Freshwater Prawn Hatchery and Nursery Production

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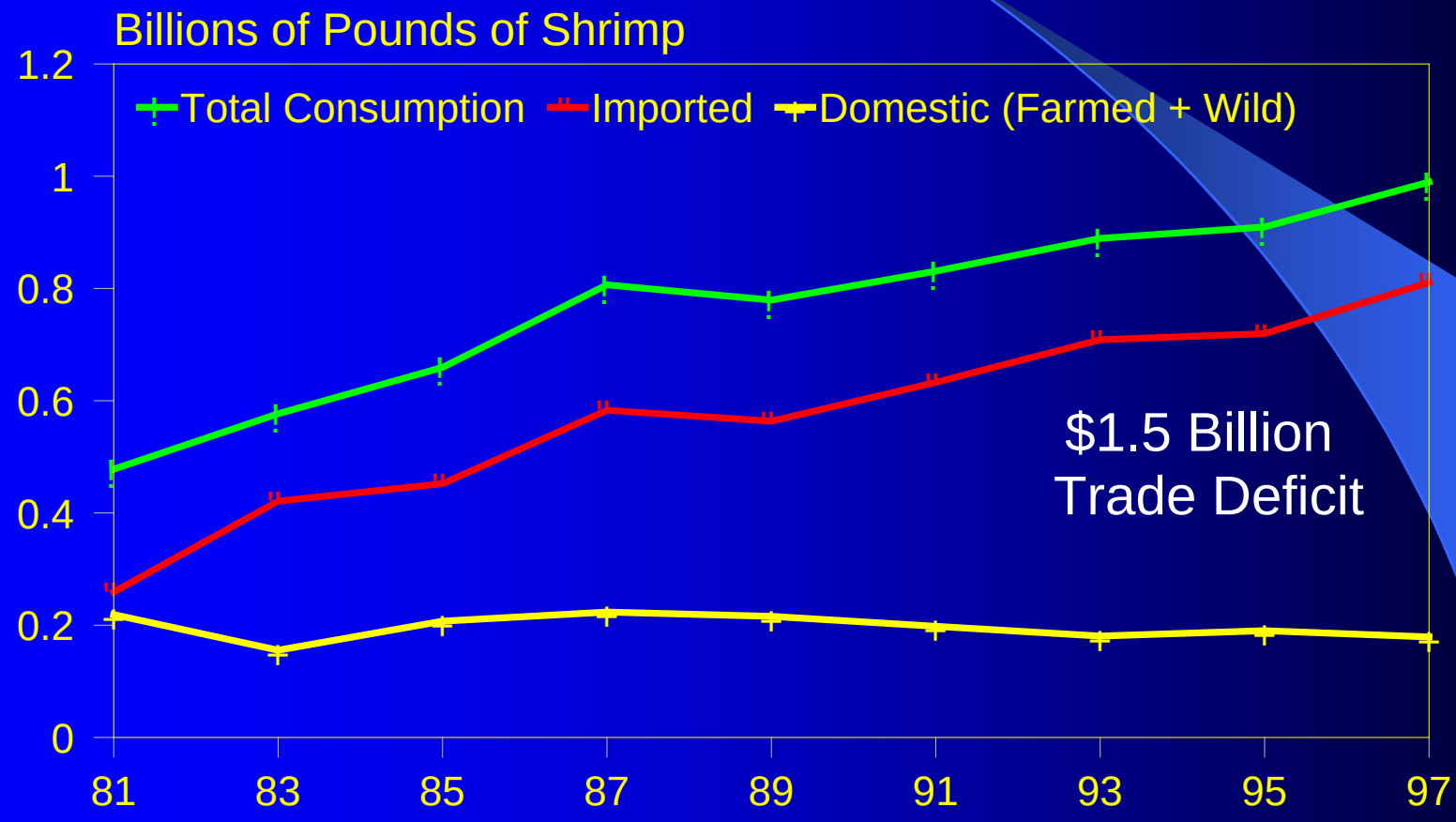
Why Prawns?

- Freshwater- can be raised inland away from the coast
- Not susceptible to common shrimp diseases
- Environmentally sustainable

Trends in U.S. Shrimp Production and Consumption



Macrobrachium rosenbergii

- The freshwater prawn is native to tropical countries along the Pacific ocean.
- Although freshwater as adults – they require salt water to reproduce.
- Widely cultured within its native range and has been shown to have culture potential even in temperate inland areas of the US.

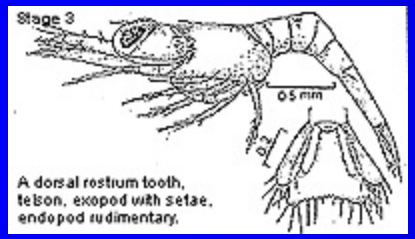
Biology and Life History

Life History

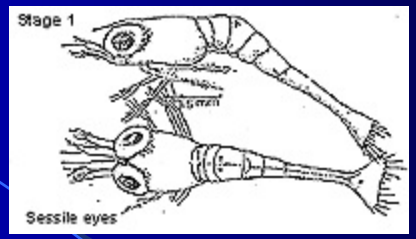
- **Prawns have a hard outer skeleton that is shed regularly for growth.**
- **Weight and size increases occur after each molt.**
- **Growth is incremental rather than continuous.**

Adults

- Older juveniles and some adults often have a blue-green or brown color.
- Color is related to the quality and type of diet.
- Adult males are larger than females. They are easily distinguished by larger heads and claws.



Larvae



- At 80 ^{o}F, approximately 20 days are required for the eggs to hatch. Larvae swim upside down and tail first.
- Larvae cannot survive in freshwater beyond 2 days and must migrate to brackish water (10-14 ppt).
- Larvae undergo 11 molts before transforming into post-larvae, which takes 25-45 days.

Morphotypes

- Male
  - Blue claw
  - Orange claw
  - Small male
- Female
  - Open (Breeding)
  - Berried (Eggs)
  - Virgin

Orange Claw Male

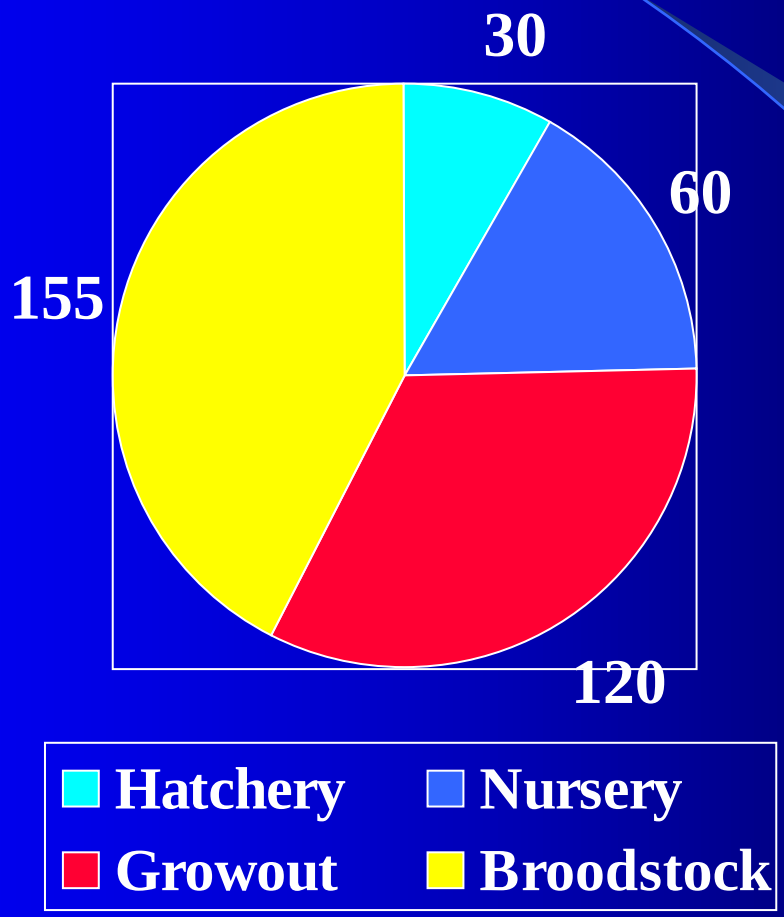
Temperate Production

- Production in temperate regions of the US has increased rapidly in recent years.
- Production includes four distinct phases; hatchery, nursery, growout, and broodstock holding.
- Hatchery, nursery and brood holding are generally conducted indoors.
- Pond growout is conducted in the summer growing season (100-150 days).

Cycle

- Hatchery – March
- Nursery – April / May
- Growout – June – September
- Broodstock – October - April

Production Cycle



Considering Shrimp Production?

- Skip the hatchery and possibly the nursery phase – purchase from supplier.
- As you become successful at pond growout consider a nursery.
- Break-even on a hatchery >1 million PL. Knowledge intensive.

Hatchery Production

Broodstock Holding

- **At pond harvest, broodstock are stocked in heated tanks and maintained throughout the winter.**

- **Broodstock are stocked at 1:4 male to female ratio in heated tanks at one prawn ft^2 or 7.5 gallons.**

Larvae

- Egg development takes two weeks at 84^{o} F, a 40 g female can produce approx. 20,000 larvae.
- Prawn larvae requires brackish water (12 ppt salt) for the 30 day larval period.
- Larvae are extremely small (<0.01 g) and are fed live food (*Artemia*) at frequent intervals.

Salt mixtures

- Commercially available sea water mixes are major expense in hatchery production, approximately $30.00 to treat 450 gal.

Biofiltration

- 4-6 week break-in period to develop bacteria colonies.
- Requires daily maintenance for:
  - Solids removal
  - Ammonia / Nitrite monitoring.

Water Quality

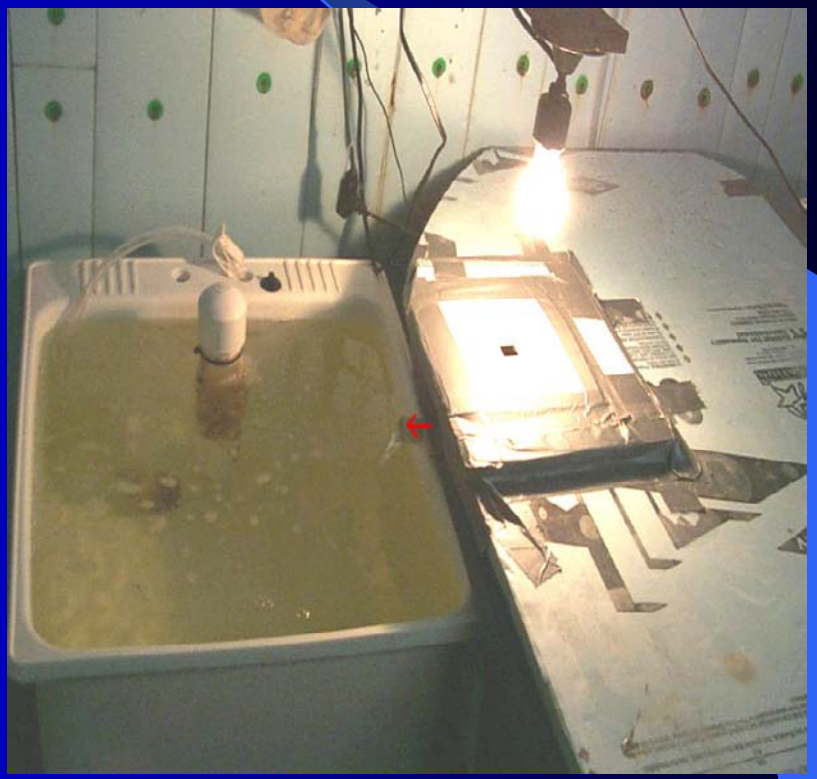
- Temperature 80-86ºF
- Salinity 12 ppt
- Ammonia < 1 ppm
- Nitrite < 0.5 ppm
- Nitrate < 50 ppm
- pH 6.5-8.5

Oxygen

- Maintained at saturation (6-8 mg/L)
- Should Have Back-up Blower and Generator

Larval Collector

- The larval collector allows better control of stocking density in larval tanks.
- It is important to have larvae as close to the the same age as possible – no more than 2-3 days apart.



First Week

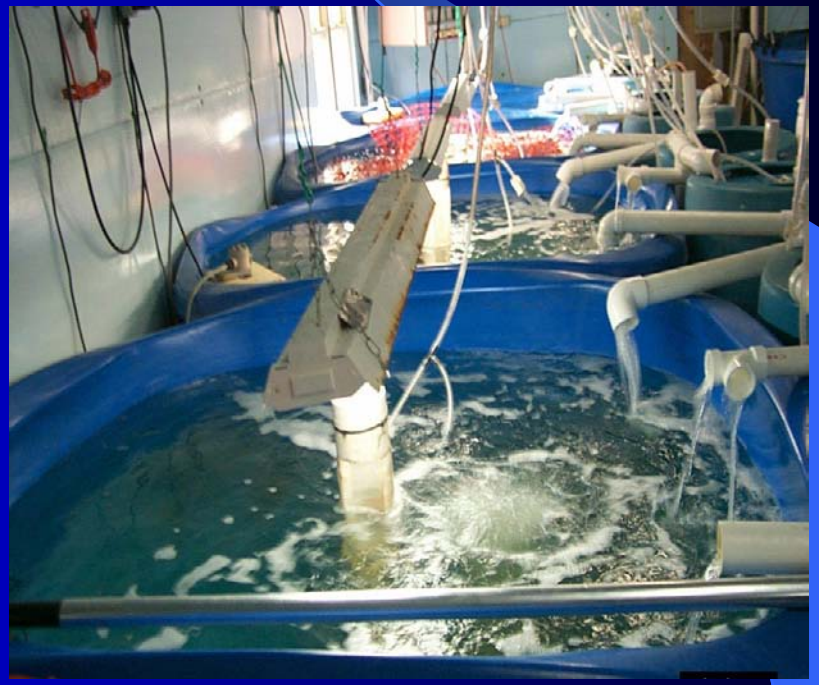
- Larvae are initially stocked in small tanks at high density (>1,000/L) for the first 6-10 days and fed *Artemia* twice a day.

Artemia

- Prawn larvae require live feed - Artemia
- Artemia require 24 hours to hatch
- Artemia cost $70/lb.

Second Stage

- After approx. 1 week, larvae are moved to larger tanks (450-1,000 gal) and the density reduced to 50-100/L.



- Supplemental feeding is initiated.

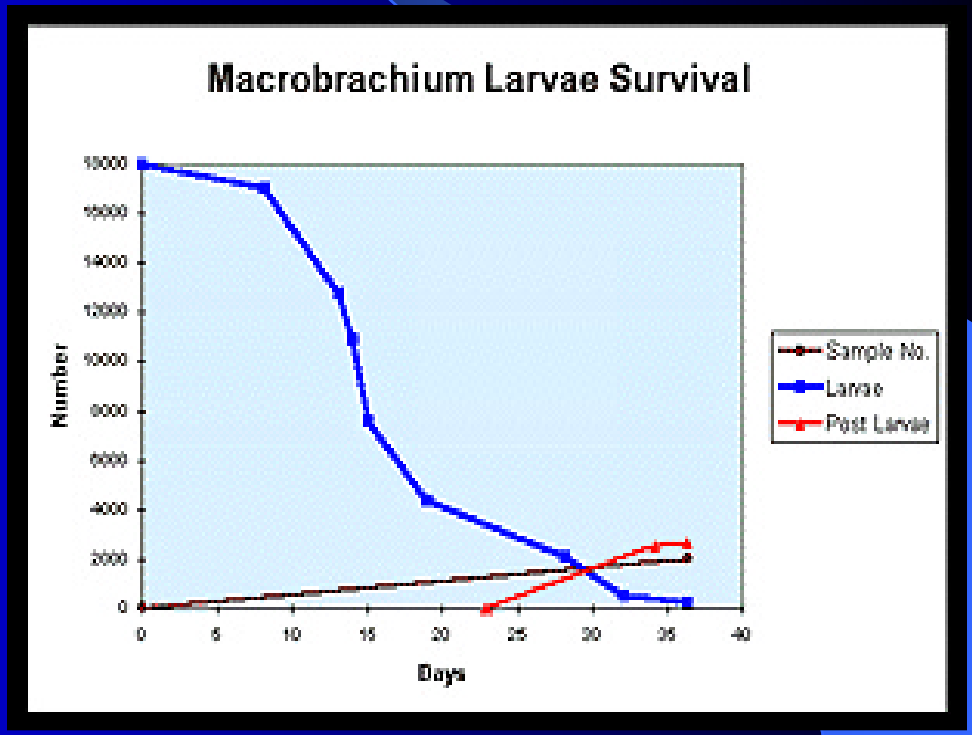
Supplemental Diet

- By day 10 larvae should be fed a supplemental diet. In addition to artemia.

- 1lb. Squid or fish
- 4 eggs
- Tsp cod liver oil
- Tsp Vit C

Survival

- Survival in larval culture ranges from 0-50%!
- At 30 days, post-larvae are harvested and remaining larvae are sacrificed (<5%) when acclimated to freshwater.



Nursery Production

Nursery

- **Growth from 0.01g to 0.3g in 45 days.**
- **The nursery stage improves survival by stocking larger animals.**
- **Developed to reduce pond growout time in temperate production.**

Nursery Period

- Beyond 60 days, the rate of mortality increases significantly and reaches maximum at 2.5g of animals per L.
- Following 30-60 days, juveniles should be >0.25g

Feeding

- Feed a commercial salmonid starter diet approx. 10% of biomass daily.
- Best to feed to satiation – observe feeding based on left over feed on tank bottom.

Recirculation Systems

Heating Water

- Heating the water is the major expense in culturing tropical animals in a temperate climate.
- Electric emersion heaters work well to maintain temperature but are expensive to operate.
- A building should be designed to have a sufficient heat source to maintain ambient temperature.

Recycle Systems

- Primarily used to have control over the culture environment.
- The only option when culturing tropical animals outside their native range.

Efficient Feeding

- Proper feeding is the most critical aspect of managing a prawn nursery.
- If larvae or post-larvae are underfed they will eat each other. If they are overfed, water quality will deteriorate and they will die.
- Feed cost insignificant
  - **20,000 juveniles for 60 days require approx. 25 lbs.**

Round Tanks

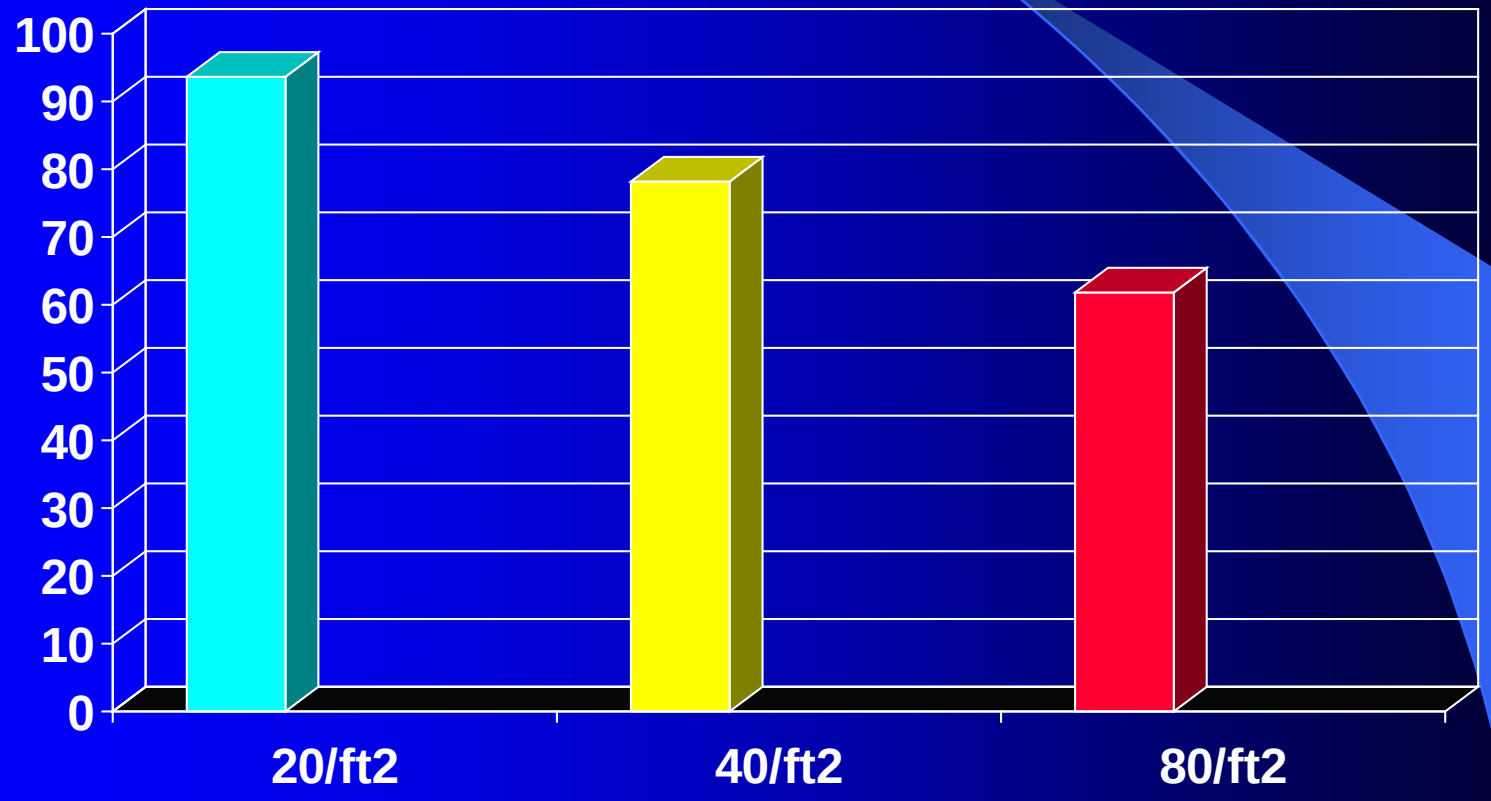
- **Small tanks may be advantageous for simplicity when stocking and harvesting.**
- **Large tanks more efficient**
- **20,000 PLs per 1,000 gal.**

Stocking Density?

- Survival during the nursery phase has been highly variable (40-100%).
- Juvenile prawns are territorial and cannibalistic and are limited by available two-dimensional space.
- Survival in nursery culture may be related to the amount of substrate provided.

Nursery Percent Survival

number of shrimp stocked ft^2



Economics of nursery to stock 1 acre pond

25,000 pls from hatchery	@ $0.03 each	$750
Utilities	$75 per month $25 for blower	$150
Feed	$25/ 50lb. bag	$50 Costs $950
Assuming 80% survival	Sell 20,000 @ $0.10 each	Gross $2,000 Net $1,050

Transport

Pond Stocking

- When the water temperatures are consistently > 68^{o} F (early June) prawns are stocked in growout ponds at 12 - 30,000 per acre.

Stocking Density

- Densities of 12,000 – 32,000 acre depending on the desired size, total ponds, and use of substrate.
- Generally lighter densities produce larger prawns, where higher densities produce more total pounds.
- Increased feeding rates and inclusion of substrate have consistently achieved 2,000 lbs/acre of 40g animals in small research ponds.