

Diseases in Indian Shrimp Farming - Prevention and Challenges

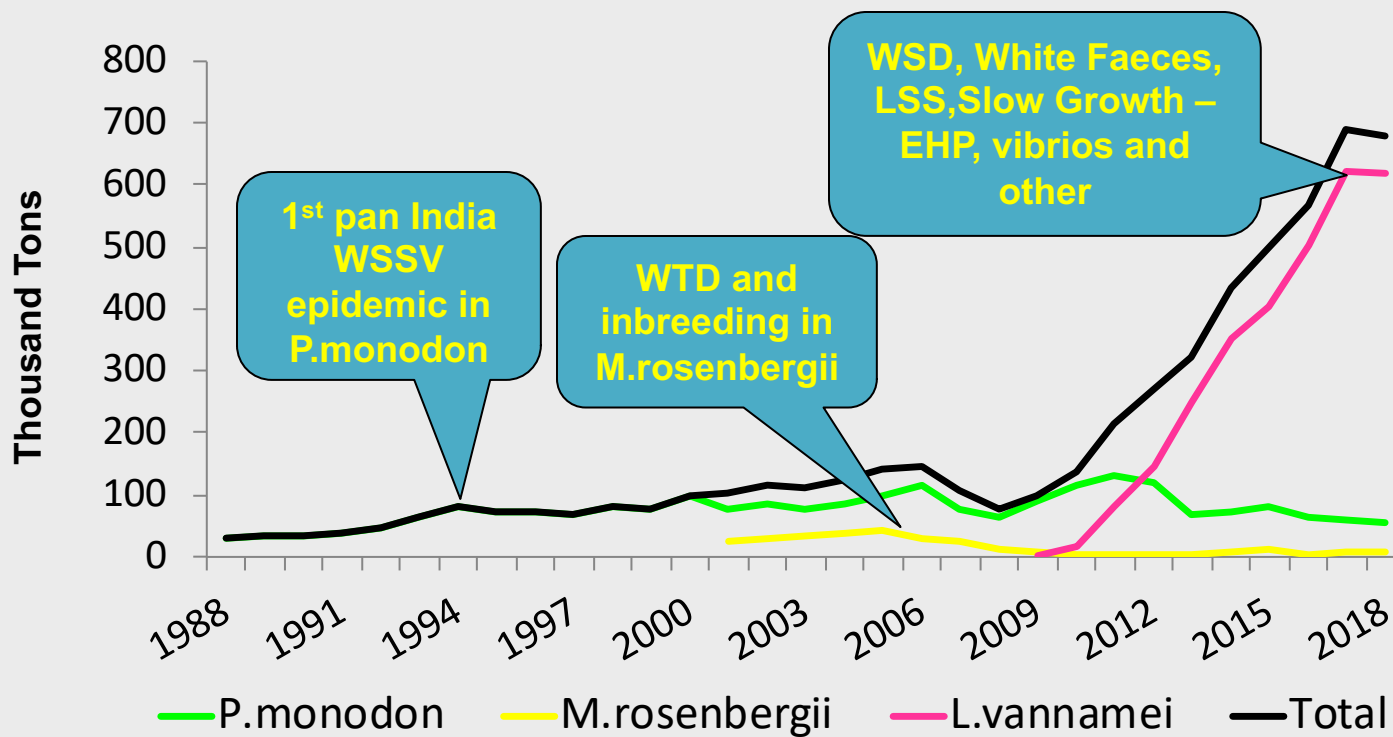
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Disease is the most important determinant in the International Trade in farmed Shrimp

– Disease determines the supply and price of Shrimp

Major disease events in Indian Shrimp farming



Diseases affecting Indian Shrimp farms

- White spot disease (WSSV)
- White faeces syndrome (Vibriosis?)
- Slow growth (EHP)
- Loose shell
- Passive/Covert/Running mortality syndrome(RMS)
- Diseases in larval rearing in hatcheries
- White tail disease (WTD) in *M.rosenbergii* (MrNV)

White Spot Syndrome Virus (WSSV)

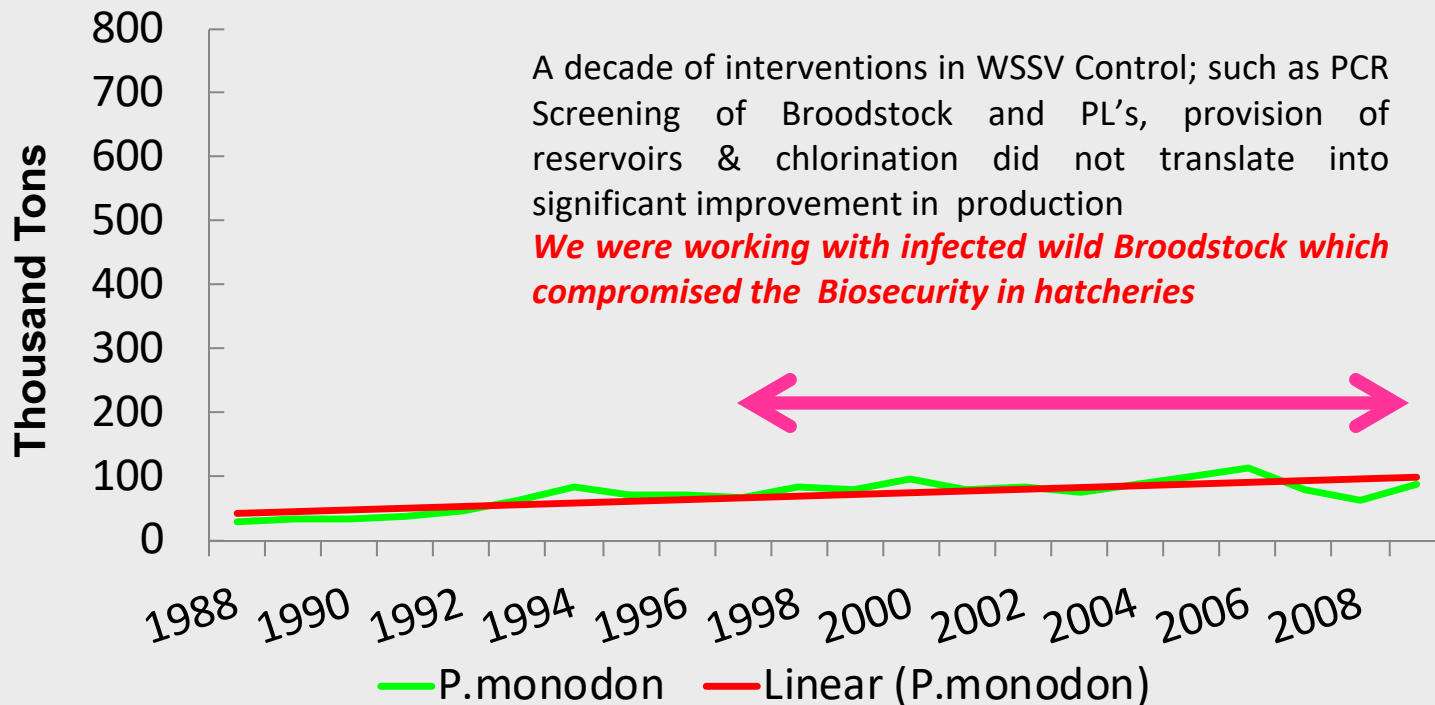


WSSV continues to cause mass mortalities in shrimp farming

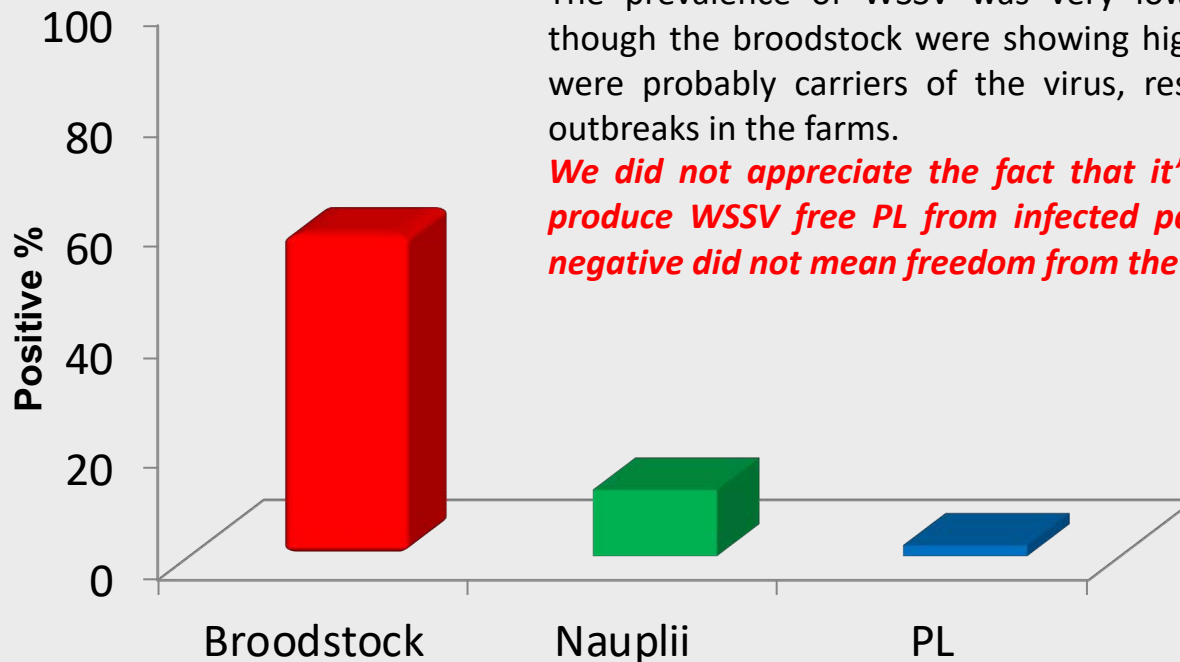
White spot disease(WSD)

- White spot syndrome virus (WSSV) continues to cause extensive crop losses, there is no let up in the virulence even after 25 years of its first appearance in the country
- SPF vannamei is no exception, is affected by WSD
- Zooplankton in the pond are reservoir hosts for WSSV, even moist soil from infected ponds could carry WSSV; highlighting the difficulties in maintaining a fail proof Biosecurity in open pond environment.
- Peak WSD outbreaks happen in cooler period Jan-March and during Monsoon from Jun-Aug. Summer has relatively a fewer WSD outbreaks – higher temperature offers a natural protection against WSD.

WSSV control measures didn't work in *P. monodon*



Anomaly in prevalence of WSSV in wild P.monodon Broodstock Vs PL



The prevalence of WSSV was very low in Post Larvae, though the broodstock were showing high positive %. PL's were probably carriers of the virus, resulting in disease outbreaks in the farms.

We did not appreciate the fact that it's not possible to produce WSSV free PL from infected parent stocks, PCR negative did not mean freedom from the pathogen

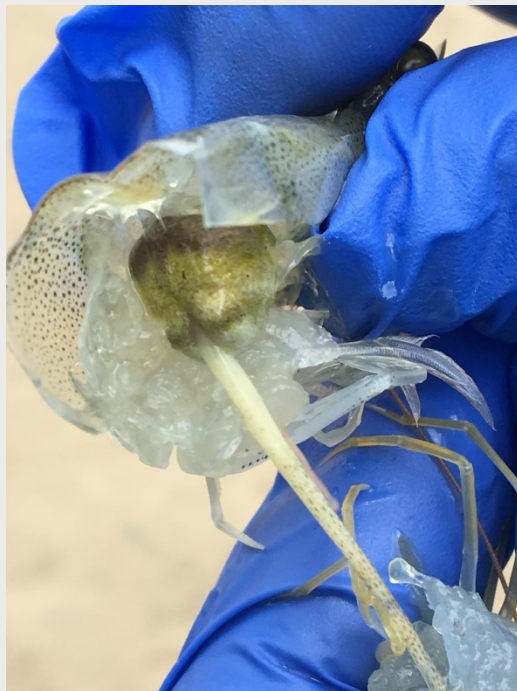
Introduction of SPF vannamei - a game changer for Indian Shrimp farming Industry

- Availability of clean WSSV free PL produced from SPF Broodstock was a key factor for the success of vannamei in India
- Clean PL is just one half solution in controlling WSD, Biosecurity for WSSV in farms remains a challenge – The reason for continued outbreaks of WSD
- Crop timing and improved Biosecurity are the best options for WSSV control, WSSV tolerant stocks hold promise for the future

White Faeces Syndrome

- White Faeces Syndrome (WFS) is a disease that causes severe damage to shrimp crop. WFS affected Shrimp show slow growth and reduced survivals, resulting in poor harvest and low returns to the farmer
- WFS is widespread across the Geographical regions in diverse environmental conditions and culture practices
- Vibrio and EHP are the pathogens those are detected in shrimp having typical WFS symptoms. Vibrio infections and their toxins are known to damage the hepatopancreas and cause sloughing as in EMS.
- Reversal of WFS condition has been reported both in the field and in the Lab, indicating the possible role of pond environment – poor water and soil quality as a cause of WFS .

WFS is rated by the farmer as the most serious threat



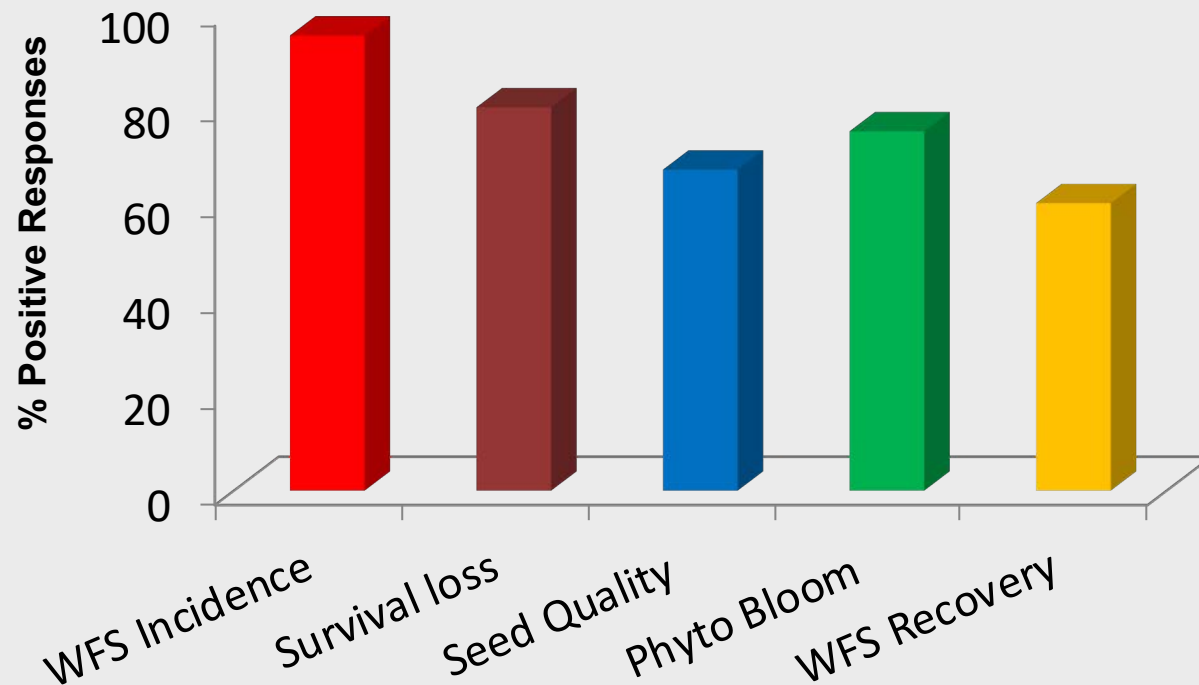
Online survey & Field surveillance of WFS affected ponds

256 Survey respondents and 155 field samples collected

An Initiative of SAP and University of Arizona



WFS Survey – Perceptions of Respondents



SAP's Surveillance of WFS Affected ponds

qPCR results for different pathogens in WFS affected Animals

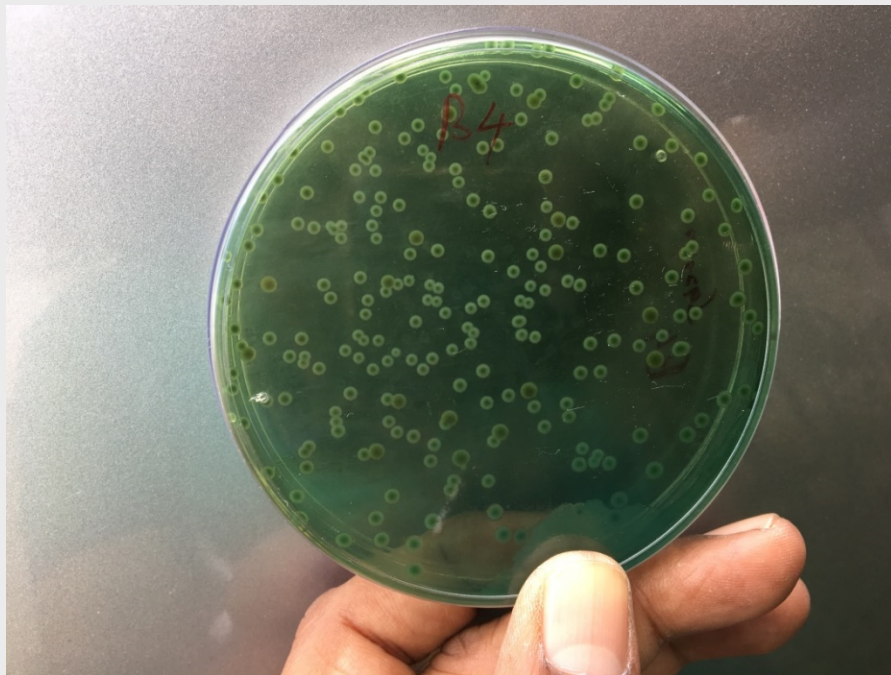
| State | No.of Ponds Tested | Nos tested Positive | | | | |
|----------------|--------------------------|---------------------|-------|-------|------|------|
| | | EHP | AHPND | IHHNV | IMNV | CMNV |
| Andhra Pradesh | 69 | 65 | 0 | 0 | 0 | 0 |
| Gujarat | 35 | 30 | 0 | 0 | 0 | 0 |
| West Bengal | 23 | 20 | 0 | 1 | 0 | 0 |
| Odisha | 21 | 21 | 0 | 0 | 0 | 0 |
| Tamil Nadu | 7 | 7 | 0 | 0 | 0 | 0 |
| Total | 155 | 143 | 0 | 1 | 0 | 0 |

Loose Shell



- Animals affected with white faeces lose digestive and assimilation capabilities over a period of time, resulting in flaccid tail muscle or “loose shell” leading to morbidity and death ultimately.
- The Mortality is slow and unnoticed, the survival at harvest is significantly reduced, farmers prefer to harvest on the onset of WFS/LS to avoid reduced survival.
- Pathogenic vibrios *V.parahemolyticus* and *V.harveyii* are predominant in the HP & Gut content of WFS affected shrimp.
- Microsporidian *Enterocytozoon hepatopenaei* (EHP) - a fungal parasite is also found in HP of the affected animals at fairly high levels.

Pathogenic Vibrios are associated with WFS



Enterocytozoon hepatopenaei (EHP)

- EHP is a fungal parasite colonising the tubules in hepatopancreas. EHP infection can cause damage to the organ and deprive efficient nutrient absorption affecting the normal growth of shrimp.
- EHP gets transmitted through infected PL and also through the remnant spores present in pond water and soil.
- EHP infection could compromise the immunity of the animals and predispose the animal to other opportunistic infections such as vibrios.
- EHP is affecting shrimp production across Asia. Due to its complex life cycle and difficulty in eradication, prevention and control of EHP is a challenge for the shrimp Industry.

EHP causes slow growth and size variation

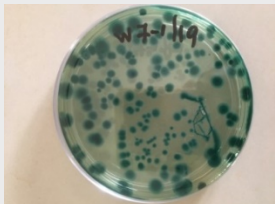


Passive/Covert/Running Mortality (RMS)



- Muscle necrosis and passive mortality of shrimp is a common observation in summer
- Dead Shrimp with typical symptoms could be seen beneath the aerators
- A significant percentage of animals at harvest show necrosed tails.
- Symptoms are similar to IMNV, PvNV and CMNV
- Although pathological tests have shown the absence of these pathogens, detailed studies are required to ascertain the cause of RMS

Diseases affecting larval and PL Production



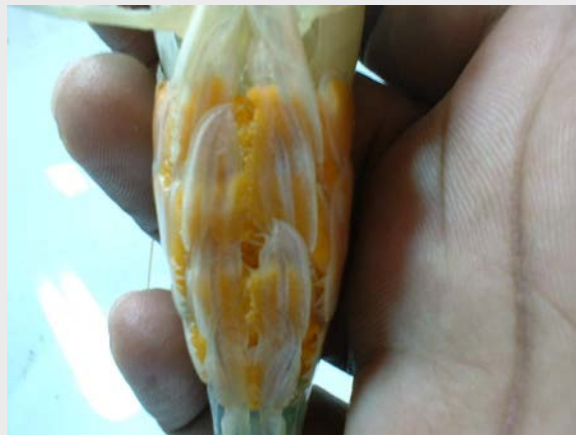
- **Vibrio Associated larval mortalities**
 - Luminescent vibriosis - *V campbeli* and other vibriosis
 - *V parahemolyticus*
 - Zoea Syndrome
- Larval mycosis
- Epicommensal filamentous bacterial and protozoan infections
- *Pseudomonas* spp associated mortality
- WSSV related mortality in late PL's
- Diseases of unknown etiology – Rapid larval mortality due to water discoloration, mucilage formation and foul odour

M.rosenbergii – A forgotten Species

Wild berried female



Pond reared berried female



WTD affected Juvenile

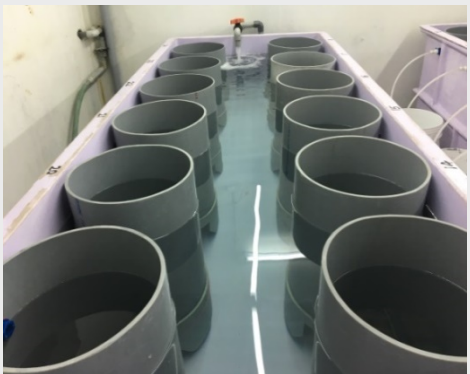


Inbreeding and White Tail Disease (MrNV) decimated scampi farming in India. SPF and selective breeding program is required for large scale farming in potential new inland areas

Strategies to prevent shrimp diseases

- Control of diseases transmission through PL
- Pond preparation – soil disinfection
- Improved Biosecurity in farms
- Better management of water quality and pond bottom
- Nursery phase
- Functional feeds
- Crop planning and timing

Prevention of disease transmission through PL's



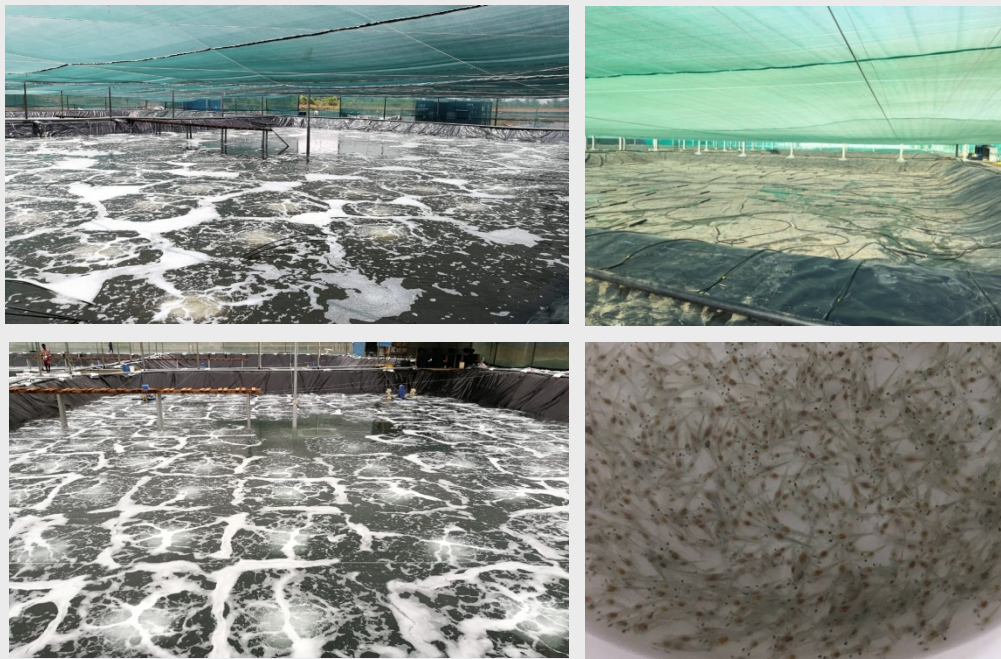
- PL could be carriers of pathogens including WSSV, EHP and Vibrios.
- Live feeds such as polychaetes and bivalves are known to harbour these pathogens; use of unprocessed feeds could result in breach in Biosecurity and infect the SPF Broodstock and PL. Use of live feed should be dispensed with.
- Egg washing and disinfection could help prevent transmission of many of these diseases.
- Focus should shift from PCR screening of PL as the critical control point to input and process control in Hatcheries.

Soil remediation and disinfection – An important step in disease control



- Drying of pond beds could eradicate most pathogens, tilling will oxidise organic matter. Organic load reduction could be achieved by balancing C:N and with microbial amendments.
- EHP spores remain in dry soil for a long period of time, alkali treatment with CaOH/CaO to render the spores unviable and prevent carry over of the pathogen for the succeeding crop

Shrimp Nurseries



Nurseries have better Biosecurity thus prevent diseases, and reduce the crop duration and improve production Efficiency

Water and sediment management



- Most shrimp farms do little or no exchange of pond water, but depend on aeration, probiotics and Biofloc system for managing the water and sediment quality
- Carbon supplementation and floc volume control remain a grey area in farms practicing Biofloc, resulting in a system that is prone to water quality deterioration and exposing the animals to stress and diseases.
- Right quantum of Carbon supplementation, floc harvest/organic load removal will help improve pond water and sediment quality.
- Better management of water and sediment quality could alleviate several diseases such as WFS

Organic Waste Management



Organic matter in a shrimp pond are ideal substrate for pathogenic vibrio and a reservoir for EHP spores. Reducing organic load reduces the risk of pathogen build up and diseases

Central drains or “Shrimp Toilets” are good way of reducing the organic load in a pond. For effective functioning of this system, the right pond size and design is critical

“Shrimp toilets” need to be linked to sedimentation ponds to prevent nutrient loading in the environment.

Summary

- After a decade of rapid growth rate, Indian Shrimp farming is entering a phase of slow down due to poor production efficiencies.
- Shrimp diseases are the primary cause for low productivity and reducing returns in shrimp farming
- WSD, WFS and Slow growth are the causes for low productivity
- Improving the biosecurity in hatcheries and farms holds the key for disease prevention
- BMP's have to be implemented in shrimp farms to maintain pond water quality and sustain shrimp production.
- Nurseries hold promise in disease control and improving production efficiency.
- Crop planning by choosing the right season will aid in preventing WSD
- Interventions such as functional feeds and Probiotics are showing promise, could be a solution for diseases such as vibriosis



**Happy Shrimp Farming..
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Thank you**