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Short note

Fatal Attraction - a Case of Multiple Amplexus and Some Breeding Peculiarities in the European Green Toad (Bufotes viridis) from the City of Plovdiv (Bulgaria)

*Ivelin A. Mollov**

University of Plovdiv "Paisii Hilendarski", Faculty of Biology, Department of Ecology and Environmental Conservation, 24 Tzar Assen Str., BG-4000 Plovdiv, BULGARIA
*Corresponding author: mollov_i@uni-plovdiv.bg

Abstract. A previously unreported case of multiple amplexus and ampleaxus with dead female, as well as some peculiarities of the breeding of a *Bufotes viridis* population from the city of Plovdiv in Bulgaria are presented. A discussion of their potential causes and comparison with similar cases are also given.

Key words: *Bufotes viridis*, breeding peculiarities, multiple amplexus, Plovdiv, Bulgaria.

Amplexus is the mating position adopted by many amphibians for breeding. In anurans, amplexus is dorsal: the male grasps the female on the back, either at the armpits - axillary amplexus or at the waist - lumbar amplexus (Dufrenes, 2019). Despite the fact that quite a lot of studies on the breeding behavior and the aberrations from the normal amplexus of anuran amphibians are conducted in Bulgaria (for comprehensive review see Mollov et al., 2010) there are still some aspects that are not well studied.

The Green Toad (*Bufotes viridis*) is regarded as near synanthropic species in most parts of Europe, occurring mainly in agricultural landscapes with a warm climate (Stöck et al. 2009). It also inhabits gardens, parks and ruderal areas and often in urban environments (Kaczmarski et al. 2019). Its ecology and breeding phenology is well described from the city of Plovdiv by Mollov (2019). In the current short note, new data about the breeding phenology of the species and a case of multiple amplexus and amplexus between alive male and dead female is reported for the first time.

In March 2022 at nature monument "Mladezhki halm" Hill in Plovdiv City, in a small temporary pond (42°08'08.5"N 24°43'42.5"E) at the south side of the hill (Fig. 1A) an unusual breeding behavior of *B. viridis* was observed. On 24.03.2022 a multiple amplexus between four males and a female green toads were successfully photographed (Fig. 1B). The female was laying on its dorsal side in the water and was dead, at the time of observation, probably drowned by the clasping males. Several other pairs in normal amplexus as well as laid cords of eggs were also recorded (Fig. 1C). Few days later (29.03.2022) the dead body of the same female toad was found in the pond as well as three dead males, scattered at different parts of the pond, who probably died due to exhaustion.

A - The study site (temporary standing water basin in the south side of NM "Mladezhki Halm" Hill.

B - Four males grasping a dead female at the study site (24.03.2022).

C - a pair in normal amplexus and layed eggs (24.03.2022).

D - hatched larvae at the study site (29.03.2022).

Fig. 1. Study site and and observed individuals of *B. viridis* in the city of Plovdiv.

Newly hatched larvae (few days old) were also recorded in the pond (Fig. 1D). By this time all adult toads have already left the water.

At the same site in 2021 the first mating calls of the males were recorded in March 2021 (surveys on March 14 and 26). Shortly after, the first cords with eggs were also registered. At the beginning of April (05.04.2021), tadpoles in an early stage of metamorphosis were already registered. Later towards the middle of April 2021, there was an unusual for this time of the year cold weather and even snow fall. Although it lasted only for two days, the bad weather probably interrupted the metamorphosis and greatly hindered toads' reproduction. After that, there was no water left in the pond in May and no tadpoles or adult frogs were recorded in the pond area. In 2022 most of the larvae managed to complete their the metamorphosis and in May 2022 there were numerous newly metamorphosed toads and almost no water left in the pond. As this was observed many times before at the same place - metamorphosis for this species in Plovdiv City finishes very fast (about 30 days) (see Mollov, 2019).

A multiple amplexus (several males on one female) was previously reported for *Bombina variegata, Rana temporaria* and *R. dalmatina* from Bulgaria even for a closely related to *B. viridis* species as the Common Toad (*Bufo bufo*) (see Mollov et al., 2010; Covaciu-Marcov & Sucea, 2021), but this is the first reported sighting of a multiple amplexus between several males and one female for *B. viridis,* as well as amplexus between alive male and dead female.

On 02.03.2008 in the same pond another peculiar aberration from the normal amplexus was observed, namely an amplexus between two males (Mollov et al., 2010), which is also reported by Huebauer (2019) from Austria.

The reason for all of these aberrations from the normal breeding behavior is most like due to the very skewed sex ratio towards the males. Thus the operational sex ratio may be strongly male biased in these cases resulting in an intense competition between males to obtain a mate. From a previous study in 2007-2008 at the same site a sex ration (males:females) of 3.68:1 was recorded (Mollov, 2019). Sistani et al. (2021) registered a sex ration for a B. viridis population from Vienna (Austria) of approximately 4:1. Multiple amplexus is especially common in explosive breeding amphibians, such as *B. viridis* where a large number of breeding adults can be present in the breeding site for a short time period (days to weeks). In these cases, females are important resources for males, because the males are present in larger numbers than females. This competition may result in multiple amplexus, takeovers, and frequently, the death of females, as it was previously observed for example in *B. bufo* (Mollov et al., 2010).

In conclusion an emphasis on the importance of recording and describing observed changes in the phenology of anurans should be made, which will result in enhancing the effectiveness of conservation or monitoring activities undertaken for management of these vulnerable species.

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