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BİOLOGY OF *LACERTA STRİGATA* (EİCHWALD, 1831) (REPTİLİA, SAURİA)

Janbakhish Najafov[a], Ramin Hashimov[b]*, Sabina Asgarova[a]

[a] *Department of Zoology and Physiology, Baku State University, 23 Z. Khalilov St, AZ-1073, Baku, Azerbaijan*
[b] *Department of Medical Biology and Genetics, Azerbaijan Medical University, 167 S. Vurgun Str., AZ 1022, Baku, Azerbaijan**

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Abstract

Growth rate of *Lacerta strigata* is maximum between I and II wintering periods. As a result of this research, it was found that the SVL sizes of males living in the same populations are larger than that of females. It was observed that the SVL sizes of females were significantly lower than those of males between the I wintering and the II wintering periods in the Djorat settlement stationary. In the tallest stationary, there was no significant difference in SVL sizes in male and female individuals between I wintering and II wintering periods. The main visible difference between them is observed between representatives who have turned 1 year old and have wintered twice. In general, females of *Lacerta strigata* tend to keep patterns in the form of lines on their bodies

Keywords: biology; ecology, lizard, distribution, population.

1. Introduction

Apart from Azerbaijan, *Lacerta strigata* is found in the north-east of the Caucasus Mountains, in the north-east of Turkey, in the east of Georgia, in the north of Iran near the shores of the Caspian Sea, in Armenia, as well as in the south-west of Turkmenistan. The distribution area of *Lacerta strigata* is expanding as there is a State program to increase greenery in the territory of the republic. *Lacerta strigata* can be found everywhere where there is greenery [2], that is in reeds, bushes, meadows, parks, mountains, and forests. In most natural ecosystems, the population density is sufficient and is considered a common species.

2. Materials and Methods

The object of the study *Lacerta strigata* (Eichwald, 1831) [Fig. 1] is included in the LC (Least concern) list. Specifically, the International Union classifies it as an unprotected species for Conservation of Nature (IUCN) because of its large number in nature. This research was carried out on the basis of a scientific work registered at BSU on April 04, 2021 under the number 3/262. In order to

* Corresponding author. Tel.: +994 70 320 71 09
E-mail address: raminhesimov@mail.ru

histologically examine *Lacerta strigata*, samples were collected from all the stationaries from the beginning of April until September 14. Materials were taken from 08:00 in the morning to 21:00 in the evening. Lizards taken from nature for histological studies [6, 11] were anesthetized before cut. After that, morphological measurements were taken, and then the head was cut off and the internal organs were removed. When measuring the morphological characteristics, the length from the front of the nose to the middle of the cloaca (SVL), the length of the head (HL), the length of the tail (TL), the length of the forelimbs (FLL), the length of the hind limbs (HLL) were measured. Lizards brought in for conducting non-histological studies were kept in a terrarium in Djorat settlement.

Fig. 1. *Lacerta strigata* (Eichwald, 1831)

To conduct research on *Lacerta strigata* (Eichwald, 1831), 6 stationaries belonging to different ecological conditions are selected: 1. Jorat settlement stationary (altitude -9m above sea level, 40°35'N latitude; 49°42'N), to study lizards living in semi-desert, dry steppe, coastal sandy semi-desert landscapes of the Absheron Peninsula; 2. Migechevir city Bozdagh ridge stationary (altitude 545m above sea level, 40°46'N. latitude; 47°05'N.), to study the lizards living in the semi-desert, dry steppe landscape of Jeyranchol-Ajinohur lowland; 3. Huju village outskirts stationary (altitude 572 m above sea level, 28°44'N. latitude; 48°35'N. longitude), to conduct research in the mountain forest landscape of Talysh mountains, in Hirkan forests, Lerik region; 4. Gobustan city outskirts stationary (former Maraza village) (altitude 771m above sea level, 40°32'N. latitude; 48°55'N. longitude), to conduct research in foothill mountain steppes; 5. Amsar village stationary, Guba region (altitude 587m above sea level,

41°20'N. latitude; 48°32'N. longitude), in the landscape of mountain forest, beech-hornbeam-oak lowland forests of the North-Eastern slope of the Greater Caucasus; 6. Shamlig village outskirts stationary (Morghuz Range), Tovuz region (altitude 1227m above sea level, 40°43'N. latitude; 45°33' N. longitude), to study the landscape of mountain-forest, beech-hornbeam-oak mid-altitude forests of the North-Eastern slope of the Caucasus. The research was conducted on these stationaries and materials collected [5].

3. Results and discussion

Caspian green lizards are newly hatched and young and do not participate in reproduction and have rows of stripes. These lines are lost, as the male representatives get older. Older males have green backs and other parts except the tail. If the temperature of the area where the adult female individuals live is too high, the lines and black dots on the body of the adult female individual can be observed even after adulthood. In general, females tend to keep patterns in the form of lines on their bodies. They shelter under tree stumps or large tree roots . In addition, it shelters itself in crevices, under large stones, or in abandoned nests of rodents. We even observe that it drives small rodents out of its nest and lays own eggs there. When chasing small rodents out of the nest, it pounces on them with a threatening posture and tries to bite it. The bite of the large *Lacerta strigata* is painful for small rodents [10], and its teeth can even pierce their skin. Striped green lizards living in the territory of Azerbaijan hibernate from November to the second half of March. They live an active lifestyle starting from the second half of March until November. Compared to other lizards living in Azerbaijan, *Lacerta strigata* does not like too high temperature. Its activity is mostly high at a temperature of 26-28C^{o}. When the air temperature is above 35C^{o}, it is mostly under bushes. Although they like to hunt individually, they are also observed in groups of 3-5 individuals in certain areas. Such groups are mainly observed during the breeding season. Mating lasts from the end of April until the first ten days of June. The egg-laying process lasts from the end of June to the end of July. The basis of its food is the representatives of the insect's class. It easily hunts representatives of Coleoptera, Dipterans and Orthoptera. They can also feed with Arachnids. They can live without food for a long time (up to two months). Young individuals are very mobile lizards. They can even climb a wall [12] and jump a certain distance if necessary. When they feel fear, they hide behind stones, bushes and other places where they can wait for a long time. After a long time, it first checks the surroundings, then slowly leaves the place. This is how *Lacerta strigata* tries to bite its prey. Autotomy is also well developed in this lizard. As soon as its tail is grabbed, it tears off its tail and runs away. Its tail, which remains on the ground moving, attracts the attention of the predator. The process of restoring Caspian green lizard's lost tail is divided into 3 stages. 1- autotomy, 2- wound healing, and 3- regeneration. Autotomy is the process of amputation of a lizard's tail by itself. Autotomy occurs from special areas of the tail vertebra of the lizard. First, the phenomenon of hemostasis occurs, preventing blood from flowing out. Since the number of thrombocytes is high in the lizard, and the muscles [7] compress the blood vessels during autotomy, bleeding does not occur. Keratinocyte cells play a major role in wound healing [1]. These cells cover and close the wound and form the wound epithelium. When the new tissue forms, myofibroblast cells [4] lessen the area of the wound, making it look like a wrinkled star. After 4-5 days, an inflammatory reaction occurs and degeneration (removal) of the destroyed, dead or dysfunctional cells in that area occurs. After the wound epithelium has finished degenerating, the surface of the wound is enclosed with covering epithelium, and blast cells [9] form under it. During the proliferation process, collagens and intercellular matrix form, providing cells to divide and reproduce. In the maturation stage, type I collagens first form from type III collagens, and some cells undergo apoptosis. Once the wound is completely healed [13], the regeneration phase begins. First, fibroblast cells become blast cells. With the help of these blast cells, the regeneration process takes place. These cells reproduce by mitosis. In the second week, the tail sprouts and a new tail forms in the shape of a tongue. First, the base of the spinal cord is noticeable in the middle part of the regeneration shoot [8]. Cartilage formed from the blastema replaces the tail vertebrae and surrounds the spinal cord. In the part of this cartilage close to the trunk, bone elements are also observed, albeit weakly. But the tip of the regenerating tail is completely cartilage. The part closer to the trunk develops better since it nourishes and receives signals well. The segmentation of the tubular spinal canal of regenerated cartilaginous tail is not noticeable. The formation of blood vessels begins at the tip of the regeneration shoot shortly after it is covered with wound epithelium [15]. These vascular beginnings arise from cells that branch off from existing vessels in the undamaged part of the tail. This process is similar to the formation of blood vessels when a cancerous tumor forms. A fully functional tail of Caspian green lizard is formed after about two months.

In *Lacerta strigata*, lipids, which are the main reserve nutrients [14], accumulate in different parts of the body, especially in the proximal part of the tail. In the body of female individuals, these lipids accumulate more than in males. Older individuals of Caspian green lizards can also swim in water. When it rains, it stays for a long time under the thick branches of large bushes or under the curves of the trunks of trees close to the ground, not in its shelter in the ground. When the rain gets stronger, it also comes out on the trunk of the tree. *Lacerta strigata* begins to hunt actively as the insects become active after the rain stops. Since they are cold-blooded animals and do not like very hot areas, they have ecto- and endoparasites.

Whether the individuals belong to the male or female sex can be determined by the size of the base (basal part) of the tail. The base of the tail of males is wider than that of females. Because, in males, the copulatory organ [3] is near the base of the tail. The presence of the copulatory organ at the base of the tail exerts a slight pressure on the tail, and males carry the tail slightly above it. The process of spermatogenesis and oogenesis in the lizard *Lacerta strigata* starts from late March to early April, after the end of the wintering period. Temperature and sunlight are important factors for the formation of gonadotropins. Lacerta strigata lizard also eats plant foods, mainly in May because they also need steroids. These factors are essential for the formation and functioning of FSH and LH hormones. The mating process in these lizards is observed in May and early June. In May, the three-year-old striped green lizard has 5-15 follicles in each ovary. Only 5-10 of the egg cells that begin to form in these follicles become eggs. A single female lays only 5-10 eggs during the egg-laying period, which occurs twice a year. Eggs are 10-15 mm long. 45-50 days after spawning, hatchlings with SVL dimensions of 25-32 mm emerge from the eggs. If the egg is large, the hatchlings will also be large. Sexual dimorphism is observed in these hatchlings at the age of one year, but they reach sexual maturity at the age of two. Hatchlings of the striped green lizards are found in nature, from July to late September. It is generally a fast-growing lizard. This growth rate is at its highest between I wintering and II wintering periods. As a result of this research, it was found that the SVL sizes of males living in the same populations are larger than that of females. It was observed that the SVL sizes of females were significantly lower than those of males between the I wintering and the II wintering periods in the Jorat settlement stationary. In the tallest stationary, there was no significant difference in SVL sizes in male and female individuals between I wintering and II wintering periods. The main visible difference between them is observed between representatives who have turned 1 year old and have wintered twice. Among these individuals, females are known to be smaller than males. We generally determined the age of maturity for reproduction in individuals living in the highlands to be three years. We determined that as the height above sea level increases, the decreases in the SVL size of *Lacerta strigata* is observed.

SVL size of females is minimum 65 mm (in individuals that overwintered once), maximum 110 mm (in individuals that overwintered four times). Their TL size is minimum 140 mm, maximum 223 mm. The length of the head of females varies between 17-22 mm. SVL size of males is minimum 71 mm (in individuals that overwintered once), maximum 104 mm (in individuals that overwintered three times). The minimum TL size of males is 117 mm, the maximum 229 mm. The length of the male head varies between 22-25 mm. Sexual dimorphism between males and females is also observed by skin coloration. Sexual dimorphism also includes a light pink-orange hemipenis in males. From the end of May to the first ten days of June, the hemipenes are long and protrude beyond the cloaca. Their shortest time is from the end of August to April. Sexual activity of females and males weakens in July and stops in August. In order to grow, lizards, unlike snakes, gradually (by parts) shed their old skin. The reason for this is that the epidermis layer of the lizard has different structures in different parts of the body. The molting process in *Lacerta strigata* lizard, which takes about two weeks, is observed more intensively from May to September. The frequency of molting is affected by the amount of food it receives or changes in body size. The seeds of *Lacerta strigata* are about 7 mm long, yellow in color and egg-shaped. Starting from April, spermatozoa begin to form and stop in August.

References

[1] Akat E, Yenmiş M, Pombal MA, Molist P, Megias M, Arman S, Veselỳ M, Anderson R, Ayaz D. Comparison of vertebrate skin structure at class level: A review. Anat. Rec. 2022, 305, p. 3543–3608. https://doi.org/10.1002/ar.24908

[2] Alekberov AM. Amphibians and reptiles of Azerbaijan (in Russian), Publishing house Elm Baku, 1978, p. 202

[3] Almeida-Santos S, Veronica MB, Claudio AR, Leticia RS, Roberto CN, Harutomi C. Reproductive biology of the Brazilian Lancehead, Bothops moojeni (Serpentes, Viperidae), from the State of Sao

Paulo, Southeastern Brazil, South American Journal of herpetology 2017, 2, p. 174-181. https://doi.org/10.2994/SAJH-D-16-00047.1

[4] Candan ZN, Kahraman S. Establishment and characterization of human embryonic stem cell lines, Turkey perspectives, *In Vitro Cell. Dev.Biol.-Animal*, 2010, 46, p. 345-355. https://doi.org/10.1007/s11626-010-9299-x

[5] Hashimov RT. Results Obtained from the Study of *Ophisops Elegans* (Menetries, 1832), *Lacerta Strigata* (Eichwald, 1831) and *Tenuidactylus Caspius* (Eichwald, 1831) (Reptilia, Sauria) Living in Different Environmental Conditions. Advanced Studies in Biology, Vol. 2024, 16 no. 1, p. 19 – 26. https://doi.org/10.12988/asb.2024.91839

[6] Hashimov RT, Najafov JA. About skin and skin elements of *Tenuidactylus caspius* (Eichwald, 1831) and *Lacerta strıgata* (Eıchwald, 1831) (Reptilia, Squamata), *Journal of Southwest Jıaotong Unıversıty*, 2023, 2 (58), 199-207. https://jsju.org.cn/pdf/02/199.pdf

[7] Hashimov RT, Najafov JA, Iskenderov TM. Histogenesis of myogenic recapitulation and myoblasts autonomous migration during lizard embryogenesis (Reptilia: Sauria), Advanced Studies in Biology 2023, 15, 97-106. https://doi.org/10.12988/asb.2023.91659

[8] Hikida RS. Aging changes in satellite cells and their functions, Curr Aging Sci. 2011, 4, p. 279-297. https://doi.org/10.2174/1874609811104030279

[9] Lewis J, Yanisch A, Holder M. Notch signaling, the segmentation clock, and the patterning of vertebrate somites, J. Biol. 2009, 8, p. 44. https://doi.org/10.1186/jbiol145

[10] Najafov JA, Hashimov RT. Distribution of Lizards of the Absheron Peninsula, *International Journal of Zoology and Animal Biology*. 2019, 2, 000147. https://doi.org/10.23880/izab-16000147

[11] Najafov JA, Hashimov RT. The histological and cytological analysis of muscles of lizards (Reptilia, Squamata), Life Sciences & Biomedicine 2021, 3, no. 76, 38-44. https://doi.org/10.29228/jlsb.5

[12] Najafov JA, Hashimov RT, Yusufova XJ, Alizade SA, Hashimova AR. Ecological features of reptile fauna formation in strongly urbanized territories of Absheron peninsula, *International Journal of Zoology Studies*, 2017, 2 (5), p. 195-197. https://www.zoologyjournals.com/assets/archives/2017/vol2issue5/2-5-34-312.pdf

[13] Noden DM, Trainor PA. Relations and interactions between cranial mesoderm and neural crest populations, *J. Anat. 2005*, 5, p. 575–601. https://doi.org/10.1111/j.1469-7580.2005.00473.x

[14] Price E.R. The physiology of lipid raft storage and use in reptiles. Biological Reviews 2017, 92, p. 1406-1426. https://doi.org/10.1111/brv.12288

[15] Williams TL, DiBona CW, Dinneen SR, et al. Contributions of phenoxazone-based pigments to the structure and function of nanostructured granules in squid chromatophores. Langmuir 2016, 32, p. 3754–3759. https://doi.org/10.1021/acs.langmuir.6b00243