

Snails of orchards and farms in West Azerbaijan Province, Iran

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During 2012-2013 in a funistic survey of snails, several species of snails were collected and identified; both from orchards, farms and the weeds. In total, 18 species belonging to 17 genera out of 10 families are identified based on morphometric characteristics including (shape and size of operculum, aperture, dextral or sinistral of shell, pneumostome, keel, radula, renal ridge and reproduction system). As a result, *Vitrea contortula*, *Vallonia tenuilabris* and *Orculella sirianocoriensis* identified as new record for Iranian mollusc fauna. Besides, the most damaging species within the yielded list identified as *Helicella krynickii* that has much importance within the north west of region.

Key words: snails, Identification, Fauna, orchards and farms, Weeds, West Azerbaijan province, Iran.

INTRODUCTION

Snails are significant agricultural pests in humid area worldwide. They feed on seeds, seedlings, leaves, fruits and damage various parts of plants (Wiktor, 1989; Maillard, 1993; Byers and Calvin, 1994; Briner and Frank, 1998; Frank, 1998). Snail damage with increasing cultivated area of orchards and farms has become increasing apparent over the past 30 or 40 years. Data indicated that the damage caused by snails are common in warm wet spring and autumn and snail populations reduced under dry conditions in north west of country (Mirzaei, 1975). The lack of data about identification of snail species in West Azerbaijan province makes it impossible to propose rational means of pest snail damage reduction. The aim of the present study is throw light on identification of land snails crops in West Azerbaijan that infesting crops.

MATERIAL AND METHODS

Snail collectings were made at monthly intervals sampling from 2012 to 2013. Seven stations surveyed (Salmas, orumiyeh, oshnavieh, shahin dej, Takub, Piranshahr and Miandoab) were selected in about 43660 square kilometers the area province. Specimens were collected by hand. Shells were put into plastic jars and labelled then they were dried at room temperature (Pennak, 1953). Living animals were first killed in cooling water then transferred into 70% ethanol. Labelling included collector name, location name and collecting date. Identification of collected species was done according to Burch et al., 1980; Cameron et al., 2008; Cameron et al., 2009. All collected snails preserved in the Agric. Res. Zoology Department of the Iranian Research Institute of Plant Protection, Tehran, Iran. Specimens were dissected and identified under a stereomicroscope.

RESULTS

According to present study 18 species recorded so far from this province, 3 species are new records while others reported earlier from this province (Tajalipour, 1982) (Table 1-3). Taxonomy, identification and distribution of them in different stations surveyed are as follows:



FIGURE 1. Localities samples in West Azerbaijan.

Family Hygromiidae

Euomphalia (Hormozica) pisiformis (Pfeiffer, 1852)

Shell size is between 12 x 15mm, spherical with a pointed round conic spiral that height is either almost equal to or greater than that of the aperture. Fully grown shells consist of 6 whorls. Umbilicus is narrow and low covered by the reflected part of the columellar edge. The surface of the shell is finely striated and has a beautiful granular sculpture. The aperture is round, very oblique, slightly notched and has a narrow thick white lip inside. The edges of the aperture are thin, sharp and slightly reflected. This mollusc was collected from all the stations.

Family Succineidae

Succinea putris (Linne, 1788)

Shell size is between 17 x 8 mm, ovate-attenuate in shape with 3-4 whorls, heigh spire and aperture is oval. The basal accessory plate is nearly square. The central tooth of the radula is quadrate and tricuspid, the lateral teeth are also quadrate, but either bicuspid or tricuspid and the marginal teeth are variable in shape. The hermaphroditic duct is covered with a thin connective tissue containing black pigment. There are two receptacula seminis of unequal length. Penis is approximately twice the length of the vagina and constricts abruptly at its posterior end where it joins with a short epiphallus. There is a well-developed penial sheath pigmented with black granules and appressed to the penis near the base. This taxon was collected from stations 1, 2, 3, 6 and 7 in province.

Family Helicidae

Helicella krynickii (Krynicky, 1833)

Shell size is 7.5 to 11mm x 12 to 17mm, low-conic with a broad-conic spiral whose height is not less than $\frac{1}{2}$ the height of the aperture; it is irregularly striated, white, and has a brown or almost black pattern of stripes and spots. The shell has five to six turns; the upper turns are slightly swollen and gradually increase in size; the ultimate turn is swollen, and twice the width of the penultimate turn; the embryonal turns ($1\frac{1}{4}$) are smooth, lustrous and dark. The aperture is comparatively large, round, oblique, and slightly notched by the penultimate turn; its juncture points are juxtaposed; the edges of the aperture are thin, simple and occasionally have a very thin white lip. The umbilicus is very characteristic; it is essentially narrow, almost dotlike but from the beginning of the last third of the ultimate turn it widens abruptly so that a small portion of the penultimate turn may be seen and the opening of the umbilicus is displaced to the left edge of the umbilical cavity (if the shell is viewed with the aperture away from the observer). This mollusc was collected from all the stations.

***Helix (Helix) lucorum* Linnaeus, 1758**

Shell size is 47x49 mm and thick, compressed spherical with prominent and rounded apex; 4 $\frac{1}{2}$ to 5 somewhat rounded, rapidly increasing turns, last being plump and low at suture, swollen at the periphery, not or only slightly widened towards mouth, slowly and shortly descending to front; first turns striated with distinct spiral striae, absent in the strongly striated last one. Whitish background color seen as a peripheral band obscured by dark brown irregular transverse bands, mostly washed with red brown; upper most band thin, with 2nd and 3rd often forming a broad belt, also 4th and 5th fused; lighter crossings in irregular distances cover the bands; aperture relatively small, oval, upper margin strongly notched, lower margin regressed, bands seen through the wall, edges smooth, blunt, base somewhat broadened, palatal wall weakly curved, inside dark brown, upper corner of brownish columellar wall curved, the rest slowly descending, strongly broadened and compressed, upper side low. This mollusc was collected from all the stations.

Family Enidae

***Turanena scalaris* (Naegele, 1902)**

Shell size is 7x4mm and high-conic, fairly thin walled, slightly lustrous, finely and transversely striated, horny in color and monochromatic. It has 5 $\frac{1}{2}$ to 6 strongly swollen turns which increase gradually in size and are separated by a deep suture. The ultimate turn is very swollen and is not raised near the aperture. The aperture is oval and very oblique; its juncture points are juxtaposed, but are not more than $\frac{1}{6}$ its circumference. The edges of the aperture are simple and unreflected except for the upper part of the columellar edge. The palatal edge is widely curved to form an arc. The columellar edge is vertical, forming an almost straight angle with the bottom part of the shell. The umbilicus is narrow but almost open and is only slightly overlapped by the reflected part of the columellar edge. This taxon was only found at station 7 of province.

***Jaminia isseliana* (Issel, 1865)**

Shell size is 8x3.5mm and cylindrical conic with a blunt conic upper part whose height is less than $\frac{1}{3}$ the height of the shell. It has seven to eight slightly swollen turns, the terminal three of which are almost equal in width; the ultimate turn has a white stripe on the back (the lip and teeth may be seen through it) and is slightly raised toward the aperture. The aperture is truncated-oval and almost vertical. Its juncture points are far apart and interconnected by a thin and transparent callus which, not infrequently, has a rather small protuberance in the right upper corner. The edges of the aperture are slightly reflected and have a thick, white lip. There are four large teeth of almost equal size; the parietal platelet is situated at some distance from the callus and is vertical; the columellar platelet is horizontal; the two palatal folds are obliquely directed upward. This mollusc was collected from all the stations.

TABLE 1. Orchards and farms gastropod diversity in present survey in West Azerbaijan (2012-2013).

Family	Genera	Species
Hygromiidae	1	1
Succineidae	1	1
Helicidae	2	2
Enidae	5	5
Lauriidae	1	1
Orculidae	3	3
Pupillidae	1	1
Zonitidae	1	2
Clausiliidae	1	1
Valloniidae	1	1
Total	17	18

TABLE 2. Land snails observed in West Azerbaijan (2012-2013).

Species	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	Station 7
<i>Euomphalia (Hormozica) pisiformis</i>	+	+	+	+	+	+	+
<i>Succinea putris</i>	+	-	+	+	-	+	+
<i>Helicella krynickii</i>	+	+	+	+	+	+	+
<i>Helix lucorum</i>	+	+	+	+	+	+	+
<i>Turanena scalaris</i>	-	-	-	-	-	-	+
<i>Jaminia isseliana</i>	+	+	+	+	+	+	+
<i>Chondrula tetradon</i>	-	-	-	-	-	-	+
<i>Zebrina hohenackeri</i>	+	+	+	+	+	+	+
<i>Ena (Pseudonapaenus) latilabris</i>	+	+	+	+	+	+	+
<i>Lauria (Lauria) cylindricai</i>	+	+	+	+	+	+	+
<i>Orcula doliolum</i>	-	-	-	+	-	-	+
* <i>Orculella sirianocoriensis</i>	-	-	-	-	-	-	+
<i>Pagodulina lederi</i>	-	-	-	+	-	-	+
<i>Pupilla signata</i>	-	-	-	+	+	-	+
* <i>Vitrea contortula</i>	-	-	-	-	-	-	+
<i>Vitrea pygmaea</i>	-	-	-	-	-	-	+
<i>Laciniaria lessonae</i>	-	-	-	+	-	-	+
* <i>Vallonia tenuilabris</i>	-	-	-	-	-	-	+
Total	8	7	8	12	8	8	18

* Species that are reported for the first time from West Azerbaijan.

***Chondrula tetradon* (Mortillet, 1854)**

Shell size is 16x6mm and cylindrical-conic, hard walled, irregularly striated, and light horn or light yellow. The conical part has a blunt apex and its height is 1/3 to 1/4 the height of the shell. There are 7 1/2 to 9 weakly swollen turns. The terminal two or three turns are of almost equal width and the ultimate turn proper is slightly raised near the aperture. The aperture is truncated-oval, almost vertical. Except for the columellar edge, the edges of the aperture are unreflected and dark and surrounded by a white lip. The callus is prominent and white. There are four teeth: large parietal and palatal and two more weakly developed columellar teeth which lie alongside each other. The umbilicus is narrow and slitlike. This taxon was only found at station 7 of province.

***Zebrina hohenackeri* (Pfeiffer, 1774)**

Shell size is 20x9 mm and high-conic, less frequently, oval-conic. It is hard walled, coarsely and irregularly striated, and occasionally covered with folds; it is usually monochromatic, white, but may occasionally have brown transverse stripes. The shell has 8 to 8 1/2 moderately swollen turns, the initial four of which increase gradually, whereas the remaining turns increase rapidly in size. The

embryonal turns (1 ½) are smooth and gray while the ultimate turn becomes attenuated toward the bottom. The suture is fairly deep. The aperture is truncated-oval, almost vertical, with ocher-yellow on the inside. The external edge of the aperture is simple, sharp, slightly curved and has a thick, brown lip. The columellar edge is vertical or slightly oblique; it forms an angle when it passes into the basal edge; it is strongly reflected and almost covers the slit of the umbilicus. The callus is lacking. This mollusc was collected from all the stations.

Ena (Pseudonapaeus) latilabris (Lindholm, 1927)

Shell size is 11x4.5mm and cylindrical-conic with a conic upper part the height of which is slightly less than 1/3 the height of the shell. It is hard walled, lustrous, weakly striated and reddish horn color with white spots behind the aperture. The shell has 7 ½ to 8 turns; the upper ones are slightly swollen while the lower ones are almost flat. The turns are separated by a deep suture. The ultimate turn is compressed around the umbilicus and strongly raised in front. The aperture is rounded-triangular, slightly oblique, and directed downward and dextrad. Its juncture points are not juxtaposed and are interconnected by a thick, white lip with an angular protuberance. The edges of the aperture are slightly reflected, widened, and have a thick, white cylindrical lip. The umbilicus is a narrow slit. The aperture is 3.9 to 4.2mm high and 3.2 to 3.4mm wide. This mollusc was collected from all the stations.

Family Lauriidae

Lauria (Lauria) cylindricai (Dacosta, 1880)

Shell size is 3.5x1.8mm and is cylindrical-oval with a rounded, blunt upper part; it is smooth, lustrous, translucent and a yellowish-horn color. There are five to six somewhat swollen turns, the ultimate of which are slightly raised toward the aperture and has a blunt keel on the bottom. The aperture is rounded-angular, somewhat oblique. The edges of the aperture are strongly reflected and sharp and have a wide, thick, white lip. There are one or two teeth in the aperture an angular and a columellar platelet. The angular platelet has a high, thick anterior part while its posterior part enters the shell in the form of a fine filament and extends not less than to the middle of the ultimate turn. Anteriorly, this platelet is connected with the upper end of the external edge of the aperture by a short callus. The columellar platelet is very thin and low; it is poorly developed and frequently absent altogether. The umbilicus is open and narrow. Animal small, dark with lighter sides and foot, upper tentacles short, lower tentacles very short. The animal crawls with the shell in a high and almost straight position. This mollusc was collected from all the stations.

Family Orculidae

Orcula doliolum (Bruguiere, 1792)

Shell size is 4.5x2.3mm and is cylindrical, with a rounded or low-conic upper part. The surface of the shell is densely covered with thin ribs which are sparser on the lower part than on the upper. There are 8 ½ to 9 slightly swollen turns; the ultimate turn is raised anteriorly and is rounded below. The aperture is truncated-oval with an obtuse angle at the top. The edges of the aperture are strongly reflected and white. There are three teeth a thin and high parietal platelet which penetrates into the shell to the beginning of the penultimate turn, two columellar platelets which are situated deep in the aperture and a supracolumellar platelet which is less developed than the columellar one. An angular platelet has the form of a small protuberance. In safety pinlike shells the upper third of the shell is the widest. This species was collected at stations 6 and 7 of west Azerbaijan province.

****Orculella sirianocoriensis (Mousson, 1854)***

Shell size is 6-12 x 3-6 mm and is horny coloured, finely striated, apex weakly pointed, 7-11 flattened whorls, often with a white line at suture, aperture with distinct parietal callus, parietalis strong, subangularis present, columellaris usually as a lamella in the last whorl, supracolumellaris flatter. This taxon was only found at station 7 of west Azerbaijan province.

TABLE 3. Distribution of land snails at various stations of West Azerbaijan.

Name of species	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	Station 7	Remarks
Family Hygromiidae <i>Euomphalia (Hormozjica)</i> <i>pisiformis</i>	+++	++	+++	++	++	+++	+++	Shell with animals
Family Succineidae <i>Succinea putris</i>	+	-	+	+	-	+	+	Shell with animals
Family Helicidae <i>Helicella krynickii</i>	++	+	++	++	+	++	+++	Shell with animals
<i>Helix lucorum</i>	++	+	++	++	+	++	+++	Shell with animals
Family Enidae <i>Chondrula tetradon</i>	-	-	-	-	-	-	+	Shell with animals
<i>Zebrina hobenackeri</i>	++	+	++	++	+	++	+++	Shell with animals
<i>Turanena scalaris</i>	-	-	-	-	-	-	+	Shell with animals
<i>Jaminia isseliana</i>	++	+	++	+	+	++	+++	Shell with animals
<i>Ena (Pseudonapaenus)</i> <i>latilabris</i>	+++	++	+++	++	++	+++	+++	Shell with animals
Family Orculidae <i>Orcula doliolum</i>	-	-	-	+	-	-	++	Shell with animals
<i>Pagodulina lederi</i>	-	-	-	++	-	-	++	Shell with animals
<i>Orculella sirianocoriensis</i>	-	-	-	-	-	-	+	Shell with animals
Family Lauriidae <i>Lauria (Lauria) cylindricai</i>	+++	++	+++	++	++	+++	+++	Shell with animals
Family Pupillidae <i>Pupilla signata</i>	-	-	-	+	+	-	+	Shell with animals
Family Zonitidae <i>*Vitrea contortula</i>	-	-	-	-	-	-	+	Shell with animals
<i>Vitrea pygmaea</i>	-	-	-	-	-	-	+	Shell with animals
Family Clausiliidae <i>Laciniaria lessonae</i>	-	-	-	+	-	-	+	Shell with animals
Family Valloniidae <i>*Vallonia tenuilabris</i>	-	-	-	-	-	-	+	Shell with animals

- = Absent

+ = Rare (1-5)

++ = Abundant (6-50)

+++ = Most abundant (more than 50)

***Pagodulina lederi* (Boettger, 1886)**

Shell size is 3.7x2 mm and is low-cylindrical, with a rounded –conic, fairly high upper part. It has a silky sheen and is horn color. The surface of the shell, starting with the second turn, is dotted with microscopic granulations. There are 8 ½ weakly swollen turns which increase slowly and gradually. The ultimate turn, starting with the final third, is so strongly raised that the edge of the aperture touches the suture of the penultimate turn and the opening of the aperture faces somewhat upward. The umbilicus is a short and narrow slit twisted into the shape of a hook. The edge of the aperture is slightly thickened and is not interrupted on the wall of the penultimate turn; it is slightly reflected. The center of the palatal edge is depressed slightly into the aperture and consequently the aperture assumes the shape of a rounded triangle. There are no teeth in the aperture but there are three teeth in the first (upper) half of the ultimate turn. The columellar platelet is thick and situated along the axis of the shell. Opposite this platelet lies a fairly long palatal fold (occupies ½ a turn). This species was collected at stations 6 and 7 of west Azerbaijan province.

Family Pupillidae***Pupilla signata* (Mousson, 1873)**

Shell size is 3.5x1.4 mm and is cylindrical with a rounded upper part, hard part, hard walled, weakly striated almost smooth and light-horn color. There are seven to eight swollen turns, the first three of which increase rapidly in size and form a rounded or rounded-conic upper part, whereas the subsequent three to four turns are of almost equal width. The ultimate turn becomes somewhat attenuated toward the bottom, is raised and prominent from the front and has a keel below. There is a large cervical swelling in the back which runs parallel to the edge of the aperture. The aperture is rounded, vertical and narrowed. The edges of the aperture meet without interruption at the walls of the penultimate turn (the aperture is complete). They are strongly reflected, white and surrounded internally by a large lip. There are four teeth: a deep-set parietal platelet a rather small columellar tooth (which is sometimes absent) and two palatal folds the lower of which is larger than the upper. The lower palatal fold has a corresponding depression on the outside. In the right corner near the external edge, there is an angular callus or projection. The umbilicus is slitlike. This taxon was collected from 5, 6 and 7 stations in west Azerbaijan province.

Family Zonitidae****Vitrea contortula* (Krynicky, 1837)**

Shell size is 1.7x3 mm and has a slightly protruding spiral and is smooth. It has six to seven slowly increasing turns; the ultimate turn is slightly wider (1 ½ times or even less) than the penultimate turn. The aperture is narrow and markedly notched by the penultimate turn to a semilunar shape. The columellar edge completely covers the umbilicus. This taxon was only found at station 7 of west Azerbaijan province.

***Vitrea pygmaea* (Boettger, 1880)**

Shell size is 0.7x1.4 mm and is small, low conic, almost flattened and has a slightly protruding spiral. It is smooth and only under high magnification can a 267 fine striation be discerned. The shell has 3 ½ to 4 slightly swollen turns; the ultimate turn is 1 ½ times as wide as the penultimate turn. The aperture is broad-semilunar and its width is somewhat greater than its height; the lower edge is somewhat bent. The umbilicus is relatively wide perspective and its width is 1/5 the width of the shell and suture is deep. This taxon was only found at station 7 of west Azerbaijan province.

Family Clausiliidae***Laciniaria lessonae* (Issel, 1866)**

Shell size is 3.5x1.8 mm and is Cylindrical to ovoid. The surfaces of shells are moderately shiny and have finely diagonal striated and are a yellowish-horn color. The shell has 6 to 7 slightly swollen turns. The ultimate turn of the shell is elongated a little to the longitudinal axis in the direction of aperture. The aperture is round and slightly is diagonal. The edges of the aperture reflected and have a thick white lip within. There are typically one or two teeth. The umbilicus is narrow and open. This species was collected at stations 6 and 7 of west Azerbaijan province.

Family Valloniidae

* *Vallonia tenuilabris* (Braun, 1842)

Shell size is 1.7x3 mm and is low-conic almost compressed-conic being low oval at the top. It is finely striated. Some of the folds of the ultimate turn protrude more sharply and are a yellowish-horn color. The height of the spiral is equal to the height of the aperture or is slightly shorter. There are four turns: the ultimate turn as a whole is considerably swollen (not only near the aperture) whereas in the region of the aperture its width is twice that of the penultimate turn. The ultimate turn descends toward the aperture. The aperture is low-oval and oblique; its juncture points are closely juxtaposed and its edges are thin reflected and without a lip. The umbilicus is perspective swollen in the final quarter of the shell and its width is more than ¼ the width of the shell. This taxon was only found at station 7 of west Azerbaijan province.

DISCUSSION

Terrestrial gastropods or land snails are members of the Phylum Mollusca, a large and diverse group with almost 100,000 described species worldwide and there are approximately 40000 species land snails and slugs (Dourson et al., 2006). Most are members of the subclass Pulmonata and some of the subclass Prosobranchia. Both subclasses belong to the class Gastropoda (Thompson, 1984). In Iran, land snails fauna appears to be poor in species. According to the literature, the number of species so far recorded from different regions of the Iran comprises 40 species whereas its population in in west Azerbaijan province reaches about 45% of this number. This paucity of land mollusc species is properly due to a lack of habitat diversity or perhaps also to lack of research.

Analysis of the fauna shows that *Euomphalia pisiiformis*, *Helicella krynickyi*, *Helix lucorum*, *Zebrina hobenackeri*, *Ena latilabris*, *Jaminia isseliana*, and *Lauria cylindricai* are the most widespread species recorded in all localities sampled, followed by *Pagodulina lederi* and *Orcula doliolum* recorded in 36% and 34% of these species sampled in station 6 and 7 respectively. The other species are rather limited in distribution, occurring in less than 30% of the sampled stations 1, 2, 3,5, 6 and 7 sampled. The rare species are found as follows: *Succinea putris*, *Pupilla signata*, *Vallonia tenuilabris*, *Vitrea contortula*, *Vitrea pygmaea*, *Laciniaria lessonae*, *Orculella sirianocoriensis*, *Pupilla signata*, *Chondrula tetradon* and *Turanena scalaris*.

Of most species recorded are considered intermediate hosts for *Dicrocoelium dendriticum* and nematode of *Angiostrongylus cantronensis* (Brown & Wright, 1980). In addition, *Zebrina hobenackeri* and *Helicella krynickyi* have been recognized as the most important intermediate hosts for *dicrocoeliasis* (College of Veterinary, Tehran University).

In station 2, due to a lack of rain, dam construction and poor water management were distribution and diversity of mollusca rare whereas the rich fauna of mollusca are reported from Station 7 which is located between two rivers and relative humidity is high.

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