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Studies on *Penaeus indicus* (white leg prawn) on the biomass production in reference with the physiochemical parameters at River Subarnarekha East Singhbhum, Jharkhand

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Abstract- The present study elucidates about the survival rate, mean body weight, length, and biomass production of white leg prawns (*Penaeus indicus*) in reference with the water quality parameters at the two different sites of river Subarnarekha at Mango, Jamshedpur and Galudih. The study reveals the seasonal fluctuation along with the physiochemical parameters such as temperature, pH, dissolved oxygen and salinity. The study was conducted through entire seasonally from August, 2019 to March, 2020 which includes four seasons of monsoon, autumn, winter, spring/summer. These physiochemical parameters show a great influence in growth and development of *Penaeus indicus*, especially dissolved oxygen and salinity are the two main factors that provide an impact on the biomass production of prawns, their size, length and their survival rate. The study also shows that the quantity and quality of prawns (*Penaeus indicus*) become low at Mango, Jamshedpur because of the water quality which happens because of the industrial area pollution as well as of domestic wastes, weeds etc. whereas, Galudih area shows a good quality of water far better than Jamshedpur area as well as its ranges too increases in biomass production as well of white leg prawns. Thus, the study reveals about the physiochemical analysis of water especially dissolved oxygen and salinity which provide a great impact on the white leg prawn's flourishing and development, as they are wild type and found naturally in the river water of Subarnarekha which is a freshwater stream without any human interference.

Key words: Physiochemical parameters, Survival rate, Biomass production, Variation, Fluctuation, Mean body weight, Dissolved oxygen, Salinity.

INTRODUCTION

East Singhbhum district of Jharkhand, India was created on 16th January, 1990. The district is flourished and covered by dense forest, beautiful places, mountains, natural waterfalls and many streams which include small but important rivers in this region. River Subarnarekha is one of the major rivers that are a main source of many

livelihoods of the local people. Earlier it was said that gold was a major element that could be found in this river besides it being a freshwater habitat. It is a rain fed river which contains many minerals with a wide variety of habitat of fishes and aquatic creatures. Among them prawns (*Penaeus indicus*) are one of the exceptional invertebrates that are easily available in this river and mostly found throughout all the seasons of the year in this region, with few other varieties but *Penaeus indicus* shows dominance in terms of prevalence in this area. Its production obtained

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naturally with the fluctuation in seasonal variation and depends on water quality. Earlier it was said by the fishermen that day by day the quantity of prawns has been reduced at an alarming rate in this region. Many years ago, the production was good but it decreased substantially because of pollution by the factories, domestic wastes, and also by many other factors. These factors can only get identified by checking of the physiochemical parameters of water quality and biomass production is one of the researching means that gives statistically accurate numbers but still local people are not aware of this technique, as they still depend on manual counting method which includes a lot of expenditure and labour. In most of the coastal areas of India where prawn cultivation flourished and being demanded in huge form, their production is checked by biomass theory. Also, many research and experiments have been performed on different species of prawns like *P. vannamei*, *P. monodon* and many more. Thus, the aim of the study is to obtain information about the biomass production of *Penaeus indicus* through the seasonal variation of water quality parameters to check its production and growth.

MATERIALS & METHODS

The study was conducted seasonally from August, 2019 to March, 2020. The study included the two different sites of River Subarnarekha; the first site is at Mango, Jamshedpur positioned on latitude 21° 15' to 23° 34' N and longitude 85° 8' to 87° 32' and other site is at Galudih which is positioned on latitude 22°60' N and longitude 86°48' E. The samples were collected randomly in the early hours of the morning. The water samples were collected seasonally in a glass bottles and titration was done in the laboratory by the help of Weinkers method by following standard methods of (APHA 2012) for physiochemical analysis that include parameters such as water temperature, pH, dissolved oxygen and salinity. The samples of the prawns were collected with a net of (35 meshes/cm) for the biomass production which was performed seasonally along with physiochemical analysis. The parameters include survival rate, length, mean body weight, and its biomass production. On both the sites, prawns (*Penaeus indicus*) were weighed (wet weight) using electronic precision scales in (± 0.01 gm) and length was measured with the help of scales/rulers. After taking measurements of the prawns, they were counted manually and soon immediately transferred into the river.

DATA ANALYSIS

For the calculation and assessment of the parameters that include survival rate, mean body weight, length and biomass production of *Penaeus indicus*, ANOVA (Analysis of Variance) method was adopted during the study period.

Following formulae was used to find the result performance.

Survival rate was followed by the formulae used by Zonnveld *et al.* (1991)¹ and Karim (2007)²

$$SR = \frac{Nt}{No} \times 100$$

Where, SR = Survival rate

Nt = No. of total population of prawns

No = No. of initial population of prawns

Mean Body Weight

MBW = Weight of the prawns/ no. of prawns

Length of the prawns was done in cm

$$\text{Biomass Production} = SR \times MBW$$

RESULT & DISCUSSION

During the course of the study period, the water quality parameters such as water temperature, pH, dissolved oxygen, salinity, were checked and analysed. Water temperature does show similar variation much like the environment temperature, it remains high in summer and rainy season and becomes low in autumn and winter. Its range varies from 29.2°C to 18.0°C which is quite a normal reading and temperature fluctuates according to season. Likewise, pH ranges from 7.1 to 7.8. These parameters provide suitable environment for prawn growth. Boyd (1990)³ reported that (DO) dissolved oxygen is one of the key ingredients that support aquatic habitat to grow effectively. Thus, here (DO) dissolved oxygen is one of the most important factors that influence not only aquatic life to be stable but also involve in growth of many organisms along with prawns. Dissolved oxygen regime varies from 4.4mg/l to 7.0mg/l. The lowest level of dissolved oxygen is 4.4mg/l which mainly occurs during the time of monsoon as river Subarnarekha is a rain fed river and during monsoon the water level increases and flows heavily. Whereas, the high DO level value goes to 8.0 mg/l, which provides a good physical and biological processes to maintain its proper balance in aquatic habitat. Dissolved oxygen is one of the water quality assessments that show a considerable affect, if there is any fluctuation in the river habitat. Fujaya (2004)⁴ observed that the decrease in oxygen supply could affect prawn's respiration

and prawn can stay alive with better respiration only with proper oxygen supply. Through the study period, it was observed that better oxygen supply shows better development of prawns and flourishes their growth in size, length, and along the weight of the prawn, as DO reduced in the rainy season the quantity of prawns decreased at a miserable rate whereas, during winters and summers the survival rate and prawn production increase because of the increase in dissolved oxygen. Boyd (1990)³ showed that the energy and consumption of food of prawns increase as the oxygen supply is more, conversely if DO is low there would be a decrease in prawns' appetite. Utpal Bhaumik (2011)⁵ observed that the salinity starts increasing in following post-monsoon months, which intensified from winter to summer months which can range from 0.41 to 27.10 ppt at river Subarnarekha. It is said that prawns (*Penaeus indicus*) are euryhaline in nature, they can easily tolerate salinity ranges but Indian white leg prawns generally stay alive at the salinity of 30-35ppt. As river Subarnarekha is a freshwater stream, it generally shows very less salinity of 0.04 to 0.12 ppt. Still in this range, *Penaeus indicus* easily found at the sites, this shows that they can tolerate the fluctuations of salinities in water and become easily adjustable to freshwater streams. A.D.

Dholakia (2010)⁶ reported that salinity which ranges from 35 ppt seawater and freshwater 0.00 ppt, influences many functional responses such as growth, migration, metabolism, osmotic behaviour, reproduction etc.

Through the experimental period it is observed that the survival growth and biomass production of *Penaeus indicus* (white leg prawn) mainly get affected by dissolved oxygen and salinity. The mean body weight, length, survival rate and biomass production of prawns were checked. The analysed data is given in Table I and Table II, which shows a strong correlation between the water quality parameters such as dissolved oxygen (DO) and salinity and growth of prawns as well as its quantity. Size, mean body weight, length and biomass production also get influenced by the environmental factors as well as fluctuation of seasonal variation which provide a key factor on prawns' development and production. The biomass production shows higher result in spring and summer, whereas the quantity decreases considerably during monsoon period as dissolved oxygen and salinity decrease with the extreme flow of water level. In winters, the size of *Penaeus indicus* becomes smaller and biomass production and survival rate become moderate but not better than spring and summer.

Table 1. Showing physiochemical analysis seasonally at two different sites of River Subarnarekha

Parameters	Site I Mango, Jamshedpur				Site II Galudih			
	Monsoon	Autumn	Winter	Spring	Monsoon	Autumn	Winter	Spring
Water Temperature (°C)	28.6±0.2	25.4±0.5	18.0±0.5	29.2±0.7	27.9±0.3	21.2±0.43	18.1±0.6	28.1±0.28
pH	7.4	7.7	7.1	7.8	7.3	7.6	7.1	7.6
DO (mg/l)	4.4±0.16	5.4±0.15	6.9±0.4	6.3±0.18	4.3±0.17	5.8±0.12	8.0±0.3	6.8±0.48
Salinity (ppt)	0.09±0.02	0.07±0.01	0.11±0.03	1.4±0.12	0.04±0.01	0.08±0.01	0.10±0.07	1.2±0.12

Table 2. Showing mean body weight, length, survival rate and biomass production of white leg prawn (*Penaeus indicus*)

Mean Body Weight (gm)	Site I Mango, Jamshedpur			Mean Body Weight	Site II Galudih		
	Length (cm)	Survival rate	Biomass production kg/ha		Length in cm	Survival rate	Biomass production kg/ha
3.9±0.6	6±0.4	44.42±1.52	173.23±15.2	4.1±0.3	13±0.3	49.50±1.08	202.15±16.7
3.1±0.8	7±0.3	58.70±1.78	181.97±14.8	3.3±0.6	9±0.3	63.64±2.4	210.01±17.2
2.9±0.10	9±0.4	64.60±2.56	187.34±16.7	2.5±0.5	8±0.4	61.20±2.16	153.00±11.2
4.4±0.5	14.5±0.2	91.23±1.65	401.41±22.4	5.1±0.5	15±0.11	94.74±1.53	483.17±27.4

CONCLUSION

During the study period, it was observed that survival rate, mean body weight, length, and biomass production of prawns get influenced by the physiochemical parameters such as water temperature, pH, dissolved oxygen and salinity. The result showed that all these parameters especially DO and salinity had a strong effect on prawns (*Penaeus indicus*) for their development and growth as they are wild prawns and grow naturally at the two river sites. The result shows that water quality of river at Galudih site is much better than that of industrial area of Mango, Jamshedpur because of industrial activities, pollution etc. Thus, the biomass production and survival rate show much better result at Galudih region of river Subarnarekha in comparison with Mango, Jamshedpur site at River Subarnarekha.

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REFERENCES

1. **Zonneveld N., Huisman E.A., Boon J. H., 1991** [Principles of fish cultivation]. Jakarta. PT. Gramedia Pustaka Utama. [In Indonesia].
2. **Karim, M.Y. 2007.** The effect of osmotic various medium salinity on vitality of female mud crab (*Scylla olivacea*). *Journal Protein*. **14(1)**: 65-72.
3. **Boyd. 1990.** Water Quality in Pond for Aquaculture Birmingham Publishing co. Birmingham. Alabama; USA. 299p.
4. **Fujaya, Y. 2004.** Basic of Fish Fisiology for Developing Fisheries Technology. *Rineka Cipta; Jakarta*. 179 p.
5. **Utpal Bhaumik. 2011.** Central inland fisheries research institute, B.K. Satpathy Indian institute of technology Bhubaneswar, Fish diversity of Subarnarekha estuary in relation to salinity.
6. **A. D. Dholakia. 2010.** Research Officer and Head Fisheries Research station, Junagadh Agricultural University Sikka Gujarat, India, Identification of Prawns / Shrimps of India and Their Culture 2010 Daya Publishing House Delhi- 110035., ISBN 978-81-7035-652-3.
