Bulletin of Pure and Applied Sciences
Zoology (Animal Science), Vol.41A, No.2,
July-December 2022: P.262-266

Print version ISSN 0970 0765
Online version ISSN 2320 3188
DOI: 10.5958/2320-3188.2022.00032.8

Content Available online at: https://www.bpasjournals.com/zoology

Original Research Article

Biology and Life Cycle of *Candaharia levanderi (Simroth, 1901)*

Ruzikulova N.A.*

Author's Affiliation:
Department of Natural Sciences, Uzbek-Finnish Pedagogical Institute, st. Spitamen Shoh, 66, Samarkand, Uzbekistan.

***Corresponding author:**
Ruzikulova N.A.
Department of Natural Sciences, Uzbek-Finnish Pedagogical Institute, st. Spitamen Shoh, 66, Samarkand, Uzbekistan.
E-mail: nilruz.sam@mail.ru

Article Info:
Received on 08.06.2022
Revised on 27.10.2022
Accepted on 29.11.2022
Published on 15.12.2022

ABSTRACT:
The article presents data on the biology and life cycle of Candaharia levanderi (Simroth, 1901) in laboratory and natural conditions. Candaharia levanderi belongs to the family Parmacellidae, common species in Uzbekistan. Lives for a year. On the plains in the first decade of March, it wakes up from hibernation and until mid-April, intensively feeding, prepares for reproduction. After laying eggs, the slugs die. Slugs hatched from eggs go into summer diapause. The life cycle of Candaharia levanderi consists of 4 stages: infantile, juvenile, adult and senile. *Candaharia levanderi* - a harmful species, the main harmfulness is high in spring. It is one of the main pests of cultivated and ornamental plants.

Keywords: Biology, Reproduction, Egg, Cycle, Infantile, Juvenile, Adult, Senile (Blue), Cultivated Plants, Ornamental Plants.

How to cite this article: Ruzikulova N.A. (2022). Biology and Life Cycle of *Candaharia levanderi (Simroth, 1901). Bulletin of Pure and Applied Sciences-Zoology*, 41A (2), 262-266.

INTRODUCTION

At present, 214 species of terrestrial mollusks are distributed in Central Asia, 160 species of terrestrial mollusks (17 of them are slugs) in Uzbekistan. The increase in the number of slug species in the territories is associated with introduced species. Human introduction of various plant species causes the spread of mollusks in different regions. Introducers, initially spreading in closed ground and small areas, expand their range due to their fertility and adaptability. As a result, they cause sufficient damage to cultivated and ornamental plants. Therefore, it is important to study the biology and life cycle of slugs, and these studies will allow the development of effective methods of dealing with them.

As noted above, the reproduction and life cycle of many species of terrestrial molluscs in the fauna of Central Asia are still insufficiently studied or completely unknown (Uvalieva, 1975; Shileiko A.A. & Rymzhanov, 2013; Rymzhanov, 2009; Izzatullaev & Karimkulov, 2007; Gaibnazarova, 2017; Ruzikulova, 2006). Reproduction and life cycle of representatives of the family Parmacellidae in Uzbekistan are still practically little studied. Biology of reproduction *Candaharia levanderi* practically not studied. There is no information in the literature about the timing of reproduction, clutch sizes, places of oviposition, timing of mating and oviposition. In this regard, we studied the features of reproduction of Candaharia levanderi in natural and laboratory conditions.

MATERIALS AND METHODS

The material for this study was our collections and observations *Candaharia levanderi*. The material was collected early in the morning. Live slugs were placed in a jar filled to the top with water, which was then tightly closed. After 20-30 minutes, the mollusks die in a straightened state. Then the mollusks were transferred to 80% alcohol, and after 1–2 weeks, fixation was carried out in 75% alcohol (Shileiko, 1978; 1984).

For anatomical studies of slugs, an autopsy was performed. The autopsy was done in a paraffin bath filled with 70% alcohol and using MBS-2 or MBS-1 binoculars with oblique concentrated light. (Likharev & Viktor, 1980). In the laboratory, slugs were kept in terrariums and glass jars.

RESULTS

In the conditions of Uzbekistan *Candaharia levanderi* widespread species. The coloration is gray or grayish-yellow, the mantle is colored slightly darker than the back and sides. Sometimes there are populations that have a dark pattern on the upper side of the body from spots and stripes. More often, only young people have such a pattern; with age, it disappears due to the general darkening of the integument. The sole is always lighter than the upper side of the body and is uniform in color (Figure 1).

Dimensions: body length when crawling from 70 to 100 mm, with a contraction from 40 to 60 mm.

Figure 1: Candaharia levanderi

It occurs mainly in flat areas, rarely in mountainous areas, at an altitude of 1800 m above sea level. It lives in cultivated biotopes and among grass thickets, along ditches and streams.

Mesophilic appearance: This species is also found in northern Afghanistan and northeastern Iran (Likhareva & Victor, 1980). In Uzbekistan, it occurs in the Zeravshan and Turkestan ranges. It occurs mainly in flat areas, rarely in mountainous areas, at an altitude of 1800 m above sea level. It lives in cultivated biotopes and among grass thickets, along ditches and streams (Pazilov & Azimova, 2003). A typical species for almost all biotopes of urban and suburban areas (Ruzikulova, 2022).

Internal structure: The vas deferens smoothly expanding, passes into a highly convoluted epiphallus, the length of which is approximately equal to the length of the vas deferens and 2 times the length of the penis. The epiphallus flows into the penis from the side, slightly retreating from this constriction. The blindly closed, almost triangular posterior section of the penis is covered inside with numerous small papillae, and a genital retractor is attached to its top from the outside. The oviduct is rather long and muscular. The reservoir of the seed receptacle is usually oval. Artrum is almost invisible (Figure 2).

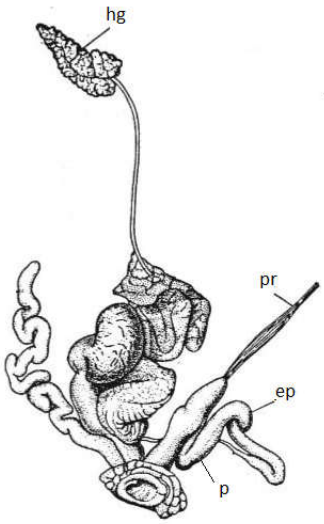

Figure 2: Reproductive system (Likhareva & Victor, 1980). Pr-prostate; ep-epiphallus; hg-hermaphrodite gland; p-penis.

Activity, according to V.I.Zhadin (1946) will begin in March. In May, the copulation process is observed, and in June the egg is poured. Individuals hatched from eggs go to diapause by October. Embryonic development is 20-25 days.

According to our data, after wintering, it comes to the surface in early spring (in the warm season - at the end of February). It feeds and grows until April, and then begins to breed (Figure 3). Reproduction begins in April and ends in May. In sexually mature mollusks, mating games with persecution begin. During a chase, a pair of slugs moves in the same direction. The pursuit phase begins a circular movement of slugs clockwise. Their speed gradually decreases. The first slug slows down the movement of the second partner catches up and begins to feel it with the help of tentacles. They bend, are in tight contact and mate. Lays eggs in the first and second decade of April. Eggs are laid in groups of 8-10 in the soil, under stones, fallen leaves or objects lying on it: the total number of eggs reaches 36-60. Under natural conditions, slugs hatch from eggs in 20-24 days. To study the reproduction of *C. levanderi* in the laboratory, slugs were taken during the mating period and after mating from natural conditions and placed in glass jars.

Figure 3: Slug Copulation

Moist soil 5-6 cm thick was poured at the bottom of the jar and uniform moisture was maintained by spraying with water. Plants that the slugs could eat were also thrown to the bottom of the jar. The temperature in the room where the slugs were kept was maintained at an average of 18°C. According to the results of the observation, it was found that slugs laid 23 to 48 eggs in the soil (Figure 4).

Figure 4: Oviposition

The color of eggs is white or light blue, length 3-4 mm (Figure 5). The laying interval for each egg is 20-25 seconds. The development period of eggs in laboratory conditions is 20-23 days. Within 2-3 days the slugs hatch from the eggs.

Figure 5: Egg *Candaharia levanderi*

The postembryonic period consists of infantile, juvenile, adult and senile periods. Slugs hatch from eggs laid in the first decade of April in the third decade of May. The body hatched from the eggs of slugs is colorless, transparent, there are black spots on the shoulder and mantle. Body length during movement 3.0-4.0 mm, width 0.5-0.8 mm, body length during shortening 2.1-3.2 mm, width 0.7-1.0 mm. After 2-3 days without food, young slugs fall into summer diapause, which lasts until the end of September. It is drawn inside a large embryonic shell and flows into a diapause.

The infantile period passes almost entirely underground.

In late September and early October, the activity of slugs increases. In the second decade of October, their length reaches 28-32 mm. This period is the juvenile period of the Kandahar slug. From the first decade of November, slugs enter a period of winter dormancy. It starts to become more active at the end of the first decade of March (in the third decade of February, when the winter is warm).

They become sexually mature in the first decade of April, the length of the slug when moving reaches 70-90 mm. During this period, the slugs observed the process of copulation. 14-15 days after copulation, they begin to lay eggs. After oviposition, the slugs die in 2-3 days. According to our observations, the generation starts in May and ends in April, that is, it lasts 12-13 months. Unlike some agrolimicides, it breeds once a year.

CONCLUSION

This species is endemic to Central Asia. The species is synanthropic, which is currently the main pest of cultivated and ornamental plants. Studying the biology and life cycle of this species will allow the development of effective measures to combat it.

Conflict of Interest

The author declares no conflict of interest

REFERENCES

1. Gaibnazarova F.P. (2017). Fauna, ecology and lifestyle of terrestrial molluscs of the Buliminidae family in Uzbekistan: Abstract of the thesis. dis.... cand. biol. Sciences. Tashkent, -21 p.
2. Izzatullaev Z.I.& Karimkulov A.T. (2007.) Study of the biological features of Xeropicta candaharica L.Pffefer (Hygromeidae) in Uzbekistan. Marine, freshwater and terrestrial mollusks. Modern results of research in the field of taxonomy, ecology and phylogeny. Mat. 7th (sixteenth) meeting on the study of molluscs, dedicated to the memory of the outstanding Russian malacologists I.M. Likharev and Ya.I. Starobogatov. St. Petersburg: ZIN Russian Academy of Sciences, - S. 117-119.
3. Likharev I.M. & Viktor A.I. (1980). Slugs of the fauna of the USSR and neighboring countries (Castropoda Terrestria Nuda). Fauna of the USSR. Mollusks.T.3.M.; 2(5), 122-437.
4. Pazilov A. & Azimov D.A. (2003). Terrestrial molluscs (Gastropoda, Pulmonata) of Uzbekistan and adjacent territories. T: Fan. - 316 p.
5. Ruzikulova N.A. (2006). Ecological and biological characteristics of the Caucasian slug (Deroceras caucasicum Simr. 1901) in Samarkand. Uzbekiston biology journal. Tashkent, 5, 56-59.
6. Ruzikulova N.A. (2022). Faunistic composition and ecology of gastropod mollusks in urban landscapes: Abstract of

the thesis. dis.... cand. biol. Sciences. Samarkand, 21 p.

7. Rymzhanov T.S. (2009). The life cycle of the Caucasian slug - Deroceras (Liolytopelte) caucasicum (Simroth, 1901) (Mollusca, Gastropoda) in the conditions of the Almaty region. Bulletin of the Kazakh National University named after Al-Farabi, 1(40), 43-49.

8. Shileiko A.A. & Rymzhanov T.S. (2013). Fauna of terrestrial molluscs of Kazakhstan and adjacent territories. Moscow-Alma-Ata: Association of Scientific Publications KMK, - 389p.

9. Shileiko A.A. (1978). Terrestrial molluscs of the superfamily Hellicoidea. Fauna of the USSR. Shellfish. - L .: Science Leningrad branch, 3(6), 384.

10. Shileiko A.A. (1984). Terrestrial mollusks of the Pupillina suborder of the fauna of the USSR (Gastropoda, Pulmonata, Geophila) Fauna of the USSR. Shellfish. - L.: Nauka, V.3. - 399 s

11. Uvalieva K.K. (1975). Life cycles and harmfulness of slugs Deroceras caucasicum (Simroth) and Parmacella rutellum (Hutton) in Alma-Ata region. - In the book: Mollusks, their system, evolution and role in nature, T.5, L., -FROM. 44-46.

12. Zhadin V.I. (1945.) Life cycle of one Central Asian slug. Nature. 2, 66-67.

****