

On an account of diversity of Aquatic and Semi Aquatic bugs from lower basin of Mundeswari river, West Bengal, India

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ABSTRACT

The Mundeswari River, situated in West Bengal, serves as a tributary to the Damodar River. Its' water plays a crucial role in both domestic and agricultural activities. However, during the monsoon season, the river poses a threat by causing floods in the Hooghly, Howrah, and East Medinipur districts. The Mundeswari River becomes a mixed blessing for the nearby villages. This study delves into the rich diversity of aquatic and semi-aquatic bugs in the lower basin of the Mundeswari River. The faunistic investigation reveals the presence of 14 species across 9 genera and 6 families, all of which are documented for the first time in this river.

Figures : 40

References : 15

Table : 00

KEY WORDS : Aquatic, Diversity, Hemiptera, Mundeswari, Nepomorpha, Taxonomy

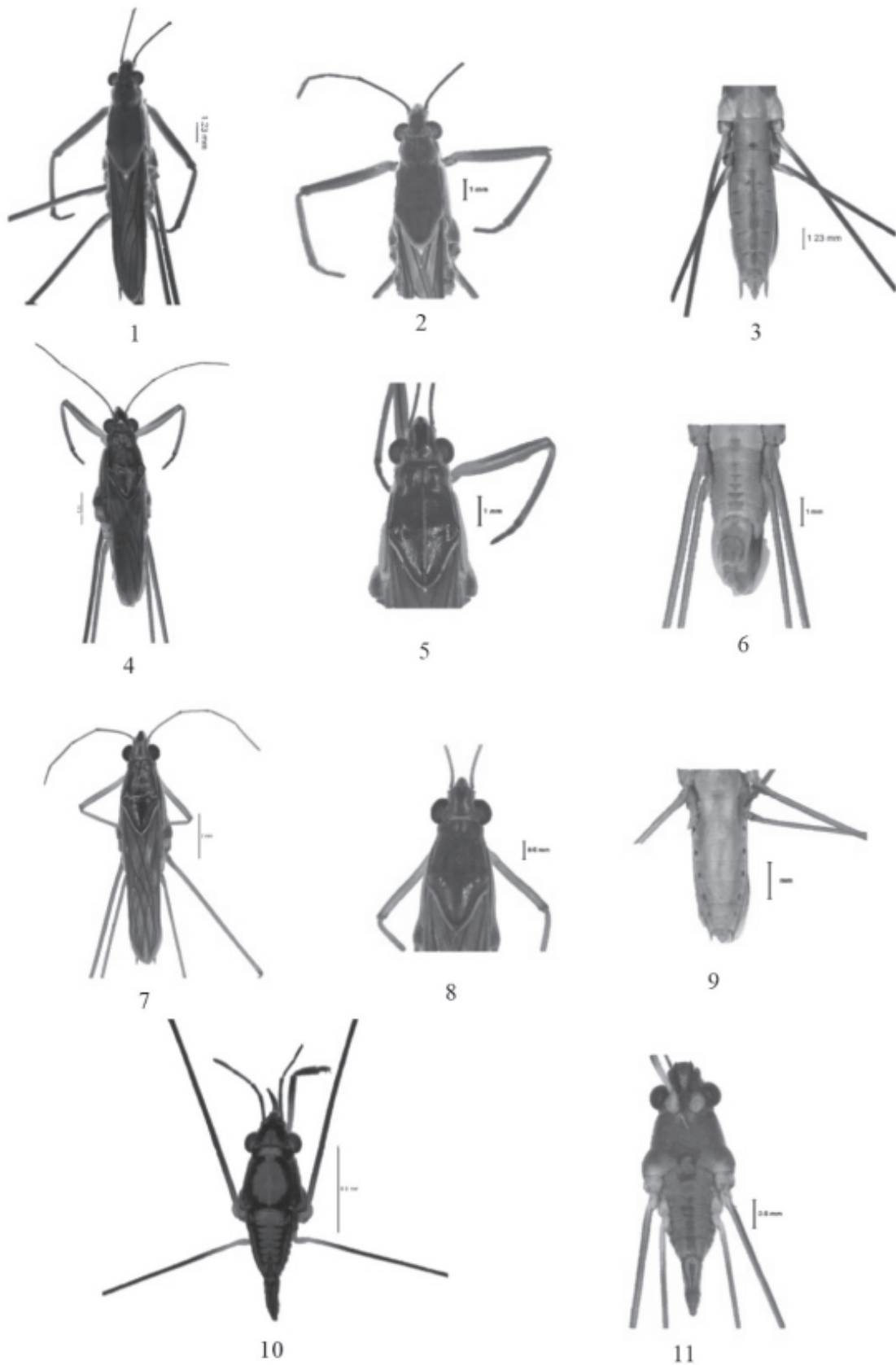
Introduction

Aquatic hemipterans, often referred to as "Water bugs," constitute integral components of aquatic ecosystems. Their significant role in preserving ecosystem stability is noteworthy, as they serve as indicators of water quality changes resulting from pollution. Due to their rapid responsiveness to such alterations, water bugs play a crucial role in signaling ecological shifts. Additionally, these insects are employed as biocontrol agents, particularly as some water bugs actively feed on the larvae of mosquitoes and other diptera, which function as vectors for certain diseases^{8,9}. All aquatic bugs belong to suborder heteroptera. Suborder heteroptera consists of three infraorder Gerromorpha, Nepomorpha, and Leptodomorpha. Nepomorpha lives in the water, Gerromorpha lives on the water surface and Leptodomorpha lives on shore, sometimes under stone. Aquatic bugs are predaceous in nature; they feed micro and macro invertebrate, sometimes fish egg and fry. For this behavior their fore

legs modified for seizing and holding the prey. There are 4000 species of aquatic bugs found worldwide^{5, 11}, From India, 325 species belonging to 84 genera and 18 families have been reported³. In the Himalayan and sub-Himalayan regions of West Bengal, there are 61 species belonging to 34 genera and 14 families of aquatic and semi-aquatic heteroptera have been reported².

According to a preceding investigation, the Mundeswari river exhibits notable spatial heterogeneity and seasonal variations in water quality parameters⁷. The water quality tends to degrade and become putrid during the pre-monsoon season, impacting the diversity and distribution of aquatic fauna, particularly aquatic insects, in this river. Aquatic insects are advantageous biological indicators, and studying their diversity, population, behavior, and taxonomy allows for the assessment of the current degradation rate and future consequences of the water body⁸. This current study specifically focuses on providing a taxonomic account of the diversity of aquatic bugs in the lower basin of the

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Figs. 1-3: *Aquarius adelaidis*, 1, habitus ; 2, pronotum; 3, connexival spine. Figs. 4-6: *Limnogonus (Limnogonus) fossarumfossarum*, 4, habitus; 5, pronotum; 6, abdomen. Figs. 7-9: *Limnogonus (Limnogonus) nitidus*, 7, habitus; 8, pronotum; 9, abdomen. Figs. : 10-11: *Rhagadotarsus (Rhagadotarsus) kraepelini*, 10, habitus (dorsal); 11, habitus (ventral).

Mundeswari River during the pre-monsoon season. The faunistic examination has identified 14 species across 9 genera and 6 families.

Materials and Methods

Collections of aquatic bugs were done with the help of a hand-operated D net from four different sites of the Mundeswari river of Hooghly district. Thereafter, specimens were preserved in 70 % ethyl alcohol in glass vials. The vials were labelled with date, locality, latitude, longitude, and name of the field collector. The morphological studies were undertaken using a LeicaM205A Stereo binocular microscope. All collections were identified by using the standard literature on the group^{1,4,12-15}. The materials studied were deposited in the National Zoological Collection, Zoological Survey of India, Kolkata.

Results

Order HEMIPTERA

Suborder HETEROPTERA

Infraorder GERROMORPHA

Family GERRIDAE

1. *Aquarius adelaidis* (Figs. 1-3)

Material examined: 10 exs (4 male, 6 female) Station 1 Near SH2, Golami Chak, Horinkhola, Arambagh, West Bengal, India, 22.8388533N, 87.9041839E, 19.iv.2023.

Diagnosis: Body elongated with prominent connexival spine (Fig.3); head and anterior lobe of pronotum black with a yellowish fascia in middle; posterior lobe of pronotum yellowish brown (Fig.2);

Distribution: India, Bangladesh, China, Indonesia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand and Vietnam.

2. *Limnogonus (Limnogonus) fossarum fossarum* (Figs. 4-6)

Material examined: 1 exs (male) Station 1, Near SH2, Golami Chak, Horinkhola, Arambagh, West Bengal, India, 22.8388533N, 87.9041839E, 19.iv.2023.

Diagnosis: Head with a central and two narrow lateral black stripes. A median longitudinal line is present on the pronotum, reaching up to the metanotum (Fig. 5). Connexival spines not prominent (Fig. 6).

Distribution: India, Bangladesh, China, Hong Kong, Indonesia, Japan, Malay Peninsula, Myanmar, Philippines, Singapore, Sri Lanka, Taiwan, Thailand and Vietnam

3. *Limnogonus (Limnogonus) nitidus* (Figs. 7-9)

Material examined: 8 exs (3 male, 5 female) Station 1, Near SH2, Golami Chak, Horinkhola, Arambagh, West Bengal, India, 22.8388533N, 87.9041839E, 19.iv.2023.

Diagnosis: Two yellow stripes are present on the anterior lobe of the pronotum, the posterior lobe is black, and the lateral margin of the pronotum has a yellow fascia (Fig: 8). Connexival spines prominent (Fig. 9).

Distribution: India, China, Indonesia, Malaysia, Maldives Islands, Myanmar, Nepal, Singapore, Sri Lanka, Thailand and Vietnam

4. *Rhagadotarsus (Rhagadotarsus) kraepelini* (Figs.10-11)

Material examined: 6exs (2 male, 4 female), Station 2, near rail bridge, Horinkhola, Arambagh, West Bengal, 22.8598161N, 87.8953018E, 21.iv.2023.

Diagnosis: Body small, black in colour. Antennae dark brown, The first abdominal sternite visible. Tip of abdomen produced to form a rod like structure (Fig. 11).

Distribution: India, Malaysia, Singapore, Java, Indonesia, Sri Lanka, Thailand, Vietnam, China, Myanmar, Taiwan.

Family : VELIIDAE

5. *Microvelia (Picaultia) douglasi* (Figs. 12-14)

Material examined: 10 exs (6 female, 4 male). Station 2, near rail bridge, Horinkhola, Arambagh, West Bengal, 22.8598161N, 87.8953018E, 21.iv.2023.

Diagnosis: Anterior margin of pronotum having one prominent transverse yellow band. Hemelytra was spotted with a greyish white spot; Clavus has two long spots; Corium has three spots; and a single large spot is present in menbranae (Fig. 14). Male genital segment with one paramere extending outward (Fig.13).

Distribution: India, Australia, Indonesia, Japan, Malaysia, Marianna Islands, New Guinea, Philippines, Samoa, Sri Lanka, Taiwan

Family: HYDROMETRIDAE

6. *Hydrometra butleri* (Figs. 15-17)

Material examined: 1 ex, female, Station 3, Purba Krishnapur village, Arambagh, West Bengal, 22.8557411N, 87.8937146E, 23.iv.2023.

Diagnosis: Body slender Two pairs of trichobothria are present on the anterior region of the head, and one pair of trichobothria is present on the posterior region of the head. Anteclypeus is conical with a blunt tip (Fig. 16). Caudal process is straightly caudad (Fig. 17).

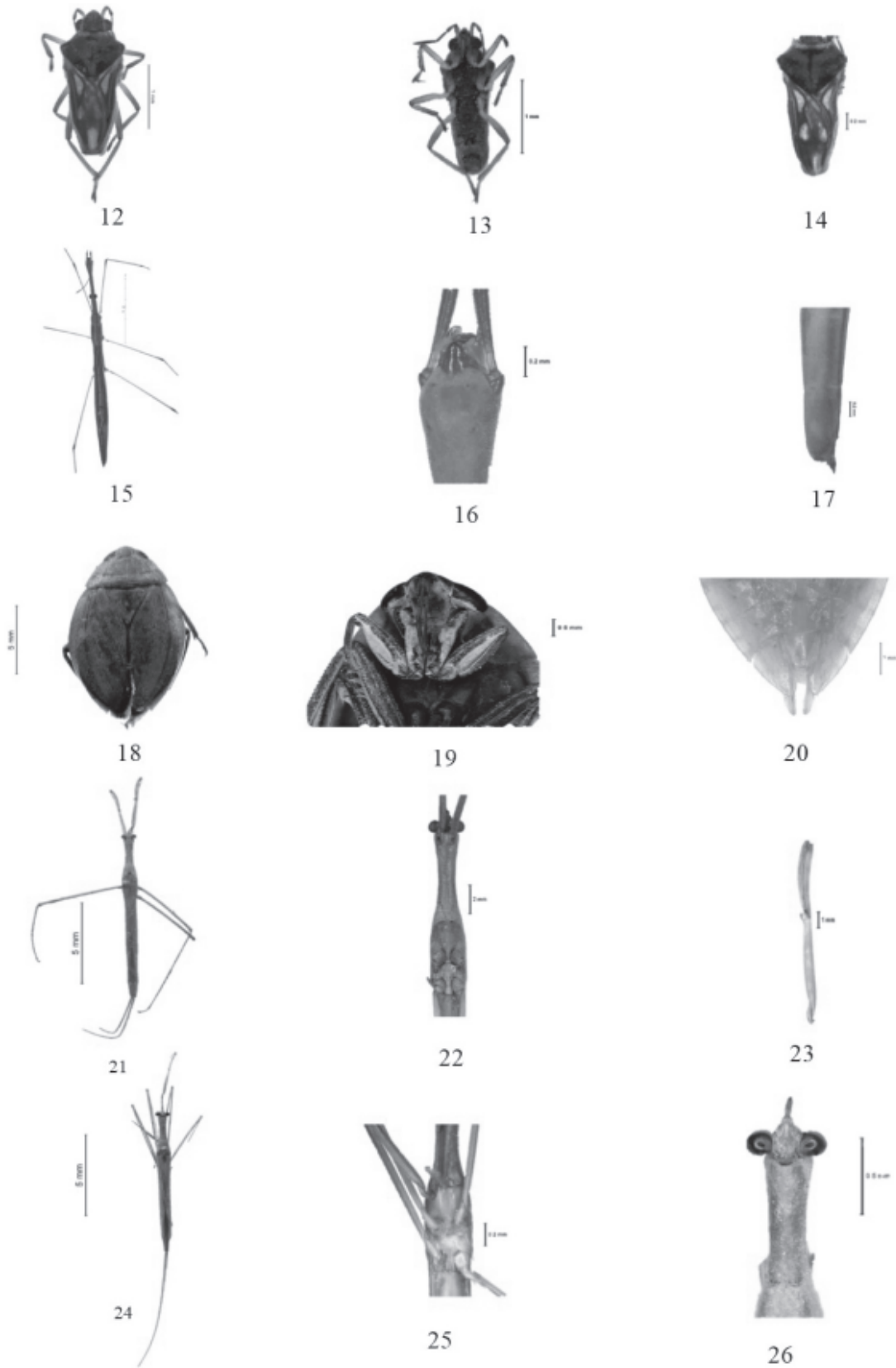
Distribution: India, Sri Lanka

Infraorder : NEPOMORPHA

Family : BELOSTOMATIDAE

7. *Diplonychus annulatus* (Figs.18-20)

Material examined: 2exs (1 male and 1 female) Station 2, near rail bridge, Horinkhola, Arambagh, West Bengal, 22.8598161N, 87.8953018E, 21.iv.2023.



Figs. : 12-14: *Microvelia (Picaultia) douglasi*, 12, habitus (dorsal); 13, habitus (ventral); 14, corium. Figs. : 15-17: *Hydrometra butleri*, 15, habitus; 16, head; 17, abdominal spine. Figs. : 18-20: *Diplonychus annulatus*, 18, habitus; 19, Fore tarsus; 20, respiratory strap. Figs.: 21-23: *Ranatra filiformis*, 21, habitus; 22, sternum; 23, Fore femora. Figs. : 24-26: *Ranatra digitata*, 24, habitus; 25, sternum; 26, anterior lobe of pronotum.

Diagnosis: The body is oval in shape, and the apex of the head is acute. Fore tarsus two segmented (Fig. 19). The respiratory strap of the male has no tuft of setae (Fig. 20).

Distribution: India, Bangladesh and Pakistan.

Family : NEPIDAE

8. *Ranatra filiformis* (Figs. 21-23)

Material examined: 3exs (2 female, 1 male) Station 2, near rail bridge, Horinkhola, Arambagh, West Bengal, 22.8598161N, 87.8953018E, 21.iv.2023.

Diagnosis: Body elongated, the vertex is usually raised between the eyes. The width of the eye is slightly less than interocular space. Metasternal process is triangular posteriorly with a distinct longitudinal groove (Fig. 22). Fore femora centrally bidentate and larger tooth of the fore femur clearly near to its distal end (Fig. 23).

Distribution: India, China, Malay Peninsula, Nepal, Pakistan, Philippines, Sri Lanka and Thailand.

9. *Ranatra digitata* (Figs. 24-26)

Material examined: 5 exs, (3 female, 2 male), Station 2, near rail bridge, Horinkhola, Arambagh, West Bengal, 22.8598161N, 87.8953018E, 21.iv.2023.

Diagnosis: Body elongated, Width of eye greater than interocular space (26). Anterior lobe of pronotum is slightly less than twice of posterior lobe. Space between middle coxa is distinctly narrow than space between hind coxa (Fig. 25).

Distribution: India, Sri Lanka

10. *Ranatra varipes atropa* (Figs. 27-29)

Material examined: 2exs (1 male, 1 female), Station 3, Purba Krishnapur village, Arambagh, West Bengal, 22.8557411N, 87.8937146E, 23.iv.2023.

Diagnosis: Body brown in colour. Anterior lobe of pronotum is almost twice as long as posterior lobe. Venteroprothoracic keel is very prominent and especially pronounced distally (Fig. 28). Fore femora broad (Fig. 29). Hind femora reaching posterior margin of sixth sternite.

Distribution: India, Java, Myanmar, and Thailand

Family : NOTONECTIDAE

11. *Anisops breddini* (Figs. 30-32)

Material examined: 9 exs, (4 male, 5 female), Station 2, near rail bridge, Horinkhola, Arambagh, West Bengal, 22.8598161N, 87.8953018E, 21.iv.2023.

Diagnosis: Eyes holoptic (Fig. 32), Rostral prong originates in proximal third of third rostral segment, second rostral segment having a distal outgrowth posteriorly (Fig. 31).

Distribution: India, Indonesia, Myanmar, New Guinea,

Singapore, Southwest China, Sri Lanka, Thailand, Vietnam and West Malaysia.

12. *Anisops barbatus* (Figs. 33-35)

Material examined: 2exs. (1 male and 1 female), Station 3, Purba Krishnapur village, Arambagh, West Bengal, 22.8557411N, 87.8937146E, 23.iv.2023.

Diagnosis: Large species, synthlipsis wide and its length is two third of anterior width of vertex (Fig. 35). Rostral prong slightly shorter than third rostral segment. Tylus swollen having a pair of tuft of bristles which reaches the base of labrum (Fig. 34).

Distribution: India, China, Indonesia, Malaya, Myanmar, Sri Lanka, Taiwan and Vietnam.

13. *Anisops bouvieri* (Figs. 36-38)

Material examined: 18exs (5male, 13 female), Station 3, Purba Krishnapur village, Arambagh, West Bengal, 22.8557411N, 87.8937146E, 23.iv.2023.

Diagnosis: Cephalic projection of head with long acuminate apex. Synthlipsis wide which is half the anterior width of the vertex (Fig. 38). Rostral prong is slightly shorter than third rostral segment, originates proximal third of third rostral segment (Fig. 37).

Distribution: India, China, Bangladesh, Malaysia, Myanmar, Thailand

14. *Nychia sappho* (Figs. 39-40)

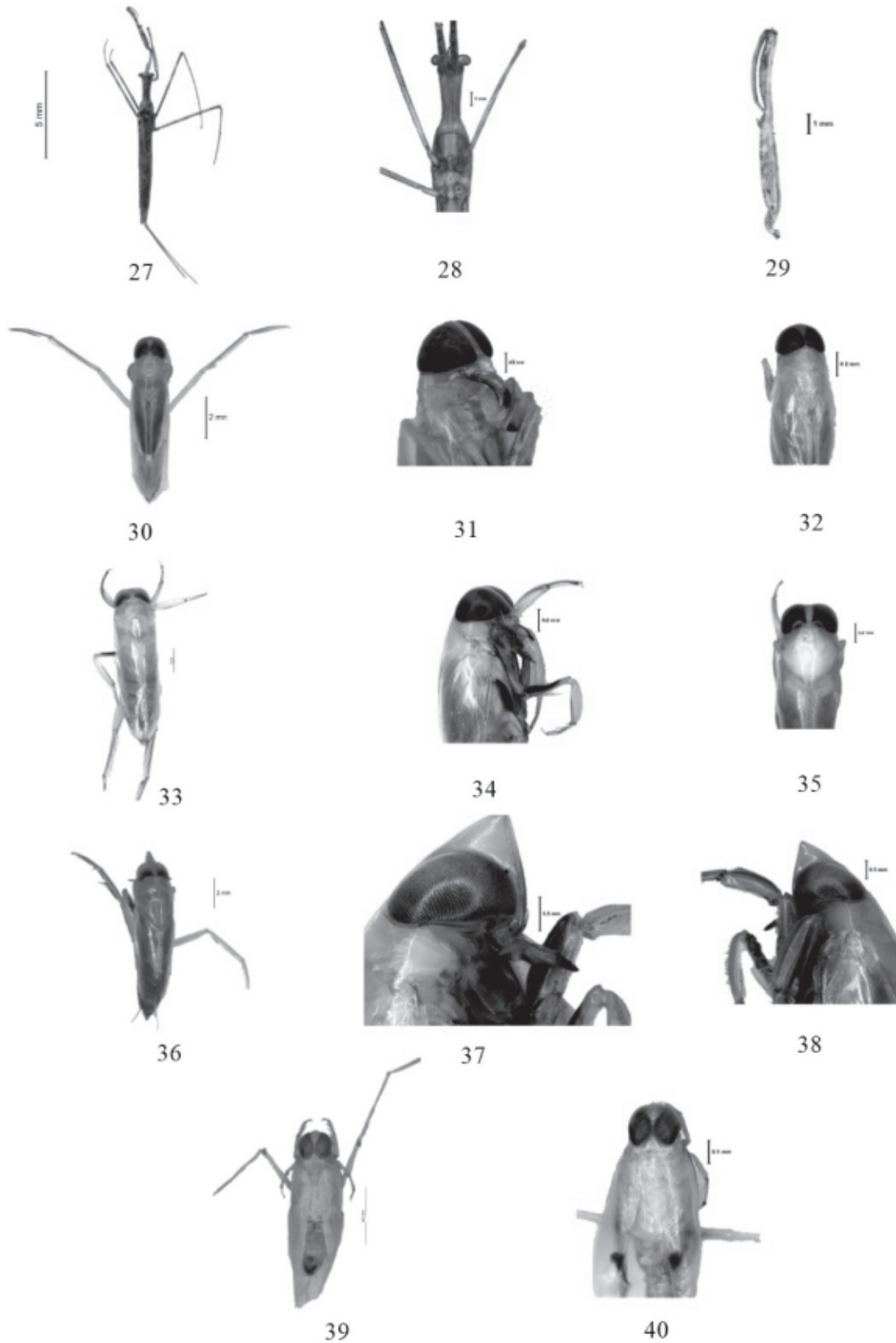
Material examined: 21 examples (13female, 8 male), Station 3, Purba Krishnapur village, Arambagh, West Bengal, 22.8557411N, 87.8937146E, 23.iv.2023.

Diagnosis: Body whitish with reddish holoptic eyes which forms an ocular commissure (Fig. 39). Claval suture present. Antero lateral margin of prothorax foveate (Fig. 40). The membrane and hind wings are fully developed.

Distribution: India, Australia, Indonesia, Malaysia, New Guinea, Sri Lanka, Africa, Taiwan, and Philippines

Discussions

Mundeswari River is a branch river of the Damodar River. The Damoder River is known as the Sorrow of West Bengal for its destructive flood activity. Under Damodar Valley Corporation, four dams and a barrage were constructed to hold water and divert the water from the barrage through a canal to the right and left banks of the river for irrigation⁷. There are a significant seasonal difference present in Water quality parameter of the Mundeswari river⁶. With the impact of seasonal changes on the diversity and distribution of aquatic fauna, our endeavor is to investigate the diversity of aquatic bugs in the study area during the pre-monsoon season. During the pre-monsoon season, this river is like a small lake, so the volume and velocity of water



Figs. : 27-29: *Ranatra varipesatropa*, 27, habitus; 28, sternum; 29, fore femora. Figs. : 30-32: *Anisops breddini*, 30, habitus; 31, rostral prong; 32, eyes. Figs. : 33-35: *Anisops barbatus*, 33, habitus; 34, rostral prong; 35, head. Figs. : 36-38: *Anisops bouvieri*, 36, habitus; 37, rostral prong; 38, Head. Figs. : 39-40: *Nychia sappho*, 39, habitus; 40, prothorax

are very low and due to extensive anthropogenic activities, the water quality becomes deteriorated. Consequently, the water stagnates, and lentic species

such as *Diplonychus annulatus*, *Anisops breddini*, and *Anisops bouvieri* thrive abundantly in this water during the pre-monsoon season.

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