Published online 2015 November 23.

Identification of Medically Important Snails of Miangran Lake in Izeh, Khuzestan Province of Iran

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Received 2015 June 1; Revised 2015 July 24; Accepted 2015 August 1.

Abstract

Background: Some freshwater snails are acting as intermediate hosts for digenetic trematodes. Studies on distribution of freshwater snails are important to determine the transmission patterns of the trematoda.

Objectives: The current study aimed to identify medically important snails of Miangran Lake in Izeh, Khuzestan province, Iran.

Materials and Methods: Sampling was conducted in fourteen sites around Miangran Lake in 2014. The collected samples were placed in plastic containers containing 70% ethyl alcohol, prior to consideration. The identification was carried out according to shell characteristics. Data were analyzed descriptively.

Results: All sampling sites were positive for medically important snails. Overall, nine genera and thirteen species were identified. The most diversity in genus was found in *Melanopsis*. Five genera of snails detected in the study with known medical importance include: *Bithynia* spp., *Bulinus* spp., *Lymnaea* spp., *Melanoides* spp. and *Melanopsis* spp. *Melanoides* spp. was observed in thirteen and *Bellamya* spp. was identified in two sites. Also, in this study *Melanoides* spp., *Bulinus* spp., and *Lymnaea* spp. were widespread snails around Miangran Lake. **Conclusions:** The reason for difference in the detected snail genera in sampling sites may be due to various physicochemical factors. According to the current study, medically important snails exist in Miangran Lake and they could be a source of trematode infections for the local people. Controlling measures after comprehensive studies should be applied.

Keywords: Identification, Trematoda, Snails, Lake, Iran

1. Background

Identification of freshwater snails is of great value because of their role as intermediate hosts of a variety of trematode parasites including liver flukes such as Fasciola spp., Opisthorchis felineus, Clonorchis sinensis, Dicrocoelium dendriticum, intestinal flukes such as Heterophyes heterophyes, Metagonimus yokogawai, Troglotrema salmincola, Echinostoma ilocanum, blood flukes of the Schistosomatidae family, and pulmonary flukes of the genus Paragonimus which infect humans (1, 2). Till now, many species of snails with medical importance are discovered in the world (3, 4). There is a need for preventive measures to control snails (5). In order to develop interventions against medically important snails, a clear picture of the entire snail fauna is needed (5). Though several researchers such as Mansoorian (6), Mowlavi (7) and Ektefa (8) studied snails in different areas of Khuzestan province; some large parts of this province such as Izeh remain unexplored. This city has many aquatic environments ranging from large rivers and lakes to rice farms which have never been evaluated.

2. Objectives

The current study aimed to identify medically important snails of Miangran Lake in Izeh, Khozestan province, Iran.

3. Materials and Methods

3.1. Study Site

Study area was located in the north of Izeh city at Khuzestan province, Iran. The Miangran Lake is almost semi-circular in shape and occupies an area ranging from 7 to 42 km2 depending upon annual rain. The study area falls in sub-humid temperate climatic condition with cold winter and moderate summer. The maximum water depth in rainy season is 5 m, while it reduces to less than 0.5 m in dry period. The lake water is mainly secured by seasonal streams. Waste water of Izeh city is also discharged into the lake (9).

3.2. Collection of Snails

Sampling was conducted in fourteen sites (Figure 1) around Miangran Lake in 2014. Sampling time was one hour per site (3). The snails were collected by hand and square net (4). The samples were placed in screw cap plastic containers containing 70% ethyl alcohol for 24 hours (10). The collected samples were transferred to the laboratory. The samples were then sieved using 0.5 mm mesh and washed with water to remove the debris and soft parts. The shells were dried at room temperature and kept in screw cap plastic containers (1).

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A, Aerial map of Miangran Lake; B, same picture with higher magnification.

Figure 2. Detected Snails

3.3. Identification of Snails

Identification was carried out according to shell characteristics based on online resources such as websites of conchology (11, 12).

3.4. Statistical Analysis

Data analysis was carried out descriptively, in other words, snails genera in each sampling site were determined.

4. Results

All fourteen sampling sites (Figure 1) were positive for medically important snails. Sampling sites of N and G with eight species had the highest diversity. The minimum diversity in all sites was five species (site L). Overall, nine genera and thirteen species were identified (Figure 2). In the current study, the names of the species were not determined. The most diversity in genus (with four species) was found in *Melanopsis. Melanoides* spp. was observed in all sampling sites except for site C. *Bellamya* spp. was observed only in



1, Bellamya spp. 2, Bithynia spp. 3, Bulinus spp. 4, Physa spp. 5, Planorbis spp. 6, Theodoxus spp. 7 and 8, Lymnaea spp. 9, Melanoides spp. 10, 11, 12 and 13, Melanopsis spp. (original).

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two sampling sites G and N (Table 1). The frequency of each snail according to the number of detected sampling sites included: Bellamya spp. (two sites), Bithynia spp. (five sites), Bulinus spp. (twelve sites), Physa spp. (eight sites), Planorbis spp. (five sites), Theodoxus spp. (four sites), Lymnaea spp. (both of species in eleven sites), Melanoides spp. (thirteen sites), Melanopsis spp. (two species (pictures of 10 and 13 in Figure 2) in three sites and other two species (pictures of 11 and 12 in Figure 2) in five and eight sites, respectively) (Table 1). Five genera of snails detected in the current study, which were known for their medical importance, included: Bithynia spp. (1, 13), Bulinus spp. (14), Lymnaea spp. (5, 15), Melanoides spp. (16, 17) and Melanopsis spp. (18). Furthermore, in this study, Melanoides spp. (observed in 13 sampling sites), Bulinus spp. (observed in 12 sampling sites), and two Lymnaea species (both of them were observed in 11 sampling sites) which all have medical importance were the most widely distributed snails in all sampling sites.

Table 1. Sampling Details and Snails		
Sampling Location Latitude/ Longitude	Sampling Site ^a	Snails ^b
31°53'23.45"N/49°52'39.45"E	А	3, 7, 12, 4, 9, 8
31°53'54.87"N/49°52'33.31"E	В	2, 4, 10, 9, 3, 8
31°54'14.10"N/49°52'3.51"E	С	3, 5, 12, 4, 8, 7
31°54'10.41"N/49°51'31.13"E	D	3, 12, 11, 6, 4, 9, 7
31°54'1.27"N/49°51'0.87"E	E	2, 5, 7, 9, 8, 13
31°53'35.55"N/49°50'38.44"E	F	3, 12, 7, 6, 9, 8
31°53'9.22"N/49°50'27.48"E	G	3, 7, 11, 9, 1, 6, 4, 8
31°52'36.69"N/49°50'31.44"E	Н	2, 3, 5, 4, 8, 9, 7
31°52'8.68"N/49°50'42.44"E	I	3, 12, 10, 11, 9, 7, 8
31°51'55.20"N/49°51'5.39"E	J	3, 7, 9, 6, 12, 13
31°51'48.66"N/49°51'38.42"E	К	3, 5, 7, 8, 13, 9
31°52'6.17"N/49°52'2.42"E	L	2, 12, 11, 9, 3
31°52'24.01"N/49°52'33.52"E	М	7, 10, 9, 4, 8, 5
31°52'54.29"N/49°52'43.74"E	N	1, 2, 12, 11, 9, 3, 8, 4

^aSampling site according to Figure 1.

^bDetected snails according to Figure 2.

5. Discussion

The presence of medically important snails in Miangran Lake threats even passengers and swimmers health. The reason for difference in the detected snail genera in sampling sites and with other literature was not determined, which may be due to various physicochemical factors such as temperature, hardness, pH, seasonal changes, topography, chemical composition, vegetation, pollution and the size of water bodies (1, 3). Researchers such as Barkia in Morocco (4), Afshan in Pakistan (3), Kebapci in Turkey (19), Kucharz in Poland (11), Dung in Vietnam (20), El-Kady in Egypt (21) conducted surveys on fresh water snails in recent years. In Iran, studies by Mansoorian (6), Mowlavi (7) and Ektefa (8) in Khuzestan province are

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examples of such studies. The current study identified a species of *Bellamya*, which correlates with the studies by Mowlavi and Ektefa (7, 8), Mansoorian (6, 22) and Afshan (3). The study found a species of *Bithynia*. This finding is in agreement with the studies by Kucharz and Spyra in Poland (11, 23), Ektefa (8), Dung and Mansoorian (20, 22), but such findings do not correlate with the study by Kebapci in turkey which found two species (19). This investigation found only one species of *Bulinus* which correlates with those of the studies by Ektefa (8) and Mansoorian (6, 22). Moreover, the study found a species of *Physa* which is in agreement with the studies by Mansoorian (6, 22), Mowlavi (7), Barkia and Magboul in Morocco (4, 24) and Spyra in Poland (23); while the finding does not correlate with the studies by Afshan (3), Kebapci and Kucharz (11, 19) which found two species. The study by Ektefa (8) showed three species of *Planorbis*, and the study by Kebapci highlighted two species (19). The current study similar to the studies by Mansoorian (6, 22), Kucharz (11) and Spyra (23) showed one species of *Planorbis*. The studies by Mansoorian (6, 22) similar to the current study found one species of Theodoxus; while the study by Ektefa (8) found two species and the one by Kebapci found four species (19). The studies by Kebapci found seven species of Lymnaea (19), Kucharz found six species (11), and Spyra and Ektefa found five species of Lymnaea (8, 23). Meanwhile, the study by Mansoorian in Khuzestan province (6) and Afshan's study (3) found four species of Lymnaea, but Mansoorian's study in North of Iran (22) and Barkia and Magboul studies (4, 24) found three species. The studies by Dung (20), Mowlavi (7) and the current study found two species of Lymnaea. Researchers such as Mowlavi and Mansoorian (6, 7), Dung (20), Barkia (4), Afshan (3), Kebapci (19) and the current study authors showed one species of Melanoides, while the study by Ektefa (8) showed two species of this genus. In addition, Mowlavi (7), Mansoorian (22) and Kebapci (19) found a species of Melanopsis in their studies, while Ektefa identified five species (8). The current study, similar to that of Mansoorian in Khuzestan province (6), identified four Melanopsis species. The current study found that Melanoides, Bulinus and two Lymnaea species were the most widespread snails in all sampling sites which correlates with the studies by Dung (20), Ektefa (8), Afshan (3), Kebapci (19), Kucharz and Spyra (11, 23). In the current research. Bellamva spp. was the least distributed snail in all sites (observed only in two sites) which does not correlate with the study by Afshan (3). The current study described the medically important snails detected for the first time in Miangran Lake as follows: Lymnaeidae snails with a diverse distribution and parasitological importance because they are intermediate hosts of some trematodes that infect human e g. Fasciola spp. (5, 15), genus Bulinus which act as intermediate hosts for Schistosomes that are responsible for a highly significant group of infections in humans termed schistosomiasis (14). Genus Bithynia that is important because some species are intermediate hosts of liver and intestinal trematodes; for example, the liver fluke Opisthorchis viverrini (13), and Genus Melanoides that is considered to be of medical significance. A checklist from 136 scientific published studies revealed that Melanoides tuberculata could be host for flukes, identified as belonging to 17 families, 25 genera, and 37 species. These trematodes are both animals and human parasites (17), and the presence of various cercariae of Melanopsis snails in some parts of Khuzestan province and their potential to make zoonotic diseases such as heterophyiasis. echinostomiasis and philophthalmiasis in human and animals was previously proved (18). The identification of medically important snails helps to control them. Control measures include using chemical methods which are now objectionable from the standpoint of their toxicity to other organisms (2). Biological control methods such as introduction and management of predators, pathogens, and other biologic methods are more suitable (2). Finally, it is suggested to use new techniques based on polymerase chain reaction to correctly identify medically important snails and their parasitic contamination in future studies in this region.

Acknowledgments

The author would like to express gratitude to Mr. A Saeidi for his substantial contributions and anonymous reviewers for their valuable comments.

Footnotes

Funding/Support:The current study was financially supported by Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.

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