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DETERMINATION OF THE SPECIES COMPOSITION OF THE DORMOUSE FAMILY (MYOXIDAE) OF ARMENIA THROUGH GENETIC ANALYSIS

H.M. SARGSYAN

Scientific Center of Zoology and Hydroecology NAS RA
hayk.s.mdd@gmail.com

In our previous articles we have mentioned about the fact, that the family of dormouse (Myoxidae) is the least studied representatives of rodents not only in Armenia, but also throughout the region. In 1954, S.K. Dahl presented only two types of dormouses, namely edible dormouse (Glis glis) and forest dormouse (Dryomys nitedula) for the Armenian Mammal's Fauna, but later our scientific group disocovered and described species which had never been described before, the garden dormouse (Eliomys quercinus).

In this article the goals, methods and results of cytogenetic research on representatives of the dormouse family are presented. The research was conducted in the scope of grant with the Institute of Zoology of the PAN in Warsaw.

Rodent group(Rodenita) – dormouse family (Myoxidae) – edible dormouse (Glis glis) – forest dormouse (Dryomys nitedula) – garden dormouse (Eliomys quercinus)

Մեր նախորդ հոդվածներում մենք նշել ենք, որ քնամկների ընտանիքը (Myoxidae) կրծողների կարգի (Rodenita) ամենաքիչ ուսումնասիրված խմբերից մեկն է ոչ միայն Հայաստանում, այլ նաև ողջ տարածաշրջանում: 1954 թ-ին Դալը, Հայաստանի կաթնասունների ֆաունակի համար, ներկայացրել է քնամկների 2 տեսակ՝ մեծ քնամուկ (Glis glis) և անտառային քնամուկ (Dryomys nitedula), բայց ավելի ուշ մեր գիտական խումբը հայտնաբերել և բնութագրել է մինչ այդ չբնութագրված տեսակ՝ այգու քնամուկ (Eliomys quercinus):

Այս հոդվածում ներկայացվում են Հայաստանի ֆաունայի քնամկների ընտանիքի (Myoxidae) ներկայացուցիչների բջջագենետիկ հետազոտությունների նպատակները, մեթոդները և արդյունքները, որոնք իրականացվել են միասնական գրանտի շրջանակներում Լեհաստանի ԳԱ կենդանաբանության ինստիտուտի հետ համատեղ:

Կրծողների կարգ (Rodenita) – քնամկների ընտանիք (Myoxidae)– մեծ քնամուկ (Glis glis) – անտառային քնամուկ (Dryomys nitedula) – այգու քնամուկ (Eliomys quercinus)

В наших предыдущих статьях мы упоминали о том, что семейство соневых (Myoxidae) является наименее изученным представителем среди грызунов не только в Армении, но и во всем регионе. В 1954 г. С.К. Даль для фауны армянских млекопитающих представил только два типа соневых: соня-полчок (Glis glis) и лесная соня (Dryomys nitedula), но позже наша научная группа обнаружила и описала вид, который ранее никогда не описывался – садовая соня (Eliomys quercinus).

В этой статье представлены цели, методы и результаты цитогенетических исследований представителей семейства соневых, которые мы провели в рамках гранта с Институтом зоологии ПАН в Варшаве.

Отряд грысунов (Rodenita) – семейство соневых (Myoxidae) – соня-полчок (Glis glis) – лесная соня (Dryomys nitedula) – садовая соня (Eliomys quercinus)

As we have mentioned in our previous articles, the family of dormouse (Myoxidae) is the least studied representatives of rodents not only in Armenia, but also throughout the region. In 1954, Dahl presented only two types of dormouses, namely edible dormouse (Glis glis) and forest dormouse (Dryomys nitedula) for the Armenian Mammals' Fauna, [1]. Later, our scientific group disocovered and described by using qualifiers, the garden dormouse (Eliomys quercinus), about which we periodically have mentioned in our previous articles [2]. It is well-known, that the standards of the species are typical for the biological species (morphological, physiological, geographical, ecological, biochemical, genetic and other). However, no one of these is absolute and in order to attribute specimen to one or another type it is necessary for specimen to comply with all standards of the kind assigned to it. That is the reason that in the scope of joint grant, our scientific group decided to send the representatives of the dormouse family (Myoxidae), which were hunted according to the license given by the Ministry of Nature Protection of RA, to the Institute of Zoology of the PAN in Warsaw. In the institute the samples with local specialists were undergone cytogenetic research. The cytogenetic researches pursued 2 main goals:

1.Genetically confirm the existence of 2 types of the dormouse family in nature of RA, described for the Armenian Mammal's Fauna, which are edible dormouse (Glis glis) and forest dormouse (Dryomys nitedula)

2.Genetically confirm the existence of the third type of the dormouse family in nature of RA, described for the Armenian Mammal's Fauna, which is garden dormouse (Eliomys quercinus) described by our scientific group.

It necessary to mention that the cytogenetic research has never been done before on the representatives of the familiy of dormouse of the Armenian Fauna and in essence, the mentioned work itself is a scientific novelty.

Materials and methods. Works were done with interruptions (from 2011 to 2013) and resumed in 2016. During the mentioned period traps and peters were used in order to hunt, fix and mark the animals. The samples of animals prepared, numbered and fixed by us in the field according to accepted standards. Samples were stored in 70 % ethanol solution. In order to decide the accurate affiliation of the type of the numbered and fixed specimen, we used DNA barcoding with our colleagues from the Institute of Zoology of the PAN in Warsaw. Cytochrome C oxidase subunit I (hereafter COI) gene received from the tissues of the sampled specimen has been subjected to a singular analysis [3], and the received digital code of the gene has been compared with the other samples' digital codes available in the international database with the BLAST (Basic Local Alignment Search Tool). As a result, we have confirmed the species affiliation of the specimen.

Results and Discussion. In total 31 collected and fixed specimen was taken to the Institute of Zoology of the PAN in Warsaw for cytogenetic research: 10 of which were preliminary characterized as Edible dormouse (Glis glis) by us through morphometric

measurements, 18 of which as forest dormouse (Dryomys nitedula) and 3 of which as garden dormouse (Eliomys quercinus). Unfortunately, after laboratory analysis of 31 samples, COI the digital code of the mitochondrial gene has been received only from 23 samples: 9 edible dormouse (Glis glis) and 15 garden dormouse (Eliomys quercinus). It is necessary to mention, that there is always a chance to receive a negative result. The reason for the negative results can be any mistake made during any period of the work

process either in the field (sample taking and fixing) or in the laboratory (separation of DNA, PCR realization, sequencing). For example, it is not always possible to keep the right portion of the 70 % ethanol for the sample keeping and in the laboratory the reasons for mistakes are too many. For example, not enough amount of DNA or primers, lost of DNA in the cleaning phase, wrong thermal parameters of the PCR reaction, etc. The digital codes, taken during the sequencing of the cytochrome C oxidase subunit I (COI) of the mitochondrial genes of 23 samples, later at computer processing stage, were compared with the other digital codes available in the international database. The results are the following.

Table 1. The results of the cytogenetic study of the family of dormouse

Type	Identification	
	Min	Max
Edible dormouse - Glis glis Linnaeus, 1758	88%	99%
Forest dormouse - Dryomys nitedula Pallas, 1779	86%	98%

As we can see in the table above, the maximum results of the identification of the edible dormouse (Glis glis) and forest dormouse (Dryomys nitedula) are accordingly 99 % and 98 %, which is pretty much high indicator.

As we already have mentioned the cytogenetic research was aimed to: (a) genetically reconfirm the existence of 2 types of the dormouse family in nature of RA, described for the Armenian Mammal's Fauna, which are edible dormouse (Glis glis) and forest dormouse (Dryomys nitedula); and (b) genetically reconfirm the existence of 3rd type of the dormouse family in nature of RA, described for the Armenian Mammal's Fauna, which is garden dormouse (Eliomys quercinus) described by our scientific group.

As a result of our research, we were able to accomplish only the first objective. Due to some reasons, we were not succed to get COI mitochondrial gene of garden dormouse during the experiments, which was described by us earlier. Now, we discuss the possibility to resume our experiments with our colleagues from the Institute of Zoology of the PAN in Warsaw. However, although we could reach only one goal, this work has a big scientific value, because the representatives of the family of dormouse (Myoxidae) were subjected to cytogenetic research for the first time.

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