International Journal of Zoology Studies
www.zoologyjournals.com
ISSN: 2455-7269
Received: 09-09-2024, Accepted: 10-10-2024, Published: 25-10-2024
Volume 9, Issue 4, 2024, Page No. 38-42

Diversity and abundance of click beetles (Coleoptera: Elateridae) in Jhunjhunu district of Rajasthan, India

Rajmohan Meena[1*], Vinod Kumari[2]
[1] Department of Zoology, Govt. College, Jayal, Nagaur, Rajasthan, India
[2] Department of Zoology, University of Rajasthan, Jaipur, Rajasthan, India

Abstract
This survey provides updated information on the diversity and abundance of click beetles in the Jhunjhunu district of Rajasthan, India. It represents the first comprehensive account of click beetle species diversity in the region. Various locations across the district, representing different types of habitats, were chosen for beetle collection. A total of 12 species, belonging to 10 genera across 3 subfamilies *viz*., Elaterinae, Agrypninae and Cardiophorinae within the family Elateridae, were identified in Jhunjhunu. This study establishes baseline data for future research in the area.

Keywords: Diversity, Elateridae, Click beetles and Jhunjhunu

Introduction

The family Elateridae in 1815, 400 genera accompanied by approximately 10,000 recognized species globally were reported by Leach, (1815) [13]. Miwa (1927) [14] studied 138 species of click beetles under 23 genera belonging to 8 subfamilies from Japan. Zwaluwenburg (1932) [26] prepared a check list of family Elateridae from Oceania that deals with 26 species of 4 genera *viz*., *Agrypnus* Eschscholtz, *Lacon* Castelnau, *Adelocera* Latreille and *Alaus* Eschscholtz. Zwaluwenburg (1959) [27] studied 77 elaterid beetle species related to 8 genera. Smith and Enns (1977) [23] noted 51 species of click beetles related to two subfamilies *viz*., Agrypninae and Pyrophorinae from Missouri.

Vats *et al*., (1992, 1996) [24, 25], who conducted surveys in the North Indian states of Haryana, Himachal Pradesh, Punjab, Rajasthan, Uttarakhand, and Jammu & Kashmir, are among the authors of more recent publications on the family Elateridae in India. Chakraborty and Chakraborty (2004) reported 45 species of click beetles related to 16 genera under 9 sub families from Sikkim. Chakraborty and Chakrabarti (2006) prepared a monograph on the click beetle fauna of West Bengal that deals with 33 species of click beetles. Schimmel (2007) [20] collected 23 species of click beetles under 11 genera from Western Ghats of Maharashtra, India in 2005. Patwardhan *et al*., (2008, 2009 & 2010) [15, 16, 17] produced descriptions for ten different species and made several new records from Maharashtra. Patwardhan *et al*., (2020) [18] reported 12 species of click beetles associated with 7 genera under 6 subfamilies from Manipur. The diversity, distribution, and conservation aspects of click beetles in the South Western Ghats region of India were studied by Deshmukh *et al*., (2012) [4] and Kundu *et al*., (2014) [12]. Basavanagoud and Shankara (2014) [1] presented an annotated checklist of click beetles in the state of Karnataka, India and provided information on the distribution and taxonomy of click beetles in the region. Schimmel and Tarnawski (2010 & 2011) [221, 22] contributed to the diversity of elaterid beetles in the region of Himalayan and recorded 6 new species in the region of China, Malaysia, and India. Fauna of click beetles in the interflute of rivers Moksha and Sura, Republic of Mordovia, Russia was studied by Ruchin *et al*., (2018) [19]. Kasmiatun *et al*., (2019) [7] examined diversity and species richness of 59 elaterid beetles belonging to 23 genera under 7 subfamilies from Jambi, Indonesia. Koval and Guseva (2019) [11] studied the diversity of 44 species of elaterid beetles in agro fields of North-western Russia, the highest number of species (31) was reported at forest boundaries, 23 species in crop fields and lowest number of species (7) in arid fields. Guseva *et al*., (2020) revealed 24 species of click beetles related to 21 genera in the agro landscape of Russia. Kirmse and Johnson (2020) have collected 20 species of click beetles in lowland rainforest in southern Venezuela. Johnson and Steury (2021) [9] identified 78 species of elaterid beetles associated with 6 subfamilies and 13 tribes from the George Washington Memorial Parkway, Virginia, USA.

Materials and Methods

A study was conducted from January, 2021 to December, 2022 at four different selected sites of Jhunjhunu district, Rajasthan, India (Photo Plate-1). The geographical location of Jhunjhunu district (the study area) lies in the north-eastern part of Rajasthan between 27º38'-28º31' north latitudes and 75º02'- 76º06' east longitudes, with a geographical area of 5,926 sq. km. The district is situated in the Shekhawati region of Rajasthan. Most part of the Jhunjhunu district is the semi-arid type of climate. December and January are the coldest months of winter and temperatures range from 0ºC - 15ºC. In summer, the temperature lies between 32ºC - 48ºC. The southwest monsoon sets from the middle of June to the end of September.

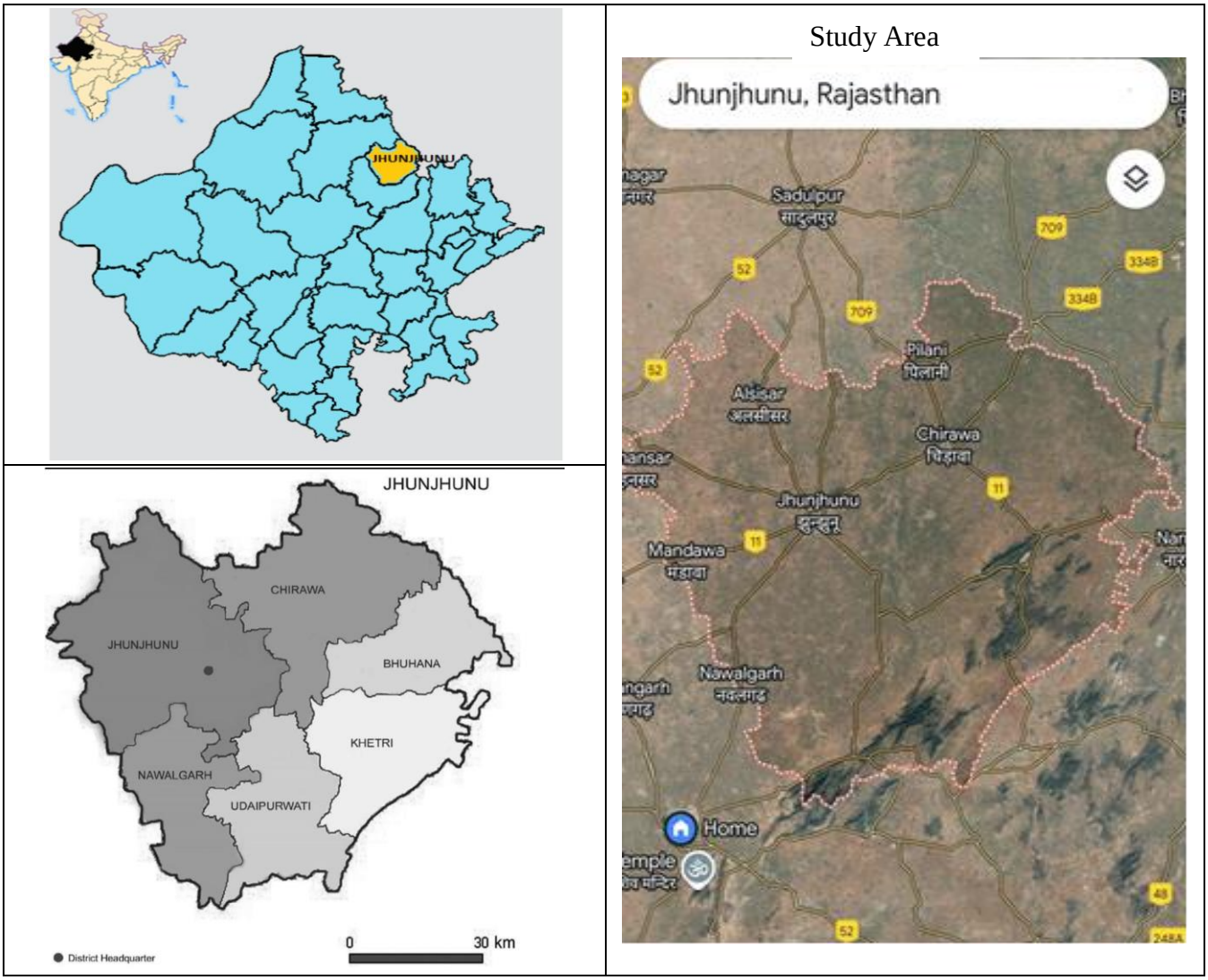

Photo Plate 1: Jhunjhunu district selected as study area

Collection methods

A sampling of the click beetles was done monthly from selected sites of the study area with methods like handpicking, light trap, pitfall trap, beating, etc. All the beetles thus, collected were then processed for further identification; specimens were narcotized by exposure to chloroform vapor, for maintaining their original colour. Following the standard protocols of pinning, each specimen was pinned and stored in wooden boxes with naphthalene balls for further study. The collected specimens were studied with the support of a Stereo Zoom Binocular Microscope (Magnus MSZ- Bi). After Identification, beetle images were captured by Redmi mobile (Model-M1901F7S). Identification was done using different taxonomic keys and published articles.

Result

A total of 12 species belonging to 10 genera under 3 subfamilies of the family Elateridae were recorded from January 2021 to December 2022 from four study sites selected in the Jhunjhunu district. As evident from species richness and abundance of different subfamilies (Table 1&2), both subfamilies Elaterinae and Agrypninae were comprised of the highest number of species (5 species each), followed by Cardiophorinae (2 species) (Fig 1). As compared to the number of individuals, Cardiophorinae was the most abundant subfamily (43.20% of the total individuals), followed by Elaterinae (29.60%) and Agrypninae (27.20%) (Fig 1).

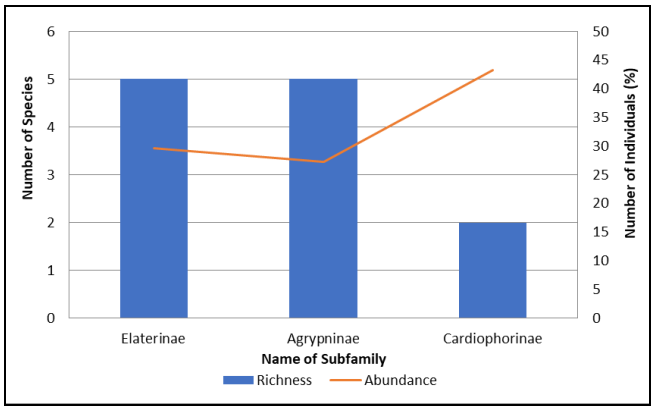

Fig 1: Species richness and abundance of Elateridae family in the study area from January 2021 to December 2022.

During the first year of study, maximum number of species belonged to the subfamilies Elaterinae and Agrypninae

constituting 5 species each, followed by Cardiophorinae (2species) (Table 2). On the other hand, again maximum number of individuals belonged to the subfamily Cardiophorinae which constituted 47.61% of the total individuals, followed by Agrypninae (27.77%) and Elaterinae (24.60%).

During the second year of study, maximum number of species belonged to the subfamily Elaterinae constituting 5 species, followed by by Agrypninae (4 species) and Cardiophorinae (2 species) (Table 2). On the other hand, maximum number of individuals belonged to the subfamily Cardiophorinae which constituted 38.70% of the total individuals, followed by Elaterinae (34.67%) and Agrypninae (26.61%).

Table 1: Click beetles Species of different subfamilies under the family Elateridae recorded from the study area from January 2021 to December 2022.

S. No.	Family	Subfamilies	Species
1	Elateridae	Elaterinae	*Agriotes lineatus*
2			*Agriotes oblongicollis*
3			*Ampedus nigricollis*
4			*Adrestus pallens*
5			*Anchastus binus*
6		Agrypninae	*Lacon punctatus*
7			*Conoderus tabidus*
8			*Conoderus* sp.
9			*Lanelater schottii*
10			*Agrypnus* sp.
11		Cardiophorinae	*Austrocardiophorus sp.*
12			*Coptostethus* sp.

Table 2: Species richness and abundance of different subfamilies under the family Elateridae recorded from the study area from January 2021 to December 2022.

Elateridae	2021		2022		2021-22	
	Richness	Abundance	Richness	Abundance	Richness	Abundance
Elaterinae	5	31	5	43	5	74
Agrypninae	5	35	4	33	5	68
Cardiophorinae	2	60	2	48	2	108
Total	12	126	11	124	12	250

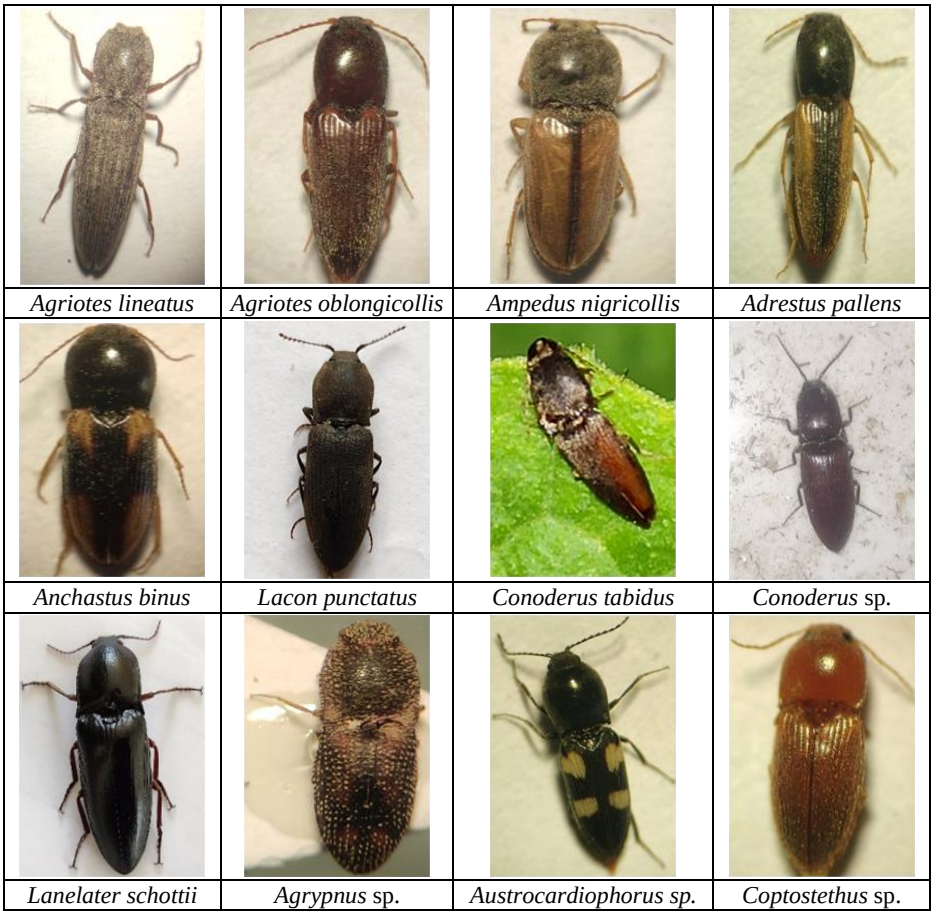

Photo Plate 2: Family- Elateridae

Discussion

Elateridae, commonly known as click beetles or elater beetles, is a diverse and widespread family of beetles. They are named "click beetles" due to their unique mechanism of escaping from danger by rapidly flexing their bodies and producing an audible clicking sound, which propels them into the air and away from potential threats. The Elateridae family includes over 10,000 described species (Costa *et al*., 2020) [6]. Click beetles are known for their ecological roles, which include both predators and decomposers, as well as their fascinating behaviour. These creatures can be found in a wide range of habitats around the world, spanning from forests and grasslands to agricultural fields and urban areas. Click beetles play a crucial role in ecosystems, serving as both predators and decomposers (Costa and Vanin, 2008) [5]. As compared to previous studies on click beetle diversity from various regions of India, the present study, reported 12 species of click beetles related to 10 genera under 3 subfamilies *viz*., Elaterinae, Agrypninae, and Cardiophorinae from the Jhunjhunu district. 400 genera accompanied by approximately 10,000 recognized species globally have been documented by Leach in 1815 [13]. Miwa (1927) [14] reported 138 species of click beetles under 23 genera belonging to 8 subfamilies from Japan. Zwaluwenburg (1932) [26] prepared a check list of family Elateridae from Oceania that deals with 26 species of 4 genera *viz*., *Agrypnus* Eschscholtz, *Lacon* Castelnau, *Adelocera* Latreille and *Alaus* Eschscholtz. Zwaluwenburg (1959) [27] recorded 77 species of elaterid beetles belonging to 8 genera. Smith and Enns (1977) [23] reported 51 species of click beetles related to two subfamilies *viz*., Agrypninae and Pyrophorinae from Missouri.

The study by Patwardhan *et al*., (2020) [18] is in consonance with the present study who reported 12 species of click beetles associated with 7 genera under 6 subfamilies from Manipur. Similarly, Patwardhan *et al*. (2008, 2009, 2010) [15, 16, 17] documented descriptions of 10 different species and made several new records from Maharashtra.

The results of the present study on click beetles are also in accordance with several studies across the globe. For example, Schimmel and Tarnawski (2010, 2011) [21, 22] contributed to the diversity of elaterid beetles in the region of Himalayan and recorded 6 new species in the region of China, Malaysia, and India. However, Schimmel (2007) [20] collected 23 species of click beetles under 11 genera from Western Ghats of Maharashtra, India in 2005. Similarly, Kasmiatun *et al*., (2019) [7] examined diversity and species richness of 59 elaterid beetles belonging to 23 genera under 7 subfamilies from Indonesia. Alike, Guseva *et al*., (2020) [8] revealed 24 species of click beetles related to 21 genera in the agro landscape of Russia. Kirmse and Johnson (2020) collected 20 species of click beetles in lowland rainforest in southern Venezuela. Chakraborty and Chakraborty (2004) [3] reported 45 species of click beetles related to 16 genera under 9 sub families from Sikkim. Chakraborty and Chakrabarti (2006) [2] prepared a monograph on the click beetle fauna of West Bengal that deals with 33 species of click beetles which are in contradiction with the results of present study. Likewise, Koval and Guseva (2019) [11] studied the diversity of 44 species of elaterid beetles in agro fields of North-western Russia, the highest number of species (31) was reported from forest boundaries, 23 species from crop fields and lowest number of species (7) from arid fields. However, Johnson and Steury (2021) identified 78 species of elaterid beetles associated with 6 subfamilies and 13 tribes from the George Washington Memorial Parkway, Virginia, USA which was quite high as compared to the present findings.

Conclusion

From the present study it was concluded that the diversity and abundance of click beetles in semi-arid regions are shaped by their ability to adapt to harsh environmental conditions, their niche specialization, and their seasonal life cycles. While their populations may fluctuate with the availability of water and plant life, they are generally well-equipped to survive and thrive in these challenging ecosystems. Their ecological roles, including soil aeration and serving as prey for other species, help maintain the overall balance of the ecosystem in semi-arid environments.

References

1. Basavanagoud K, Shankara P. Annotated checklist of click beetles (Coleoptera: Elateridae) in Karnataka, India, with information on distribution and taxonomy. International Journal of Fauna and Biological Studies,2014:1(1):11-19.
2. Chakraborty P, Chakrabarti S. A contribution to the fauna of click-beetles (Coleoptera: Elateroidea: Elateridae) of West Bengal. Records of the Zoological Survey of India,2006:254:1-220.
3. Chakraborty P, Chakraborty S. Insecta: Coleoptera: Elateridae (Elateroidea). Zoological Survey of India. State Fauna Series 10: Fauna of Manipur,2004:353–358.
4. Deshmukh S, Gupta S, Bhosale H. Diversity, distribution, and conservation of click beetles in the South Western Ghats region of India. Journal of Insect Science,2012:12(1):1-14.
5. Costa C, Vanin SA. Click beetles (Coleoptera: Elateridae) from the Andes of Southern Brazil. Zootaxa,2008:1728(1):37-58.
6. Costa C, Vanin SA, Lawrence JF, *et al*. An illustrated catalogue of the types of Elateridae (Insecta, Coleoptera) deposited in the Museu de Zoologia da Universidade de Sao Paulo, Brazil. Zootaxa,2020:4870(1):1-103.
7. Kasmiatun, Nazarreta R, Hidayat P, Buchori D. Diversity and species composition of click beetles (Coleoptera: Elateridae) at different land-use types in Harapan Rainforest landscape, Jambi, Indonesia. Southeast Asia Plant Protection Conference,2019:468:1-6.
8. Guseva OG, Shpanev AM, Koval AG. Click beetles (Coleoptera, Elateridae) under the conditions of anthropogenic landscape transformation. Russian Journal of Ecology,2020:51(3):266-274.
9. Johnson PJ, Steury BW. The elateroid beetles of the George Washington Memorial Parkway, Virginia, USA, including new records. The Maryland Entomologist,2021:8(1):31-51.
10. Kasmiatun S, Hidayat P, Fitriana Y, *et al*. Assessing click beetle diversity in different land-use types: A case study in the Harapan Rainforest landscape, Jambi, Indonesia. Biodiversity and Conservation,2020:29(14):4117-4135.

11. Koval AG, Guseva OG. Click beetles (Coleoptera, Elateridae) in agrolandscapes of Northwestern Russia. Entomological Review,2019:99(6):744-752.
12. Kundu S, Chakraborty R. Study on the diversity of click beetles in the South Western Ghats region of India. Journal of Entomology and Zoology Studies,2014:2(4):18-26.
13. Leach WE. Entomology. Edinburgh Encyclopaedia,1815:9:57-172.
14. Miwa Y. Descriptions of new species of Japanese Elateridae. Insecta Matsumurana,1927:2(1):12-22.
15. Patwardhan A, Phuge S, Dahanukar N. Descriptions and new records of click beetles from Maharashtra. Journal of Entomological Research,2008:32(4):319-326.
16. Patwardhan A, Phuge S, Dahanukar N. New records and species descriptions of click beetles from Maharashtra. Indian Journal of Entomology,2009:71(4):324-331.
17. Patwardhan A, Phuge S, Dahanukar N. Click beetles of Maharashtra: Additional descriptions and new records. Journal of Threatened Taxa,2010:2(1):647-653.
18. Patwardhan A, Phuge S, Dahanukar N. Diversity of click beetles in Manipur: Records of 12 species associated with 7 genera and 6 subfamilies. Journal of Biodiversity and Environmental Sciences,2020:16(3):27-32.
19. Ruchin AB, Egorov LV, Semishin GB. Fauna of click beetles (Coleoptera: Elateridae) in the interfluve of river Moksha and Sura, Republic of Mordovia, Russia. Biodiversitas,2018:19(4):1352-1365.
20. Schimmel R. New records on Elateridae, and description of a new species from Western Ghats in India (Insecta: Coleoptera). Genus (Wroclaw),2007:18(2):221-238.
21. Schimmel R, Tarnawski D. Monograph of the subtribe Elaterina (Insecta: Coleoptera: Elateridae: Elaterinae). Genus (Wroclaw),2010:21(3):325-487.
22. Schimmel R, Tarnawski D. Six new species of the genus *Mulsanteus* Gozis, 1875 from China, India, and Malaysia (Insecta: Coleoptera: Elateridae). Genus (Wroclaw),2011:22(4):565-577.
23. Smith JW, Enns WR. The click beetle subfamilies Agrypninae, Pyrophorinae, and Melanotinae (Coleoptera: Elateridae) in Missouri: Part I. Journal of the Kansas Entomological Society,1977:50(3):436-468.
24. Vats LK, Chauhan RL. Description of species of *Anchastus* LeConte from North India (Coleoptera: Elateridae). Journal of Entomological Research,1992:16(3):85-188.
25. Vats LK, Kashyap SL. Species of *Meristhus* Candeze from North India (Coleoptera: Elateridae: Agrypninae). Journal of Entomological Research,1996:20(1):67-72.
26. Zwaluwenburg RHV. Checklist of the Elateridae of Oceania. Bernice P. Bishop Museum. Occasional Papers,1932:9(23):1-23.
27. Zwaluwenburg RHV. Some type designations, with notes on Pacific Elateridae (Coleoptera). Pacific Insects,1959:1(4):347-414.