Original Article

Biodiversity of Aquatic Insects of Zayandeh Roud River and Its Branches, Isfahan Province, Iran

Mansoreh Shayeghi 1, *Hassan Vatandoost 1, Abdollah Gorouhi 1, Ali Reza Sanei-Dehkordi 1, Yaser Salim-Abadi 1, Mohsen Karami 1, Mohammad Reza Jalil-Navaz 1, Amir Ahmad Akhavan 1, Zahra Shiekh 1, Sajad Vatandoost 3, Mohammad Hossein Arandian 2

1Department of Medical Entomology and Vector Control, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
2Isfahan Health Research Station, National Institute of Health Research, Tehran University of Medical Sciences, Tehran, Iran
3Department of Zoology, University of Tehran, Tehran, Iran

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Abstract

Background: Aquatic insects are the major groups of arthropods that spend some parts of their life cycle in the water. These insects play an important role for transmission of some human and animal diseases. There is few information about the aquatic insects fauna of Iran.

Methods: To study the aquatic insects fauna, adult, nymphal and larval collections were carried out from different habitats using the standard technique in Zayandeh Roud River, Isfahan Province, central Iran, during summer 2011.

Results: In total, 741 speimens of aquatic insects were collected and morphologically identified. They include 7 families and 12 genera representing 2 Orders. The order of Diptera (92.31%) and Coleoptera (7.69%). The families Culicidae, Syrphidae and Chironomidae from Diptera order, Gyrinidae, Dytiscidae, Haliplidae, Hydrophilidae from Coleoptera order were identified.

Conclusion: Some aquatic insects play an important role for transmission of human and animal diseases. These insects also are important for biological control. Therefore ecological study on aquatic insects can provide information about ecology of insects in an area for any decision making.

Keywords: aquatic insects, Zayandeh Roud River, Iran

Introduction

Aquatic insects are a major group of arthropods which at least one stage of their life cycle occurs in water. Most of them live in water in primary stages that followed by terrestrial adult (eg, Ephemeroptera, Odonata, Plecoptera, Trichoptera, Megaloptera). Semi aquatic insect are only associated with aquatic and semi aquatic vegetation, the water's surface, or the margins of water habitats (Merritt and Cummins 1996).

Some species of aquatic insect are medically important vectors that transmit diseases such as malaria, dengue, filariasis, yellow fever, and some other main arboviruses (Foil 1989). Furthermore few numberof them have a painful bite that cause dermatological effect on human and animal host (Villiers 1987). Some of them act as a host of termatods such as dragonfly and damselfly (Chae et al. 2000).

In some countries dragonfly are considered as a threat to the poultry industry because they transmit a parasitc flatworm of Prosthogonimus spp (Angel 1973). Some aquatic insects are used as an indicator of water contamination. Water quality is evaluated by comparing the number of tolerant species (some midge larva) to the number of intolerant species (Ephemeroptera, Plecoptera, Trichoptera, Megaloptera).

*Corresponding author: Prof Hassan Vatandoost, E-mail: hvatandoост1@yahoo.com

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Aquatic insect orders like Ephemeroptera, Plecoptera, and Trichoptera are found in a wide variety of aquatic habitats, such as ponds, springs, streams, and rivers, which differ in salinity, pH, and other characteristics. Apart from their importance in toxicological researches in primary stages, these insects play an important role in the ecosystem. They serve as food for fish, amphibians, and water birds. They are also involved in the breakdown of organic matter and nutrients. Some aquatic insects are responsible for breaking down dead leaves and plants that fall on the water surface. This material provides the base of the food chain in some aquatic environments. Some of them filter suspended particles in water and cause light to reach the bottom of streams, where algae grow. Another kind of aquatic insects mix soft sediment of the bottom while searching for food, making the bottom appropriate for organisms, and this phenomenon is due to oxygen enrichment of the bottom. Additionally, predator aquatic insects reduce the numbers of other invertebrates and help to maintain a balance among different organisms and food reservoirs.

This study attempts to investigate aquatic insect fauna in Isfahan Province. Apart from researches that have been conducted on Culicidae family members, there is a few studies on aquatic insects.

Materials and Methods

Study area

Present study conducted in the Zayandeh Roud River of Isfahan Province during summer 2011. The Isfahan Province located in the center of Iran and situated 340 kilometers far away of Iran’s capital. Isfahan region has a generally arid climate with hot summer and cold winter. It has an average annual rainfall of 150 millimeter. Zayandeh Roud River in this region provides a suitable habitat for aquatic insects. Isfahan Province is surrounded by Qoum, Semnane, and Markazi Provinces to the north, Fars, and Kohkiloiye Province to the south, Yazd Province to the east, and Lorestan, Khuzestan, and Chaharmahal to the west. With a total area of around 105,937 square kilometers (6.57% total area of Iran). It lies at an altitude of 1575 meters above sea level at a latitude of 30° 42’ N to 34° 30’ N and a longitude 49° 36’ E to 55° 32’ E. The climate is temperate. It has the warm and semi-humid climate in the north and east parts and cold climate in the south. The studied areas were selected by clustered random sampling consist of several localities in the study area. We started our survey from Zarinshahr City, ca. 1684 m (32º 22’ N, 51º 22’ E) to Baghbahadoran City, ca. 1751 m (32º 23’ N, 51º 10’ E), (Fig. 1).

Data sampling

Aquatic insects collected in different habitats. The sampling was carried out from rifles, under stones, aquatic vegetation, overhanging terrestrial vegetation, within burrows, leaf packs and fine sediment. The specimens collected by D frame net-collector, plastic pipette and forceps. After collection, all specimens were preserved in 70% alcohol, date and time of sampling and place of collection were recorded on each container. The samples were transferred to the laboratory of medical entomology department, Tehran University of Medical Sciences. Then the samples were identified using stereo-typed microscope, and valid identification keys (Clifford 1991, Borror and White 1998, Epler 2001, Bouchard 2004, Sangradub and Boonsoong 2006, Subramanian and Sivaramakrishnan 2007, Azari-Hamidian and Harbach 2009, Mullen and Durden 2009).
Results

During several times sampling in the study area a total of 741 aquatic insects were collected that including: 2 Orders, 7 families and 12 genera which summarized in Table 1. In the Diptera order there are 3 families: Culicidae (n=384, 51.82%), Syrphidae (n=4, 0.54%) and Chironomidae (n=296, 39.95%) and Coleoptera order was including 4 families: Gyrinidae (n= 6, 0.81%), Dytiscidae (n=24, 3.23%), Haliplidae (n=7, 0.94%), Hydrophilidae (n=20, 2.7%) and Culex theileri belong to Culicidae family was the most frequent (51.82%) moreover Peltodytes in the Haliplidae family with 0.40% of all collected samples was the least frequent (Table 1 and Fig. 2, 3).

Table 1. The prevalence of some aquatic insects in the study area

| Order       | Family     | Genus           | No.  | Percent (%) |
|-------------|------------|-----------------|------|-------------|
| Diptera     | Culicidae  | Culex (Culex theileri) | 384  | 51.82       |
|             | Syrphidae  | Eristalis       | 4    | 0.54        |
|             | Chironomidae | Chironomus | 296  | 39.95       |
|             | Gyrinidae  | Gyrinus         | 6    | 0.81        |
|             |            | Agabus          | 5    | 0.67        |
|             | Dytiscidae | Dytiscus        | 13   | 1.75        |
|             |            | Hydroporus      | 6    | 0.81        |
| Coleoptera  | Haliplidae | Haliplus        | 4    | 0.54        |
|             |            | Peltodytes      | 3    | 0.40        |
|             | Hydrophilidae | Laccobius | 10   | 1.35        |
|             |            | Enochrus        | 4    | 0.54        |
|             |            | Hydrobius       | 6    | 0.81        |
| Total       | 7 families | 12 Genus        | 741  | 100         |

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Discussion

Total number of 741 samples belongs to 2 Orders and 7 families and 12 genera were identified using stereo-typed microscope. The results are summarized in Table 1. *Culex theileri* with 51.82% of collected sample was the most abundance frequent (Table 1 and Fig. 2). In the same study that conducted in the our study area by Shayeghi et al. in 2011, their result were compatible with our result, for the study on the aquatic insects of Isfahan Province and also their probable use of biological control, Coleoptera order was one of the abundance collected aquatic insect and this result was likely to our result (Shayeghi et al. 2012) *Cx. theileri* was one of the collected samples in the study area. Research conducted by Mousa-kazemi et al. in 2002, *Cx. theileri* was the most abundance frequency and their results were agree with our results (Mousa-kazemi et al. 2000). This species is the more prevalent species at higher altitudes in rural areas of Zanjan Province (Ghavami and Ladonni 2005) and East Azerbaijan Province (Abai et al. 2007). Dehghani et al. (2007) conducted a study for studying fauna of aquatic insects in sewage maturation ponds of Kashan. The families of Chironomidae and Hydrophilidae were prevalent. In the other study that conducted by Vafaie et al. 2007 for surveying of the aquatic beetles (Coleoptera: polyphaga) of Markazi Province (central Iran) after investigation In freshwater habitats of study area, 24 species (Coleoptera: Hydrophilidae, Helphororidae, Hydraenidae, Elmidae, and Dryopidae) belonging to 13 genera and five families were identified and in this study Hydrophilidae family was one of the collected samples like present study (Vafaie et al. 2007). Some aquatic insect are an important for biological control of larvae and adults of mosquitoes in the breeding places also some of these insects play an important role in transmission of some human and animal diseases, for example in Iran several species belong to Anophelinae sub family including *Anopheles culicifacies* s.l., *An. stephensi*, *An. dthalii*, *An. fluviatilis* s.l., *An. superpictus*, are known to be the malaria vectors (Naddaf et al. 2003, Doosti et al. 2006, Oshaghi et al. 2006, Vatandoost et al. 2006, Hanafi-Bojd et al. 2011, Mehravaran et al. 2011, http://jad.tums.ac.ir Published Online: April 09, 2014
Oshaghi et al. 2011, Vatandoost et al. 2011, Hanafi-Bojd et al. 2012a, 2012b, 2012c, Vatandoost and Abai 2012a, Soleimani-Ahmadi et al. 2012a, 2012b, Vatandoost and Hanafi-Bojd 2012). Therefore the ecological specifi-
cations of these insects could provide a clue for further Arthropod-borne disease control.

Conclusion

According to the results it could be con-
cluded that there are several species of in-
sects in the study area. They are involved in
the food chain of aquatic insects. They also
could be considered as biological control
agent for vectors as well as bio indicators.

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