

The first known chamopsiid lizard (Squamata) from the Upper Cretaceous of Europe (Csehbánya Formation; Hungary, Bakony Mts)

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Abstract

The Upper Cretaceous (Santonian) Iharkút terrestrial vertebrate locality, in Hungary, has yielded several lacertilian taxa since its discovery in 2000. One of these is represented by a left mandible fragment and two dentary fragments. The characters observed on these remains support assignment to the family Chamopsiidae (Scincomorpha). Moreover, the remains belong to a new genus and species, *Pelsochamops infrequens* n. g. n. sp. *Pelsochamops* is the first known occurrence of chamopsiids outside North America and adds another scincomorphan lizard to the Iharkút fauna. It represents an additional evidence for dispersal routes between North America and Europe.

Keywords: Squamata; Chamopsiidae; Upper Cretaceous; Csehbánya Formation; Europe

Résumé

Le gisement de vertébrés terrestres du Crétacé supérieur (Santonien) d'Iharkút a fourni plusieurs taxons de lacertiens depuis sa découverte en 2000. L'un d'eux est représenté par un fragment de mandibule gauche et deux fragments de dentaires. Les caractères observés sur ces restes soutiennent l'hypothèse d'une attribution à la famille des Chamopsiidae, et même leur appartenance à un nouveau genre et espèce, *Pelsochamops infrequens* n. g. n. sp. *Pelsochamops* est le premier cas connu de chamopsiidé hors d'Amérique du Nord et représente un scincomorphe supplémentaire dans la faune d'Iharkút; c'est aussi une nouvelle preuve de voies de dispersion entre l'Amérique du Nord et l'Europe.

Mots clés: Squamata; Chamopsiidae; Crétacé supérieur; Formation Csehbánya, Europe

Formázott: portugál (brazíliai)

1. Introduction

Late Cretaceous terrestrial lizards have been found in various European localities since the 19th century, the most important remains come from France (Gheerbrant et al., 1997; Buffetaut et al., 1996; Buffetaut et al., 1997; Buffetaut et al., 1999; Tabuce et al., 2004; Buffetaut, 2005; Vullo and Néraudeau, 2008; Vullo et al., 2011), Romania (Grigorescu et al., 1999; Codrea et al., 2002; Venczel and Csiki, 2003; Folie and Codrea, 2005; Grigorescu, 2005; Csiki et al., 2008; Codrea et al., 2010a, 2010b; Grigorescu, 2010; Vasile and Csiki, 2010; Weishampel et al., 2010; Vasile and Csiki, 2011; Codrea et al., 2012; Jipa, 2012) and Spain (Rage, 1999; López-Martínez et al., 2000; Company, 2004; Blain et al., 2010; Narváez and Ortega, 2010; Houssaye et al., 2013).

Formázott: francia (franciaországi)

The Iharkút Late Cretaceous (Santonian) terrestrial vertebrate locality, situated in the Bakony Mts, western Hungary (Fig. 1), was discovered in 2000. Since that time, it has yielded remains of lepisosteid and pycnodontiform fishes (Ősi et al., 2012b), albanerpetontid and anuran amphibians (Szentesi and Venczel, 2010, 2012; Szentesi et al., 2013), bothremydid turtles (Rabi et al., 2012), the first known freshwater mosasaur *Pannoniasaurus* (Makádi et al., 2012), alligatoroid, ziphosuchian and heterodont eusuchian crocodiles (Ősi et al., 2007; Ősi et al., 2012b), azhdarchid pterosaurs (Ősi et al., 2005), a rhabdodontid ornithopod (Ősi et al., 2012a), the ceratopsian dinosaur *Ajkaceratops* (Ősi et al., 2010b), the basal nodosaurid ankylosaur *Hungarosaurus* (Ősi, 2005; Ősi and Makádi, 2009), theropods (Ősi et al., 2010a), and enantiornithine birds (Dyke and Ősi, 2010) as well as well-preserved remains of lizards (Makádi, 2006, 2007; Ősi et al., 2012b).

Formázott: francia (franciaországi)

Previously four different lizards (excluding *Pannoniasaurus*) were distinguished in the Iharkút fauna, based on dentaries, maxillae and isolated teeth (Makádi, 2006, 2007; Ősi et al., 2012b). Among these, the most abundant was *Bicuspidon* aff. *hatzeiensis* Folie and Codrea, 2005 from the subfamily Polyglyphanodontinae (Makádi, 2006), and even up till now *Bicuspidon* unambiguously remains the most frequent lizard of the locality. However, a partial lacertilian mandible with borioteioid affinities was known to be present in the fauna already in 2006 and was mentioned as ‘Teiidae indet.’ (Makádi, 2007), or as ‘Borioteiioidea indet.’ (Ősi et al., 2012b) in various publications.

Recent excavations and screenwashing at Iharkút produced new lacertilian finds, including more material of this taxon, namely two new dentary fragments. These new finds, together with the aforementioned mandible allow the description of a previously unknown chamopsiid species in the Iharkút fauna.

2. Geographical and geological setting

The locality is situated in the Bakony Mts, Western Hungary near the villages Némethánya and Bakonyjákó (Fig. 1A), at the place of the former village Iharkút, destroyed by mining. At the fossil site, the open-pit mining of bauxite exposed the bone-yielding Csehbánya Formation in a thickness of up to 50 meters. The Csehbánya Formation is the overburden of both the Nagytárkány Bauxite Formation and Triassic Main Dolomite Formation (Fig. 1B). It is a flood plain and channel deposit built up of variegated clay, siltstone with grey and brown sand, sand and sandstone beds (Haas et al., 1977; Mindszenty et al., 1984; Knauer and Siegl Farkas, 1992; Jocha-Edelényi, 1996; Ósi and Mindszenty, 2009; Ósi et al., 2012b).

The main bone yielding bed at the locality is at the SZ-6 site (Fig. 1C). SZ-6 is an approximately 2–3 m thick sequence of beds built up of coarse, pebbly sand and organic-rich silt and clay. The bonebed at SZ-6 is a 10 to 50 cm thick, basal breccia composed of gray sand, siltstone, clay clasts, pebbles, and plant debris (also charcoal) that occasionally contains surprisingly well-preserved bones, but more frequently yields fragmentary ones. The basal breccia is sometimes interrupted by finer sediments that settled out under calmer circumstances (Fig. 1C). The breccia was previously interpreted as a result of crevasse splay deposits (Ósi et al., 2012b). Almost all vertebrate remains have been found in this sediment by either picking out by hand or screenwashing the sediment left behind after looking for larger bones.

A sand-sandstone bed with a thickness of a few centimeters covers the basal breccia, while the former is overlain by a laminated, grayish siltstone of variable thickness (30 cm to 1.5 m). The sequence is closed by a greyish siltstone of several meters (Ósi and Mindszenty, 2009; Ósi et al., 2012b). The cycles sometimes end with paleosoils, moreover, several similar sequences are exposed within the mine. Practically almost any of these sediments might yield rare vertebrate remains, but the basal breccia is the main bone-yielding horizon (Ósi and Mindszenty, 2009; Ósi et al., 2012b).

In the area, the Csehbánya Formation is sometimes covered by the Eocene Iharkút Conglomerate Formation or just by Quaternary deposits (Fig. 1B); in other locations it is covered by the Oligocene–Miocene Csátka Formation (Haas et al., 1977; Mindszenty et al., 1984; Knauer and Siegl Farkas, 1992; Jocha-Edelényi, 1996; Ósi and Mindszenty, 2009). Palynological studies suggested a Santonian age for the Csehbánya Formation (Knauer and

Siegl Farkas, 1992), and this age was confirmed by recent paleomagnetic data from samples acquired at the SZ-6 site (Ósi et al., 2012b).

3. Material and methods

For the present paper a partial left mandible (MTM 2006.106.1.) and two dentary fragments (MTM PAL 2013.24.1. and PAL 2013.25.1.) were available (Figs. 2-4). All of them were yielded by the bonebed of the SZ-6 site (Fig. 1C).

The bones are black of pyrite and organic material (Tuba et al., 2006), and are extremely fragile, but relatively well preserved. The most complete remain, the partial mandible was found during the field works by picking out by hand. The two dentary fragments were found by screenwashing the sediment that was left behind after looking for larger bones by hand.

Screenwashing at Iharkút usually destroys relatively larger microvertebrate remains because the bones at the locality, though sometimes well preserved, are full of cracks and are sometimes held together by the matrix. Thus it is not unlikely that the dentary fragments were originally more complete, just like the partial mandible.

Preparation of MTM 2006.106.1. was conducted in the laboratory of the Dept. of Paleontology, Eötvös University, using stereo-microscope and dentist's tools. Since MTM PAL 2013.24.1. and PAL 2013.25.1. were screenwashed, no preparation was necessary for their study.

The specimens were fixed with super-glue (cyanoacrylate) and/or PVB (polyvinyl-butyril). ESEM photographs of MTM 2006.106.1. were made with a Hitachi 2360N environmental scanning electron microscope at the Department of Plant Anatomy, Eötvös University. Environmental Scanning Electron Microscopy (ESEM) was first chosen to evade the need for coating the specimen in carbon or gold. Later, in order to achieve better resolution, the specimen was coated with carbon and additional SEM photographs of MTM 2006.106.1. were taken using an Amray 1830I scanning electron microscope at the Department of Petrology and Geochemistry, Eötvös University at an accelerating voltage of 20kV. However, the specimen showed significant charging despite the coating, rendering the images to low quality. After taking the photos the specimen was carefully cleaned of most carbon with ethanol.

MTM PAL 2013.24.1. and PAL 2013.25.1. were photographed through a stereo microscope with a Canon EOS 350D DSLR.

For the anatomical descriptions of the dentition the orientation terminology proposed by Smith and Dodson (2003) was used. This terminology can be briefly explained as follows: the terms ‘mesial’ and ‘distal’ designate tooth surfaces and directions facing toward and away from the mandibular symphysis (thus relative to the median saggital plane of the animal, similarly to limb bones, etc.). ‘Labial’ stands for those surfaces and directions which face the lips or cheeks, while ‘lingual’ means those which face the tongue. ‘Basal’ is used for the direction toward crown or tooth bases, ‘apical’ is for the direction toward crown tips. ‘Occlusal’ is used for views of the occlusal surfaces.

The specimens are housed in the Hungarian Natural History Museum (MTM), the abbreviation “MTM PAL” stands for the paleontological collection of the museum (previously only “MTM” was used as a prefix of inventory numbers).

4. Systematic paleontology

Order: SQUAMATA Opperl, 1811

Infraorder: SCINCOMORPHA Camp, 1923

Unranked Clade: BORIOTEIIOIDEA Nydam, Eaton et Sankey, 2007

Family: CHAMOPSIIDAE Denton et O’Neill, 1995

Genus: *Pelsochamops* n. g.

Diagnosis. As for type species (see below).

Type species. *Pelsochamops infrequens* n. sp.

Included species. *Pelsochamops infrequens* n. sp.

Type locality and horizon. As for type species (see below).

Etymology. Generic name derived from “*Pelso*”, after Pelso Block, the tectonic unit carrying the Bakony Mts (Lacus Pelso originally being the Latin name for nearby Lake Balaton in Roman times) and from “*Chamops*”, the type genus of the family and, though not explained by Marsh (1892), originally from Greek, “khámo” (χάμω) meaning down, and “ops” (ὄψ), meaning “face, appearance”: “down-face”.

Pelsochamops infrequens n. sp.

Figures 2–4

2007 Teiidae indet., Makádi, p. 29.

2012 Borioteiioidea indet., Ősi et al., p. 566.

Formázott: angol (USA-beli)

Holotype. MTM 2006.106.1. partial left mandible (Figs. 2 and 3) preserving the posterior part of dentary with four teeth, splenial, coronoid and crushed postdentary bones.

Paratype. MTM PAL 2013.24.1. right dentary fragment (Fig. 4A–C).

Referred specimen. MTM PAL 2013.25.1. left dentary fragment (Fig. 4D–F).

Type locality and horizon. Iharkút open-pit bauxite mine, Bakony Hills, western Hungary, Upper Cretaceous (Santonian) Csehbánya Formation (Ósi et al., 2012b).

Etymology. Specific name “*infrequens*” meaning infrequent in Latin, a referral to the rarity of the species at Iharkút. Diagnosis: Small Late Cretaceous chamopsiid lizard with uniform, symmetrically monocuspid posterior teeth. Differs from all chamopsiids except *Haptosphenus* in having coronoid fused. Differs from *Chamops*, *Leptochamops*, and *Tripennaculus* in having monocuspid teeth instead of tricuspid. Differs from *Socognathus* and *Meniscognathus* in having non recurved teeth, further differs from *Socognathus* in having symmetrical tooth crown. Differs from *Gerontoseps* in having shorter teeth and lower apex on tooth crown, and having large subcircular resorption pits instead of elongated ones. Differs from *Stypodontosaurus* in having more gracile dentary and shorter teeth and in lacking well-defined crest encircling horseshoe shaped depression lingually on tooth crown. Differs from *Haptosphenus* in having more gracile dentary, lack of subacrodonty and massive teeth. Differs from *Glyptogenys* in having more gracile dentary and symmetrical monocuspid posterior teeth, lacking ornamentation. Differs from *Harmodontosaurus* in having different tooth crown, lacking shoulder-like process formed by medial carina.

Description and comparisons.

Holotype, MTM 2006.106.1. right mandible (Figs. 2 and 3)

The most complete partial mandible is 8 mm long, and preserves a part of the dentary, splenial, and coronoid. The rostral part of the dentary is missing, and the caudal part is partially crushed, making other bones, such as surangular, indistinguishable.

The bone is straight in occlusal view (Fig. 2B) and its ventral border is slightly convex in lingual view (Fig. 2A). In labial view the mandible exhibits a row of small foramina (the exits of nervus alveolaris inferior). No ornamentation is visible on the labial surface, similar to *Chamops*, *Meniscognathus* (Estes, 1964), or *Harmodontosaurus* (Nydham, 2002).

In lingual view (though it is covered by the splenial) the rostral part of the preserved portion of the Meckelian groove is narrow, in caudal direction it widens abruptly below the last but one tooth and its posterior part is widely open. The splenial is articulated to the dentary, not fused as in some specimens of *Gerontoseps*, or *Haptosphenus* (Estes, 1964, 1983;

Gao and Fox, 1996). The subdental shelf is relatively wide labio-lingually and the sulcus dentalis appears to be deep, the latter condition being in contrast to that seen in MTM PAL 2013.24.1. and MTM PAL 2013.25.1., thus can be caused by the slight compression of the remain. Since no suture is visible between them, the coronoid seems to be fused to the dentary, similarly to *Haptosphenus* (Gao and Fox, 1996).

The dentary preserves the last four teeth. An empty tooth place mesially to them is also visible, while mesially to this empty position a small portion of the broken base of the preceding tooth is preserved, just where the anterior portion of the dentary is broken and missing. The most distal tooth appears to be smaller than the preceding ones, similarly to *Chamops* (Estes, 1964), though its crown has the same size and its base is crushed thus this is uncertain. Considering the shape of the preserved part of the dentary, and the relatively wide spacing of the teeth, the original tooth count might have been not much higher than 10-15. The tooth attachment is an advanced form of pleurodonty termed 'subpleurodont' in teioids and borioteioids, with cementum deposition at the tooth bases, characteristic for the aforementioned groups (Estes et al., 1988; Nydam et al., 2007). The second preserved tooth has a large, subcircular resorption pit-like hole at its base similar to MTM PAL 2013.24.1., however since its edges seem to be broken, its original size is not certain.

Though the most mesial preserved tooth is slightly more slender than the next ones, the preserved part of the dentition is homodont. The cylindrical, relatively widely spaced straight teeth are massively built, robust, with a mid-shaft swelling causing a barrel-shaped look, typical for chamopsiids (Nydam et al., 2010). They project above the labial parapet of the dentary with approximately one third of their height.

The tooth crowns (Fig. 3) are not transversely oriented in contrast to some members of Polyglyphanodontinae (Estes, 1983; Nydam, 1999; Nydam and Cifelli, 2002; Folie and Codrea, 2005; Nydam and Cifelli, 2005) but similar to chamopsiids (Nydam et al., 2010). Though the apices are worn, they show a characteristic morphology, slightly resembling the mesial teeth of *Prototeius stageri* Denton et O'Neill, 1995 (Denton and O'Neill, 1995), or the teeth mentioned for *Chamops cf. segnis* specimen OMNH 33852 (Nydam and Voci, 2007: p.214-215 and Fig. 3C). The crowns are basically monocuspid as opposed to e.g. *Leptochamops* (Estes, 1983), but have mesial and distal accessory ridges, forming shoulders on the crown, similarly to those noted for chamopsiids (Nydam et al., 2010). These ridges, or carinae extend in basal-lingual direction, become very blunt and hardly visible as they meet on the lingual side of the crown, and encompass the apex similarly to a cingulum.

The crowns bear distinct striation on both their lingual and labial sides similar to the Chamopsiinae of Denton and O'Neill (1995). In occlusal view, enamel and dentine are well distinguishable as the result of wear.

MTM PAL 2013.24.1. right dentary fragment (Fig. 4A–C)

The preserved part is only 1.3mm long bearing two complete teeth and an empty tooth place mesially. In labial view (Fig. 4C) the bone exhibits two mental foramina. In lingual view (Fig. 4A), the upper edge of the open Meckelian canal starts to rise just under the last (the second preserved) tooth, indicating that the fragment might be from the posterior part of the dentary, when compared to MTM 2006.106.1.

The preserved teeth project with one third of their height beyond the labial parapet of the dentary. At the base of the mesial preserved tooth, a large subcircular resorption pit is visible, as in most borioiteioids (Nydam et al., 2007), in contrast to *Gerontoseps* (Gao and Fox, 1996), however at the base of the next tooth the pit is small.

The morphology of the teeth is identical to that seen in MTM 2006.106.1., but in MTM PAL 2013.24.1. the apices of the teeth are not worn (though the second preserved tooth is slightly damaged). The intact first preserved tooth reveals that the mesial and distal accessory ridges are more pronounced than in MTM 2006.106.1. due to the lack of wear or abrasion., however, they are not so prominent as in *Chamops* (Nydam and Voci, 2007: Fig 3E). These carinae turn abruptly in apical direction when they reach the labial side of the apex, and meet forming a sharp labial corner. This acute point is slightly higher than the apex, in contrast to e.g. *Gerontoseps* (Gao and Fox, 1996). The morphology described above gives the crown a weakly tricuspid outline in labial and lingual view, but it is obvious that the mesial and distal shoulders formed by the carinae are not cusps, neither regarding their morphology, nor probably their function, this is well visible on the holotype (Fig. 3). The outline of the tooth crown of *Pelsochamops* in labial and lingual view is not unlike that of *Socognathus*, but this structure is symmetrical on the Iharkút specimens in contrast to the latter (Nydam et al., 2010). The apex and the pointed labial corner formed by the encompassing carinae are linked together by a short transverse ridge. The apex is finely striated on both its lingual and labial sides.

MTM PAL 2013.24.1. left dentary fragment (Fig. 4D–F)

This dentary fragment is 2.5mm long and bears two preserved teeth distally and the base of a broken one mesially. The shape of the Meckelian canal assumes that it is from the same region of the dentary as MTM PAL 2013.24.1., thus in lingual view it looks like the mirrored counterpart of the latter. However, it is twice larger, and is more poorly preserved, with the

crowns of the teeth badly worn, abraded. Otherwise, it shows the same morphology as MTM 2006.106.1. or MTM PAL 2013.24.1.

5. Discussion

The wide subdental shelf, the caudally wide Meckelian groove, and the cylindrical teeth lead to refer the mandible to the Scincomorpha. The ‘subpleurodont’ dentition with cementum deposition at the tooth bases, and the large subcircular resorption pits were traditionally interpreted as ‘teiid’ synapomorphies and were useful characters for the identification of fossil members of Teiidae (*sensu* Estes et al., 1988) (Estes, 1983; Nydam and Cifelli, 2002). However, since Nydam et al. (2007) have erected the taxon Borioteiioidea for a part of the previous Teiioidea (*sensu* Estes et al., 1988), the aforementioned characters are synapomorphies for the Teiioidea-Borioteiioidea assemblage.

The first studies of MTM 2006.106.1. already revealed that it might be related to the ‘Chamopsiinae’ of Denton and O’Neill (1995), especially *Chamops*, *Leptochamops*, and *Meniscognathus* (Denton and O’Neill, 1995). Though MTM 2006.106.1. does not exhibit much of the diagnostic characters of Chamopsiinae (*sensu* Denton and O’Neill, 1995), its tooth morphology is similar to that of *Chamops*. Later, Nydam et al. (2010) re-ranked Chamopsiinae as Chamopsiidae, and included *Chamops*, *Leptochamops*, and *Meniscognathus*, as well as several other taxa in the clade, but excluded *Prototeius*. They diagnosed Chamopsiidae on the basis of the dentary and dentition, helping the assignment of MTM 2006.106.1. and the dentary fragments to this group.

The barrel-shaped teeth, having crowns with a conical apex and bordering mesial and distal accessory ridges, the relative wide spacing of teeth, as well as the lack of transversal elongation of tooth crowns are all synapomorphies of Chamopsiidae (Nydam et al., 2010). Some diagnostic characters, such as the long mandibular symphysis are not observable due to the lack of more complete material of *Pelsochamops*, however the aforementioned characters make it unequivocal that it belongs to Chamopsiidae.

Chamopsiidae is composed of the following genera, according to Nydam et al. (2010): *Chamops*, *Gerontoseps*, *Glyptogenys*, *Harmodontosaurus*, *Haptosphenus*, *Leptochamops*, *Meniscognathus*, *Socognathus*, *Stypodontosaurus* and *Trippenaculus*.

Pelsochamops differs from all chamopsiids except *Haptosphenus* in apparently having its coronoid fused to the dentary.

It can be easily distinguished also from *Chamops* in not having true tricuspid teeth posteriorly. Though the last tooth in MTM 2006.106.1 appears diminished in size compared to the preceding ones similarly to *Chamops*, its crown has the same size as the other teeth and its base is crushed. Thus it is uncertain if *Pelsochamops* had smaller teeth distally as *Chamops* (Estes, 1964), or had teeth of equal size all along the distal part of the tooth row.

Leptochoamops has even more tricuspid teeth than *Chamops*, moreover the teeth in *L. denticulatus* are strongly recurved, unlike *Pelsochamops* (Estes, 1983; Gao and Fox, 1996).

Similarly, *Tripennaculus* possesses strongly tricuspid tooth crowns with the accessory cusps being nearly as tall as the main one, and also exhibits strong crenulations on the main cusp, unlike the fine striae observed in *Pelsochamops* (Nydam and Voci, 2007).

Pelsochamops also differs from *Socognathus*, which has a labial dentary parapet only one third of tooth height as opposed to two thirds, and has a strong mesial and a weaker distal ridge on the tooth crown, instead of equally developed ridges. Moreover, its teeth are set at an oblique angle to axis of dentary, which is not the case in *Pelsochamops* (Gao and Fox, 1996; Nydam et al., 2010).

The teeth of *Meniscognathus* are labiolingually compressed and medially concave, the posterior teeth are weakly tricuspid with the distal accessory cusp less developed than the mesial one. In *M. molybrochoros* the tricuspid posterior teeth are also strongly recurved (Estes, 1964; Gao and Fox, 1996; Nydam and Voci, 2007). This morphology is again different from that of *Pelsochamops*.

Gerontoseps has its splenial partially fused in some individuals, which does not seem to happen in the case of *Pelsochamops*. On the tooth crowns of *Gerontoseps* mesial and distal ridges are more prominent, and teeth have elongated replacement pits positioned posteromedially as opposed to medially situated subcircular pits observed in *Pelsochamops*. Moreover, no striations on the tooth crowns are mentioned in *Gerontoseps* (Gao and Fox, 1996).

Stypodontosaurus seems to have a more robust dentary than *Pelsochamops*, and its tooth crowns are different, *Pelsochamops* has shorter teeth and it lacks the crest encircling a horseshoe shaped depression lingually on tooth crown that was described in *Stypodontosaurus* (Gao and Fox, 1996).

Pelsochamops differs from both *Haptosphenus* and *Glyptogenys* in having a more gracile dentary (Gao and Fox, 1996). Besides, *Haptosphenus* has its dentary, splenial, coronoid and surangular fused, its dentary bears massive teeth, the sulcus dentalis is lost, and the labial parapet of the dentary is reduced resulting in a 'subacrodont tooth attachment' (Estes, 1964,

1983; Gao and Fox, 1996). These features give a characteristic appearance to *Haptosphenus*, differing markedly from *Pelsochamops*. The dentary of *Glyptogenys* similarly differs to a great extent from that of *Pelsochamops*, in being heavily ornamented in adult specimens, in having its tooth crowns recurved, and bearing bicuspid distal teeth (with a smaller mesial cusp) (Gao and Fox, 1996).

Finally, *Harmodontosaurus* has different tooth crowns with mesial and distal carinae, the more robust mesial one forming a "shoulder-like process" and a more acute linguodistally directed apex with no medial striae (Nydam, 2002).

It is worth to mention that the tooth morphology exhibited by the paratype of *Pelsochamops* is not unlike that was described and figured for the probable scincomorph *Bothriagenys mysterion* Nydam, 2002 (Nydam, 2002: p.649, Fig. 5). *Bothriagenys* also seems to have homodont dentition, its preserved most distal two teeth are conical, with the apex being medially striate. The apex is bordered by a mesial and a distal carina that wrap around the crown just like in *Pelsochamops*, and other chamopsiids. As evidenced by Nydam (2002: Fig. 5), *Bothriagenys* has the apex and the labial acute tip (which is formed by the meeting mesial and distal carinae) linked together by a transverse ridge, similarly to *Pelsochamops*, a feature undocumented in other chamopsiids. Otherwise, *Bothriagenys* differs from *Pelsochamops* and other members of Chamopsiidae in having a narrow slit-like Meckelian canal, tall and relatively slender teeth lacking the characteristic barrel-shape.

Based on their morphology, MTM 2006.106.1., MTM PAL 2013.24.1. and MTM PAL 2013.25.1. can be assigned to a new genus and species of Chamopsiidae as *Pelsochamops infrequens* n. g. n. sp. Relationships within the family have not been investigated due to the lack of material (Nydam et al., 2010), and the present paper also leaves these studies pending. *Pelsochamops* is the first known member of the family in Europe, as well as outside North America.

The oldest known chamopsiid is *Harmodontosaurus* from the Albian-Cenomanian Mussentuchit Member of the Cedar Mountain Formation (Nydam, 2002), the same unit that yielded *Bicuspidon numerosus* Nydam et Cifelli, 2002 (Nydam and Cifelli, 2002). Other members of the family occur throughout the Late Cretaceous west of the Western Interior Seaway (Estes 1964, 1983; Gao and Fox, 1996; Nydam et al., 2010). The occurrences of *Bicuspidon* (Makádi, 2006) and *Pelsochamops* at Iharkút support paleobiogeographic connections between North America and Europe before the Santonian, as suggested by other authors (Vullo and Néraudeau, 2008), moreover these dispersal routes must have also crossed the Western Interior Seaway to let chamopsiids like *Pelsochamops* (and members of

Polyglyphanodontinae such as *Bicuspidon*) disperse to landmasses in the European Archipelago.

6. Conclusions

The first known chamopsiid lizard from Europe is described as belonging to a new genus and species. This new species, *Pelsochamops infrequens* extends the geographic distribution of the family outside North America into the Late Cretaceous of the European Archipelago. Besides adding another species of scincomorphan lizard to the Iharkút fauna, it supports dispersal routes linking the western shores of the Western Interior Seaway in North America to islands in the European area of the Tethys.

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Figure legends

Fig. 1. Geographical and geological setting. Geography (A) and geology of the Iharkút vertebrate locality (B) and the most important SZ-6 site (C) within the mine. Q: Quaternary, ICF: Iharkút Conglomerate Formation, CsF: Csehbánya Formation, NBF: Nagytárkány Bauxite Formation, MDF: Main Dolomite Formation.

Contexte géographique et géologique. Géographie (A) et géologie du gisement de vertébrés d'Iharkút (B) et du plus important site, SZ-6 (C), à l'intérieur de la carrière. Q: Quaternaire, ICF: Formation Conglomérat d'Iharkút, CsF: Formation Csehbánya, NBF: Formation du Bauxite de Nagytárkány, MDF: Formation de la Dolomie Principale.

Fig. 2. Holotype partial left mandible (MTM 2006.106.1.) of *Pelsochamops infrequens* n. g. n. sp. from Iharkút. A, lingual view; B, occlusal view. ESEM micrographs. Scale bar equals 1 mm.

Holotype, mandibule gauche incomplète (MTM 2006.106.1.) de Pelsochamops infrequens n. g. n. sp. d'Iharkút. A, vue linguale; B, vue occlusale. Images MEB. L'échelle est égale à 1 mm.

Fig. 3. Tooth crown of the holotype (MTM 2006.106.1.) of *Pelsochamops infrequens* n. g. n. sp. from Iharkút in lingual view. ESEM micrograph. Scale bar equals 200µm.

Couronne dentaire de l'holotype (MTM 2006.106.1.) de Pelsochamops infrequens n. g. n. sp. d'Iharkút en vue linguale. Image MEB. L'échelle est égale à 200 µm.

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Fig. 4. Paratype (MTM PAL 2013.24.1.) and referred material (MTM PAL 2013.25.1.) of *Pelsochamops infrequens* n. g. n. sp. from Iharkút. Paratype right dentary fragment in A, lingual, B, occlusal, and C, labial views. Left dentary fragment in D, lingual, E, occlusal, and F, labial views. Scale bars equal 1 mm.

Paratype (MTM PAL 2013.24.1.) et matériel de référence (MTM PAL 2013.25.1.) de Pelsochamops infrequens n. g. n. sp. d'Iharkút. Paratype, fragment de dentaire droit en vues linguale, A, occlusale, B, et labiale, C. Fragment de dentaire gauche en vues linguale, D, occlusale, E, et labiale, F. L'échelle est égale à 1 mm.