Influence Of Ecological Factors (Heavy Metals And Radiation) On Lizards Of Azerbaijan

SH.A.TOPCHIYEVA, M.A.MEHRABOVA, A.R.JAFAROV,
Institute of Zoology of Azerbaijan National Academy of Sciences
Institute of Radiation Problems of Azerbaijan National Academy of Sciences
Az 1073 Baku, Pass.1128, block 504
AZ1143, Baku, Azerbaijan Republic, 9, B.Vakhabzadeh str.
Azerbaijan Republic
Shafiga.topchiyeva@mail.ru, mehrabova@mail.ru, anar.jafarov@mail.ru

Abstract: - Influence of ecological factors (heavy metals and radiation) on lizards of Azerbaijan has been revealed. Content and quantity of heavy metals in the samples of Sauria, plants, water tests, as well as in soil tests taken from the habitation place of the Sauria under study, has been determined by the roentgen florescent spectrophotometer method (XRF) – Innov –X firm. The activity of radionuclides in the samples was conducted at "Canberra" γ-spectrometer with a plenary HP Ge-detector.

Natural radioactive elements in investigated samples have been revealed. These radio nuclides are isotopes $^{226}$Ra and $^{228}$Ra (together with disintegration products), entering into numbers of natural radio actives $^{238}$U and $^{232}$Th and isotopes of natural radioactive $^{40}$K not entering into these numbers. Higher concentration of heavy metals and activity of $^{238}$U , $^{235}$U and $^{40}$K isotopes has been defined in the organisms of Sauria. Presence of small activity of radio nuclides in investigated samples testifies to presence of influence of environment on an organism of lizards and possibly on their biodiversity.

The data obtained by us testifies to accumulation of ecological pollutants in an organism of lizards, thus influencing a biodiversity and morphological changes of animals on preliminary our supervision. The data on accumulation of radio nuclides and heavy metals can serve in an organism of lizards as criterion of a condition of impurity of biosphere and can be applied in quality of bioindicators of environment.

Key-Words: -radionuclides, heavy metals, radiation, lizards, pollution, Sauria, bioindicators

1 Introduction.

The problem of pollution of biosphere of Apsheron of Azerbaijan by radionuclidaes and heavy metals like Pb, Hg, As, Cd, Ni, Cu, Va, Zn, Co, Mo, Sr and other metals, has arisen with emission in an atmosphere of technogens emissi-ons of the industrial enterprises. They are the most dangerous toxic elements for fauna and animals and the people by entering in the basic biological circulation of substances. Studying of the given problem is the actual problem, having important value for biology and ecology [9,10].

Problem of pollution of biosphere of Apsheron of Azerbaijan by heavy metals as Lead, the Hectogram As, Cd, Ni, copper, Va, Zn, Co, Mo, the Sir and other metals, has arisen with issue in atmosphere technogens issues of the industrial enterprises. They are the most dangerous poisonous elements for fauna, animals and people, entering the basic biological reference of substances. Studying of the given problem is an actual problem, having important value for medicine, biology and ecology.

Research of influence of global technogenic environmental contaminations on an organism is one of the major problems of modern ecology, because microelement environmental contamination restricts natural forms of a pathology of live beings and inevitably leaves on their the deforming mark. Today in the world the first place on priority is occupied by proof toxic pollutants — heavy metals. In modern conditions of development of a society, preservation of the environment and rational use of natural resources have turned to one of the most complicated problems which permission demands the appendix of efforts in the most different directions [1].

Complexes of anthropogenous factors which influence a condition of ecosystems, are various enough- it is an environmental contamination by emissions of industrial production, motor transport, and others. anthropogenous stressor arise with such speed that biological systems doesn’t have time to adapt for them, at the same time their biological
characteristics change under the influence of all factors. It is possible to refer heavy metals to one of the most toxic substances what get to biosphere as a result of industrial activity of people.

They are in each organism in small quantities, but substantial growth of their concentration can lead to death of animals. The role of animals in biogene migration of substances in land ecosystems has been studied insufficiently. Activity of animals in biogenoses can be considered as the factor, the regulating this biogene circulation [2].

Gobustan is the western part of Gobustan-Absheron file. The most part of Gobustan consists of ravines and gorges.

Lizards – Sauria
1. Eremias arguta (Pallas, 1773) – One of the most widespread lizards of Gobustana We met this racerrunner almost in all Gobustan.
2. Ophisops elegans (Menetries, 1832) – We met it in the southern Gobustan. Has the highest number and widespread. Lives in the diversified biotopes of semi-desert and steppe.
3. Cyrtopodion caspius (Eichvald, 1831) – The gecko is observed everywhere in Gobustan, both in apartment houses of any settlement, and in the thrown constructions. Lives in semi-desert or steppe.
4. Eremias velox (Pallas, 1771) – We found it everywhere in a seaside strip both in southern and northern, and in EastGobustan. are met less often In central Gobustan. Lives in a semi-desert zone. They are rather fast in movements and catching them is difficult enough
5. Laudakia caucasica (Eichvald, 1831) – lives everywhere on heights in Gobustan, they were found on mountains Kargabazar, and also on Kichik-Dash and Kyzyl-KUM and in a number of other stony heights. They are met also on clay breakages of valleys of the river Dzhejran-Kechmez [2-8].

A research main objective. was Definition of influence of ecological pollutants of heavy metals and radiation on the lizards living in Gobustan

2 Materials and Method

The collection gathering and the field researches spent on stationary sites and during expeditions during various seasons 2004 – 2009 and also share collections of Institute of Zoology ANAS of Azerbaijan have served as basis for work.

For the research modern devices of the Institute Radiational Problems of Azerbaijan National Academy of Sciences has been utilized.

The activity of radionuclide in the samples has been specified at "Canberra" 𝛾-spectrometer with a plenary Ge-detector (Fig.1).

Content and quantity of heavy metals in the samples has been determined by the Roentgen florescent spectrophotometer (XRF) Innov –X firm (Fig.2).

Determination of content and activity of the radionuclides and quantity of heavy metals in the tests specimen of Sauria, as well as, in the tests of soil, plant and water, taken from the habitation place of the Sauria under study, has been conducted in the Institute of Radiation Problems NANA. The activity of radionuclides in the samples was specified at "Canberra" 𝛾-spectrometer with a plenary Ge-detector. The weight of the Sauria were measured at an electron microscope

![Fig.1 „Canberra“ gamma -spectrometers with HP Ge detector](image1)

Fig.1 „Canberra“ gamma -spectrometers with HP Ge detector

![Fig.2 Roentgen florescent spectrophotometer](image2)

Fig.2 Roentgen florescent spectrophotometer

For measurement of sample activities they fulfilled following operations: 1) weighed Petri dishes; 2) weighed Petri dishes with samples; 3) found out the weights of the enumerable sample on a difference of weights; 4) placed chemical dishes with samples in the device gamma – spectrometer “Canberra“, closed the cover with lead protection and measured the radiation activities of sample.

3 Results and their discussion

There was a necessity of an estimation of a radio ecological condition of district of dwelling of investigated lizards For object in view achievement.
Higher concentration of heavy metals and activity of $^{238}$U, $^{235}$U and $^{40}$K isotopes has been defined in the organisms of Sauria.

Content and quantity of heavy metals in the samples of Sauria, plants, water tests, as well as in soil tests taken from the habitation place of the Sauria under study, has been determined by the roentgen florescent spectrophotometer method (XRF) – Innov –X firm.

It was determined the activity of radionuclides ($^{40}$K, $^{226}$Ra, $^{232}$Th, $^{137}$Cs, $^{235}$U, $^{238}$U) in the Sauria, soil, plant and water samples taken from the Gobustan region of the Azerbaijan republic in table 1 is given the results of analysis of natural radionuclides in Sauria, taken from the investigated regions.

In Fig.1-Fig.5 are given spectra of radionuclides in samples of Sauria collected in the Gobustan region of Azerbaijan.

Action of ionizing radiation on a live organism interested a world science from the moment of opening and the first steps of application of radioactive radiation as from the very beginning researchers have faced its negative effects. From this point of view that radiation influence on a lizard, and also on environment, its dwelling plays an important role.

Catching of lizards has been spent, and also samples of soils, water and plants from places of catching of lizards for definition of activity of radio nuclides have been taken. Activity of gamma radiating radio nuclides in tests has been defined on a gamma spectrometer "Canberra" with the planar Ge-detector. For carrying out of measurement of activity of samples following operations have been carried out: 1) weighed cups of Petri; 2) weighed cups of Petri with the sample; 3) on a difference of weights weight countable sample has been found; 4) chemical ware with the sample has been placed in the gamma spectrometer device "Canberra", has been with closed a cover with lead protection and measurement of activity of samples has been spent. Spectra of radio nuclides as a part of samples of lizards (Fig. 1) have been removed.

After evaporation of investigated water of 20 l the dry rest has been analysed by a gamma spectroscopic method. After drying of samples of investigated plants with weight 3 kg, they have been charred within 5 hours at temperature 270-300°C, further homogenized and placed in cups of Petri. Investigated samples within 30 days have been stored in hermetic conditions, with the subsequent carrying out of their analysis on HPGe a spectrometer. The local polluted sites have been revealed. The top layer of earth (0 - 5cm) is most polluted by natural radio nuclides. In samples of soil considerable activity of isotope $^{40}$K has been revealed on the basis of what it is possible to assume that presence of radioactive elements in an integument of lizards is connected with their presence in soils where lizards live. Presence of small activity of radio nuclides in investigated samples of lizards testifies to environment influence on biodiversity.

![Fig.1](image1.jpg)
![Fig.2](image2.jpg)
![Fig.3](image3.jpg)
![Fig.4](image4.jpg)
![Fig.5](image5.jpg)
In Fig.1-Fig.5 Spectra of radionuclids in samples activity of the Lizards collected in Gobustan of Azerbaijan are given.

For research of lizards expeditions have been organized to Gobustan. During expedition catching of lizards has been spent. Lizards, also samples of soil, plant, soil have been dried up for analysis, carrying out on definition of activity of radionuclides in their content.

The weight of dried lizards has been measured on an electronic microscope. Experiment time-24 hour. The spectrum defining activity of radionuclides in samples has been defined on a « Canberra » gamma spectrometer.

In table 1 the data of specific activity of radionuclides in an organism of lizards is presente

Table 1 Radiation activity of elements in samples of Sauria collected in the Gobustan region of Azerbaijan

<table>
<thead>
<tr>
<th>Element</th>
<th>Value</th>
<th>Eremias arguta</th>
<th>Ophisops elegans</th>
<th>Cyrtopodion caspius</th>
<th>Eremias velox</th>
<th>Laudakia caucasica</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cs-137</td>
<td>mBk/g</td>
<td>MDA=0.512</td>
<td>MDA=0.97</td>
<td>1.9 +/- 0.4</td>
<td>MDA=0.437</td>
<td>5.37 ± 0.35</td>
</tr>
<tr>
<td>Ra-226</td>
<td>mBk/g</td>
<td>3.58 ±0.79</td>
<td>4.489 ±0.95</td>
<td>MDA=1.38</td>
<td>5.42 ± 0.45</td>
<td>2.1 ±0.67</td>
</tr>
<tr>
<td>Th-232</td>
<td>mBk/g</td>
<td>2.95±0.1</td>
<td>2.76 ±0.45</td>
<td>MDA=2.45</td>
<td>4.24 ± 0.32</td>
<td>1.69 ±0.48</td>
</tr>
<tr>
<td>K-40</td>
<td>mBk/g</td>
<td>19.8 ±1.3</td>
<td>22.8 ± 1.4</td>
<td>63.89 ±4.3</td>
<td>43.7 ± 5.6</td>
<td>18.8 ±1.9</td>
</tr>
<tr>
<td>U-235</td>
<td>mBk/g</td>
<td>8.12</td>
<td>5.01</td>
<td>MDA=3.3</td>
<td>14.01</td>
<td>3.64</td>
</tr>
<tr>
<td>U-238</td>
<td>mBk/g</td>
<td>175.3</td>
<td>64.5</td>
<td>MDA=58.4</td>
<td>247.04</td>
<td>59.1</td>
</tr>
</tbody>
</table>

Definition of the maintenance of metals in samples by a method rentgeno - fluorescent spectrophotometry are presented in table 2.

Table 2 The content of elements and their consentration in Sauria, soil and plant samples(mg/kg) Sample Number

<table>
<thead>
<tr>
<th>Sample number</th>
<th>S</th>
<th>K</th>
<th>CA</th>
<th>CR</th>
<th>MN</th>
<th>FE</th>
<th>ZN</th>
<th>RB</th>
<th>Sr</th>
<th>ZR</th>
<th>Pb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eremias arguta</td>
<td>468</td>
<td>4523</td>
<td>1265</td>
<td>479</td>
<td>1658</td>
<td>1946</td>
<td>836</td>
<td>458</td>
<td>658</td>
<td>1638</td>
<td>106</td>
</tr>
<tr>
<td>Ophisops elegans</td>
<td>102</td>
<td>1856</td>
<td>1359</td>
<td>249</td>
<td>1549</td>
<td>4467</td>
<td>858</td>
<td>258</td>
<td>849</td>
<td>1369</td>
<td>174</td>
</tr>
<tr>
<td>Cyrtopodion caspius</td>
<td>246</td>
<td>1674</td>
<td>1045</td>
<td>438</td>
<td>2148</td>
<td>4712</td>
<td>972</td>
<td>357</td>
<td>784</td>
<td>1673</td>
<td>247</td>
</tr>
<tr>
<td>Eremias velox</td>
<td>512</td>
<td>6734</td>
<td>2046</td>
<td>487</td>
<td>1738</td>
<td>6657</td>
<td>996</td>
<td>261</td>
<td>757</td>
<td>1572</td>
<td>94</td>
</tr>
<tr>
<td>Laudakia caucasica</td>
<td>325</td>
<td>1935</td>
<td>1376</td>
<td>334</td>
<td>1579</td>
<td>3859</td>
<td>936</td>
<td>347</td>
<td>793</td>
<td>1672</td>
<td>342</td>
</tr>
</tbody>
</table>

Natural radioactive elements in investigated samples have been revealed. These radio nuclides ARE isotopes $^{226}$Ra and $^{228}$Ra (together with disintegration products), entering into numbers of...
natural radio actives $^{238}$U and $^{232}$Th and isotopes of natural radioactive $^{40}$K not entering into these numbers. Specific activity of radio nuclide $^{226}$Ra counted on 352 KэV GAamma lines of isotope $^{210}$Pb, being a product of its disintegration after 18 day preservations of samples in hermetic conditions. Radionuclide $^{226}$Ra has 186 KэV gamma line. Because of presence of radio nuclide $^{235}$U in objects of environment and coincidence 185.7 KeV gamma line of this isotope with 186 KeV gamma line of radio nuclide $^{226}$Ra (or creations spectral a hindrance), we didn't define radio nuclide $^{226}$Ra on gamma line by direct method. We defined specific activity of radio nuclide $^{226}$Ra basically on 338.4 KeV, 911 KeV and 968.9 KeV on gamma lines of isotope $^{228}$Ac, being a product of its disintegration. Isotope $^{40}$K has been defined on 1461 KeV to photopeak.

4 Conclusion

Activity of radio nuclides and elementary structure, including quantity of heavy metals in samples of lizards and tests of soil, water and the plants taken from district of their dwelling has been defined.

It has been revealed that the maintenance of heavy metals in an organism of lizards is exposed to considerable fluctuations. The maintenance of ions S in an integument at a lizard 1 (468) considerably prevails in comparison with concentration of ions S at a lizard 2 (102). The greatest maintenance of ions K (6734mg/kg) is marked in an integument of a lizard 4, the least (1674 mg/kg) – lizards 3. Prevalence of ions of Ca (2046 mg/kg) at a lizard 4, the least quantity (1045)- lizards 3. Concentration Cr in the greatest quantity is marked at a lizard 1 (479mg/kg), and in the least (249 mg/kg) at a lizard 2. The greatest maintenance of ions Mn (2148mg/kg) is marked in an integument of a lizard 3, the least (1549 mg/kg) – lizards 2. The greatest maintenance of iron (6657mg/kg) is marked in an integument of a lizard 4, the least (1549 mg/kg) – lizards 2. The greatest maintenance of ions Mn (2148mg/kg) is marked in an integument of a lizard 3, the least (1549 mg/kg) – lizards 2. The greatest maintenance of ions Mn (6657mg/kg) is marked in an integument of a lizard 4, the least (1549 mg/kg) – lizards 2. The greatest maintenance of ions Zn (996 mg/kg) at a lizard 4, the least quantity (836 ) -lizards 1. The maintenance of ions Rb in an integument at a lizard 1 (458) considerably prevails in comparison with concentration of ions Rb at a lizard 2 (258). The greatest maintenance of ions Sr (849mg/kg) is marked in an integument of a lizard 2, the least (658 mg/kg) – lizards 1. Prevalence of ions Zr (1673 mg/kg ) at a lizard 3, the least quantity (1369)-lizards 2. Concentration Pb in the greatest quantity is marked at a lizard 5 (342mg/kg), and in the least (94 mg/kg) at a lizard 4. Thus, heavy metals collecting in an integument of lizards can serve as criterion of degree of impurity of the given district.

So, we have defined natural radio nuclides of low activity in an organism of a lizard and in samples of soils, water and the plants taken from territory where catching of lizards has been spent. The revealed activity of an element of uranium in a spectrum of the sample grows out of a radiating background which is formed at influence of ionizing radiation on environment. Presence of small activity of radio nuclides in investigated samples testifies to presence of influence of environment on an organism of lizards and possibly on their biodiversity. The data obtained by us testifies to accumulation of ecological pollutants in an organism of lizards, thus influences a biodiversity and morphological changes of animals on preliminary our supervision. The data on accumulation of radio nuclides and heavy metals can serve in an organism of lizards as criterion of a condition of impurity of biosphere and can be applied in quality bioindicators of environment.

Influence of ecological factors (heavy metals and radiation) on lizards of Azerbaijan has been revealed. Content and quantity of heavy metals in the samples of Sauria, plants, water tests, as well as in soil tests taken from the habitation place of the Sauria under study, has been determined by the roentgen florescent spectrophotometer method. It has been established that heavy metals collecting in an integument of lizards can serve as criterion of degree of impurity of the given district.

References:
fauna Apsheron and its principal causes,
ASUScientific records, Baku, 1973, pp. 46-49

[8] M.I. Ahmedov. To studying of herpetofauna of
islands of the Southwest part of Caspian

Gasimova, Sh.A. Topchiyeva. To ecology and
distribution of rale kinds of amphibious of
Azzerbajan. Ninth Baku International Congress
Baku, Azerbaijan Republic, 7-9 June,

[10] A.R. Jafarov, Sh.A. Topchiyeva. To the
influence of antropogenous pressure on the
biology of Laudakiya Caucasicus Eichw.1831,
The works of Azerbaijan Zoologist Society,
Elm, Baku, II v., 2010, pp. 829-832.