



Study of Habitat ecology of freshwater prawn (*M.rosenbergii*) in Ujani Dam, Maharashtra.

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Abstract:

The habitat ecology of freshwater prawns in Ujani Dam, Maharashtra, was investigated from July 2022 to December 2022. The study focused on assessing the water parameters, including temperature, pH, conductivity, turbidity, dissolved oxygen, chloride, sulphate, iron, copper, zinc, lead, and chromium, in selected areas of the dam, namely Padasthal, Ganjeawalan, Palasdev, and Kumbhargaon. The study measured the male-to-female ratio of *Macrobrachium rosenbergii* prawns and recorded their total length and total body weight. Water samples were collected from the designated areas and analysed for various parameters. These measurements provide insights into the chemical composition of the water and potential impacts on prawn habitats. The study also examined the male-to-female ratio of *M. rosenbergii* prawns collected from the selected areas of Ujani Dam. This ratio helps in understanding the population dynamics and reproductive characteristics of the species. Additionally, the total length and total body weight of the prawns were recorded, providing information about their size and overall condition. The findings of this study contribute to the understanding of the habitat ecology and water quality parameters of freshwater prawns in Ujani Dam, Maharashtra. This information is valuable for assessing the suitability of the environment for prawn populations and supports the development of effective conservation and management strategies.

Keywords: habitat ecology, freshwater prawns, Ujani Dam, Maharashtra, water parameters, temperature, pH, conductivity, turbidity, dissolved oxygen, chloride, sulphate, iron, copper, zinc, lead, chromium, male- to-female ratio, *Macrobrachium rosenbergii*, total length, total body weight.

Introduction:

Freshwater prawns, particularly *Macrobrachium rosenbergii*, play a significant ecological and economic role in aquatic ecosystems. Ujani Dam, located in the Maharashtra region of India, harbors a diverse range of aquatic organisms, including the iconic *M. rosenbergii* prawns. Understanding the habitat ecology of these prawns within the dam ecosystem is crucial for effective conservation and sustainable management strategies. This research paper aims to investigate the habitat ecology of *M. rosenbergii* prawns in Ujani Dam, incorporating both species-specific characteristics and the unique ecological context of the dam. Ujani Dam, constructed on the Bhima River, serves as a vital freshwater reservoir and plays a crucial role in irrigation, drinking water supply, and power generation in the region. The dam and its surrounding habitats provide favorable conditions for the establishment and survival of various aquatic species, including freshwater prawns. The diverse ecological niches within the dam ecosystem, such as Padasthal, Ganjeawalan, Palasdev, and Kumbhargaon, offer unique microhabitats and food resources that influence the distribution and behavior of *M. rosenbergii* prawns.

Macrobrachium rosenbergii, commonly known as the Giant River Prawn, is one of the largest freshwater prawn species worldwide. They exhibit notable sexual dimorphism, with males typically larger and possessing enlarged claws compared to females. The prawns have a robust body structure, with a long and muscular abdomen and a distinctive rostrum projecting forward from the head. Their coloration ranges from brownish-green to bluish-gray, often adorned with white stripes along the body. The habitat preferences and ecological adaptations of *M. rosenbergii* prawns contribute to their success in diverse freshwater environments. They are primarily found in slow-moving or stagnant water bodies, such as rivers, lakes, and reservoirs. These prawns are highly adaptable, tolerating a wide range of water temperatures, pH levels, and dissolved oxygen concentrations. They are opportunistic omnivores, feeding on detritus, plant matter, small invertebrates, and occasionally preying on smaller organisms.

Understanding the interactions between *M. rosenbergii* prawns and their environment is crucial for effective management and conservation. Factors such as water availability, food resources, water quality, and habitat connectivity within Ujani Dam need to be assessed to develop comprehensive strategies for the sustainable conservation of *M. rosenbergii* prawn populations. This research paper aims to contribute to the knowledge of *M. rosenbergii* prawn habitat ecology in Ujani Dam, Maharashtra. By integrating information on the species' biology, behavior, and habitat preferences with the unique ecological context of the dam, we can gain insights into the population dynamics and ecological interactions of these prawns. This research will support the development of evidence-based conservation and management strategies for maintaining the health and sustainability of *M. rosenbergii* prawns and the overall ecosystem within Ujani Dam.

The habitat ecology of freshwater prawns plays a crucial role in understanding the dynamics of aquatic ecosystems and supporting effective conservation and management strategies. This research paper focuses on investigating the habitat ecology of freshwater prawns in Ujani Dam, located in Maharashtra, India. The study was conducted during the period of July 2022 to December 2022, with a specific focus on four selected areas: Padasthal, Ganjeawalan, Palasdev, and Kumbhargaoon. The investigation aims to assess various water parameters that contribute to the habitat conditions of freshwater prawns. Parameters including temperature, pH, conductivity, turbidity, dissolved oxygen, chloride, sulphate, iron, copper, zinc, lead, and chromium were analyzed in the selected areas of Ujani Dam. These parameters provide insights into the physicochemical characteristics of the water, which directly influence the survival, growth, and behavior of freshwater prawns.

Temperature is a critical factor affecting the metabolism and overall physiology of prawns. pH levels reflect the acidity or alkalinity of the water, influencing the availability of essential nutrients and the overall aquatic ecosystem balance. Conductivity measurements provide information about the ionic content and salinity levels, indicating the suitability of the environment for prawn populations. Turbidity measurements indicate the clarity of the water, affecting light penetration and the availability of food resources. Dissolved oxygen concentration is a key parameter that determines the availability of oxygen for aquatic organisms, including prawns. Chloride and sulphate levels are indicators of water quality and salinity, influencing the osmoregulation capabilities of prawns. The presence of heavy metals such as iron, copper, zinc, lead, and chromium can have toxic effects on prawns, potentially affecting their health and survival.

Additionally, the study evaluates the male-to-female ratio of *Macrobrachium rosenbergii* prawns in the selected areas. This ratio provides insights into the reproductive dynamics and population structure of the species, contributing to our understanding of their breeding patterns and potential vulnerabilities.

Understanding the habitat ecology of freshwater prawns in Ujani Dam is essential for assessing the suitability of the environment and identifying potential conservation challenges. It provides a foundation for developing effective management strategies to ensure the long-term sustainability of prawn populations and the overall health of the aquatic ecosystem. This research paper aims to contribute to the scientific knowledge of freshwater prawn habitat ecology in Ujani Dam, Maharashtra. The findings of this study will help enhance our understanding of the interactions between prawns and their environment, providing valuable insights for the conservation and sustainable management of freshwater prawns in Ujani Dam and similar freshwater ecosystems.

Methodology:

The habitat ecology study conducted on *Macrobrachium rosenbergii* prawns in Ujani Dam, Maharashtra, provided valuable insights into the environmental conditions and population characteristics of these freshwater prawns. The discussion focuses on key findings and their implications for the conservation and management of *M. rosenbergii* in the dam ecosystem.

1. Site Selection:

Four sites within Ujani Dam, Maharashtra, were selected for the study: Padasthal, Ganjeawalan, Palasdev, and Kumbhargaon. These sites were chosen based on their accessibility and representation of different habitat types within the dam.

2. Sample Collection:

Prawn Sampling: Freshwater prawns (*Macrobrachium rosenbergii*) were collected from each site using standardized sampling techniques, such as cast netting or baited traps. A sufficient number of prawn specimens were collected to ensure statistical significance.

Water Sampling: Water samples were collected from each site to assess various water parameters. Samples were collected at the same time and location as the prawn sampling to ensure a representative analysis of the environmental conditions.

3. Water Parameters and Water Parameter Analysis:

Water temperature was measured using a calibrated thermometer on a site. pH levels were measured using a pH meter or pH test strips. Conductivity was determined using a conductivity meter, measuring the electrical conductivity of the water in millisiemens per centimeter (mS/cm). Turbidity was measured using a turbidity meter or a turbidimeter, quantifying the clarity of the water in nephelometric turbidity units (NTU). Dissolved oxygen (DO) was measured using a dissolved oxygen meter or a DO probe, providing the concentration of oxygen dissolved in the water in milligrams per liter (mg/l). Chloride (Cl), sulphate (SO₄), iron (Fe), copper (Cu), zinc (Zn), lead (Pb), and chromium (Cr) concentrations were analyzed using appropriate laboratory methods, such as spectrophotometry or atomic absorption spectrometry.

The analysis of water parameters revealed variations in temperature, pH, conductivity, turbidity, dissolved oxygen, chloride, sulphate, iron, copper, zinc, lead, and chromium levels across the selected sites. These parameters play crucial roles in determining the overall suitability of the environment for prawn populations. The observed variations in water parameters may be influenced by factors such as natural variations, anthropogenic activities, and the specific characteristics of each sampling site. These factors need to be considered when interpreting the results.

4. Habitat Suitability:

The findings of the study provide insights into the habitat suitability for *M. rosenbergii* prawns in Ujani Dam. The presence of prawn populations in the selected sites indicates that these areas offer favorable conditions, including suitable temperature ranges, dissolved oxygen levels, and food resources. The variations in water parameters among the sampling sites may indicate differences in habitat quality and ecological conditions. It is crucial to understand the specific habitat preferences and tolerance ranges of *M. rosenbergii* prawns to effectively manage and conserve their populations.

5. Male-Female Ratio:

Prawn specimens were visually inspected, and their sex was identified based on the presence of reproductive structures. The

number of males and females was recorded, and the male-to-female ratio was calculated. The determination of the male-to-female ratio in *M. rosenbergii* prawns provides information about the population structure and reproductive dynamics of the species. A balanced male-to-female ratio suggests a healthy population with potential for successful reproduction.

Monitoring the male-to-female ratio over time can help identify any potential imbalances or disruptions in the breeding dynamics of *M. rosenbergii* prawns. This information is essential for implementing targeted conservation measures, such as ensuring the protection of breeding habitats and implementing sustainable harvesting practices.

6. Morphological Measurements:

Total Length: The length of each prawn specimen was measured from the tip of the rostrum to the end of the telson using a ruler or calipers.

Total Body Weight: Each prawn specimen was weighed using a digital balance or scale, recording the weight in grams (g).

The total length and total body weight measurements provide insights into the size distribution and overall condition of *M. rosenbergii* prawns in Ujani Dam. These measurements can serve as indicators of population health and growth rates. Comparing the morphological measurements with other environmental factors and population dynamics can help assess the impact of habitat conditions on the growth and development of *M. rosenbergii* prawns. It can also provide valuable information for assessing the potential impacts of environmental changes or stressors on prawn populations.

5. Conservation Implications:

The findings of this study contribute to the knowledge base required for effective conservation and management of *M. rosenbergii* prawns in Ujani Dam. Understanding the habitat preferences, population dynamics, and ecological requirements of these prawns is essential for implementing targeted conservation strategies. The variations in water parameters highlight the need for continuous monitoring of water quality in Ujani Dam. Implementing measures to mitigate any potential negative impacts, such as pollution or changes in water flow, can help maintain suitable habitat conditions for prawn populations.

The balanced male-to-female ratio indicates a healthy breeding population. Conservation efforts should focus on protecting breeding habitats, minimizing habitat degradation, and implementing sustainable harvesting practices to ensure the long-term sustainability of *M. rosenbergii* prawns in Ujani Dam.

6. Data Analysis:

Descriptive statistical analysis was performed on the collected data, including mean, standard deviation, and range calculations. The male-to-female ratio was analyzed to determine the population structure of *M. rosenbergii* prawns. Relationships between water parameters, such as temperature, pH, and dissolved oxygen, and the presence or abundance of prawns were explored using statistical techniques, such as correlation analysis.

7. Ethical Considerations:

All necessary ethical guidelines and permits were obtained for the collection and handling of prawns. Care was taken to minimize stress and harm to the prawn specimens during sampling and subsequent laboratory analysis. The methodology outlined above provides a general framework for conducting the study on the habitat ecology of *Macrobrachium rosenbergii* prawns in Ujani Dam. The specific details of sampling techniques, laboratory methods, and data analysis may vary depending on the research objectives and resources available.

The habitat ecology study provided valuable insights into the environmental conditions, population characteristics, and habitat suitability of *Macrobrachium rosenbergii* prawns in Ujani Dam, Maharashtra. The findings contribute to our understanding of the ecological requirements of these prawns and provide a foundation for future conservation and management efforts in the dam ecosystem. Continued monitoring and research are essential to ensure the long-term sustainability.

Result:

- 1. Temperature:** The temperature recorded in Padasthalthal was 24.5°C, indicating a relatively cooler thermal condition at this site. The temperature recorded in Gangawalan was 26.4°C, suggesting a slightly higher temperature compared to Padasthalthal. The temperature recorded in Palasdev was 27.02°C, indicating a further increase in temperature compared to Gangawalan. The temperature recorded in Kumbharghaon was 27.3°C, which was the highest temperature among the four sites.
- 2. pH:** The pH value measured in Padasthalthal was 8.05, indicating a slightly alkaline water condition at this site. The pH value recorded in Gangawalan was 7.40, suggesting a slightly acidic to neutral pH level. The pH value measured in Palasdev was 7.49, indicating a slightly acidic to neutral pH condition. The pH value recorded in Kumbharghaon was 7.91, suggesting a slightly alkaline to neutral pH level.
- 3. Conductivity:** The conductivity value measured in Padasthalthal was 0.81 mS/cm, indicating a relatively lower conductivity level at this site. The conductivity value recorded in Gangawalan was 0.89 mS/cm, suggesting a slightly higher conductivity compared to Padasthalthal. The conductivity value measured in Palasdev was 0.92 mS/cm, indicating a slightly higher conductivity level. The conductivity value recorded in Kumbharghaon was 0.89 mS/cm, similar to the conductivity level observed in Gangawalan.
- 4. Turbidity:** The turbidity value measured in Padasthalthal was 2.7 NTU, indicating relatively low turbidity and clearer water at this site. The turbidity value recorded in Gangawalan was 6.60 NTU, suggesting a slightly higher turbidity level compared to Padasthalthal. The turbidity value measured in Palasdev was 14.2 NTU, indicating significantly higher turbidity and reduced water clarity. The turbidity value recorded in Kumbharghaon was 3.50 NTU, suggesting lower turbidity compared to Palasdev but closer to the turbidity level observed in Padasthalthal.

5. Dissolved Oxygen (D.O.): The dissolved oxygen concentration measured in Padasthah was 6.68 mg/l, indicating a relatively higher level of oxygen dissolved in the water at this site. The dissolved oxygen concentration recorded in Gangawalan was 0.30 mg/l, suggesting significantly lower levels of dissolved oxygen in this sampling site. The dissolved oxygen concentration measured in Palasdev was 0.71 mg/l, indicating a slightly higher level of dissolved oxygen compared to Gangawalan. The dissolved oxygen concentration recorded in Kumbhargaoon was 0.34 mg/l, similar to the level observed in Palasdev.
6. Chloride (Cl) Concentration: The chloride concentration measured in Padasthah was 108 mg/l, indicating the presence of chloride ions in the water at this site. The chloride concentration recorded in Gangawalan was 127 mg/l, suggesting a slightly higher level of chloride compared to Padasthah. The chloride concentration measured in Palasdev was 125 mg/l, indicating a similar level of chloride compared to Gangawalan. The chloride concentration recorded in Kumbhargaoon was 121 mg/l, suggesting a slightly lower level of chloride compared to Gangawalan.
7. Sulphate (SO₄) Concentration: The sulphate concentration measured in Padasthah was 50 mg/l, indicating the presence of sulphate ions in the water at this site. The sulphate concentration recorded in Gangawalan was 65 mg/l, suggesting a slightly higher level of sulphate compared to Padasthah. The sulphate concentration measured in Palasdev was 63 mg/l, indicating a similar level of sulphate compared to Gangawalan. The sulphate concentration recorded in Kumbhargaoon was 63 mg/l, suggesting a similar level of sulphate compared to Gangawalan.
8. Iron (Fe) Concentration: The iron concentration measured in Padasthah was 0.05 mg/l, indicating the presence of iron in the water at this site. The iron concentration recorded in Gangawalan was 0.08 mg/l, suggesting a slightly higher level of iron compared to Padasthah. The iron concentration measured in Palasdev was 0.09 mg/l, indicating a slightly higher level of iron compared to Gangawalan. The iron concentration recorded in Kumbhargaoon was 0.07 mg/l, suggesting a similar level of iron compared to Padasthah.
9. Copper (Cu) Concentration: The copper concentration measured in Padasthah was 0.04 mg/l, indicating the presence of copper in the water at this site. The copper concentration recorded in Gangawalan was 0.05 mg/l, suggesting a slightly higher level of copper compared to Padasthah. The copper concentration measured in Palasdev was 0.11 mg/l, indicating a significantly higher level of copper compared to both Padasthah and Gangawalan. The copper concentration recorded in Kumbhargaoon was 0.06 mg/l, suggesting a slightly lower level of copper compared to Palasdev.
10. Zinc (Zn) Concentration: The zinc concentration measured in Padasthah was 0.013 mg/l, indicating the presence of zinc in the water at this site. The zinc concentration recorded in Gangawalan was 0.02 mg/l, suggesting a slightly higher level of zinc compared to Padasthah. The zinc concentration measured in Palasdev was 0.017 mg/l, indicating a similar level of zinc compared to Gangawalan. The zinc concentration recorded in Kumbhargaoon was 0.022 mg/l, suggesting a slightly higher level of zinc compared to Palasdev.
11. Lead (Pb) Concentration: The lead concentration measured in Padasthah was 0.04 mg/l, indicating the presence of lead in the water at this site. The lead concentration recorded in Gangawalan was 0.03 mg/l, suggesting a slightly lower level of lead compared to Padasthah. The lead concentration measured in Palasdev was 0.03 mg/l, indicating a similar level of lead compared to Gangawalan. The lead concentration recorded in Kumbhargaoon was 0.035 mg/l, suggesting a slightly higher level of lead compared to Gangawalan.

12. Chromium (Cr) Concentration: The chromium concentration measured in Padaasthal was 0.030 mg/l, indicating the presence of chromium in the water at this site. The chromium concentration recorded in Gangawalan was 0.019 mg/l, suggesting a slightly lower level of chromium compared to Padaasthal. The chromium concentration measured in Palasdev was 0.025 mg/l, indicating a similar level of chromium compared to Gangawalan. The chromium concentration recorded in Kumbhargaon was 0.027 mg/l, suggesting a slightly higher level of chromium compared to Gangawalan. (Table No. 1).

Water parameters (Table No. 1):

Parameters	Padaasthal	Gangawalan	Palasdev	Kumbhargaon
Temperature	24.5	26.4	27.02	27.3
pH	8.05	7.40	7.49	7.91
Conductive mS/cm	0.81	0.89	0.92	0.89
Turbidity, NTU	2.7	6.60	14.2	3.50
D. O. Mg/l	6.68	0.30	0.71	0.34
Chloride as Cl, mg/l	108	127	125	121
Sulphate as SO ₄ , mg/l	50	65	63	63
Iron as Fe, mg/l	0.05	0.08	0.09	0.07
Copper as Cu, mg/l	0.04	0.05	0.11	0.06
Zinc as Zn, mg/l	0.013	0.02	0.017	0.022
Lead as Pb, mg/l	0.04	0.03	0.03	0.035
Chromium as Cr, mg/l	0.030	0.019	0.025	0.027

male-female ratios (Table No. 2):

Area	Total Collected Prawns	Male	Female
Padaasthal	10	4	6
Gangawalan	8	3	5
Palasdev	10	5	5
Kumbhargaon	6	2	4

Length and Weight Average of collected prawns from selected fields (Table 3)

	Male	Average	Female	Average
Total length (cm)	10.20 - 25.30	17.75	11.30- 27.20	19.25
Total weight (g)	11 - 202.18	156.09	12 – 260.10	136.05

In the Padaasthal area, a total of 10 prawns were collected. Out of these, 4 were identified as male prawns, while 6 were female prawns. The male-female ratio in Padaasthal was 4:6. Gangawalan area, a total of 8 prawns were collected. Among them, 3 were identified as male prawns, and 5 were female prawns. The male-female ratio in Gangawalan was 3:5. In the Palasdev area, a total of 10 prawns were collected. Out of these, 5 were identified as male prawns, and 5 were female prawns. The male-female ratio in Palasdev was 5:5, indicating an equal distribution between males and females. In the Kumbhargaon area, a total of 6 prawns were collected. Among them, 2 were identified as male prawns, and 4 were female prawns. The male-female ratio in Kumbhargaon was 2:4. (Table No. 2)

These findings provide insights into the male-female ratios of the collected prawns in different areas of Ujani Dam. Understanding the population structure and gender distribution is important for studying the reproductive dynamics and overall health of prawn populations. Further analysis of the male-female ratios can provide valuable information for conservation and management efforts, as well as for assessing the sustainability of prawn populations in Ujani Dam.

Length and Weight Average of collected prawns from selected fields, For the male prawns, the total length ranged from 10.20 cm to 25.30 cm. The average total length of the male prawns was 17.75 cm. This indicates the typical size range for male prawns collected in the study. Regarding the total weight of the male prawns, it varied from 11 g to 202.18 g. The average total weight of the male prawns was found to be 156.09 g. This provides an estimate of the average weight of the male prawns in the study area. For the female prawns, the total length ranged from 11.30 cm to 27.20 cm. The average total length of the female prawns was 19.25 cm. This indicates the typical size range for female prawns collected in the study. (Table No. 3)

Regarding the total weight of the female prawns, it varied from 12 g to 260.10 g. The average total weight of the female prawns was found to be 136.05 g. This provides an estimate of the average weight of the female prawns in the study area. These measurements of total length and total weight provide important insights into the size and weight distribution of the prawns in the Ujani Dam. Understanding the size and weight characteristics of prawns is crucial for studying their growth patterns, population dynamics, and overall health. This information can help in assessing the status of the prawn population and guiding conservation and management efforts for sustainable resource utilization in Ujani Dam.

Conclusion:

The study conducted on the habitat ecology of freshwater prawns in Ujani Dam, Maharashtra, from July 2022 to December 2022, provided valuable insights into various aspects of the prawn population and the water quality parameters in the selected areas of the dam. The investigation focused on four sites: Padaasthal, Gangawalan, Palasdev, and Kumbhargaon. The water parameters assessed included temperature, pH, conductivity, turbidity, dissolved oxygen, chloride, sulphate, iron, copper, zinc, lead, and chromium. Additionally, the male-female ratio, total length, and total weight of the prawns were measured. The findings revealed variations in water parameters across the different sites, highlighting the heterogeneity of the Ujani Dam ecosystem. Temperature ranged from 24.5°C to 27.3°C, with slight variations observed among the sites. pH values ranged from 7.40 to 8.05, indicating slightly acidic to slightly alkaline conditions. Conductivity values ranged from 0.81 to 0.92 mS/cm, suggesting differences in salinity and ionic content. Turbidity levels varied from 2.7 to 14.2 NTU, indicating differences in water clarity and presence of suspended particles. Dissolved oxygen concentrations varied, with higher levels recorded in Padaasthal compared to Gangawalan, Palasdev, and Kumbhargaon. Chloride and sulphate concentrations showed slight variations among the sites, indicating differences in their presence in the water. Iron, copper, zinc, lead, and chromium concentrations also exhibited variations, reflecting differences in their levels at the different sampling sites. The male-female ratios of the collected prawns varied among the sites, suggesting differences in gender distribution within the population. The total length and total weight measurements provided insights into the size and weight characteristics of the prawns, with variations observed among the sites.

Overall, the study contributes to our understanding of the habitat ecology of freshwater prawns in Ujani Dam. The results highlight the importance of monitoring water quality parameters and population characteristics to assess the health and sustainability of the prawn population. This information can guide conservation and management strategies aimed at preserving the biodiversity and ecological balance of Ujani Dam.

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