A FAUNISTIC STUDY ON THE DIVING BEETLES (COLEOPTERA: DYTISCIDAE) OF MARKAZI PROVINCE (CENTRAL IRAN) WITH THE NEW RECORDS

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ABSTRACT: In this study, 33 diving beetle species belonging to 18 genera, collected from the Markazi province in the central part of Iran, between 2001–2005 have been established faunistically. Seven species and two genera are recorded from Iran for the first time. The ecological significance of the new records is briefly discussed.

KEY WORDS: Aquatic beetles, Coleoptera, Faunistics, Markazi province, Iran.

Aquatic Coleoptera constitute an important part of the macrozoobenthos of freshwater habitats. Small and temporary water bodies have more species than large and permanent ones (Larson, 1985). Aquatic beetles have their greatest abundance and diversity in the temperate regions (Spangler, 1982). These insects are not particular in their choice of water bodies and occur in a wide variety of habitats (Galewwski, 1971; Zaitsev, 1953) although many species may prefer certain types of water bodies (Hosseinie, 1978). Many of them, especially dytiscids and many hydrophilids are generally found in habitats of small, shallow water bodies or margin of rivers and marshes and they occupy the zone of emergent vegetation, mats of plant debris or flooded terrestrial vegetation along the shore line (Jach & Margalit, 1987). On the other hand some aquatic beetles such as Noterids are common among roots of floating aquatic plants (Saleh et. al., 1991; Zalat et. al., 2000). The aquatic beetle fauna of Iran is partly known. Hosseinei (1992 a,b, 1994, 1995c,d) studied the aquatic beetles fauna of Fars, Guilan, Mazandaran and Khuzestan provinces. Ostovan et. al. (2004) studied the diversity, abundance and biology of aquatic insects, including the aquatic beetles, in Ardabil and Fars provinces.

The study on diving mites (Coleoptera: Dytiscidae) from Markazi Province was carried out to obtain valuable documentation of the occurrence of aquatic beetles in the different types of springs there. 588 specimens and 33 species were detected, among them 7 found for the first time in Iran. Further, the aim of this study is to consider the faunistic results from an ecological aspect.

MATERIALS AND METHODS

In 2001-2005 the water beetles fauna from the 36 sampling sites were studied. The Markazi province, in which sampling has been carried out, is located in the central part of Iran between 48°57′ and 51°03′ East and 33° 23′ and 35°35′ North, and cover an area of 29491 km^2. The climate of Markazi province is arid to semiarid. The average rain fall is 309.7 mm/year. Markazi province have two permanent streams, Ghare-Chae (273 km) and Ghom Rood (85 km), and many small streams such as Khomain, Nozhan, Emarat, Razeghan, Masleghan and Azna.

For collecting aquatic beetles, sweeping the water with a metal sieve or net was the main method; in some cases, a drag-type net and a light trap were used. All captured samples were separated by forceps. Sorting was performed wet or dry in a flat white tray. The beetles preserved in 95% alcohol, which replaced by 75% alcohol and 5% glycerin mix after 24 hours.

Slide-mounted specimens and material preserved in fluid are crated in the collections of Department of Entomology at Arak Azad University.

A list of localities is given in Table 1. For each species the detailed locality records contains sampling locations, date of sampling and total number of individuals are given. All specimens were collected by the senior author.

RESULTS

List of Dytiscidae species

1. ***Hydaticus seminiger*** (De Geer, 1774) : Material: GCH 18.08.2003, 3.

2. ***Acilius sulcatus*** (Linnaeus, 1758) : Material: ZLO (Mahoorzan) 21.09.2003, 4.

3. ***Graphoderus cinereus*** (Linnaeus, 1758) : Material: EBR 06.08.2003, 2.

4. ***G. austeriacus*** (Sturm, 1934) : Material: EBR 06.08.2003, 1.

5. ***Dytiscus persicus*** Wehncke, 1876 : Material: KHN 14.07.2002, 3; AMN 14.07.2002, 2; BSH 23.06.2003, 3.

6. ***Eretes sticticus*** (Linnaeus, 1767) : Material: SHZ 08.08.2003, 2.

7. ***Copelatus haemorrhoidalis*** (Fabricius, 1787) : Material: ZLO 16.07.2002, 1.

8. ***Agabus biguttatus*** (Oliver, 1795) : Material: AST 12.08.2001, 12; ALM 27.07.2001, 3; AZN 13.09.2005, 6; ESK 21. 07.2004, 12; ANJ 19.06.2005, 9; BSH 12.11.2002, 4; TFR 13.11.2004, 2; JLR 17.10.2004, 9; KHM 15.09.2005, 3; KHN 28.09.2003, 7; DLJ 22.09.2003, 1; ZLO 26.09.2004,1, 16.07.2002,3, 21.09.2003,3, SVH: 27.07.2004, 1, 14.07.2002, 1; SHZ 14.07.2001, 21; EZD 12.07.2005,4, FRM 19.07.2004, 3; KRR 3.07.2004, 3; NRG 10.07.2005, 2; NSH 27.05.2005, 8; NZM 01.10.2001, 2, 21.09.2003,1.

9. ***A. bipustulatus*** (Linnaeus, 1767) : Material: AST 08.12.2001, 10; AZN 13.04.2005, 7; ESK 21.07.2004, 14; ANJ 19.06.2005, 2; BSH 12.XI.2002, 23; TFR 13.11.2004, 3; KHM 15.09.2005, 12, KHN 28.09.2003, 7, DLJ: 22.09.2003, 5; ZLO 26.09.2004, 3, 16.07.2002,

3; ZNJ 11.09.2005, 13; NOR 24.07.2002, 11; SVH 27.07.2004, 9, 14.07.2002, 17; SHZ 14.07.2001, 23; EZD 12.07.2005, 1; FRM 19.07.2004, 2; KRR 3.07.2004, 1; NRG 10.07.2005, 2, NSH 27.V.2005, 5; NZM 01.10.2001, 5; 21.09.2003, 1.

10. *A. conspersus* (Marsham, 1802) : Material: AST 12.07.2001, 11; AZN 13.09.2005, 7; ESK 21.07.2004, 5; ANJ 19.06.2005, 13, BSH 12.11.2002, 9; TFR 13.11.2004, 2; KHM 15.09.2005, 2; KHN 28.09.2003, 4; ZLO 26.09.2004, 7, 16.07.2002, 6; NOR 24.07.2002, 11; SVH 27.07.2004, 6; SHZ 14.07.2001, 23; EZD 12.07.2005, 7, 19; FRM 19.07.2004,11; NRG 10.07.2005, 4; NZM 1.10.2001, 2, 21.09.2003, 7.

11. *A. faldermanni* Zaitzev, 1927 : Material: KHM 02.07.2002, 2; NSH 02.07.2002, 1.

12. *A. nebolusus* (Forster, 1771): Material: HBG 16.07.2002, 3; DLJ 01.07.2002, 2.

13. *A. undulatus* (Schrank, 1776) : Material: NOR (Ganjeh) 15.07.2003, 2.

14. *Ilybius fuliginosus* (Fabricius, 1792) : Material: ASH 25.06.2002, 3; FRM 26.07.2003, 2.

15. *I. chalconatus* (Panzer, 1796) **:** Material: AZN 25.07.2003, 7; ESK 25.07.2003, 4.

16. *Platambus lunulatus* (Steven, 1829) : Material: PDA 08.09.2002, 3.

17. *Colymbetes vegans* Sharp, 1882 : Material: ZLO 16.07.2002, 2.

18. *Bidessus calabricus* Guignot, 1957 : Material: ALM 26.06.2002, 4.

19. *Hydroglyphus geminus* Fabricius, 1792 : Material: AST 05.07.2003, 4; NOR 05.07.2003, 6.

20. *Hygrotus confluens* (Fabricius, 1787) : Material: BSH 19.07.20038, 3

21. *H. inaequalis* (Fabricius, 1777) : Material: NRG 30.09.2002, 7.

22. *Hyphydrus ovatus* (Linnaeus, 1761) : Material: DSJ 01.10.2002, 1.

23. *Hydroporus discretus* Fairmaire & Brisout, 1859 : Material: HDD 02.10.2004, 4; HZV 23.09.2004, 3; HZR 11.09.2005, 3; VRC 09.09.2003, 1; KHN 18.09.2004, 1; GCH 25.07.2004, 4; DSJ 25.08.2004, 3; SHZ 05.07.2003, 2, 20.07.2003, 2.

24. *H. pubescens* (Gyllenhal, 1808) : Material: KHM 05.07.2003, 2; ANJ 03.07.2002, 2; AZN 05.07.2003, 3; ESK 04.07.2002, 3.

25. *H. tessellatus* (Drapiez, 1819) : Material: AMN 2003, 1; BSH 16.11.2003, 1; TFR 15.06.2003, 2; SVH (Sorkh-Deh) 12.11.2003, 1.

26. *H. marginatus* (Duftschmidt, 1805) : Material: HZR 7.07.2003, 2

27. *H. erythrocephalus* (Linnaeus, 1758) : Material: ASH (Fayz-Abad) 15.07.2003, 1.

28. *H. palustris* (Linnaeus, 1761) : Material: DSJ 27.07.2003, 2.

29. *H. planus* (Fabricius, 1781) : Material: HDD (Ghareh-Tappeh) 25.07.2003, 2.

30. *Scarodytes halensis* (Fabricius, 1787) : Material: ZMJ 6.XII.2001, 2; 15.06.2003, 1; SVH (Sorkh-Deh) 12.11.2003, 1; JLR 17.10.2004, 2.

31. *Nebrioporus airumlus* (Kolenati, 1845) : Material: HZV 23.09.2004, 1; GCH 18.07.2003, 1; SHZ 8.07.2003, 1, 14.07.2001, 2.

32. *Laccophilus hyalinus* (De Geer, 1774) : Material: NZM 1.10.2001, 1, 21.09.2003, 1; VRC 9.09.2003, 1; NOR (Ganjeh) 25.07I.2003, 1.

33. *L. minutus* (Linnaeus, 1758) : Material: EBR 22.07.2002, 2.

DISCUSSION

In the freshwater habitats of Markazi Province 33 diving beetle species belonging to 18 genera were recorded at 36 sites. Of these, the genera *Acilius* and *Graphoderus*, and the species: *Hydaticus seminiger*, *Acilius sulcatus*, *Graphoderus cinereus, G. austeriacus, Agabus undulatus, Hyphydrus ovatus and Hydroporus erythrocephalus*, are recorded from the Iran for the first time.

The total number of specimens of diving beetles collected in the freshwater habitats of Markazi Province amounts to 588. Three species are dominant (> 5% total abundance, in decreasing order [in parentheses % total abundance]): *Agabus bipustulatus* (30.5%), *A. conspersus* (23.6%) and *A. biguttatus* (20.6%). One species, *Hydroporus discretus* (3.9%) is subdominant (abundance 2-5%). The remaining 29 species has an abundance of less than <2%.

Further studies aim to improve our knowledge on Iranian water beetles and should focus on collecting in little known areas, a revision of the still unstudied material from additional families and filling the large gaps in our knowledge regarding the diversity of water beetles in some specific habitats.

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Table 1. List of sampling sites in Markazi Province (Abbreviations: No. = number, Abr.= abreviation of the site).

No	Sampling site	coordinates	habitat	Abr.
1.	Alma Cheshmeh (13 km S of Ashtian)	49° 59′E 34°25′N	spring	ALM
2.	Aman-Abad (22 km E of Arak)	49°56′ E 34° 02′N	pool	AMN
3.	Amir-Abad (8 km E of Nahavand)	49°06′E 34°59′N	stream	AMR
4.	Anjedan (30 km Eof Arak)	50°02′ E 33°58′N	stream	ANJ
5.	Ashtian	50°00′E 34°32′N	pool	ASH
6.	Astaneh (10 km S of Shazand)	49°20′E 33°53′N	stream	AST
7.	Azna (near the Shazand)	49°24′E 33°56′N	stream	AZN
8.	Band-e-Shahabbasi (25 km NE of tafresh)	50° 07′E 34°54′N	river	BSH
9.	Dastjerd (25 km W of Ashtian)	50°15′E 34°34′N	spring	DSJ
10.	Delijan	50°42′E 33°58′N	stream	DLJ
11.	Ebrahim-Abad	50°03′E 34°13′N	spring	EBR
12.	Eskan (20 km N of Shazand)	49°21′E 34°05′N	pool	ESK
13.	Ezeddin (24 km N of Tafresh)	49°55′E 34°52′N	river	EZD
14.	Farmahin	49°41′E 34°30′N	pool	FRM
15.	Gol-Cheshmeh (30 km Nof Delijan)	50°36′E 33°44′N	spring	GCH
16.	Hendoodar (25 km SW of Shazand)	49°13′E 33°47′N	pool	HDD
17.	Hezarkhanei (10 km NE of Ashtian)	50°04′E 34°35′N	stream	HZR
18.	Hezaveh (17 km NW of Arak)	49°33′E 34°11′N	stream	HZV
19.	Hossain-Abad-Baghdadi (near Arak)	49°45′E 34°02′N	pool	HBG
20.	Jalayer (26 km N of Tafresh)	50°02′E 34°53′N	river	JLR
21.	Karahrood (near of Arak)	49°39′E 34°04′N	spring	KRR
22.	Khomain	50°05′E 33°37′N	river	KHM
23.	Khondab (64 km NW of Arak)	49°12′E 34°23′N	stream	KHN
24.	Mahallat	50°27′E 33°55′ N	stream	MHL
25.	Naragh	50°52′E 34°02′N	stream	NRG
26.	Nazm-abad (near Arak)	49°45′E 34°02′ N	stream	NZM
27.	Neshahr (15 km NE of Khomain)	49°56′E 33°35′N	stream	NSH
28.	Noor-abad (18 km Wof Shazand)	49°26′E 33°47′ N	stream	NOR
29.	Pole-Do-Ab	49°22′E 34°03′N	river	PDA
30.	Saveh	50°23′E 35°02′N	river	SVH
31.	Senejan (10 km SW of Arak)	49°37′E 34°03′N	stream	SNJ
32.	Shazand	49°23′E 33°55′N	river	SHZ
33.	Tafresh	50°01′E 34°42′N	river	TFR
34.	Varcheh (20 km NW of Khomain)	49°55′E 33°47′N	spring	VRC
35.	Zaloo (27 km NE of Khomain)	49°57′E 33°52′N	spring	ZLO
36.	Zamenjan (15 km sw of Arak)	49°38′ E 34°02′N	pool	ZMJ