GORTANIA
Geologia, Paleontologia, Paletnologia 37 (2015) 65-83 Udine, 1.XII.2016 ISSN: 2038-0410

Emmanuel M.E. Billia
Júlia Zervanová

STEPHANORHINUS KIRCHBERGENSIS (JÄGER, 1839) (MAMMALIA, RHINOCEROTIDAE) FROM VERNASSO (UDINE, NE ITALY) AND OTHER LOCALITIES IN ADJACENT AREAS WITH REPORTS ON OLIGO-MIO-PLIOCENE RHINOCEROSES. AN ESSAI DE SYNTHÈSE

STEPHANORHINUS KIRCHBERGENSIS (JÄGER, 1839) (MAMMALIA, RHINOCEROTIDAE) PROVENIENTE DA VERNASSO (UDINE, NE ITALIA) E DA ALTRE LOCALITÀ SITUATE IN AREE ADIACENTI, CON CON MENZIONE DEI PIÙ SIGNIFICATIVI SITI A RINOCERONTE DELL'OLIGO-MIO-PLIOCENE. UN TENTATIVO DI SINTESI

Riassunto breve - Viene presentata una panoramica dei ritrovamenti di resti relativi a *Stephanorhinus kirchbergensis* (Jäger, 1839) iniziando dalla Cava Italcementi (attualmente non più attiva) ubicata a Vernasso presso Cividale del Friuli (Udine, Friuli, Italia nordorientale), per proseguire con quelli provenienti da altre località dell'Italia nord-orientale, nonché da alcuni altri depositi situati in aree limitrofe (Austria, Slovenia, Croazia, Ungheria, Slovacchia e Repubblica Ceca). Sino alla data attuale, i resti rinvenuti a Vernasso restano l'unica testimonianza di questa specie in Friuli. Questi, unitamente a quelli provenienti da Šaľa (circa 60 km a est di Bratislava, distretto di Šaľa, regione di Nitra, Slovacchia sud-occidentale), rinvenuti nel 1973, rivestono un interesse particolare. Purtroppo i dati stratigrafici non sono quasi mai disponibili. Valutando il numero - relativamente limitato - di siti dislocati in Eurasia dove è stato rinvenuto durante gli ultimi due secoli, *S. kirchbergensis* resta - al di là di ogni altra considerazione - una specie rara. Una panoramica generale relativa alle segnalazioni di *S. kirchbergensis* sul territorio eurasiatico è già disponibile in Billia (2008, 2011, 2014) e Billia & Zervanová (2015). Con l'occasione, vengono riportati anche i dati relativi a significativi ritrovamenti, nelle medesime aree, di rinoceronti oligo-mio-pliocenici. Per il territorio ungherese, sono disponibili anche dati relativi a un ritrovamento di età eocenica.
Parole chiave: Rhinocerotidae, *Stephanorhinus kirchbergensis*, Eocene, Oligocene, Miocene, Pliocene, Pleistocene, Italia, Europa.

Abstract - Stephanorhinus kirchbergensis *(Jäger, 1839) remains were recovered into a quarry at Vernasso/Dolenj Barnas near Cividale del Friuli (Udine, Friuli), in other Northeastern Italian provinces located in Friuli Venezia Giulia and Veneto as well as on adjacent territories (Austria, Slovenia, Croatia, Hungary, Slovakia, and Czech Republic). Of particular interest appear the remains from Vernasso and those from Šaľa (about 60 km east of Bratislava, Săľa district, Nitra region, Southwestern Slovakia) found in 1973. In several cases, no stratigraphical data are unfortunately available. In any case, until today* S. kirchbergensis *was rarely been found everywhere in Eurasia during last two centuries. For more details on the* S. kirchbergensis *records in Eurasia vide in Billia (2008, 2011, 2014) and Billia & Zervanová (2015). In addition, selected reports on Oligo-Mio-Pliocene rhinoceros remnants found in the same areas are also taken into consideration. In one case, data on a Hungarian find of Eocene age is also listed.*
Key words: *Rhinocerotidae*, Stephanorhinus kirchbergensis, *Eocene, Oligocene, Miocene, Pliocene, Pleistocene, Italy, Europe.*

Introduction

The present paper represents an overview concerning the *Stephanorhinus kirchbergensis* presences in Northeastern Italy (Friuli Venezia Giulia, and Veneto), Austria, Slovenia, Croatia, Hungary, Slovakia, and Czech Republic (fig. 1). In particular, the remains from Vernasso (Friuli, NE Italy) and those from Šaľa (Šaľa district, Nitra region, Southwestern Slovakia) appear to be of a certain interest.

Unfortunately, stratigraphical data are unavailable in most of the cases.

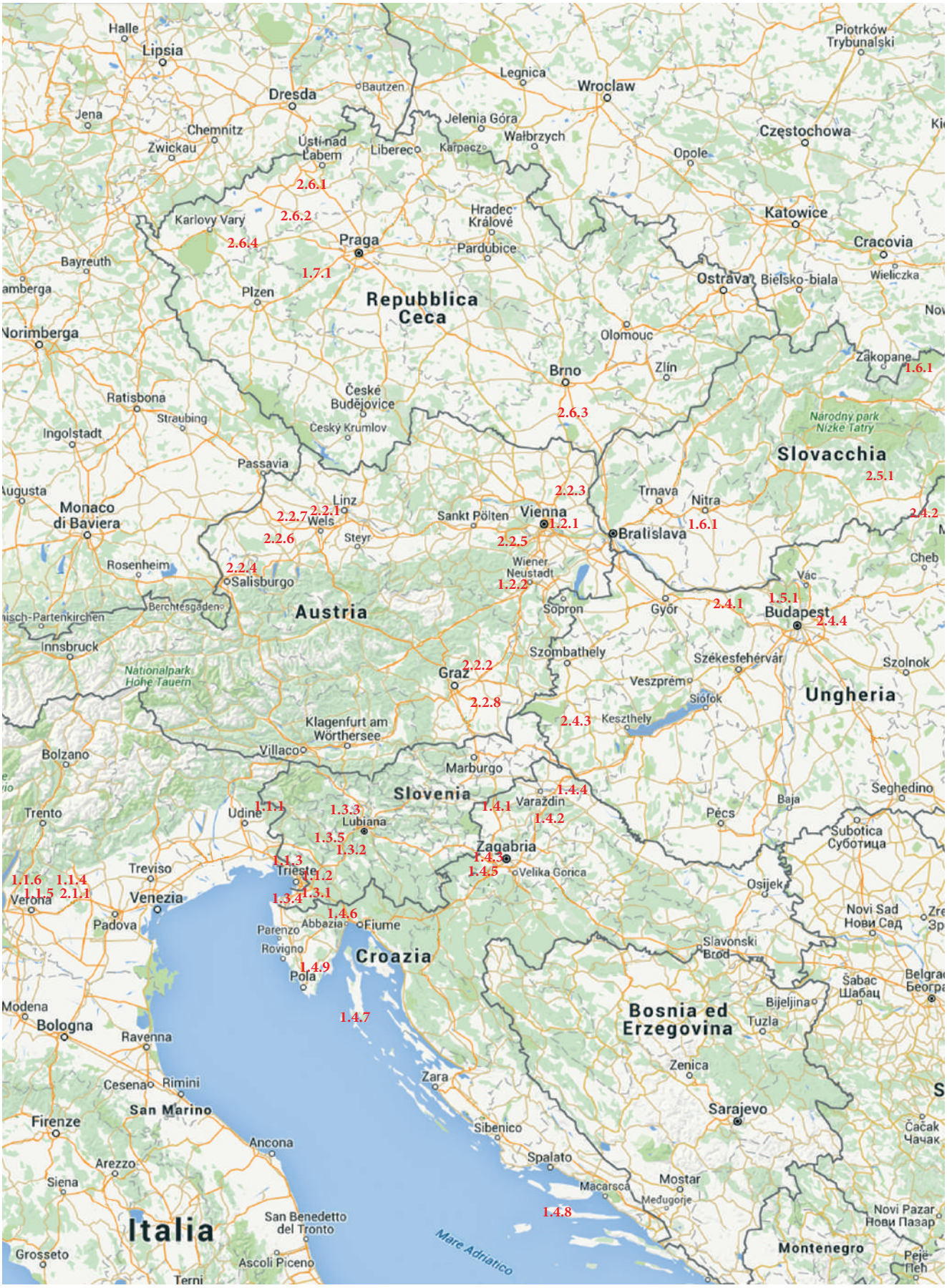

Fig. 1 - A map showing the localities quoted in the text.
- *Mappa con le località citate nel testo.*

History, synonymy, general characters, anatomical and odontological distinguishing features of *S. kirchbergensis* have extensively been discussed in previous papers (Billia 2008, 2011). More details on the *S. kirchbergensis* records in Eurasia are available in Billia (2011, 2014) and Billia & Zervanová (2015).

The second part of this paper is dedicated to Oligo-Mio-Pliocene rhinoceros found throughout the time in the same areas (apart from Croatia). In one case, data on a Hungarian find of Eocene age is also listed.

1. Northeastern Italian, Austrian, Slovenian, Croatian, Hungarian, Slovak and Czech localities with *Stephanorhinus kirchbergensis* remnants

1.1 Northeastern Italy

1.1.1 "Cava Italcementi" (Monte dei Bovi, Vernasso, Cividale del Friuli e San Pietro al Natisone, Udine, Friuli Venezia Giulia)

Until now, it represents the sole *S. kirchbergensis* discovery in Friuli. The "Cava Italcementi" (figs 2 and 3) is a marl quarry (presently abandoned) which opens on the Monte dei Bovi, in the village of Vernasso, at the border between the towns of Cividale del Friuli and San Pietro al Natisone, along the SS 54 highway (Udine-Kobarid [Slovenia] axis). Here, in some natural cavities within limestone blocks and in rock fractures of karst origin, filled with "terra rossa" (red soil; fig. 4), two second upper molars, one fourth upper premolar as well as one second lower molar have been recovered in 1989. The odontological remains were formerly described by Pellarini (1999).

The Southern Julian Pre-Alps area is characterized by the presence of a powerful flyschoid succession dated from the Late Cretaceous to the Eocene. In particular, in the so-called "Flysch del Grivò" [Grivò Flysch] (Late Paleocene - Early Eocene) outcrop five main megabeds in total. As consequences of submarine landslides, those megabeds are alternated with other minor ones. The one known as "Megastrato di Vernasso" [Vernasso megabed] is really of colossal proportions. With a thickness of

Fig. 2 - Geographical localisation of Vernasso Quarry.
- *Localizzazione geografica della Cava di Vernasso.*

Fig. 3 - Aerial view of the Italcementi Quarry at Vernasso. The red point shows the area of the find (photo E. Turco).
- *Vista aerea panoramica della cava Italcementi di Vernasso con indicata l'area del rinvenimento (foto E. Turco).*

Fig. 4 - The recovery of 1989: note the karstic fill deposit (photo Archivio Museo Friulano di Storia Naturale).
- *Il recupero del 1989: si noti il deposito di riempimento carsico (foto Archivio Museo Friulano di Storia Naturale).*

Fig. 5 - *Stephanorhinus kirchbergensis* (JÄGER, 1839). No stratigraphical data: Cava "Italcementi" (Vernasso, Cividale del Friuli, Udine, Friuli, NE Italy). Second upper molar [MFSN 220297]: a) occlusal and b) vestibular views.
- Stephanorhinus kirchbergensis *(JÄGER, 1839). Stratigrafia indeterminabile: Cava "Italcementi" (Vernasso, Cividale del Friuli, Udine, Friuli, NE Italia). Secondo molare superiore [MFSN 220297]: a) norma occlusalis e b) norma vestibularis.*

Fig. 6 - *Stephanorhinus kirchbergensis* (JÄGER, 1839). No stratigraphical data: Cava "Italcementi" (Vernasso, Cividale del Friuli, Udine, Friuli, NE Italy). Second upper molar [MFSN 220298]: a) occlusal and b) vestibular views.
- Stephanorhinus kirchbergensis *(JÄGER, 1839). Stratigrafia indeterminabile: Cava "Italcementi" (Vernasso, Cividale del Friuli, Udine, Friuli, NE Italia). Secondo molare superiore [MFSN 220298]: a) norma occlusalis e b) norma vestibularis.*

Fig. 7 - *Stephanorhinus kirchbergensis* (Jäger, 1839). No stratigraphical data: Cava "Italcementi" (Vernasso, Cividale del Friuli, Udine, Friuli, NE Italy). Fourth upper premolar [MFSN 220299]: a) occlusal and b) vestibular views.
- Stephanorhinus kirchbergensis *(Jäger, 1839). Stratigrafia indeterminabile: Cava "Italcementi" (Vernasso, Cividale del Friuli, Udine, Friuli, NE Italia). Quarto premolare superiore [MFSN 220299]: a) norma occlusalis e b) norma vestibularis.*

Fig. 8 - *Stephanorhinus kirchbergensis* (Jäger, 1839). No stratigraphical data: Cava "Italcementi" (Vernasso, Cividale del Friuli, Udine, Friuli, NE Italy). Second lower molar [MFSN 220300]: a) occlusal and b) buccal views.
- Stephanorhinus kirchbergensis *(Jäger, 1839). Stratigrafia indeterminabile: Cava "Italcementi" (Vernasso, Cividale del Friuli, Udine, Friuli, NE Italia). Secondo molare inferiore [MFSN 220300]: a) norma occlusalis e b) norma buccalis.*

230 m, probably represents one of the most impressive sedimentary phenomena originated by a sole episode of sedimentological deposition known in all over the world. A good number of boulders of considerable size (several hundred of cubic meters) are included in it. Very often, these olistolites are of limestone litology, containing fossil associations previously studied in the nineteenth century. Into the Hauterivian-Barremian laminated limestones the most ancient specimens of Clupeomorphs are preserved and they are internationally known. Otherwise, into the greenish coeval dolomitic limestones an extremely rare level of mass mortality can be found. Is is mainly constituted by picnodontiform fishes. The Senonian black limestones contain a rich continental flora described by Bozzi (1891). Even if the access to the quarry is prohibited, the quarry fronts are visible from the nearby road.

The "Megastrato di Vernasso" is constituted by several large carbonate blocks and abundant calcareous matrix. So that the megabed has been affected by karstic together with cavity formations (even if of scarce dimensions) showing the presence of internal concretions as well.

During quarry excavations, one of these cavities has been banked bringing to light its "terra rossa" fill deposits. In the debris at the base of this deposit, some teeth belonging to a large mammal together with small bone fragments were recognized. The discover of these remains, Roberto Rigo, reported on this discovery to the Museo Friulano di Storia Naturale in Udine. This institution, in accordance with the local Soprintendenza, started a campaign (fig. 4) in order to recover the fossil material under the direction of Francesca Bressan, at that time curator of the palethno-anthropological section of the Museo Friulano di Storia Naturale in Udine. These interventions allowed to collect four teeth of large size and some damaged bone fragments of small dimensions.

In 1957, the local press reported on a discovery of "mammuth" remains at the Vernasso quarry. No more information/details on the newspaper article content as well as on the remains conservation site are presently available. Surely, these are not present in any collection of public institutions in Friuli. After a critical review, according with Dalla Vecchia (2008) those remains could more likely belong to a rhinoceros than to a mammuth. In any case, as to the 1957 report, we can not exclude the presence of those mammuth remains in the quarry. But, a possible removal attempt without any proper consolidation could have caused the complete destruction of the remains.

The four very large sized teeth found in 1989, uncommonly well-preserved (with the exception of a second upper molar), show demi-bright and smooth enamel. The two second upper molars (one of them damaged in its mesial portion) [MFSNU 220297 and MFSNU 220298; figs 5 and 6] are very brachyodont with remarkably bulbous protocones and metacones. Mesial cingula are also present. The fourth upper premolar [MFSNU 220299; fig. 7] appears less brachyodont than the molars. The ectoloph, mesially, curves strongly towards the inside of the tooth. The tooth presents narrow interior valley, mesial and lingual cingula. The second lower molar [MFSNU 220300; fig. 8] shows strongly reduced mesial and distal valleys, mesial and distal cingula. All these characters are typical of *S. kirchbergensis*.

Conservation: Museo Friulano di Storia Naturale, Udine.

1.1.2 Caverna degli Orsi (San Dorligo della Valle / Dolina, Carso Triestino, Trieste, Friuli Venezia Giulia)

From this cave comes a dental gemma of a fourth lower deciduous jugal referable to *S.* cf. *S. kirchbergensis* (Berto & Rubinato 2010) supposedly correlated with the Eemian (MIS 5e).

1.1.3 Along the Trieste-Venezia railway near Aurisina (Carso Triestino, Trieste, Friuli Venezia Giulia)

Two upper molars (Leonardi 1945-47: Pl. V - fig. 4, Pl. VI - fig. 2) were collected in this site.

Conservation: Museo Civico di Storia Naturale, Trieste.

1.1.4 Cava "Calcara" (Monte di Malo, Vicenza, Veneto)

Only one fourth upper premolar (fig. 9) was recovered in 1955 in a rock crack of this quarry in which some other rhinoceros osteological remains (untraceable, at present) were contained.

Conservation: Museo Paleontologico di Priabona, Monte di Malo (Vi).

1.1.5 Monte Zoppega (= Grotta di San Lorenzo di Soave, Soave, Verona, Veneto)

Two mandibular branches (with P2-M3 and P4-M3), few isolated upper teeth, and some skeletal remains belonging to only one individual were discovered in this site (Scortegagna 1844; Molon 1875; Fabiani 1919: Pl. XVII). The remains were referred by Fabiani (1919) to the Mindel-Riss.

Conservation: odontological material - Museo Civico di Storia Naturale, Vicenza; skeletal remains - Istituto di Geologia, Università di Padova.

1.1.6 La Fornace di S. Ambrogio di Valpolicella (Verona, Veneto)

Three upper molars, three upper premolars, three lower molars, and two lower premolars (MCSN-V 9637, MCSN-V 9638, MCSN-V 9641, MCSN-V 9646, MCSN-V 9647, etc) have been found in La Fornace di S. Ambrogio di Valpolicella in the first half of the XX century. Well-preserved, large-sized with rather polish

and smooth enamel, even if isolated, the remains form two semiarches, an upper and a lower-one respectively, belonging to one individual. Another second upper molar is also present. No additional information on this discovery is available. The upper molars are remarkably brachyodont, their protocones and metacones appear remarkably bulbous. Some styli are present at the entrance of the interior valley. The third and the fourth upper premolars are less brachyodont than the upper molars. The ectoloph, mesially, curves strongly towards the inside of the tooth. Their lingual cones are also bulbous, the interior valleys are narrow. In both cases, the mesial cingula are also present.

The lower molars are very brachyodont. The first and the third one are slightly damaged in their distal portions, whereas the second molar is slightly damaged in the mesial one. The lower premolars are more hypsodont than the lower molars. Molars and premolars show both the mesial and distal valleys strongly reduced. Mesial and distal cingula are always present. In some cases, the roots are still present.

Conservation: Museo Civico di Storia Naturale, Verona.

Fig. 9 - *Stephanorhinus kirchbergensis* (Jäger, 1839). No stratigraphical data, North-Eastern Italy: Cava "Calcara" (Monte di Malo, Vicenza, Venezia Euganea). Fourth upper premolar (calcum), occlusal view [Museo Paleontologico di Priabona, Monte di Malo, s.n.].
- Stephanorhinus kirchbergensis *(Jäger, 1839). Stratigrafia indeterminabile, Italia nord-orientale: Cava "Calcara" (Monte di Malo, Vicenza, Venezia Euganea). Quarto premolare superiore (calcum): norma occlusalis [Museo Paleontologico di Priabona, Monte di Malo, s.n.].*

1.2 Austria

1.2.1 Wien-Heiligenstadt

From this deposit comes a hemimaxilla with the six teeth described as *Rhinoceros Mercki* Jäger var. *Vindobonensis* (Toula 1907: 449-454, Pl. XI-figs 1, 2) found by H. Wolf in 1870.

1.2.2 Willendorf–I (about 4 km S of Spitz an der Donau, Niederösterreich)

Three *S. kirchbergensis* teeth were recovered in 1893 at Willendorf-I by Woldřich (1893) who erroneously assigned them to *Coelodonta antiquitatis* (Blumenbach, 1799) (Thenius 1956-59: 160-162, figs 116-118; Frank & Rabeder 1997: 69).

Conservation: Prähistorische Abteilung des Naturhistorischen Museums, Wien.

The Willendorf-I accompanying fauna (revised by Thenius in 1956) consists of: *Aquila chrysaëtos* (L., 1758), *Ochotona pusilla* Pallas, 1768, *Arvicola terrestris* (L., 1758), *Lepus* sp., *Canis lupus* L., 1758, *Vulpes vulpes* (L., 1758), *Alopex lagopus* (L., 1758), *Gulo gulo* (L., 1758), *Ursus* cf. *U. arctos* L., 1758, *Panthera spelaea* (Goldfuss, 1810), *Lynx lynx* (L., 1758), *Cervus elaphus* ssp., *Rangifer* sp., *Alces alces* (L., 1758), *Capra ibex prisca* Woldřich, 1893, *Bison priscus* Bojanus, 1827, *Mammuthus primigenius* (Blumenbach, 1799), *Equus* sp.

1.3 Slovenia

1.3.1 Materja / Matteria near Cosina (Hrpelje-Kozina / Erpelle-Cosina municipality, Istra / Istria, SW Slovenia)

Toula (1907: 447) reports on "ein Zahn aus einer Höhle nächst Matteria bei Cosina (zwei Meilen von Triest; Jahrbuch der Kaiserlich-Königlichen Geologischen Reichsanstalt, Jhrg 1860, p. 114)" attributed to *S. kirchbergensis*. Unfortunately, no further information on this report is available.

Hrpelje-Kozina (Erpelle-Cosina in Italian) lies on Istrian karst territory and borders upon Trieste and Ćićarija (Cicceria, in Italian) close to Croatia.

1.3.2 Dolarjeva jama near Logatec / Longatico (about 25 km SW of Ljubljana)

No better specified *S. kirchbergensis* remains were recognised at this site (Rakovec 1933).

1.3.3 Kamnitnik (Škofija Loka, about 20 km NW of Ljubljana, W-Slovenia)

A second upper molar belonging to *Dicerorhinus kirchbergensis* (Jäger, 1839) (= *S. kirchbergensis*) was reported by Rakovec (1942: 247-250, Pl I - fig. 5).

Conservation: Inštitut za geologijo in paleontologijo univerzitet v Ljubljani [Geological-Palaeontological Institute, Ljubljana University].

1.3.4 Črni Kal/S. Sergio (SE of the Osp / Ospo village, Koper/ Capodistria municipality, Istra / Istria, SW Slovenia)

In a cave near Črni Kal (S. Sergio, in Italian), a *S. kirchbergensis* second deciduous molar [inv. Čk 210] was recovered (Adam 1958: Abb 1; Rakovec 1958; Malez 1986).

Conservation: Inštitut za geologijo in paleontologijo univerzitet v Ljubljani [Geological-Palaeontological Institute, Ljubljana University].

1.3.5 Betalov Spodmol cave (Postojna / Postumia, about 20 km NW of Ljubljana, W Slovenia)

Some other remains ascribed to *S. kirchbergensis* could come from the Betalov Spodmol cave near Postojna (Postumia, in Italian) (Rakovec 1959: 310-312) (age: Riss-Würm Interglacial).

1.4 Croatia

1.4.1 Hušnjakovo Brdo at Krapina (Hrvatsko Zagorje, about 50 km N of Zagreb)

From this internationally famous site come significant *S. kirchbergensis* remains. The most notheworty one is represented by the very well-known skull found in this site, damaged at the right zygomatic arch and, *in illo tempore*, described as *Rhinoceros Mercki* var. *Krapinensis* by Gorjanović-Kramberger (1913a: Pls I, II). It represents one of the six *S. kirchbergensis* skulls found until now in Europe(1). At Hušnjakovo Brdo, *S. kirchbergensis* mandibles, isolated teeth and postcranial bones were also collected (Gorjanović-Kramberger 1913a: Pls. III, IV, V, VI,VII, VIII, IX, X, XI, XIII; Malez 1970, 1986). The entire stock of rhinoceros remains collected in this site - belonging to both *S. kirchbergensis* and *Coelodonta antiquitatis* (Blumenbach, 1799) - consists of 324 specimens in total (Gorjanović-Kramberger 1913a).

Conservation: *vide* 1.4.2 paragraph.

This site is very famous all over the world also because it represents the richest one in *Homo neanderthalensis* King 1864 finds (876 remains in total, belonging to dozen and dozen individuals - male and female - from 2 to 40 years in age) (Schwartz & Tattersall 2006).

1.4.2 Varaždinske Toplice (about 13 km SE of Varaždin and about 45 km E of Krapina)

S. kirchbergensis is represented by the dental elements discovered in calcareous tuffs at Varaždinske Toplice (Gorjanović-Kramberger 1913a: Pl XI).

Conservation: the *S. kirchbergensis* material coming from Hušnjakovo Brdo and from Varaždinske Toplice is preserved at the Palaeontological Museum of the Quaternary Institute of HAZU [Hrvatska Akademija Znanosti i Umjetnosti (= Croatian Academy of Sciences and Arts), former Yugoslavian Academy of Sciences and Arts (JAZU), Zagreb] and at the Museum of Geology and Palaeontology of SAN [Srpska Akademija Nauka (= Serbian Academy of Sciences), former Yugoslavian Academy of Sciences and Arts (JAZU), Beograd].

1.4.3 Veternica cave (southwest of Medvednica, Medvednica Mountain, about 9 km W of Zagreb)

The four rhinoceros remains from the Veternica cave (306 m asl, 45°50'36", 13°32'24") - a fragmentary left second lower molar [VTR. 199] (damaged on its anterior portion) (Malez 1963a: Pl. XXII - figs 3a, b, c), a first phalanx [VTR. 200], a third phalanx [VTR. 201] (Malez 1958: 5-7, 19, Pl I - figs 2a, 2b; Malez 1963a: Pl. XXII - figs 1a, b, c), and a rib shaft fragment [VTR. 202] - come from the "j" level of the cave. They were previously described by Malez (1963a: 108-112, Pl XXII, Pl XXIV - figs 1a, b, c) who assigned them to *D. kirchbergensis* (= *S. kirchbergensis*). Malez (1961: 74-75) dubiously correlated these remains with the Riss-Würm Interglacial. Later, Miracle & Brajković (1992: 2) "suggest that a more prudent identification of these remains is *Dicerorhinus* sp.". This cave is situated ca 1,5 km N of Bizek (*vide* 1.4.5 paragraph). On the cave stratigraphy/speleology/geo-interpretations, *vide autem* in Malez (1963b).

The Veternica cave yielded a great amount of Pleistocene remains. The site is famous because of the finds concerning *Homo sapiens* L., 1758. Apart from *S. kirchbergensis*, *H. sapiens*, and the "cave bear" (*Ursus spelaeus* Rosenmüller & Heinroth, 1793) as the dominant species, other 78 genera, species or subspecies - belonging to Artiodactyla, Insectivora, Chiroptera, Carnivora and others - were recovered.

1.4.4 Vindija cave near Donja Voća (Varaždin County, ca 55 km NE of Zagreb and ca 20 km W of Varaždin)

The Vindija cave near Donja Voća is a cave in Tortonian conglomeratic limestone. From this cave possibly come other *Dicerorhinus mercki* (= *S. kirchbergensis*) remains (Vuković 1954: 27-28). The cave was described in a previous work by the same author (Vuković 1953).

The Vindija cave displays a total of 13 levels dated between 150 ky ago and the present. Levels from G to D yielded over than hundred hominin remains. Both *H. neandethalensis* and *H. sapiens* were found in this cave (Malez et al. 1980; Wolpoff 1980; Wolpoff

1) The remaining five European skulls are those from Daxlanden (Meyer 1863-64; Schroeder 1903; Staesche 1941; Loose 1975, *inter alios*), Mosbach (Schroeder 1903; Freudenberg 1914; Wüst 1909, 1911, 1914; Loose 1975, *inter alios*) and Steinheim a.d. Murr (Staesche 1941, *inter alios*) (all these three deposits are located in Germany), as well as from the Wisła [Vistula] river in Warsaw (Poland) (Borsuk-Białynicka & Jakubowski 1972), and that from Spinadesco (Cremona, Italy) (Persico et al. 2015).

et al. 1981; Trinkaus & Smith 1995; *inter alios*). A *Homo neandethalensis* bone (Vi-80) - found in the level G in 1974 - represents one of the best preserved *H. neandethalensis* remains ever found till to day. In 2008, the Svante Pääbo research team reported on the first complete mtDNA genome sequence reconstructed by using the Vi-80 bone with 8341 mtDNA sequences identified among 4.8 Gb of DNA generated from ~0.3 g of the same bone. The bone was direct-dated to 38,310 ± 2,130 RCYBP (Green et al. 2006, 2008, 2010).

Summarizing, the Vindija cave (1.4.4 paragraph) as well as that of Veternica (1.4.3 paragraph) (Malez 1958: 7; Smith 1976a; Smith et al. 1999; Wolpoff 1979) - just as for Hušnjakovo Brdo at Krapina (1.4.1 paragraph) (Gorjanović-Kramberger 1904, 1906, 1913b; Smith 1976a) and Velika Pečina (428 m asl, also know as "Mačkova pećina", Ravna Gora, Hrvatsko Zagorje, about 2 km SW of Kijevo and about 50 km N of Split) (Smith 1976b; Smith et al. 1999) - yielded significant well-known Late Pleistocene fossil hominids (Jelinek 1969; Wolpoff et al. 1981, *inter alios*) as well as a lot of human artifacts (Valoch 1968, *inter alios*). Patterns of faunal/climatic changes were provided by Malez (1978a, 1978b, 1978c). However, *H. neanderthalensis* remains were collected at Vindija and at Krapina, while Veternica and Velika Pečina yielded *H. sapiens* remains only. Another cave with significant Palaeolithic human traces (artifacts only) is Crvena Stijena (Nikšić, Crna Gora / Montenegro, close to the border with Bosnia and Herzegovina) (Rakovec 1958).

1.4.5 Bizek (Medvednica Mountain, about 1,5 km S of Veternica and about 9 km W of Zagreb)

Malez (1961: 66) refers to a *Dicerorhinus kirchbergensis* (= *S. kirchbergensis*) second upper molar of large dimensions belonging to a young-adult individual. The exceptionally well-preserved tooth (s.n.) (Malez 1961: 65, Pl 1 - figs 1, 2, Pl 2 - figs 1, 2, 3, Pl 3 - fig. 1) was found in a calcareous rock crack into a cave situated immediately N of Bizek (Medvednica Mountains, ca 1,5 km S of Veternica - *vide* 1.4.3 paragraph - and ca 9 km W of Zagreb). Malez (1961: 65) correlated this tooth with the Riss-Würm Interglacial just as for Veternica (*vide* 1.4.3 paragraph).

Conservation: Palaeontological Museum of the Quaternary Institute of HAZU [Hrvatska Akademija Znanosti i Umjetnosti (= Croatian Academy of Sciences and Arts), former Yugoslavian Academy of Sciences and Arts (JAZU), Zagreb].

1.4.6 Volosko / Volosco / Volosca or Preluk / Preluca (N of Opatija / Abbazia, Kvarnar gulf / Golfo del Quarnaro, Dalmacija / Dalmatia)

In literature, is sometime cited a deposit located at Volosko (Volosco or Volosca, in Italian) as well as Preluk (or Preluca, in Italian) (Fabiani 1919). Actually, Volosko and Preluk represent the same palaeontological site which lies N of Opatija (Abbazia, in Italian). From this deposit comes a rhinoceros first upper molar at that time assigned to *Rhinoceros mercki* Jäger (= *S. kirchbergensis*) by Fabiani (1919) who hypothetically referred it to the Mindel-Riss. The same author also refers that "(omissis)… la presenza della specie è indicata a Preluca da un primo molare superiore conservato nella collezione privata Valle a Trieste…" (Fabiani 1919: 90, Pl XVII - figs 8a, 8b). Battaglia (1926: 77, 79) reported on "…breccie ossifere di Preluca/ Volosca…". There is no doubt that both authors referred to the same deposit. Leonardi (1945-47: Pl VI - fig. 1) agreed in ascribing the tooth to *S. kirchbergensis*. Later, Malez (1960-61: 77, 1963a: 112, 179) *sic et sempliciter* mentioned the sole toponym (Volosko). Afterwards, in another paper regarding a systematic revision of the whole Yugoslavian fauna, Volosko in not taken into consideration.

Conservation: Valle private collection, Trieste.

1.4.7 Island of Lošinj/Lussino (Kvarnar archipelago / arcipelago del Quarnero, Dalmacija / Dalmatia)

Two very well-preserved upper molars (a second and a third ones; MCSN-TS s.n.) were recovered in an unknown site on the Lošinj island (Isola di Lussino, in Italian) during the first half of the XX century (Leonardi 1945-47: 150-151, Pl VI - fig. 1).

They represent a gift from prof. A. Haracich to the Museo Civico di Storia Naturale di Trieste.

Conservation: Museo Civico di Storia Naturale, Trieste.

An exceptionally well-preserved lower molar (possibly a third one) of unknown provenance (Leonardi 1945-47: 151-152, Pl V - figs 1, 3) shows a status of fossilisation very similar to that of the above described two molars. Not only, because of both its morphological and biometrical features might belong to the same individual, so that we may assume that it comes from Lošinj as well (Leonardi 1945-47:151).

Conservation: Museo Civico di Storia Naturale, Trieste.

1.4.8 Island of Hvar/Lesina (off the Dalmatian coast)

From the Hvar island (Isola di Lesina, in Italian), without anyone indication concerning the site and its localization, come two rhinoceros mandibular fragments (IGUP n.n. and MCSN-TS n.n.) preserving two molars on both specimens (Woldřich 1882: 455-456, Pl. X - figs 26-27; Woldřich 1886: 178; Battaglia 1926: 78; Leonardi 1945-47: 154-156, Pl. IV - figs 2, 3; Leonardi 1947: 17-18, Pl. III - fig. 8). These two remains may dubiously be attributed to *S. kirchbergensis* (just as in Woldřich 1882, 1886 and in Leonardi 1945-47, 1947). According to Toula (1902: 5, 1907:

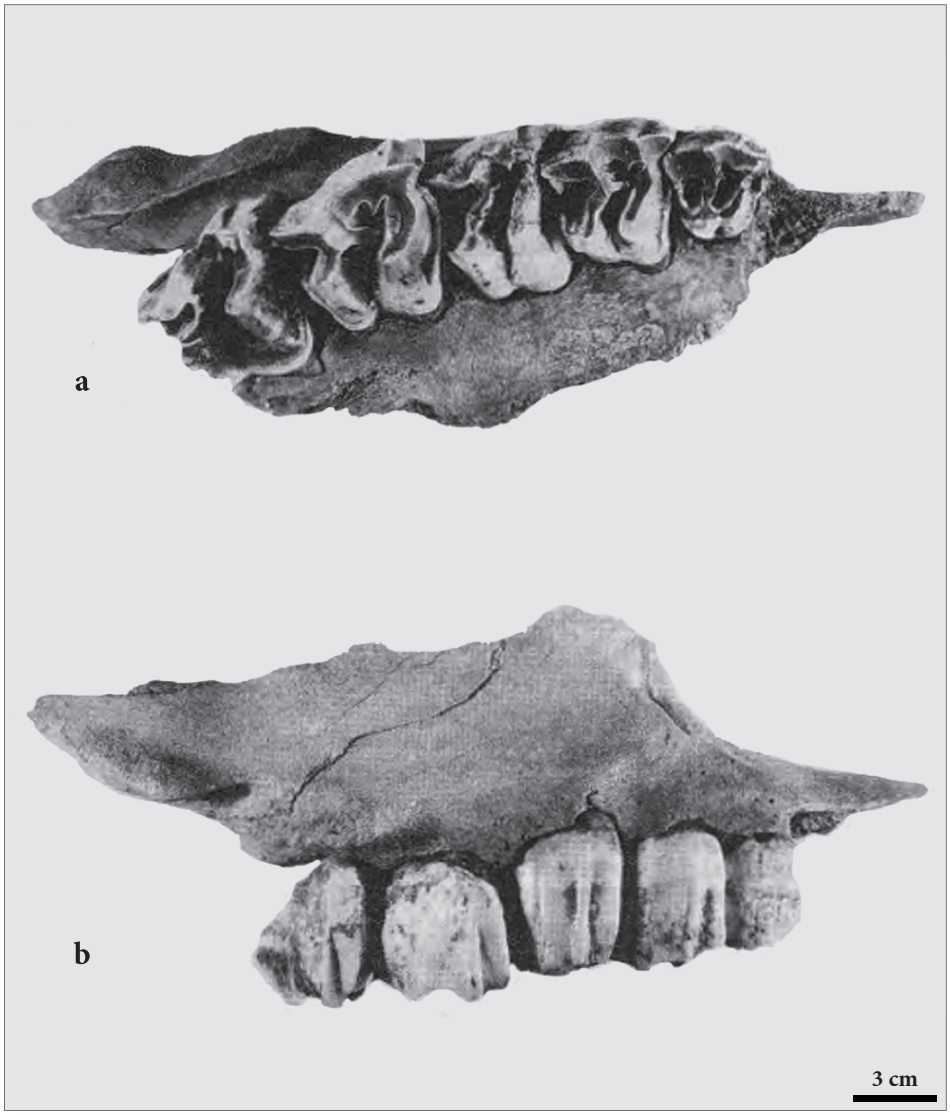

Fig. 10 - *Stephanorhinus kirchbergensis* (Jäger, 1839). No stratigraphical data; Slovakia, Váh river near Šaľa (about 60 km east of Bratislava, Šaľa district, Nitra region, Southwestern Slovakia). Right hemimaxilla with P2-M2: a) occlusal view, b) vestibular view (conservation: Slovenské Národné Múzeum - Prírodovedné Múzeum [Slovak National Museum - Natural History Museum], Bratislava, inv. Z 14170) [after Ďurišová 1994].
- Stephanorhinus kirchbergensis *(Jäger, 1839); stratigrafia indeterminabile; fiume Váh presso Šaľa (ca 60 km ad est di Bratislava, distretto di Šaľa, regione di Nitra, Slovacchia sud-occidentale). Emimascellare destro con P2-M2: a) norma occlusalis, b) norma vestibularis (Slovenské Národné Múzeum - Prírodovedné Múzeum [Museo Nazionale Slovacco - Museo di Storia Naturale], Bratislava, inv. Z 14170) [da Ďurišová 1994].*

447-448) they must be ascribed to *Rhinoceros etruscus* (= *S. etruscus*), not to *S. kirchbergensis*.

Conservation: one of these remains is preserved in the collections of the Istituto di Geologia dell'Università di Padova (Leonardi 1947), the second one is in the collections of the above mentioned Museo Civico di Storia Naturale di Trieste (Leonardi 1945-47).

Till to the Leonardi's research, the second one was believed as coming from Opčine (Opicina or Villa Opicina, in Italian) just as it was reported on its museum label.

An attentive consideration allowed to ascertain that both mandibular fragments are mirror. For this reason, they surely belong to the same individual, so that both them come from the same site (Hvar) (Leonardi 1945-47: 154).

1.4.9 Ossiferous breccia near Pula (Istra / Istria)

Some other remains ascribed to *S. kirchbergensis* could come from ossiferous breccia near Pula (Malez 1963b).

1.5 Hungary

1.5.1 Ördöglyuk cave (about 1 km W of the Solymár village, eastern slope of the Zsíros Hill, NW border of Budapest, left side of the 10 Highway, Budapest-Dorog axis, western side of the Danube)

Two *S. kirchbergensis* fragments of mandible and some postcranial remains of late Middle Pleistocene age - found together with *Bison* (*Urus*) *hungaricus* Kretzoï, 1942 skeletal remains - come from the top of the strata at the "entrance N° 1" of the Ördöglyuk cave (about 300 m asl; Jánossy 1986: 111, 113, Pl II - figs 2, 3, p. 188).

Conservation: Őslénytani és Földtani Tár, Magyar Természet-Tudományi Museúm [Department of Palaeontology, Hungarian Museum of Natural History], Budapest.

Jánossy (1986) chronologically correlated the above mentioned strata with Steinheim (Baden-Württemberg) and Swanscombe (Kent). Further data on the Ördöglyuk cave at Solymár are also available in Fostowicz-Frelik & Gasparik (2006).

1.6 Slovakia

1.6.1 Gánovce-Hrádok (about 3 km SE of Poprad, Poprad district, Prešov region, NE Slovakia)

The first record is attested at Gánovce-Hrádok, a remarkable Pleistocene palaeontological site of Central Europe investigated since the XIX century. The site is well-known because of the find (in 1926) of a *Homo neanderthalensis* King, 1864 travertine cranial endocast recovered together with a radius and a fibula casts (Vlček et al. 1958; Vlček 1969, 1995). A great amount of fossils (mammals, molluscs, plants), of archaeological artifacts from the Middle and Upper Palaeolithic as well as other "younger cultures" artifacts (Neolithic, Aeneolithic, Bronze Age, Hallstatt and Roman Period) were discovered here (Vlček 1995). Fejfar (1958), who investigated the site from 1955 to 1958, recognised seven different layers (from A to G) at Gánovce. The *S. kirchbergensis* remains come from the C layer.

Conservation: a good number of these remains are in the collection of the Národní Muzeum [National Museum, Prague, Czech Republic] and in the Podtatranske Museum in Poprad.

For an exhaustive report on this site *vide autem* in Ďurišová (2008, 2009).

1.6.2 Along the Váh river near Šaľa (about 60 km E of Bratislava, Šaľa district, Nitra region, SW Slovakia)

The second record consists of a right branch of a maxilla [Z 14170] with five very well-preserved teeth (P2–M2) (fig. 10) recovered in fluvial deposits along the Váh river near Šaľa in 1973 (Ďurišová 1994). The dental elements are described in detail by Ďurišová (1994). It is here confirmed that all the odontological traits are peculiar of *S. kirchbergensis*. No stratigraphical data are available.

Conservation: Slovenské Národné Múzeum-Prírodovedné Múzeum [Slovak National Museum - Natural History Museum], Bratislava.

Further data on the Šaľa deposit may be found in Šefčáková et al. (2005).

1.7 Czech Republic

1.7.1 Chlupáčova sluj (Kobyla old mine) and Petrbokova sluj (Zlatý kůň old mine) near Koněprusy (Beroun district, central Bohemia)

Between 1950 and 1970, near the karst locality of Koněprusy (Beroun district, central Bohemia) sixteen *S. kirchbergensis* odontological remains were recovered. Thirteen of them come from Chlupáčova sluj [Chlupáč

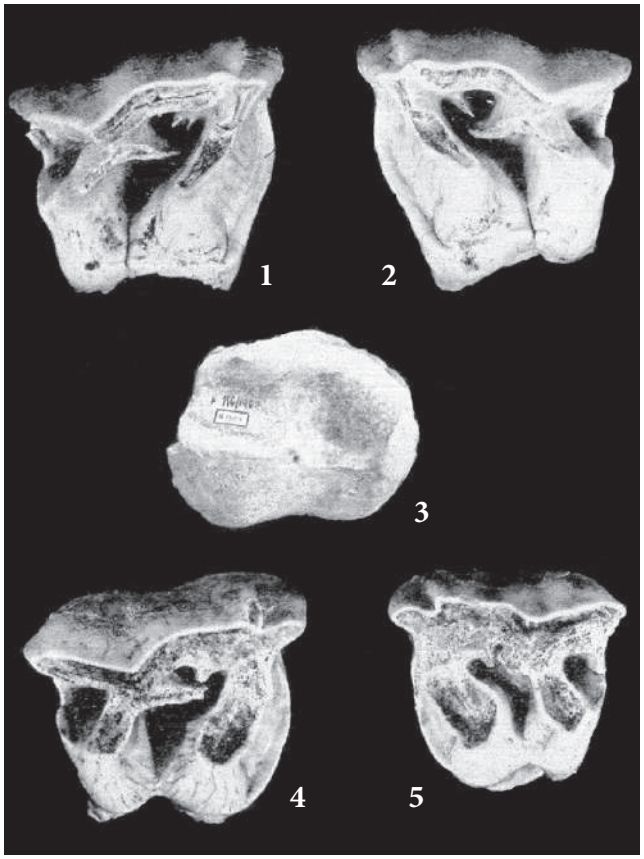

Fig. 11 - *Dicerorhinus* (= *Stephanorhinus*) *kirchbergensis* (Jäger, 1839) from Chlupáčova sluj [Chlupáč cave] near Koněprusy (Beroun district, central Bohemia): 1 - right second upper molar; 2 - left second upper molar; 3 - left radius, pars dist.; 4 - right fourth upper deciduous molar; 5 - left third upper deciduous molar (after Mostecký 1966).

- Dicerorhinus (= Stephanorhinus) kirchbergensis *(Jäger, 1839); Chlupáčova sluj [grotta Chlupáč] presso Koněprusy (distretto di Beroun, Boemia centrale): 1 - secondo molare superiore dx; 2 - secondo molare superiore sx; 3 - radius sx, pars dist.; 4 - quarto molare superiore deciduo dx; 5 - terzo molare superiore deciduo sx (da Mostecký 1966).*

Invent. num.	num.	accessory	locality
R1915	36950	*S. kirchbergensis* M_2sin.	Koněprusy, Kobyla, Chlupáčova sluj
R1914	36950	*S. kirchbergensis* M_1sin.	Koněprusy, Kobyla, Chlupáčova sluj
R1742	p111/1957	*S. kirchbergensis* M_2dext.	Koněprusy, Kobyla, Chlupáčova sluj
R1743	111/1957	*S. kirchbergensis* M_1sin.	Koněprusy, Kobyla, Chlupáčova sluj
R1734	p151/1959	*S. kirchbergensis* P_4dext.	Koněprusy, Kobyla, Chlupáčova sluj
R1913	36950	*S. kirchbergensis* P_4sin.	Koněprusy, Kobyla, Chlupáčova sluj
R1740	p111/1957	*S. kirchbergensis* P_4sin. (mléčná)	Koněprusy, Kobyla, Chlupáčova sluj
R1911	!!	*S. kirchbergensis* P_4dext.	Koněprusy, Zlatý kůň, Petrbokova sluj
R1909	p150/1959	*S. kirchbergensis* P_3dext. mléčný	Koněprusy, Zlatý kůň, Petrbokova sluj
R1733	p151/1959	*S. kirchbergensis* P_3sin.	Koněprusy, Kobyla, Chlupáčova sluj
R1739	p111/1957	*S. kirchbergensis* P_2sin. (mléčná)	Koněprusy, Kobyla, Chlupáčova sluj
R1732	p151/1959	*S. kirchbergensis* P_2dext.	Koněprusy, Kobyla, Chlupáčova sluj
R1731	p6/1960	*S. kirchbergensis* P_2sin. (fragment)	Koněprusy, Kobyla, Chlupáčova sluj
R1910	p150/1959	*S. kirchbergensis* P_2sin.	Koněprusy, Zlatý kůň, Petrbokova sluj
R1738	p111/1957	*S. kirchbergensis* P_2sin. (mléčná)	Koněprusy, Kobyla, Chlupáčova sluj
R1912	36950	*S. kirchbergensis* P_2dext.	Koněprusy, Kobyla, Chlupáčova sluj

Tab. I - Detailed list of the sixteen *Stephanorhinus kirchbergensis* (Jäger, 1839) dental elements from Chlupáčova sluj and Petrbokova sluj near Koněprusy (Beroun district, central Bohemia) (after Pícha 2013).

- *Elenco dettagliato dei sedici elementi dentari attribuiti a* Stephanorhinus kirchbergensis *(Jäger, 1839) provenienti da Chlupáčova sluj e da Petrbokova sluj presso Koněprusy (distretto di Beroun, Bohemia centrale) (da Pícha 2013).*

cave] in the Kobyla old mine (Mostecký 1961, 1966) (some of those remains are in fig. 11). The remaining three teeth were collected in the Petrbokova sluj [Petrbok cave] in the Zlatý kůň old mine (Pícha 2013). A detailed list of the sixteen *S. kirchbergesi*s remains from both the caves is displayed in tab. I (Pícha 2013: 45). From the Chlupáčova sluj also come *Coelodonta antiquitatis* (Blumenbach) remnants (Mostecký 1961, 1966). Until now, Koněprusy represents the unique Czech locality in which *S. kirchbergensis* remains have been found (Štěpán Pícha 2016, pers. comm.).

Conservation: Národní muzeum [National Museum], Prague.

A recent revision of Pleistocene rhinoceros (*Stephanorhinus etruscus* (Falconer), *Coelodonta antiquitatis* (Blumenbach), *S. kirchbergensis*) in Czech Republic is available in Pícha (2013).

2. Northeastern Italian, Austrian, Slovenian, Hungarian, Slovak, and Czech Oligo-Mio-Pliocene rhinoceroses

The species recognised on the six areals are as follows (in alphabetical order): *Aceratherium* (*Alicornops*) aff. *pauliacense* (Richard, 1937), *Aceratherium incisivum* Kaup, 1832, *Aceratherium* sp., *Brachypotherium brachypus* (Lartet, 1837), *Brachypotherium* cf. *brachypus* (Lartet, 1837), *Brachypotherium goldfussi* (Kaup, 1834), *Diceratherium kuntneri* Spillmann, 1969, *Dicerorhinus schleiermacheri* (Kaup, 1832), *Dicerorhinus steinheimensis* (Jäger, 1839), "*Dihoplus*" *megarhinus* (de Christol, 1834), *Epiaceratherium bolcense* Abel, 1910, *Haploaceratherium* cf. *tetradactylum* (Lartet, 1851), *Hoploaceratherium* sp. Ginsburg & Heissig, 1989, *Hyrachyus* cf. *stehlini* (Depéret, 1904), *Lartetotherium sansaniense* (Lartet, 1848), *Lartetotherium* sp., *Meninatherium teller* Abel, 1910 (recte *Prohyracodon orientale* Koch, 1897), *Mesaceratherium gaimersheimense* Heissig, 1969, *Praeaceratherium kerschneri* Spillmann 1969, *Prosantorhinus laubei* Heissig & Fejfar, 2007, *Protaceratherium minutum* (Cuvier, 1822), *Stephanorhinus jeanvireti* (Guérin, 1972), *Stephanorhinus* cf. *megarhinus* (de Christol, 1834).

2.1 Northeastern Italy – Oligo-Mio-Pliocene rhinoceroses

2.1.1 Monteviale (Monti Lessini orientali, about 8 km NW of Vicenza)

Until now, the most ancient rhinoceros found in North-eastern Italy appears to be *Epiaceratherium bolcense* Abel, 1910 coming from the Early Oligocene lignite of Monteviale (Abel 1910; Uhlig 1996: fig. 2 and Pl 1 - figs 1-3; Uhlig 1999). Represented by a juvenile mandible (inv. 28011), through the time these remains had chronologically been ascribed to the *Lophiodon* genus by Omboni (1901), to the *Hyracodon* genus by Stehlin (1901), to *Trigonias ombonii* by Dal Piaz (1930). Fabiani (1915) mentioned this fossil as *Hyracodon ombonii* Stehlin. The attribution by Dal Piaz can not be accepted, having remains of this North American genus (*Trigonias*) never been found in Europe (at least, till to-day). *E. bolcense* is also treated in Kotsakis (1984: 142-145) and Maritan (2005).

Conservation: Museo di Geologia e Paleontologia, Università di Padova.

2.2 Austria - Oligo-Mio-Pliocene rhinoceroses

2.2.1 Alharting (Leonding, Linz-Land district, Oberösterreich)

From two different Oligocene sand horizons near Alharting come remains attributed to *Diceratherium kuntneri* Spillmann ("das kleine Nashorn") and *Praeaceratherium kerschneri* Spillmann ("das grosse Nashorn") (Spillmann 1969). The remnants referred to *D. kuntneri* consist of cranial and dental material belonging to three individuals found in 1943. Those ascribed to *P. kerschneri* consist of cranial and dental material belonging to only one individual found during excavations carried on between 1935 and 1942.

Conservation: Oberösterreichisches Landes-Museum, Linz.

2.2.2 Gratkorn (about 10 km NNW of Graz, Steyermark)

According to Aiglstorfer et al. (2014: figs 2-3), at the late Middle Miocene site of Gratkorn remains belonging to *Aceratherium* sp. (a D2 fragment, inv. UMJGP 203711), to *Brachypotherium brachypus* (Lartet, 1837) (a lateral half of astragalus, inv. UMJGP 203434 and a metatarsal II, inv. UMJGP 204720), and to *Lartetotherium sansaniense* (Lartet, 1848) (a M1 and a fragment of M2, inv. UMJGP 203459) were collected.

More details on the Gratkorn site are available in Aiglstorfer et al. (2014) and in Havlik et al. (2014) as well.

2.2.3 Atzelsdorf (about 35 km NE of Vienna, western margin of the Vienna Basin, Niederösterreich)

From Atzelsdorf come both Late Miocene *Aceratherium incisivum* Kaup, 1832, and *Brachypotherium goldfussi* (Kaup, 1834) remains (Heissig 2009). According to Heissig (2009), the Atzelsdorf site deposits belong to the Hollabrunn-Mistelbach Formation. Biostratigraphic investigations (Harzhauser 2009) and well-logging correlations led to a correspondence of the Atzelsdorf fauna with the Vienna Basin Pannonian Zone C, basal MN9, and an absolute age of about 11.2-11.1 Ma.

The *A. incisivum* material consists of: a tibia proximal fragment (NHMW 2008z0060/0001, ex coll Schebeczek

S152), a tibia distal fragment (NHMW 2008z0060/0002, ex coll Schebeczek S151), an astragalus (NHMW 2008z0060/0003, ex coll Schebeczek S151) (Heissig 2009: Pl 1 - fig 1 and Pl 2 - figs 2, 3).

The *B. goldfussi* one consists of: a P2 fragment (NHMW 2008z0061/0001, ex coll Schebeczek S28), a D4 fragment (NHMW 2008z0061/0002, ex coll Schebeczek S99), an os carpale II (NHMW 2008z0061/0003, ex coll Penz P31) (Heissig 2009: Pl 2 - fig. 1 and Pl 2 - figs 2-3).

Conservation: Naturhistorisches Museum [National History Museum, NHMW], Vienna.

2.2.4 Maria Schmolln (Braunau am Inn district, Oberösterreich)

A Miocene tibia distal fragment of *Aceratherium* sp. (inv. 142/1940) was collected at Maria Schmolln (Braunau am Inn, Oberösterreich) (Thenius 1952).

Conservation: Oberösterreichisches Landes-Museum, Linz.

2.2.5 Brunn-Vösendorf (about 10 km SW of Wien, Mödling district, Niederösterreich)

Odontological remains of *Aceratherium incisivum* Kaup, 1832 (Thenius 1953: 75-76; Pl 9 - figs 4-7, 12-14).

2.2.6 Haag am Hausruck (Grieskirchen district, Oberösterreich)

Early Pliocene nasalia ascribed to *Dicerorhinus schleiermacheri* (Kaup, 1832) (inv. 288/1925) (Thenius 1952: fig. 3) were discovered in a gravel quarry at Haag am Hausruck.

Conservation: Oberösterreichisches Landes-Museum, Linz.

2.2.7 Alt-Lichtenwarth (Mistelbach district, Niederösterreich)

Fluvial gravels near Alt-Lichtenwarth yielded Pliocene remains of *Dicerorhinus megarhinus* (de Christol, 1834) [= *Stephanorhinus megarhinus* (de Christol, 1834)] (Thenius 1978).

2.2.8 Oberdorf (N of Voitsberg, Köflach-Voitsberg coalfield, Steiermark)

From the lignite open-cast mine at Oberdorf come some tooth fragments of an uncertain determination (Made 1998). At that time, these remains were considered as belonging to *Aceratherium tetradactylum* (Lartet, 1837) by Mottl (1970).

2.3 Slovenia - Oligo-Mio-Pliocene rhinoceroses

2.3.1 Motnik (about 35 km NE of Ljubljana, Tuhinj Valley, Kamnik municipality)

Meninatherium telleri Abel, 1910 (recte *Prohyracodon orientale* Koch, 1897) remains are known from Motnik (Abel 1910). The material has irremediably been lost during the World War II. Age is unknown (possibly Late Eocene-Early Oligocene).

2.4 Hungary - Eocene-Oligo-Mio-Pliocene rhinoceroses

2.4.1 Csordakút (Gerecse Hills, NW Hungary)

Kocsis (2002) reports on three well-preserved upper molars (M1-M2-M3) ascribed to a juvenile *Hyrachyus* cf. *stehlini* (Depéret, 1904) found in Middle Eocene marine marl of the abandoned bauxit pit of Csordakút II. It was the fourth Eocene fossil land mammal recovered in Hungary. "During Eocene, the Csordakút area lay on an island of the Adriatic microplate of the Tethys. These fossils suggest the possibility of a temporary land connection with the European continent. According to the mammalian fossils, the beds can be correlated to the Rhenanian or Geiseltalian mammalian unit. *Hyrachyus* lived in tropical and subtropical marsh and mangrove on alluvial plains or seashore. This kind of biotope was recognised in Middle Eocene of Transdanubia" (Kocsis 2002).

2.4.2 Rudabánya (Borsod-Abaúj-Zemplén province, NE Hungary)

Heissig (2004) referred to remains of a Late Miocene *Aceratherium incisivum* Kaup, 1832 from Rudabánya.

2.4.3 Kávás (Zala Subbasin, Pannonian Basin, W Hungary)

Late Miocene "*Dihoplus*" *megarhinus* (de Christol, 1834) skull fragments, upper and lower teeth as well as numerous other skeletal remains come from Kávás (Pandolfi et al. 2015, 2016).

Conservation: Őslénytani és Földtani Tár, Magyar Természet-Tudományi Museúm [Department of Palaeontology, Hungarian Museum of Natural History, HNHM], Budapest.

2.4.4 Gödöllő (Pest province, N Hungary)

Stephanorhinus jeanvireti (Guérin, 1972) remains come from Gödöllő (Pest province, Northern Hungary) (Kováč et al. 2011).

2.5 Slovakia - Oligo-Mio-Pliocene rhinoceroses

Slovakia is very rich in fossil rhinoceroses. Records of at least five Oligo-Mio-Pliocene genera were reported on its territory: *Aceratherium* sp., *Haploaceratherium* cf. *tetradactylum* (Lartet, 1851), *Brachypotherium* cf. *brachypus* (Lartet, 1837), *Lartetotherium* sp., *Dicerorhinus steinheimensis* (Jäger, 1839), *Stephanorhinus* cf. *megarhinus* (de Christol, 1834), and *Stephanorhinus jeanvireti* (Guérin, 1972).

One of the most notheworthy site is that of Hajnáčka-I (Rimavská Sobota, Banská Bystrica region) (Ďurišová

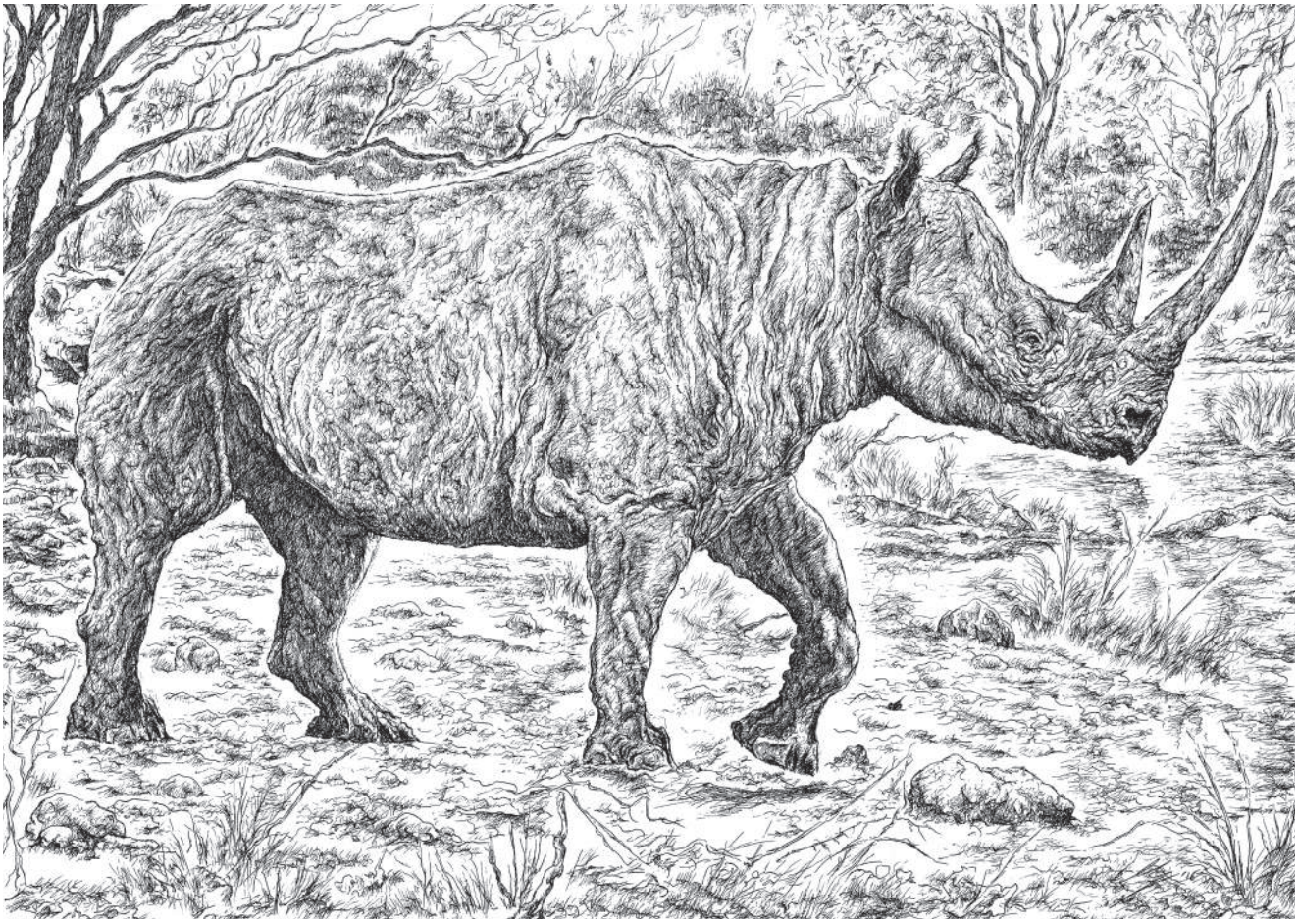

Fig. 12 - Reconstruction of *Stephanorhinus kirchbergensis* (Jäger, 1839) in its hypothetical palaeoenvironment (after Gianfranco Mensi, 2016; personal present. This unpublished illustration is used here through the courtesy of the artist, all rights reserved).
- *Ricostruzione di* Stephanorhinus kirchbergensis *(Jäger, 1839) in un suo ipotetico ambiente (Gianfranco Mensi, 2016; omaggio personale; per gentile concessione dell'artista, inedita, tutti i diritti riservati).*

2004; Sabol et al. 2006, *inter alios*). However, a revision of the Oligo-Mio-Plio-Pleistocene Slovak rhinoceroses is available in Zervanová (2014).

2.6 Czech Republic - Oligo-Mio-Pliocene rhinoceroses

2.6.1 Merkur-North (about 125 km NW of Prague, N Bohemia)

According to Fejfar et al. (2003), at the Merkur-North open brown coal pit remains of Early Miocene (MN3a) *Protaceratherium minutum* (Cuvier, 1822) were recovered.

Merkur-North and Tuchořice (vide 2.6.2 paragraph) are two palaeoecologically different sites, but reveal nearly contemporaneous Early Miocene mammal faunas (Fejfar et al. 2003).

2.6.2 Tuchořice (Louny district, Ústí nad Labem region, NW Bohemia)

From the Early Miocene travertine of Tuchořice come remains assigned to four Rhinocerotidae species just as *Protaceratherium minutum* (Cuvier, 1822), *Aceratherium* (*Alicornops*) aff. *pauliacense* (Richard, 1937), *Mesaceratherium gaimersheimense* Heissig, 1969, *Prosantorhinus laubei* Heissig & Fejfar, 2007 (Fejfar et al. 2003; Heissig & Fejfar 2007).

2.6.3 Czujan's sand pit (2 km E of Mikulov, Ústí nad Labem region, NW Bohemia)

The Czujan's sand-pit - even if it is only occasionally mentioned in published sources - represents a unique locality with a Middle Miocene mammalian assemblage (Březina & Ivanov 2014).

Eleven taxa in total were identified in Czujan'ssand-pit including Rhinocerotidae, Proboscidea, Cervidae, Bovidae, Equidae, Chalicotheriidae, and Carnivora. As to the Rhinocerotidae, remnants of *Hoploaceratherium* sp. Ginsburg & Heissig 1989 and *Brachypotherium* cf. *brachypus* (Lartet, 1837) were discovered in this site. Czujan's sand-pit probably represents fluvial deposits of deltaic channel. Biostratigraphic comparisons between the mammalian species corresponds the age of 14,9-13,5 Ma (Middle-Late Badenian; Astaracian, MN 6 Zone -

lower part of MN7+8 Zone). These individuals represent both forest and open environment species (Březina & Ivanov 2014).

2.6.4 Dětaň (about 30 km E of Karlovy Vary and about 2,5 km S of Nepomyšl, Doupovské hory, NW Bohemia)

From this site come Oligocene highly fragmented skeletal remains ascribed to *Ronzotherium* cf. *filholi* Osborn, 1900 (Mikuláš et al 2003: 94).

Manuscript received on 02.VII.2016, accepted on 20.VII.2016.

Acknowledgments

The authors would like to express their gratitude to Miroslava Janetková (Akademická Knižnica, Univerzita Komenského, Prírodovedecká fakulta, Mlynská Dolina, Bratislava) and to Daniela Gondová (Akademická Knižnica, Univerzita Komenského, Filozofická fakulta, Šafárikovo námestie, Bratislava) for kindly supporting their work.

E.B. is much indebted to Gianfranco Mensi for providing the *S. kirchbergensis* reconstruction. Many thanks also to the anonymous Referees.

References

Abel, O. 1910. Kritische Untersuchung über die paläogenen Rhinocerotiden Europas. *Abhandlungen der Kaiserlich-Königlichen Geologischen Reichsanstalt* 20 (3): 1-52.

Adam, K.-D. 1958. *Dicerorhinus kirchbergensis* (Jäger, 1839) aus einer Karsthöhle bei Crni Kal (Istrien, Jugoslawien) [with Slovenian abstr.]. *Razprave [Dissertationes], Slovenska Akademija Znanosti i Umetnosti (Academia Scientiarum et Artium Slovenica) [SAZU], Ljubljana* 4 (4): 437-40.

Aiglstorfer, M., H. Bocherens & M. Böhme. 2014. Large mammal ecology in the late Middle Miocene Gratkorn locality (Austria). *Palaeobiodiversity and Palaeoenvironment* 94: 189-213 [doi:10.1007/s12549-013-0145-5].

Aiglstorfer, M., K. Heissig & M. Böhme. 2014. Perissodactyla from the late Middle Miocene Gratkorn locality (Austria). *Palaeobiodiversity and Palaeoenvironments* 94: 71-82 [doi:10.1007/s12549-013-0138-4].

Battaglia, R. 1926. Paleontologia e paletnologia delle grotte del Carso. In *Duemila Grotte,* cur. L.V. Bertarelli & E. Boegan, 75-100. Milano: Touring Club Italiano (ristampa anastatica F.lli. Fachin ed., Trieste, 1986).

Berto, C., & G. Rubinato. 2010. The Upper Pleistocene mammal record from Caverna degli Orsi (San Dorligo della Valle - Dolina, Trieste, Italy). A faunal complex between Eastern and Western Europe. In *Quaternary Stratigraphy and Paleontology of the Southern Russia - Connections between Europe, Africa, and Asia)*, cur. V.V. Titov & A.S. Tesakov, 26. Abstracts of the International INQUA-SEQS Conference, Rostov-on-Don, June 21-26, 2010. Rostov-on-Don: Southern Scientific Centre RAS.

Billia, E.M.E. 2008. Revision of the fossil material attributed to *Stephanorhinus kirchbergensis* (Jäger, 1839) (Mammalia, Rhinocerotidae) preserved in the museum collections of the Russian Federation. *Quaternary International* 179 (1): 25-37 [doi:10.1016/j.quaint.2007.09.034].

Billia, E.M.E. 2011. Occurrences of *Stephanorhinus kirchbergensis* (Jäger, 1839) (Mammalia, Rhinocerotidae) in Eurasia - An account. *Proceedings of the 7th Romanian Symposium of Palentology, Cluj-Napoca, Romania, October 22-24, 2009), Romanian Society of Palaeontologists. Acta Palaeontologica Romaniae* 7: 17-40.

Billia, E.M.E. 2014. *Stephanorhinus kirchbergensis* (Jäger, 1839) (Mammalia, Rhinocerotidae) from European Russia - A new, detailed inventory of sites and referred material. *Central European Geology, Akadémiai Kiadó* 57 (2): 165-95 [doi:10.1556/CEuGeol.57.2014.2.4].

Billia, E.M.E., & J. Zervanová. 2014. New *Stephanorhinus kirchbergensis* (Jäger, 1839) (Mammalia, Rhinocerotidae) records in Eurasia - Addenda to a previous work. *Gortania, Geologia Paleontologia Paletnologia* 36: 55-68.

Borsuk-Bialynicka M., & G. Jakubowski. 1972. The skull of *Dicerorhinus mercki* (Jäger) from Warsaw. *Prace Muzeum Ziemi [Proceedings of the Museum of the Earth]* 20: 187-99.

Bozzi, L. 1891. La flora Cretacea di Vernasso in Friuli. *Bollettino della Società Geologica Italiana* 10: 371-82.

Březina, J., & M. Ivanov. 2014. Middle Miocene mammals from the Czujan's sand-pit (Mikulov, Czech Republic). *Abstract book of the 15th Czech-Polish-Slovak Paleontological Conference, Banská Bystrica, Slovakia, November 2014*: 34-5. Banská Bystrica: Geological Institute, Slovak Academy of Sciences.

Dalla Vecchia, F.M. 2008. *Vertebrati fossili del Friuli. 450 milioni di anni di evoluzione*. Udine: Pubblicazioni del Museo Friulano di Storia Naturale, 50.

Dal Piaz, G. 1930. I Mammiferi dell'Oligocene veneto, *Trigonias ombonii*. *Memorie dell'Istituto di Geologia dell'Università di Padova* 9: 2-63.

Ďurišová, A. 1994. *Dicerorhinus kirchbergensis* (Mammalia, Rhinocerotidae) z fluviálnych náplavov Váhu v Šaľi (Slovenská republika). *Zborník Slovenského národného Múzea (Prírodné Vedy)* 40: 7-13.

Ďurišová, A. 2004. Rhinoceroses (*Dicerorhinus jeanvireti* Guérin, 1972). In *Early Villanyian Site of Hajnáčka I, (Southern Slovakia) - Palaeontological Research (1996/2000)*, cur. M. Sabol, 98-110. Gemer-Malohont Museum in Rimavská Sobota and Comenius University in Bratislava.

Ďurišová, A. 2008. Mammals of Pleistocene Travertine in Gánovce Site (Northern Slovakia). *The 6th Meeting of the European Association of Vertebrate Palaeontologists. Abstracts volume*: 122-5, 7.

Ďurišová, A. 2009. Pleistocene travertine site of Gánovce (Northern Slovakia). *The 15th International Cave Bear Symposium, September 17-20, 2009, Spišská Nová Ves, Slovakia*: 54-8.

Fabiani, R. 1915. Il Paleogene del Veneto. *Memorie dell'Istituto di Geologia dell'Università di Padova* 3: 1-336.

Fabiani, R. 1919. I mammiferi quaternari della regione Veneta. *Memorie dell'Istituto di Geologia della Regia Università di Padova* 5: 1-174.

Fejfar, O. 1958. Die fossilen Säuger aus den Travertinen in Gánovce bei Poprad. In *Zusammenfassen der Bericht über den Fundort Gánovce und die Reste des Neandertalers in der Zips (ČSR)*, cur. E. Vlček et al., 50-2. Praha: Československá akademie věd. Archeologicky Institut.

Fejfar, O., Z. Dvorák & E. Kadlecová. 2003. New record of Early Miocene (MN3a) mammals in the open brown coal pit Merkur, North Bohemia, Czech Republic. In *Distribution and Migration of Tertiary Mammals in Eurasia - A volume in honour of Hans De Bruijn)*, cur. J.W.F. Reumer & W. Wessels, 163-82. Deinsea 10.

Fostowicz-Frelik, L., & M. Gasparik. 2006. The taxonomic status of leporid remains from Ördöglyuk Cave, Solymár (Hungary). *Acta Zoologica Cracoviensia* 49A (1-2): 151-61.

Frank, Ch., & G. Rabeder. 1997. Willendorf in der Wachau. In *Pliozäne und Pleistozäne Faunen Österreichs - Ein Katalog der wichtigsten Fossilfundstellen und ihrer Faunen)*, cur. D. Döppes & G. Rabeder, 1-69. Wien: Mitteilungen der Kommission für Quartärforschung der Österreichischen Akademie der Wissenschaften.

Freudenberg, W. 1914. Die Säugetiere des Altern Quartärs von Mitteleuropa mit besonderes Berücksichtigung der Faunen von Hundsheim und Deutsch-Altenburg in Niederösterreich nebst Bemerkungen über verwandte Formen anderer Fundorte. *Geologische und Paläontologische Abhandlungen* 12 (4-5): 455-671.

Gorjanović-Kramberger, D. 1904. Der paläolithische Mensch und seine Zeitgenossen aus der Diluvium von Krapina in Kroatien. *Mitteilungen der Anthropologischen Gesellschaft* 31: 189-216.

Gorjanović-Kramberger, D. 1906. *Der Diluviale Mensch von Krapina in Kroatien*. Wiesbaden, Kreidels: 1-277.

Gorjanović-Kramberger, D. 1913a. Fossilni rinocerotidi Hrvatske i Slavonije, s osobitim obzirom na *Rhinoceros Mercki* iz *Krapine* (De rhinocerotidibus fossilibus Croatie et Slavoniae, praecipua ratione habita *Rhinocerotis Mercki* var. *Krapinensis* mihi) [in Croatian and Latin]. *Djela Jugoslavenske Akademije (JAZU)* 22 (8): 1-70.

Gorjanović-Kramberger, D. 1913b. Život i kultura diluvijalnoga čovjeka iz Krapine u Hrvatskoj. *Djela Jugoslavenske Akademije (JAZU)* 23: 1-54.

Green, R.E., J. Krause, S.E. Ptak, A.W. Briggs, M.T. Ronan, J.F. Simons, L. Du, M. Egholm, J.M. Rothberg, M. Paunović & S. Pääbo. 2006. Analysis of one million base pairs of Neanderthal DNA. *Nature* 444 (7117): 330-6 [doi:10.1038/nature05336].

Green, R.E., A.-S. Malaspinas, J. Krause, A.W. Briggs, Ph.L.F. Johnson, C. Uhler, M. Meyer, J.M. Good, T. Maricic, U. Stenzel, K. Prüfer, M. Siebauer, H.A. Burban, M. Ronan, J.M. Rothberg, M. Egholm, P. Rudan, D. Brajković, Ž. Kućan, I. Gušić, M. Wikström, L. Laakkonen, J. Kelso, M. Slatkin & S. Pääbo. 2008. A complete Neandertal mitochondrial genome sequence determinated by high-throughput sequencing. *Cell* 134 (3): 416-26.

Green, R.E., J. Krause, A.W. Briggs, T. Maricic, U. Stenzel, M. Kircher, N. Patterson, H. Li, Zhai Weiwei, M. Fritz Hsi-Yang, N.F. Hansen, E.Y. Durand, A-S. Malaspinas, J.D. Jensen, T. Marques-Bonet, C. Alkan, K. Prüfer, M. Meyer, H.A. Burbano, J.M. Good, R. Schultz, A. Aximu-Petri, A. Butthof, B. Höber, B. Höffner, M. Siegemund, A. Weihmann, Ch. Nusbaum, E.S. Lander, C. Russ, N. Novod, J. Affourtit, M. Egholm, Ch. Verna, P. Rudan, D. Brajković, Ž. Kućan, I. Gušic, V.B. Doronichev, L.V. Golovanova, C. Lalueza-Fox, M. de la Rasilla, J. Fortea, A. Rosas, R.W. Schmitz, Ph.L.F. Johnson, E.E. Eichler, D. Falush, E. Birney, J.C. Mullikin, M. Slatkin, R. Nielsen, J. Kelso, M. Lachmann, D. Reich, & S. Pääbo. 2010. A draft sequence of the Neandertal genome. *Science* 328 (5979): 710-22 [doi:10.1126/science.1188021].

Harzhauser, M. 2009. The Early Vallesian vertebrates from Atzelsdorf (Austria, Late Miocene). 2-Geology. *Annalen des Naturhistorischen Museum Wien, S.A.* 111: 479-88.

Havlik, Ph., M. Aiglstorfer, A.K. Beckmann, M. Gross & M. Böhme. 2014. Taphonomical and ichnological considerations on the late Middle Miocene Gratkorn locality (Styria, Austria) with focus on large mammal taphonomy. *Palaeobio. Palaeoenv.* 94: 171-88 [doi:10.1007/s12549-013-0142-8].

Heissig, K. 2004. The fossil Rhinoceroses of Rudabànya. *Palaeontographica Italica* 90: 217-58.

Heissig, K. 2009. The early Vallesian vertebrates of Atzelsdorf (Late Miocene, Austria). 11 - Rhinocerotidae and Chalicotheriidae (Perissodactyla). *Annalen des Naturhistorischen Museums in Wien* 111 A: 619-34.

Heissig, K., & O. Fejfar. 2007. Die fossilen Nashörner (Mammalia, Rhinocerotidae) aus dem Untermiozän von Tuchořice in Nordwestböhmen. In *Die Säugetiere aus dem Untermiozän von Tuchořice in Nordwestböhmen*. Sborník Národního Muzea v Praze - Acta Musei Nationalis Pragae (Řada B, Přírodní Vědy - ser. B, Historia Naturalis/Natural History) 63 (1): 19-64.

Jánossy, D. 1986. *Pleistocene Vertebrate Faunas of Hungary*. Budapest: Akadémiaio Kiadó: 1-209 [a revised translation of: Jánossy, D. 1979. A Magyarországi Pleisztocén Tagolása Gerinces Faunák Alapján. Budapest: Akadémiaio Kiadó].

Jelinek, J. 1969. Neanderthal man and *Homo sapiens* in Central and Eastern Europe. *Current Anthropology* 10: 475-503.

Kocsis, L. 2002. Vertebrates remains of the Middle Eocene Csordakút basin, Hungary. *Abstracts of the 7th European Workshop on Vertebrate Palaeontology, Sibiu, Romania, July 2002*, 23.

Kotsakis, T. 1984. Problemi paleobiogeografici dei mammiferi fossili italiani - Le faune oligoceniche. *Geologica Romana* 23: 141-55.

Kovač, M., R. Synak, K. Fordinál, P. Joniak, C. Tòth, R. Vojtko, A. Nagy, I. Baráth, J. Maglay & J. Minár. 2011. Late Miocene and Pliocene history of the Danube Basin: inferred from development of depositional systems and timing of sedimentary facies changes. *Geologica Carpathica* 62: 519-34.

Leonardi, P. 1945-47. Resti fossili di rinoceronti del Museo di Storia Naturale di Trieste. *Atti del Museo Civico di Storia Naturale di Trieste* 16 (12): 145-60.

Leonardi, P. 1947. Resti fossili inediti di rinoceronti conservati nelle collezioni dell'Istituto Geologico dell'Università di Padova. *Memorie dell'Istituto di Geologia dell'Università di Padova* 15: 1-30.

Loose, H.K. 1975. Pleistocene Rhinocerotidae of Western Europe with Reference to the Recent Two-horned Species of Africa and S.E. Asia. *Scripta Geologica* 33: 1-59.

Made, J.v.d. 1998. Vertebrates from the Early Miocene lignite deposits of the opencast mine Oberdorf (Western Styrian Basin, Austria). 8-Rhinocerotidae (Mammalia). *Annalen des Naturhistorischen Museum in Wien* 99A: 163-8.

Malez, M. 1958. Neki noviji rezultati paleontološkog istraživanija Pećine Veternice [Einige neue Resultate

derpaläntologischen Erforshung der Höhle Veternica]) [in Croatian and German]. *Palaeontologia Jugoslavica* 1: 5-24.

Malez, M. 1960-61. Nalaz dvaju pleistocenskih sisavaca kod Zagreba i pregled okolnih nalazišta [The find of two Pleistocene mammals near Zagreb and an overview on adjacent find localities] [in Croatian, German summ.]. *Geoloski Vjesnik* 14: 63-88.

Malez, M. 1961. Staro pleistocenska fauna koštane breće poluotoka Marjana kod Splita [Die Altpleistozäne Brekzienfauna der Halbinsel Marjan bei Split (Dalmatien)] [in Croatian, German summ.]. *Palaeontologia Jugoslavica* 4: 5-43.

Malez, M. 1963a. Qvartarna Fauna Pećine Veternice u Medvednici [Die Quartäre Fauna der Höhle Veternica (Medvednica, Kroatien)] [in Croatian, German summ.]. *Palaeontologia Jugoslavica* 5: 108-112+178-179.

Malez, M. 1963b. Pećina Veternica u Medvednici - I. Opći speleološki pregled - II. Stratigrafija kvartarnih taložina. *Acta Geologica* 4.

Malez, M. 1970. Rezultati revizija pleistocenska fauna iz Krapine [Results of the revision of the Pleistocene fauna from Krapina] [in Croatian, German & English]. In *Krapina 1899-1969*, 45-56.

Malez, M. 1978a. Novija istraživanja paleolitika u Hrvatskom Zagorju. In *Arheoloska istraživanja u Sjeverozapadnoj Hrvatskoj*, cur. Z. Rapanic, 6-69. Hrvatsko arheolosko drustvo 2.

Malez, M. 1978b. Populacije neandertalaca i neandertalcima slicnih ljudi u Hrvatskoj. In *Krapinski Pracovjek I Evolucija Hominida*, cur. M. Malez, 331-71. Zagreb: Jugoslavenska Akademija Znanosti i Umjetnosti.

Malez, M. 1978c. Fossile Menschen aus Nordwestkroatien und ihre quartärgeologische, paläontologische und paläolithische Grundlage. *Collegium Antropologicum* 2: 29-41.

Malez, M. 1986. Die quartären Vertebraten-Faunen in der SFR Jugoslawien [English & Russian summ.]. *Quartärpaläontologie* 6: 101-17.

Malez, M., F.H. Smith, J. Radovčić & D. Rukavina, 1980. Upper Pleistocene hominids from Vindija, Croatia, Yugoslavia. *Current Anthropology* 21: 365-7.

Maritan, M. 2005. *I mammiferi delle ligniti dell'Oligocene di Monteviale (Vicenza) conservati nel Museo di Geologia e Paleontologia dell'Università di Padova*. Thesis presented at the Dipartimento di Geologia, Paleontologia e Geofisica dell'Università di Padova.

Meyer, H.v. 1863-64. Die diluvianen Rhinoceros-Arten. *Palaeontographica* 11: 233-83.

Miracle, P.T., & D. Brajković. 1992. Revision of the Ungulate Fauna and Upper Pleistocene Stratigraphy of Veternica Cave (Zagreb, Croatia). *Geologia croatica* 45: 1-14.

Molon, F. 1875. Sulle ossa fossili della caverna di Zoppega al monte S. Lorenzo, presso S. Bonifazio di Verona. *Atti del Regio Istituto Veneto di Scienze* s. 5, 1: 1-22.

Mostecký, V. 1961. Pleistocénní savci z "Chlupáčovy sluje" na Kobyle u Koněprus (Berounsko). *Časopis Národního muzea, odd. přírodov.* 130 (1): 22-5.

Mostecký, V. 1966. Rhinocerotidae aus der Höhle "Chlupáčova sluj" bei Koněprusy. S*borník Národního Muzea v Praze - Acta Musei Nationalis Pragae* 22 B (4): 143-61.

Mottl, M. 1970. Die jungtertiären Säugetierfaunen der Steiermark, Südost-Österreichs. *Mitteilungen des Museums für Bergbau, Geologie und Technik am Landesmuseum "Joanneum"* 31:3-85.

Omboni, G., 1901. Denti di *Lophiodon* degli strati eocenici del Monte Bolca. *Atti del Reale Istituto Veneto di Scienze, Lettere ed Arti di Padova* 60: 631-38.

Pandolfi, L., M. Gasparik & I. Magyar. 2016. Rhinocerotidae from the Upper Miocene deposits of the Western Pannonian Basin (Hungary) - Implications for migration routes and biogeography. *Geologica Carpathica* 67 (1): 69-82 [doi:10.1515/geoca-2016-0004].

Pandolfi, L., M. Gasparik & P. Piras. 2015. Earliest occurrence of "*Dihoplus*" *megarhinus* (Mammalia, Rhinocerotidae) in Europe (Late Miocene, Pannonian Basin, Hungary) - Palaeobiogeographical and biochronological implications - La plus ancienne occurrence de "*Dihoplus*" *megarhinus* (Mammalia, Rhinocerotidae) en Europe (Miocène supérieur, basin Pannonien, Hongrie) - Implications paléobiogéographiques et biochronologiques. *Annales de Paléontologie* 101: 325-39 [http://dx.doi.org/10.1016/j.annpal.2015.09.001].

Pellarini, P. 1999. Note sul rinvenimento di alcuni resti fossili di *Stephanorhinus kirchbergensis* (Jaeger, 1839) provenienti dalla cava di Vernasso (Cividale, Udine). *Gortania. Atti del Museo Friulano di Storia Naturale* 21: 65-8.

Persico, D., E.M.E. Billia, S. Ravara & B. Sala. 2015. The skull of *Stephanorinus kirchbergensis* (Jäger, 1839) (Mammalia, Rhinocerotidae) from Spinadesco (Cremona, Lombardia, Northern Italy): morphological analyses and taxonomical remarks - An opportunity for revising the three other skulls from the Po Valley. *Quaternary Science Reviews* 109: 28-37.

Pícha, S. 2013. *Revize pleistocénních zástupců čeledi nosorožcovitých (Rhinocerotidae, Mammalia) v ČR [Review of the Pleistocene Representatives of the Family Rhinoceroses (Rhinocerotidae, Mammalia) in Czech Republic]*. Diplomová práce [Diploma thesis] presented to the Univerzita Karlova v Praze, Přírodovědecká fakulta, Master of Sciences, 1-108.

Rakovec, I. 1933. *Coelodonta mercki* Jäger iz Dolarjeve jame pri Logatcu [*Coelodonta mercki* Jäger aus der Höhle "Dolarjeva jama" bei Logatec] [in Slovenian]. *Prirodne Razprave [Dissertation on Natural Science], Slovenska Akademija Znanosti i Umetnosti (Academia Scientiarum et Artium Slovenica) [SAZU], Ljubljana* 2: 5-41.

Rakovec, I. 1942. Nosorog s Kamnitnika pri Skofji Loki [On the rhinoceros remains from Kamnitnik hill near Skofya Loka] [in Slovenian]. *Mat.-Prirodoslov. Razprave [Math.-Natural History Dissertation], Slovenska Akademija Znanosti i Umetnosti (Academia Scientiarum et Artium Slovenica) [SAZU], Ljubljana* 2: 241-62.

Rakovec, I. 1958. The Pleistocene Mammalia from the cave Črni Kal in Northern Istria. *Prirodne Razprave [Dissertation on Natural Science], Slovenska Akademija Znanosti i Umetnosti (Academia Scientiarum et Artium Slovenica) [SAZU], Ljubljana* 4: 367-433.

Rakovec, I. 1959. Kvartarna sesalka favna iz Betalovega spodmola pri Postojni [Quaternary mammalian fauna from the Betalov Spodmol Cave near Postojna]. *Razprave [Dissertation on Natural Science], Slovenska Akademija Znanosti i Umetnosti (Academia Scientiarum et Artium Slovenica) [SAZU], Ljubljana* 5: 287-348.

Sabol, M., V. Konečný, D. Vass, M. Kováčová, A. Ďurišová & I. Túnyi. 2006. Early Late Pliocene site of

Hajnáčka I - Geology, palaeovolcanic evolution, fossil assemblages and palaeoenvironment. *Courier Forschungs-Institut Senckenberg* 256: 261-74.

Schroeder, H. 1903. Die Wirbelthier-Fauna des Mosbacher Sandes - 1. Gattung *Rhinoceros*. *Abhandlungen der Kaiserlich-Königlichen Preussischen Geologischen Landesanstalt* 18: 1-143.

Schwartz, J.H., & I. Tattersall. 2006. Morphology, Variability, and Systematics - Lessons from Krapina. *Periodicum Biologorum* 108 (4): 389-401.

Scortegagna, F.O. 1844. Notizie sulle ossa fossili degli animali mammiferi rinvenute sepolte nel Monte Zoppega. *Annali di Scienze del Regno Lombardo-Veneto* 5-6.

Šefčáková, A., R. Halouzka & M. Thurzo. 2005. Príspevok k histórii, stratigrafii a datovaniu neandertálca Šaľa 1 zo Slovenska [Contribution to the history, stratigraphy and dating of the Neanderthal specimen Šaľa 1 from Slovakia] [in Slovak]. *Acta Rerum Naturalium Musei Nationalis Slovaci* 51: 71-87.

Smith, F.H. 1976a. *The Neandertal Remains from Krapina - A Descriptive and Comparative Study*. University of Tennessee, Department of Anthropology, Report of Investigations 15.

Smith, F.H. 1976b. A fossil hominid frontal from Velika Pećina (Croatia) and a consideration of Upper Pleistocene hominids from Yugoslavia. *American Journal of Physical Anthopology* 44 (1): 127-34 [doi:10.1002/ajpa.1330440118].

Smith, F.H., E. Trinkaus, P.B. Pettitt, I. Karavanić & M. Paunović, 1999. Direct radiocarbon dates for Vindija G1 and Velika Pećina Late Pleistocene hominid remains. *Proceedings of the National Academy of Sciences of the United States of America* 96 (22): 12281-6 [doi:10.1073/pnas.96.22.12281].

Spillmann, F. 1969. Neue Rhinocerotiden aus den oligozänen Sanden des Linzer Beckens. *Jahrbuch des Oberösterreichischen Musealvereines* 114 (1): 201-54.

Staesche, K. 1941. Nashörner der Gattung *Dicerorhinus* aus Diluvium dem Württembergs. *Abhandlungen der Reichsanstalt Bodenforschungen*, 200: 1-148.

Stehlin, H.G. 1901. Appendice alla nota sui denti di *Lophiodon* del Bolca. *Atti del Reale Istituto Veneto di Scienze, Lettere ed Arti di Padova* 61: 189-91.

Thenius, E. 1952. Die Säugetierreste aus dem Jungtertiär des Hausruck und Kobernausserwaldes (O.-Österreich) und die Alterstellung der Schichten. *Jahrbuch der Geologischen Bundesanstalt* 95 (1): 119-44.

Thenius, E. 1953. Mammalia. In *Vösendorf - Ein Lebensbild aus dem Pannon des Wiener Beckens - Ein Beitrag zur Geologie und Paläontologie der unterpliozänen Gongerienschichten des südlichen Wiener Beckens*, cur. A. Papp & E. Thenius E., 1-125. Mitteilungen der Geologischen Gesellschaft in Wien, 46.

Thenius, E. 1956-59. Die jüngpleistozäne Wirbeltierfauna von Willendorf i. d. Wachau, N.Ö. *Mitteilungen der Prähistorischen Kommission, Österreichische Akademie der Wissenschaften* 8-9: 133-70.

Toula, F. 1902. Das Nashorn von Hundsheim *Rhinoceros* (*Ceratorhinus* Osborn) *hundsheimensis* nov. form. mit Ausführungen über die Verhältnisse von elf Schädeln von *Rhinoceros* (*Ceratorhinus*) *sumatrensis*. *Abhandlungen der Kaiserlich-Königlichen Geologischen Reichsanstalt* 19 (1): 1-92.

Toula, F. 1907. *Rhinoceros mercki* Jäger in Österreich. *Jahrbuch der Kaiserlich-Königlichen Geologischen Reichsanstalt* 77 (3): 445-54.

Trinkaus, E., & F.H. Smith. 1995. Body Size of the Vindija Neanderthals. *Journal of Human Evolution* 28: 201-8. [doi:10.1006/jhev.1995.1015].

Uhlig, U. 1996. Erstfund eines juvenilen Unterkiefers von *Epiaceratherium bolcense* Abel, 1910 (Rhinocerotidae, Mammalia) aus dem Unteroligozän von Monteviale (Italien). *Mitteilungen der Bayerischen Staatssammlung für Paläontologie und historische Geologie* 36: 135-44.

Uhlig, U. 1999. Paleobiogeography of some Paleogene rhinocerotoids (Mammalia) in Europe. *Acta Palaeontologica Romaniae* 2: 477-81.

Valoch, K. 1968. Evolution of the Paleolithic in Central and Eastern Europe. *Current Anthropology* 9: 351-90.

Vlček, E. 1969. *Neandertaler der Tschechoslowakei*. Praha: Academia, 1-276.

Vlček, E. 1995. Kamenný mozek. Výlitek mozkovny neandertálce, Hrádok v Gánovcích na Spiši. *Vesmír* 74 (11): 615-24.

Vlček, E. et al., 1958. *Zusammenfassender Bericht über den Fundort Gánovce und die Reste des Neandertalers in der Zips (ČSR)*. Praha: AÚ ČSAV, 1-81.

Vuković, S. 1953. Pećina Vindija kao pre historijska stanica. *Speleolog - Časopis Speleološke Sekcije P.D. Željezničar* 1 (1).

Vuković, S. 1954. Istraživanje pretpećinskog terena Vindije. *Speleolog - Časopis Speleološke Sekcije P.D. Željezničar* 2: 23-8.

Woldřich, J.N. 1882. Beiträge zur Fauna der Breccien und anderer Diluvial-gebilde Oesterreichs mit besonderer Berücksichtigung des Pferdes. *Jahrbuch der Kaiserlich-Königlichen Geologischen Reichsanstalt* 32 (4): 435-70.

Woldřich, J.N. 1886. Diluviale Funde in der Prachover Felsen bei Jicin in Böhmen. *Jahrbuch der Kaiserlich-Königlichen Geologischen Reichsanstalt* 37 (2): 223-32.

Woldřich, J.N. 1893. Reste diluvialer Faunen und des Menschen aus dem Waldviertel Niederösterreichs. *Denkschriften der Mathematisch-Naturwissenschaftlichen Klasse der Kaiserlichen Akademie der Wissenschaften* 60: 566-634.

Wolpoff, M.H. 1979. The Krapina dental remains. *American Journal of Physical Anthropology* 50: 67-113.

Wolpoff, M.H. 1980. *Paleoanthropology*. New York: Knopf, 1-878.

Wolpoff, M.H., F.H. Smith, M. Malez, J. Radovčić & D. Rukavina. 1981. Upper Pleistocene remains from Vindija Cave, Croatia, Yugoslavia. *American Journal of Physical Anthropology* 54: 499-545 [doi:10.1002/ajpa.1330540407].

Wüst, E. 1909. Das Vorkommen von *Rhinoceros merckii* Jäger in den oberen Travertinen von Ehringsdorf bei Weimar und seine Bedeutung für die Beurteilung der Klimaschwankungen das Eiszeitalters. *Centralblätter für Mineralogie, Geologie und Paläontologie* 3: 23-5.

Wüst, E. 1911. Zwei bemerkenswerte *Rhinoceros*-Schädel aus dem Pliozän Thüringens. *Palaeontographica* 58: 133-8.

Wüst, E. 1914. Rhinoceros-zähne aus dem Sande von Mauer bei Heidelberg. In *Die Säugetiere des Älteren Quartärs von Mitteleuropa mit Besonder Berücksichtigung der Faunen von Hundsheim und Deutsch-Altenburg in Nieder-Österreich nebst Bemerkungen über verwandte Formen anderer*

Fundorte, cur. W. Freudenberg, 23-6+475-8. Geologische und Paläontologische Abhandlungen 12 (4-5).

Zervanová, J. 2014. *Vyhynutí Zástupcovia Čeľade Rhinocerotidae z Územia Slovenska - Celkové Zhodnotenie [Extinct Representatives of the Rhinocerotidae Family from Territory of Slovakia - A Revision] [in Slovak, English abstr*]. Dizertačná Práca [dissertation]. Thesis presented to the Comenius Univ. of Bratislava, Faculty of Natural Sciences, Chair of Geology and Palaeontology, 1-187.

Authors' addresses - Indirizzi degli Autori:
- Emmanuel M.E. Billia
  via Bacchiglione 3, I-00199 ROMA
  e-mail: e.billia@yandex.ru, eme.billia@alice.it
- Júlia Zervanová
  Drobného 16/9, SK-84101 BRATISLAVA
  e-mail: lia20lia@gmail.com