

First record of tail bifurcations in the snake-eyed skink *Ablepharus kitaibelii* Bibron & Bory de Saint-Vincent, 1833 from Pastrina hill (northwestern Bulgaria)

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Abstract

First record of tail bifurcations in the snake-eyed skink Ablepharus kitaibelii Bibron & Bory de Saint-Vincent, 1833 from Pastrina hill (northwestern Bulgaria).— We report for the first time on the occurrence of tail bifurcations in the snake-eyed skink (*A. kitaibelii*). This morphological anomaly was identified during a four-year monitoring program conducted in a herpetological hot-spot at Pastrina hill (northwestern Bulgaria). From a total of 415 captured specimens, four animals (0.96%) showed symmetrical or asymmetrical lateral duplication of the tail. Only bifurcations of the distal-most caudal section were detected in contrast to some other lizards (e.g. Gekkonidae, Lacertidae, Teiidae) that are reported to survive with bifurcations at more proximal tail sections.

Key words: Lizard, Autotomy, Regeneration

Resumen

Primer registro de bifurcación caudal en Ablepharus kitaibelii Bibron & Bory de Saint-Vincent, 1833 del monte Pastrina (noroeste de Bulgaria).— Registramos el primer caso de bifurcaciones caudales en *A. kitaibelii*. Esta anomalía morfológica fue identificada en un estudio de seguimiento de cuatro años realizado en una zona de elevada presencia herpetológica en el monte Pastrina (noroeste de Bulgaria). De un total de 415 especímenes capturados, cuatro (0,96%) presentaron una duplicación lateral simétrica o asimétrica de la cola. Se registraron únicamente bifurcaciones de la sección caudal más distal, lo que contrasta con las registradas en otros lagartos como, por ejemplo, Gekkonidae, Lacertidae y Teiidae, en los que se han registrado supervivencias con bifurcaciones en las secciones caudales más proximales.

Palabras clave: Lagarto, Autotomía, Regeneración

Resum

Primer registre de bifurcació caudal en Ablepharus kitaibelii Bibron & Bory de Saint-Vincent, 1833 del puig Pastrina (nord-oest de Bulgària).— Registrem el primer cas de bifurcacions caudals en *A. kitaibelii*. Aquesta anomalia morfològica va ser identificada en un estudi de

seguiment de quatre anys portat a terme en una zona d'elevada presència herpetològica al puig Pastrina (nord-oest de Bulgària). D'un total de 415 espècimens capturats, quatre (0,96%) van presentar una duplicació lateral simètrica o asimètrica de la cua. Només es van registrar bifurcacions de la secció caudal més distal, la qual cosa contrasta amb les registrades en altres llangardaixos com ara Gekkonidae, Lacertidae i Teiidae, en què s'han registrat supervivències amb bifurcacions a les seccions caudals més proximals.

Paraules clau: Llangardaix, Autotomia, Regeneració

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Introduction

Many lizard species have a special anatomical construction of the tail that allows them to detach the caudal part without blood loss (for an overview, see Zani, 1996; Bateman & Fleming, 2009; Alibardi, 2010). In some cases of incomplete caudal autotomy, additional tail sections may develop because the process of tail regeneration can be initiated even in cases where the old tail section is still firmly attached to the body, and some specimens may survive for a period with deformed tails (Strijbosch, 1999). The tail bifurcation is known for several lizard families but is considered rare (Dudek & Ekner-Grzyb, 2014). Sometimes, trifurcations (Pheasey et al., 2014; Koleska & Jablonski, 2015; Passos et al., 2016), and even hexafurcations, may occur (Pelegrin & Leão, 2015). Tail bifurcations have been recorded in some Agamidae species (Ananjeva & Danov, 1991; Martins et al., 2013), and also in some lacertids (Strijbosch, 1999; Stojanov et al., 2011; Dudek & Ekner-Grzyb, 2014), gekkonids (De Andrade et al., 2015), anguids (Cozendey et al., 2013), teiids (Goghliath et al., 2012; Cordes & Walker, 2013; Passos et al., 2016) and scincids (McKelvy & Stark, 2012).

Recently, a tail bifurcation was reported for a lizard from the genus *Ablepharus* [*A. deserti* Strauch, 1868 (Jablonski, 2016)]. The genus *Ablepharus* belongs to the Family Scincidae and includes ten species of relatively small lizards with weakly developed extremities (Uetz & Hošek, 2016). Data on the frequency of occurrence of specimens from this genus with tail bifurcation are lacking. In the present study, we provide the first report on the occurrence of tail bifurcations in a member of the genus *Ablepharus* (the snake-eyed skink *A. kitaibelii* Bibron & Bory de Saint-Vincent, 1833).

Material and methods

One of the ten species of genus *Ablepharus* (*A. kitaibelii*) inhabits Bulgaria. The species occurs sporadically and shows habitat preferences for dry meadows with bush vegetation and sparse oak forests (Stojanov et al., 2011). The studied area (see fig. 1) covers approximately 0.6 ha of the ecotone zone between an oak forest and a meadow, at an altitude of 280 m. It is located on Pastrina hill, near Montana town (northwestern Bulgaria). The coordinates of the studied area are N43.384828, E23.301825 (Datum: WGS84, GCS). The site was visited at irregular intervals of approximately 10 days during the active period of

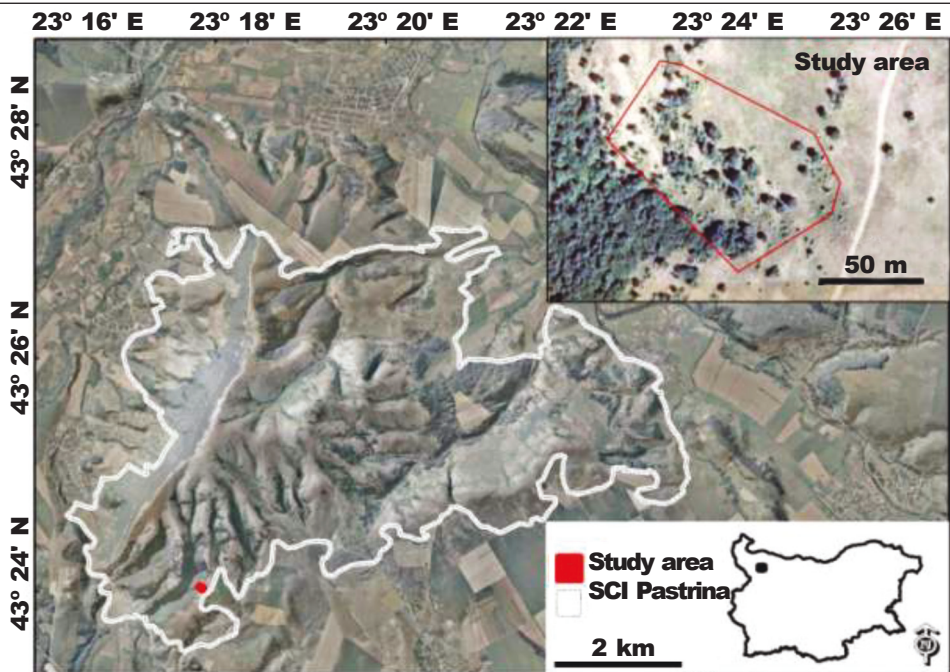


Fig. 1. Map of the site where the study was performed in Pastrina hill (Montana, northwestern Bulgaria).

Fig. 1. Mapa de la zona donde se realizó el estudio en el monte Pastrina (Montana, noroeste de Bulgaria).

the species (Stojanov et al., 2011) from 2012 to 2016. The geographic coordinates were recorded by hand-held Garmin GPSMAP 62s unit (Garmin International Inc., Kansas, USA). Photo-documentation was made by using a Sony Cyber-shot DSC-HX300.

This study was conducted in compliance with the national laws of Bulgaria (collection permits No. 411/14.07.2011 and No. 520/23.04.2013) and the international requirements for ethical attitude towards animals. No animals were collected or harmed. All lizards were measured and documented and released at the site of capture.

Results and discussion

During a four-year monitoring program of population characteristics of the snake-eyed skink in Bulgaria, we captured 415 specimens. In four of the lizards (0.96 % of the captured individuals), we identified a tail bifurcation (fig. 2). The percentage in *A. kitaibelii* seems lower than the 1.7% and 1.2% reported by Vrcibradic & Niemeyer (2013) for populations of two skink species, belonging to the genera *Mabuya* and the *Notomabuya* (Hedges & Conn, 2012).

According to Stojanov et al. (2011) and McKelvy & Stark (2012), the caudal bifurcation in lizards may be lateral, as well as dorso-ventral. In all of our specimens with this kind of deformation, the bifurcation was lateral, as found in *A. deserti* (Jablonski, 2016).

The tail bifurcation in lizards may be either symmetrical or asymmetrical (Dudek & Ekner-Gryzb, 2014). In two of our specimens the second tale was substantially shorter than the autochthon part and in the other two both sections developed similarly (fig. 2). In all four

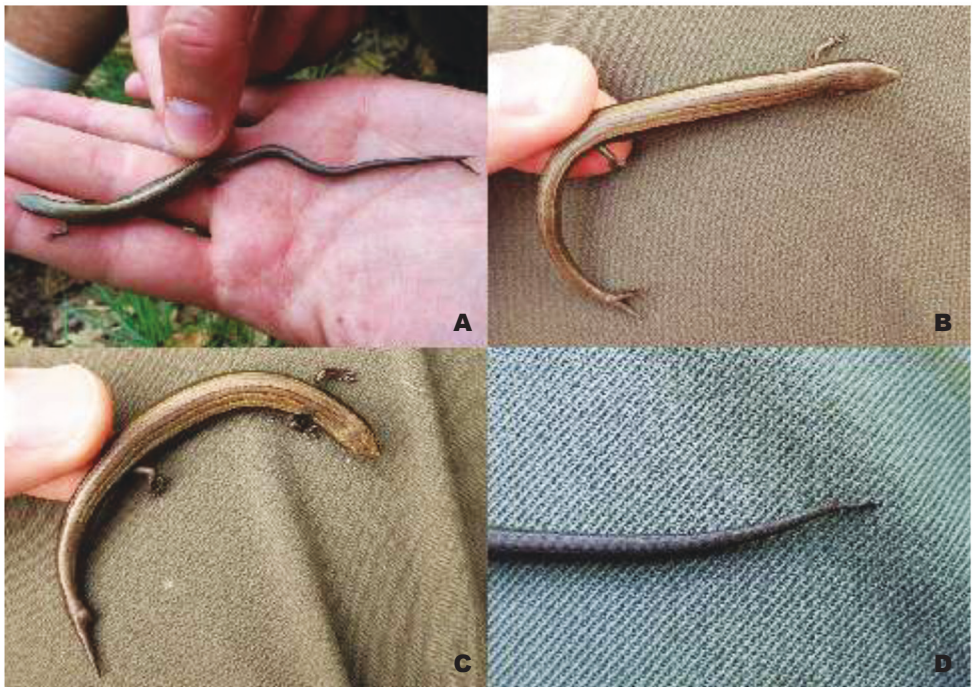


Fig. 2. Four snake-eyed skinks (*Ablepharus kitaibelii*) with bifurcations of the distal tail section: A, B. Symmetrical tail bifurcations; C, D. Asymmetrical tail bifurcations.

Fig. 2. Cuatro *Ablepharus kitaibelii* con bifurcación caudal: A, B. Bifurcación caudal simétrica; C, D. Bifurcación caudal asimétrica.

studied specimens, the bifurcation was at the distal-most section of the tail. In some lizard species, the bifurcation may be positioned rather proximally (closer to the pelvis) and both sections of the tail may be equally developed (Dudek & Ekner-Grzyb, 2014; De Andrade et al., 2015; Passos et al., 2016). According to Passos et al. (2016), such design may impact the locomotor performance of the affected individuals. The snake-eyed skink mainly inhabits the layer of fallen leaves in the oak forests (Stojanov et al., 2011) and avoids being eaten by sudden changes of direction in the 3-D surrounding. Changes in the geometry of the tail could potentially diminish its chances to avoid predation.

No reports concerning tail bifurcation in *A. kitaibelii* have been reported to date. Our results from a four-year population study of over 400 individuals suggest that specimens with terminal lateral bifurcations are rare. The tail splitting presumably has a random character, and we propose that it is caused by errors in regeneration after partial or full autotomy of the distal caudal sections.

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