

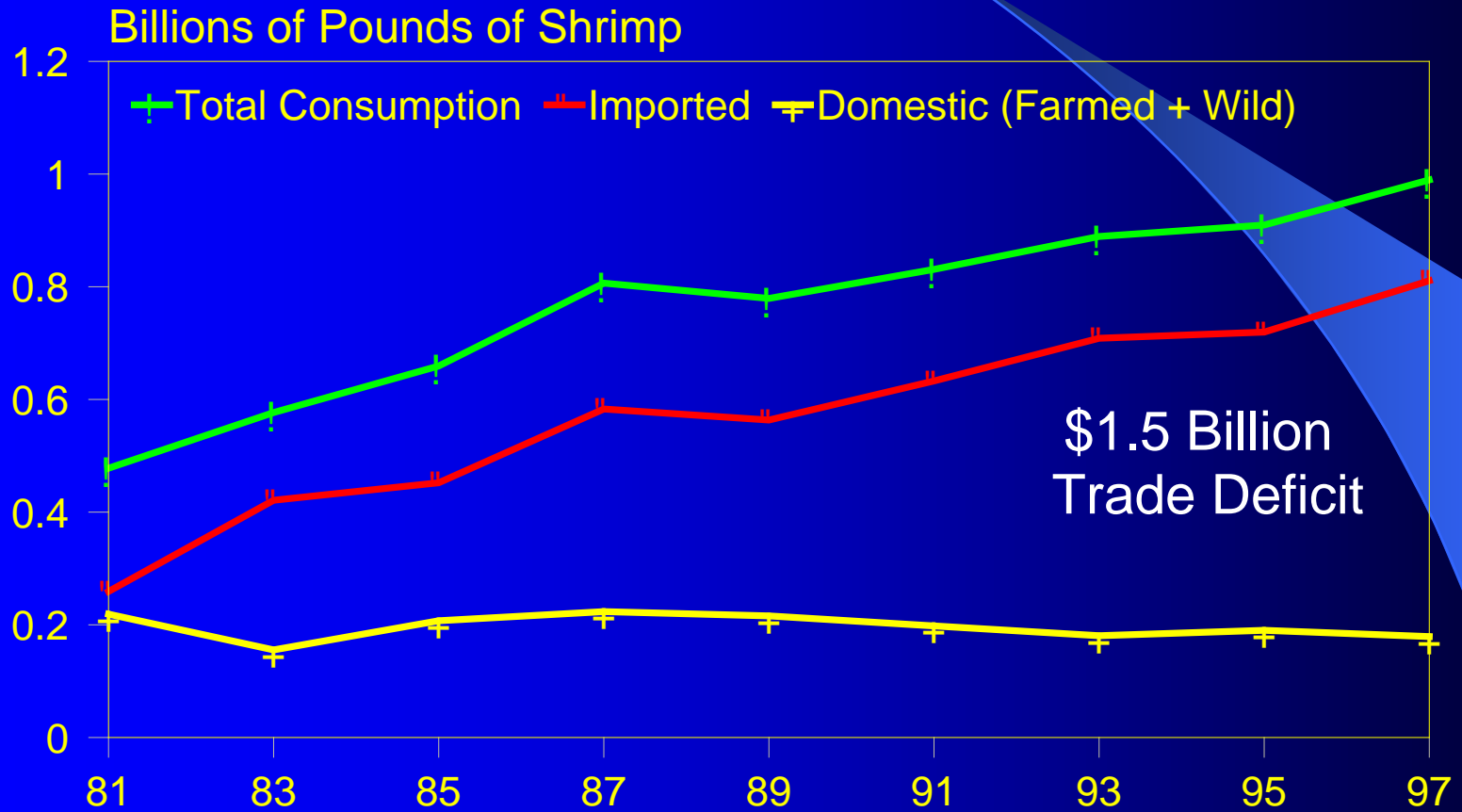
Freshwater Prawn Production in Kentucky

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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



Biology and Life History



Life History

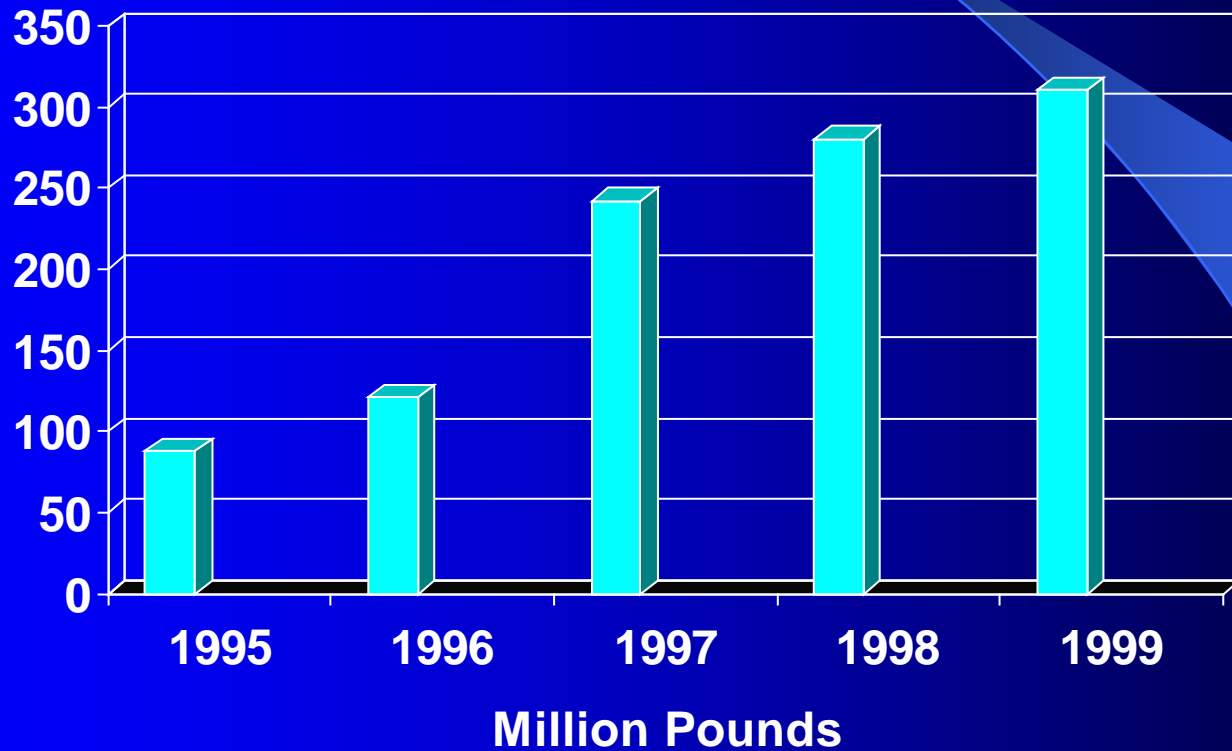
- **Prawns have a hard outer skeleton that is shed regularly for growth.**
- **Weight and size increases occur after each molt.**
- **Growth is incremental rather than continuous.**



Macrobrachium rosenbergii

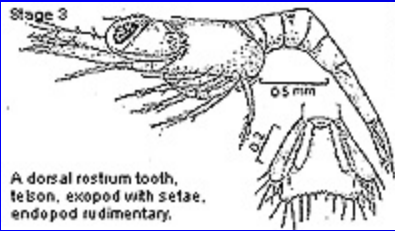
- The freshwater prawn is native to tropical countries along the Pacific ocean.
- Although freshwater as adults – they require salt water to reproduce.
- Widely cultured within its native range and has been shown to have culture potential even in temperate inland areas of the US.

World Prawn Production

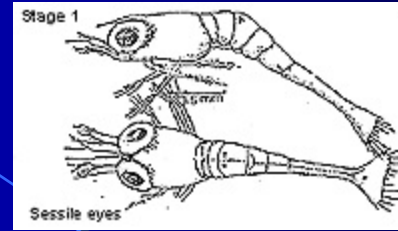


Breeding

- Females generally become mature within 6 months
- Mating can occur only between hard shelled males and soft shelled females
- Eggs develop in the “head” of female and are transferred within a few hours after mating to the underside of tail region



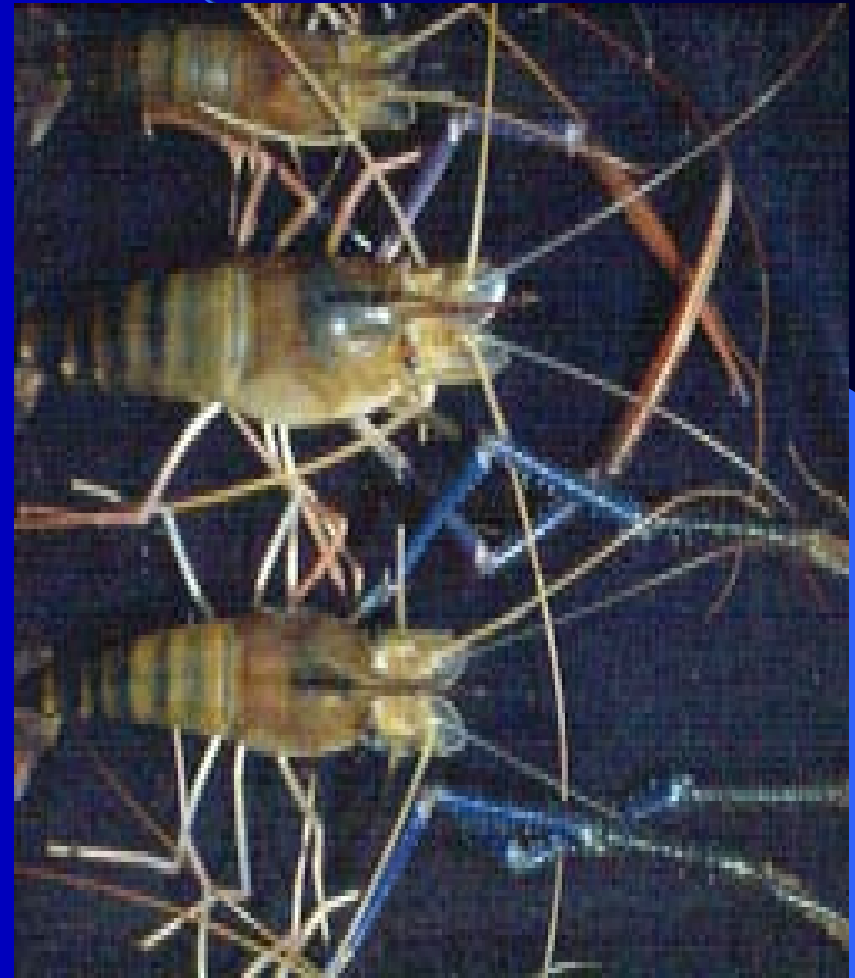
Larvae



- At 80 °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.

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.



Morphotypes

- Male

- Blue claw
- Orange claw
- Small male

- Female

- Open (Breeding)
- Berried (Eggs)
- Virgin



Orange Claw Male



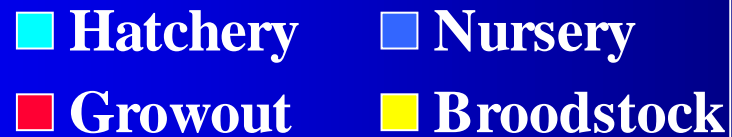
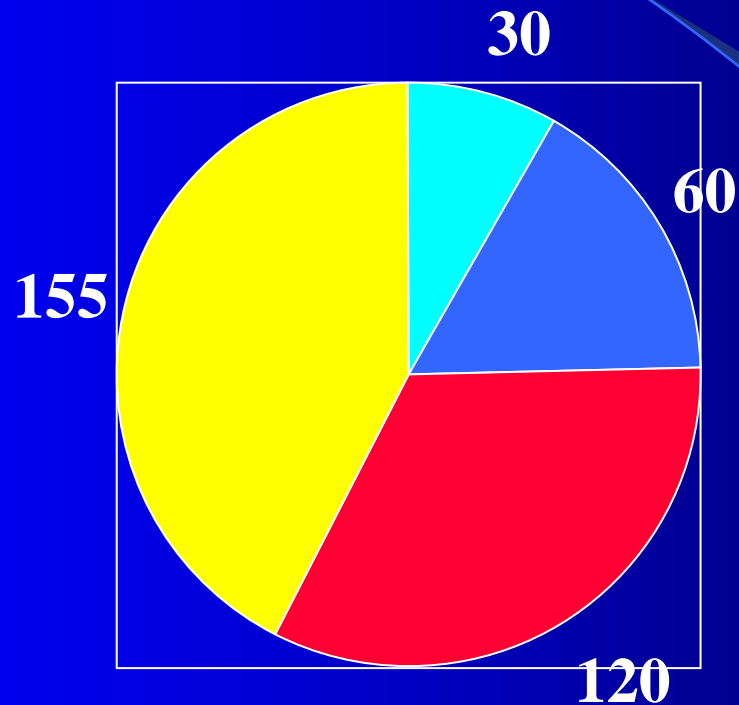
Temperate Production

- 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.



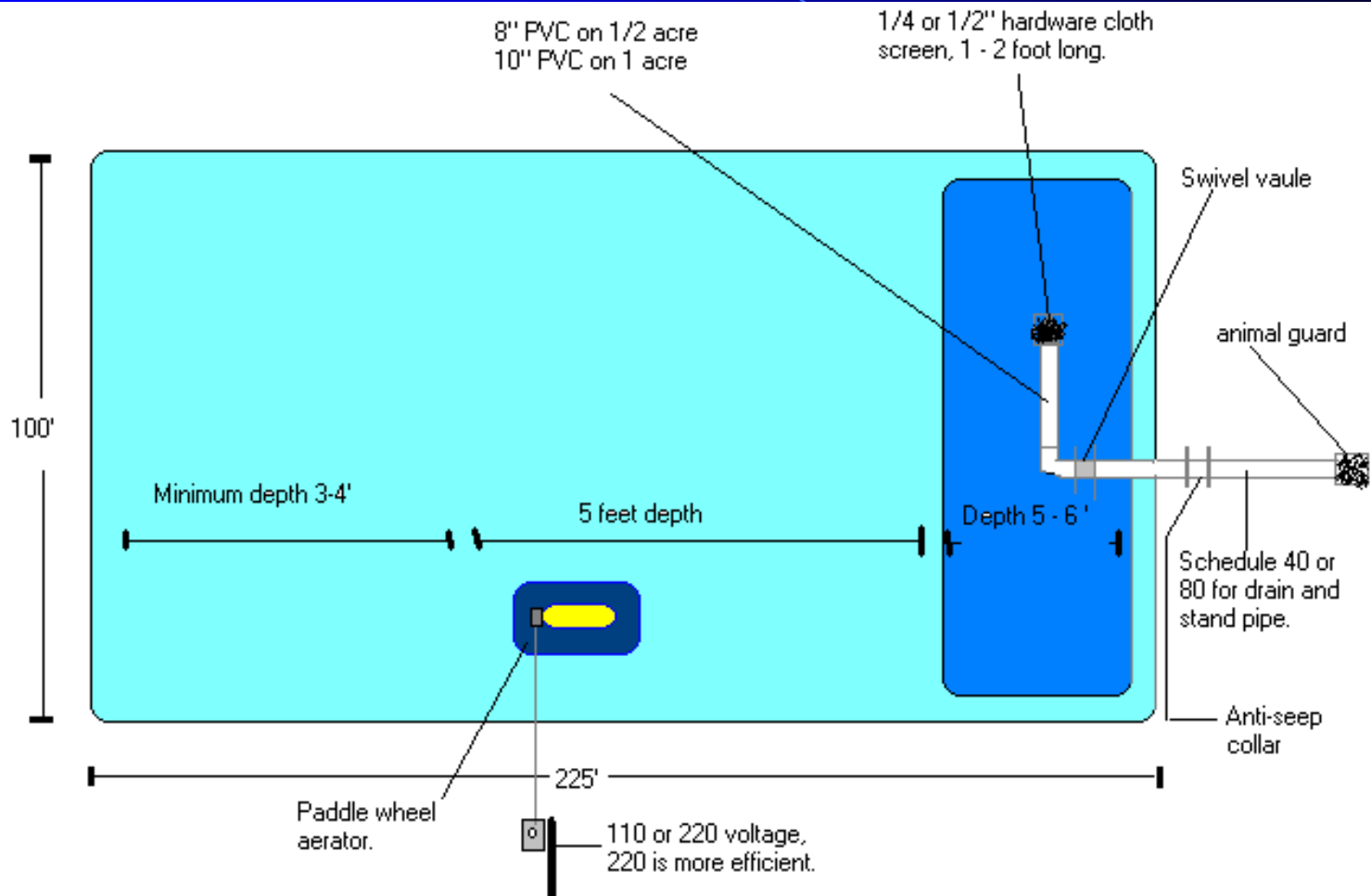
Pond Design, Preparation and Aeration

Water source

- Well water - Good
- Surface water – pond or stream
- City water – for hatchery or nursery is Risky!

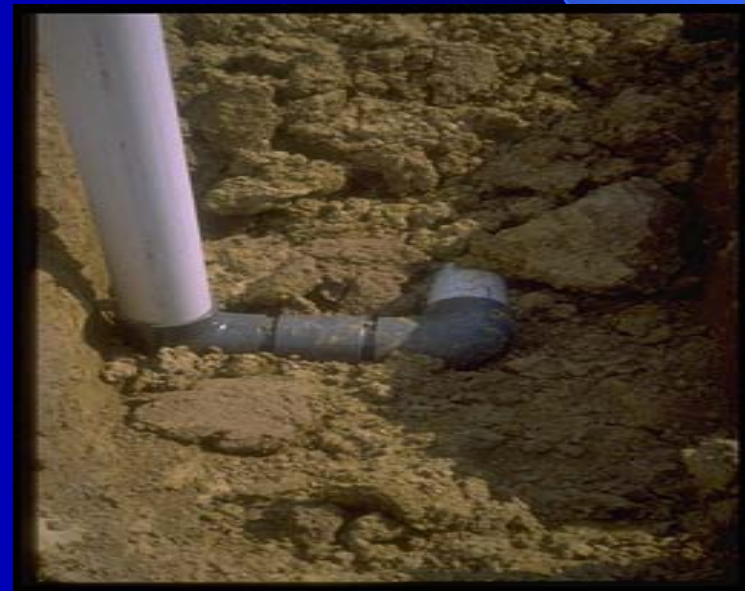
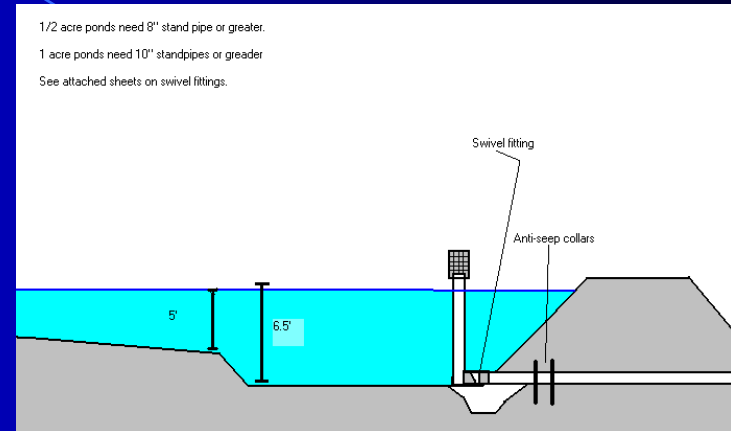


Pond Design



Shrimp Pond

- Catch basin at drain end
- Drain pipe at the bottom of catch basin
- Anti-seep collar installed around drain



Catch basin

- Incorporation of catch basins greatly increases harvest efficiency.
- Requires less labor with a catch basin.



Access

- Consider pond access when selecting a site and designing levees.

One levee should be at least 16' with grass or gravel



External or Internal Catch Basin?



Bottom grade

- Have 2-5% pond bottom slope to catch basin.
- Eliminate low spots or puddles as prawns will become stranded at harvest.



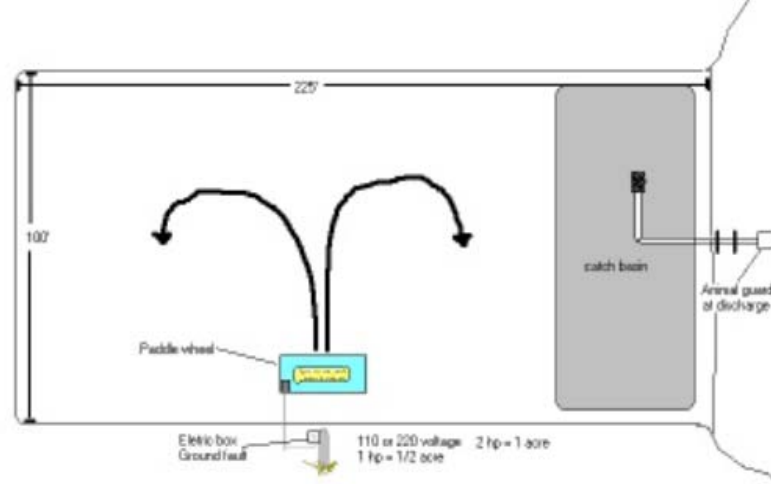
Bottom Slope



Aeration and Circulation

Paddlewheel

- Good circulation and destratification
- Relatively cheap
- Have had problems with reliability – may need backup unit



Vertical pump

- OK for small ponds
- Do not destratify or circulate as well as other types
- May use in combination with air stones on pond bottom.



Fountain Type

- Poor aerator in terms of efficiency
- May be used in combination with diffused air system (air stones on pond bottom)



Beware

- Several companies selling aeration products that have not been proven effective.



Aerator Placement with Substrate

- To prevent the aerator from washing out the substrate an open canal is left in front of the aerator.



Daily Management

- Full time aeration and good feed distribution are essential, added substrate can increase production approx. 30%.



Preparation for Pond Stocking

- Apply organic fertilizer material for 3-6 weeks prior to pond stocking.
 - Dried distillers grains or cottonseed meal applied at 25lbs/acre/day to increase natural productivity.
- Maintain a green bloom by the addition of inorganic fertilizer if necessary at one quart per acre.

Predator Treatment



- Check for fish. If necessary rotenone at least 30 days prior to stocking prawns.
- Aquatic insects can be a problem. 1 week prior to stocking can treat with 1:20 ratio of diesel fuel:motor oil @ 5 gal/acre.
- Recent research indicated corn oil or fish oil also effective at 5 gal/acre for controlling insects.

Stocking and Feeding

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Transport



Pond Stocking

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



New Feed Rates

- First month continue with 25 lbs./acre/day.
- For next 30 to 60 days feed a sinking pellet containing 28-32% protein (\$350 ton) (50 lbs./acre/day).
- A 40% shrimp feed (\$700 ton) may be beneficial for last 4 weeks (75 lbs./acre/day).

Feed Distribution

- Prawns are territorial and will not migrate across the pond to feed
- Essential to distribute the feed as uniformly as possible over the entire pond.



Problems in Growout

- Weeds = Poor growth and difficult harvest.
- Fish = Poor survival and difficult harvest.



Shrimp eaters!



The background is a solid blue color. A white arc starts from the top left and curves towards the right. On the right side, there is a white shape that looks like a stylized arrow or a bracket pointing to the right.

Is Adding Substrate Worth It ?

Potential Pond Production without Substrate

- 800-1000 pounds/acre/year
- Average weight between 30-45g
- Feed conversion 2.5:1

Economics for 1 acre pond without substrate

Nursed Juveniles	20,000 @ \$0.10/ea. \$2,000
Feed	2.0 ton @ \$300/ton \$600
Aeration and Electric	Paddlewheel @ \$250/yr Electric @ \$2/day \$250
Assuming 1,000 lbs/acre Break even at \$3/lb.	\$3,100

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**.

Substrate

- As a territorial, benthic animal, production is limited by two dimensional space.
- Substrate inclusion increasing pond surface area 50-100% has increased production up to 40%.



Vertical Substrate



Practical Implications

- Substrates should last > 5 years
- Preliminary economic analyses indicate that substrates are cost effective stocking strategy when prawn prices exceed \$2.00/lb live wt.
- Future research should evaluate higher inclusion rates, different substrate mesh sizes, materials, and orientations

Harvesting Freshwater Prawns

Past Experience



Harvest Time

- Drain harvest is the most efficient method, seining will only remove approx. 50%.
- Limited by water temperature, $< 55^{\circ}\text{F}$ will result in 100% mortality, growth slow $< 65^{\circ}\text{F}$.



Harvest

- Once the water is down the majority of the animals are removed with seine
- Then pick up the remaining animals by hand.



Proper Handling

- Problems have been reported with prawns improperly handled at harvest.
- Cleanup or purge tank
- Chill kill tank



Grading

- Graded animals at harvest may bring a higher price
- Animals will grade themselves if you don't put too many in grader box (so they can swim through).



Pumps

- Good to have a trash pump to remove the last of the water or to save water



Weed Problems

- Weeds can be a significant problem at harvest – Should treat >4 weeks prior to harvest.



Drain Size Vs. Time

- Watching water drain is inefficient use of labor.
- An 8" pipe in a 1/2 acre pond will take approximately 8 hrs to drain pond with little obstruction.



Harvest Trailer

- A KDA grant to KAA has made available a harvest trailer which can be rented for \$50 from KAA.
- Everything needed to harvest and temporarily hold harvested prawns is on the trailer.





Marketing

Introduction

- Due to temperature constraints, a relatively narrow marketing window exists for live and fresh products.
- The profitability of an enterprise is largely dependant on the ability to harvest, hold, and transport live product.

Pond Side Marketing

- Immediate sales at harvest
- Relatively quick – low infrastructure
- Need ready access to public and “people skills”



Retail Sales

- Need for advanced advertising
- Harvested prawns are perishable and should be frozen if not sold the day of harvest.



Live Markets

- If efficient harvest, holding, and transport techniques can be developed, the potential exists for sales of large amounts of product in the live ethnic markets of Chicago, New York and Toronto



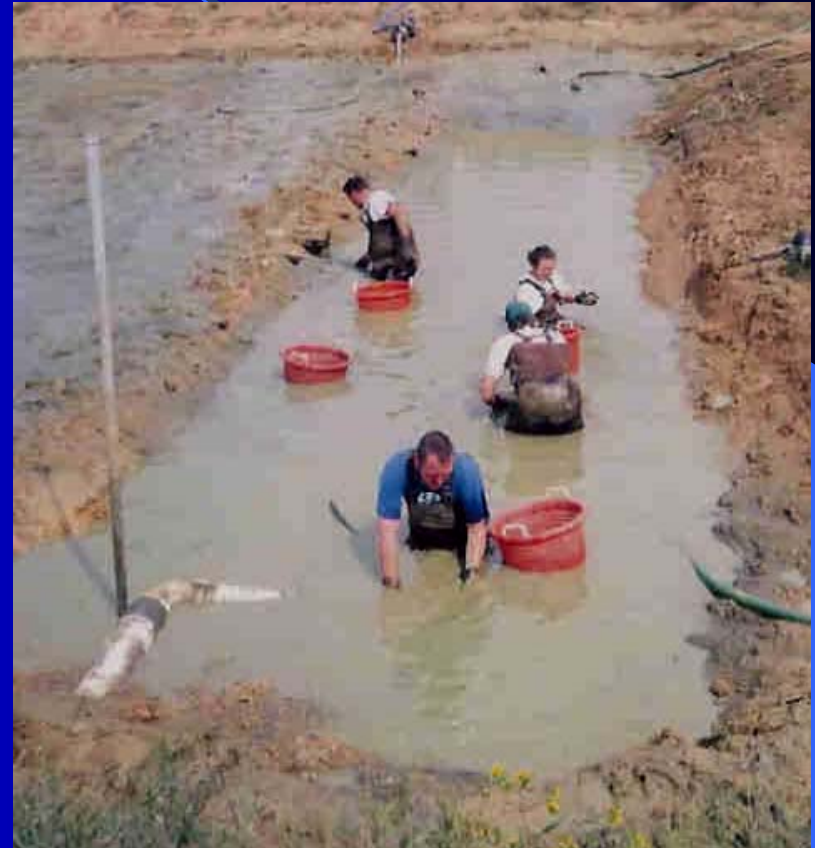
Problems

- Wholesale buyers have often experienced problems in handling live prawns:
- Long waits for trucks
- Poor post-harvest survival in transport
- Limited seasonal availability



Improved Harvest Techniques

- Incorporation of aerated catch basins in production ponds and later harvest dates (cooler water temperatures) have greatly improved post-harvest survival.



Holding Tanks

- Pond-side holding tanks allow farmers to harvest ponds prior to pickup.
- Recent availability has improved turn around time for transport trucks.



Transport Survival

Reduced water temperature to 68 degrees F and stocking densities of 0.25-0.5 lb. per gallon have greatly improved survival in transport containers.



Summary

Successful adaptation of improved harvest, holding and transport techniques have helped to simplify harvest and in the establishment of new markets.



