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## Study on taxonomic investigation of shellfish fauna of Madhepura: Bihar

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### Abstract

The various species of shellfish were taken into consideration for the taxonomic study in Madhepura in the current investigation. Study was conducted on fifteen species of shellfish from several classes, including the Gastropoda, Malacostraca, and Bivalvia. Eight species, all dominant and exceptional shellfish, were identified as belonging to the class Gastropoda among these species in Madhepura, North Bihar. Within the class Gastropoda, the genera *Bellamyia*, *Pila*, *Gyraulus*, and *Indoplanorbis* were established. There are just four known species of *Corbicula* among the *Parreysia*, *Lamellidens*, and other *Bivalvia* genera. Lastly, there are roughly three species in each of the genera *Sartoriana*, *Penaeus*, and *Macrobrachium* among the Malacostraca. The biogeographic diversity of the area supports a healthy population of shellfish, which raises the biological richness of the surrounding waters. The current study's findings therefore showed that North Bihar's Madhepura region is home to a diverse array of shellfish.

**Keywords:** Effect, haematological parameters, toxicity, *Heteropneustes fossilis*, deltamethrin

### Introduction

The name "shellfish" refers to exoskeleton-bearing aquatic invertebrates, such as different species of mollusks, crustaceans, and echinoderms, that are used as food in fisheries. The phrase is frequently applied to the edible species within the groupings, particularly those that are farmed or fished for profit. Some species of shellfish can be found in freshwater, however the majority are taken from saltwater habitats. A few land crab species are also consumed, such as *Cardisoma guanhumi* in the Caribbean. One of the most prevalent food allergies is shellfish. In spite of their name, shellfish are just aquatic creatures, not true fish. The Arthropoda and Mollusca order, which includes shellfish, is responsible for the majority of taxonomic research on the animal richness of the environment in Madhepura, Bihar. By transmitting energy and matter from phytoplankton, macrophytes, and zooplankton to fish, amphibians, reptiles, birds, mammals, and other wild species, they play a significant role in the food chain for higher animal groups. Despite their name, shellfish are only aquatic creatures, not really fish.

The taxonomy, biology, ecology, and behaviour of mollusks in the Indian subcontinent have all been extensively studied (Hora, 1925; Prasad, 1932; Tonapi 1971; Rao *et al.*, 1971; Subba Rao and Mitra, 1982; Sharma *et al.*, 1983; Singh, 1990) [3, 2, 4, 1, 6, 8]. However, there is essentially no data on the potential for shellfisheries in the various Madhepura district. Finding out the taxonomic diversity of the shellfish in the Madhepura wetlands was the aim of this study.

### Resources and Techniques

The districts of Madhepura in North Bihar were chosen for this investigation. An investigation was conducted into the shellfish that were exploited in these five districts by various groups of people. Regular large-scale field visits were undertaken, and data were gathered through surveys, interviews, and in-person inquiries. After being gathered, the shellfish were transported to the lab and preserved in 10% formalin.

After each container was correctly labelled in accordance with the physical sampling data sheet, it was brought to the lab for species confirmation and identification. To determine growth rings, the whole animals were carefully cleaned under running tap water and then

somewhat decalcified in an aqueous acidic media. The literature that was accessible helped identify the specimens (Sharma *et al.*, 1983) [6]. The specimens that were gathered were turned in to the University Department of Zoology, Madhepura, museum.

#### Area of Research

Large lentic resources, including ponds, tanks, oxbow lakes, swamps, chauras, canals, road and railway side depressions, flood plains, and wetlands, can be found in North Bihar, which is located between 83021' to 88017' NL and 24055' to 27031' EL. These water bodies have a great deal of potential for fish culture (Dehadrai, 1994; Verma, 1994) [10, 7].

#### Results and Discussion

During the investigation, the following species were discovered:

(1) **Source of Materials:** Bolten (*Pila globose*).

**Location of collection:** Madhepura North Bihar's Baiwah paddy lands.

**Biology:** Found in freshwater ponds, lakes, rivers, and tanks, it is a common aquatic organism that feeds on succulent aquatic plants. It may survive in both terrestrial and marine settings. They can go into long diapause periods during protracted droughts, and they eventually return to normal after rainfall.

(2) **Source of Material:** *Penaeus monodon*, often known as Asian tiger shrimp or big tiger prawn, Tresaugue.

**Site of collection:** *Achatina* (Lissachatina) *fulica*. Similar biology to *Pila globose*.

#### Taxonomic overview

- (i) Males are slightly smaller at 20–25 cm (8–10 in) long and weigh 100–170 g (3.5–6.0 oz); females can grow to a maximum length of 33 cm (13 in), but are usually 25–30 cm (10–12 in) long and weigh 200–320 g (7–11 oz).
- (ii) Alternate red and white bands are transversely striped throughout the carapace and abdomen.
- (iii) The antennae have a brownish-gray colour.
- (iv) Fringing setae are highlighted in red, and brown pereopods and pleopods are visible.

**Niche:** Extensively found in canals and ponds rich in debris.

(3) **Source of Materials:** *Paratelphusa spinigera*.

**Location of collection:** Madhepura's Budhma River.

**Biology:** It digs burrows beside ponds and rivers. These crabs emerge from their burrows to feed, but they quickly retreat back into their hole at the first sign of disturbance. It provides food for a variety of tiny creatures as well as aquatic plants.

#### Taxonomic overview

- (i) Dorso-ventrally compressed, with a stumpy abdomen and a wide, broad cephalothorax.
- (ii) The epistome and carapace are joined at the side and almost always in the middle.

- (iii) Absence of rostrum.
- (iv) The carapace sockets house the antennae and eye stalks.
- (v) The mouth parts are covered by the wide, flat, valve-like third maxillipedes.
- (v) Thoracic legs have five pairs and are fully developed.
- (vi) Under cephalothorax, the abdomen is decreased and fixed.
- (vii) There are remarkably fewer pleopods—two pairs in the male and four pairs in the female.

**Niche:** Dwell in the holes or burrows found on the sides of lakes, ponds, and rivers.

(4) **Source of Materials:** Race Mandiensis, *Bellamya bengalensis* (Kobelt) Location of Collection: Drawn from Haraili's ponds and rivers.

**Biology:** They live in freshwater ponds, rivers, reservoirs, ditches, and lakes. The water in these areas is rich in macrovegetations, particularly *Eichhornia crassipes*, and is copious in detritus.

#### Taxonomic overview

- (i) Broadly ovate, conic, somewhat thick, globosely turbinated shell.
- (ii) Whorls 4-5 are convex and consistently increase in size. They have transverse reddish-brown stripes and spaced spiral striae or bands, with 5 in the fourth whorl and 9 in the body whorl.
- (iii) The foot is not larger than the snout and is of a moderate size.

**Niche:** They were found in large quantities on algal mats.

(5) **Source of Materials:** Lamarck's *Lamellidens marginalis*.

**Location of collection:** Taken from Madhepura's Loram River

**Biology:** *Lamellidens corrianus* is the same.

#### Description of Taxonomix

- (i) The shell is oval, ovate, or transversely oblong.
- (ii) Each shell valve has umbos, which are inflated, knob-like structures with coarse ridges that are located quite close to the anterior end.

**Niche:** It stays 1.5" below the surface.

(6) **Source of materials:** *Gyraulus convexiusculus* (Hutton) that was collected from ditches next to the Duas River.

**Biology:** This completely herbivorous snail can be found in most bodies of water, especially those with an abundance of aquatic plants and weeds.

#### Taxonomic overview

- (i) Its thin, transparent shell is marked by a helical ridge and incredibly fine transverse striations.
- (ii) The whorls of the tiny, discoidal shell are rounded to allow for carmination.
- (iii) There is an oblique and somewhat bent aperture.

**Niche:** It is found in ditch macrovegetation and aquatic weeds.

**(7) Source of Materials:** *Bellamyia variata* (Viviparous) (Frauenfeld) Pools and canals in the Madhepura areas of North Bihar were used for collection.

**Biology:** Comparable to other viviparous species.

#### Taxonomic overview

- (i) Compared to other species of the genus, it is smaller.
- (ii) Shells range in tint from pale to dark green.
- (iii) There are five whorls, each of which is slightly convex or moderately inflated.
- (iv) There are no bands.
- (v) The middle level of the body whorls has a well-developed spiral keel. A niche is a place where organic materials from ponds and slowly flowing canals are found. It is covered with algae and has nearby aquatic plant materials.

**(8) Source of Materials:** Deshayes' *Indoplanorbis exustus*.

**Site of collection:** ecosystems in lakes.

**Biology:** It is the most prevalent herbivorous freshwater air-breathing gastropod, found in lakes, ponds, and grasslands.

#### Taxonomic overview

- (i) A sturdy, brown shell with spiral coils encloses it.
- (ii) The shell has a depressed spire and is discoidal and sinistral.
- (iii) The spire has three whorls, each with transverse striations.

**Niche:** It is situated on the herbaceous grasses that are next to ponds and rivers.

**(9) Source of Material:** *Achatina fulica* (Lissachatina) Bowdich.

**Location of Collection:** Gathered from Koshi River banks' gardens and grasslands.

**Biology:** Primarily a terrestrial pulmonate, it lives in open grasslands and loves humid environments, particularly those with bank vegetation. It is primarily nocturnal, spending the day hidden behind plants and aestivating in the summer. It is herbivorous, consuming the local vegetation.

#### Taxonomic overview

- (i) The shell is thick, long, and has a light horny hue.
- (ii) In adults, the whorl and collarumella of the shell are whitish with brown stripes.
- (iii) The spire has six whorls total, with an oval and elongated body whorl.
- (iv) Absence of periplasm.
- (v) The large ventral sole of the foot has been adapted for creeping, making it flat.
- (vi) A big tubular slime gland that produces a copious amount of slime is located on the foot.

**Niche:** They were found on a variety of garden plants, from tiny to huge.

**(10) Source of Material:** Deshayes' *Corbicula striatella*.

**Location of collection:** the Koshi Rivers in Kazakhstan.

**Biology:** An omnivore by nature, it lives in rivers and streams where the sand or gravel at the bottom acts as a substratum. Taxonomic overview–

- (i) A shell with strong striating that is dark brown.
- (ii) The shape is triangular, and the outside is often covered in shiny, greenish peristracum and sculpted with concentric ridges.
- (iii) Each valve has two cardinal teeth and serrated lateral teeth.
- (iv) Well-marked growth lines.

**Niche:** Found on substrate free from rooted green algae, close to the bottom.

**(11) Source of materials:** Madhepura's freshwater ponds, rivers, and lakes; *Lamellidens corrianus* (Lea).

**Biology:** A bottom dweller of freshwater ponds, rivers, and lakes, it typically excavates a big ventral foot-hole in the mud at the bottom of ponds. Because the rear extremities of the valves are omnivorous in nature and stay exposed to both inhalant and exhalant respiratory water currents, it does not descend very far into the burrow.

#### Taxonomic overview

- (i) The left and right valves each have two pseudo cardinals that are parallel lamellar pseudo cardinals.
- (ii) The shell is big, thinner, transverse, and equilateral.
- (iii) The right valve has two extended, straight lateral teeth, while the left valve has a single, thin cardinal tooth that resembles a lamella.
- (iv) Umbos have rough ridges and are somewhat raised. Nestled in the pond's mud, the niche was encircled by a variety of aquatic plants.

**(12) Source of Material:** Muller's *Melanoides tuberculatus*.

**Location of collection:** same as above. Similar to *Melanoides lineatus* in biology.

#### Taxonomic overview

- (i) The shell has several transverse ridges and is extremely elongated.
- (ii) Shell length ranges from 20–27 mm to 30–36 mm on average Glöer P. (2002), yet unusual specimens can reach up to 80 mm in length.
- (iii) The spire has eight to nine convex whorls.
- (iv) Spire has a deep depression. (iv) A tiny, oval body whorl. (v) Radula's central tooth is denticulate and less wide.

**Niche:** Surrounded by a variety of aquatic vegetations, they were situated at the bottom of ponds.

**(13) Source of Material:** Lamarck's *Pila virens*.

**Site of collection:** *Achatina* (Lissachatina) *fulica*. Similar biology to *Pila globose*.

**Taxonomic overview**

- (i) Less shell than that of *Pila globosa*.
- (ii) The spine is more severely bent at a ratio of 1/4th of the shell's overall length.
- (iii) Less pronounced and inflated spire whorls.
- (iv) The umbilicus has a narrower perforation and is smaller.
- (v) The outside of Operculum is concave, pale, fleshy brown, and horny.

**Niche:** Commonly found in paddy fields, canals, and ponds rich in detritus; encircled by humus and carrion.

**(14)Source of Material:** *Rosenbergii macrobrachium*.

**Site of collection:** *Achatina* (Lissachatina) *fulica*. Similar biology to *Pila globose*.

**Taxonomic overview**

- (i) *M. rosenbergii* is a shrimp with a remarkable appearance, and its second pair of walking legs fully justifies the genus name, which means "large arms."
- (ii) These walking legs in males have the potential to grow twice as long as the body and to have a vivid blue colour.
- (iii) The largest males can reach a total length of 320 mm from the tip of the rostrum to the end of the telson, while the greatest females can only reach a length of 250 mm.
- (iv) The rostrum, which has 8–10 ventral teeth and 11–14 dorsal teeth, is a highly noticeable feature at the front of the cephalothorax.
- (v) The female has a broader belly and longer pleura, while the male has a narrower abdomen.

**Niche:** found in ponds by rivers, over land, and up vertical surfaces (weirs, minor waterfalls, etc.).

**(15)Source of Material:** *Spinigera sartoriana*.

**Site of collection:** *Achatina* (Lissachatina) *fulica*. Similar biology to *Pila globose*.

**Taxonomic overview**

- (i) The carapace colour of *S. spinigera* ranges from orange to brown, while the chillet colour is orange to brown.
- (ii) The crab's carapace has a very greasy texture.
- (iii) The Wood Meson crab, as the name suggests, has a big "V"-shaped pattern on its carapace that has a dark brown mark on it.
- (iv) In the mud soil of the littoral zone of wetlands, these crabs can be discovered crawling, burrowing, and even buried.
- (v) The crab's semi-triangular, oily, smooth carapace is covered in many spines that are frequently covered in algae and other encrusting organisms.

**Niche:** Prominent in paddy fields, canals, and ponds that are rich in detritus.

The current study on the state of the shell fisheries in the Madhepura area of North Bihar reveals that the region's river basin is rich in diversity of molluscan and crustacean fauna. The diversity of shell fishes in this area indicates a well-established, balanced ecosystem, and their abundance

in terms of taxonomic diversity indicates a good life support system for fish and birds. Shell fishes are the main group of macro-invertebrates; they act as a link between zooplankton and vertebrate taxa, including fish and birds, and they are essential to the energy flow and bio-geochemical cycle of wetland habitats.

Total number of species collected were about 15 from the different parts of Madhepura. Among these 15 species 8 belonged to the class Gastropoda, 4 belonged to the class Bivalvia and 3 belonged to the class Malacostraca. The taxonomic diversity in terms of number and abundance is more in Gastropoda and dominant species and were also among the edible aquatic animals while species belonging to Malacostraca were found to be least. It was observed that the appreciable seasonal changes of their population may be correlated with the appearance and disappearance of macrovegetations of the habitat. The emergent portion of the plants affords shelter to the adult stages of Mollusca. The floating vegetations constitute a biotope with varied ecological niches for almost all types of shell fishes found. Most of the molluscans were also found among the submerged parts of plants such as Gastropods. The free-floating vegetations such as *Eichhornia crassipes* afford the colonization of molluscs such *Bellamya bengalensis*, *Lamellidens marginalis*, *Corbicula* and others. Thus, macrophytes provide shade, shelter and site for oviposition and development of these shell fishes. A number of fish and avian fauna diversity directly depend upon the molluscs population of these habitats. The commercial aspect of shell fishes as raw material for food, finance, recreation, medicines, vitamins and minerals supplements etc., for local human population and ecological aspect for increasing biological diversity and maintaining ecological balance for the animals occupying the higher trophic level of the food chain. Thus, the considerable scope with respect to the shell fisheries for their medicinal value and these resources need judicious utilization on commercial basis to generate employment opportunity and enhance the income of the local people.

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