IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 3, December 2024

Heteropteran Bugs of the Order Hemiptera - A Review Article

Pravin B. Kale[1] and Chandrakant V. Sirsat[2]
Research Std. Deogiri College, Chatrapati Sambhajinagar, India[1]
Guide, & HoD, Vinayakrao, Patil College, Vaijapur, Chatrapati Sambhajinagar, India[2]
*Corresponding author: pbkale9850143602@gmail.com

Abstract: *Various diversity research papers &surveys on the order hemiptera-heteroptera from different regions have been reported by different researchers. This review article, considered more than 382 articles published from 1902 to 2024 (122 years) from which only 58 were selected for the analysis based on the current objectives. The plant bugs (hemiptera: Heteroptera) contains general and specific feeders on plants and on animals,some feeding on vertebrate blood has evolved at least three times. Many Heteropterans (especially infraorders pentatomidae) prefer the reproductive parts of plants, flowers, ovules, ovaries, ripening and ripened seeds. Other (Miridae and Tingidae: infraorder Cimicomorpha) damage nonreproductive parts of plant, causing the plant to mobilize nitrogen to make repairs. Heteropterans thus injure plants directly, by destroying or reducing the fecundity and fertility of reproductive structure desired also by humans or by forcing the plant into under taking energetically costly repairs. Heteropterans thrust their styles into plant tissue, between cells. Many Heteropterans are predaceous. Heteropterans causes various physiological and biochemical changes in the tissue of host plants. (Schaefer and Panizzi 2000)[1]. People around the world are using insects as food and for therapeutic purposes. Edible insects contain various metabolites. There are reports on the presence of various primary and secondary metabolites like steroids, triterpenoids, cardiac glycosides, anthraquinones, favonoids, tannins, alkaloids, amino acids and reducing sugars in methanolic extract of Henicuswhellani (crickets) and Macrotermesfacilger (termites).*

Keywords: Hemiptera, Heteroptera, True bugs

I. INTRODUCTION

Entomology is the branch of zoology which deals with study of insects. It aims in understanding their body organization and function, their habits, behavior, relation to others and surrounding in which they live. Also study their classification, development, distribution, origin, past history and economic importance.

The kingdom Animalia is represented by 1552310 sp. that have been described so far globally in 40 phyla in a new evolutionary classified. The phylum Arthropoda alone includes 1242045 species, constituting about 80 % of the total number of species (ZSI, 2011).

The Plant bugs belong to the phylum arthropoda. These insects are mostly terrestrial, some species are aquatic. The main characters of phylum arthropods are the triploblastic and bilaterally symmetrical. Body segmented & jointed externally. Body are covered with hardened and chitinous exoskeleton. The central nervous system are consist of the brain. The animals usually undergoes metamorphosis.

The most successful group of class insect, account for about 1020007 species in 39 orders of all animals. Insect has been able to exploit almost every conceivable type of environment form almost cosmopolitan in nature. The class insecta or higher taxa-subphylum hexapoda is the world's most species rich group of organism with over 1.5 million described species. (Chandra, 2011) Hexapods are well established monophyletic group characterized by the presence of three major body division head, thorax, abdomen and single pair of locomotory appendages on each segment but some primitive insect these are much smaller and function less .The more derived group usually have a pair of wings, which have modified or lost in some group of insect especially in the diptera. The abdomen is divided of ambulatory appendages. Genital opening is situated near the posterior end of the body. Insects constitute the largest class of the

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 3, December 2024

living world. The largest class of insect species known vary from 700-1500 thousand equal to 70-90% of all known species in the animal kingdom (Patil. R).

Hemiptera order includes the heteroptera or "true bugs" & the homoptera made up plant hoppers, aphids, tree-hoppers, leaf-hoppers, scales, whiteflies, cicadas & others. All have exclusively modified mouthparts that are in the form of piercing-sucking nib (Distant, 1902-1918) that they use to obtain food. The predatory sp. Pierce their prey, usually other insects injected gastric enzymes to kill & begin the process of digestion. Predation is restricted to some heteropterans, few are also feed on vertebrate blood (More, *et. al*., 2017). The majority of the heteropterans& all the homopterans are plant feeders, some species including many aphids, are important agricultural pests, causing crops by the direct action of sucking sap, but harming them indirectly by being the vectors of serious viral diseases (Azim, 2011). Some species have been used as food(Bonysana, 2024).

In the living eco-system, every species performs their function either with beneficial / Harmful / both aspects. The true bugs affect humans and their concern branches in several ways, such as infesting the crops, sucking vertebrates' blood, transmitting the pathogens, manifesting nuisance and predating the other insects, arthropods including vectors and pest species. Because of the majority of the Pentatomorphan and few of Cimicomorphan families including Miridae, Tingidae and Thaumastocoridae are usually phytophagous and considered as minor or occasional pests; it has been observed that some species feed on the essential crops utilized as food or textile goods or medicines in humans welfare; some feed on plants that are essential for the continuation of the habitat renewal and some can cause plant disease that are inflicting damage on crops, forests, orchards, and finally human life.

II. MATERIALS AND METHODS

In this review, articles, research papers published from 1902 to 2024 (122 years) were searched using the keywords "Hemiptera", "Heteroptera", "True Bugs". Thissearch yielded 382 articles, from which only 58 were selected for the analysis based on the current objectives.

III. RESULT AND DISSCUSION

A detailed account of Hemiptera fauna of central India had been done by Distant (1902, 1904, 1904a and b). Later on brief account of this order were described by Ghosh and Biswas, 1995, Ramakrishna *et al*. 2006, Chandra 2008 and 2009 & other respectively. A brief account of hemiptera fauna of Central India had been by Distant (1902 & 1904). The 35 species belonging to 28 genera under 11 familles, reported in faunal diversity of Jabalpur district. Chandra et al. investigate the hemiptera fauna of Ralamandal wildlife sanctuary madhyapradesh, after a deep observation of the surveyed area of the wild life sanctuary were 34 species belonging to 30 genera under 12 families reported (2015). Dellape G. et al. reported 2,653 Specimen distributed among 23 families of terrestrial true bugs of family coreoidea and pentatomidae (2018). Kailash Chandra, et. al., recorded 30 species from 13 families of order hemiptera from veeranganadurgavati WLS that are new record to the sanctuary (2015). The Chandra et. al., Collected the hemiptera from veeranganadurgavati WLS, it comprises 24 species distributed among 23 general over 9 families (2012). Tidame and Ansari recorded the total of 15 specles belongs to 14 genera and 6 families occur in Nashik (2016). J.Lyngdoh et. al., Collected 34 species under 19 genera and 10 families of aquatic and semi-aquatic) bugs were reported from Rajsthan. K. Chandra et al. reported the total of 73 speies belonging to 57 genera, 26 families and 7 infraorders from suborders Auchenorryncha and Heteroptera from Great Nicobar Biosphere Reserve (GNBR). 15 species reported through the survey made during the year 2010 (2013). Abu Ul Hassan Faiz et. al., he was conducted to find insect association with plants in rural areas of Dhirkot in 2019 recorded 65 species of insects in association with 150 plants.Chandra and Kushwaha collected total 126 specimens, which yielded the identification of 26 species under 24 genera and 10 families from Kheoni Wildlife Sanctuary Madhya Pradesh.. (2013). H.Kaur and et al. during the extensive survey conducted, 85 species belonging to 61 genera representing 13 families have been collected from different districts of Punjab 2012). Chandra et al.recorded 30 species from 13 families of order Hemiptera from Ratapani Wildlife Sanctuary, Madhya Pradesh (2015). Rashmi Gupta et al. reported 34 species of family Corridae belong to two subfamilies and 12 genera from North India covering the states of Himachal Pradesh, Haryana, Punjab, Uttarakhand and some parts of Jammu Kashmir (2012). Kailash Chandra et al. recorded 53 speeies of assassin bugs belonging to 29 genera under the 7 subfamilies of Reduviidae from Madhya Pradesh (2014). Kishore Chandra Sahoo et

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 3, December 2024

al. recorded a total of 12,575 individuals under 22 families of Hemiptera from Agri- biodiversity park of Professor Jayashankar Telangana state Agricultural University, Hyderabad, Telangana (2021). Altaf Hussain Sheikh et al.reported 5 species of family Lygaeidae are first time from Dumna Nature park, Jabalpur, Madhya Pradesh (2017). Altaf Hussain Sheikh et al. reported 3 species of Hemiptera belonging to 3 genera and 3 different subfamilies from Dumna Nature Park, Jabalpur, Madhya Pradesh (2017). Same author reported 5 species of family Coreoidea first time from the Dumna Nature Park, Jabalpur, Madhya Pradesh (2017). Andrew and Hughes (2005) has been reported 98 species of phytophagous Hemiptera were collected from A. falcata. Forty-eight species were from the family Cicadellidae, six from the family Aleyrodidae, five each from the families Delphacidae, Psyllidae and Tingidae, four each from the families Cixiidae, Cicadae and Miridae, two each from the families Lygaeidae, Meenoplidae, Membracidae and Pentatomidae, and one each from the families Aphididae, Aphrophoridae, Eurybrachyidae, Fulgoridae, Piesmatidae, Pseudococcidae, Thaumastocoridae and Tropiduchidae.Biswas and Bal. (2007) gives identified key of hemiptera families in fauna of Andhra Pradesh.Mendonca*et al* (2009) reported overall 154 individuals of pentatomidae were captured, 45 nymphs, 32 species. Found species are distributed four families and six subfamilies.Biswas and Bal, (2010) Reported 40 species under 33 genera belonging to 9 families of the superfamily pentatomidae from fauna of Uttarakhand; &Saha and Bal. also reported 17 species under 10 genera of the family pyrrhocoridae from fauna of Uttarakhand (2010).Kumar and Naidu (2010) Recorded 22 families, 51 genera and 58 species. Out of these 7 families, 11 genera and 13 species belong to Homoptera while 15 families, 40 genera and 45 species belong to Heteroptera from 62 gardens and agricultural fields all around Vadodara. The results show that this city sustains a good diversity of 58 species, 51 genera and 22 families of hemipterans.The hemiptera order described by Kilash Chandra *et.al.* 2011, 2012, 2013 a & b, 2014, 2015a,b & c respectively from different regions of India, mostly in Madhya Pradesh. In 2011 has studied an account of the current insect diversity in India for first time insect species diversity of state & union territories is described with gaps are highlighted by region , group & strategy for conservation of insect is also discussed.Madhya Pradesh (2012) has reported based on collection of hemiptera from VerranganaDurgavati Wildlife Sanctuary of 25 species distributed among 23 genera over 9 families.Madhya Pradesh (2012) the 25 species of true bugs belonging to 22 genera spreading over 9 families from Pachmarhi Biosphere Reserve. Ghahari (2013) reported 19 species of aquatic and semi aquatic heteroptera from the families Corixidae, Gerridae, Hydrometridae, Notonectidae, Saldidae were collected and identified from some regions of Northern Iran, southern areas of Caspian Sea.Chandra and kushwaha (2013) reported first time 38 species belonging to 13 families of the order hemiptera from Singhori wildlife sanctuary.Chhattisgarh (2013) reported about 65 species of aquatic bugs are collected but only 20 species are belonging to 5 families & 14 genera from Nine Districts.Madhya Pradesh (2014) has reported 53 species of Assassin Bugs belonging to 29 genera under 7 subfamilies of Reduviidae subfamily harpactorinae was dominant while subfamily salyavatinae with only one species.Madhya Pradesh (2014) present investigation of family lygaeidae reported 18 species belongs to 13 genera with 5 subfamilies of these 11 species are new records.Madhya Pradesh (2015) has been study of 11 species pertaining to two families' largidae and pyrrhocoridae of the superfamily pyrrhocoridae.Chatterjee *et al* (2017) has been 50 species under 24 families of hemipteran insects, which 26 species (under 25 general of 13 families) are reported for the first time from the Salt Lake City. Thirumalai and krishnan, recorded the total 64 species, 35 accommodated in 24 genera under 5 families; 30 species, 19 genera, 5 families; 18 species, 13 genera, 4 families and 43 species, 25 genera, 5 families occur in Kamataka, Kerala and Tamil Nadu respectively. Hamza Ali (2020) it has been reported by A total 23 species genera under 22 belonging to 12 families were identified in this study family. Pentamidae was the most dominant& had 9 species a species identified for family were cydnidae. Henry and foreschner (1988) has been sported by approximately Go species Occur 20 coord wide of appseximately. Species occure in North America follow- ing 3 genera containing & species of Belostomatidae family. Springer (2006) has been reported by Vegetation structure and flower abundance are important factor for bug species richness hence the wildflower area meadows Clarly increase bug species they are Resulted by wildflower area of meadows in order to restore both heteropteran diversity. Musolin and Aida H. Saulich has been reported the known adaptation .we use two approaches first all seasonal adaptation into three categories, AS Summer of autumn adaptation we discuss Summer dipause photoperiodic control of nymphal development of Colorution of nymph and adult behavioural adaptation of migration. B. pfitta (2014) reported that the present Communication reports 29 Species under 29 genera belonging to 12 families of Hemiptera permanent residents or

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 3, December 2024

Hansient Visitor in the mangroves of indian part of suncombon. A total of 160 species under 129 generdbelon- ging to 42 families of orclerHemipterachespeaded over in the mangroves state and anion territories of India. plittesil 2013 the has been report ated A total of 11, gso individual 5,312 of them adult belonging to /18 species were collected. Species raichness and abundance of true bug coerenegar- tively affected by flooding duration Composition cliffered between meados of species different flooding regimes our study prove that anthropogenically included" changes in hydrological elynamics · of floodp- lains can have a Tremendous effect on richness and spradure of terrestrial true bug Comunities. Thirumalai (1997) described Nerthraarunachalensis as new species from Arunachal Pradesh and recognized another 3 species of that genus namely N. asiatica (Horváth), N. indica (Atkinson), and N. spissa (Distant) from India. Bonysana, R., Singh, K. D., Devi, W. D. et al. (2024) report on Ethno-entomotherapeutic and metabolite profiling of *coridiuschinensis* (Dallas), a traditional edible insect species of north- east India. *C. chinensis*is an alternate food resource with several health benefts to human.AtanuSeni (2021) was described hemipteran fauna associated with pigeonpea and their relative abundance was carried out at Chiplima, Odisha, India. A total of 18 hemipteran insect taxa belonging to 11 insect families were documented from the pigeonpea ecosystem during 2019-20. All the hemipteran insect's incidence was negatively correlate with temperature and rainfall where as positively correlated with morning relative humidity.PéterKóbor (2023) described new species big-eyed bugs *Germaluskozari sp. nov.*(Hemiptera: Heteroptera: Lygaeoidea: Geocoridae)andalso reported *Germalusgreeni* is the first time from outside of India and Sri Lanka.Hemant V. Ghate, et al., (2023) reported *Aurelianus yunnananusXiong,* 1987 (Hemiptera: Heteroptera: Pentatomomorpha: Coreidae: Coreinae: Mictni) is the first time from India. It was collected from Tripura, in the eastern part of our country. In this report also adds the genus *Aurelianus* to the known Indian Coreidae genera.

IV. CONCLUSION

The majority of the heteropterans& all the homopterans are plant feeders, some species including many aphids, are important agricultural pests, causing crops by the direct action of sucking sap, but harming them indirectly by being the vectors of serious viral diseases (Azim,2011). Some species have been used as food. In the living ecosystem, every species performs their function either with beneficial / Harmful / both aspects. The true bugs affect humans and their concern branches in several ways, such as infesting the crops, sucking vertebrates' blood, transmitting the pathogens, manifesting nuisance and predating the other insects, arthropods including vectors and pest species. Because of the majority of the Pentatomorphan and few of Cimicomorphan families including Miridae, Tingidae and Thaumastocoridae are usually phytophagous and considered as minor or occasional pests; it has been observed that some species is rich in various primary and secondary metabolites with numerous therapeutic properties that can be translated into nutraceuticals, medicine, food supplement and other industrial applications & some feed on the essential crops utilized as food or textile goods or medicines in humans welfare; some feed on plants that are essential for the continuation of the habitat renewal and some can cause plant disease that are inflicting damage on crops, forests, orchards, and finally human life.

ACKNOWLEDGMENT

Authors are thankful to the MAHAJYOTI, Govt. of Maharashtra and Principal, Deogiri College, Chhatrapati Sambhajinagar for his encouragement and providing facilities.

BIBLIOGRAPHY

[1]. Andrew,N., and Hughes, L., Diversity and assemblage structure of phytophagous Hemiptera along a latitudinal gradient: predicting the potential impacts of climate change. Global Ecology and Biogeography 2005, 14: 249-262.

[2]. AltafHussaen Sheikh, Contribution to the study of pentatominae (Pentatomidae:Hemiptera) bugs From Dumna Nature Park, Jabalpur, India International Journal of zoology studies, Volume 2; Issue 6; November 2017 ; Page No. 24-27.

[3]. Altafhussaen Sheikh., Kushwaha, S., Thomas, M., Bhandari, R., 2017. Study of Lygaeidae (Lygaeoidea : hemiptera) species from Dumna Nature Park, Jabalpur, Madhya Pradesh. National Journal of Multidisciplinary Research and Development Rec.Zool. surv. India, Occ. Paper No., 107 : 90.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 3, December 2024

[4]. AtanuSeni., Diversity of hemipteran insect fauna and their relative abundance in pigeonpea, Cajanuscajan (L.) Millsp, Journal of Entomology and Zoology Studies 2021; 9(1): 1072-1079

[5]. Biswas, B., and Bal, A.,2010. Insecta: Hemiptera: Pentatomidae, fauna of Uttarakhand, State Fauna Series, 18 (Part-2): 229-244.

[6]. Bonysana, R., Singh, K. D., Devi, W. D. et al. report on Ethno-entomotherapeutic and metabolite profiling of coridiuschinensis (Dallas), a traditional edible insect species of north- east India.Sci Rep 14, 6545 (2024) .

[7]. Chandra, K., and Kushwaha. S., 2012. Studies on the Hemiptera fauna of Barhawapara Wildlife sanctuary Chhatisgarh, India. DCSI Vol. 07: 101-108.

[8]. Chandra, K., and Kushwaha. S., 2012. Addition to the True Bugs (Hemiptera) fauna of Pachmarhi Biosphere Reserve, Madhya Pradesh, India. Ann. For., 20(2): 250-254.

[9]. Chandra,K., 2008. Insecta:Hemiptera, faunal diversity of jabalpur district, Madhya Pradesh, Zoological Survey of India. 141-157.

[10]. Chatterjee, T., Bhaumik, s., Roy, s., 2017.Diversity of the bugs (Insecta : Hemiptera) in salt Lake City, Kolkata. Bionotes. Vol. 19(1),24-25pp.

[11]. Chandra, K., kushwaha, S., Sambath, S., Biswas,B.,2012. Distribution and Diversity of hemiptera fauna of VeeranganaDurgavati Wildlife Sanctuary, Damon, Madhya Pradesh (India). Biological Forum- An International Journal, 4 (1):68-74.

[12]. Chandra, K., Kushwaha, S., and Jehamalar, E., 2013. New records of Hemiptera (Insecta) from Great Nicobar Biosphere Reserve Andaman and Nicobar Islands, India. Journal of the Andaman Science Association vol. 18 (2) : 160 - 164.

[13]. Chandra, K., Bhandari, R., and Kushwaha, S.,2015. On a collection of true bugs (Insecta:Hemiptera) from Ralamandal Wildlife Sanctuary, Madya Pradesh, India. Munis Entomology and zoology, Munis Entomology and Zoology. VOL.10(2): 486-488.

[14]. Chandra, K., Biswas, B., and Kushwaha, S.,2015. Diversity of Pyrrhocoridae (Hemiptera : Heteroptera) of Madya Pradesh, India. Munis Entomology and Zoology, 10 (1):169-171.

[15]. Chandra, K., kushwaha, S., Biswas, B., Mukherjee, P., and Bal, A., 2012. Eight New Record of Genus Acanthaspis (Hemiptera : Ruduviidae) from Madhya Pradesh, India. World Journal of Zoology 7 (3): 226-231.

[16]. Chandra, K., Hassan, M., and Kushwaha.,2017. Diversity of Hemiptera fauna of Daman and Diu. India. International Journal of Global Science Research Vol.4, No. 1, 497-502pp.

[17]. Chatterjee, T., Bhaumik, S., and Roy, S., 2017. Diversity of the bugs (Insecta : Hemiptera) in Salt Lake City, Kolkata. 24-25.

[18]. Chandra, K., Bhandari, R., and Kushwaha, S., 2015. Hemiptera fauna of Ratapani Wildlife Sanctuary, Madhya Pradesh, India. International journal of fauna and Biological Studies 2(2): 20-26.

[19]. Chandra, K.,2008. Faunal Diversity of Jabalpur District. M. P. 141-157.

[20]. Chandra,K., Kushwaha, S., and Sambath, S., 2014.True bugs (Hemiptera) from Nauradehi Wild life Sanctuary, Narsinghpur, Madhya Prades India. Bionotes VOL.16(3) :93-94

[21]. Chandra, K., and Kushwaha, S.,2014. superfamily coreoidea (Hemiptera) from Madya Pradesh. Bionotes VOL. 16 (1): 9-11.

[22]. Deepa, J. & Banerjee, S. (2023) A faunistic survey of the aquatic and semi-aquatic bugs (Hemiptera, Heteroptera) of the Tiger Reserves in Telangana, India. Journal of Insect Biodiversity and Systematics, 9 (4), 775–790.

[23]. Distant w. L. 1902-1918. The fauna of British India including Ceylon and Burma. Rhynchota. Vols. 1-7. Taylor and Francis, London.

[24]. Distant, W.L., 1904. The fauna of British India including Cylon and Burma, 2: 77-321

[25]. Distan.W.L.1902. The fauna of British india including ceylon and burma, Rhynchota Vol.2, Taylor and franscis, London :1-503pp.

[26]. Distant W. L. (1906) The fauna of British India including Ceylon and Burma, Rhynchota, III: 1-502.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 3, December 2024

[27]. Donald C. Weber, Ariela I., Haber, Kayla, Pasteur, Sean M. Boyle, Thomas P. Kuhar, and Mary L. Cornelius, 2024.Environmental Entomology, XX(XX), 2022, 1–5

[28]. Dellape, G., Colpo, K., Melo, M., Montemayor, S., and Dellape, P.,2018. Biodiversity of Coreoidea and Pentatomidae (Heteroptera) from Atlantic forest protected areas. Insights into their Conservation. An Acad Bras Cienc 90(1): 109-122

[29]. Forero D, Castro-Huertas V, Morales-Devia H, Barão Kr, Bianchi FM, Campos LA, Dellapé PM, Melo MC &Schwertner CF. 2024. Heteroptera research in Latin America and the Caribbean (Insecta, Hemiptera): status and perspectives in the 21st century. An Acad Bras Cienc 96: e20230218. DOI 10.1590/0001-3765202420230218.

[30]. Ghahari, H.,2013. A study on aquatic and semiaquatic bugs (Hemiptera : Heteroptera) from Northern iran. Linzer biol. Beitr. 45 (2): 1991-1996.

[31]. Gupta, R., Singh, D., Kaur, H., and Kaur, R., 2012. A survey report on family Coreidae (Hemiptera: Heteroptera) from North India. Ann. Entomol., 30 (2) : 11 - 16.

[32]. Ghate, H.V., P. Pansare& R. Lodh (2023). First report of a coreid bug Aurelianus yunnananusXiong, 1987 (Hemiptera: Heteroptera: Coreidae) from India. Journal of Threatened Taxa 15(1): 22522–22527. https://doi.org/10.11609/jot.8121.15.1.22522-22527

[33]. K. Chandra and S. kushwaha, 2013. Dstribution and diversity of hemiptera fauna of singhori wildlife sanctuary, Raisen District, Madhya Pradesh, India munis Entomology and zoology, 8(2): 677-681

[34]. Kailash Chandra, (2011) Insect fauna of states & Union territories in India .ENVIS Bulletin. Vol. 14, No. 1; 89-118.

[35]. Kailash Chandra, S. Kushwaha, S. Sambath, & B. Biswas , (2012) Distribution & Diversity of Hemiptera fauna of VerrangangaDurgavati Wildlife Sanctuary, Damoh, Madhya Pradesh (India) Biol. Forum-An Into. J. , 4(1); 68-74.

[36]. K. Chandra et.al. Assassin Bugs (Reduviidae: Hemiptera) from Madhya Pradesh, India. J. Of Ento. & Zool. Studies-2014; 2(1); 38-50.

[37]. K. Chandra & S. Kushwaha, Ground Bugs (Hemiptera: lygaeidae) of Madhya Pradesh, with there distribution in India, Mun. Enter. Zool. Vol. 9(1); Jan-2014; 535-539.

[38]. Kaur, H., Singh, D., and Suman, V., 2012. Faunal diversity of terrestrial Heteroptera (Insecta : Hemiptera) in Punjab, India. J. ent. Res., 36 (2) : 177 - 181.

[39]. Kumar, D. And Naidu, B., 2010. A contribution towards the insect fauna of Vadodara, Gujarat (India): The Order Hemiptera. Halters, Vol. 1, No. 2 : 58-63.

[40]. Mendonca, M., Schwertner, C., and Grazia. J.,2009. Diversity of Pentatomoidea (Hemiptera) in riparian forests of southern Brazil: taller forests, more bugs 53 (1):121-127.

[41]. Lyngdoh, J., Basu, S., Chandra, K., and Kushwaha, S., 2021. On a collection off Insecta : Hemiptera (Aquatic and semi-aquatic) fauna of Rajsthan., India. Journal of Natural Resource and Development 16 (1) 9-18.

[42]. More S. V., M. S. Prashant, A. Singh & K. N. Nikam, (2017) First Record of the Assassin Bug Acanthaspisfulvipes (Heteroptera: Reduviidae: Reduviinae) from Maharashtra, India, Indian J. Sci. Res. 13(1); 80-82.

[43]. Patil, R., A textbook of Insect Morphology and Systematics.

[44]. Panizzi, A., and Grazia, J.,2015. Introduction to true Bugs (Heteroptera) of the Neotropics.3-20.

[45]. PéterKóbor2023.Germaluskozari sp. nov.: Description of a new representative of big-eyed bugs from the Indomalayan Region with notes on allied species (Heteroptera: Lygaeoidea: Geocoridae) ActaPhytopathologica et EntomologicaHungarica. pp. 1-13. DOI: 10.1556/038.2023.00178

[46]. Saha, P., and Bal, A., 2010. Hemiptera : Pyrrhocoridae.Fauna of Uttarakhand, State Fauna Series, 18(Part-2): 245-253.

[47]. Saha, P., and Bal, A., 2010. Insecta: Hemiptera : Lygaeidae, fauna of uttarakhand, state fauna series,18(part-2) insect: 219-228.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 3, December 2024

[48]. Sheikh, A., Thomas, M., Bhandari, R., (2017) On an account of Coreoidea (Heteroptera: Hemiptera) from Dumna Nature Park, Jabalpur, India. National Journal of Multidisciplinary Research and Development vol. 2: 244 - 247.

[49]. Smt. Rekha U. Jadhav, Dr. Dhanraj B. Goswami2019. Diversity of Family Pentatomidae (Hemiptera – Heteroptera) From Nashik Region, Maharashtra, India. JETIR April 2019, Vol 6, 4: 69-72. Impact factor 7.93.

[50]. Sahoo, K., Sunitha, V., Vasudeva Rao,V., and Chary, S., 2021. Diversity of Hemipteran families at Agri - biodiversity park, Hyderabad, India. Entomon. 46 (2): 143 - 148.

[51]. Smt. Rekha U. Jadhav, Dr. Dhanraj B. Goswami2021. Biodiversity of Pentatomoidea bugs (Hemiptera – Heteroptera) of surganatehsil, Nashik district, Maharashtra, India. JETIR April 2021, Vol 8, 7: d58-d63. Impact factor 7.93.

[52]. Thirumalai, G., and Krishnan, S., 1997-1998. Diversity of Gerromorpha (Heteroptera: Hemiptera : Insecta) in the Western Ghats States, India. Record of The Zoological Survey of India,98 (Part-4) 61-82

[53]. Thirumalai, G., and Krishnan, S., 2000. Diversity of Gerromorpha (Heteroptera: Hemiptera: Insecta) in the Western Ghats States, India. Record of The Zoological Survey of India, 98 (Part-4) 61-82.

[54]. Thirumalai, G., 2008. Diversity of Insect Pests and their Natural Enemies Infesting Teak (Tectona Grandis, Verbenaceae) in Coastal Odisha (11): 1421-1432.

[55]. Thirumalai, G., 2009. Insecta : Hemiptera : Nepomorpha and Gerromorpha, fauna of Tamil Nadu, state fauna series,17. Fauna of Tamil Nadu (Part-1):65-71.

[56]. Tidame, S., and Ansari, H., 2016. Diversity of Terrestrial Bugs (Hemiptera : Heteroptera) From Nashik, Maharashtra, India. Scholar world - International Refereed Multidisciplinary Journal of Contemporary Research Impact Factor: 4. 433.

[57]. Tripathy. M., and Rout, M., 2018. Diversity of Insect Pests and their Natural Enemies Infesting Teak (Tectona Grandis, Verbenaceae) in Coastal Odisha (11): 1421-1432.

[58]. van der Heyden2024. New records of Heteroptera from the Canary Islands (Spain), XI. ARQUIVOS ENTOMOLÓXICOS, 28: 119-122