International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 03 | Mar 2020 www.irjet.net p-ISSN: 2395-0072

CAUSES OF DECLINING RATE OF PRAWN PRODUCTION IN PONDS

Vikas Kumar Gautam[1], Jigar Kumar Patel[2], Ravindra Patel[3], Himanshu singh[4], Deman Sahu[5], Prince Rathod[6]

[1]Student, Mechanical Engineering Department, Parul University, Vadodara, Gujarat, India
[2]Student, Mechanical Engineering Department, Parul University, Vadodara, Gujarat, India
[3]Student, Civil Engineering Department, Parul University, Vadodara, Gujarat, India
[4]Student, Mechanical Engineering Department, Parul University, Vadodara, Gujarat, India
[5]Professor, Mechanical Engineering Department, Parul University, Vadodara, Gujarat, India
[6]Professor, Civil Engineering Department, Parul University, Vadodara, Gujarat, India

---

Abstract – *A freshwater prawn farm is a type of aquaculture business practised to raise and produce freshwater prawns or shrimp for human consumption in direct and indirect forms. Freshwater prawn farming shares many similar characteristics and problems with marine shrimp farming. Unique problems are introduced in the forms of developmental life cycle of the main species. The global annual production of freshwater prawns in 2009 was about 444000 tons, of which China produced some 300000 tons, followed by India and Thailand with some 5,0000 tons each. Most of the farmed freshwater prawns today belong to the genus Macrobrachium species. Giant river prawns are farmed using traditional methods in Southeast Asia for a long time. First experiments of artificial breeding cultures of M. rosenbergii was done in the early 1960 in Malaysia, where it was discovered that the larva needed brackish water for survival. Industrial-scale rearing processes was perfected in the early 1970 in Hawaii, and spread first to Taiwan, Thailand, and then to other countries. In the present study, the prawn production and the technologies associated with it has been studied thoroughly. The problems that has arrived since last few years has also been studied. Different aerators and associated technologies has been studied to give the optimum technology without affecting the natural biodiversity and providing the conditioned and perfect environment.*

***Key Words*: Prawn, aquaculture, production, salinity, dissolved oxygen, aeration, and aerators.**

1. INTRODUCTION

Aquaculture has been defined by FAO as "The farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated."

Aquaculture is different to the traditional capture fisheries by the fact that unlike capture fisheries which involves only hunting, aquaculture is an activity where by the species are raised in enclosed grow out systems like ponds and are cultured up to its consumable size and proportions. Aquaculture is a system where in a dedicated environment is created where in the species are grown for human consumption.

According to an estimate the world population is expected to grow to nearly 9.6 billion by the year 2050, which results into an ever increasing demand for seafood which the traditional capture fisheries cannot fulfill. The market for aquaculture products is massive. It is one of the fastest growing food production sectors in the world. With over-exploited marine fishery resources, the importance of aquaculture has increased with the expectations of reducing the gap between the supply and demand of fish products for the ever increasing population of the world.

Aquaculture not only provides solution for the problem of food security to the growing population, it also has a huge potential for earning foreign exchange. A major portion of the total production of aquaculture is exported, to countries like, USA, Europe, EU, etc thereby creating an inflow of foreign exchange.

Aquaculture is the fastest growing sector in the world. Asia continues to dominate the world aquaculture market where in nearly 90% of the world's aquaculture production comes from Asia. India currently ranks second in the world in terms of aquaculture production, only next to china. However relatively, India produces only about 1/20th of what china produces annually. India is the second largest aquaculture nation in the world with 10.79 million tons of production falling next to china. The vast resource in terms of water bodies and species of fish and shell fish in different agro ecological region of the country provide for a wide array of culture system and practice.

1.1 Indian aquaculture industry

Indian aquaculture industry is growing; however there are still issues of unutilized resources and bottlenecks, which have limited the growth of the sector. Among the Indian states, Gujarat has been a major producer of fishery products, both marine and aquaculture. Gujarat state possesses rich and diversified fisheries resources. A long coastal-line of 1600 kms. Which is broken by several bays, inlets, estuaries and marshy lands, widest continental shelf with an area of 1.64 lakh Sq.Km. Brackish water area of 3.67 lakh Ha. are some of the unique features of Gujarat's marine topography.

1.2 Nature of Aquaculture business

Aquaculture is considered to be a high risk high return sector. On one hand where it has a potential to generate huge returns, on the other hand it also demands high risk taking ability as an aquaculture farmer. Careful handling at each stage of its operation and appropriate preventive measures must be ensured for its success.

Shrimp farming has a great potential to secure the income for the rural population of the country situated at the coastal regions as well as for those situated at the bank of rivers as well as increase the GDP of the nation. Now a day shrimp farming is facing few problems such as shortage of seepage, water scarcity, poor nursery management, and disease out breaks. To face these problems, a shift towards the advanced technologies like raceways technology, lined pond culture, re-circulatory aquaculture system, aerobic microbial flock technology are being adopted to tackle the problems arising due to increasing demand. With the changing environmental conditions and increasing global warming, the effect of the aquatic life has been very adverse and the survival of the species are becoming very rare without the ad of the artificial culture and advancements.

1.3 Objectives of the Research

The objectives of this research are –

- To study the shrimp farming practices adopted by shrimp farmers of Olpad taluka of Surat District
- To study the effect of soil and water salinity on the prawn production
- To study the effect of dissolved oxygen level on the prawn and its production
- To study the different types of aerators to be used in ponds to maintain the DO rate
- To identify the problems and issues faced by the shrimp farmers in the region
- To study the factors affecting the productivity of shrimp and their role in the overall culture management
- To study the aquaculture management practices adopted by shrimp farmers in the region
- To study the risk management practices related to shrimp aquaculture

1.4 Scope of the Research

This research paper has focused on the management practices, properties of the bottom soil sediments, and process occurring at the bottom soil and in water soil interface. The paper has also focussed on the different parameters of the shrimp growth and cultivation factors. Shrimp as animals normally live near the bottom, are exposed to the condition on the pond bottom and they are exposed to the toxic material present in the water.

Another aspect of this research is to study about the different state of art techniques of the aeration system. These aeration system are the modifications of the standard waste water aeration equipment. Aerators were developed to tackle the problem of the dissolved oxygen decrement in the ponds which lead to the increased mortality rate of the pond. The aerators are usually positioned in ponds to provide the maximum water circulations, but this practice results in the embankments and accumulations of sediment and feed piles in central areas of the ponds.

2. METHODOLOGY

During the research, the data has been collected from different sources like interview with the workers, farmers and owners of the field, questioner filling by the people associated with the prawn farming in the area and the supervisors. The following were the people included in the survey.

2.1 Primary source of data

- Questionnaire:

A questioner was created consulting the technicians, subject matter experts and farmers. The questioner were filled by the workers at the pond, field technicians, and lab technicians of the reason, feed vendors and the owners of the pond. This data is recognised as the primary source of data.

Table -1: OCCUPATION OF PEOPLE INCLUDED IN SURVEY

PEOPLE INCLUDED IN SURVEY		
SR. NO	OCCUPATION	NO. OF RESPONDERS
1	POND WORKERS	83
2	POND OWNERS	36
3	SEED VENDOR	3
4	ELECTRICIANS AT POND	4
5	FIELD TECHNICIANS	5
6	LAB TECHNICIAN	1
7	FEED VENDOR	5

- Personal Interview:
  - With selected farmers in the taluka
  - With selected Feed and seed suppliers/dealers in both the taluka
  - With Selected Technicians, providing advice and consultation to shrimp farmers in both the areas
- Personal visits to shrimp farms in the taluka

2.2 Secondary source of data

Data and records collected from government agencies (Commissioner of fisheries' office, Surat.)

Published reports of government and semi government agencies.

Data and information published by government agencies and agencies in the field of fisheries and aquaculture like annual reports, statistical handbooks, reports and other.

Books and magazines on the subject.

Magazine articles, newspapers and other published source of information.

Website and other online resource.

3 SUMMARY OF FINDINGS

A survey was undertaken in Olpad taluka of Surat district, in order to study the shrimp farming practices adopted by the brackish water shrimp farmers in these region and further to identify variations if any, in the practices adopted by the shrimp farmers of Olpad taluka.

Following observations were made during the study-

- 93% of shrimp Farmers in the region perceived shrimp aquaculture as risky business. Shrimp aquaculture is considered to be highly profitable as well by the shrimp farmers.
- The selection of site for the construction of ponds and facilities depends highly on the availability of land resources and nearby areas. Gujarat government's department of fisheries has initiated efforts and allocated land to the beneficiaries in the Olpad taluka for the purpose of shrimp farming.
- Among the key characteristics expected by the shrimp farmers for suitable shrimp farming location, water source and salinity are considered to be of high importance. Water is one of the most important ingredients for successful shrimp aquaculture farming
- Shrimp farmers in Olpad carries out semi-intensive farming of shrimps, and adopts monoculture of species for their culture. Among the two shrimp species more than 90% farmers in cultured P. vannamei for culture as compared to P monodon (tiger). In recent years there has been a growing use of vannamei shrimps in the regions as a result of easy availability of seeds and better economic value.
- More than 90% of the shrimp farmers experienced an attack of diseases causing mortality of shrimps and external predators in past. Among the other problems high price of feed, quality issues in seeds, higher cost of fuel and electricity were also observed. The shrimp farmers in Olpad taluka also encountered conflict with society over past few years.
- Dissolved oxygen and temperature changes in the past few years were crucial and has led to the decline of the shrimp production.

4. CONCLUSIONS

After the research work we have reached to a number of problems that has led to the declining production of shrimp. pH of water, temperature, salinity of sea water used and the DO fluctuations are a few problems which are having major impact on the shrimp production as well as the entire aquatic life of the ponds.

The disease outbreaks are the major problems faced by the shrimp farmers after the growth of the shrimp before the harvest period. The antibiotics are becoming inefficient due to the fluctuating parameters and the surrounding conditions are favourable to the disease spreading bacteria. After extensive study and consultation with microbiological professionals about the disease causing bacteria and viruses, we have reached to the conclusion that they can only be stopped by making the condition unfavourable for them and those are the conditions favourable for the shrimp.

The excessive salinity that are caused by the extensive use of the sea water can be controlled by the use of the rain water that are harvested in the ponds of the village. Additional ponds can be dig in the village to store the rain water and can be used in the summer periods to use the water proportionally with the sea water.

The salt already being accumulated in the soil of the pond can be removed from it by removing the 3 inch layer of soil while currently they remove only 1 inch of soil level from the pond after each harvest.

The excessive use of biomass of feed can be prevented by the proper use of feeding techniques. By using the automatic feeder machines and feed check tray properly, the feeding process of shrimp can be made effective and this way can reduce the extra biomass that produce excessive nitrogen and causes pond water to get dirty. And thus pH can also be maintained.

The problem of DO downfall can be controlled by the effective use of the aerators. The different types of aerators that are present in the market for different purposes are proved ineffective at certain point of time in the ponds and also they are not used at their full capacity. Thus wasting the resources. So proper aerators can be designed to properly harness the potential and also can work on the non-conventional sources of energy as the cost of energy play a crucial role in the use of aerators as they have high operational cost and also high maintenance cost.

Recirculation aquaculture system can be applied to the prawn fields to tackle the problems of water turbidity and can be further studied about it to study the effects of it on the prawn fields.

ACKNOWLEDGEMENT

I would like to express my appreciation to my guide Prof. Deman Sahu and Prof. Prince Rathod while accomplishing out this this to its final form. I came across a number of people whose contributions in various ways helped. It is a pleasure to convey my gratitude to all of them. First and foremost, I would like to express my deep sense of gratitude to my supervisors Prof. Deman Sahu and Prof. Prince Rathod for his invaluable suggestions and support for this research. I am highly thankful to different faculties and Head of Department of mechanical department Prof. Mr. Imran Molvi and Head of Department of Civil Engineering Department Dr. Suhasani Kulkarni for their support and permission to use the available facilities in the university. I am obliged to Prof. Navagan Mahida of applied science department of PIAS for his support and co-operation. The ideas shared by him are always memorable for me. Lastly, I would like to express my deepest gratitude and respect to my family and friends for their continuous encouragement to make all the things possible. Their support and patience are just making me feel better.

REFERENCES

[1] M. Troell, C. Halling, A. Neori et al., "Integrated mariculture: asking the right questions," Aquaculture, vol. 226, no. 1–4, pp. 69–90, 2003.
[2] V. H. Rivera-Monroy, L. A. Torres, N. Bahamon, F. Newmark, and R. R. Twilley, "The potential use of mangrove forests as nitrogen sinks of shrimp aquaculture pond effluents: the role of denitrification," Journal of theWorldAquaculture Society, vol. 30, no. 1, pp. 12–25, 1999.
[3] Y. Mao, H. Yang, Y. Zhou, N. Ye, and J. Fang, "Potential of the seaweed Gracilaria lemaneiformis for integrated multi-trophicaquaculture with scallop Chlamys farreri in North China,"Journal of Applied Phycology, vol. 21, no. 6, pp. 649–656, 2009.
[4] A. Miranda-Baeza, D. Voltolina, M. G. Fr´ıas-Espericueta, G.Izaguirre-Fierro, andM. E. Rivas-Vega, "Budget and discharges of nutrients to the Gulf of California of a semi-intensive shrimpfarm (NW Mexico)," Hidrobiol´ogica, vol. 19, no. 1, pp. 43–48, 2009.
[5] C. Lezama-Cervantes, J. Paniagua-Michel, and J. Zamora-Castro, "Utilizando tapetes microbianos en un sistema derecirculaci´on," Latin American Journal of Aquatic Research, vol.38, pp. 129–142, 2010.
[6] L. R. Martinez-Cordova, A. Campa˜na-Torres, and M. A.Porchas-Cornejo, "Promotion and contribution of biota in low water exchange ponds farming blue shrimp Litopenaeusstylirostris (Stimpson)," Aquaculture Research, vol. 33, no. 1, pp.27–32, 2002.
[7] A. L. Lawrence, F. Castille, M. Velasco, and T. Samocha, "'Enviromentally friendly' or 'least polluting' feed managementprogram for shrimp farming," in The NewWave. Proceedings ofthe Special Session on Sustainable Shrimp Culture, C. L. Browdy and D. E. Jory, Eds., pp. 84–91, World Aquaculture Society, Baton Rouge, La, USA, 2001.
[8] T. Garc´ıa-Sanz, J. M. Ruiz, M. P´erez, and M. Ruiz, "Assessment of dissolved nutrients dispersal derived from offshore fishfarm using nitrogen stable isotope ratios (δ15N) in macroal galbioassays," Estuarine, Coastal and Shelf Science, vol. 91,no. 3, pp.361–370, 2011.
[9] R. Casillas-Hern´andez, F.Magall´on-Barajas, G. Portillo-Clarck,and F. P´aez-Osuna, "Nutrient mass balances in semi-intensive shrimp ponds from Sonora, M´exico using two feeding strategies: trays and mechanical dispersal," Aquaculture, vol. 258, no. 1–4, pp. 289–298, 2006.
[10] COSAES, "Informe final sanidad e inocuidad camar´on 2014," Comit´e de Sanidad Acu´ıcola Del Estado de Sonora, 2014, http://www.cosaes.com/.
[11] M. A. Burford and K. C. Williams, "The fate of nitrogenous waste from shrimp feeding," Aquaculture, vol. 198, no. 1-2, pp. 79–93, 2001.
[12] C. Jackson, N. Preston, P. J. Thompson, and M. Burford, "Nitrogen budget and effluent nitrogen components at an intensive shrimp farm," Aquaculture, vol. 218, no. 1–4, pp. 397– 411, 2003.
[13] A. Miranda, D. Voltolina, M. A. Brambilla-G´amez, M. G. Fr´ıas-Espericueta, and J. Simental, "Effluent characteristics and nutrient loading of a semi-intensive shrimp farm in NW Mexico," Life and Environment, vol. 57, no. 1-2, pp. 21–27, 2007.
[14] J. Kittiwanich, P. Songsangjinda, T. Yamamoto, K. Fukami, and P. Muangyao, "Modeling the effect of nitrogen input from feed on the nitrogen dynamics in an enclosed intensive culture pond of black tiger shrimp (Penaeusmonodon)," CoastalMarine Science, vol. 35, no. 1, pp. 39–51, 2012.
[15] L. R. Mart´ınez-C´ordova, J. A. L´opez-El´ıas, G. Leyva-Miranda, L. Armenta-Ay´on, and M. Mart´ınez-Porchas, "Bioremediation and reuse of shrimp aquaculture effluents to farm whiteleg shrimp, Litopenaeus vannamei: a first approach," Aquaculture Research, vol. 42, no. 10, pp. 1415–1423, 2011.
[16] C. E. Boyd and D. Teichert-Coddington, "Dry matter, ash, and elemental composition of pond-cultured Penaeus vannamei and Penaeus stylirostris," Journal of the World Aquaculture Society, vol. 26, no. 1, pp. 88–92, 1995.
[17] S. J. Funge-Smith and M. R. P. Briggs, "Nutrient budgets in intensive shrimp ponds: implications for sustainability," Aquaculture, vol. 164, no. 1–4, pp. 117–133, 1998.
[18] M. A. Burford, N. P. Preston, P. M. Glibert, andW. C. Dennison, "Tracing the fate of 15N-enriched feed in an intensive shrimp system," Aquaculture, vol. 206, no. 3-4, pp. 199–216, 2002.
[19] F. P´aez-Osuna, S. R. Guerrero-Galv´an, A. C. Ruiz-Fern´andez, and R. Espinoza-Angulo, "Fluxes andmass balances of nutrients in a semi-intensive shrimp farm in north-western Mexico," Marine Pollution Bulletin, vol. 34, no. 5, pp. 290–297, 1997.