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

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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

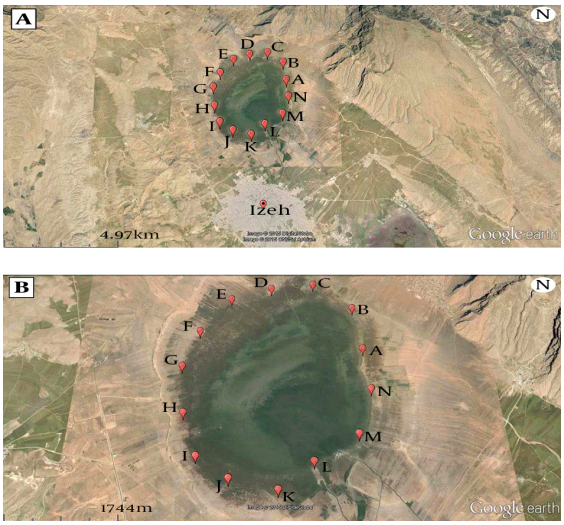
3.1. Study Site

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).

Figure 1. Sampling Sites (Red Dots)



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

3.3. Identification of Snails

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

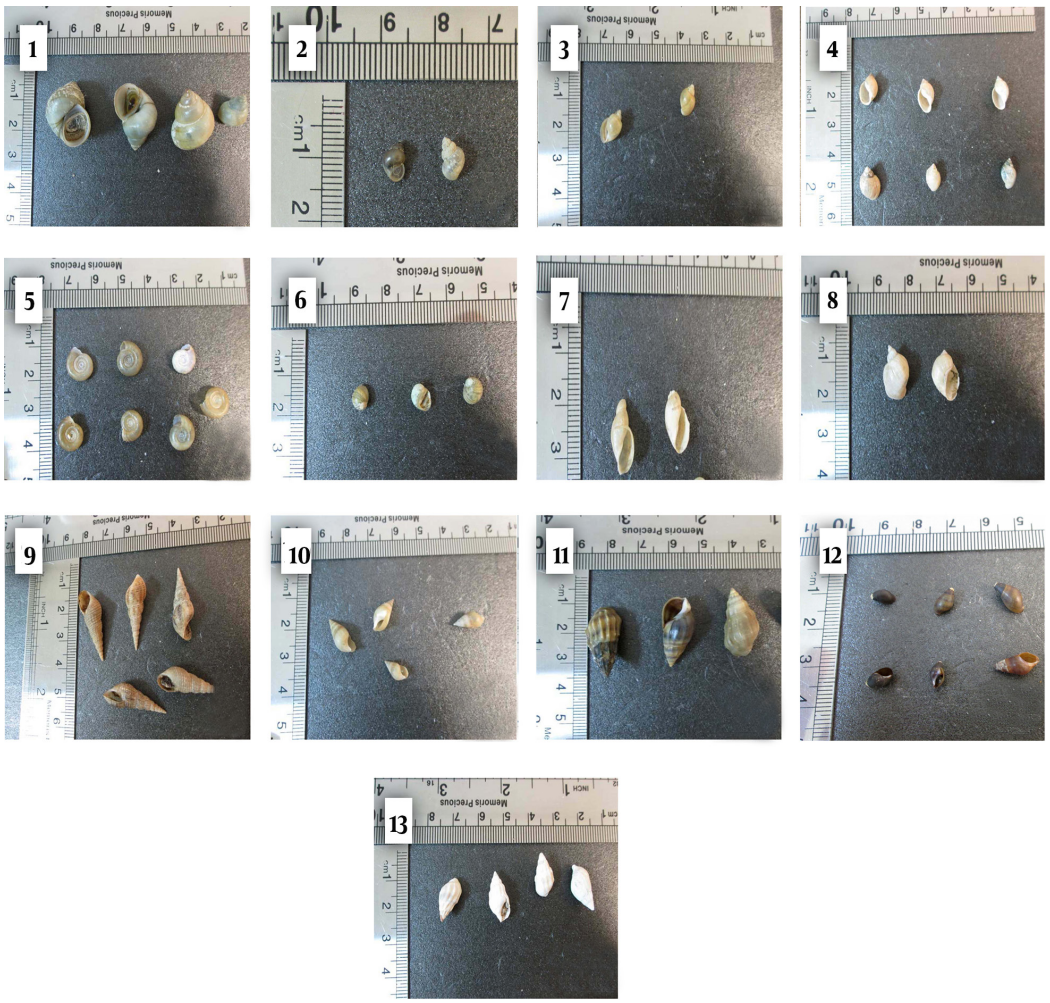
3.4. Statistical Analysis

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

Figure 2. Detected Snails



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).

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	A	3, 7, 12, 4, 9, 8
31°53'54.87"N/49°52'33.31"E	B	2, 4, 10, 9, 3, 8
31°54'14.10"N/49°52'3.51"E	C	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	H	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	K	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	M	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

[a]Sampling site according to Figure 1.
[b]Detected 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 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 Maqboul 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 Maqboul 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, *Bellamya* 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.

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Footnotes

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References

1. Shahabuddin M, Panezai A, Nawaz Y, Iqbal A. First record of fresh water snails Melanoides tuberculata from different regions of Balochistan province. *Pakistan. Sci Int (Lahore).* 2012;**24**(1):87–9.
2. Pokora Z. [Role of gastropods in epidemiology of human parasitic diseases]. *Wiad Parazytol.* 2001;**47**(1):3–24. [PubMed: 16888946]
3. Afshan K, Azhar BM, Ahmad I, Ahmad MM, Qayyum M. Freshwater Snail Fauna of Pothwar Region, Pakistan. *Pakistan J Zool.* 2013;**45**(1):227–33.
4. Barkia H, Barkia A, Yacoubi R, Guamri YE, Tahiri M, Kharrim KE, et al. Distribution of Fresh-Water Mollusks of the Gharb Area (Morocco). *Environments.* 2014;**1**(1):4–13.
5. Madsen H, Hung NM. An overview of freshwater snails in Asia with main focus on Vietnam. *Acta Trop.* 2014;**140**:105–17. doi: 10.1016/j.actatropica.2014.08.005. [PubMed: 25149356]
6. Mansoorian A. Fresh water Gastropod of Khuzestan Province, South-West of Iran. *Iranian Int J Sci.* 2001;**2**(2):96–103.
7. Mowlavi G, Behdasht Mansoorian A, Mahmoodi M, Pourshojaei R, Salehi M. Identification of freshwater snails in cane-sugar fields in the northern part of Khuzestan Province from a public health perspective. *J Sch Public Health Inst Public Health Res.* 2009;**7**(1):69–76.
8. Ektefa Z, Ahmadi E, Shamohammadi F. Identification Snails of Dez River in Khuzestan Province and Introduction Two New Records from Iran. *Exp anim biol J Payame Noor University.* 2013;**2**(3):51–62.
9. Kalantari N, Pawar NJ, Keshavarzi MR. Water resource management in the intermountain Izeh Plain, Southwest of Iran. *J mt sci.* 2009;**6**(1):25–41. doi: 10.1007/s11629-009-0212-6.
10. Zuhair AM, Al-Shammari AM. Terrestrial snails of Ha'il region, Saudi Arabia. *Saudi Arabia. Int J Curr Sci.* 2013;**5**(1):1–5.
11. Michalik-Kucharz A. The occurrence and distribution of freshwater snails in a heavily industrialised region of Poland (Upper Silesia). *Limnologica.* 2008;**38**(1):43–55. doi: 10.1016/j.limno.2007.09.003.
12. Kebapci U, Yildirim MZ, Gülle İ, Öztop M, Çağlan DC. The land snail fauna of Mut District (Mersin Province, Turkey). *Turk J Zool.* 2012;**36**(3):307–18.
13. Petney T, Sithithaworn P, Andrews R, Kiatsopit N, Tesana S, Grundy-Warr C, et al. The ecology of the Bithynia first intermediate hosts of Opisthorchis viverrini. *Parasitol Int.* 2012;**61**(1):38–45. doi: 10.1016/j.parint.2011.07.019. [PubMed: 21821148]
14. Kane RA, Stothard JR, Emery AM, Rollinson D. Molecular characterization of freshwater snails in the genus Bulinus: a role for barcodes? *Parasit Vectors.* 2008;**1**(1):15. doi: 10.1186/1756-3305-1-15. [PubMed: 18544153]
15. Correa AC, Escobar JS, Durand P, Renaud F, David P, Jarne P, et al. Bridging gaps in the molecular phylogeny of the Lymnaeidae (Gastropoda: Pulmonata), vectors of Fascioliasis. *BMC Evol Biol.* 2010;**10**:381. doi: 10.1186/1471-2148-10-381. [PubMed: 21143890]
16. Ukong S, Krailas D, Dangprasert T, Channgarm P. Studies on the morphology of cercariae obtained from freshwater snails at Erawan Waterfall, Erawan National Park, Thailand. *Southeast Asian J Trop Med Public Health.* 2007;**38**(2):302–12. [PubMed: 17539280]
17. Krailas D, Namchote S, Koonchornboon T, Dechruksa W, Boonmekam D. Trematodes obtained from the thiarid freshwater snail Melanoides tuberculata (Muller, 1774) as vector of human infections in Thailand. *Zoosystematics Evol.* 2014;**90**(1):57–86.
18. Farahnak A, Vafaie-Darian R, Mobedi I. A Faunistic Survey of Cercariae from Fresh Water Snails: Melanopsis spp. and their Role in Transmission Diseases. *Iran J Public Health.* 2006;**35**(4):70–4.
19. Kebapci U, Yildirim MZ. Freshwater snails fauna of lakes region (Göller Bölgesi), Turkey. *Oltenia.* 2010;**26**(10):75–83.
20. Dung BT, Madsen H, The DT. Distribution of freshwater snails in family-based VAC ponds and associated waterbodies with special reference to intermediate hosts of fish-borne zoonotic trematodes in Nam Dinh Province, Vietnam. *Acta Trop.* 2010;**116**(1):15–23. doi: 10.1016/j.actatropica.2010.04.016. [PubMed: 20457118]
21. El-Kady GA, Shoukry A, Reda LA, El-Badri YS. Survey and population dynamics of freshwater snails in newly settled areas of the Sinai Peninsula. *Egypt J Biol.* 2004;**2**(1):42–8.
22. Mansoorian A. Some fresh water snail from northern Iran. *Iranian J Publ Health.* 2009;**29**(1):77–82.
23. Spyra A, Serafinski W, Strzelec M. The species diversity of freshwater snails (Gastropoda) in differently managed fishponds in South-Western Poland. *Ecology-Bratislava.* 2007;**26**(1):83.
24. Maqboul A, Aoujdad R, Fadli M, Fekhaoui M. Population dynamics of Physa acuta in the lakes of Rif mountains (Northern Morocco, Ouergha watershed). *J Entomol Zool Stud.* 2014;**2**(6):240–5.