

Locomotory techniques in Upper Cretaceous frogs (Iharkút, Hungary)

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(with 4 figures)

The Iharkút lissamphibian assemblage consists of a mixture of autochthonous Laurasian taxa [albanerpetontid allocaudatans, discoglossid (*Bakonybatrachus*) and pelobatid anurans] along with those of Gondwanan origin (the neobatrachian *Hungarobatrachus*). Functional anatomical interpretations of the preserved iliac structures and taphonomical observations were used in the reconstruction of the paleoecological conditions. Different paleoecological circumstances of these groups are indicated by the attachment surfaces of locomotory muscles in the preserved iliac bones of *Bakonybatrachus* and *Hungarobatrachus* and compared to recent representatives of discoglossid and ranid frogs (i.e. *Discoglossus* and *Rana*). Large insertion surfaces for m. gluteus maximus and for the m. iliacus externus pars externa indicates that *Bakonybatrachus* had good jumping and swimming abilities pointing to a periaquatic life-style, whereas the large m. iliacus externus and m. ilifibularis-iliofemoralis combined with a huge interiliac tubercle, suggest that *Hungarobatrachus* was a strong jumper, swimmer or both.

Keywords: Lissamphibia, albanerpetontids, Anura, *Bakonybatrachus*, *Hungarobatrachus*, locomotion, taphonomy, paleoenvironments.

Introduction

Jumping and swimming are commonly used locomotory techniques in frogs (Nauwelaerts et al. 2007). The jumping is associated with radical anatomical modification when compared to general structure of other tetrapods (PŘIKRYL et al. 2009). These notable alterations include, among others, the elongation of hindlimbs, reduction of the presacral vertebrae, fusion of the postsacral vertebrae into an urostyle, elongation of the iliac shaft by the posterior shift of the pelvic region, and reduction of ribs (Gans and PARSONS 1966, PŘIKRYL et al. 2009). Modifications of the skeletal structure and muscular system of the pelvic region have produced a peculiar locomotory mechanism (Fig. 1), which practically lets the frog flying

during the jump (KARGO and ROME 2002, KARGO et al. 2002). Part of the pelvic muscular system derived from the epaxial trunk musculature is responsible for the rotation and sliding of the pelvis in the iliosacral joint, whereas the remaining muscles originate on the pelvis and are inserted on the limb (PŘIKRYL et al. 2009).

The aim of the current study is to compare the locomotor types (saltation and swimming) of the Iharkutian frogs with recent analogous species in order to reconstruct their paleoecological constraints. Additional observations derived from taphonomy may help also in the paleoecological reconstructions.

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