

1-1-2005

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Recommended Citation

KAYA, UĞUR; ÇEVİK, İ. ETHEM; and ERİŞMİŞ, UĞUR C. (2005) "Population Status of the Taurus Frog, *Rana holtzi* Werner (1898), in Its Terra Typica: Is There a Decline?," *Turkish Journal of Zoology*: Vol. 29: No. 4, Article 5. Available at: <https://journals.tubitak.gov.tr/zoology/vol29/iss4/5>

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Population Status of the Taurus Frog, *Rana holtzi* Werner (1898), in Its Terra Typica: Is There a Decline?

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Received: 16.09.2004

Abstract: The herpetofauna of the Taurus Mountains is diverse, and many species are locally abundant. The Taurus frog, *Rana holtzi*, is endemic to Maden Lake in the Taurus Mountains in Turkey. Although it was thought to be abundant in its restricted habitat, the population size of the Taurus frog and its related trend are uncertain. Like many animals, a great number of anurans have declined or become extinct over the past decades. In 2003, we conducted a mark-recapture study on the Taurus frog population in its terra typica. Our objective was to monitor *R. holtzi* in its terra typica to estimate its population size and assess the extent of any decline. Our results indicate that this species is facing a very high risk of decline in its natural habitat.

Key Words: Taurus frog, *Rana holtzi*, Maden Lake (Karagöl), population size, anuran decline

Toros Kurbağası, *Rana holtzi* Werner (1898)'in Tip Lokalitesindeki Populasyon Durumu: Azalma mı var?

Özet: Toros Dağları herpetofaunası çeşitlidir ve çoğu tür lokal olarak boldur. Toros Kurbağası, *R. holtzi* Toros Dağları'ndaki Maden Gölü'ne endemiktir. Bu türün sınırlı habitatında daha önceleri bol olduğu düşünülmesine rağmen, populasyon büyüklüğü ve buna ait eğilimi belirli değildir. Diğer hayvanlarda olduğu gibi, çoğu anurun geçmiş yıllarda azaldığı veya neslinin tükendiği bilinmektedir. 2003 yılında Toros Kurbağası'nın tip lokalitesinde markala-tekrar yakala çalışması yapılmıştır. Amacımız bu çalışma ile *R. holtzi*'nin doğal yaşam ortamında gözlenmesi, populasyon büyüklüğünün hesaplanması ve sayıca azalmanın belirlenmesidir. Elde ettiğimiz sonuçlar bu hayvanların doğal habitatlarında ciddi bir azalma ile karşı karşıya kaldıklarını göstermektedir.

Anahtar Sözcükler: Toros Kurbağası, *R. holtzi*, Maden Gölü (Karagöl), populasyon büyüklüğü, anur azalması

Introduction

There has been growing concern about worldwide declines in amphibian populations since the first World Congress of Herpetology in 1989. Six leading hypotheses are proposed as underlying these amphibian population declines. These are (1) alien species (Bradford et al., 1993; Goodsell and Kats, 1999; Knapp and Matthews, 2000), (2) over-exploitation (Jennings and Hayes, 1985), (3) land use (Hecnar, 1997; Woodford and Meyer, 2003), (4) global changes including UV radiation (Blaustein, 2003) and global warming (Pounds and Crump, 1994), (5) toxic chemicals (Bishop, 1992; Quillet et al., 1997), and (6) infectious diseases (Berger, 1998; Muths et al., 2003). Although amphibian populations are well documented and thought to be declining in some parts of the world (South and Central America, Canada

and Australia), no data on population decline in Turkey are available.

Since 1996, the Taurus frog has been on the IUCN (The World Conservation Union) Red List of Threatened Species and categorized as an Endangered (EN) species. There is only 1 Taurus frog population known in Maden Lake (Karagöl). Sometimes, specimens belonging to this population can be seen in the vicinity of Çinigöl, which is situated approximately 100 m north of and around 50 m higher than Karagöl. At this site the Taurus frog population has been monitored since the late 1960s but never quantified. At that time, this species was abundant at this site (İ. Baran, pers. comm.). Baran (1969) noted that his study population was large, without giving any quantification. However, more recent information indicates that the numbers may be declining in this

habitat. According to Baran et al. (2001), Taurus frogs are estimated to have experienced a decline of approximately 60-70% in their population size in this habitat. It was estimated that the Maden Lake population consists of approximately 30,000 adults. Population size estimates in this study were made on the basis of counting the frogs around the lake and were not repeated. Our objective was to identify an appropriate method for monitoring the population size of *R. holtzi* and to assess possible declines.

Materials and Methods

Our mark-recapture study was conducted on August 11-13th, 2003, and took place between 9:00 a.m. and 8:00 p.m. The water temperatures were 19, 20 and 19 °C, respectively, on the 3 days. To estimate the population size of Taurus frogs in Maden Lake, all individuals, including froglets, were marked by coloring the venter of the right or the left foot, coded by days with vital dye eosin. These were then released and recaptured on subsequent days. Taurus frogs were not seen in Çinigöl during our 3 day study. We used Begon's (1979) triple catch method to estimate population size and critically investigated the entire periphery of the lake during our 3 day survey.

Results and Discussion

In Maden Lake 445, 525 and 482 individuals were captured during the 3 day study. Of the 525 frogs captured on day 2, 26 had day 1 marks (they were also given day 2 marks by coloring both feet). The rest were given only day 2 marks. Of the 482 frogs captured on day 3, only 1 had a day 1 mark, and 17 had day 2 marks. The population size was estimated to be 1019 on day 2. We assumed that the survival and the gain rates were constant and that the interval between the samples was

the same (Begon, 1979). Accordingly, the population sizes were estimated to be 725 on day 1 and 1432 on day 3. The survival rate and the population gain were estimated to be 0.12 and 0.92, respectively.

Declines of amphibian populations have been reported from many countries all around the world, especially in the last decade (Wake, 1991; Blaustein et al., 1994). Population size and demographic information concerning the frog populations in Turkey are still lacking (Kaya and Erişmiş, 2001). We estimated the population size of Maden Lake Taurus frogs to be between 725 and 1432. This species was abundant in the late 1960s, but its numbers declined as much as 70% towards the late 1990s (Baran, 1969; Baran et al., 2001). In the absence of long-term monitoring studies, no solid trends in the population size can be determined. However, our estimates suggest that the population size in Maden Lake is smaller than previously thought, and when we compared our results with those of previous studies, the Taurus frogs showed the most dramatic decline during the previous 3 years. Baran et al. (2001) made an estimate of 30,000 individuals at this site. If there is a decline, then what has caused it? In the light of the previously reported evidence (Baran et al., 2001) the introduction of the common carp, *Cyprinus carpio*, may be responsible for the decline in the *R. holtzi* population at this site. The effects of fish introduction on native frogs have already been documented in several studies (Bradford et al., 1993; Goodsell and Kats, 1999; Knapp and Matthews, 2000; Gillespie, 2001). As mentioned previously, the Taurus frog has been categorized as an Endangered (EN) species on the IUCN Red List. Our results indicate that it is facing a very high risk of decline, and long-term monitoring studies must be planned. Thus, if the trends in the population size of *R. holtzi* continue to decline, it should be categorized as a Critically Endangered (CR) species on the IUCN Red List rather than merely on EN.

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