



## Conference Paper

# Researching Malformations in Frogs of the *Pelophylax esculentus* Complex (Amphibia: Anura) in the Natural Populations of the Trakhtemyriv Peninsula (Ukraine)

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## Abstract

As a result of research held during student practicals between 2012 and 2016 and a study of the population of the *Pelophylax esculentus* complex, we have found up to 13.3% of samples from the species *Pelophylax ridibundus* have abnormalities. Moreover, 6 different variants of limb malformations have been found: phocomelia, rotation, ectrodactyly, mixed patterns (brachydactyly ectrodactyly), polymelia and polyphalangy.

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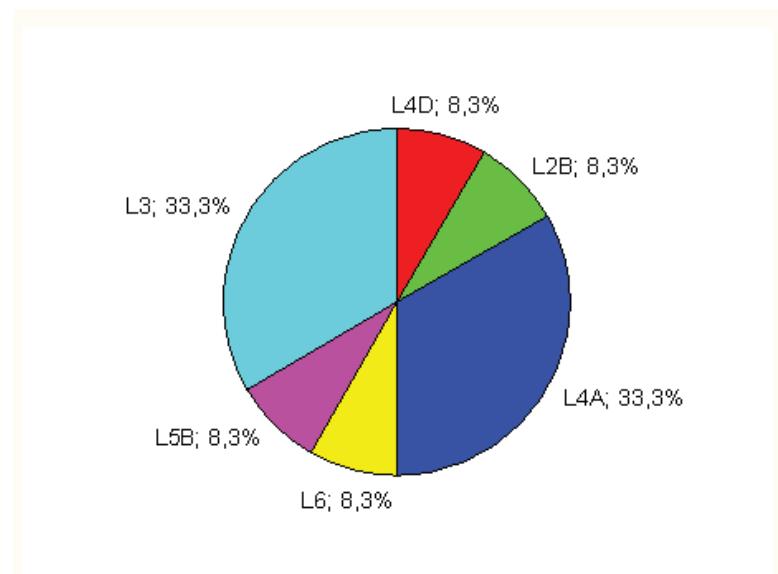
## 1. Introduction

The decline in the population of amphibians and the appearance of a huge number of species with various abnormal features over the last two decades has aroused huge concern among scientists. The literature describes amphibian anomalies in Eastern Ukraine [2], Western Ukraine [1, 3, 10], Southern Ukraine [5], and in Ukraine generally [4]. In the middle Dnipro region, we previously registered malformations in limbs, heads (craniofacial), spines, skin, etc. [6]. According to the literature, anomalies are rarer in natural populations than in populations in an anthropogenic environment (Vereshchin, 1997; Nekrasova, 2002; Borkin et al., 2012), and therefore there is huge interest in the natural biotopes of the Trakhtemyriv Peninsula. The peninsula is situated in the middle of the Dnieper River and is surrounded on three sides by the waters of the Kaniv water storage plant. In the mid-1970s, the construction and opening of the water storage plant had a significant influence on the flora and fauna of this region. The regional landscape park "Trakhtemyriv" is located on the territory of the peninsula.

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## 2. Methods

We sampled abnormal anurans belonging to *Pelophylax esculentus* complex from the Trakhtemyriv Peninsula (Cherkasy region) near the village of Buchak ( $49^{\circ}51'53''N$ ,  $31^{\circ}26'21''E$ ). During the field work, material was collected by the student-biologists of Pereiaslav-Khmelnytskyi State Pedagogic University named after Hryhorii Skovoroda in 2012 (57 species collected in July) and in 2013 (45 species collected in July). The total amount of the material collected and researched was 102 frog species (ad & sad). In 2014 – 2016, only the number of amphibians was studied. The frogs were examined according to standard methods during their life cycles. They were classified in terms of their morphological traits [6]. The anomalies were studied according to the classification system we developed earlier ([7]; Fig.1).



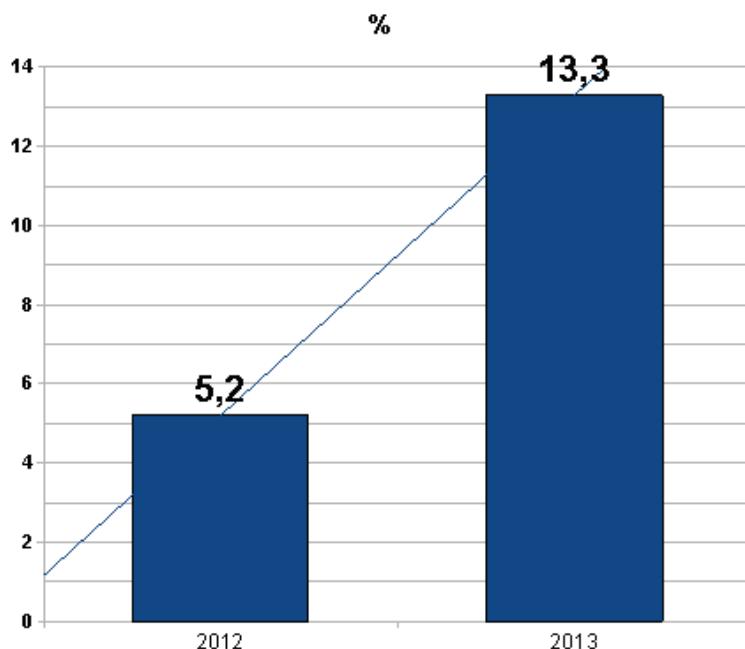
**Figure 1:** The proportion of the occurrence of various types of abnormalities in lake frogs on the Trakhtemyriv Peninsula (2012-2013, subscriptions in the text).

## 3. Results

As a result of the research, it was found that all members of the green frog *Pelophylax esculentus* complex can be found in the investigated territory – parents of the marsh frog *Pelophylax ridibundus* (Pallas, 1771) (in 2012 - 71%; in 2013 – 93%); the pool frog *Pelophylax lessonae* (Camerano, 1882) (in 2012 – 5.2%; in 2013 – 4.4%); and their hybrid *Pelophylax* kl. *esculentus* (in 2012 – 23.8%; in 2013 – 2.6%). Therefore, it was indicated that in mixed population systems (LER type) there were fewer hybrids and pool frogs. The total number of frogs was two times lower. Anomalies were found only in *P.*

*ridibundus*: in 2012, they were found in 5.2% of the specimens, and in 2013 in 13.3% (3 frogs each had 2 anomalies).

*Limb Malformations* (Fig.1, 2).



**Figure 2:** The proportion of frogs with abnormalities on the Trakhtemyriv Peninsula.

*Phocomelia* (L2B) - absence of the proximal portion of a limb, found in 8.3% (f, 2013).

*Rotation*(L3C) - rotation different parts of the limbs, often found in 33.4% (m, f, 2012-2013).

*Ectrodactyly* (L4A) - missing part of limb or digits. Found in 33.4% (m, f, 2013).

*Mixed patterns* (L4D) - *Brachydactyly* (short toes or missing phalanges) and *Ectrodactyly*, found in 8.3% (f, 2012).

*Polyphalangy* (L5B) - extra bones in a digit, found in 8.3% (2013).

*Polymelia* (L6) - with one extra hind limb, found in 8.3% (f, 2013; Fig. 3). A similar number of cases of polymelia were found in lake frogs (*P. ridibundus*) from the park "Kin-Grust" in Kyiv. In 2001, up 42% of specimens had additional limbs (up to 7; Nekrasova et al., 2007).

The artificial lake Buchak emerged in place of the lower pit of the incomplete Kaniv Pumped Storage Plant. The construction of the plant started in 1984 and was suspended after the Chernobyl NPP accident. In 1992, all construction works were completely stopped for economic reasons. During the construction, part of the village of Buchak was partially relocated and demolished, with the oak forest being uprooted and the existing ecosystem disrupted. It is worth mentioning that some oaks 1.5 meters in



**Figure 3:** Picture of polymelia (L6) - *P. ridibundus* with one extra hind limb.

diameter were preserved in certain areas (400 m from the fish farm). Lake Buchak is a drainage lake filled by waters from springs. It was here that we found for the first time a new kind of reptilian - *Natrix tessellata* - for the Cherkasy region [6]. Recently, tourist activities have had a strong influence on the lake. The number of amphibians is in gradually decline.

#### 4. Conclusion

As a result of this work, we came to the conclusion that hybrids and pool frogs were the most sensitive to the changing conditions, as their populations decline with each year. Meanwhile, the number of marsh frogs with anomalies increased to 13.3%, and the range of the anomalies has increased to 6 variants. Possible explanations for the emergence of anomalies in natural waters could be parasitic invasions, natural background factors (the general deterioration of water conditions in the Dnipro River and radioactive background from the gamma radiation in granite outlets) and significant recreational activities during amphibian breeding and development. In the near future, we plan to study this phenomenon more precisely.

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