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AQUATIC BEETLES (COLEOPTERA: INSECTA) OF JAMMU, KASHMIR & LADAKH REGION (NORTH-WEST HIMALAYA): INVENTORY AND BIODIVERSITY

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Abstract

A total of 75 species of aquatic beetles , belonging to 42 genera, under 10 families of sub-order Adephaga and Polyphaga, is known to occur in diverse water bodies (River, Wetlands, Lakes, Streams, Springs, Ponds, Marshes and Rice-fields, etc.), in vast areas and localities of Jammu, Kashmir and Ladakh Himalyan region. In these regions, Adephaga includes a total of 60 speccies of 27 genera, under four families, *viz*. Carabidae, Dytiscidae, Gyrinidae and Noteridae. The Polyphaga is represented by 15 species, under 14 genera, belonging to 6 families, *viz*. Curculionidae, Dryopidae, Elmidae, Helophoridae, Hydrophilidae and Psephenidae. The dominant family of aquatic beetles in these Himalayan regions is Dytiscidae, having 50 spp., pertaining to 21 genera. The families like Curculionidae, Dryopidae, Helophoridae and Psephenidae, have one species, under one genus each. The updated systematic inventory of aquatic beetle-fauna, has been provided. In addition to this, faunal biodiversity, with local distribution and species richness, have briefly been discussed.

Key words : Aquatic beetles, Inventory, Biodiversity, Jammu, Kashmir, Ladakh Himalaya

INRODUCTION

The aquatic beetles of Jammu, Kashmir and Ladakh Himalayan region of paramount zoogeographical importance, occur in vast areas and localities and are inhabitants of diverse water bodies like river, wetlands, lakes, streams, springs,' nallahas', ponds, marshes and rice fields, etc. The aquatic beetles of these regions belong to two sub-orders of order Coleoptera, under ten families: sub-order 1 Adephaga, families, Noteridae (burrowing water beetles), Carabidae (Harpalinae) (ground beetle), Dytiscidae (predaceous diving beetles), Gyrinidae (whirligig beetles) ; sub-order 2 Polyphaga, families , Curculionidae (weevils), Dryopidae (long-toed water beetles), Elmidae (riffle beetles), Helophoridae , Hydrophilidae (water scavenger beetles) and Psephenidae (water-penny beetles).

Both larvae as well as adults are aquatic in case of Dytiscids, Elmids , Gyrinids, Hydrophilids, Noterids, Carabids (Harpalinid) and Helophorid. The Psephenid has larva as aquatic and adult as terrestrial. Curculionid and Dryopid, are larvae as terrestrial and aquatic as adults. The Aquatic beetles are classified as clingers, climbers, sprawlers, swimmer and divers.

The feeding habits of aquatic beetles are also diverse. These are as herbivores, scavengers, voracious predators, carnivores and detritivores. Harpaline ground beetle and Elmids , are as indicator of water quality (bio indicator). Dytiscids , Grinids and Hydrophilids, are predaceous on aquatic insects and other small organisms. Helophorid larva may damage agricultural crops (food, vegetable). The Hydrophilids have potential as bio-control agent of mosquitoes. Adults of Psephenid and Noterids, are capable flight and are attracted to light.

In the present communication, an attempt has been made to provide a systematic inventory of aquatic beetle-fauna of Jammu, Kashmir and Ladakh Himalayan regions. The inventory has been updated in the light of recent taxonomic and nomenclatural changes. The new names and synonymies, have been incorporated pertaining to the taxa. The synonymies are listed under listed valid species in the inventory. In addition to this, the faunal biodiversity, distribution and species richness, have been briefly discussed.

The references / authors in the inventory are cited in front of listed valid / new names and synonymies of the beetle species, are given as reference number in the parentheses. In the text also, the references are given in the parentheses. In the updated inventory, the synonymies of the species, are given under the listed valid / new names of species, belonging to various Super families, Families, Sub-families and Tribes. In addition to these, in the inventory, the local distribution of taxa has been given for each listed species and in this connection, the abbreviations are used as : JA= Jammu; KA= Kashmir; LA= Ladakh.

RESULTS AND DISCUSSION

SYSTEMATIC INVENTORY

ORDER COLEOPTERA

SUBORDER I: ADEPHAGA

Family : Noteridae (Burrowing water beetle)

Subfamily: Noterinae

Tribe: Noterini

1 *Canthydrus* sp. : JA (Mansar Lake) [31]

2 *Hydrocanthus* sp. : KA (Water bodies, Kupwara) [28]

3 *Noterus clavicornis* (de Geer) : KA [14, 23, 24, 40]

Noterus clavicornis var. conexiusulus Reiche & Sauley : KA [16]

4 *Noterus crassicornis* (Muller) : KA [14, 23, 24, 35]

Superfamily 1: Caraboidea

Family : Carabidae (Ground beetles)

Subfamily: Harpalinae

5 *Amblystomus* sp. : JA (Mansar Lake) [31]

6 *Stenolophus rufus* Godart : JA (Gharana wetland, R.S.Pora [32]

Superfamily:2. Dytisciodea

Family:Dytiscidae (Predaceous diving beetles)

Subfamily 1.: Agabinae

Tribe: Agabini

7 *Agabus (Gaurodytes*) *adustus* Guignot:; LA, KA [14, 22 , 36, 40]

Agabus adustus Guignot: KA [16]

8 *Agabus (Gaurodytes) bipustulatus* (Linnaeus) : KA; LA [4, 6, 14, 22, 36, 41]

9 *Agabus (Gaurodytes) biguttatus* (Olivier): KA [14, 22]

Agabus biguttatus (Olivier): KA [13]

Agabus (Dichonectus) biguttatus (Olikvier): KA [17, 37,41]

Agabus indicus Regimbart : KA [36, 40]

Dytiscus nitidus Fabricius: KA [36, 40]

Agabus (Dichonectes) nitidus (Fabricius):; KA [36, 40]

10 *Agabus (Gaurodytes) conspersus* (Marsham) : KA [14, 36 ,40]

11 *Agabus (Gaurodytes) bebilipes* Regimbart: KA [14, 22,36, 41]

Agabus skarduensis Guignot : KA [17]

12 *Agabus (Gaurodytes) freudei* Gueorguier: KA [14, 22]

13 *Agabus guttatus guttatus* (Paykull): KA [14]

Agabus pamiricus Guignot : KA [15]

Agabus (Gaurodytes) winkleri Gschwendtner: KA [22]

14 *Agabus (Gaurodytes) solskii* Jakovlev: KA [14, 22]

15 *Agabus* sp.: KA (Neelnag Lake, Rice fields) [2, 10]

16 *Hydronebrius kashmirensis* (Vazirani): KA [14, 22, 25]

Amphizoa kashmirensis Vazirini : KA (Ganderbal) [34]

Hydronebrius guignoti (Vazirani): KA [36, 40]

17 *Platambus coriaceus* (Regimbart) : KA, LA (Kargil) [14, 22]

Agabus (Anagabus) jucundus Guignot: KA [36, 40]

Agabus jucundus Guignot : LA [16]

Agabus (Anagabus) vatelloides Regimbart: KA [36 ,40]

18 *Platambus lineatus* Gschwendtner: KA [14, 15]

19 *Platambus sogdianus* (Jakovl): LA (Kargil) [14, 40]

Agabus (Anagabus) jucundus Guignot: LA (Kargil) [16]

20 *Platambus wewalkai* Brancucci : JA (Banihal, Patnitop, Sonder region) [14, 22]

Platambus (Anagabus) wewalkai Brancucci: JA [7]

21 *Platynectes (Gueorguievtes) kashmiranus kashmiranus* Balfour-Browne: KA [14, 25]

Colymbetes lineatus Redtenbacher : KA [29]

Platynectes (Gueorgauievtes) kashmiranus Balfour-Browne : KA [39]

Platynectes kashmirensis Balfour- Browne: KA [3]

Subfamily 2. Colymbetinae
Tribe Colymbetini

22 *Colymbetes fuscus* (Linneaus): KA [17, 22]
Dytiscus fuscus (Linneaus): KA [36, 40]
23 *Rhantus suturalis* Macleay: KA, LA [13, 14 ,22]
Colymbetes pulverosus Stephens:, KA, LA [36, 40]
Dytiscus punctatus Geoffory: KA [40]
Rhantus pulverosus:; KA, LA [4, 6, 36, 40]
24 *Rhantus* sp.: KA (Rice fields) [2]

Subfamily 3. Dystiscinae
Tribe 1.Cybistrini

25 *Cybister lateralemarginalis torquatus* Fischer von Waldheim: KA [14, 22]
Cybister lateralemarginalis (Dee Geer): KA [35, 40]
26 *Cybister rugulosus* (Redtenbacher): KA [14, 40]
Cybister (Meganectes) rugulosus (Redtenbacher): KA [40]
Cybister (s. str.) *rugulosus (* Redtenbacher): KA [22]
Trochalus rugulosus Redtenbacher: KA [29]
27. *Cybister tripunctatus lateralis* (Fabricius) : JA, KA [14, 24]
Cybister tripunctatus asiaticus Sharp: KA [35]
Cybister tripunctatus Olivier: JA (Mansar Lake), KA (Water bodies) [21, 31]
28 *Cybister* sp. : JA (Gharana wetland, R.S.Pora), KA (Rice fields) [2, 32]

Tribe 2. Dytiscini

29. *Dytiscus latro* Sharp: KA [6,14]
30. *Dytiscus marginalis* Linnaeus : KA (Water-bodies and Rice fields) [2, 11,19, 27, 38]
31. *Dytiscus thianschanicus* (Gschwendtner): KA [14, 22]
32. *Dytiscus* sp.: JA(Gharana weland), KA(Neelnag, Lakes, Streams,etc.) [9,10,18,27, 32]

Tribe 3. Eretini

33 *Eretes griseus* (Fabricius): KA [14, 25]
34 *Eretes stricticus* (Linnaeus): KA [14, 25]

Tribe 4, Hydaticini

35 *Hydaticus* (*Prodaticus*) *histrio* Clark : KA [14]
Hydaticus (Guignotites) *histrio* Clark: KA [4]
36 *Hydaticus vittatus vittatus* (Fabricius): KA [14, 22, 25]
Hydaticus (Guignotites) *vittatus* (Fabricius): KA [35]

Subfamily 4. Hydroporinae
Tribe 1. Bidessini

37 *Bidessus* sp.: JA (Mansar lake) [31]
38 *Hydroglyphus geminus* (Fabricius): KA [13,14, 22]
Guignotus pusillus (Fabricius) : KA [5, 6, 36, 37]
Dytiscus pussilus (Fabricius): KA [40]

Tribe 2. Hydroporini

39. *Boreonectes griseostriatus* (De Geer): LA, KA [14 , 25]
Potamonectes (s.str.) *griseostriatus* (De Geer): LA, KA [4, 6, 36, 40]
40 *Deronectes vestitus* (Gebler): KA [37, 40]
41 *Hydroporus discretus discretus* Fairmaire & Brisoutde Barneville: KA [13, 14, 22, 25]
Hydroporus discretus Faimaire & Brisoutde Barneville: KA [36, 39]
42 *Hydroporus martensi* Brancucci: KA (Pir Panjal mountain, Tangmarg) [6, 14,22, 25]
43 *Hydroporus* sp.: JA (Gharana wetland, R.S.Pora) [32]
44 *Nebrioporus airumlus* (Kolenati): KA [13, 14, 22, 25]
Deronectes (Potamodytes) kashmirensis: KA [41]
Hydroporus kashmirensis Regimbart : KA (Gurez valley) [30]
Hydroporus (s. str.) *kashmirensis* (Regimbart) : KA [37]
Potamonectes (s. str.) *kashmirensis* Regimbart : KA [40]
45 *Nebrioporus indicus* (Sharp): KA [14, 22, 25]
Potamonectes manii Vazirani: KA [37]

Potamnectes (s. str.) *manii* Vazirani : KA [37, 40]
46 *Nebrioporus insignis* (Klug): KA [14, 22]
Potamonectes (Zimmermanicus) insignis (Klug): KA [36, 40]
Tribe 3. Hygrotini
47 *Herophydrus vaziranii* (Nilsson): KA [14, 22, 25]
Hydroporus kashmirensis Vazirani : KA [37]
48 *Hygrotus (Coelambus) confluens* (Fabricius): KA [14, 22, 25]
Coelambus confluens (Fabricius): KA [16, 40, 41]
49 *Hygrotus (Coelambus) flaviventris* (Motschulsky): KA [14, 22, 25]
Coelambus flaviventris (Motschulsky): KA [36, 39]
50 *Hygrotus (Coelambus) impressopunctatus* (Schaller): KA [14, 22, 25]
Coelambus impressopunctatus (Schaller): KA [37, 40]
Tribe 4. Laccorini
51 *Laccornis* sp.: KA(Neelnag lake) [10]
Subfamily 5. Laccophilinae
Tribe Laccophilini
52 *Laccodytes* sp.: KA (Neelnag lake) [10]
53 *Laccophilus fasciatus terminalis* Sharp: KA (Neelnag lake) [10, 14, 22,25]
54 *Laccophilus minutus* (Linnaeus): KA [4, 6, 13, 14, 22]
Dytiscus minutus Linnaeus: KA [38]
Laccophilus parvulus Aube : JA (Gharana wetland, R.S.Pora) [32]
56 *Laccophilus* sp.: JA (Mansar lake), KA (Rice fields , Neelnag) [2, 19, 31]
Superfamily 3. Gyrinoidea
Family Gyrinidae (Whirligig beetle)
Subfamily Gyrininae
Tribe 1 Gyrinini
57. *Gyrinus distinctus* Aube : KA [20, 33]
58 *Gyrinus substriatus* Stephens : KA (Rice fields of Kashmir Valley) [2]
59 *Gyrinus* sp.: KA (Lidder & Sind Stream, Pahalgam) [9]
Tribe 2 Enhydrini
60 *Dineutes* sp.: KA (Neelnag) [19]

SUBORDER II. POLYPHAGA
Superfamily 1. Byrrhoidea
Family 1. Elmidae (Riffle beetles)
Subfamily Elminae
61 *Grouvellinus* sp.: KA (Buniyar Nallah, Uri) [12]
Tribe Elmini
62 *Stenelmis* sp.: KA (Buniyar Nallah, Uri) [12]
Family 2. Psephenidae (Water Penny beetle)
Subfamily Psephenoidinae
63 *Psephenoides rajouri* Chowdhary: JA (Rajouri) [8]
Superfamily 2. Curculionidea
Family Curculionidae (Weevil)
Subfamily Bagoinae (Aquatic weevil)
64 *Bagous* sp:; JA (Mansar Lake) [31]
Superfamily 3. Dryopoidea
Family Dryopidae (Long-toed water beetle)
65 *Dryops ocellai* Olmi : KA [26]
Superfamily 4. Hydrophiloidea
Family 1. Helophoridae
66 *Helophorus* sp.: KA (Rice fields of Kashmir Valley) [2]
Family 2. Hydrophilidae (Water scavenger beetles)
Subfamily 1. Hydrophilinae
Tribe 1. Acidocerini

67 *Enochrus* sp.: KA (Neelnag Lake) [10]

Tribe 2. Berosini

68 *Berosus* sp.: JA (Mansar Lake), KA (Rice fields) [2, 31]

69 *Regimbartia* sp.: JA (Gharana wetland, R.S.Pora) [32]

Tribe 3. Hydrophilini

70 *Hydrochara* sp.: KA (Neelnag) [10]

71 *Hydrophilus piceus* Linnaeus : KA (Water bodied) [21]

72 *Hydrophilus* sp.: KA (Water bodies and rice fields) [2, 10, 11,18,19, 27]

73 *Tropisternus* sp.: KA (Neelnag) [10]

Tribe 4. Laccobini

74 *Laccobius* sp.: KA (Rice fields) [2]

Subfamily 2.Sphaeridiinae

Tribe Coelostomatini

75 *Dactylosternum* sp.: JA (Mansar Lake) [31]

From the above given inventory, it is evident that a total of 75 species of aquatic beetles, belonging to 42 genera, under 10 main families, pertaining to sub-order Adephaga and Polyphaga, occur in the vast localities and areas of Jammu, Kashmir and Ladakh Himalayan regions, inhabitants of diverse water bodies. The adephaga includes a total of 60 species of 27 genera ,under four families, *viz.* Carabidae, Dytiscidae, Gyrinidae and Noteridae. Sub-order Polyphaga is represented by 6 families as Curculionidae, Dryopidae, Elmidae, Helophoridae, Hydrophilidae and Psephenidae, including a total of 15 species, under 14 genera. The aquatic Adephaga species accounts for 80 % and Polyphaga as 20 % of total aquatic Coleopterans species prevalent in this region (Table 1).

The number of species of aquatic beetles, belonging to different families, occurring in different water bodies of Jammu, Kashmir and Ladakh, is 16 spp., 62 spp. and 6 spp. respectively. The various families, not encountered in three separate regions are: Carabidae, Curculionidae and Psephenidae from Kashmir; Dryopidae, Elmidae, Gyrinidae and Helophoridae from Jammu ; all the nine families, excluding Dytiscidae, from Ladakh region, see Table 1.

Of the various aquatic Coleopteran families, the dominant family is found to be Dytiscidae, having 50 species, pertaining to 21 genera, followed by Hydrophilidae, having 9 species belonging to 8 genera. The family Noteridae incorporated 4 species of 3 genera, followed by Gyrinidae, with 4 spp. (1 genus) and 2 spp. (2 genera) each found to be in case of family Carabidae and Elmidae. The rest of the families , *viz.* Cuculionidae, Dryopidae , Helophoridae and Psephenidae, have one species, under one genus each (Table 1).

The species richness of taxa showed highest number of species i. e . 9, pertaining to genus *Agabus* (tribe Agabini, sub-family Agabinae), followed by genus *Laccophilus* (Laccophini : Laccophinae), having 5 species. 4 species each pertain to genera – *Cybister* (Cybistini: Dytiscinae), *Dytiscus* (Dysticini : Dysticinae), *Platambus* (Agabini: Dytiscinae). The genera such as : *Hydroporus*, *Nebrioporus* (Hydroporini : Dystiscinae), *Hygrotu*s (Hygrotini : Dytiscinae) and *Gyrinus* (Gyrinini : Gyrininae), have three species each. Two species each are found in case of genera : *Noterus* (Noterini : Noterinae), *Eretes* (Eritini : Dystiscinae), *Hydaticus* (Hydaticini : Dytiscinae), *Hydrophilus* (Hydrophilini : Hydrophilidae). The rest of the 29 genera, cited in the inventory, belonging to different tribes, under various sub-families, have one species each.

In the recent years (1991- 2012), the investigations conducted by various workers, have revealed the prevalence of aquatic beetles in various types of water bodies as : i) wetlands of Kashmir (Haigam, Hokersar, Malgam, Mirgund and Nowgam, having only 2 species [27] and of Jammu (Gharana wetland), harboured a total of 6 species [32] ; ii) River Jehlum (Uri, Kashmir,) inhabited two species [12] ; iii) Mansar Lake, showed the existence 8 species [31] and, Dal and Neelnag lakes of Kashmir, having 5 species [18, 19] ; iv) the rice fields of 6 Districts of Kashmir region , showing the occurrence of 10 species [2] ; v) the other water bodies in Kupwara (Kashmir), inhibited two species [28]

During past two decades, the in depth studies on limnology, habitat ecology and nektonic

fauna of rice fields of Jammu, Kashmir (India administered), *inter alia* focussed on aquatic entomo-fauna, have confirmed the present status of comparatively smaller number of aquatic beetle species i.e. 25 of 22 genera, to the already known species from these regions. Also, the identification of taxa in majority of cases has been made available up to the generic level. To ascertain the present actual status of aquatic beetles, distributed in different aquatic habitats and ecosystem of these Himalayan regions, detailed monitoring need to be undertaken in future. The decline in the number of beetle species in the recent past can be attributed to degradation in the aquatic environment, quality of water and intensive anthropogenic influences.

REFERENCES

1. Aube, C.1838, Hydrocanthares et gyriniens, In : Dejean, P.F.Species general des coleopteres de la Collection de M.le Comte Dejean Vol.6 , Paris : *Mequignon Peres et Fils*, xvi+ 804 pp.
2. Bahaar, S.W.N. and Bhat, G.A. 2011, Toxocoenosis and distribution of necktonic- fauna in the Ricefields of Kashmir (J & K), India. *Pakistan J. Biological Sciences*,14,483-489
3. Balfour- Browne, J.,1944, new names and new synonymies in the Dytiscidae (Col.), *The Annals & Mag. of Nat. Hist*., (11) 11,345-359
4. Brancucci, M., 1979, Dytiscidae aus dem Himalaja (Col.), *Entomogica Basiliensia*, 4, 193-212
5. Brancucci, M.,1980, Beitrag zur kenntnis einiger orientalischer Bidessini (Col., Dytiscidae), *Senckenbergiana Biologica*, 60 (1979), (3-4), 171-174
6. Brancucci, M., 1981, Dytiscidae aus Nepal, Kashmir und Ladakh (Insecta : Coleoptera), *Senckenbergiana Biologica*, 61 (1980), 179-186
7. Brancucci, M., 1982, Les *Platambus* du sous- genre Anagabus (Col. Dytiscidae), Mitteilungen der Scheeizerischer, *Entomologischen Gesellschaft*, 55,115-124
8. Chowdhary, S.K., 1977, A new species of Genus *Psephenoides* (*Psephenoides rajouri* SK, sp. nov. (Coleoptera : Psephenidae), *Indian J. Animal Res*., 11, 50-52
9. Chowdhary, S. K.,1984, studies on the bioecology of aquatic insects of Sind and Lidder streams of Kasnhmir, *Indian J. Ecol*.,11 (1), 160-165
10. Chowdhary, S.K. and Das, S.M.1970, a survey of aquatic entomo-fauna of Kashmir, *Ichthyologica*, 10 (1-2), 28-31
11. Das, S.M. and Verma, K. D.,1965, The insects of Kashmir (A special entomo-fauna), Kashmir Science,2: 142-146
12. Engblom, Eva and Lingdell, Par- EriK, 1999, analysis of benthic invertebrates In: Lennart Nyman (Ed.), *River Jhelum, Kashmir : Impacts on the aquatic Environment*, pp.39-75, SWEDMAR, The International Consultancy Group of National Board of Fisheries, Sweden.
13. Erman, O.K. and Erman, O., 2008, Dyscidae Species (Coleoptera), In Artvin & Rize Provinces of North eastern Turkey, *Munis Entomology & Zoology*, 3 (2), 582-593
14. Ghosh, S.K. and Nilsson, A.N., 2012, Catalogue of the diving beetles of India and adjacent countries (Coleoptera : Dytiscidae), *Skornopparn, Unea, Sweden, Supplement*, 3, 1-77
15. Gueorguier V.B., 1965, Zoologische Irgebnisse der osterreichischen Iran, Expedition 1945/50, Karakorum – Expedition, 1958, und Irak Expedition, 1963 (Coleoptera : Dytiscideae et Gyrinidae), *Reinchenbachia*, 15, 113-118
16. Guignot, F., 1954z, Dytiscides recoltes par la Yale North Indian Expedtion au Kashmir et au Pendjab, *Opuscula Entomologica*, 19, 221-224
17. Guignot, F., 1958, Dytiscides de la Mission Zoologique Suisse au Cachemire (1953-1956), *Bulletin Mensuel de la Societe Linneenne de Lyon*, 27, 28-30
18. Kawnsar- ul- Yaqoob, Wani, S.A. and Pandit A., 2007, A comparative study of macrobenthic community in Dal and Nilnag Lakes of Kashmir, Himalaya, *J. Himalayan Ecol. Sustain. Dev*., 2, 55-60
19. Kawnsar-ul- Yaqoob, Pandit, A.K. and Wani, S. A. , 2008, some aspects of Habitat Ecology of aquatic entomo -fauna in two fresh water Lakes of Kashmir Himalaya, In: M. Sengupta and R. Dalwani (Eds.), pp. 1916-1921, *Proc. of Taal 2007 : The 12th World Lake Conference*.
20. Lobl, I. & Smetana (Eds.), 2004, *Catalogue of Palaearctic Coleoptera, Vol. 2, Hydrophiloidea, Histeroidea, Staphylionidea*, Stenstrup: Apollo Books, 942 pp.
21. Nath, Surrender, 1974, Notes on the entomo-fauna of Jammu & Kashmir State (India)), Part 1., on the occurrence of *Cybister tripunctatus* Oliv (Coleoptera : Adephaga : Dytiscidae) and

Hydrophilus piceus Linn. (Polyphaga : Hydrophilidae) in Kashmir Valley, *Proc. Nat Acad. India, annual number (1974*)
22. Nilsson, A.N.,2001, *World catalogue of Insects, Vol 3., Dytiscidae, Coleoptera*, Stenstrup : Apollo Books, 395 pp.
23. Nilsson, A.N., 2003, Noteridae. Pp. 33-35: Lobl, I & Smetana, A. (Eds.), Catalogue of Palaearctic Coleoptera, Vol. I, Stenstrup : Apollo Books, 819 pp.
24. Nilsson, A.N.,2006, *A world catalogue of the family Noteridae or the burrowing beetles (Coleoptera : Adephaga)*, Version 16.vii.2006, University of Umea, Sweden, www.emg.umu.se/ begins/ andersn/WCN/wen_indexhtm
25. Nilsson, A.N., 2012, ttp:// www.2.emg.emu.se/ projects/biginst /andersn/ Cat_main.htm.
26. Olmi, M.,1978, *Dryops oscellai*, new species from Kashmir, India, Coleoptera : Dryopidae, *Bolletino del Musco Civicodi Storia natural di Verona*, 5 : 381-384
27. Pandit, A.K. 1992, Ecology of insect community in some wetlands of Kashmir Himalaya, In : Yousuf, A.R., Raina, M.K. and Qadri, M. Y. (eds.), 1992, *Current Trends in Fish and Fishery Biology and aquatic Ecology*, University of Kashmir, Srinagar, pp.271-283
28. Pandit,A. K., Haroon-ul- Rashid, Rather, G.H. and Lone,, H. A., 2007, Limnological survey of some fresh water bodies in Kupwara region of Kashmir Himalaya, *J. Himalayan Ecol. Sustain. Dev*., 2 : 92- 97
29. Redtnbacher, L.,1844, *Trochalus rugosus*, p.502, *Colymbetes lineatus*, p.503, In: Kollar, V. & Redtenbacher, L: Aufzahlung und Bescheibung der von Freihervn Car v. Hugel auf seinner Insecten , pp. 393-564, In Hugel c. von (Ed.), *Kaschmir und das Reich der Siek, Vol. 4*, Stuttgart, Hallbergerche
30. Regimbart, M.,1899, Revision de Dytiscidae de la region Indo-Sino- Malaise, *Annales de la Societe, Entomologique de France*, 68: 186-367
31. Sharma, B. and Ayri, Shalloo, 2009, Biodiversity and abundance of Hemiptera and Coleoptera and water characteristics of Lake Mansar, In: (Joshi, B.D., Tripathi,C.P.M and Joshi, P.C. (eds.), *Biodiversity & Environment Management*, pp.11-14, A.P.H. Publishing Corporation, New Delhi
32. Tara, J.S., Kour, Ramnik and Sharma, Sunil, 2012, Aquatic coleopteran and Hemipteran Diversity of Gharana wetland, Jammu, India, *J. Insect Science*, 25(2) : 220-223
33. Vfaei, Reza, Darilmaz, Mustafa, Nazari, Edvin, Incekara, Umit and Piazak, N.,2009, contribution to the knowledge of Iranian- fauna (Dytiscidae : Gyrinidae, Helophoridae and Hydrophilidae), with new records and notes on the rare species, *Coleostoma transcaspicum* Reitter, 1906, *Acta entomologica serbica*, 14(1), 101-111
34. Vazirani, T. G., 1964, On a new species of aquatic beetle of the genus *Amphizoa* Le Conte, 1853 (Insecta : Coleoptera : Amphizoidae) from Kashmir, India, *Proc. Zoological Soc*. Calcutta,17, 145-147
35. Vazirani, T.G.,1969, Contribution to the study of aquatic beetles (Coleoptera) 2. A review of the sub-family Noterinae, Laccophilinae, Dytiscinae and Hydroporinae (in part) from India, *Oriental Insects*, 2 (1): 221-341
36. Vazirani, T.G.,1970a, Contribution to the study of aquatic beetles (Coleoptera) VII, A revision of Indian Colymbetinae (Dytiscidae), *Oriental Insects*, 4,303-362
37. Vazirani, T.G., 1970 b, Contribution to the study of aquatic beetles (Coleoptera), VI,A review of Hydroporinae: Dytiscidae in part, from India, *Oriental Insects*, 4,93-129.
38. Vazirani,T.G., 1971, On the reported occurrence of *Dytiscus marginalis* Linnaeus (Coleoptera : Dytiscidae) from India, *Bull. Ent.*, 12 (2) : 137
39. Vazirani, T.G., 1976, Contribution to the study of aquatic beetles (Coleoptera) 15, subgeneric classification of *Platynecte*s Regimbart (Dytiscidae), *Records of Zoological Soc. India*, 71,169-173
40. Vazirani, T.G.,1977 ,C atalogue of Oriental Dytiscidae, *Records of the Zoological Soc. India, Miscellaneous Publication, Occasional Paper*, 6 (1976),1-111
41. Zimmermann, A.,1920, Dytiscidae, Haliplidae, Hydrobiidae, Amphizoidae, In : Schenkling, S (Ed.), *Coleopterorum Catalogue, Vol. 4, pars 71*, Berlin, W. Junk, 326 pp.

Table 1 .0: Number of Genera and Species of aquatic beetle families and their distribution in Jammu, Kashmir and Ladakh region
(JA= Jammu; KA= Kashmir; LA= Ladakh)

Taxa classification	**No. of Genera**	**No. of Species**	**Distribution**		
			JA	**KA**	**LA**
Carabidae (Adephaga)					
Harpalinae	02	02	02	--	--
Curculionidae (Polyphaga)					
Bagoinae	01	01	01	--	--
Dryopidae (Polyphaga)	01	01	--	01	--
Dytiscidae (Adephaga)					
Agabinae					
Agabini	04	15	01	13	04
Colymbetinae					
Colymbetini	02	03	--	03	01
Dystiscinae					
Cybistrini	01	04	02	03	--
Dytiscini	01	04	--	04	--
Eretini	01	02	--	02	--
Hydaticini	01	02	--	02	--
Hydroporinae					
Bidessini	02	02	01	01	--
Hydroporini	04	08	01	07	01
Hygrotini	02	04	--	04	--
Laccorini	01	01	--	01	--
Laccophilinae					
Laccophilini	02	05	02	04	--
Elmidae (Polyphaga)					
Elminae	02	02	--	02	--
Gyrinidae (Adephaga)					
Gyrininae					
Gyrinini	01	03	--	03	--
Enhydrini	01	01	--	01	--
Helophoridae (Polyphaga)	01	01	--	01	--
Hydrophilidae (Polyphaga)					
Hydrophilinae					
Acidocerini	01	01	--	01	--
Berosini	02	02	02	01	--
Hydrophilini	03	04	--	04	--
Laccobini	01	01	--	01	--
Sphaeridiinae					
Coelostomatini	01	01	01	--	--
Noteridae (Polyphaga)					
Noterinae					
Noterini	03	04	01	03	--
Psephenidae (Polyphaga)					
Psephenoidinae	01	01	01	--	--
TOTAL	42	75	16	62	06