

Diversity and Distribution of Aquatic Beetles (Insecta: Coleoptera) in Kawal Tiger Reserve, Telangana, India

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To Cite:

Jaiswal D, Kumar D, Shankar S, Madasamy K. Diversity and Distribution of Aquatic Beetles (Insecta: Coleoptera) in Kawal Tiger Reserve, Telangana, India. *Species*, 2022, 23(71), 277-284

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Peer-Review History

Received: 15 March 2022

Reviewed & Revised: 19/March/2022 to 19/May/2022

Accepted: 20 May 2022

Published: 23 May 2022

Peer-Review Model

External peer-review was done through double-blind method.



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ABSTRACT

Aquatic beetle's fauna of Kawal tiger reserve has been studied between years 2018 to 2022. It documents around 41 species belonging to four families. The family Dytiscidae shows more number of species richness and followed by Hydrophilidae, Gyrinidae and Noteridae. The species *Berosus indicus*, *B. pulchellus*, *Cybister tripunctatus*, and *Dineutes indicus* commonly *Rhantus taprobanicus*, *Gyrinus convexiuscules*, *Coelostoma bhutanicum* and *Lacconectus regimbarti* were rarely distributed in tiger reserve. The sampling has been carried out around 25 stations of tiger reserve, in which Pathatharlapadu has 17 species Dharmajipet 13 species comparatively higher than that of other sampling stations. Out of 41 species 39 has been reporting from first from the tiger reserve.

Keywords: Taxonomy, Diversity, Kawal Tiger Reserve, Documentation, Systematic list, Telangana.

1. INTRODUCTION

Aquatic beetle diversity consists of 13000 species, which are distributed throughout the globe (Andrew and Short, 2017), of which 776 species of aquatic coleopteran documented from India belonging to 137 genera, 17 families and 3 suborders. The family Dytiscidae had maximum number (256) of species, followed by Hydrophilidae, Scirtidae and Gyrinidae (Chandra *et al.*, 2017). Out of 4 suborders of Coleoptera, the suborder Myxophaga is truly aquatic whereas 8 of the 11 extant families of Adephaga are regarded as truly aquatic (Gyrinidae, Haliplidae, Meruidae, Noteridae, Amphizoidae, Aspidytidae, Hygrobiidae, Dytiscidae). As far as Polyphaga is concerned, the largest suborder of Coleoptera, only 13 of the 150 families are regarded as truly aquatic (Helophoridae, Epimetopidae, Hydrochidae, Spercheidae, Hydrophilidae, Hydraenidae, Scirtidae, Elmidae, Dryopidae, Lutrochidae, Psephenidae, Cneoglossidae, and Eulichadidae) Jäch&Balke (2008). The family members of Dytiscidae are commonly known as predacious diving beetles (Roughley and Larson, 2001), members of Hydrophilidae are known as water

scavenger beetles (Tassell and Van, 2001), Gyrinidae beetles are commonly known as whirligig beetles (Roughley, 2001a), The members of Noteridae family are called as burrowing water beetles (Miller, 2009). Aquatic beetles play a vital role in maintaining the food chain and food web. They are chosen as biological indicators because of their quick response to changes in habitations and pollutions (Lundkvist et al., 2003, Culler and Lamp, 2009).

Kawal Tiger Reserve is located in north part of Telangana state viz Nirmal, Mancherial and Adilabad districts. It has the catchment of the river Godavari and Kadam, which are flowing towards south of the tiger reserve. The forest type is southern tropical deciduous and more than 70% of vegetation is teak. Reserve forms the southernmost tip of the central Indian Tiger landscape (Srinivasulu, 2003). Studies on beetles from this tiger reserve not available, the current study aims to explore the aquatic beetle species composition and distribution from Kawal Tiger Reserve, Telangana.

2. MATERIALS AND METHODS

The study was carried out between years 2018 to 2022 and aquatic beetles specimens collected from 25 different aquatic habitats, which includes Temporary pools, Ponds, Streams and Reservoirs Tab (1).The beetle collections were made by using D- Shaped Insect net. Collected specimens were preserved in 70% Ethanol. Leica EZ4 microscope was used for specimen observation and dissections, Leica M205A used from photographs. Identification of the specimens followed by Miller & Bergsten (2016), Vazirani (1967, 1969, 1969a, 1969b, 1969c), Ghosh & Nilsson (2012), Jäch & Ji (1998, 2003). Identified specimens were deposited in the National Zoological Collection of Zoological Survey of India, Freshwater Biology Regional Centre, Hyderabad.

Table 1: List of sampling stations in Kawal Tiger Reserve.

Sl. No	Location Name	Latitude	Longitude
1	Kunthala waterfalls	19.2045 N	78.5035 E
2	Pembi	19.2479 N	78.5947 E
3	Pulgampandri	19.2483 N	78.5913 E
4	Kadem	19.1013 N	78.7783 E
5	Indanpelly	19.1583 N	78.8816 E
6	Tappalguda	19.0991 N	79.0441 E
7	Dharmajipet	19.1583 N	78.8812 E
8	Utnur	19.3572 N	78.7808 E
9	Kadem Reservoir	19.1137 N	78.7670 E
10	Udumpur	19.1984 N	78.8868 E
11	Gangapur	19.2542 N	78.7860 E
12	Gandi Pocharam Temple	19.2546 N	78.8207 E
13	Pathatharlapadu	19.0897 N	78.6305 E
14	Kalleda	19.1502 N	78.8644 E
15	Balandpur	19.3191 N	79.1016 E
16	SavathulaGunda Waterfall	19.3091 N	79.0936 E
17	Pochara Waterfall	19.3427 N	78.3869 E
18	Solar Peti	19.1262 N	79.0995 E
19	Morigudem	19.1347 N	78.9595 E
20	Laxmipur	19.6968 N	78.6578 E
21	MaisammaLoddhi	19.2075 N	78.9875 E
22	Allampally	19.2534 N	78.7873 E
23	Thatiguda	19.2471 N	78.5948 E
24	Vattivagu reservoir	19.2683 N	79.2525 E
25	Beersaipeta	19.3039 N	78.8168 E

3. RESULT AND DISCUSSION

A total of forty-one species of aquatic beetles from Kawal tiger reserve belonging to four families. The family Dytididae contributes high number of species with 25(61%) followed by Hydrophidae 7(17%) species, Gyronidae 6(15%) species and Noteridae with 3(15%) Fig (1) species. During the study period apart from 41 species four more species were also collected, which are belonging to the genus, *Hydrovatus*, *Hyphydrus* (Dytiscidae) *Hydrobiomorpha*, *Allocotocerus* (Hydrophilidae) and identification is in progress. The genus *Allocotocerus* Kraatz, 1883 measured 5.5- 6.25mm in size, characterized by globular shape and documented 27 species thought the globe in which 4 species known from India, single species *Allocotocerus leachi* know from south India i.e Tamilandu, and it's also found that studies on genus *Allocotocerus* limited not only from India but also from world. It requires also the taxonomic and molecular revision to bring out the current status of genus *Allocotocerus*. The genus *Hydrovatus*, *Coelostoma* were collected and documented for the first time from tiger reserve and also the state of Telangana. The location Pathatharlapadu were reported the highest number of species with 17, which because of high range of vegetation, wide variety of habitation and low range of human conflict. The species richness was followed by Darmajipet 13 species, Laxmipur 12 species, Thattiguda 11 species, Solar peti, Oblapur, Gangapur were reported 10 species respectively. Sampling station Pulgampanndri documented 9 species, Udampur, Gandhi Maissama temple stream, Vattivagu reservoir reported 8 species each. Beersaipeta reported 7 species, Kadam, Kunthala waterfall, Savthula Gunda waterfall and Kadam reported 6 species respectively. Pochera waterfall, Maissamma Loddi and Allempally documented 5 species respectively. Indenpally and Utnur were reported 5 species. The sampling station Banlanderpur reported a single species. *Berosusindicus* were most common species in tiger reserve it was observed from 11 different sampling stations then it followed by *B. pulchellus* 10 sampling stations, the genus *Berosus* shows wide variety of habitation, mostly found in low waters. In other hand *Dineutus indicus* is second most abundant species in reserve it was observed from 10 different locations, mostly found in fast flowing streams and waterfalls. *Cybister tripunctatus* large size predatory beetle found in 9 different sampling stations of tiger reserve. *Hydroglyphus flammulatus* is small predatory water beetles was observed more abundant and reported from 9 different locations. *Laccophilus sharpi*, *Peschetius quadricostatus* and *Sternolophus rufipes*, *Hydrophililus olivaceous*, *Orectochilus limbatus*, *Peschetius toxophorus*, *Hydrovatus seminaris* were found 8 and 7 different sampling stations respectively. *Rhantus taprobanicus*, *Gyrinus convexiuscules*, *Coelostoma bhutanicum* and *Lacconectus regimbarti* were documented from single sampling location respectively. *Coelostoma bhutanicum* and *Rhantus taprobanicus* are documented from collection locations Kunthala waterfall and Pathatharlapadu respectively. *Gyrinus convexiuscules* and *Lacconectus regimbarti* were collected from Solarpeti and Utnur respectively Fig (2). The genus *Peschetius* was first reported from not only from tiger reserve and also from Telanagana state (Deepa *et al.*, 2021). The state Telangana has been documented 59 species of aquatic beetles, which comparatively tiger reserve holds almost 65% aquatic beetle diversity (Chandra *et al.*, 2021). Kawal tiger reserve is one of the rich biodiversity regions in Telangana state, home for many vertebrates and invertebrates. In other hand tiger reserve ecosystem facing human encroachment and habitat distraction. However, kawal tiger need long term monitor to bring out the actual diversity of aquatic beetles and their distribution status. The present documentation is a base line study of aquatic beetle diversity in kawal tiger reserve, which may help in better understanding the species diversity and ecosystem management.

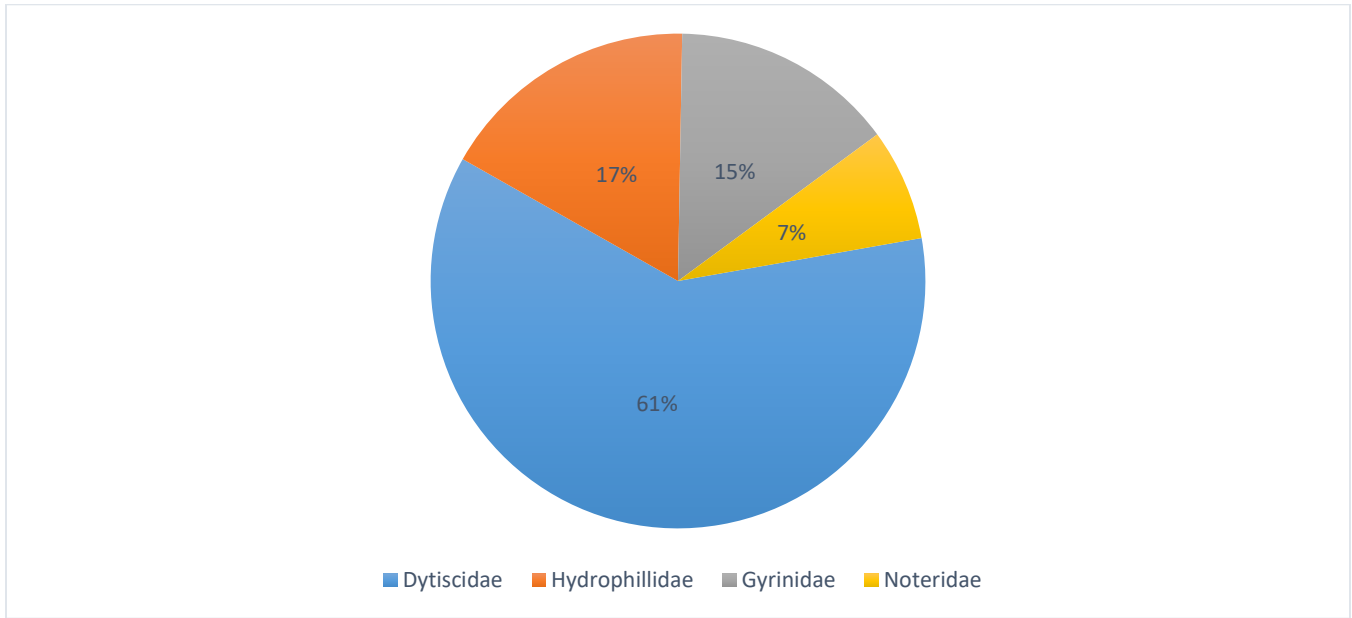


Figure 1: Family wise aquatic Beetle species composition of Kawal Tiger Reserve.

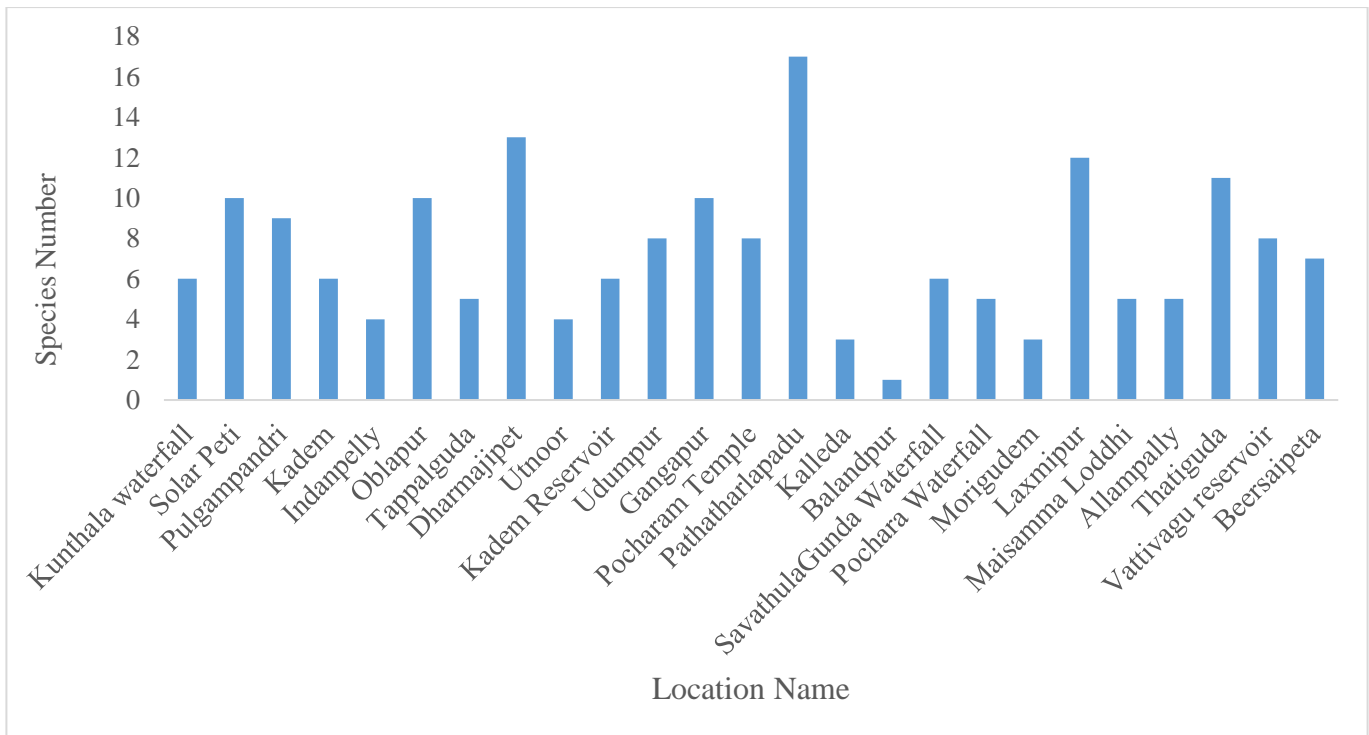


Figure 2: sampling station wise species diversity.

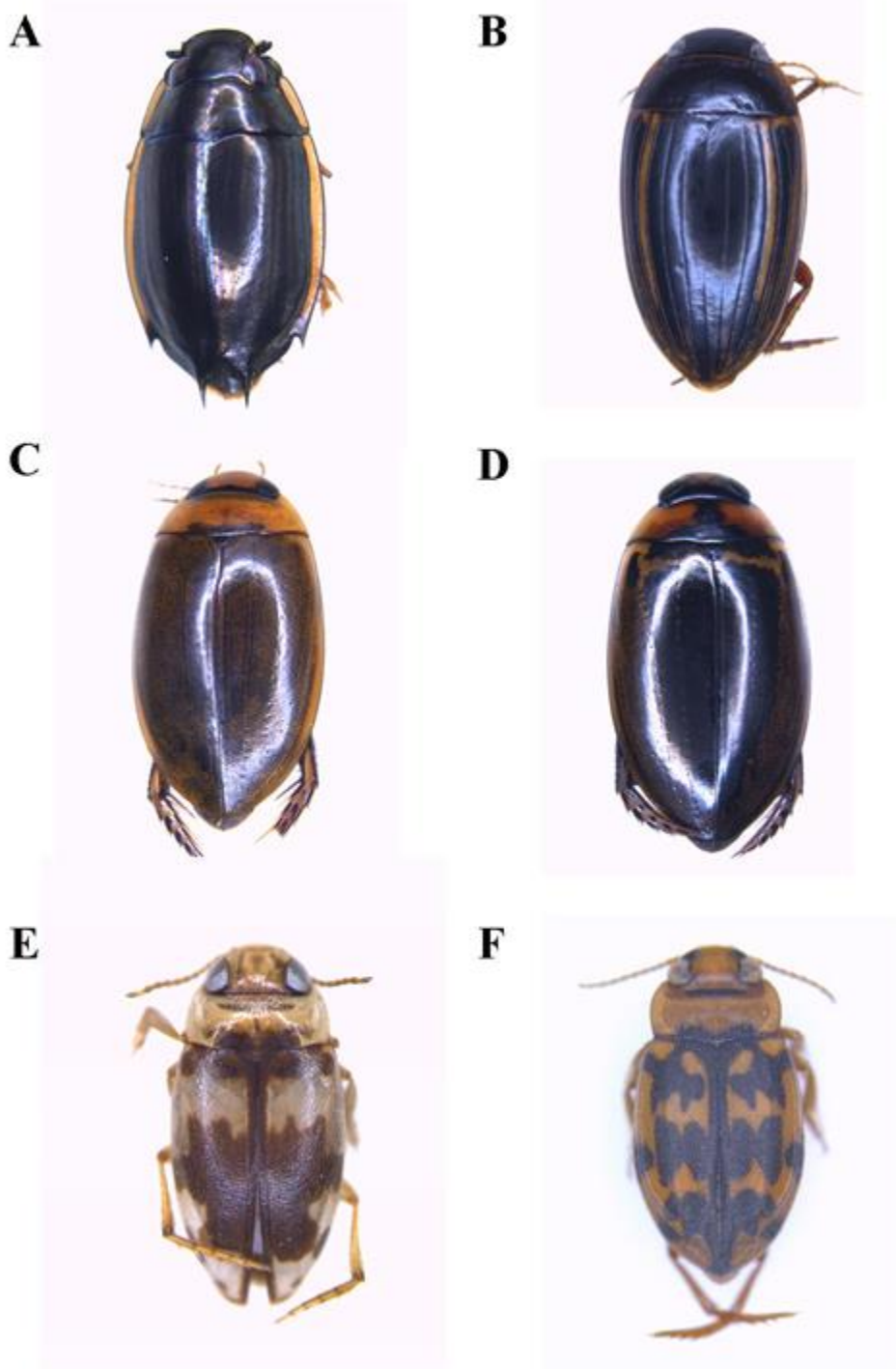


Figure 3: A- *Dineutus spinosus*, B- *Copelatus indicus*, C- *Hydaticus ricinus*, D- *Hydaticus luczonicus*, E- *Hydroglyphus flammulatus*, F- *Peschetius quadricostatus*.

SYSTEMATIC LIST

Phylum: Arthropoda

Class: Insecta

Order: Coleoptera

Family: **Noteridae**

Subfamily: Noterinae

Genus: *Canthydrus* Sharp, 1882

1. *Canthydrus flavus* (Motschulsky, 1855)

2. *Canthydrus laetabilis* Walker, 1882

Genus: *Neohydrocoptus* Motschulsky, 1859

3. *Neohydrocoptus* subvittatus

Family: **Dytiscidae**

Subfamily: Copelatinae

Genus: *Copelatus* Erichson, 1832

4. *Copelatus sociennus* Balfour-Browne, 1952

5. *Copelatus neelumae* Vazirani, 1973

6. *Copelatus indicus* Sharp, 1882

Subfamily: Colymbetinae

Genus: *Rhantus* Dejean, 1833

7. *Rhantus taprobanicus* Sharp, 1890

Genus: *Lacconectus* Motschulsky, 1855

8. *Lacconectus regimbarti* Brancucci, 1986

Subfamily: Laccophilinae

Genus: *Laccophilus* Leach, 1817

9. *Laccophilus flexuosus* Aube, 1838

10. *Laccophilus ceylonicus* Zimmermann, 1919

11. *Laccophilus parvulus* Aube, 1838

12. *Laccophilus sharpi* Regimbart, 1889

Subfamily: Hydroporinae

Genus: *Hydrovatus* Motschulsky, 1855

13. *Hydrovatus acuminatus* Motschulsky, 1859

14. *Hydrovatus seminarius* Motschulsky, 1859

Genus: *Hydroglyphus* Houlbert, 1934

15. *Hydroglyphus flammulatus* Sharp, 1854

Genus: *Hyphydrus* Illiger, 1802

16. *Hyphydrus renardi* Severin 1890

Genus: *Peschetius* Guignot, 1935

17. *Peschetius quadricostatus* (Aube, 1838)

18. *Peschetius toxophorus* Guignot, 1942

Genus: *Yola* Gozis, 1886

19. *Yola consanguinea* (Regimbert, 1892)

Subfamily: Dytiscinae

Genus: *Eretes* Castelnau, 1833

20. *Eretes sticticus* (Linnaeus, 1833)

Genus: *Hydaticus* Leach, 1817

21. *Hydaticus satoi satoi* Wewalka, 1975

22. *Hydaticus ricinus* Wewalka, 1979

23. *Hydaticus luczonicus* Aube, 1838

Genus: *Sandracottus* Sharp, 1882

24. *Sandracottus mixtus* (Blanchard, 1843)

25. *Sandracottus dejeani* (Aube, 1838)

Genus: *Rhantaticus* Sharp, 1882

26. *Rhantaticus congestus* (Klug, 1833)

Genus: *Cybister* Curtis, 1827

27. *Cybister (Meganectes) convexus* Sharp, 1882

28. *Cybister (Meganectes) tripunctatusasiaticus* Sharp, 1899

Family: **Gyrinidae**

Subfamily: Enhydrinae

Genus: *Dineutus* Macleay, 1825

Subgenus: *Dineutus (Protodineutus)* Ochs

29. *Dineutus (Protodineutus) indicus* Aube, 1838

Subgenus: *Dineutus (spinosodineutus)* Hatch, 1927

30. *Dineutus spinosus* Fabricius, 1781

Subfamily: Orectochilinae

Genus: *Orectochilus* Eschscholtz, 1833

Subgenus: *Orectochilus (Patrus)* Dejean, 1833

31. *Orectochilus (Patrus) discifer* (Walker, 1859)

32. *Orectochilus (Patrus) semivestitus* Guerin, 1893

33. *Orectochilus (Patrus) limbatus* Régimbart, 1883

Subfamily: Gyrininae

Genus: *Gyrinus* Geoffroy, 1762

34. *Gyrinus convexiusculus* Macleay, 1871

Family: **Hydrophilidae**

Subfamily: Hydrophilinae

Genus: *Hydrophilus* Leach, 1764

35. *Hydrophilus olivaceus* (Fabricius, 1781)

Genus: *Coelostoma* Brullé, 1835

Subfamily: Sphaeridiinae

36. *Coelostoma bhutanicum* Jayaswal, 1972

37. *Coelostomahorni* (Régimbart, 1902)

Genus: *Sternolophus* Solier, 1834

Subfamily: Hydrophilinae

38. *Sternolophus rufipes* (Fabricius, 1792)

39. *Sternolophus inconspicuus* (Nietner, 1865)

Genus: *Berosus* Leach, 1861

40. *Berosus indicus* Motschulsky, 1861

41. *Berosus pulchellus* Macleay, 1825

Acknowledgment: The authors are grateful to Director, Zoological Survey of India (ZSI), Kolkata, and to the Officer-in-Charge, ZSI, Hyderabad for providing necessary facilities and constant encouragement to carry out the work in a successful manner.

Authors' contribution: All authors have contributed equally to manuscript.

Ethical approval

Aquatic Beetles (Insecta: Coleoptera) was observed in the study from Kawal Tiger Reserve, Telangana, India. The Animal ethical guidelines are followed in the study for species observation & identification. Identified specimens were deposited in the National Zoological Collection of Zoological Survey of India, Freshwater Biology Regional Centre, Hyderabad, India.

Funding: This study has not received any external funding.

Conflicts of interests: The authors declare that there are no conflicts of interests.

Data and materials availability: All data associated with this study are present in the paper.

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