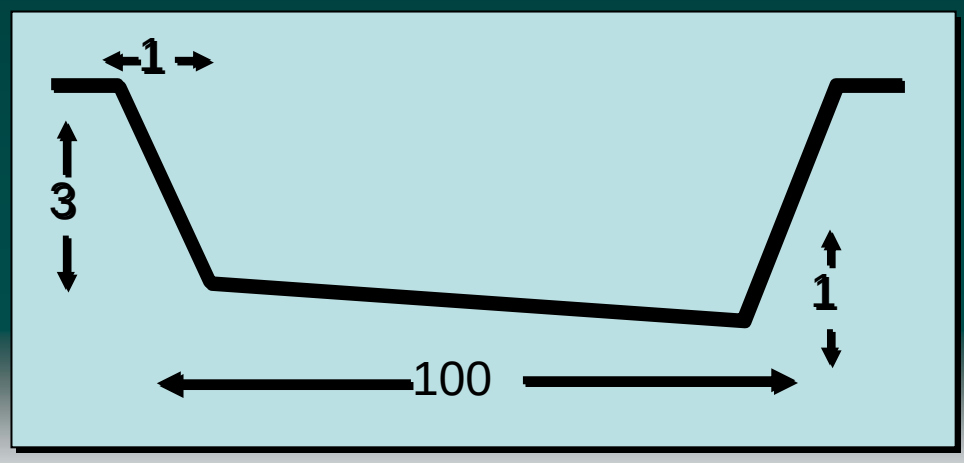
Pond Criteria for Rearing

Drainable ponds preferred

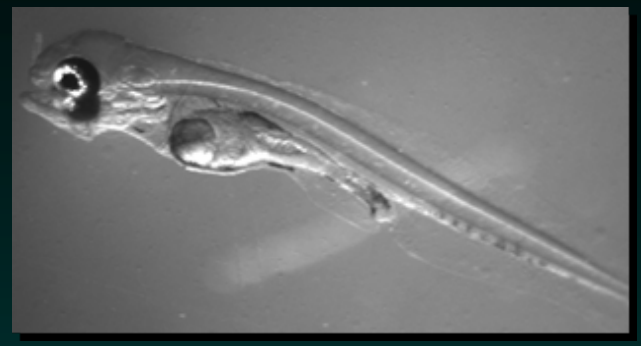
- If using non-drainable ponds, eliminate unwanted fish and invertebrates prior to stocking

Dimensions

- Sizes vary 1 to 5 acres
- 4 to 10 feet in depth
- Bottom slope 1:100 rise/run
- Bank slope 3:1 rise:run



Feeding Strategy



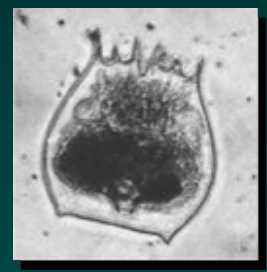
After hatching, larval HSB feed endogenously on yolk sac

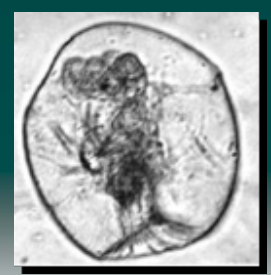
- Yolk sac is fully absorbed after ~5 days

Fry begin feeding on plankton according to gape size

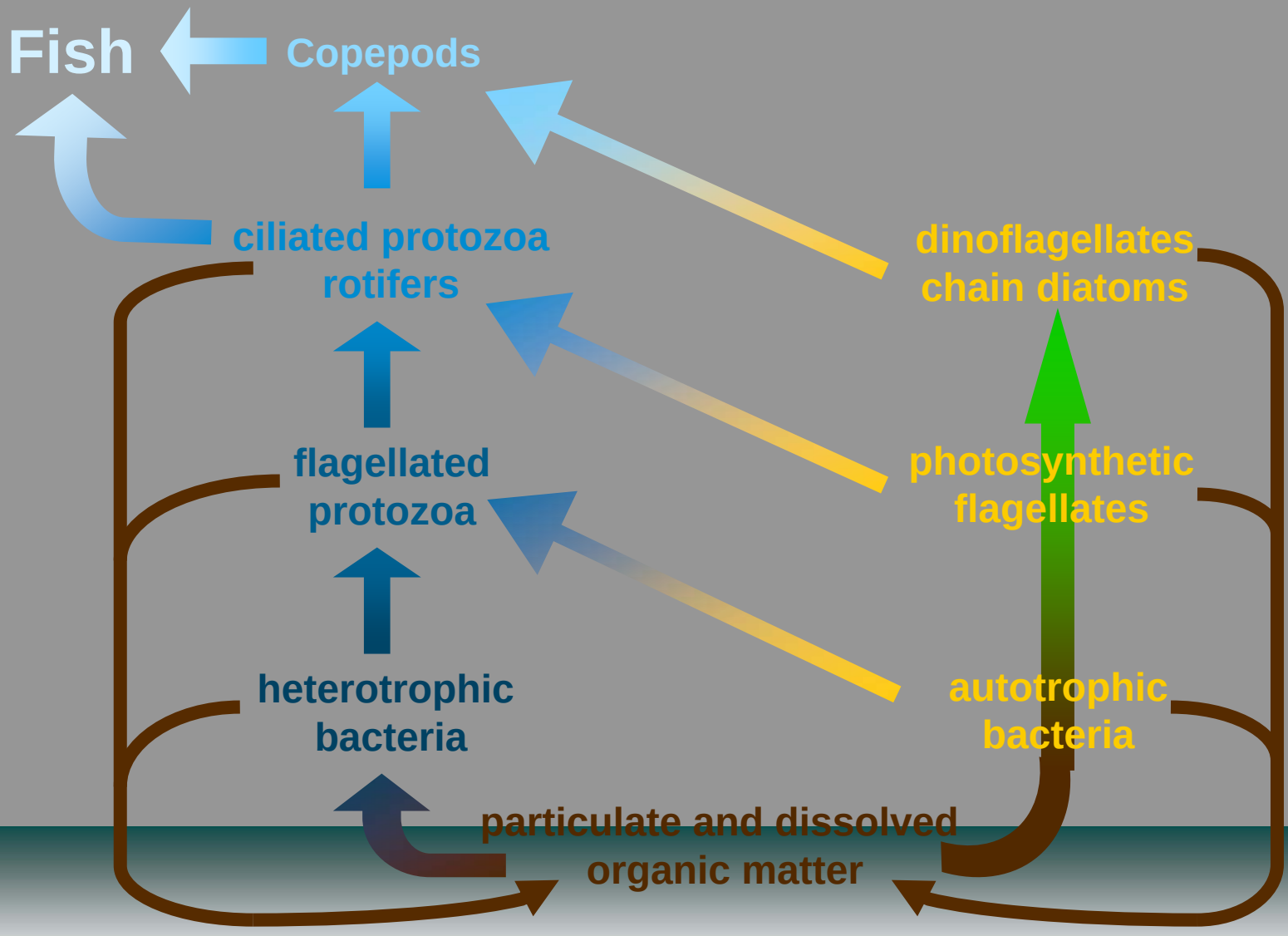
- Small zooplankton
  - Rotifers and cladocerans
- Larger zooplankton
  - Cladocerans and copepods
- Macro-invertebrates

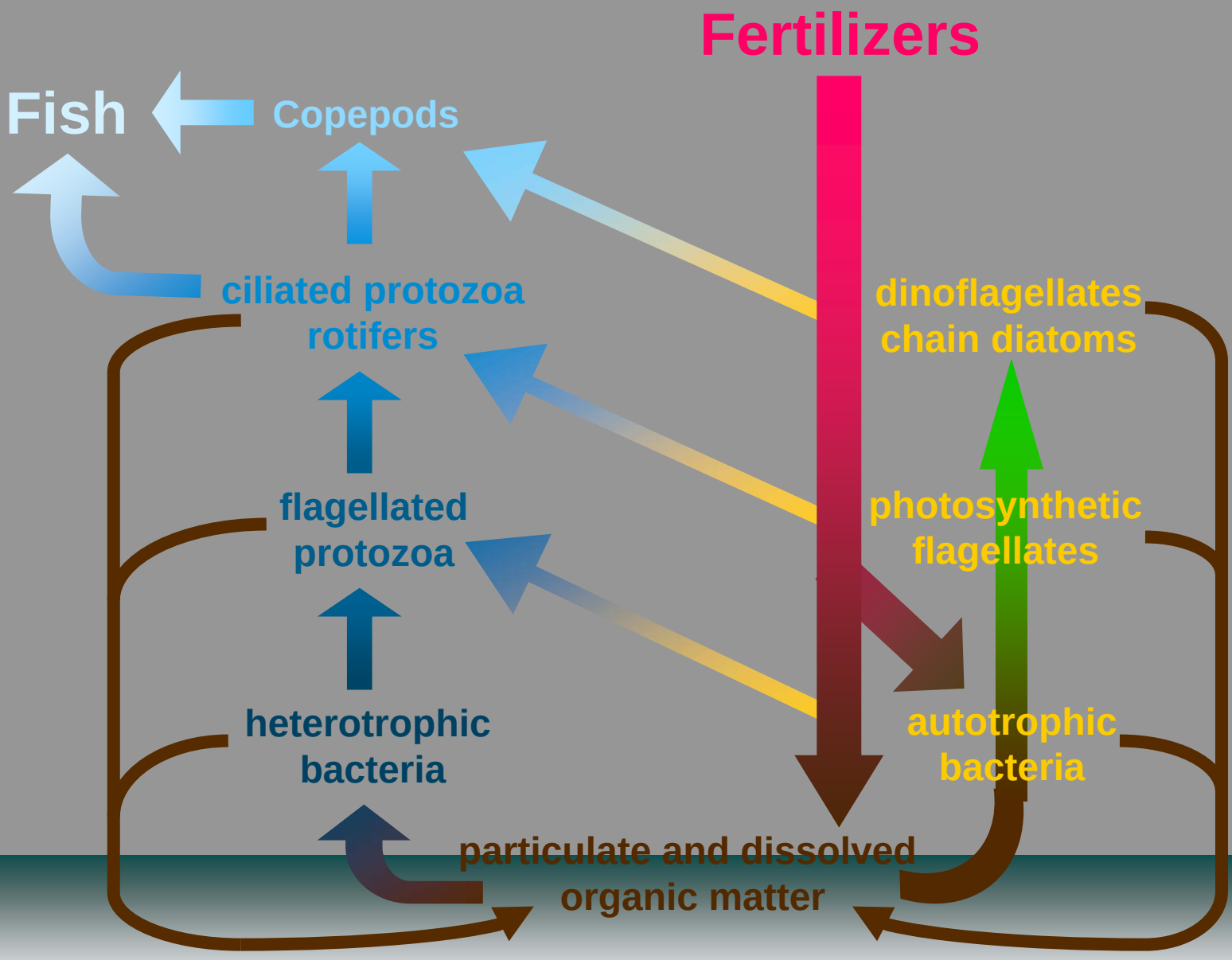
Transition to prepared feeds





Generalized Pond Food Web




Fertilizers
Fish
Copepods
ciliated protozoa
rotifers
dinoflagellates
chain diatoms
flagellated
protozoa
photosynthetic
flagellates
heterotrophic
bacteria
autotrophic
bacteria
particulate and dissolved
organic matter

Fertilizer Types

Inorganic

- Nitrogen: calcium nitrate, potassium nitrate
- Phosphorus: superphosphate, rock phosphate

Organic

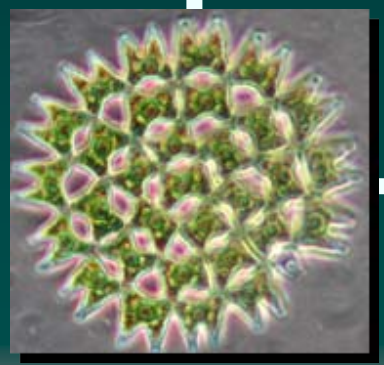
- Manures: traditional livestock
- Hays: alfalfa, bermuda, clover
- Meals: cottonseed, corn, soybean

Food Web Stimulation

Autotrophic

Larval Fish

Inorganic Fertilizer



Phytoplankton

Zooplankton

Food Web Stimulation

Heterotrophic

Larval Fish

Bacteria and Protozoans

Organic Fertilizer

Zooplankton

Aquatic Insects

Fertilization Regimes and Rates

Management recommendations range

- No fertilization
- Organic fertilization
- Inorganic fertilization
- Combined inorganic and organic fertilization

Inorganic fertilizer

- 0.25-1.00 mg/L active ingredient/volume
- Applied as needed

Organic fertilizer

- 500-1500 lb/ac
- Applied in separate portions
- Over 4-6 week culture period

Nutrient Ratios

Maintaining a high N:P ratios

- > 7:1 (N:P)
- May inhibit unwanted phytoplankton (blue-green algae or cyanobacteria)

Characteristics of blue-greens

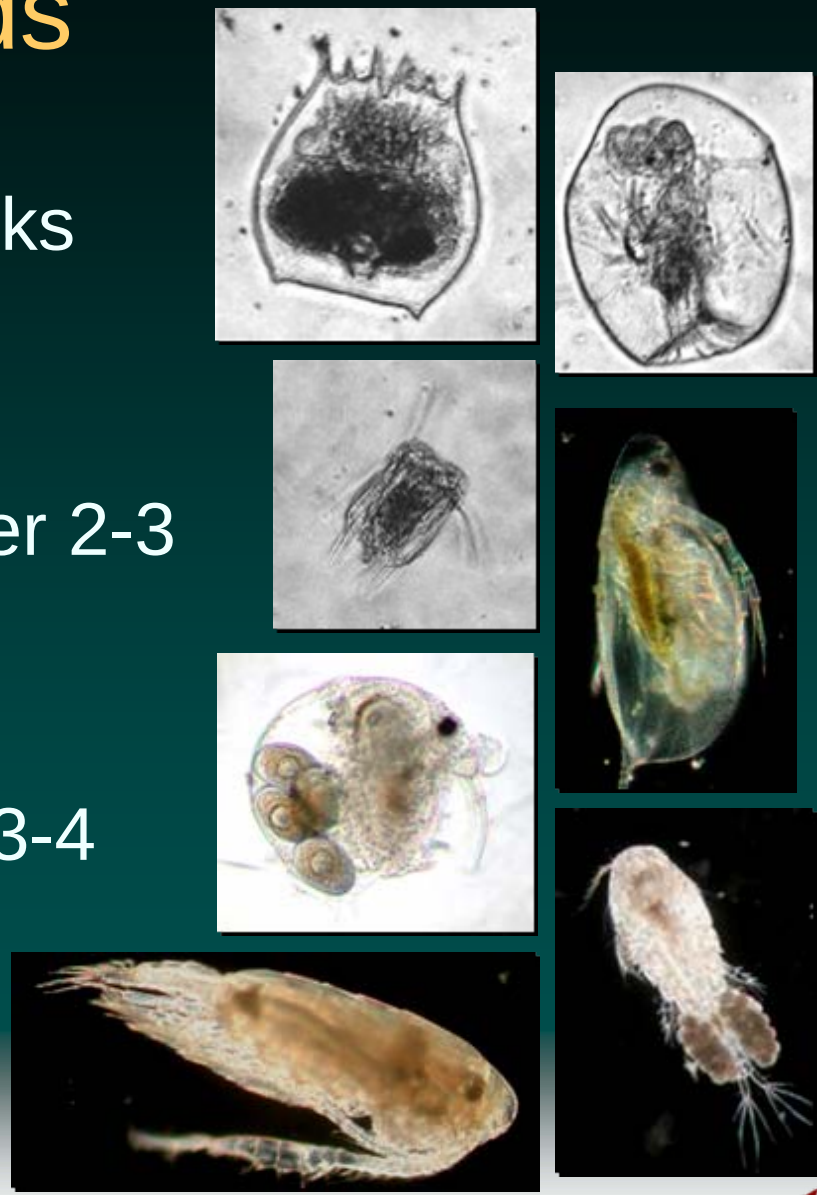
- May release toxins
- May form unsightly mats that hamper seining efforts
- Not a desirable food source for zooplankton

Zooplankton Trends

Rotifers present 1-2 weeks post-flooding

Cladocerans present after 2-3 weeks

Copepods present after 3-4 weeks

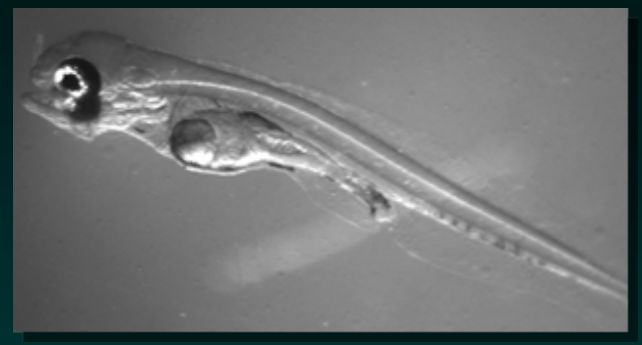


Zooplankton Monitoring

Sample prior to stocking and weekly throughout Phase I

- Appropriate samplers
- Desirable number: 500+ animals/gal

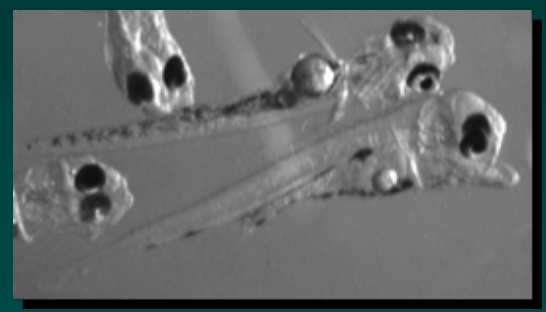
Stocking Ponds



Stock fry at 4-5 days post-hatch

- 100,000-200,000 fry/ac
- Stock at night or late afternoon

Time between stocking and first-feeding is a critical window for survival



- Ponds must be prepared
  - Filled on time
  - Forage base established
  - Appropriate water temperature
- HSB fry are fragile and must be carefully handled
  - Use plastic bags or move holding tanks to pond
  - Gradually acclimatize to pond conditions

HSB Fry are Small Relative to Other Fishes

Common Name	Fry Length (inches, mm)
Hybrid Striped Bass	1/16-1/4”, 2-6 mm
Fathead Minnow	5/32-1/4”, 4-6 mm
Yellow Perch	3/16-9/32”, 5-7 mm
Walleye	1/4-9/32”, 6-9 mm
Channel Catfish	13/32-15/32”, 10-12 mm

Water Quality

- Daily measurements of temperature and oxygen levels
- Weekly measurements of various nitrogen and phosphorus compounds and pH

Optimum Water Quality

Temperature

- Maximum growth 25 -27C (77-81F)
- < 15C (59F) low feed consumption and reduced growth
- > 28C (83F) high feed consumption and poor feed conversion

Dissolved oxygen

- < 4 mg/L is detrimental
- Paddlewheel aerators required
- Tractor (PTO) driven paddlewheels will likely be necessary (1 per 4 ponds)

Optimum Water Quality

Alkalinity and hardness

- > 100 mg $CaCO_3$/L preferred

pH

- Can tolerate 6 – 10
- Optimal growth 7 – 8.5

Ammonia

- < 1 mg/L

Fry Monitoring

Hurry up and wait!

2-3 weeks, sample ponds with a small, soft mesh (non-tarred) seine (1/16-1/8 inch)

Potential Problems

Forage declines as fish consume zooplankton

- Slow growth
- Cannibalism among siblings

Predacious insect establishment

- Consume fish
- Decreased production

Fingerling Harvest

Harvest 4-6 weeks after stocking, or when fish become visible at bank

- Alternatively, can begin feed training process by offering starter feed in ponds

Expect 1-2 inch fish and variable survival (10-25%)

Phase I Harvest

Grade to uniform size

- Removes cannibals

Options

- Restock at reduced density for Phase II
  - ~ 10,000 fish/ac
  - Use same rearing ponds
  - Requires more ponds
- Move fish to tank to
  - Feed train in tanks for Phase II
- Sell fish at this size