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Emmanuel M.E. Billia
Júlia Zervanová

UPDATED, DETAILED REPORTS ON OTHER FINDS OF *STEPHANORHINUS KIRCHBERGENSIS* (JÄGER, 1839) (MAMMALIA, RHINOCEROTIDAE) FROM EURASIA ADDENDA – 6

SEGNALAZIONI AGGIORNATE E DETTAGLIATE AL RIGUARDO DI ULTERIORI RITROVAMENTI DI *STEPHANORHINUS KIRCHBERGENSIS* (JÄGER, 1839) (MAMMALIA, RHINOCEROTIDAE) IN EURASIA ADDENDA - 6

Abstract - As already done in the past, a series of detailed reports (the "sixth addenda") concerning other *Stephanorhinus kirchbergensis* (Jäger, 1835-39) remains discovered on Eurasian territory are taken into consideration here as an integration of seven other previous papers (listed below). The *S. kirchbergensis* material discussed here comes from Spain, Italy, Slovenia, Albania, Poland, Ukraine, China, and Japan. Furthermore, it was deemed appropriate to provide here two updated overviews reporting on the thirteen Polish sites (the "Poland" paragr.) as well as a certain number of Chinese ones (the "China" paragr.) that yielded *S. kirchbergensis* remains throughout history. At the same time, it is considered suitable to reiterate some fundamental notes concerning *S. kirchbergensis*.
Key words: *Stephanorhinus kirchbergensis*, Rhinocerotidae, Pleistocene, Eurasia.

Riassunto breve - *Con l'analogo criterio già adottato in passato, vengono qui trattate ("sesta addenda") ulteriori segnalazioni di resti di* Stephanorhinus kirchbergensis *(Jäger, 1835-39) rinvenuti sul territorio eurasiatico a ulteriore integrazione dei sette articoli precedenti elencati più sotto. Il materiale ascritto a* S. kirchbergensis *preso qui in considerazione proviene da Spagna, Italia, Slovenia, Albania, Polonia, Ucraina, Cina e Giappone. Con l'occasione, si è ritenuto opportuno proporre anche due panoramiche aggiornate a riguardo tanto dei tredici siti polacchi (paragr. "Poland"), quanto di alcuni siti cinesi (paragr. "China") che, nel corso del tempo, hanno restituito resti di* S. kirchbergensis. *Vengono anche riproposte alcune sostanziali note al riguardo di* S. kirchbergensis.
Parole-chiave: Stephanorhinus kirchbergensis*, Rhinocerotidae, Pleistocene, Eurasia*.

Introduction

This work follows seven other previous ones (Billia 2011a, 2011b, 2014; Billia & Zervanová 2014, 2015, 2016, 2022) easily available for consultation on the Rhino Resource Center website [url: www.rhinoresourcecenter.com], the worlds largest rhinoceros information website committed to assisting research and conservation of the rhinoceros worldwide by collecting all publications and maintaining archives.

Stephanorhinus kirchbergensis (= *Rhinoceros kirchbergensis* = *Rhinoceros mercki* = *Dicerorhinus kirchbergensis* = *Dicerorhinus mercki* = *Dihoplus kirchbergensis* …) was first described by Georg Friedrich Jäger on the basis of a second upper molar (SMNS 34000.3), a third upper molar (SMNS 34000.2), and a lower premolar (SMNS 34000.1) found at Kirchberg an der Jagst (Schwäbisch Hall, Stuttgart, Baden-Württemberg, Germany; 384 m asl; 49° 12' N – 09° 58' E) (Jäger, 1835-39, Pl. 16 figs. 31, 32, 33, respectively). The three specimens are preserved at the Staatliches Museum für Naturkunde in Stuttgart [SMNS] (Fig. 1). These three remains are cotypes. According to Staesche (1941, p. 9), the second upper molar represents the lectotype (Fig. 2, after Schroeder, 1903, Taf. IX, fig. 2-2a), just also as in Made (2010) and in Pandolfi (2022).

Regarding the lower premolar (SMNS 34000.1), it is interesting to remember that – at that time – Staesche (1941) described it as "*ein Unterkiefermolar*" (in German, "a lower molar").

The generic name "*Stephanorhinus*" was proposed by the eminent Hungarian geologist and palaeontol-

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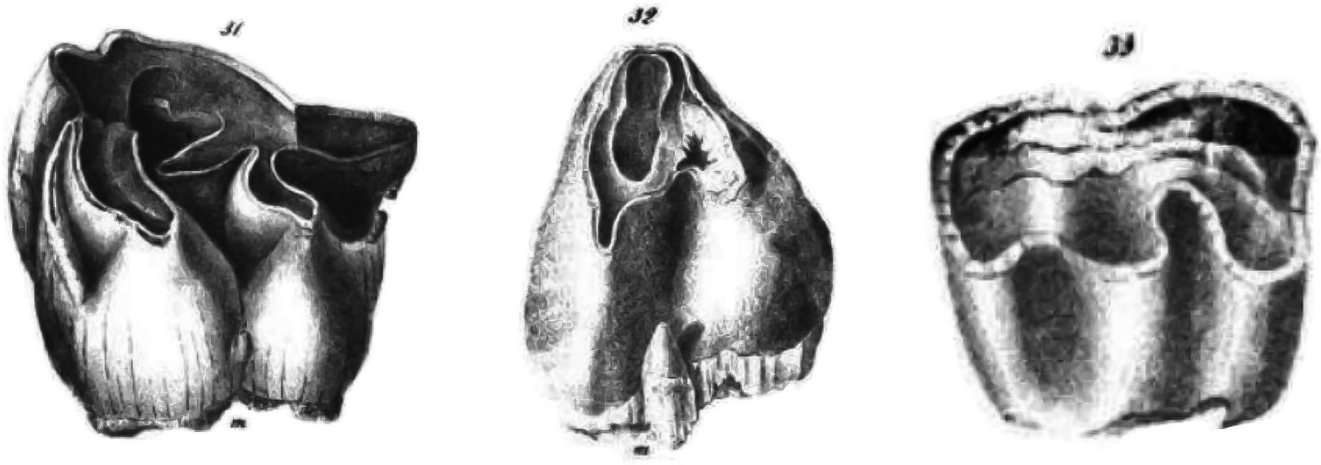

Fig. 1 - Sketch representing the second upper molar (SMNS 34000.3), the third upper molar (SMNS 34000.2), and the lower molar (SMNS 34000.1) found at Kirchberg an der Jagst (Schwäbisch Hall, Stuttgart, Baden-Württemberg, Germany) (after Jäger, 1835-39; Pl. 16, figs. 31, 32, 33, respectively).
- *Schizzo del secondo molare superiore (SMNS 34000.3), del terzo molare superiore (SMNS 34000.2) e del molare inferiore (SMNS 34000.1) rinvenuti a Kirchberg an der Jagst (Schwäbisch Hall, Stoccarda, Baden-Württemberg, Germania) (da Jäger, 1835-39; tav. 16, rispettivamente figg. 31, 32, 33).*

ogist Miklós Kretzoï (February 9, 1907 – March 15, 2005) in 1942 in honour of the Hungarian king Stephen I (Nárcisz M. Z., a Hungarian biologist, 2004, pers. comm.).

The *S. kirchbergensis* material taken into consideration here comes from Spain, Italy, Slovenia, Albania, Poland, Ukraine, China, and Japan. The paragraph (§) numbers used here in the text correspond to the same used in Billia (2011a)

Europe

Spain

López González (2003) reported *Dicerorhinus mercki* [= *S. kirchbergensis*] from A Valiña (about 12 km north of Castroverde, Lugo province, Galicia, N-W Spain), dated to 34.8–31.6 ka B.P. However, the specimen was neither described nor figured.

This diagnosis was later discarded both by Made et al. (2017) and by Sanisidro & Cantalapiedra (2022) who ascribed this record to *Stephanorhinus* sp. (? maybe *S. hemitoechus*).

Back in the past, there have been some "timid" reports concerning *S. kirchbergensis* presence in Spain. However, none of these have ever found scientific credence.

Italy, § 1.7

Not far from Castel di Guido (Agro Romano, west of Rome) – at Collina Barbattini (between the via Aurelia km 18.930 and km 18.970, direction Rome) – excavations were carried out in sandy sediments at the base of the stratigraphic succession in 1990. Among many other faunal remains belonging to *Palaeoloxodon antiquus* (Falconer & Cautley 1847), *Bos primigenius* Bojanus, 1827, Cervidae, Amphibia as well as micromammals, remains attributable to *Stephanorhinus* cfr. *S. kirchbergensis* were also mentioned (Anzidei et al. 1993). This is also reported in Ceruleo et al. (2021, p. 91), a work in which the authors provide a detailed list of the great amount of palaeontological material already described by different authors in the past.

According to Perrone (2016, unpublished thesis), a complete ulna of *Stephanorhinus* cf. *S. kirchbergensis* was collected on the same site by Ernesto Longo together with other fossil remains of *Sus scrofa* Linnaeus, 1758, *Ursus* cf. *U. spelaeus* Rosenmüller & Heinroth, 1793, *Panthera* cf. P. *spelaea* (Goldfuss, 1810), *Equus ferus* Boddaert, 1785. In a more recent work (Petronio et al. 2023), the ulna from Collina Barbattini is mentioned and illustrated (vide "Appendice" [Appendix] of the same work, pp. 22-23, fig. 39 [url: http://www.stsn.it/attia2023/petronio_suppl_online_152.pdf]).

However, in both cases the rhinoceros remains (as well as the remaining taxa of the two faunal complexes) fall into the "San Paolo" [St. Paul] Formation (MIS 11) biochronological interval (Ceruleo et al. 2019; Petronio et al. 2019). The "San Paolo" Formation is also known as "Torrino" Formation (*vide autem* in Funiciello & Giordano, 2008).

It should be noted that the morphological features of the rhinoceros ulna cannot provide useful elements to define the species.

In the specific case of *S. kirchbergensis*, the present authors believe they identified some postcranial remains – certainly attributed to *S. kirchbergensis* – that

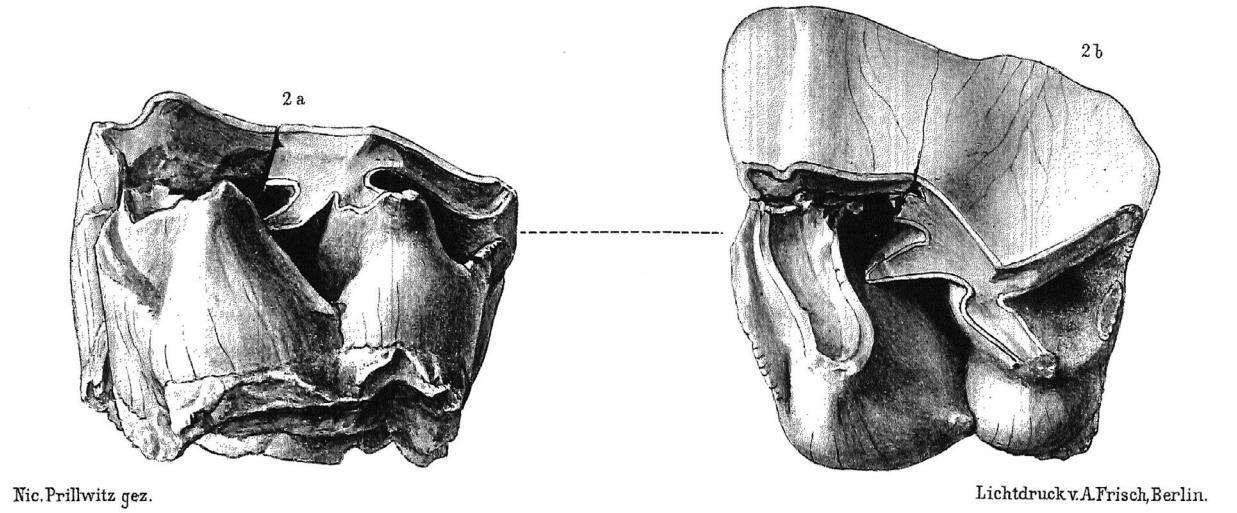

Fig. 2 - Sketch of the second upper molar (the lectotype) (SMNS 34000.3) found at Kirchberg an der Jagst (Schwäbisch Hall, Stuttgart, Baden-Württemberg, Germany) (after Schroeder 1903; Taf IX, fig 2-2a).
- *Schizzo del secondo molare superiore (lectotipo) (SMNS 34000.3) rinvenuto a Kirchberg an der Jagst (Schwäbisch Hall, Stoccarda, Baden-Württemberg, Germania) (da Schroeder 1903; Taf IX, fig 2-2a).*

display absolutely distinctive characteristics of this species. Among these, the ulna is absolutely not included among these few elements.

This topic will be the subject of a forthcoming publication by the two authors.

Pandolfi et al. (2023) selected a certain number of remains chosen from those previously excavated in the site and currently preserved in the Casal de' Pazzi Museum (N-E part of Rome, Q. XXIX Ponte Mammolo and Q. XXI Pietralata). Among these, three dental elements are considered here: a third upper molar (CdP104), a first lower molar (CdP105), and a second lower molar (CdP106) (Pandolfi et al. 2023, fig. 5 – from D to L).

The Casal de' Pazzi faunal complex was chronologically referred to MIS 7 (~240-200 ka) (Caloi et al. 1998; Marra et al. 2017, 2018; Petronio et al. 2019; Palombo 2023; Briatico et al. 2023).

The remains are preserved in the collections of the Museo di Casal de' Pazzi (via Egidio Galbani 6, Roma).

The museum structure covers a part of this site (an area of approximately 1200 m^2) which represents an important deposit of fluvial origin.

Slovenia, § 1.8

The Črni Kal (San Sergio, in Italian) quarry (253 m asl; 45°33'00" N – 13°52'42" E) (Fig. 3) lies along the Koper-Kozina ring road 409, very close to the edge of the Karst plateau, practically next to the small inhabited centre of Črni Kal, about 3,5 km SE of the Osp village (Koper Municipality, Primorska region [Slovenian Karst-Littoral statistical region]). In this cave – opened in 1955 – Eocene Alveolinid-Nummulitid limestone is extracted. It is considered one of the oldest quarries in Primorska (Slovensko Primorje or "Slovenian Coast"; "Litorale Sloveno", in Italian).

Already shortly after its opening (1955), the quarry revealed itself to be palaeontologically very rich.

The first systematic excavations began under the direction of Srečko Brodar already in the same year (1955) and allowed to collect – in just a few weeks – 750 remains (Rakovec 1958). Among them, Adam (1958, p. 441, fig. 1) identified one of the most interesting remains, the well-known external wall of a left second upper deciduous tooth (Čk 210) which he attributed to *S. kirchbergensis,* coming from a karst fissure situated to the left of the quarry entrance (presently identified as site-1). The same Čk 210 specimen was also described – but not figured – by Rakovec (1958, pp. 395-396 + 419-420) same months later. The site-1 was subsequently completely destroyed due to the expansion works of the quarry itself.

Over time, these expansion works have made it possible to distinguish six other sites (2, 3a, 3b, 4a, 4b, and 5) which yielded a remarkable number of faunal remains.

From the sites 3a-3b – probably originally linked – Pavlovec & Pohar (1997) mention remains of an undetermined rhinoceros custula. The sites 2-3a-3b were destroyed by subsequent excavation works shortly thereafter (at the beginning of the third millennium). Jamnik et al. (2013) report on rhinoceros remains from the site 4b illustrating – in their article – an upper molar belonging to *S. kirchbergensis*.

Some time later Križnar & Presinger (2017) reported on a very well-preserved third upper molar presenting the typical characteristics of *S. kirchbergensis* (e.g., the tooth remarkable brachyodontia, the notable diameter – about 30 mm – at the base of the

Fig. 3 - The Črni Kal (San Sergio, in Italian) quarry along the Koper-Kozina ring road 409 very close to the edge of the Karst plateau, next to the small inhabited centre of Črni Kal (Koper Municipality, Primorska region [Slovenian Karst-Littoral statistical region]) (photo by E.M.E. Billia, 2025).
- *La cava di Črni Kal (San Sergio) lungo la circonvallazione 409 Capodistria-Kozina – molto prossima al margine dell'altopiano carsico – nei pressi del piccolo centro abitato di Črni Kal (Comune di Capodistria, Regione del Litorale sloveno) (foto E.M.E. Billia, 2025).*

cone) found in the new site named Črni Kal-3 ("Novo Najdišče-3") located in the northern part of the Črni Kal quarry.

Both the "Novo Najdišče-3" and the third upper molar are respectively figured in Križnar & Presinger (2017, p. 91, fig. 3 and p. 93, fig. 5-C).

Further expansion of the Črni Kal quarry allowed to bring back to light the site 5, unfortunately now destroyed (Križnar & Preisinger 2017).

Over the course of several years, Hitij & Polak found a great amount of fossil remains in the Črni Kal quarry.

Among these, remains attributable to at least two species of Pleistocene rhinoceroses (including *S. kirchbergensis*) were also found. This remarkable and rich fossil assemblage is currently the subject of a very extensive study, the results of which will be included in a forthcoming publication.

Albania (The Republic of)

The Gajtan Cave (SE of Shkodër, between the villages of Renc and Gur i Zi, Shkodër Municipality, N-W Albania) is formed by karst in the Triassic-Jurassic limestones and starts with a karst well. Next to it, there is a Iron Age fortified Illyrian settlement. The earliest records of human activity on the Albanian territory have been discovered just in this cave. In 1980s, exploration of the Gajtan Cave (Fistani 1993) yielded Lower Palaeolithic artefacts. The artefact assemblage consists of chopping-tools, atypical handaxes and "other tools", mostly made of quartzite.

Artefacts apart, the cave of Gajtan (Darlas 1995) also contained warm-loving mammalian fauna including *Dicerorhinus* cf. *mercki* (= *Stephanorhinus* cf. *S. kirchbergensis*), *Sus scrofa* L., 1758, *Cervus elaphus* L., 1758, *Capreolus capreolus* L., 1758, *Dama dama* L., 1758, *Bison priscus* Bojanus, 1827 as well as carnivore remains. Traces of defleshing, intentional fragmentation and fire were observed on the collected bones. Based on the faunal remains, the Gajtan Cave layers were dated to the late phase of the Middle Pleistocene (Holstein interglacial) (Fistani 1993; Darlas 1995).

The diagnosis concerning *S. kirchbergensis* is expressed here doubtfully. If it will be confirmed in the future, this would be the first find of this species in Albania and immediately contiguous areas.

Poland, § 1.13, p. 24-25 – (an updated overview)

The *S. kirchbergensis* skeleton from Górzow Wielkopolski (NW-Poland) dated approximately 120 ka apart (Sobczyk et al. 2020; Stefaniak et al. 2023a), an updated summary of the twelve other Polish sites that – throughout history – yielded *S. kirchbergensis* remains is presented schematically here (Stefaniak et al. 2023b; Stefaniak et al. 2024). Unfortunately, most of them are unable to provide precise datings:

1. Chmeilnik quarry – 3. Grudziądz, Wisła River – 4. Grupa, Świecie county – 5. Imbramowice – 6. Kamieńczyk – 7. "Konin" Brown Coal Mine – 8. Minięta, Sztum county – 9. Oborniki – 10. Opatów – 11. Siekierki, a Warsaw district, Wisła River – 12. Szczęśliwice near Warsaw – 13. Wrocław, Hallera street 1.

Therefore the *S. kirchbergensis* remains come from Lower Silesia, Wielkopolska (Polonia Maior, in Latin), Pomerania as well as from Central and Eastern Poland. Mostly of them were found in lacustrine and fluvial deposits (Stefaniak et al. 2023b). They consist of skulls, mandibles, teeth, and bones (Ślósarski 1884; Gürich 1905; Gürich 1913; Hermann 1911; Hermann 1913; Pax 1921; Lubicz-Niezabitowski 1926; Schroeder 1930; Kowalski 1959; Czyżewska 1962; Borsuk-Białynicka & Jakubowski 1972; Lorek 1988; Kubiak 1989a; Kubiak 1989b; Wiśniewski et al. 2009, 2013, 2022; Zervanová 2014; Badura et al. 2017; Marciszak et al. 2019; Sobczyk et al. 2020; Alexandrowicz et al. 2021).

The specimen from Górzow Wielkopolski represents the only almost complete *S. kirchbergensis* skeleton ever found on Eurasian territory to date. Attributed to a female individual, on the basis of the results deriving from the osteometric investigations it would be one of the largest known individuals of the species (Stefaniak et al. 2021a).

Based on the results of geological and palaeobotanical analyses, both the *S. kirchbergensis* from Gorzów Wielkopolski and the "Konin" Brown Coal Mine lived during the warmest stages of the Eemian Interglacial (MIS 5e) (Sobczyk et al. 2020; Stefaniak et al. 2021a, 2021b).

The remains found at Szczęśliwice near Warsaw are historically the first *S. kirchbergensis* remains found in Poland.

Those from Imbramowice, "Konin" Brown Coal Mine, and Gorzów Wielkopolski were found in sediments of the Eemian Interglacial (MIS 5e). They are the earliest confirmed occurrences of the species in Poland. At the same time, they are also the oldest occurrences of *S. kirchbergensis* in Poland.

However, based on geological investigations, the specimen found at the Wrocław-Hallera 1 site may be even earlier (Wiśniewski et al. 2009, 2013, 2022). The interglacial age may be supported by the results of δ13C isotope studies of tooth enamel which indicate that the Wrocław-Hallera 1 individual lived in a "canopy forest" environment (Stefaniak et al. 2021a).

Isotopic data obtained for the well-known *S. kirchbergensis* skull from Siekierki district in Warsaw (Borsuk-Białynicka & Jakubowski 1972) indicate that the *S. kirchbergensis* from Siekierki likely lived in a colder period (e.g., the end of the Eemian Interglacial or the beginning of the Last Glacial).

This is the only information that allowed a possible stratigraphic attribution in the absence of a precise dating for this specimen (Stefaniak et al. 2021a).

Ukraine, § 1.16, p. 25

Here, *S. kirchbergensis* is reported for the first time from Biljaïvka (Beljaevka, in Russian) representing one of the earliest occurrences of this species in Europe (Stefaniak et al. 2023a, 2023b). At that time, two *S. kirchbergensis* mandible fragments from Biljaïvka (Martonosha Interglacial, MIS 17) were described by Logvynenko (2008).

Other rhinoceros remains – no better identified – previously ascribed to *Dicerorhinus* aff. *merki* (Jäger, 1839) [= *S.* aff. *S. kirchbergensis* (Jäger, 1839)] coming from Syniakove-1 (Pidoplichko 1956) have been assigned to *Coelodonta antiquitatis* (Blumenbach, 1799).

In literature, Syniakove-1 is almost always reported as Synjakovo-1 (in accordance with the Russian language). The Syniakove-1 site (49°01'44" N – 25°49'23" E) is situated near Čortkiv (Ternopil'/Ternopol' Oblast', W-Ukraine). Here, remains of 48 species were found. Among them, the most significant are: *Spelaearctos spelaeus* Rosenmüller, 1793 (small form), *Crocuta* cf. *spelaea* Goldfuss, 1823, *Felis spelaea* Goldfuss, 1810 [recte *Panthera spelaea* (Goldfuss, 1810)], *Cuon* sp., *Canis* sp. (Pidoplichko 1956). Together with the *C. antiquitatis* remains from Vasylivka (47°26'36" N – 35°16'48" E) (Vasil'evka, in Russian) (Zaporižžja Oblast', E-Ukraine), those from Syniakove/Synjakovo-1 represent the oldest *C. antiquitatis* Ukrainian finds. Both the sites are dated to MIS 13–12, like the oldest *C. antiquitatis* finds in Poland (Stefaniak et al. 2023b).

Asia

China (The Popular Republic of), § 2.7, pp. 28-29 – (an updated overview)

As in Tong (2001, pp. 585-586) in China – at least at that time – the Rhinocerotidae family included seventeen genera and sixty-two species (including four subspecies and two variants) recognised or originally named in China. According to Tong & Moigne (2000), Quaternary is one of the most productive periods for rhino fossils in China. In this regard, it should be noted that more recent studies (Tong & Wu 2010; Pandolfi 2022; Antoine et al. 2025, *inter alios*) are

able to provide more updated and refined insights into rhinocerotid diversity and fossil distribution during this period.

Among all, the most frequent ones turned out to be *Rhinoceros sinensis* Owen, 1870 [= *Rhinoceros plicidens* Koken, 1885 = *Rhinoceros simplicidens* Koken, 1885], *Coelodonta antiquitatis* (Blumenbach, 1799), and *Dicerorhinus mercki* (Jäger, 1839) [= *S. kirchbergensis* (Jäger, 1839)].

Even if *R. sinensis, C. antiquitatis,* and *S. kirchbergensis* are among the most frequently appearing species it does not mean that they are the best known ones, especially as regards *R. sinensis* (Tong & Moigne 2000, p. 261, fig. 3).

All the material relating to *C. antiquitatis* is very well-preserved unlike that attributed to *D. mercki* / *S. kirchbergensis*.

Until a few years ago, *R. sinensis* and *D. mercki* / *S. kirchbergensis* were the subject of heated debates. Recently, scholars have taken note of the fact that there are only modest morphological differences between the two species: the *R. sinensis* teeth are much smaller by comparison with those of *D. mercki* / *S. kirchbergensis,* and their ectolophs are characterised by strong ribs on the outer wall (Tong 2002, p. 118). *D. mercki* / *S. kirchbergensis* remains are more abundant in N-E China where the species spreaded across the Yangtze River (Tong 2002, p. 118). Conversely, *R. sinensis* has the highest frequency of occurrence in S. China, even if this may be attributed to an inappropriate taxonomic classification of the species (Tong & Moigne 2000, p. 257).

Some authors consider *R. sinensis* to be a junior synonym of *R. unicornis* (Bacon et al. 2008; Yao et al. 2023). However – in this specific regard – other important works dealing with the taxonomic status of Southern China Middle Pleistocene *R. sinensis* should be considered (Antoine 2012, pp. 161, 164, 165, and 166; Antoine et al. 2022, p. 421, *inter alios*).

Regarding the *S. kirchbergensis* phylogenetic position, in the recent past Deng et al. (2011) placed this species in the *Dihoplus* genus on the basis of their cladistic analyses. Subsequently, other scholars (e.g., Kirillova et al. 2017, pp. 4-7, fig. 5; Cappellini et al. 2019, pp. 103-107, fig. 4; Liu et al. 2021, pp. 4875-4879, fig. 2; Pandolfi 2023, pp. 291-293, figs. 1-3) placed *S. kirchbergensis* outside the *Dihoplus* lineage presenting more comprehensive morphological and molecular frameworks.

According to Tong (2012, p. 560), "*S. kirchbergensis* is the most geographically and temporally widespread species among all the Dicerorhinae recovered in China. The taxonomy of this species has been in a state of confusion over the past few decades because the majority of the Quaternary non-*Coelodonta* rhinoceroses in North China were allocated to this species. Unfortunately, most of the fossil specimens are very poorly-preserved".

Being difficult to determine the origin of the Chinese Quaternary rhino fauna, probably the non-*Coelodonta* Dicerorhinae came from Europe (Tong 2012).

In any case, about thirdy Chinese localities with *S. kirchbergensis* fossils were reported.

The *S. kirchbergensis* Chinese time span goes from the Early to the Late Pleistocene with a concentration in the Middle Pleistocene (Tong 2002).

From the Middle Pleistocene (absolute age = 0,5 Ma) of the Huludong Cave (where the Nanijing *Homo erectus* was discovered) (Tong 2002, p. 112) come: a) a damaged maxilla (N-D001) with D1, D2, D3, and D4 on the left side, and D1, D2, D3 on the right side; b) a right hemimaxilla (N-D002) with D1, D2, D3, and D4; c) four other isolated teeth: a right D3 (N-D003), a right d4 (N-D004), a left m1 (N-D005), and a left p2 (N-D006). Both N-D001 and N-D002 remains are figured in Tong (2002, p. 112, figs. 1, 2).

The remains on the whole are placed in the collections of the Institute of Vertebrate Palaeontology and Palaeoanthropology of the Chinese Academy of Sciences [IVPP-CAS] in Beijing.

In addition, there are some other specimens from the same site: d) a left hemimaxilla with D1, D2, D3, and D4 (D.053); e) a right P3 (D.0-164), a left P4 (D.0-165), a left D4 (D.0-167), and a left D3 (D.0-168) which are in the collections of the Nanjing Municipal Museum.

According to Tong et al. (2019, p. 626), *S. kirchbergensis* remains were found in the Bailongdong (or Bailong Cave, Yunxi County, N-W part of the Hubei Province) which is a cave site of ancient humans.

The remains (Tong et al. 2019, p. 627, fig. 5) consist of: two second upper molars (IVPP V 26161.1 and IVPP V 26161.2, fig. 5-7, fig. 5-8), an upper and a lower deciduous molars (IVPP V 26161.3; and YXM-004, fig. 5-9, fig. 5-10), a third metacarpal, Mc III (YXM-005, fig. 5-11), a right talus (IVPP V 26161.4, fig. 5-12).

Zhangshan (lower Huaihe River Region, Suqian, Jiangsu Province) is a fossil locality which was accidentally found in the 1950's during the Xinyihe River construction project (Chen et al. 2020).

In more recent times other early Late Pleistocene remains were collected (the whole of finds is known as the "Zhangshan fauna"): *Alligator* cf. *sinensis* Fauvel, 1879, *Palaeoloxodon huaihoensis* Qi, 1999, *Equus hemionus* Pallas, 1774 (= *Equus hemionus* Stehlin & Graziosi, 1935 = *Equus asinus* Frisch, 1775), *Sus lydekkeri* Zdansky, 1928, *Sinomegaceros ordosianus* (Young, 1932), *Cervus (Sika) grayi* (Zdansky, 1925) (recte *Cervus grayi* Zdansky, 1925), and *Bison priscus* Bojanus, 1827.

Among them, a damaged *S. kirchbergensis* third lower molar (XZSF.6) was also recovered (Chen et al. 2020, p. 323, fig. 2-E1, E2). The Zhangshan fauna suggests a mixed habitat of swamp, forest and grassland in a relatively warm and humid climate. The early Late Pleistocene age is presumed only (Chen et al. 2020, p. 320).

From the Middle Palaeolithic open-air site of Xuchang-Lingjing (Henan) in a lowland depression at the southern edge of the Northern China Plain, apart from two fragmented, incomplete human (possibly Denisovan) skulls (Xuchang 1 and Xuchang 2), more than 15,000 artefacts and more than 40,000 mammalian remains representing at least 20 taxa, three *S. kirchbergensis* teeth (upper P3 dext., upper P4 dext., lower p3? sin.) were also discovered (Wang et al. 2022, Table 9, fig. 10a–c).

However, the fact that the Lingjing assemblage represents the southernmost Palearctic fauna questions the assumption that the Lingjing Middle Palaeolithic finds date from an interglacial period. A late Middle Pleistocene (MIS 6) or Late Pleistocene glacial or stadial phase (MIS 4) seems more likely (Wang et al. 2022).

According to Tong (2012, p. 560), "the best material is an almost complete cranium with all the teeth in situ (IVPP V2682) from CKT Loc. 20 (Chow 1963)".

Moreover, a good number of damaged crania, mandibles, isolated teeth, and postcranial material come from CKT Loc. 1 (Wang 1931; Chow 1979) and CKT Loc. 13 (Teilhard de Chardin & Pei 1941) as well as from Anping, Liaoning Province (Xu 1986).

A few specimens also come from the Nanjing *Homo erectus* site (Huang 1996; Tong 2002).

The fauna found in the Yanlidong Cave (Guangxi Zhuang Autonomous Region, Southern China) (Yao et al. 2023) also includes rhinoceros remains: three teeth (p. 7-fig. 5, (11) YL-2-7-440, right DP1; (12) YL-2-7-439, right m2; (13) YL-R-432, left M3), and a tooth fragment.

All these remains were attributed by the authors to *R. sinensis* and dating back to around 0.6 Ma B.P. (Uranium-series dating on fossil teeth and layered flowstones).

Back in the past, Wang (1961) reported on the presence of *Rhinoceros mercki* and *Stegodon zdanskyi* Hopwood, 1935 at Taiyuan (Shanxi Province). However, in China it is assumed that *Stegodon zdanskyi* was present from 3.5 to 2.9 Ma B.P. (Geer et al. 2011) or at least to disappear around 2.0 Ma B.P. (Saegusa et al. 2005). Tong (2006) considers Taiyuan a Middle Pleistocene site.

Among the whole Chinese localities which gave back *S. kirchbergensis* remains, the earliest occurrences would currently be those from Gongwangling (latest Early Pleistocene) (Liu et al. 2015) and from the Tuozidong Cave dated to approximately 1.6 Ma B.P. (Dong et al. 2013).

Obviously, such ancient datings may induce a certain skepticism ... However, it is worth remembering here that – at that time – the Gongwangling site was dated to the late Early Pleistocene / early Middle Pleistocene (at that time, about 1,36 Ma B.P.) (Hu & Qi 1978). Not only: most likely, the Xihoudu (Xihoudu = Hsi Hou Tu) site was also date to the same period (Chia & Wang 1978).

However, it should be noted that – at that time – *Dicerorhinus kirchbergensis, Dicerorhinus mercki,* and *Dicerorhinus choukoutienensis* were considered as synonymous.

In any case, if the datings of the first two deposits (Gongwangling and Tuozidong) were confirmed, these would be the earliest ones in all of Eurasia.

With regard to the site of CKT-Loc. 13 (early Middle Pleistocene, about 0,78 Ma B.P.) (Tong 2012), the dating would not be in doubt.

As for the youngest records in China, three sites are known in literature: the Xiniudong site, also known as the "Rhino cave" (Hongping Town, Shennongjia Forest District, Hubei Province) (Wu 1998; Tong & Wu 2010), the Xiaogushan marble cave (Haicheng, Liaoning Province, north of Liaodong Peninsula, N-E China) (Zhang et al. 1985), and the Harbin site (Heilongjiang, the northernmost Chinese province) (Tong 2012).

The "Rhino cave" in the Shennongjia Forest District is an atypical site. This is not only due to the unusual altitude at which it is located (over 2,000 meters asl), but also because it is considered the richest site in *S. kirchbergensis* remains after CKT. In addition to several very well-preserved *S. kirchbergensis* (*R. sinensis*, in Wu 1998, p. 125) remnants the site gave also back a good number of Middle Palaeolithic tools (scrapers, pointed tools, gravers, awls, picks, …) (Wu 1998). The whole of the faunal remains allows dating the "Rhino cave" to the Late Pleistocene (Tong & Wu 2010).

Although the Palaeolithic culture present in Shennongija is not mentioned (it seems that to date no specific name has been attributed to it), the tools themselves found there are already eloquent. In this regard, it is worth remembering here that the Palaeolithic has different extensions depending on the different areas of the planet. As far as China is concerned, it must be considered that the different Cultures in China make their appearance in the Middle-Upper Palaeolithic / Upper Palaeolithic only.

According to Hou et al. (2013), compared to the classical Middle and Upper Palaeolithic culture sequence in Europe, Late Pleistocene lithic materials in China seem to lack a clear divisional criterion for Middle and Upper Palaeolithic.

The Xiaogushan marble cave (Haicheng, Liaoning Province, north of Liaodong Peninsula, N-E China) (Zhang et al. 1985) was excavated in 1983. Here, thirty-eight mammalian species were found, *S. kirchbergensis* included. In addition to the mammalian remains, a very rich collection of stone artifacts, ornaments, bone and antler implements, ash from cooking fire ("Xiaogushan Industry technical style") were also recovered. On the base of the mammal fauna the authors dated the Xiaogushan fauna to the Late Pleistocene, while the associated important "Xiaogushan Culture" complex allows for an even more precise chronological placement, the Upper Palaeo-

lithic (Zhang et al. 1985). The dating – at that time proposed by Zhang et al. (1985) – is consistent with the chronology for the Chinese Palaeolithic.

Later, Zhang et al. (2010) confirming the Upper Palaeolithic age of the numerous lithic and bone artifacts found in the Xiaoguashan cave do not fail to underline that these are similar to those of the Upper Palaeolithic Culture ("Osborn") in Europe and that Xiaogushan represents the oldest evidence for Eyed bone needles in China.

Regarding the Harbin (Heilongjiang) site, Tong (2012) stated that it represents the youngest site among all the sites that yielded remains of *S. kirchbergensis,* dating it to approximately 20 ka B.P.

However, at the present moment this dating appears to be only supposed.

In conclusion, the chronological placements of the first two sites (Shennongija and Xiaogushan) – presenting faunas associated with two Palaeolithic Chinese Cultures – appear more realistic than the third one (Harbin).

In this case, Shennongija and Xiaogushan – together with the Chondon River site (Yakutya, Russian Far East) (Kirillova et al. 2017) – would become the three youngest *S. kirchbergensis* records on the entire Eurasian territory.

Japan

In this area, the *S. kirchbergensis* presence has already been discussed in Billia & Zervanová (2022).

Here, other indeterminate rhinoceros species were also present from Early to Middle Pleistocene (Handa & Takahashi 2024). It is necessary point out that several Plio-Pleistocene rhinoceros specimens are in private collections, or have not yet been published, or have been lost (Handa & Takahashi 2024).

Based on the recent revision carried out on the currently available material by the two Japanese authors,

the following few remains have been attributed to *S. kirchbergensis* (previously *Dicerorhinus nipponicus* Shikama et al., 1967, vel *Dicerorhinus nipponicus,* Shikama 1970, vel *Dicerorhinus nipponicus,* Kamei 1981): those from the Isa Cement Quarry at Isa (Kagoshima Prefecture, southern tip of the island of Kyushu) (NMNS-PV 9600, n. 255 and n. 256) and that from a limestone fissure of the Yosizawa quarry (Ôgano at Kuzuû, Tochigi Prefecture, Kantō region, on the island of Honshū) (n. 94347861).

This last specimen was collected in December 1947 (Handa & Takahashi 2024, figs. 3, 4, and 5; Nagasawa 1953; Nagasawa 1961, fig. 1).

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References

Adam K.-D. 1958. Dicerorhinus kirchbergensis *(Jäger) aus einer Karsthöhle bei Črni Kal (Istrien, Jugoslawien)*, Razprave, Slovenska Akademija Znanosti i Umetnosti, 4, pp. 437-440.

Alexandrowicz W., Skoczylas-Śniaz S., Sobczyk A., Stefaniak K., Kotowski A., Przybylski B., Ciszek D., Badura J., Urbański K. 2021. *Mollusc faunas of lake deposits in Gorzów Wielkopolski (NW Poland) as an indicator of environmental changes during Eemian and Early Weichselian*, Geological Quarterly, 65(3), p. 36.

Antoine P-O. 2012. *Pleistocene and Holocene rhinocerotids (Mammalia, Perissodactyla) from the Indochinese Peninsula*, Comptes Rendus Palevol, 11, pp. 159-168.

Antoine P-O., Reyes M.C., Amano N., Bautista A.P., Chang C-H., Claude J., De Vos J., Ingicco T. 2022. *A new rhinoceros clade from the Pleistocene of Asia sheds light on mammal dispersals to the Philippines*, Zool J Linn Soc, 194, pp. 416-430.

Antoine P-O., D. Becker, L. Pandolfi, Geraads D. 2025. *Evolution and fossil record of Old World Rhinocerotidae,* in Melletti M., Talukdar B., Balfour D. (eds.), Rhinos of the World: ecology, conservation, and management, Springer Cham, pp. 31-48.

Anzidei A.P., Caloi L., Giacopini L., Mantero D., Palombo M.R., Sebastiani R., Segre A.G. 1993. *Saggi di scavo nei depositi pleistocenici del km. 18,900 della via Aurelia e di Collina Barbattini (Castel di Guido-Roma)*, Archeologia Laziale, 11, pp. 81-90.

Bacon A.M., Demeter F., Duringer P., Helm C., Bano M., Vu The Long, Nguyen Thi Kim Thuy, Antoine P.O., Bui Thi Mai, Nguyen Thi Mai Huong, Dodo Y., Chabaux F., Rihs S. 2008. *The late Pleistocene Duoi U'Oi cave in Northern Vietnam: palaeontology, sedimentology, taphonomy, and palaeoenvironments*, Quaternary Science Review, 27 (15-16), pp. 1627-1654.

Badura J., Ciszek D., Kotowski A., Przybylski B., Ratajczak U., Stefaniak K., Urbański K. 2017. *Szczątki nosorożca (*Stephanorhinus *sp.) oraz daniela (*Dama dama*) odkryte w osadach kopalnego jeziora eemskiego na Równinie Gorzowskiej*, Przegląd Geologiczny, 65, pp. 219-226.

Billia E.M.E. 2011a. *Occurrences of* Stephanorhinus kirchbergensis *(Jäger, 1839) (Mammalia, Rhinocerotidae) in Eurasia. An account*, Acta Palaeontologica Romaniae, 7, pp. 17-40.

Billia E.M.E. 2011b. *Siti paleontologici a "Rinoceronte di Merck",* Stephanorhinus kirchbergensis *(Jäger, 1839) (Mammalia, Perissodactyla), in Istria, Quarnero e Dalmazia*, Atti Centro Ricerche Storiche, Rovigno / Centar za Povijesna Istrazivanja, Rovinj / Središče za Zgodovinska Raziskovanja Rovinj, 41, pp. 9-31.

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-Acta Geologica Hungarica, 57(2), pp. 163-92.

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

Billia E.M.E., & Zervanová J. 2015. Stephanorhinus kirchbergensis *(Jäger, 1839) (Mammalia, Rhinocerotidae) from Vernasso (Udine, NE Italy) and other localities in adjacent areas with reports on Oligo-Mio-Pliocene rhinoceroses*, Gortania. Geologia, Paleontologia, Paletnologia, 37, pp. 65-83.Billia E.M.E., & Zervanová J. 2016. *Some other occurrences of* Stephanorhinus kirchbergensis *(Jäger, 1839) (Mammalia, Rhinocerotidae) from Eurasia. Addenda to other previous works,* Gortania. Geologia, Paleontologia, Paletnologia, 38, pp. 77-83.

Billia E.M.E., & Zervanová J. 2022. *Further reports of* Stephanorhinus kirchbergensis *(Jäger, 1839) (Mammalia, Rhinocerotidae) from Eurasia – Addenda 5*, Gortania. Geologia, Paleontologia, Paletnologia, 44, pp 5-13.

Borsuk-Bialynicka M., & Jakubowski G. 1972. *The skull of* Dicerorhinus mercki *(Jäger) from Warsaw*, Prace Muzeum Ziemi, Prace Paleozoologiczne, Polska Akademia Nauk, Warszawa, 20, pp. 187-199.

Briatico G., Gioia P., Bocherens H. 2023. *Diet and habitat of the late Middle Pleistocene mammals from the Casal de' Pazzi site (Rome, Italy) using stable carbon and oxygen isotope ratios*, Quat Int, 676 (3), pp. 53-62.

Caloi L., Palombo M.R., Zarlenga F. 1998. *Late Middle Pleistocene mammal faunas of Latium (Central Italy): stratigraphy and environment*, Quat Int, 47-48, pp. 77-86.

Cappellini E., Welker F., Pandolfi L., et al. 2019. *Early Pleistocene enamel proteome from Dmanisi resolves* Stephanorhinus *phylogeny*, Nature, 547(7776), pp. 103-107.

Ceruleo P., Rolfo M., Marra F., Petronio C., Salari L., Gatta M. 2019. *New chronological framework (MIS13-9) and depositional context for the lower Palaeolithic sites north-west of Rome – Revisiting the early hominin in central Italy*, Quat Int, 510, pp. 119-132.

Ceruleo P., Rolfo M., Petronio C., Salari L. 2021. *Review of Middle Pleistocene archaeological and biochronological data in Malagrotta, Ponte Galeria area (Rome, Central Italy)*, Atti della Società Toscana di Scienze Naturali - Memorie, Serie A, 128, pp. 85-103.

Chen X., Wu S., Wang P., Wang X., Chao J. 2020. *A report on the Late Pleistocene vertebrate fossils from the Zhangshan locality, Suqian, Jiangsu Province* [in Chinese, Abstract in English], Acta Anthropologica Sinica, 39(2), pp. 319-331.

Chia L.P. & Wang C.K. 1978. *Hsi-Hou-Tu – A Culture Site of Early Pleistocene in Shansi Province*, Pei-ching, Wenwu Press (Cultural Relics Publ. House), 85 p.

Chow, Ben Shun. 1963. *On the skull of Dicerorhinus choukoutienensis Wang from Choukoutien Locality 20* [in Chinese, Abstract in English], Vertebrata PalAsiatica, 7, pp. 62-70

Chow B.S. 1979. *The fossil Rhinocerotids of locality 1, Choukoutien* [in Chinese, Abstract in English), Vertebrata PalAsiatica, 17, pp. 236-258.

Czyżewska T. 1962. *Uzebienie górnej szczeki* Dicerorhinus mercki *(Jäger) ze Szczesliwice kolo Warszawy* [in Polish, Abstracts in Russian and English], Acta Palaeontol Pol, 71-2, pp. 223-234.

Darlas A. 1995. *The Balkans*, in Roebroeks W. & van Kolfschoten T. (eds.), *The Earliest Occupation of Europe: Proceedings of the European Science Foundation Workshop at Tautavel (France), 1993,* Analecta Praehistorica Leidensia, 27, pp. 51-59.

Deng T., Wang X., Fortelius M., Li Q., Wang Y., Wang T., Zhijie J, Takeuchi G.T., Saylor J.E., Säilä L.K., Xie G. 2011. *Out of Tibet – Pliocene woolly rhino suggests high-plateau origin of Ice Age megaherbivores*, Science, 333, pp. 1285-1288.

Dong W., Liu J., Fang Y. 2013. *The large mammals from Tuozidong (eastern China) and the Early Pleistocene environmental availability for early human settlements,* Quat Int, 295, pp. 73-82.

Fistani A. 1993. *Human Evolution in Albania for the Quaternary Period*, in Sigmon B. (ed.), Before the Wall Fell: The Science of Man in Socialist Europe, Toronto, Canadian Scholars Press, pp. 141-178.

Funiciello R., & Giordano G. 2008. *La Carta Geologica di Roma alla scala 1:10.000. Litostratigrafia e organizzazione stratigrafica*, in Funiciello R., Praturlon A., Giordano G. (eds.), La geologia di Roma: dal centro storico alla periferia, Roma, Memorie Descrittive della Carta Geologica d'Italia, 80, pp. 39-86.

Geer A. van der, Lyras G., De Vos J., Dermitzakis M. 2011. *Evolution of Island Mammals: Adaptation and Extinction of Placental Mammals on Islands*, Wiley-Blackwell, 479 p.

Gürich G. 1905. *Der Scheckenmergel von Ingramsdorf und andere Quartärfunde in Schlesien*, Jahrbuch der Königlich Preussischen Geologischen Landesanstalt und Bergakademie, 26, pp. 43-57.

Gürich G. 1913. *Weitere Aufschlussen im Schneckenmergel von Ingramsdorf*, Jahrbuch der Preußischen Geologischen Landesanstalt, 2, pp. 600-606.

Handa N., & Takahashi K. 2024. *A review of the taxonomy, biostratigraphy and paleobiogeography of Plio-Pleistocene rhinoceroses in Japan*, J Asian Earth Sci, 276, pp. 106-357.

Hermann R. 1911. *Über* Rhinoceros merckii *Jäger im Diluvium West-preussens und seine Beziehungen zur norddeutscher Diluvialfauna*, Zeitschrift der Deutschen Geologischen Gesellschaft, 63(1), pp. 13-35.

Hermann R. 1913. *Die Rhinoceroarten des westpreussuschen Diluviums*. Schriften der Naturforschenden Gesellschaft in Danzig, 13, pp. 110-173.

Hou Y-M., Yang S-X., Dong W., Zhang J-F., Yang L. 2013. *Late Pleistocene representative sites in North China and their indication of evolutionary human behavior*, Quat Int, 295, pp. 183-190.

Hu C. & Qi T. 1978. *Gongwangling Pleistocene mammalian fauna of Lantian, Shaanxi*, Palaeontologia Sinica, 155(21), pp. 36-39.

Huang Y.P. 1996. *Animal fossils*, in Tangshan Archaeological Team (eds.) Nanjing Municipal Museum and Archaeology Department of Peking University, Locality of the Nanjing Man fossils (1993-1994), Beijing, Cultural Relics Publ. House, pp. 183-188.

Jäger G.F. 1835-39. *Über die Fossilen Säugethiere Welche in Württemberg in Verschiedenen Formationen Aufgefunden*

Worden Sind, Nebst Geognotischen Bemerkungen über diese Formationen, Stuttgart, Carl Erhard Verlag, 214 p.

Jamnik P., Križnar M., Turk M. 2013. *Novi podatki o paleolitskih in paleontoloških najdiščih v kamnolomih Črni Kal in Črnotiče nad Koprom* [New data on Palaeolithic and palaeontological sites in the Črni Kal and Črnotiče quarries near Koprom] [in Slovenian], Arheološki Vestnik, 64, pp. 9-25.

Kirillova I.V., Chernova O.F., Made J. van der, Kukarskih V.V., Shapiro B., Plicht J. van der, Shidlovskiy F.K., Heintzman P.D., van Kolfschoten T., Zanina O.G. 2017. *Discovery of the skull of* Stephanorhinus kirchbergensis *(Jäger, 1839) above the Arctic Circle*, Quat Res, 88, pp. 537-550.

Kowalski K. 1959. *Katalog Ssaków Plejstocenu Polski*, Oddzial Kraków, Kraków, Polska Akademia Nauk, Institut Zoologii, pp. 153-154.

Križnar M., & Preisinger D. 2017. *Novo najdišče pleistocenske sesalske favne v kamnolomu pri Črnem Kalu (Primorska, Slovenija) ter problematika zaščite in ohranjanja najdišč v kamnolomih*, Geologija, 60-61, pp. 87-97

Kubiak H. 1989a. *Perissodactyla*, in Kowalski K. (ed.), *Historia i Ewolucja Lądowej Fauny Polski*, Wrocław, Zakład Narodowy im. Ossolińskich, pp. 197-201.

Kubiak H. 1989b. *Proboscidea*, in Kowalski K. (ed.), *Historia i Ewolucja Lądowej Fauny Polski*, Wrocław, Zakład Narodowy im. Ossolińskich, pp. 203-208.

Liu W., Dong W., Liu J., Fang Y., Limin Z. 2015. *New materials of the Early Pleistocene mammalian fauna from Tuozidong, Tangshan, Nanjing and the indications of paleoenvironment*. Quaternary Sciences, 35(3), pp. 596-606.

Liu S., Westbury M.V., Dussex N., et al. 2021. *Ancient and modern genomes unravel the evolutionary history of the rhinoceros family*, Cell, 184, pp. 4874-4885.

Logvynenko V.M. 2008. *Large Mammals of the Late Neogene and Early Anthropogene of Ukraine*, Kyïv, EKMO, 203 p.

López-González F. 2003. *Paleontology and Taphonomy of Pleistocene Macromammals of Galicia (NW Iberian Peninsula)*, Sada (A Coruña), Ediciós do Castro, 323 p.

Lorek I. 1988. *Szczątki nosorożca Mercka,* Dicerorhinus kirchbergensis *(Jäger, 1839) z eemskich osadów odkrywki Jőzwin Kopalni Węgla Brunatnego Konin*, Zeszyty Muzealne, Muzeum Okręgowe w Koninie, 2, pp. 105-112.

Lubicz-Niezabitowski K.E. 1926. *Szczatki Nosorozca Wlochatego (Rhinoceros antiquitatis Blum.) – Znalezione na Ziemi Wielkopolskiej*, Rocznik Muzeum Wielkopolski, 2, pp. 1-52.

Made J. van der. 2010. *The rhinos from the Middle Pleistocene of Neumark-Nord (Saxony-Anhalt),* Veröffentlichungen des Landesamtes für Denkmalpflege und Archäologie, 62, pp. 433-500.

Made J. van der, Rosell J., Blasco R. 2017. *Faunas from Atapuerca at the Early-Middle Pleistocene limit: the ungulates from level TD8 in the context of climatic change*, Quat Int, 433, pp. 296-346.

Marciszak A., Kotowski A., Przybylski B., Badura J., Wiśniewski A., Stefaniak K. 2019. *Large mammals from historical collections of open-air sites of Silesia (southern Poland) with special reference to carnivores and rhinoceros*, Hist Biol, 31(6), pp. 696-730.

Marra F., Ceruleo P., Pandolfi L., Petronio C., Rolfo M.F., Salari L. 2017. *The aggradational successions of the Aniene River Valley in Rome: age constraints to early neanderthal presence in Europe*, PLoS One, 12, e0170434.

Marra F., Nomade S., Pereira A., Petronio C., Salari L., Sottili G., Bahan J-J., Boschian G., Di Stefano G., Falguères C., Florindo F., Gaeta M., Giaccio F., Masotta M. 2018. *A review of the geologic sections and the faunal assemblages of Aurelian Mammal Age of Latium (Italy) in the light of a new chronostratigraphic framework*, Quat Sci Rev, 181, pp. 173-199.

Nagasawa J. 1953. *On a new fossil rhinoceros from Kuzuû* [in Japanese], Journal of the Geological Society of Japan, 59(694), p. 326.

Nagasawa J. 1961. *A fossil rhinoceros from Kuzuû, Tochigi Prefecture, Japan*. Transactions and Proceedings of the Palaeontological Society of Japan, New Series, 42, pp. 63-67.

Palombo M.R. 2023. The Casal de Pazzi mammal fauna – Biochronological and paleoecological notes, and research perspectives, in Gioia P., Milli S., Silvestri L. (eds.), *40 Years of Casal dé Pazzi in the Framework of Pleistocene Archeo-Paleontological Sites (400.000-40.000 BP): Current Knowledge and New Research Perspectives*, Journal of Mediterranean Earth Sciences, 15, pp. 81-105.

Pandolfi L. 2022. *A critical overview on Early Pleistocene Eurasian* Stephanorhinus *(Mammalia, Rhinocerotidae): Implications for taxonomy and paleobiogeography*, Quat Int, 674-675, pp. 109-120.

Pandolfi L. 2023. *Reassessing the phylogeny of Quaternary Eurasian Rhinocerotidae*. J Quat Sci, 38(3), pp. 291-294.

Pandolfi L., Martino R., Palombo M.R. 2023. *New insights on the fossil mammals from Casal de' Pazzi (Rome)*, Journal of Mediterranean Earth Sciences, 15, pp. 107-125.

Pavlovec R., Pohar V. 1997. *The Črni Kal Quarry – An example of destroying Geotopes*, Geologica Croatica, 50(2), pp. 181-184.

Pax, F. 1921. Die Tierwelt Schlesiens, Jena, Verlag von Gustav Fischer, 342 p.

Perrone F. 2016. *Il sito di Collina Barbattini nella biocronologia della Campagna Romana*. Unpublished Master Thesis in Natural Science, "Sapienza" Università di Roma, 74 p.

Petronio C., Di Stefano G., Kotsakis T., Salari L., Marra F., Jicha B.R. 2019. *Biochronological framework for the late Galerian and early-middle Aurelian Mammal Ages of peninsular Italy*, Geobios, 53, pp. 35-50.

Petronio C., Ceruleo P., Capasso Barbato L., Di Stefano G., Esu D., Ferracci A., Kotsakis T., Pandolfi L., Rolfo M., Salari L. 2023. *I siti paleontologici e paletnologici del Pleistocene dell'Area di Roma*, Atti della Società Toscana di Scienze Naturali, Memorie, Serie A, 130, pp. 47-71.

Pidoplichko I.G. 1956. *Materialy do Vyvchennia Mynulych Faun URSR* [Materials for the Study of the Extinct Faunas of UkSSR] [in Ukrainian], Kiev/Kyïv, Izd-vo AN UkSSR, Naukova Dumka, 225 p.

Rakovec I. 1958. *Pleistocenski sesalci iz jame pri Črnem Kalu v Istri,* Razprave, Slovenska Akademija Znanosti i Umetnosti, 4(4), pp. 367-433.

Saegusa H., Thasod Y., Ratanasthien B. 2005. *Notes on Asian Stegodontids*, Quat Int, 126-128, pp. 31-48.

Sanisidro O., & Cantalapiedra J.L. 2022. *The Rhinocerotidae fossil record in the Iberian Peninsula*, Hist Biol, 34(8), pp. 1591-1610.

Schroeder H. 1930. *Über* Rhinoceros mercki *und seine*

nord- und mitteldeutschen Fundstellen, Abhandlungen der Königlich Preussischen Geologischen Landesanstalt, 124, pp. 1-114.

Słósarski A. 1884. *Zwierzęta zaginione (dyluwialne) - Kilka slów o nosorozcach dyluwialnich* - Rhinoceros tichorhinus *Fischer i* Rhinoceros Merckii *Jäger*, Pamietnik Fizyjograficzny, 4(4), pp. 357-374.

Sobczyk A., Borówka R.K., Badura j., Stachowicz-Rybka R., Tomkowiak J., Hrynowiecka A., Sławińska J., Tomczak M., Pitura M., Lamentowicz M., Kołaczek P., Karpińska-Kołaczek M., Tarnawski D., Kadej M., Moska P., Krąpiec M., Stachowicz K., Bieniek B., Siedlik K., Bąk M., Made J. van der, Kotowski A., Stefaniak K. 2020. *Geology, stratigraphy and palaeoenvironmental evolution of the* Stephanorhinus kirchbergensis*-bearing Quaternary palaeolake(s) of Gorzów Wielkopolski (NW Poland, Central Europe)*, J Quat Sci, 35, pp. 539-558.

Staesche K. 1941. *Nashörner der Gattung* Dicerorhinus *aus Diluvium dem Württembergs*, Abhandlungen der Reichsstelle für Bodenforschung, 200, pp. 1-148.

Stefaniak K., Stachowicz-Rybka R., Borówka R.K., Hrynowiecka A., Sobczyk A., Moskal-del Hoyo M., Kotowski A., Nowakowski D., Krajcarz M.T., Billia E.M.E., Kovalchuk O. 2021a. *Browsers, grazers or mix-feeders? Study of the diet of extinct Pleistocene Eurasian forest rhinoceros* Stephanorhinus kirchbergensis *(Jäger, 1839) and woolly rhinoceros* Coelodonta antiquitatis *(Blumenbach, 1799)*, Quat Int, 605-606, pp. 192-212.

Stefaniak K., Kovalchuk O., Kotusz J., Stachowicz-Rybka R., Mirosław-Grabowska J., Winter H., Niska M., Sobczyk A., Barkaszi Z., Kotowski A., Malkiewicz M., Alexandrowicz W.P., Raczyński P., Badura J., Przybylski B., Ciszek D., Urbański K. 2021b. *Pleistocene freshwater environments of Poland: a comprehensive study of fish assemblages based on a multi-proxy approach*, Boreas, 50(2), pp. 457-476.

Stefaniak K., Kotowski A., Badura J., Sobczyk A., Borówka R.K., Stachowicz-Rybka R., Moskal-del Hoyo M., Hrynowiecka A., Tomkowiak J., Sławińska J., Przybylski B., Ciszek D., Alexandrowicz W.P., Skoczylas-Śniaz S., Ratajczak-Skrzatek U., Shpansky A.V., Ilyina S.A., Moska P., Urbański K., Mirosław-Grabowska J., Niska M., Capalbo C., Nowakowski D., Made J. van der, Popović D., Baca M., Billia E.M.E. 2023a. *A skeleton of peat-trapped forest rhinoceros* Stephanorhinus kirchbergensis *(Jäger, 1839) from Gorzów Wielkopolski, Northwestern Poland: a record of life and death of the Eemian large mammals*, Neues Jahrb Geol Palaontol Abh, 308(1), pp. 45-77.

Stefaniak K., Kovalchuk O., Ratajczak-Skrzatek U., Kropczyk A., Mackiewicz P., Kłys G., Krajcarz M., Krajcarz M.T., Nadachowski A., Lipecki G., Ridush B., Sabol M., Płonka T. 2023b. *Chronology and distribution of Central and Eastern European Pleistocene rhinoceroses (Perissodactyla, Rhinocerotidae) – A review*, Quat Int, 674-675, pp. 87-108.

Stefaniak K., Ratajczak-Skrzatek U., Zarzecka-Szubińska K., Nowakowski D., Frydrychowicz D. 2024. *Szczatki nosorożca lesnego (Stephanorinus kirchbergensis), na odkrywce "Jőzwin" KWB Konin - zapomniane znalezisko*, Koninskie Zeszyty Muzealne, Muzeum Okregowe w Koninie, 18, pp. 109-118.

Teilhard de Chardin C.P., & Pei W-C. 1941. *The fossil mammals from Locality 13 of Choukoutien*, Palaeontologia Sinica, Series C, 11, pp. 1-106.

Tong, H.W. 2001. *Rhinocerotids in China – Systematics and material analysis / Les Rhinocerotidae de Chine: systématique et repartition*, Geobios, 34(5), pp. 585-591.

Tong, H.W. 2002. *Fossil material of rhinoceros (*Dicerorhinus mercki*) from the Middle Pleistocene Nanijing* Homo erectus *site*, Nanjing, Jiangsu Science and Technology Publishing House, pp. 111-120.

Tong, H.W. 2006. *Mammalian faunal differentiations between North and South China during the Quaternary period*, L'Anthropologie, 110, pp. 870-887.

Tong, H.W. 2012. *Evolution of the non-*Coelodonta *dicerorhine lineage in China – Évolution des Dicérorhinés (autres que* Coelodonta*) de Chine*, Comptes Rendus Palevol, 11, pp. 555-562.

Tong H.W. & Moigne A-M. 2000. *Quaternary rhinos in China*, Acta Anthropologica Sinica, 19, pp. 257-263.

Tong H.W. & Wu X.Z. 2010. Stephanorhinus kirchbergensis *(Rhinocerotidae, Mammalia) from the Rhino Cave in Shennongjia, Hubei*, Chin Sci Bull, 55(12), pp. 1157-1168.

Tong H.W., Zhang B., Wu X., Qu S. 2019. *Mammalian fossils from the Middle Pleistocene human site of Bailongdong in Yunxi, Hubei*, Acta Anthropologica Sinica, 38(4), pp. 613-640.

Wang K.M. 1931. *Die Fossilen Rhinocerotiden von Choukoutien*, Contributions from the National Research Institute of Geology, Nanking, 1(3), pp. 69-84.

Wang T.Y. 1961. *The occurence of* Stegodon *and Merck's Rhinoceros near Taiyuan, Shansi*, Vertebrata PalAsiatica, 6(2), pp. 160-163.

Wang H., Li Z., Tong H., van Kolfschoten T. 2022. *Hominin paleoenvironment in East Asia – The Middle Paleolithic Xuchang-Lingjing (China) mammalian evidence*, Quat Int, 633, pp. 118-133.

Wiśniewski A., Stefaniak K., Wojtal P., Zych J., Nadachowski A., Musil R., Badura J., Przybylski B. 2009. *Archaeofauna or palaeontological record? Remarks on Pleistocene fauna from Silesia*, Sprawozdania Archeologiczne, 61, pp. 31-87.

Wiśniewski A., Adamiec G., Badura J., Bluszcz A., Kowalska A., Kufel-Diakowska B., Mikołajczyk A., Murczkiewicz M., Musil R., Przybylski B., Skrzypek G., Stefaniak K., Zych J. 2013. *Occupation dynamics north of the Carpathians and sudetes during the weichselian (MIS5d–3): the lower Silesia (SW Poland) case study*. Quat Int, 294, pp. 20-40.

Wiśniewski A., Wilczyński J., Przybylski B., Ciombor M., Stefaniak K. 2022. *Bovid bone accumulation in late Middle Palaeolithic Poland*, J Field Archaeol, 48(3), pp. 180-197.

Wu X.Z. 1998. *The report on the excavation of Palaeolithic cave at Shennongjia District, Hubei Province*, Acta Anthropologica Sinica, 17, pp. 121-136.

Xu X.F. 1986. Dicerorhinus kirchbergensis *(Jäger, 1839) from the late Middle Pleistocene mammalian fauna of Anping, Liaoning* [in Chinese, Abstract in English], Vertebrata PalAsiatica, 24, pp. 229-241.

Yao Y., Fan Y., Bae C.J., Tian C., Liang H., Chen J., Zhang B., Wei S., Shao Q., Wei L, Wang W. 2023. *Early Mid-Pleistocene mammal fauna from Yanlidong Cave, South China*, Hist Biol, pp. 1-18. https://doi.org/10.1080/08912963.2023.2185886

Zervanová J. 2014. *Vyhynutí Zástupcovia Čeľade Rhinocerotidae z Územia Slovenska – Celkové Zhodnotenie*. Thesis submitted to the Chair of Geology and Palaeontology, Faculty of Natural Sciences, Universitas Comeniana Bratislavensis in Bratislava for the degree of "Doctor of Philosophy", 187 p.

Zhang J-F., Huang W-W., Yuan B-Y., Fu R-Y., Zhou L-P. 2010. *Optically stimulated luminescence dating of cave deposits at the Xiaogushan prehistoric site, northeastern China*, J Hum Evol, 59, pp. 514-524.

Zhang Z., Fu R., Chen B., Liu J., Zhu M., Wu H., Weiwen H. 1985. *A preliminary report on the excavation of Palaeolithic site at Xiaogushan of Haicheng, Liaoning province*, Acta Anthropologica Sinica, 6(1), pp. 70-79.

Indirizzi degli Autori – Author's addresses
- Emmanuel M.E. Billia
Roma, Italy
e-mail: e.billia@yandex.ru

- Júlia Zervanová
Drobného 16/9
84101 Bratislava
e-mail: lia20lia@gmail.com