

## **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**

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### **Abstract**

The most important abiotic factors affecting the distribution of lizards include temperature, humidity, amount of sunlight and altitude above sea level. If lizards are exposed to heat with a stable temperature for a long time, parasites and conventional pathogens will activate in their body and harm the animal. In lizards exposed to new environmental conditions, the adaptation in tissue structure first happens in the skin. The melanophore cells located in the skin of the gecko living at high temperatures weaken the pigment transfer to the cells of the basal layer. In this case, the keratin substance accumulates more than usual in the cells of the dorsal part of the skin and pigmentation decreases. The amount of adipose located in the hypodermis decreases. The diameter of the sinusoids increases in their livers.

**Keywords:** Lizard, environment, stress, cells, EPR

## 1. Introduction

*Ophisops elegans* is found in open and arid plains, cultivated fields and stony-rocky slopes, in areas with sparse vegetation or low shrubs. This lizard also appeared in sparse vegetation of pine and oak forests. One of the factors influencing its wide spread in the areas is the absence of harsh winter. The shelter of this lizard is in abandoned rodent burrows, among gravestones, under stones, between cracks in the ground. *Ophisops elegans* does not go far from its shelter. It is often seen on the side of dirt roads. If a snake-eyed lizard is chased, it runs a certain distance in a straight line, then turns to the right or left and runs into a nearby bush, grass, or crack [1]. After staying in the hiding place for a while, it returns to the vicinity of its shelter [2]. This suggests that each of these lizards has its own territory. The Caspian green lizard, *Lacerta strigata*, occupies various habitats across the Caucasus and the South Caspian Sea, with the Hyrcanian Forests and north of the Alborz Mountains forming the core of the range [3]. *Lacerta strigata* (Eichwald, 1831) is expanding its area due to the increase of green areas in Azerbaijan [4]. Within its range, the Caspian green lizard, *Lacerta strigata*, occurs in the Elburz Mountains (northern Iran) at elevations from below sea level to approximately 2700 m a.s.l. [5]. This lizard lives in grasslands, thickets or the edges of woodlands in areas rich in vegetation. Caspian green lizard runs well [6], climbs trees, bushes or walls and can even jump from a height to a certain distance. When it is hot, it cools down by standing on wet soil, and it has also been observed that it enters the water and swims. They feed on insects and spiders. The Caspian bent-toed gecko is naturally widespread in semi-desert rocky, arid ecosystems where it can hide [7, 8, 9]. In some areas of Azerbaijan, the Caspian bent-toed gecko is a hemisinanthropic species. With regard to global warming and the increase in the number of buildings, the area of Caspian bent-toed geckos is expanding in the territory of Azerbaijan. The frequency of appearance of *Tenuidactylus caspius* lizard is high up to 550 meters above sea level, and then the frequency decreases. If the Caspian bent-toed gecko caught a prey in March and April, it heats up in the open sun at the first opportunity. They reduce the number of some disease carriers by eating small insects.

## 2. Material and methodology

This research work was carried out on April 4, 2021, according to the Doctor of Sciences training program registered at Baku State University No 3/262. To conduct research on *Ophisops elegans* (Menetries, 1832), *Lacerta strigata* (Eichwald, 1831) and *Tenuidactylus caspius* (Eichwald, 1831) lizards, 6 stationaries belonging to different ecological conditions are selected: 1. Djorat 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 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 steppes, 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. Pieces taken from different organs of lizards are fixed in 10% formalin solution [10]. Fixed organ pieces are made possible be cut with the help of special chemicals [11]. Then, it is cut 4-5 µm thick using a microtome [12, 13]. Preparations placed on a glass slide, after being freed from paraffin, are stained with hematoxylin and eosin dyes. Finished preparations are examined by means of a Primo Star (Zeiss) microscope, and the photos of significant images in the preparation are taken with an EOS D650 (Canon) digital camera. To determine the age of the lizards, annual rings in the cross-section of the femur are counted. When counting the sinusoids in the liver, the sinusoids in a certain area with the central vein in the middle are counted.

### 3. Research results and discussions

As reptiles are cold-blooded animals [14], temperature is one of the first factors affecting them in the changed ecological conditions of the environment. Lizards warm up in direct sunlight from March to April, which activates enzymes in their bodies. Temperature is a regulator of daily and seasonal activity of lizards. The species of lizards [15] used in the research work need to warm up their body temperature to 28-35°C in order to be active. In one of our experiments, when *Lacerta strigata* lizards were kept in a terrarium at a constant temperature of 32-33°C for 13 days, it was found out that one out of six individuals died and three others had feeding difficulties. When dead and surviving lizards were analyzed, an overgrowth of helminths in these creatures was observed. All of these lizards died after the experiment. When the lizards were kept in a stable warm environment for a long time, parasites and conventional pathogens activated in their body and harmed the animals. These observations revealed that the number of helminths in the digestive system of lizards living in areas close to human settlements is lower than that of lizards living in the wild environment. Among the lizards [16] used in the study, *Lacerta strigata* has the characteristic of growing faster. Females of *Lacerta strigata* in semi-desert and dry desert (areas below 300 meters above sea level) landscape (Djorat settlement and Bozdagh ridge stationary) grow weakly

compared to males up to one year of age. This process was not observed in *Ophisops elegans* and *Tenuidactylus caspius* lizards living in the same areas. Compared to the lizards living in mountainous areas (Shamlig village stationary), it was determined that the lizards living in semi-desert and dry steppe landscape (in the stationaries of Djorat settlement and Bozdagh range) reach sexual maturity earlier. Lizards living in mountain forest (800-1800 m above sea level) landscapes live longer than the lizards living in stationary areas of Djorat settlement and Bozdagh range. The age of the lizards was determined on the basis of rings observed in the cross-section of the femur formed every year. *Tenuidactylus caspius* lizards [17] were caught from Tangalti and Shamlig village stationaries located above sea level and brought to Djorat settlement stationary in order to study the adaptations of lizards brought to new environmental conditions. This experiment was repeated 5 times in the summer of different years, and 6 lizards were used for each experiment. It was observed that the brought lizards first show different behavior from the lizards of this area. The brought lizards did little hunting in the first days, and rarely went outside the shelter they found. But these lizards were very sensitive to environmental stimuli. Accordingly, the lizards brought to a new environment were frequently leaving the shelter as a result of external influences, consequently, becoming the prey of cats, crows or other predators. Over time, the lizards in a new environment gain physiological-biochemical adaptations as well as behavioral adaptations. These lizards, after 1-2 years, also achieve tissue adaptation to the changed new environment. All organs and tissues of lizards play a role in adapting to changed environmental conditions. However, within these organs, the changes in the tissue structure of the skin, liver, skeletal muscles and lungs are more obvious. During adaptations [18] to changed environmental conditions, the first adaptation in tissue structure happens in the skin. The melanophore cells located in the skin of the gecko living at high temperatures weaken the pigment transfer to the cells of the basal layer. In this case, the keratin substance accumulates more than usual in the cells of the dorsal part of the skin and pigmentation decreases. The amount of adipose located in the hypodermis reduces. The diameter of the sinusoids increases in their livers. The capillaries (sinusoids) observed in the liver are the capillaries with the largest diameter. When the livers of stationary lizards were observed, it was determined that the diameter of sinusoids decreases as the height above sea level increases, but the number of sinusoids per unit area increases. When the liver of lizards was analyzed using the EPR method [19, 20, 21], it was found that the typical EPR spectrum consisted of a superposition of two signals. Here, the first line has a wide width and its spectral parameters vary among the species of lizards used in the study. It was determined that these parameters could also be used in type determination. The second line is located above the first broad line, appears in the form of a thin peak, and this line is revealed when the animal is exposed to a stress factor. Using the spectroscopic parameters of the second line, it is possible to measure the amount of tension caused by the stress factor in the animal body. The skin of the lizard has different histological structures in different parts of its body. Although the histological structure of the skin in the same part of the body is the identical in lizards of the same age and living in the same area, the thickness of

the keratinized epidermis layer is inversely related to the length of the animal. In lizards living in salty soils, the keratinization of the epidermis layer of the skin on the underside of the body is stronger. As *Lacerta strigata* gets older, the bilverdin-serpin substance of its skin accumulates in the dermis layer. To protect the internal organs of lizards from the harmful effects of the sun, a black layer covers the body cavity from the outside. The black layer covering the body is absent in *Tenuidactylus caspius*. This layer is absent in newly hatched individuals of day-active lizards, but forms later. In addition to the function of protecting the internal organs from the harmful effects of the solar rays, the black coverage also protects the internal organs from overheating and overcooling. The *Tenuidactylus caspius* lizard, which uses the darkness of the night to be protected and to avoid competition with predators, loses its ability to defend itself if there is artificial lighting in the evening. The lizards living in areas higher than sea level have more folds in their lungs. Caspian bent-toed geckos also have tubes inside their lungs, where gas exchange takes place and air is stored as a reserve.

#### 4. Practical suggestions

1. Placing signs on green zones and parks for people's recreation indicating that the lizards are not poisonous, but useful animals and that they should not be killed can preserve both the ecosystem and the biological diversity of lizards.
2. In research works, when choosing stationary areas, it is necessary to determine such an area that, apart from having geographical and ecological suitability for the research work, it should be convenient for the researcher to visit that area safely and comfortably.
3. The amount of free radicals generated in animals exposed to a stress factor decreases in a short time when they actively move in a large area. Therefore, in order to reduce the amount of acquired stress in the lizards kept for the experiment, it is necessary to ensure their active movement in a wide area.
4. EPR method can also be used to measure the amount of stress received by an organism in forensics.
5. Being aware of the change in the first tissue-organ level caused by external environmental factors in lizards which manifests itself in the skin, it can be used in medicine and veterinary medicine. The skin is a mirror of the impact of external and internal environment on a living being. By examining the skin in depth, an idea about the processes taking place in organisms is revealed.

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