Indian Journal of Ecology (2024) 51(2): 421-426
DOI: https://doi.org/10.55362/IJE/2024/4253

Manuscript Number: 4253
NAAS Rating: 5.38

New State Records of Water Beetles (Insecta: Coleoptera) from Dhurwa Dam, Ranchi, Jharkhand, India

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Abstract: With over, 13,000 species globally, water beetles exist in almost all types of freshwater habitats, such as rivers, springs, lakes, ditches, puddles, seeps, and groundwater. We examined over 121 water beetle samples from Dhurwa Dam, situated in Indian state of Jharkhand. The identification of the specimens yielded 15 species belonging to 12 genera and 3 families, Noteridae (1 species), Dytiscidae (6 species) and Hydrohilidae (8 species), which are reported for the first time from Dhurwa Dam. Additionally, *Cybister sugillatus* Erichson, 1834, *Leiodytes orissaensis* (Vazirani, 1969) and *Sternolophus rufipes* (Fabricius, 1792) are reported for the first time from Chota Nagpur Plateau in Jharkhand state. These results are based on recent collections, including observation notes on the species habitat. This study is intended to contribute to an appropriate discussion of the diversity of water beetles in the future. With intensive surveys of unexplored areas such as the Chota Nagpur Plateau in the state of Jharkhand, more species of water beetles are expected in the future.

Keywords: Dhurwa Dam, Habitat, Freshwater biodiversity, New record, Water beetles

Water beetles exist in almost all types of freshwater habitats, such as rivers, springs, lakes, ditches, puddles, seeps, and groundwater and vary significantly in size, length and habits. They play several important roles in aquatic ecosystems, contributing to their overall health and balance through their role in nutrient cycling, environmental monitoring, and food webs (Akünal and Aslan 2017). The beetles of the family Dytiscidae are ubiquitous predators in most freshwater habitats, impacting prey populations and other ecological properties of aquatic food webs (Culler et al 2014). Numerous studies have confirmed the role of adult and larval caterpillars in the diet of birds, particularly in water-associated bird species (Culler et al 2014). They also have potential as biological control agents of mosquitoes and demonstrate synergistic effects on mosquito populations (Freitag 2015).

Of the over 13,000 aquatic beetle species discovered worldwide, India represents over 776 species belonging to 137 genera and 17 families in three suborders (Komarek 2003, Jäch and Balke 2008, Chandra et al 2017). Of the four suborders of Coleoptera, the suborder Myxophaga is actually aquatic, while 8 of the 11 extant families of Adephaga are considered aquatic: Gyrinidae, Haliplidae, Meruidae, Noteridae, Amphizoidae, Aspidytidae, Hygrobiidae, and Dytiscidae. As for Polyphaga, the largest suborder of Coleoptera, only 13 of the 150 families are considered truly aquatic: Helophoridae, Epimetopidae, Hydrochidae, Spercheidae, Hydrophilidae, Hydraenidae, Scirtidae, Elmidae, Dryopidae, Lutrochidae, Psephenidae, Cneoglossidae and Eulichadidae.

In recent surveys at Chota Nagpur Plateau in Jharkhand state, we collected water beetle samples from Dhurwa Dam in Jharkhand using various collection methods and assigned them to 15 species. Apart from this, and the few recent studies by Sonali et al (2022), the water beetle fauna of Jharkhand is largely known through works by Nahar (2004) and Vazirani (1968, 1970a, 1970b), which are rather older and do not contain illustrations to identify the species. The purpose of this work is to document and report water beetles from Dhurwa Dam, Jharkhand for the first time, complementing the new geographical distribution in this ecologically significant plateaus. The species are provided with their valid names and their distribution in India and outside India are also reviewed.

MATERIAL AND METHODS

The materials for the present study were collected from Dhurwa Dam (23.288694N, 85.251212E), which is a water reservoir on the ring road of Ranchi district, Jharkhand, built over the Subarnarekha River. The climate is subtropical, and survey was conducted during month of February when climate remain cool and dry and temperatures range from 10°C to 25°C during day. A long-handled D- aquatic net with a 30 cm mouth and 1 mm mesh and small hand sieve was used for collecting the specimens. A total of 121 specimens were collected in 70% ethyl alcohol. After cleaning, the specimens

were stretched, pinned and dried in insect drying chamber for at least 2 days in the laboratory. Male specimens were dissected for examining the male genitalia. After 8–10 hours in 10% KOH at room temperature, male genitalia were transferred to a drop of distilled water, and the cleaned genitalia were subsequently glued on hard cards and pinned along with the specimen. Habitus photographs were taken using a Leica DMC 4500 microscope. The specimens were identified up to the species level by using available literature. For Dytiscidae, the literary works of Vazirani (1968) and Jiang et al (2023) were referred; for Noteridae Toledo (2008) was followed and for Hydrophilidae Schödl (1993), Jia and Wang (2010), and Nasserzadeh and Komarek (2017) were referred. The specimens are deposited in the Zoological Survey of India, Kolkata (NZSI).

RESULTS AND DISCUSSION

A total of 121 examples were examined and identified using morpho-taxonomic approach. Identification of collected water beetle samples from Dhurwa Dam revealed a total of 15 species belonging to 12 genera and 3 families, Noteridae (1 species), Hydrophilidae (8 species) and Dytiscidae (6 species). The species account of the recorded species from the study area is as follows:

Suborder Adephaga Schellenberg 1806

Family Noteridae Thomson 1860

Subfamily Noterinae Thomson 1860

Tribe Noterini Thomson 1860

1. *Canthydrus laetabilis* (Walker, 1858) (Fig. 1a)

Material examined: India: Jharkhand, Ranchi, Dhurwa Dam, 23.2898°N, 85.2490°E, 08.ii.2022, 9 exs., leg. Shipra Sonali [NZSI].

Distribution in India: Andhra Pradesh, Assam Bihar, Delhi, Gujarat, Himachal Pradesh Jammu and Kashmir, Jharkhand, Kerala Madhya Pradesh, Maharashtra, Meghalaya, Odisha, Punjab, Puducherry, Rajasthan, Sikkim, Telangana, Tripura, Uttarakhand, Uttar Pradesh, and West Bengal (Vazirani 1968, Ghosh et al 2023). Elsewhere: Bangladesh, Myanmar, Nepal and Pakistan (Nilsson 2011).

Remarks: The species is widespread in India. The samples in the present study were collected from slow-moving water on the sides of the dam with vegetation growth. The species has also been reported from Hazaribagh Wildlife Sanctuary, Ranchi and West Singhbhum districts of Jharkhand (Vazirani 1968).

Family Dytiscidae Leach, 1815

Subfamily Cybistrinae Sharp, 1880

Tribe Cybistrini Sharp, 1880

2. *Cybister* (*Cybister*) *tripunctatus lateralis* (Fabricius 1798) (Fig. 1b)

Material examined: India: Jharkhand, Ranchi, Dhurwa Dam, 23.2898°N, 85.2490°E, 08.ii.2022, 8 exs., leg. Shipra Sonali [NZSI].

Distribution in India: Andaman & Nicobar Islands, Andhra Pradesh, Assam, Delhi, Gujarat, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Odisha, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, and West Bengal. Elsewhere: Afghanistan, Bangladesh, Bhutan, Myanmar, Nepal, Pakistan, Sri Lanka, China, Cyprus, Iran, Iraq, Japan, Kyrgyzstan, Mongolia, Russia, Syria, Tajikistan, Turkey, Turkmenistan, Uzbekistan, and Europe (Ghosh and Nilsson 2012).

Remarks: This species is widespread in artificial habitats such as irrigation canals, flooded rice fields, open swamps, fish ponds and ornamental ponds (Jiang et al 2023). They are predators and are considered pests in fish farming because they attack fish fry and parts of aquatic food webs. The species was reported by Vazirani (1968) from Dumka, Hazaribagh, Ranchi and West Singhbhum districts of Jharkhand.

3. *Cybister* (*Melanectes*) *sugillatus* Erichson, 1834 (Fig. 1c)

Material examined: India: Jharkhand, Ranchi, Dhurwa Dam, 23.2898°N, 85.2490° E, 08.ii.2022, 6 exs., leg. Shipra Sonali [NZSI].

Distribution in India: Andaman and Nicobar Islands (Great Nicobar Island), Assam, Bihar, Himachal Pradesh, Jharkhand (new record), Madhya Pradesh, Maharashtra, Manipur, Odisha, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, and West Bengal. Elsewhere: Afghanistan, Bhutan, Myanmar, Nepal, Pakistan, Sri Lanka, China, Indonesia, Japan, and Philippines (Ghosh and Nilsson 2012, Ghosh and Gupta 2022).

Remarks: This species is reported for the first time from Jharkhand. At the collection site, 6 specimens were collected along with 8 specimens of *C. tripunctatus lateralis*.

Subfamily Dytiscinae Leach, 1815

Tribe Hydaticini Sharp, 1880

4. *Hydaticus ricinus* Wewelka 1979 (Fig. 1d)

Material examined: India: Jharkhand, Ranchi, Dhurwa Dam, 23.2898°N, 85.2490°E, 08.ii.2022, 7 exs., leg. Shipra Sonali [NZSI].

Distribution in India: Assam, Jharkhand, and Tamil Nadu. Elsewhere: Afghanistan, Bhutan, China, Laos, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, and Vietnam (Ghosh and Nilsson 2012, Sonali et al 2022).

Remarks: This is the first report for Ranchi district, Jharkhand, previously reported by Sonali et al (2022) from Hazaribagh Wildlife Sanctuary. Samples were collected from

the sides of the reservoir where there was vegetation growth and water seeped into surrounding farms.

Subfamily Hydroporinae Aubé, 1836

Tribe Bidessini Sharp, 1880

5. *Hydroglyphus inconstans* (Régimbart 1892) (Fig. 1e)

Material examined: India: Jharkhand, Ranchi, Dhurwa Dam, 23.2898°N, 85.2490°E, 08.ii.2022, 16 exs., leg. Shipra Sonali [NZSI].

Distribution in India: Andaman & Nicobar Islands, Andhra Pradesh, Assam, Goa, Gujarat, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Odisha, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, and West Bengal. Elsewhere: Bangladesh, Bhutan, Myanmar, Nepal, Sri Lanka, China, Indonesia, Japan, Malaysia and Taiwan (Ghosh and Nilsson 2012).

Remarks: This species was reported by Vazirani (1968) from Hazaribagh, Ranchi and West Singhbhum districts of Jharkhand.

6. *Leiodytes orissaensis* (Vazirani 1969) (Fig. 1f)

Material examined: India: Jharkhand, Ranchi, Dhurwa Dam, 23.2898°N, 85.2490°E, 8.ii.2022, 4 exs., leg. Shipra Sonali [NZSI].

Distribution in India: Gujarat, Jharkhand (new record), Odisha, and West Bengal. Elsewhere: Bangladesh and Pakistan (Ghosh and Nilsson 2012).

Remarks: This is the first record of this species from Jharkhand. *Leiodytes indicus* (Régimbart, 1892) is the other species in the genus reported from Jharkhand by Vazirani (1968).

Subfamily Laccophilinae Gistel, 1856

Tribe Laccophilini Gistel, 1856

7. *Laccophilus inefficiens* (Walker 1859) (Fig. 2a)

Material examined: India: Jharkhand, Ranchi, Dhurwa Dam, 23.2898°N, E 85.2490°E, 08.ii.2022, 5 exs., leg. Shipra Sonali [NZSI].

Distribution in India: Andaman & Nicobar Islands, Andhra Pradesh, Assam, Bihar, Goa, Gujarat, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Odisha, Punjab, Rajasthan, Sikkim, Tripura, Tamil Nadu, Uttarakhand, Uttar Pradesh, and West Bengal. Elsewhere: Bangladesh, Bhutan, Myanmar, Nepal, Pakistan, Sri Lanka, Indonesia, Iran, and Malaysia (Ghosh and Nilsson 2012).

Remarks: This species was previously reported by Vazirani (1968) from Deoghar, Hazaribagh, Ranchi and West Singhbhum districts of Jharkhand.

Suborder Polyphaga Emery, 1886

Family Hydrophilidae Latreille, 1802

Subfamily Hydrophilinae Latreille, 1802

Tribe Berosini Mulsant, 1844

8. *Berosus* (*Enoplurus*) *chinensis* Knisch, 1992 (Fig. 2b)

Material examined: India: Jharkhand, Ranchi, Dhurwa Dam, 23.2898°N, 85.2490°E, 08.ii.2022, 8 exs., leg. Shipra Sonali [NZSI].

Distribution in India: Jammu & Kashmir, Jharkhand, Madhya Pradesh, Puducherry, Rajasthan, Sikkim, and Uttar Pradesh (Sonali et al 2022, Ghosh et al 2023). Elsewhere: Afghanistan, Arabian Peninsula, Bangladesh, China, Iran, Myanmar, Nepal, Pakistan, Thailand and Vietnam (Hansen 1999).

Remarks: This species was recently detected in the Hazarabagh Wildlife Sanctuary by Sonali et al (2022).

9. *Berosus* (*Berosus*) *pulchellus* MacLeay, 1825 (Fig. 2c)

Material examined: India: Jharkhand, Ranchi, Dhurwa Dam, 23.2898°N, 85.2490°E, 08.ii.2022, 23 exs., leg. Shipra Sonali [NZSI].

Distribution in India: Andaman & Nicobar Islands, Andhra Pradesh, Assam, Bihar, Dadra Nagar Haveli, Daman, Delhi, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Odisha, Puducherry, Punjab, Rajasthan, Sikkim, Tamil Nadu, Telangana, Uttarakhand, Uttar Pradesh, and West Bengal. Elsewhere: Australia, Bangladesh, China, Indochina, Indonesia, Iran, Japan, Laos, Saudi Arabia, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Taiwan, Thailand, and Vietnam (Schödl 1993, Sonali et al 2022, Ghosh et al 2023).

Remarks: This is a widespread species in the Indo Malayan, Palearctic and Australasian geographical regions.

10. *Regimbartia attenuata* (Fabricius 1801) (Fig. 2d)

Material examined: India: Jharkhand, Ranchi, Dhurwa Dam, 23.2898°N, 85.2490°E, 08.ii.2022, 2 exs., leg. Shipra Sonali [NZSI].

Distribution in India: Andaman & Nicobar Islands, Andhra Pradesh, Bihar, Dadra Nagar Haveli, Diu, Gujrat, Maharashtra, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Madhya Pradesh, Manipur, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, West Bengal, and Telangana (Ghosh and Hedge 2013, Sonali et al 2022). Elsewhere: Afghanistan, Australia, China, Cambodia, Indonesia, Japan, Malaysia, Myanmar, New Guinea, Oman, Pakistan, Philippines, South Korea, Sri Lanka, Taiwan, Thailand, Vietnam, and Yemen (Hansen 1999).

Remarks: This is a widespread species in the Indo Malayan, Palearctic and Australasian geographical regions and in the case of India, it is one of the most common water beetle species.

Tribe Hydrophilini Latreille, 1802

11. *Hydrophilus olivaceous* (Muller, 1764) (Fig. 2e)

Material examined: India: Jharkhand, Ranchi, Dhurwa Dam, 23.2898°N, 85.2490°E, 08.ii.2022, 1 ex., leg. Shipra Sonali [NZSI].

Distribution in India: Andhra Pradesh, Bihar, Chhattisgarh, Haryana, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Odisha, Rajasthan, Tamil Nadu, Telangana, and West Bengal. Elsewhere: China, Nepal, Myanmar, Malaysia, Thailand, and Vietnam (Hansen 1999, 2004, Mukhopadhyay and Sengupta 2004).

Remarks: This species is mainly distributed in peninsular India, with few records from Palearctic regions such as China and Nepal.

12. *Sternolophus decens* Zaitzev, 1909 (Fig. 2f)

Material examined: India: Jharkhand, Ranchi, Dhurwa Dam, 23.2898°N, 85.2490°E, 08.ii.2022, 11 exs., leg. Shipra Sonali [NZSI].

Distribution in India: Bihar, Jharkhand, Madhya Pradesh, Maharashtra, and Uttarakhand. Elsewhere: Djibouti, Oman, Saudi Arabia, United Arab Emirates, Iran, Pakistan, and Nepal (Hansen 1999, Nasserzadeh and Komarek 2017, Sonali et al 2022).

Remarks: This species, which is only known from a few places in India, is even distributed as far as the Arabian Peninsula.

13. *Sternolophus rufipes* (Fabricius 1792) (Fig. 2g)

Material examined: India: Jharkhand, Ranchi, Dhurwa Dam, 23.2898°N, 85.2490°E, 08.ii.2022, 6 exs., leg. Shipra Sonali [NZSI].

Distribution in India: Assam, Dadra Nagar Haveli and Diu, Jammu & Kashmir, Jharkhand (new record), West Bengal, Sikkim, Tamil Nadu, Maharashtra, Meghalaya, Uttar Pradesh, Manipur, Andhra Pradesh, Bihar, Punjab, Tripura, Delhi, Madhya Pradesh, Rajasthan, Uttarakhand, Himachal Pradesh, Odisha, Haryana, and Kerala. Elsewhere: China, Indonesia, Philippines, Sri Lanka, Taiwan, Thailand, Vietnam, Japan, South Korea, and Myanmar (Hansen 1999, Nasserzadeh and Komarek 2017).

Remarks: The present record is the first record of this species from the state of Jharkhand. This is a widespread species in the Indomalayan and Palearctic geographical regions and is one of the most common water beetle species in India.

Subfamily Acidocerinae Zaitzev, 1908

Tribe Acidocerini Zaitzev, 1908

14. *Helochares pallens* (MacLeay 1825) (Fig. 2h)

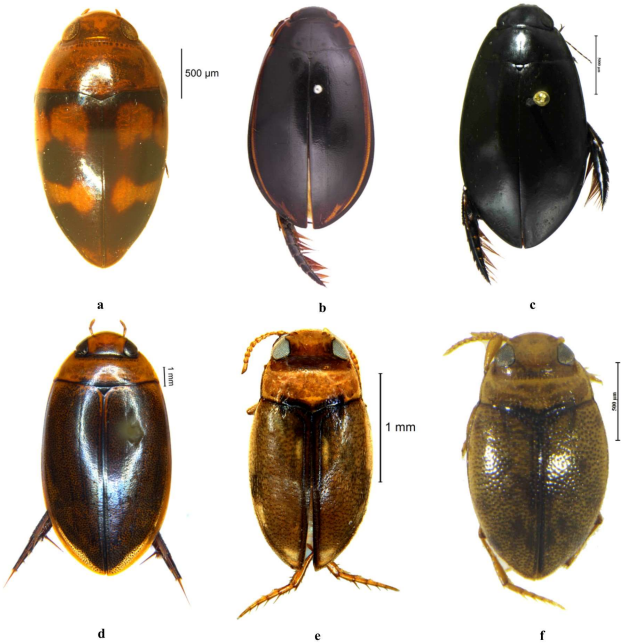

Fig. 1. Habitus of water beetles. (a) *Canthydrus laetabilis*. (b) *Cybister tripunctatus lateralis*. (c) *Cybister sugillatus*. (d) *Hydaticus ricinus*. (e) *Hydroglyphus inconstans*. (f) *Leiodytes orissaensis*

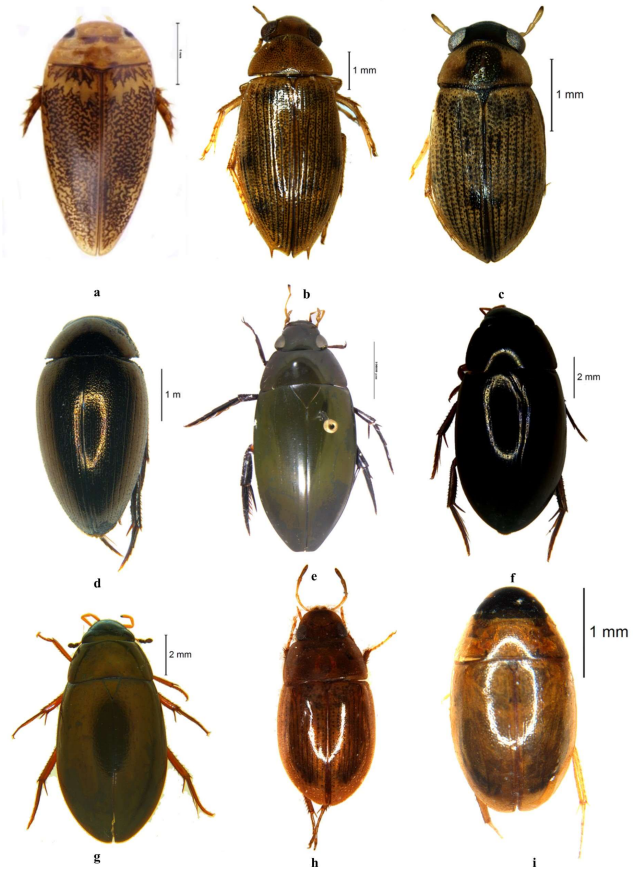

Fig. 2. Habitus of water beetles. (a) *Laccophilus inefficiens*. (b) *Berosus chinensis*. (c) *Berosus pulchellus*. (d) *Regimbartia attenuata*. (e) *Hydrophilus olivaceous*. (f) *Sternolophus decens*. (g) *Sternolophus rufipes*. (h) *Helochares pallens*. (i) *Enochrus esuriens*

Material examined: India: Jharkhand, Ranchi, Dhurwa Dam, 23.2898°N, 85.2490°E, 08.ii.2022, 5 exs., leg. Shipra Sonali [NZSI].

Distribution in India: Andhra Pradesh, Assam, Bihar, Dadra Nagar Haveli, Daman and Diu, Jammu and Kashmir, Jharkhand, Uttar Pradesh, Madhya Pradesh, Manipur, Sikkim, Telangana, and West Bengal (Mukhopadhyay and Sengupta 2004, Ghosh et al 2018, Sonali et al 2022). Elsewhere: Afrotropical, Benin, Botswana, Chad, Congo, Ethiopia, Ghana, Guinea, Kenya, Madagascar, Namibia, Rwanda, South Africa, Sudan, Tanzania, Yemen, and Zambia (Hansen 1999).

Remarks: This is a widespread species in the Indo-Malayan, Palearctic and Afrotropical geographical regions and in the case of India, it has also been recorded in the Himalayas and the Indian peninsula.

15. *Enochrus* (*Methydrus*) *esuriens* (Walker 1858) (Fig. 2i)

Material examined: India: Jharkhand, Ranchi, Dhurwa Dam, 23.2898°N, 85.2490°E, 08.ii.2022, 7 exs., leg. Shipra Sonali [NZSI].

Distribution in India: Andaman & Nicobar Island (Nicobar Island), Andhra Pradesh, Dadra Nagar Haveli, Daman, Jammu & Kashmir, Jharkhand, Madhya Pradesh, Manipur, Maharashtra, Odisha, Punjab, Sikkim, Telangana, Uttarakhand, Uttar Pradesh, and West Bengal. Elsewhere: Bangladesh, China, Indonesia, Malaysia, Philippines, Sri Lanka, Thailand, Vietnam, Japan, Saudi Arabia, South Korea, Australia, Fiji, New Caledonia, New Guinea, Solomon Island, and Vanuatu (Hansen 1999, Mukhopadhyay and Sengupta 2004, Sonali et al 2022).

Remarks: This is a widespread species in the Indo-Malayan, Palearctic and Afrotropical geographical regions and in the case of India, it has also been recorded in the Himalayas and the Indian peninsula.

A total of 121 examples were studied from Dhurwa Dam, Jharkhand, India using a morpho-taxonomic approach. Identification of collected water beetle samples revealed a total of 15 species belonging to 12 genera and 3 families, Noteridae (1 species), Hydrophilidae (8 species) and Dytiscidae (6 species). Dytiscidae comprises the genera, *Cybister* Curtis (2 species), *Hydaticus* Leach (1 species), *Laccophilus* Leach (1 species), *Leiodytes* Guignot (1 species), and *Hydroglyphus* Motschulsky (1 species), and Hydrophilidae *Berosus* Leach (2 species), *Enochrus* Thomson (1 species), *Helochares* Mulsant (1 species), *Hydrophilus* Geoffroy (1 species), *Regimbartia* Zaitzev (1 species) and *Sternolophus* Solier (2 species). Noteridae includes only a single species. All of these species have been reported for the first time from the study area. However, *Cybister* (*Melanectes*) *sugillatus* Erichson, 1834, *Leiodytes orissaensis* (Vazirani, 1969), and *Sternolophus rufipes* (Fabricius, 1792) have been recorded for the first time from the state of Jharkhand. Similar studies by Sonali et al. (2022) reported 38 water beetle species from 22 genera, six subfamilies and three families from Hazaribagh Wildlife Sanctuary, Jharkhand. Insect diversity in Indian freshwater includes more than 5014 species/subspecies in 9 major groups (Chandra and Gupta 2022a, b), which are severely affected by over-exploitation, water pollution, flow modifications, habitat destruction or degradation, invasion of exotic species and hydropower (Gatti 2016). The water bodies in Ranchi district are polluted by domestic sewage and runoff from agricultural areas and hospitals (Kirti et al 2012), which is likely to impact insect communities in the region. Therefore, measures must be taken at the administrative level for better biodiversity management in the region.

CONCLUSIONS

The present study on water beetles from Dhurwa Dam, Jharkhand, India has provided valuable insights into the diversity and distribution of these species in the study area. A total of 15 species from 12 genera and 3 families, Noteridae (1 species), Hydrophilidae (8 species) and Dytiscidae (6 species), provide an overview of the water beetle community in the region, with 3 new records from the state of Jharkhand. The study not only presents the current diversity and distribution of water beetles in the Chota Nagpur region of the Indian state of Jharkhand, but also highlights the urgency of conservation efforts to ensure the continued existence of these species. The present work resulted in a database of aquatic beetles that will assist in future work to conserve, conserve and expand the local biodiversity of these beetles.

AUTHORS CONTRIBUTION

S. Sonali: Collection, preservation and identification of specimens, and writing of the manuscript, P. Basu: Identification and writing of the manuscript, S.K. Ghosh: Identification of specimens, D. Gupta: Identification of specimens and writing the manuscript.

ACKNOWLEDGEMENT

Authors would like to thank Director, Zoological Survey of India, Kolkata for providing necessary facilities for the research work. Shipra Sonali is thankful to the Council of Scientific & Industrial Research for the financial support in the form of CSIR-UGC JRF (File number- 09/1181(0016)/2021-EMR-I). The present communication is part of Ph.D. thesis work of the first author.

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Received 20 September, 2023; Accepted 12 March, 2024