

New data on the batrachofauna of South Park, Sofia (Bulgaria) – species composition, distribution, and conservation threats

ATANAS GROZDANOV^{1*}, ANTON SOKOLOV², PETAR PETROV¹,
DIMITAR DIMITROV², VASIL ATANASOV², HRISTO PESHEV³,
EMANUIL MITREVICHIN⁴

¹*Sofia University “St. Kliment Ohridski”, Faculty of Biology, Department of Zoology and Anthropology, Sofia, Bulgaria*

²*Educational students club Skorec, Sofia, Bulgaria*

³*Fund for wild flora and fauna, Blagoevgrad, Bulgaria*

⁴*South-West University “Neofit Rilski”, Faculty of Mathematics and Natural Sciences, Department of Geography, Ecology and Environmental Protection, 2700 Blagoevgrad, Bulgaria*

**Corresponding author: atanas_grozdanov@biofac.uni-sofia.bg*

Abstract. Although some amphibians are found in human settlements, they have been rarely studied in detail. Here we provide information on the batrachofauna of South Park Sofia. Six species were registered, and most of the species populations were in stable condition. Further, some of them increased their number and density. However, some conservation threats to the populations of the species were identified. The most significant threats were the presence of an invasive taxon and artificial ponds with vertical borders, which act as ecological traps. In this regard, some recommendations were made to minimise the negative impact on the batrachofauna in the park.

Key words: amphibians, urban environment, conservation threats.

Introduction

The first detailed study on the batrachofauna of the city of Sofia was carried out by Milchev (1985). It was not until three decades later that information about the amphibians found in the city was published (Tzankov *et al.* 2015). To date, the most thoroughly studied urban herpetofauna in Bulgaria is that in the city of Plovdiv (Mollov 2005, 2011, 2019, etc.).

The study aimed to summarise the information on amphibian species that had been observed in the South Park for almost 20 years.

Material and Methods

South Park is one of the largest city parks of Sofia, covering c. 1,48 square kilometres in the southern part of the city. The park includes various habitats such as deciduous, coniferous, and mixed forest zones, shrub lands, meadows, a river, a series of swamps of different sizes, as well as artificially-made ponds. Unlike some other city parks, South Park includes parts that are not intensively managed, and this is favourable for many wildlife species.

Based on random transect and point observations, the study area was frequently visited in the period 2005–2024. Information for the locations of the species was gathered in a database, along with behaviour specifics and conservation threats. Photo and video documentation of the species observed was taken when possible. Additional data were

*Received: 21.05.2025, Accepted: 24.06.2025, Университетско издателство “Паисий Хилендарски”
Published: 27.06.2025 Plovdiv University Press “Paisii Hilendarski”*

gathered from some colleagues as well as volunteers and citizens visiting the park, including through the Facebook-based group Amphibians and Reptiles in Bulgaria with over 20,000 members at present.

Results and Discussion

During the study, we identified the following species of amphibians:

Buresch's Crested Newt, *Triturus ivanbureschi* Arntzen and Wielstra, 2013

Regularly occurred in the wetlands in the western part of the study area. Reproducing was confirmed, with regular observations of larval individuals. The maximum number of adult newts registered in the most suitable pond was about 10 individuals per day.

European Green Toad, *Bufotes viridis* (Laurenti, 1768)

Regularly observed in the park, including reproduction in part of the wetlands. The species is well adapted to the urban environment and thus often enters the neighbouring built-up areas near the park. Approximately 2000 juvenile individuals were observed in the western part of the area.

Common Toad, *Bufo bufo* (Linnaeus, 1758)

Regularly observed during its activity period. The species can be found during the day in spring when both sexes enter the swamps to breed. Unlike *B. viridis*, *B. bufo* moves outside the boundaries of the park.

Eastern Tree Frog, *Hyla orientalis* Bedriaga, 1890

Even though there are suitable habitats in the park, only one adult and one juvenile individual, which was ingested by a Grass Snake, were registered. Moreover, we did not observe any breeding attempts. For now, the status of *H. orientalis* is thus unclear, and the species is possibly in significant decline.

Agile Frog, *Rana dalmatina* Fitzinger in Bonaparte, 1838

Regularly reproducing in some wetlands in the park. After the breeding season, the adults were rarely seen on dry land. This is probably because they enter the most undisturbed forest and shrubland areas.

Marsh Frog, *Pelophylax ridibundus* (Pallas, 1771)

Widespread species in both natural and artificial water bodies across the study area. The species density was higher in the natural swamp areas, which are rich with aquatic and coastal vegetation.

Considering the intensive human activities and habitat degradation in the neighbouring areas, the species diversity in the park can be evaluated as high in the context of urban zones. The presence of most species is related to the different types of wetlands in the park. Most of the wetlands are in their natural state, with unmodified coastlines and abundant aquatic and coastal vegetation, which provide suitable shelters and breeding grounds. In addition, artificial wetlands were also present, thus offering new areas for amphibian reproduction, but also creating some ecological constraints (see Conservation threats).

Milchev (1985) registered 7 amphibian species in the city of Sofia, of which only *Bombina variegata* (Linnaeus, 1758) was not observed during our study. Milchev predicted future extinction or negative population trends for most amphibians in Sofia, due to the

intensified urbanisation. However, our work showed that most of the amphibians in the park are in stable or increasing numbers, excluding *H. orientalis*.

We identified the following conservation threats for the batrachofauna of South Park:

- Presence of artificial ponds with vertical borders, which act as ecological traps. Such ponds were identified as annual breeding grounds of *T. ivanbureschi*, *B. viridis*, and *R. dalmatina*. These ponds were unsuitable for fish presence, which is considered a positive factor for the amphibians (Beebee 1996; Vasconcelos & Calhoun 2006). However, our recent observations showed that they had been inhabited by some small fish species. Moreover, the vertical stone banks block the retreat of the adults to the land after the reproduction period. This is possibly the reason for the regularly found dead newts, frogs, and toads during our research.
- Presence of invasive species with potential for negative influence on the native populations. The human presence in the city parks increases the possibility of accidental or intentional introduction of invasive species. During our research, we observed in at least two park wetlands the Largemouth Bass, *Micropterus salmoides* (Lacepède, 1802), which was recently reported for the first time in Bulgaria (Uzunova *et al.* 2019). The individuals were of different sizes and had probably reproduced here for at least 3 years. Another study indicated that *M. salmoides* prefers to attack tadpoles of the genus *Hyla* rather than *Bufo*, which is generally avoided (Kruse & Stone 1984). We thus suggest that the very scarce recent observations of *H. orientalis* in the park may be related to the presence of *M. salmoides*. On the other hand, *B. bufo* and *B. viridis* were in stable increasing numbers during the present study. Our numerous observations of newts, frogs, and toads in the artificial ponds of the park may be indicative of their effective avoidance of predatory fish.

Despite the significant human presence, the South Park of Sofia provides favourable conditions for some amphibians. We can conclude that the high species diversity identified in the park is likely due to the variety of habitats, the presence of inaccessible areas with low human impact, and the generally positive or neutral attitude of the park visitors towards the local batrachofauna. Furthermore, we did not find any significant decline in the target species, except *H. orientalis*, which, according to previous research (Milchev 1985), had been common in the park. On the contrary, other species were in a stable or positive trend than predicted in the past – *B. bufo* and *T. ivanbureschi*. Despite the generally optimistic tendencies, different conservation threats were detected, and we can thus define the following recommendations:

- Installation of information plates that give details about the species distributed in the park, their biology, and conservation specifics.
- Organisation of thematic informational campaigns for popularising wildlife in the city parks.
- Establishment of proper installations in the artificial ponds that would help amphibians escape after the breeding season.
- Preservation of the park areas with a lower level of management of the vegetation.

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