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ARTICLE

Aquatic Beetles (Coleoptera: Dytiscidae, Haliplidae, Noteridae, Hydrophilidae) From Borujen and Lordegan (Chaharmahal and Bakhtiari Province, Iran)

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ABSTRACT

This research was aimed to study aquatic coleopteran faunas of Borujen and Lordegan (as two main towns of the Chaharmahal and Bakhtiari Province). Sampling was done at six stations between September 2017 to July 2018. The aquatic Coleoptera were identified to the species level with the help of keys and related references. Identification of samples was based on morphological characteristics such as taxonomic characters and external genitalia with appropriate entomological reference books and authors. A total of 12 species belonging to 11 genera and 4 families were identified. The greatest number of species identified were found in the family Dytiscidae Leach, 1815 and the least number in the family Hydrophilidae Latreille, 1802. Two species of *Agabus* Leach, 1817 namely, *Agabus conspersus* Marsham, 1802 and *Agabus bipustulatus* Linnaeus, 1767 were the most abundant insects.

1. Introduction

Aquatic Coleoptera known as water beetles, with more than 13,000 described species, is one of the most abundant aquatic insects [19]. They play an important role in freshwater ecosystems and are considered as a suitable bioindicator [3]. Since the maintenance of biological diversity (or biodiversity)- as a measure of the variety of all organisms- is one of the main goals of conservation for sustainable use of resources and animal survival, the identification and assessment of animal habitats are considered topics to be a priority for research. In this regard, aquatic Coleoptera as biodiversity indicators in freshwater ecosystems are of great importance [18]. The Dytiscidae with more than 4,000 described species is the most species family of water beetles which occur in virtually any freshwater habitat around the world [14]. The Hydrophilidae is the second most abundant family which are generally found in habitats of small shallow water bodies and they occupy in most kinds of stagnant waters, but also commonly inhabit streams, rivers, and seepage [4].

There is Little information about fauna of aquatic insects of Iran. For instance, [8-12] studied the aquatic beetle fauna of Fars, Guilan, Mazandaran and Khuzestan provinces. Ostovan and Niakan, [16] studied the diversity, abundance, and biology of aquatic insects, including the aquatic beetles in Fars province. The fauna of diving beetles was studied in Markazi province by Vafaei *et al.*, [20].

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The other most important publications on Iranian aquatic beetles are: Atamehr and Alaei [1], Mousavi *et al.* [15], Darilmaz *et al.* [2], Samin *et al.* [17], and Van Vondel *et al.*, [21]. Apart from a study conducted by Heydarnejad [7] on aquatic coleopteran of Choghakhor in 2010, no other study has not been done in Chaharmahal and Bakhtiari province so far. Thus, this study aimed to study aquatic coleopteran faunas of Borujen and Lordegan, Chaharmahl and Bakhtiari province, Iran.

2. Materials and Description of Sampling Station

Chaharmahl and Bakhtiari, one of the 31 Provinces of Iran, lies in the southwestern part of the country. Its capital is Shahrekord surrounded by the famous Zakros mountains. Due to the high mountainous nature, which is in the path of the wet winds of the Mediterranean systems, which makes these systems rise and discharge, the province has relatively good rainfall to the extent that this region, with only one percent of Iran's construction, is ten percent the country has water resources (Figure 1). Between September 2017 to July 2018 a field trip to Borujen and Lordegan (as two main towns of the province) was carried out by M.Taher. During this trip 6 sampling stations were examined that are listed below and presented on the map (Figure 2). The results are based on the study of 51 adults of Dytiscidae, 20 adults of Haliplidae, 17 adults of Noteridae, and 4 adults of Hydrophilidae. Identification of samples was based on morphological characteristics such as external taxonomic characters and external male genitalia with appropriate entomological reference books and authors [5,6,13,22]. All samples were deposited in the Zoological Museum, Shahrekord University (ZMSU).

Station 1: Zaghi River, substrate: muddy; 2136 m a.s.l.; near Dehno, 20 Km from the town of Borujen; 3202'54" N 5106'35" E; 23. IV. 2018, 16. V. 2018

Station 2: Kalbibak River, substrate: clay with dense aquatic vegetation; 2278 m a.s.l.; near Boldaji, 35 Km from the town of Borujen; 3153'40" N 5153'16" E; 23. IV. 2018,

Station 3: Gandoman Marsh, substrate: muddy with dense aquatic vegetation; 2219 m a.s.l.; near Gandoman, 15 Km from the town of Borujen; 3151'05"N 5105'34" E; 16. III. 2018, 16. V. 2018.

Station 4: Bizhgerd Spring, substrate: muddy; 2216 m a.s.l.; near Bizhgerd, 45 Km from the town of Borujen; 3146'55"N 5111'35" E; 16. III. 2018, 16. V. 2018.

Station 5: Barm malkhalife Spring, substrate: rubber cement; 1744 m a.s.l.; near malkhalife, 55 Km from the town of Lordegan; 3117'21"N 5115'58" E; 29. IV. 2018.

Station 6: Sendegan Spring, substrate: muddy; 1739 m a.s.l.; near Sendegan, 60 Km from the town of Lordegan; 3115'35"N 5117'00" E; 29. IV. 2018.

Figure 1. Location of Chaharmahl & Bakhtiari province within Iran

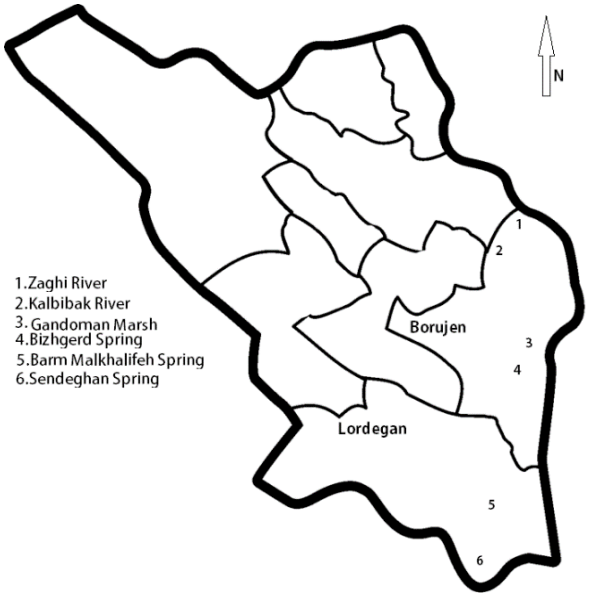

Figure 2. Location of 6 stations within Chaharmahl & Bakhtiari

3. Results

In this research totally 12 species of aquatic beetles from the families Dytiscidae, Haliplidae, Hydrophilidae, and Noteridae were collected and identified from some aquatic ecosystems in Borujen and Lordegan. The list of species is given as a checklist of the species and a list of the stations with the species collected.

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Table 1. List of a water beetles recorded from Borujen and Lordegan Species recorded from Chaharmahal and Bakhtiari province for the first time are indicated by an asterisk (*)

Species	Station
Dytiscidae	
Dytiscus persicus Wehncke, 1876	3
Laccophilus hyalinus (De Geer, 1774)	3,5
*Agabus conspersus** (Marsham, 1802)	1,4
Agabus bipustulatus (Linnaeus, 1767)	3,1,6
*Nebrioporus airumlus** (Kolenati, 1845)	4
*Hydroglyphus geminus** (Fabricius, 1792)	1,5
*Hydroporus inscitus** Sharp, 1882	4
Haliplidae	
Peltodytes caesus *(Duftschmid,1805)	3
*Haliplus obliquus** (Fabricius, 1787)	3
Hydrophilidae	
*Hydrobius fuscipes** (Linnaeus, 1758)	5
Noteridae	
*Noterus clavicornis** (De Geer,1774)	2

According to this checklist, 12 species of aquatic beetle are currently known from Borujen and Lordegan: Dytiscidae - eight species, Haliplidae - two species, Hydrophilidae - one species and Noteridae -one species.

List of stations with collected species

Station 1 :Dytiscidae: *Agabus conspersus, Agabus bipustulatus, Hydroglyphus geminus*

Station 2 :*Noteridae: Noterus clavicornis*

Station 3 :*Dytiscidae: Dytiscus persicus, Laccophilus hyalinus, Colymbetes fuscus, Agabus bipustulatus*; Haliplidae: *Peltodytes caesus, Haliplus obliquus*

Station 4 : Dytiscidae: *Agabus conspersus, Nebrioporus airumlus, Hydroporus inscitus*

Station 5 :Dytiscidae: *Laccophilus hyalinus, Hydroglyphus geminus*; Hydrophilidae: *Hydrobius fuscipes*

Station 6: Dytiscidae: *Agabus bipustulatus*

4. Discussion

This study investigated aquatic coleopteran faunas of Borujen and Lordegan, Chaharmahl and Bakhtiari province, Iran. From six stations surveyed, 11 genera and 4 families were found and identified. The most abundant families were Dytiscidae (51 samples), followed by Haliplidae (20 samples), Noteridae (17 samples), and Hydrophilidae (4 samples). In line with this research, the family Dytiscidae has been reported as the most abundant family in the study of aquatic Coleoptera by Hosseini [8-10], Ostovan and Niakan, [16] and Dong *et al.* [3]. Also, this study showed that *Agabus conspersus* and *Agabus bipustulatus* species were found in half of the stations where the samples were obtained. According to the results, Gandoman Marsh station is considered with the highest species richness. Among the total number of specimens collected respectively *Laccophilus hyalinus*, *Agabus conspersus*, *Agabus bipustulatus*, *Hydroporus inscitus*, *Peltodytes caesus* were dominant species. This indicates that the abundance of these species was more than 5% of the total number of specimens. *Colymbetes fuscus, Nebrioporus airumlus, Hydrobius fuscipes*, which contain 2 to 5% of all specimens, were semi-dominant species, but *Dytiscus persicus, Hydroglyphus geminus, Haliplus obliquus* which their abundance was less than 2% of the total number of specimens, were rare species [10].

5. Conclusion

This study, which was conducted to investigate aquatic coleopteran faunas of Borujen and Lordegan, Chaharmahl & Bakhtiari province, Iran, showed that Most species belong to the family Dytiscidae and the least to the family Hydrophilidae. Of the 12 species identified in this study, 11 species were reported for the first time in this province. Two species of Agabus with the names *Agabus conspersus* and *Agabus bipustulatus* were the most abundant specimens.

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