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Age Determination in Some Ophisops elegans Mènètriès 1832 (Sauria: Lacertidae) Populations Living in the Vicinity of Çanakkale and Akşehir-Eber

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Abstract. In this study, age determination was performed with the method of skeletochronology in 23 (13 ♂♂, 10 ♀♀) *Ophisops elegans* specimens collected from Çanakkale in the west of Turkey and 20 (10 ♂♂, 10 ♀♀) *Ophisops elegans* specimens collected from the vicinity of AkÇehir-Eber in the Central Anatolia Region. The mean ages of the specimens whose femur cross sections had been examined were determined to be 2.9±0.99 (1-4) in females and 2.85±0.68 (2-4) in males of the Çanakkale population and 3.9±1.19 (3-6) in females and 4.6±1.17 (3-6) in males of the AkÇehir-Eber population. The oldest age among the specimens was found to be six in two female and three male individuals of the AkÇehir-Eber population. When all specimens were evaluated altogether, the correlation between snoutvent length and age was computed as (r=0.572, p=0.008) in females and as (r=0.642, p=0.001) in males.

Key words: *Ophisops elegans*, skeletochronology, Çanakkale, AkÇehir, Eber.

Introduction

The Snake-eyed lizard, *Ophisops elegans*, one of the most commonly encountered lizard species in Turkey, is distributed in south-eastern Balkans, Turkey and Transcaucasia, on some islands of the Eastern Mediterranean Sea and the Aegean Sea, and in Syria, Palestine and the north of Africa (LANTZ, 1930; BODENHEIMER, 1944; BARAN, 1984; CHIRIO & BLANC, 1993; SCHLEICH *et al*., 1996; FRYNTA *et al*., 2000; SINDACO *et al*., 2000; GÖÇMEN *et al*., 2008). The studies on species *O. elegans*, which has been distributed over an extensive area in Turkey and whose taxonomic position has not been fully clarified yet, are generally on taxonomy and feeding biology (TOK, 1992; 1993; TOK *et al*., 1997; OLGUN & TOK 1999; AKKAYA & UĞURTAĞ, 2006; YILDIZ *et al*., 2012). In the morphology-based taxonomic studies, the need to make evaluations by dividing the animals into age groups was highlighted (CASTANET & SMIRINA, 1990). However, the age determination studies on reptiles are rather scarse in Turkey (OLGUN *et al*., 2005; MIAUD *et al.,* 2007; ÜZÜM, 2009; ÜZÜM & OLGUN, 2009; KUTRUP *et al.,* 2011; YAKIN *et al.,* 2012).

Today one of the most frequently used methods to determine the age of reptiles is skeletochronology. In this method, the diaphysial region which displays weak branching in the long bones of reptiles is the part that yields the best result (CASTANET *et al.,* 1993). The energy metabolism depends on temperature in reptiles, as in many other ectothermic living things. Throughout hibernation, reptiles live at low energy levels; therefore, their longevity increases depending on the duration and energy of

hibernation (CASTANET, 1994). A resting line occurs in reptiles during hibernation. These structures are in the form of rings which indicate the local osteogenesis that stops temporarily (CASTANET et al., 1993; SMIRINA *et al*., 1986).

The current study aims to perform age determination with the method of skeletochronology on *O. elegans* specimens collected in the field studies carried out in the western and Central Anatolian regions of Turkey and to reveal the correlation between the parameters of age and snout-vent length (SVL) in two different populations. Another aim of the present study is to provide more reliable data about the age-SVL relationship in the morphological studies to be made regarding the species.

Material and Methods

Totally 43 (23 ♂♂, 20 ♀♀) wild-collected specimens during the field studies in the vicinity of Çanakkale and AkÇehir-Eber were examined with the method of skeletochronology. 20 (10 ♂♂, 10 ♀♀) specimens from the Çanakkale population and 23 (13 ♂♂, 10 ♀♀) specimens from the AkÇehir-Eber population were evaluated. In the study, the approximate ages of species *O. elegans* were determined, and the age-SVL relationship in the individuals of both populations was investigated. Body measurements of the specimens were done by using a digital compass sensitive to 0.01 mm. The measurement values were provided in millimeters.

After the morphometric measurements of the *O. elegans* specimens had been obtained, the left femora of the specimens were excised with scissors on both sides by opening a small incision in the femoral region so as not to damage the material. The surrounding tissues were cleaned off the femora. Later on, they were left in 5% nitric acid (HNO_3) for 3-5 hours for the procedure of decalcification. After the femora had been embedded in paraffin, 10-µm-thick sections were obtained. The preparations were stained with the Ehrlich's Hematoxylin and Olympus BX51 light microscope was used for the. They were photographed by using an Olympus Analysis LS program.

The t-test was applied for the SVL values and ages between sexes and localities, while linear regression and Spearman's correlation test were applied in order to reveal the correlation between age and SVL. The statistical analyses were made by using SPSS 15.0, and the significance level was considered to be 0.05.

Results

The Çanakkale Population. An age evaluation was made in 23 (13 ♂♂, 10 ♀♀) individuals of the Çanakkale population. The SVL values ranged from 40.54 to 50.52 mm in males, and the mean was calculated as 46.21±3.23 mm. In females, the SVL values ranged from 38.41 to 52.63 mm, and the mean was 46.53±4.01 mm (Table 1). No difference in SVL was determined between male and female individuals in the Çanakkale population ($p \leq 0.83$). Likewise, the values of age between male and female individuals of this population were found to be close ($p \leq 0.78$).

The Akşehir-Eber Population. An age evaluation was made in 20 (10 ♂♂, 10 ♀♀) individuals of the AkÇehir-Eber population. The SVL values ranged from 46.70 to 50.35 mm in males, and the mean was calculated as 49.19±1.05 mm. In females, the SVL values ranged from 46.62 to 53.47 mm, and the mean SVL was 49.22±2.01 mm (Table 2). No difference in SVL was observed between male and female individuals in this population ($p \leq 0.96$). The mean values of age between female and male specimens of the AkÇehir-Eber population were found to be close ($p \leq 0.19$). Between the Çanakkale and AkÇehir-Eber populations, a difference in SVL was determined among males ($p \leq 0.05$), whereas no difference was detected among females ($p \leq 0.07$).

The distribution of ages of *O. elegans* specimens by population is provided in Fig. 1. When the values of age for male and female specimens were compared between the populations, it was determined that the males were older ($p \leq 0.00$), but the females were at similar ages in the Central Anatolian specimens which had been collected almost in the same season ($p \leq 0.06$).

Table 1. Descriptive statistics of SVL (mm) and age (year) of investigated specimens and results of ındependent-samples T test (SVL: Snout-Vent Length; SE: Standard Error; SD: Standard Deviation).

		Çanakkale Population						Akşehir-Eber Population						
	Sex	N	Min	Max	Mean	SE	SD	N	Min	Max	Mean	SE	SD	P
SVL	♂♂	13	40.54	50.52	46.21	0.89	3.23	10	46.70	50.35	49.19	0.33	1.05	0.01*
	♀♀	10	38.41	52.63	46.53	1.27	4.01	10	46.62	53.47	49.22	0.63	2.01	0.07
Age	♂♂	13	2	4	2.85	0.19	0.68	10	3	6	4.60	0.37	1.17	0.00*
	♀♀	10	1	4	2.90	0.31	0.99	10	3	6	3.90	0.37	1.19	0.06

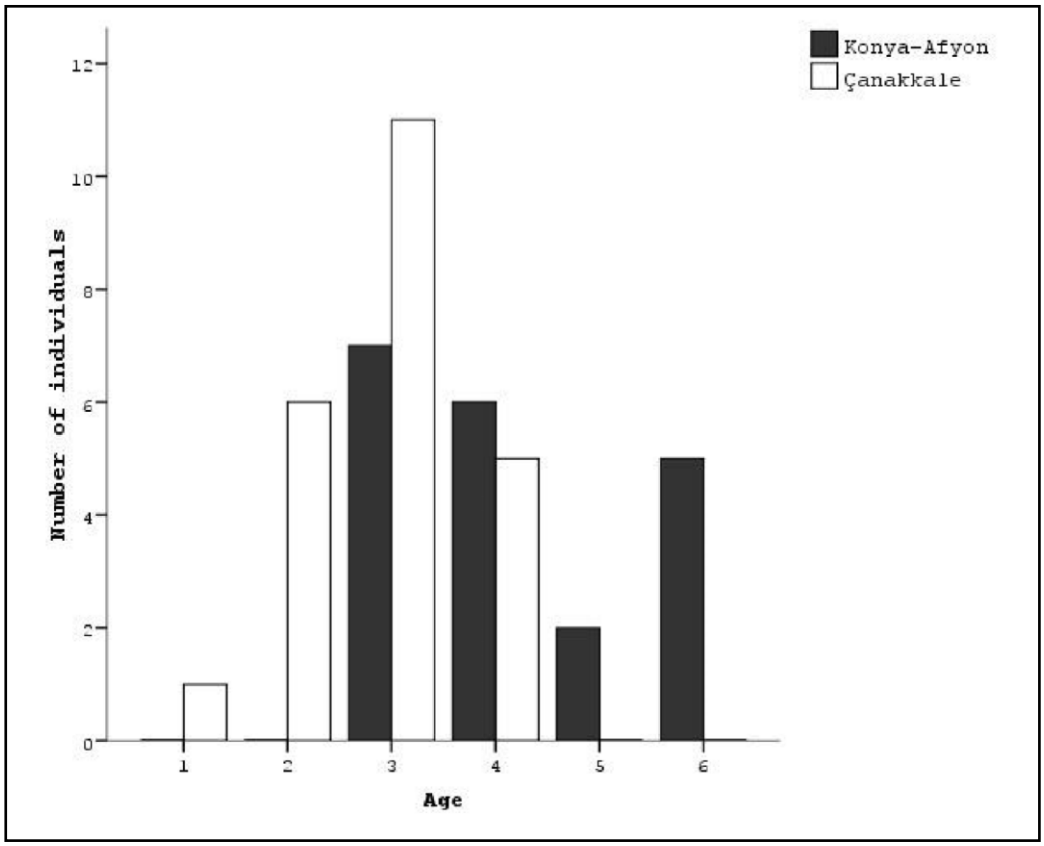

Fig. 1. Populations and age distributions of *O. elegans* specimens.

The graphs of the correlation between SVL and age in the Çanakkale and AkÇehirEber populations by sex are presented in Fig. 2 for males and in Fig. 3 for females. According to the linear regression analysis, a significant correlation between age and SVL was detected between the specimens of the Çanakkale population (male, ANOVA: F=6.31, df=1, p≤0.029; female, ANOVA: F=8.03, df=1, p≤0.021) and the specimens of the AkÇehirEber population (male, ANOVA: F=5.59, df=1, p≤0.041; female, ANOVA: F=6.02, df=1, p≤0.047). According to Spearman's correlation test, it was established that there was a moderately positive correlation between age and SVL (Çanakkale: male, r_s=0.52, n=13; female, r_s=0.56, n=10; AkÇehir-Eber: male, r_s=0.68, n=10; female, r_s=0.48, n=10). When all specimens were evaluated altogether, the correlation between SVL and age was computed as (r=0.572, p=0.008) in females and as (r=0.642, p=0.001) in males.

The approximate ages of the specimens were calculated according to the rings of age in the femur sections of the *O. elegans* specimens (Fig. 4).

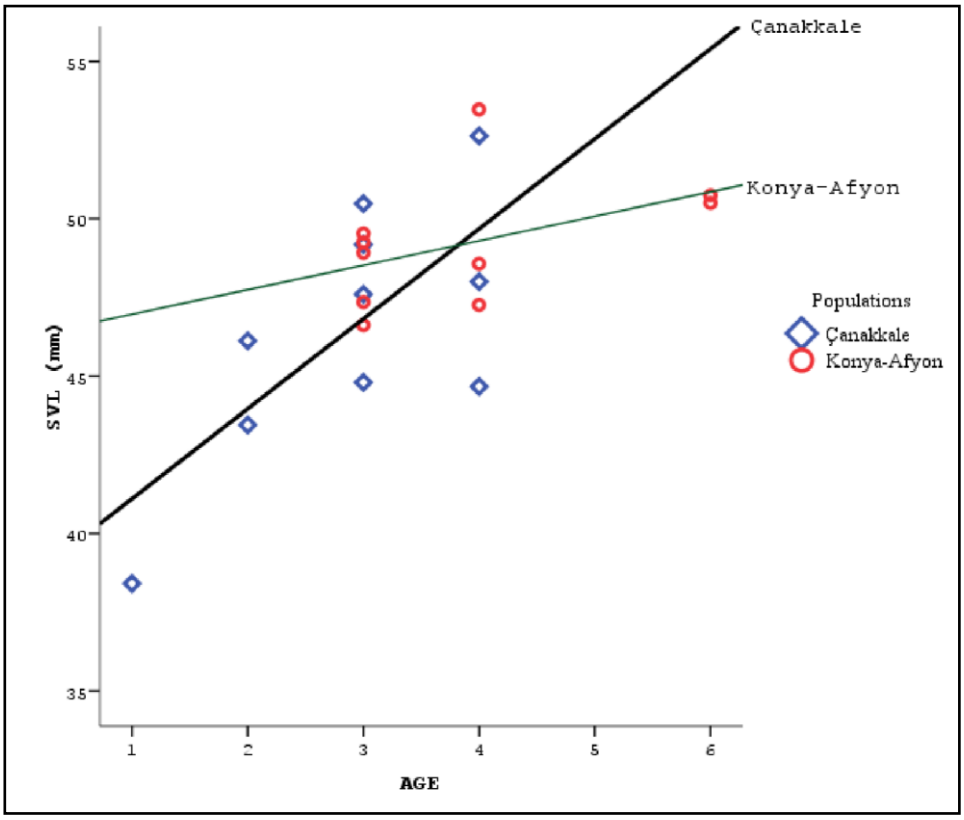

Fig. 2. The relationship between age and SVL of female *O. elegans* specimens.

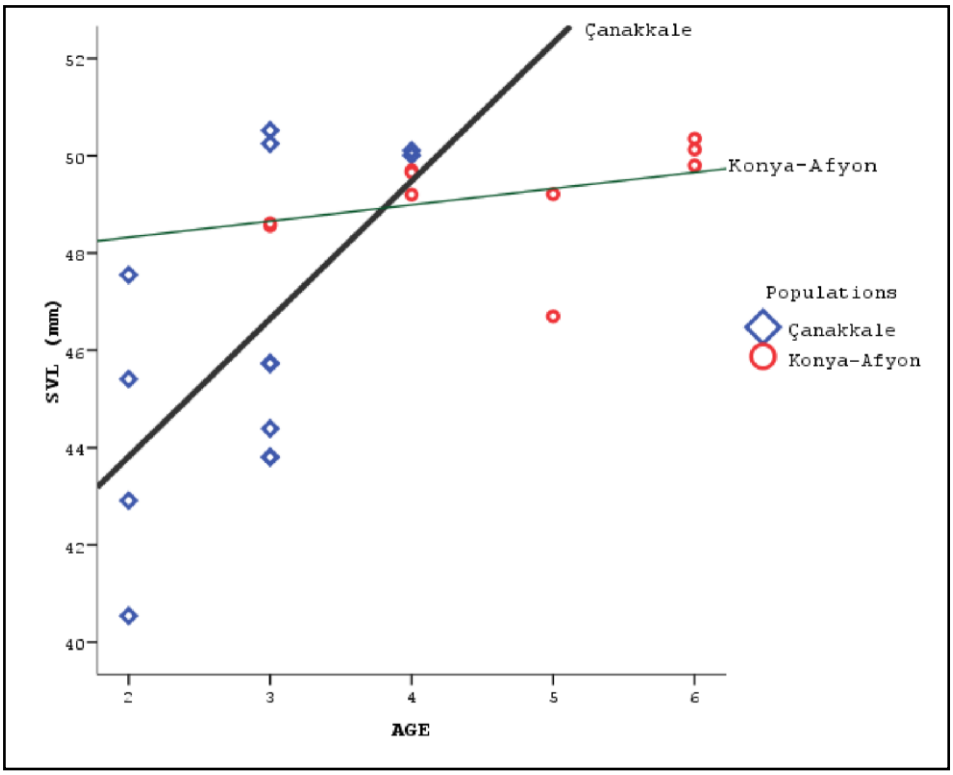

Fig. 3. The relationship between age and SVL of male *O. elegans* specimens.

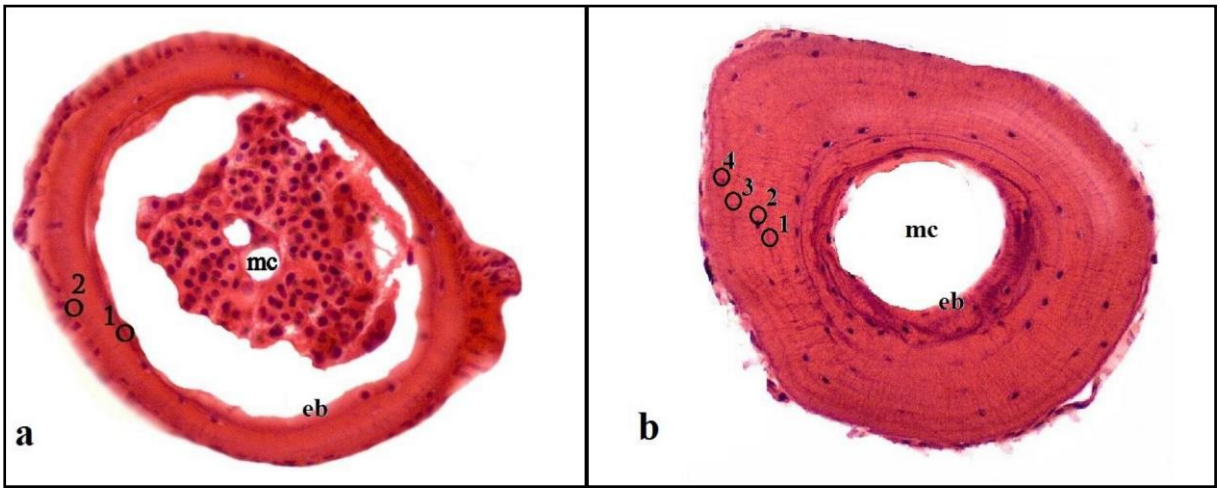

Fig. 4. Cross-sections of the femur of *O. elegans* a. 2-yr-old; b. 4-yr-old (mc: marrow cavity, eb: endosteal bone).

It was determined that endosteal resorption was present in the only one-year-old specimen of the Çanakkale population, and the SVL value was measured as 38.41 mm. In addition, endosteal resorption was detected in 4 three-year-old specimens of the Çanakkale population (57%), in 5 three-year-old specimens of the AkÇehir-Eber population (45%), and in three six-year-old specimens of the AkÇehir-Eber population (60%).

Discussion

The mean SVL of 25 juvenile and adult *O. elegans* specimens collected from west of Iran was reported 48.75 mm with no significant difference between males and females (GHARZI & YARI, 2013). According to TOK (1999) SVL was reported to be 46.99±0.29 mm in males and 46.77±0.31 mm in females in the 94 *O. elegans* specimens collected from the ReÇadiye (Datça) Peninsula. In our study, SVL was measured as 46.21±0.89 mm in males and 46.53±1.27 mm in females in the specimens of Çanakkale. The mean SVL values are in agreement with the study concerned. In another study, it was determined that the mean SVL values were higher in the 43 *O. elegans* specimens collected from the vicinity of Konya than those of the western population (TOK, 1992). However, the mean SVL was measured as 49.19±1.05 mm in males and as 49.22±2.01 mm in females in the AkÇehir-Eber specimens evaluated in our study (Table 1). As also stated in the literature, the specimens distributed in Central Anatolia have greater SVLs as compared with the western populations. Differences were determined for the male specimens in our study, which is in agreement with the literature (Table 1).

It was observed that generally no importance was attached to the distribution of ages when analyzing the morphological measurements in the majority of the taxonomic studies with reptiles. Nevertheless, it is stated that it is important to determine the ages of the specimens under examination in order to be able to make an accurate analysis (CASTANET & SMIRINA, 1990). When the specimens examined in our study were categorized according to the distribution of ages, it was determined that the majority of them were aged three (41.8%) and four (25.5%) years.

The difference in SVL values is thought to correlate with the fact that the maximum and mean ages were found to be greater in the male specimens from AkÇehir-Eber under examination.

Studies of age performed in some lacertid species by using the method of skeletochronology are known (CASTILLA & CASTANET, 1986; GUARINO *et al.*, 2010; KOLAROV *et al.*, 2010; GHARZI & YARI, 2013). In these studies, the maximum ages detected in the wildcollected lacertid species vary. In ARAKELYAN & DANIELYAN (2000) it was stated that the maximum age was seven in *L.*

armeniaca and six in *L. unisexualis*, *L. dahli* and *L. raddei* and that the oldest specimens in species *L. nairensis* were aged five years. In another lacertid study, however, the maximum age was found to be four in the males and five or six in the females of *L. derjugini* (ORLOVA & SMIRINA, 1983). In species *L. strigata* and *L. agilis*, longevity was computed as six or seven years (ROITBERG & SMIRINA, 1995). Nevertheless, longevity does not exceed four years in *Lacerta vivipara* specimens (PILORGE & CASTANET, 1981). Other lacertids, *Gallotia atlantica*, *G. galloti* and *G. stahlini*, can live for five, nine and eleven years, respectively (CASTANET & BAEZ, 1991). In GHARZI & YARI (2013) it was reported that maximum age in females and males was 5 and 4 years, respectively. In our study, the maximum age was found to be six in the specimens of the AkÇehir-Eber population and four in the specimens of the Çanakkale population. CASTANET (1994) as well, reported that the small lacertids living under colder environmental conditions have longer longevity. Semi-arid climatic conditions prevail in the vicinity of AkÇehir and Eber, located in the lower sections of Central Anatolia, and the Mediterranean climatic conditions, in which winters are warm and rainy, prevail in the coastal sections of Çanakkale, located in the Aegean sub-section where our specimens had been collected (ATALAY, 2002). We are of the opinion that the finding of older individuals among the specimens collected from the vicinity of AkÇehir-Eber with lower mean temperatures than the coastal sections of Çanakkale might relate to climatic conditions.

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