

**New locality records for Turkish endemic species *Rana tavasensis* (Baran and Atatür, 1986)**

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**Abstract:** Five specimens of *Rana tavasensis* from Atlidere, Muğla Province were collected in September 2014 during fieldwork in western Anatolia. The results of this study, including metric measurements of specimens, are compared with the data given in the previous literature. The phylogenetic position of the newly recorded specimens was approved previously. Together with this new record, known natural habitat of *R. tavasensis* expanded to 30 km north from the last declared location (Lake Girdev, Muğla). Protected area must be reevaluated for this endangered endemic species.

**Keywords:** New locality, *Rana tavasensis*, Muğla, Turkey

**Türkiye'ye Endemik *Rana tavasensis* (Baran ve Atatür, 1986) Türüne Ait Yeni Lokalite Kaydı**

**Öz:** Batı Anadolu'daki saha çalışması sırasında Muğla ili Atlidere'den beş adet *Rana tavasensis* örneği Eylül 2014'te toplanmıştır. Bu çalışmanın sonuçları, örneklerin metrik ölçümleri dahil olmak üzere, literatürde verilen veriler ile karşılaştırılmıştır. Yeni kaydedilen örneklerin filogenetik konumu daha önceki çalışmada onaylanmıştır. Bu yeni kayıtla birlikte, *R. tavasensis*'in bilinen doğal yaşam alanı, son bildirilen konumdan (Girdev Gölü, Muğla) 30 km kuzeye genişlemiştir. Nesli tükenmekte ve endemik olan bu tür için koruma alanının yeniden değerlendirilmesi gereklidir.

**Anahtar sözcükler:** Yeni lokalite, *Rana tavasensis*, Muğla, Türkiye

**INTRODUCTION**

Turkish endemic species, *Rana tavasensis* (Tavas Frog) (Baran and Atatür, 1986) was firstly identified from the area of Akdağ (near Tavas in Denizli province). According to IUCN Red List, this species is also observed from Lake Girdev (Muğla) and its close vicinity west of Elmali (Max Kasperek pers. comm. November 2008; Franzen et al. 2008). *R. tavasensis* is listed as Endangered because the extent of occurrence is less than 5000 km<sup>2</sup> and area of occupancy is less than 500 km<sup>2</sup> with all individuals occurring on two locations, with ongoing habitat loss and fragmentation within the species' range (IUCN Red List, 2018).

Tavas frog is a member of Anatolian mountain frogs (*Rana macrocnemis*, *Rana camerani* and *Rana holtzi*) and was known as a subspecies of *R. macrocnemis* for a long time. The first identification of this species was made by Baran (1969). After that, the same researcher declared that this species was a subspecies of *R. macrocnemis* (Baran and Atatür, 1986). Many researchers present different taxonomic conclusion for Tavas frog. Veith et al. (2003)

showed that this species differentiated from the other Anatolian mountain frogs in terms of the mitochondrial DNA variation (16S region). In the mean time, Picariello et al. (2016) indicated that *R. tavasensis* is conspecific with *R. macrocnemis* according to S1 satellite DNA structure. Final study declared that this species differentiated from other Anatolian mountain frogs with molecular markers (COI (Barcode) and Cyt b gene regions) with a high differentiation rate (Ergül Kalaycı et al., 2017).

In this study, we present a new locality and extend the habitat range of this endangered species to 30 km north of its known range distribution. Also, we pointed out that gaps among its distribution range must be reevaluated carefully.

**MATERIAL and METHODS**

Five specimens were caught from the Atlidere locality (Muğla) (36° 86' N, 29° 70' E, 1402 m a.s.l.) during the field study in September 2014. After morphometric measurements were taken, specimens were released into the same habitat (Fig 1A.). Taxonomic validation of studied

specimens was approved by molecular analysis, which made by Ergül Kalaycı et al. (2017).

The habitat of *R. tavasensis* is covered by the members of *Mentha* and *Jungus* genus and representative of the Poaceae family (Fig. 1B). The ground surface is usually wet due to water fountain nearby. The habitat of Tavas frog is far away from human settlements and characterized as stepped (Fig.1C, D).



**Figure 1.** The habitat of the Atlidere locality A-General view of the right side of the road B- General view of the left side of the road C- View of the habitat where the specimens were found D- Flora of the habitat.

The morphometric measurements were made with a digital caliper of 0.01 mm sensitivity according to Baran (1969) and Terenjev & Chernov (1965): External naris-Mouth slit Distance (EMD), Orbit Diameter (OD),

Tympanum Diameter (TD), Head Length (HL), Rostrum Length (RL), External naris-orbit distance (EOD), Rostrum width (RW), Internarial Distance (ID), First (foreleg) Toe length (FTL), Snout-vent Length (SVL), Foreleg Length (FoL), Femur Length (FL), Tibia Length (TL), Tarsus Length (TaL), Hindlimb length (HLL), First (hindleg) Toe length (FTL) and Metatarsal Tubercle Length (MTL).

Morphometric measurements given from the type locality of the species were presented (Şahin, 2008). The mean values of morphometric measurements of studied specimens and previous data obtained from type locality were examined.

## RESULTS and DISCUSSION

Comparative descriptive statistics of some morphometric characters of studied population and literature data were given in Table 1. The mean values of morphometric data were similar for both populations (Akdağ and Atlidere) (Table 1).

According to molecular analysis; *R. tavasensis* was differentiated from other Anatolian mountain frogs (Veith et al., 2003, Ergül Kalaycı et al., 2017). Classification of the newly reported population was conformed according to the Cyt b and COI gene regions. Sequences of newly recorded locality and other Anatolian mountain frog populations, compared with regard to molecular analysis. According to the phylogenetic tree topologies, specimens from the type locality (Akdağ, Tavas) and newly recorded (Atlidere, Muğla) one shared the same branch (Ergül Kalaycı et al. 2017). The morphometric measurements of the Atlidere population was similar to values given by Şahin (2008).

**Table 1.** Comparison of some morphometric measurements of our specimens with given by Şahin (2008) (n= number of individuals).

Characters	Atlidere population (n=5)		Akdağ population (literature data) (n= 29)	
	Range (mm)	Mean ±S.D. (mm)	Range (mm)	Mean±S.D.(mm)
External naris-Mouth slit Distance (EMD)	1.80-4.27	3.12±1.20	3.43-5.85	4.34±0.56
Orbit Diameter (OD)	1.40-2.93	2.28±0.75	3.50-5.87	4.41±0.53
Tympanum Diameter (TD)	0.88-4.22	2.77±1.45	2.25-4.26	2.95±0.56
Head Length (HL)	7.86-22.23	14.78±6.42	13.84-20.78	16.59±1.88
Rostrum Length (RL)	3.62-9.35	6.61±2.46	5.95-9.46	7.64±0.99
External naris-orbit distance (EOD)	1.77-4.75	3.44±1.2	3.10-4.60	3.76±0.37
Rostrum width (RW)	3.68-9.05	6.53±2.40	5.69-9.35	7.19±0.94
Internarial Distance (ID)	2.33-4.64	3.49±1.06	3.23-4.99	4.08±0.47
First (foreleg) Toe length (FTL)	2.86-8.00	5.43±2.34	4.94-7.58	6.13±0.76
Snout-vent Length (SVL)	23.17-69.94	44.13±19.56	40.30-61.18	48.72±6.79
Foreleg Length (FoL)	6.28-17.39	11.02±4.49	9.95-14.84	12.22±1.38
Femur Length (FL)	10.68-43.36	26.01±13.35	20.65-34.38	26.60±3.33
Tibia Length (TL)	12.17-46.46	27.68±13.95	24.58-40.41	30.92±4.16
Tarsus Length (TaL)	6.31-21.20	13.61±6.78	11.98-19.94	15.31±1.96
Hindlimb length (HLL)	12.76-38.11	25.97±11.72	22.78-37.82	29.15±3.91
First (hindleg) Toe length (FTL)	2.37-7.67	4.87±2.48	4.51-6.92	5.45±0.69
Metatarsal Tubercle Length (MTL)	0.89-2.41	1.73±0.73	2.15-3.75	2.83±0.42

Under the result of this study, distribution range of *R. tavasensis* was extended. Range expansion of this endangered species must be studied broadly and the whole

field between type locality (Akdağ, Tavas) and Lake Girdev (Muğla) must be searched.

The new locality reported here represent an extension of the geographic range of *R. tavasensis* by ca. 30 km north of the recognized range by IUCN (Fig. 2). Specifically, the new locality is 30 km northeast from Lake Girdev and 150 km southeast from Tavas (type locality). Concretely, we recommend that the new polygon inclusive

this new locality and should be considered in the next IUCN Red List assessments. Given the geographic proximity to Lake Girdev, it is possible that *R. tavasensis* also occurs at other nearby localities of this lake.



**Figure 2.** Distribution map of *R. tavasensis*. Red star showed type locality (Tavas, Denizli) and square indicated Lake Girdev (Muğla) which was obtained literature data, circle indicated current studied locality.

In summary, both morphological and molecular values were approved the taxonomic status of the newly reported locality. Our findings provide valuable information to update maps of the known geographic range of this species. To take a strong precaution for conservation is difficult with the lack of information about the current distributional range of species. Because this species listed as endangered, current habitat of *R. tavasensis* must be revealed in details. Protected areas must be immediately determined.

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