Stephanorhinus elatus (Rhinocerotidae, Mammalia): proposal for the conservation of the earlier specific name and designation of a lectotype

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Published on 30 December 2016

urn:lsid:zoobank.org:pub:5CA3AFDD-AD86-4261-9CFE-ADE163E32A33

Ballatore M. & Breda M. 2016. — *Stephanorhinus elatus* (Rhinocerotidae, Mammalia): proposal for the conservation of the earlier specific name and designation of a lectotype. *Geodiversitas* 38 (4): 579-594. https://doi.org/10.5252/g2016n4a7

ABSTRACT
Croizet & Jobert (1828) described as *Rhinoceros elatus* a large rhinoceros from the late Pliocene deposits of the Puy-de-Dôme District (Auvergne, France). In the following century and a half, the species had been sporadically recognized and its name had been almost forgotten. Guérin (1972) described as *Dicerorhinus jeanvireti* the remains of the same species from the locality of Vialette (Haute-Loire, France), pretending that "*elatus*" was a *nomen oblitum*. After that, the name "*jeanvireti*" was used by most of the following authors. At present, there is general agreement in the literature that the two names are synonyms but some authors prefer "*elatus*" while others use "*jeanvireti*", thus leading to increasing confusion. The present investigation reveals that "*elatus*" deserves the right of priority because in 1972 it was not a *nomen oblitum*. The younger synonym "*jeanvireti*", according to the rules of the International Code of Zoological Nomenclature, cannot be considered a valid name. Furthermore, most of the rhinoceros remains described by Croizet & Jobert (1828), namely the syntypes of the species, are still existing and are housed at the Muséum national d'Histoire naturelle in Paris. Since this material has never been described in detail after Croizet & Jobert's work, it is revised in modern key and compared to close fossil species. Among this material, an articulated anterior leg is hereby designated as lectotype of the species *Stephanorhinus elatus* Croizet & Jobert, 1828.

KEY WORDS
Nomenclatur,
Etouaires,
lectotypification.

RÉSUMÉ
Stephanorhinus elatus *(Rhinocerotidae, Mammalia) : proposition de conservation de l'ancien nom d'espèce et désignation d'un lectotype.*
Croizet & Jobert (1828) ont décrit en tant que *Rhinoceros elatus* un grand rhinocéros des dépôts du Pliocène tardif du Puy-de-Dôme (Auvergne, France). Au cours du siècle-et-demi suivant, cette espèce n'a été qu'occasionnellement reconnue, et son nom a presque sombré dans l'oubli. Guérin (1972) a attribué à *Dicerorhinus jeanvireti* les restes de la même espèce originaires de la localité de Vialette (Haute-Loire, France), affirmant que « *elatus* » était *nomen oblitum*. Par la suite, le nom de « jeanvireti » sera utilisé par la plupart des auteurs suivants. À l'heure actuelle, il est généralement admis dans la littérature que les deux noms sont synonymes, mais certains auteurs préfèrent « *elatus* » tandis que d'autres utilisent « *jeanvireti* », ce qui peut prêter à confusion. La présente étude révèle que « *elatus* » est prioritaire puisqu'il n'était pas *nomen oblitum* en 1972. Selon le Code international de Nomenclature zoologique, le plus récent synonyme « *jeanvireti* » ne peut pas être considéré comme valide. De plus, la majorité des restes de rhinocéros décrits par Croizet & Jobert (1828), qui sont les syntypes de cette espèce, existent encore et sont conservés au Muséum national d'Histoire naturelle à Paris. Parmi ce matériel, une patte antérieure articulée est désignée comme lectotype de l'espèce *Stephanorhinus elatus* Croizet & Jobert, 1828. Depuis le travail de Croizet & Jobert, ce matériel n'avait jamais été décrit en détail. Il est révisé ici et comparé à des espèces fossiles proches.

MOTS CLÉS
Nomenclature,
Etouaires,
lectotypification.

INTRODUCTION

Rhinoceroses are an important element of the European mammal faunas of the Plio-Pleistocene and their study brings significant contributions to the reconstruction of the palaeoenvironment, palaeoclimate and ecology of the continental palaeocommunities. Many authors treated the various species in detail but, unfortunately, the reduced morphological variability in the teeth and postcranial bones, often led to erroneous identifications of the remains. An additional problem, especially during the past centuries, is the disagreement about the specific names to be used for the different forms, which led to wrong interpretations.

The most iconic example is the different meaning of *Rhinoceros leptorhinus* Cuvier, 1822: *R. leptorhinus* was introduced by Cuvier (1822) describing Italian remains form Piacenza (Italy) and distinguishing this species from *R. ticorhinus* Cuvier, 1822 (considered a synonym of *Coelodonta antiquitatis* Blumenbach, 1799), but de Christol (1834) erroneously considered these two species as synonyms and introduced *R. megarhinus* referring to the coeval fossil remains from Montpellier (France), indeed belonging to the same species of Piacenza (Guérin *et al.* 1969). Later, Owen (1846) improperly attributed the name *R. leptorhinus* to some English remains more recent than those from Piacenza and currently attributed to *Stephanorhinus hemitoechus* Falconer, 1868 (Guérin *et al.* 1969). Thus, *R. leptorhinus* "sensu Cuvier" is considered *S. megarhinus*; *R. leptorhinus* "sensu de Christol" is considered *C. antiquitatis*; *R. leptorhinus* "sensu Owen" is considered *S. hemitoechus.*

Most of the nomenclatural problems and disagreements concerning the Quaternary rhinoceroses have now been solved (e.g. Guérin 1980; Fortelius *et al.* 1993). The present paper aims to tackle one of the problems still to be addressed concerning a large rhinoceros species from the European Late Pliocene.

Croizet & Jobert (1828) described the species *Rhinoceros elatus* on material collected from several localities in the Puy-de-Dôme District (Auvergne, France). This species has been rarely recognized and its name has not been used very frequently through the 19th century. As a consequence, the specific name "*elatus*" had been almost forgotten at the point that Guérin (1972), in recognizing the same species at Vialette (Haute-Loire, France), introduced the new name *Dicerorhinus jeanvireti*, pretending that "*elatus*" should have been considered a *nomen oblitum*. The name "*jeanvireti*" was accepted by most of the following authors. Since the European fossil rhinoceroses have been grouped into the genus *Stephanorhinus* Kretzoï, 1942 (after Groves 1983; Fortelius *et al.* 1993), the name *S. jeanvireti* has been preferably used (first by Campanino *et al.* 1994 – see the list of other authors using *Stephanorhinus* in the Appendix) even if Guérin and few others still prefer *Dicerorhinus* (e.g. Holec 1996; Guérin & Tsoukala 2013).

While the acceptance of the generic name *Stephanorhinus* is almost universal and does not need discussion (see Fortelius *et al*. 1993; Lacombat 2005), the nomenclatural problem regarding the specific epithet still needs to be properly addressed. In fact, although there is general agreement in the literature that the two names are synonyms and that they represent a true species, some authors prefer *S. elatus* while others use *S. jeanvireti*. The aim of this paper is investigating the question in order to point out which name should be correctly used.

Rhinoceros elatus Croizet & Jobert, 1828

Croizet & Jobert (1828) described the species *Rhinoceros elatus* in the treatise on the Perrier Plateau and surrounding area (Puy-de-Dôme, Auvergne, France). The authors were dealing with an heterogeneous set of bones collected from different places: "Telles sont les circonstances qui accompagnent les

TABLE 1. — List of the specimens of *Stephanorhinus elatus* described by Croizet & Jobert (1828) and now mostly housed at the MNHN. The bones not recorded in the 1829-1857 catalogue have not been accessioned at the MNHN. Other specimens which are recorded in the 1829-1857 catalogue but are not present in the MNHN's collection have now been lost.

Croizet & Jobert 1828	Element	Side	MNHN.F.	Previous number	1829-1857 catalogue
p. 144; fig. 1, pl. VI; fig. 8, pl. XII	Mandibular fragment with M2-M3 and the disjointed rostral portion	–	(not found)	–	100
p. 146-147; fig. 7, pl. I and fig. 1, pl. V	Cervical vertebra and dorsal vertebra	–	(not found)	–	100.7-100.8
p. 147; fig. 2, pl. XII	Humerus	R	PET2002	–	100.1
p. 148; fig. 1, pl. XII	Radius	R	AC 2317	AC 2317	100.2
p. 148; fig. 5, pl. XI	Metacarpal III	R	PET244	AC 2332	100.3
p. 148; fig. 6, pl. XI	Metacarpal II	R	PET242	AC 2333	100.3
p. 149 (not figured)	Magnum	–	–	–	(not listed)
p. 150; fig. 3, pl. V	Femur (diaphysis of young individual)	–	–	–	(not listed)
p. 150; fig. 1, pl. XI	Femur	–	–	–	(not listed)
p. 150; fig. 2, pl. XI	Femur	R	PET2003	–	100.4
p. 152; fig. 3B, 4, 5 and 6, pl. IV	Astragalus	L	PET240	AC 2327	100.5
p. 152; fig. 3A, pl. IV and fig. 2, pl. V	Calcaneus	L	PET239	–	100.5
p. 152; fig. 4, 7, pl. XI	Astragalus and calcaneus (young individual)	–	–	–	(not listed)
p. 152; fig. 4, pl. V	Cuneiform	–	–	–	(not listed)
p. 152; fig. 3, pl. XI	Metatarsal III	L	PET245	–	100.6

fossiles dans les divers gisements que nous avons exploités. Le ravin des Etouaires, Malbattu, les lignites, enfin la pente de Perrier qui regarde Issoire" (Croizet & Jobert 1828: 91), but they reported the rhinoceros remains as coming from the Perrier Mountain and Malbattu. In the "Montaigne de Perrier" are included several minor localities, then collectively considered as Etouaires after Heintz (1970). As concerning Malbattu, a fragmented mandible is reported, and Croizet & Jobert (1828) erroneously considered it together with the specimens collected in the Perrier Mountain. Despite the close position, the sediments outcropping at Malbattu are not coeval with the lower strata of the Perrier Mountain (Pomel 1846; Depéret *et al.* 1923).

Croizet & Jobert's work is a well detailed description, including figures and metric tables, of 17 skeletal elements (Table 1). The authors compare the bones by a morphological and biometrical point of view with the two fossil species known at that time (*R. leptorhinus* and *R. ticorhinus* now respectively called *S. megarhinus* and *Coelodonta antiquitatis*) and with the five extant species. Croizet & Jobert (1828) point out how the rhinoceroses remains they were describing differ from the other fossil species in being more slender, and as this peculiarity is particularly evident in the distal elements of the limb (metapodial bones). Although the authors do not designate a holotype, the specimens described and pictured represent on their own right syntypes of the species *S. elatus*.

DICERORHINUS JEANVIRETI GUÉRIN, 1972

Guérin (1972) describes the species *Dicerorhinus jeanvireti* on the rhinoceros remains from the Lower Villafranchian site of Vialette (Haute-Loire, France).

The rhinoceros remains from Vialette have been given a very confusing set of names by previous authors (Pomel 1852; Pictet 1853; Falconer 1868; Sacco 1895; Depéret *et al.* 1923; Viret 1954; Thenius 1955; Bout 1960; Azzoroli 1962; Kurtén 1963; Hürzeler 1967), but none of them approached the rhinoceros from Vialette to the species described by Croizet & Jobert, Guérin (1972) being the first author to clearly state they were the same species.

Guérin (1972: 59) explains that he would not "retenir les anciennes dénomination qui sont toutes des *nomina oblita* et dont aucune ne convenait parfaitement par suite de l'absence de diagnose ou de figuration, et parce que la plupart recouvrait plusieurs espèce". Moreover, Guérin (1972: 58) equates his new species to Croizet & Jobert's "*elatus*": "Une dénomination plus ancienne me paraît également pouvoir s'appliquer en partie au rhinocéros de Vialette: il s'agit de *Rhinoceros elatus*, décrit en 1828 par J.B. Croizet & A. Jobert, à partir de quelques pièces osseuses provenant sans doute de Perrier-Etouaires.".

In conclusion, Guérin (1972) recognizes the rhinoceros from Vialette as the same species from Etouaires described by Croizet & Jobert (1828), but refuses the name "*elatus*" as a *nomen oblitum* and introduces the epithet "*jeanvireti*" as a tribute to Prof. Jean Viret.

MATERIAL AND METHODS

The International Code of Zoological Nomenclature (ICZN) is the reference for the zoological nomenclature and any nomenclatural diatribe must be analyzed and resolved accomplishing its rules. Thus the present research starts from an analysis of the rules involved in this case and takes under investigation the bibliographical works using any of the two synonyms, in order to evaluate if Guérin (1972) was correct in considering the older synonym as a *nomen oblitum*.

Then the rhinoceros bones from Etouaires stored at the Muséum national d'Histoire naturelle, Paris (MNHN) are analysed and compared to the descriptions and pictures by Croizet & Jobert (1828), namely the syntypes of the species, in order to clarify how many of them are still present, and to assess their preservation state. The specific identity of the rhinoceros remains from Etouaires and from Vialette has

been stated at first by Guérin (1972), however he did not give evident comparison. So the syntypes from Etouaires are here compared with the corresponding elements from Vialette stored at the Naturhistorisches Museum Basel (NMB) and at the Musée des Confluences, Lyon (MHNL), in order to confirm whether they belong to the same species (i.e., if *S. jeanvireti* and *S. elatus* are synonyms).

Moreover, according to Guérin (1972, 1980) and Heintz *et al.* (1974), Etouaires yielded also some *S. etruscus* remains in addition to the material described by Croizet & Jobert (1828). Indeed, the amount of specimens collected from Etouaires through time is larger than the restricted batch described in 1828. This further material is scattered in several European Museums and a revision is ongoing but only the batch of Croizet & Jobert (1828) is relevant to the present nomenclatural issue. In order to assess whether any of them might pertain to this species, the syntypes of *S. elatus* are compared with the corresponding bones of *S. etruscus* from the locality of Senèze (Guérin 1980; Lacombat 2005), here chosen as a morphological and metrical reference for this species. The studied material is housed at the MNHN, at the NMB and in the Collections de Géologie of the Laboratoire de Géologie de Lyon – Terre Planètes Environnement, Université Claude Bernard Lyon 1 (UCBL).

All the specimens have been measured according to the biometrical method of Ballatore (PhD thesis, Ballatore 2016), that summarizes and integrates previous methods (Guérin 1980; Fortelius *et al.* 1993; Lacombat 2005) and morphological characters have been observed.

PRIORITY OF THE SPECIFIC EPITHET "*ELATUS*"

The current 4th Edition of the ICZN (1999: art. 23.1) quotes: "The valid name of a taxon is the oldest available name applied to it, unless that name has been invalidated or another name is given precedence by any provision of the Code or by any ruling of the Commission". This means that, when two synonyms are in use, the earlier one must be preferred based on the Principle of Priority but it can be rejected in case it is a *nomen oblitum*.

Thus, if in 1972 the specific epithet "*elatus*" could have been considered a *nomen oblitum*, Guérin would have been allowed to choose a new name for the rhinoceros species from Vialette and Etouaires, otherwise his younger name "*jeanvireti*" must be rejected in virtue of the Principle of Priority.

Results

In order to prove if in 1972 "*elatus*" was a *nomen oblitum*, we carried out a close examination of the literature from 1828 to present. The Appendix lists all the 77 works in which either "*elatus*" or "*jeanvireti*" has been used. Some of these works deserve particular attention.

In 1868 Falconer specifically refers to Croizet & Jobert's *Rhinoceros elatus* even if the author does not believe it is a distinct species and claims: "The *Rhinoceros elatus* of Croizet, and the *R. mesotropus* of Aymard, found in Auvergne, are not distinct species. I have examined the chief collections in Auvergne. The specimens in M. Pichot's collection and in the Museum of Le Puy are mainly *R. etruscus*, while the *R. mesotropus* of Aymard comprises both *R. leptorhinus* and *R. antiquitatis*" (1868: 309).

Falconer (1868: 315) also testifies that in the 19th century "*elatus*" had not been recognized as a distinct species from other, previously described, rhinoceroses: "Croizet and Jobert, in 1828, described and figured remains of a Rhinoceros from Puy-de-Dome, which from its general slender proportions they designated *Rhinoceros elatus*. No perfect cranium of this form has yet been discovered in the Velay; and the jaws and teeth at present known are not sufficiently pronounced to determine with certainty whether *Rhinoceros elatus* is distinct, or to what nominal species it ought to be referred. De Blanville identified it with the Miocene *Rhinoceros incisivus*! Laurillard doubted whether it ought to be referred to *R. megarhinus* or to *R. leptorhinus*; Pomel refers it to his *Atelodus aymardi*, which includes *R. elatus*, together with *R. megarhinus* of Christol; and Gervais hesitatingly refers it, together with Owen's form of *R. leptorhinus* from Clacton, also to *R. megarhinus*".

Other specialistic 19th century works do not mention "*elatus*" (de Christol 1834; Owen 1846; Sacco 1895), but this name is used in some non specialized works (e.g. "The penny cyclopaedia of the society for the diffusion of useful knowledge" (Knight 1837) and "The geology and extinct volcanos of central France" (Scrope 1858)).

Also in the 20th century most authors did not recognize the validity of "*elatus*" and attributed its remains to different rhinoceros species (Sacco 1906; Toula 1911; Kretzoï 1942; Schaub 1943; Thenius 1955; Piveteau 1958; Kurtén 1963; Hürzeler 1967). The only exception was Depéret *et al.* (1923: 29) who record the species from Perrier giving the synonymy "*Rhinoceros etruscus* Falconer (= *R. elatus* Croizet et Jobert)" and, later, Feru *et al.* (1965) and Rădulescu & Kovács (1968) who record *Dicerorhinus elatus* from Romania considering it as a valid name: "Aceasta succesiune de ordin stratigrafic, stabilita pentru tara noastra in bazinul Baraolt, ar putea fi identificata eventual cu saria urmatoare di Europa occidentala: *D.* cf. *megarhinus* de la Vialette, *D. elatus* de la Perrier-Etouaires (ind. *D. megarhinus* de la Valdarno inferiore si poate *D. etruscus* var. *astensis* de la Dusino), *D. etruscus* din Valdarno superiore" (Feru *et al.* 1965: 291, 292).

Just four years after Rădulescu & Kovács's (1968) work, Guérin (1972) introduces the name "*jeanvireti*" and wrongly refuses "*elatus*" as a *nomen oblitum*.

After the designation of *D. jeanvireti*, most of the authors follow Guérin but significantly some continue using "*elatus*". In particular Samson & Rădulescu (1973: 217) point out the nomenclatural issue in a specific note: "Toutefois, la nomenclature de ces Rhinocéros n'est pas des plus claires ; il est connu que l'on a décrit des Etouaires *Rhinoceros elatus* Croizet et Jobert et de Dusino *Rhinoceros etruscus* var. *astensis* Sacco (= *D. megarhinus astensis* d'après Hürzeler 1967), les deux formes datant également du 'Villafranchien inférieur' comme *D. jeanvireti* de Vialette, auquel, de plus, elles sont assez apparentées. Il est d'usage, d'après les règles de nomen-

TABLE 2. — Biometric data of *Stephanorhinus elatus* Croizet & Jobert, 1828 lectotype and paralectotype from Etouaires in comparison with the values of *S. elatus* from Vialette (NMB, MHNL) and of *S. etruscus* Falconer, 1868 from Senèze (MNHN, NMB, UCBL). Measurements in mm. Since the humerus is badly damaged, the measurements in brackets could be unreliable because affected by the restoration.

Body part (MNHN.F collection number)	Specimen from Etouaires	Specimen from Vialette			Specimen from Senèze		
		N	Mean	Range	N	Mean	Range
Humerus (MNHN.F.PET2002)							
Max. length	(390)	–	–	–	–	–	–
Distal breadth	(130)	–	–	–	–	–	–
Distal depth (lateral side)	(91)	–	–	–	–	–	–
Trochlear medial length	85	6	99	98-100	9	77	66-82
Trochlear lateral length	60	6	73	71-74	9	57	49-63
Trochlear breadth	92	6	100	97-102	8	85	75-90
Radius (MNHN.F 2317)							
Max. length	385	6	408	390-420	7	361	340-380
Proximal breadth	98	6	101	98-104	8	90	82-97
Proximal depth	67	5	67	66-70	10	57	52-61
Breadth of the diaphysis	51	7	47	41-55	10	44	34-49
Depth of the diaphysis	41	7	44	36-49	10	39	33-45
Distal breadth	98	7	105	90-108	9	89	85-94
Distal depth	68	5	68	60-72	10	63	60-69
McIII (MNHN.F.PET244)							
Max. length	223	5	222	210-235	9	200	192-210
Proximal breadth	57	5	65	62-68	10	54	50-56
Proximal depth	50	6	54	46-58	10	46	41-48
Breadth of the diaphysis	53	6	56	52-60	11	48	42-53
Depth of the diaphysis	21	5	23	21-24	11	20	18-22
Distal breadth	65	5	65	60-72	11	57	54-61
Distal articular breadth	54	5	53	51-55	9	47	45-49
Distal depth	42	5	48	41-50	11	39	35-42
McII (MNHN.F.PET242)							
Max. length	193	1	204	–	8	176	170-181
Proximal depth	46	1	40	–	9	42	37-45
Breadth of the diaphysis	40	2	40	38-41	9	28	24-32
Depth of the diaphysis	25	2	30	25-35	9	27	21-30
Distal breadth	47	3	50	48-51	9	40	36-45
Distal articular breadth	39	3	41	40-43	9	34	26-40
Distal depth	40	3	46	44-48	10	38	33-41
Femur (MNHN.F.PET2003)							
Max. length	495	7	521	510-535	5	430	390-470
Proximal breadth	190	7	197	190-201	3	156	133-168
Proximal depth	85	5	91	86-97	4	63	50-74
Distal breadth	140	8	152	145-157	8	121	111-132
Distal lateral depth	135	7	141	135-148	7	110	102-114
Trochlear breadth	80	6	80	77-90	4	70	66-73
Head breadth	85	8	94	91-99	5	79	75-84
Head depth	81	8	91	88-96	6	76	70-79
Astragalus (MNHN.F.PET240)							
Max. length	87	5	92	90-96	8	76	75-81
Max. breadth	93	6	102	100-104	9	83	79-85
Medial length	80	5	85	82-89	10	68	63-73
Medial depth	60	6	63	60-65	10	53	48-55
Lateral length	82	5	84	82-85	9	69	65-74
Lateral depth	45	6	46	45-48	9	38	35-40
Calcaneus (MNHN.F.PET239)							
Max. length	131	3	137	130-149	7	120	111-130
Max. breadth	82	4	84	83-85	6	71	69-74
Max. depth	70	3	74	73-75	10	58	51-65
MtIII (MNHN.F.PET245)							
Max. length	195	4	202	199-204	5	172	165-179
Proximal breadth	54	6	57	52-59	8	47	43-54
Proximal depth	45	5	46	42-51	8	42	38-45
Breadth of the diaphysis	45	6	48	44-52	7	39	33-42
Depth of the diaphysis	23	5	25	23-26	6	22	20-24
Distal breadth	55	4	63	59-65	8	50	43-54
Distal articular breadth	46	3	49	47-50	6	43	38-45
Distal depth	40	3	43	41-45	8	38	36-39

clature (Code International de Nomenclature Zoologique, IIe Édition, Londres, 1964), de retenir le nom le plus ancien qui a été appliqué au taxon respectif, en l'occurrence *elatus*. Mais, nous sommes d'accord avec Guérin (1972) pour accepter une différence possible entre le Rhinocéros de Vialette (3,8 MA) et celui des Etouaires (3 ou 3,4 MA) ; on aurait affaire, dans ce cas, à deux sous-espèces successives de *D. elatus* (*D. elatus jeanvireti* au début, *D. elatus elatus* ensuite). C'est d'ailleurs ce que nous avons déjà suggéré, d'après un matériel malheureusement assez incomplet, en séparant les Rhinocéros du commencement du 'Villafranchien inférieur' (*D.* cf. *leptorhinus* = *D.* cf. *megarhinus*) de ceux de la fin du même intervalle (*Dicerorhinus* sp. = ? *D. elatus*) (Feru *et al.* 1965; Rădulescu & Kovács 1968)".

Thus the authors do not consider "*jeanvireti*" as synonymous of "*elatus*" but, rather, as an earlier evolutionary stage, proposing a distinction in two subspecies: *D. elatus jeanvireti* and *D. elatus elatus* respectively.

Shortly after, Samson *et al.* (1973: 244) wrote in a foot note: "D'après Guérin (1972), les grands Rhinocéros du Villafranchien s.s. n'appartiennent pas à *D. leptorhinus* (= *D. megarhinus*) du Roussillon, mais à une nouvelle espèce, *D. jeanvireti.* La nomenclature reste cependant assez embrouillée vu que deux (sous) espèces ont été déjà créées : *D. elatus* aux Étouaires (Croizet et Jobert, 1828) et *D. megarhinus astensis* à Dusino (Sacco, 1895, Hürzeler, 1967)".

Nevertheless Guérin (1980: 444) confirms the preference for "*jeanvireti*" and clearly states that the new name replaces the old name "*elatus*": "On en retiendra que *D. jeanvireti* a été signalé pour la première fois dès 1828 par J.B. Croizet & A. Jobert qui décrivirent sous le nom de *Rhinoceros elatus* un mélange de restes de *D. jeanvireti* et *D. etruscus*. La confusion entre les deux espèces dura longtemps et fut même générale (voire à titre d'exemple le *Rhinoceros etruscus* var. *astensis* Sacco) ; par la suite *D. jeanvireti* sera souvent considéré comme une forme évoluée de *D. megarhinus* (Thenius 1955; Hürzeler 1967; Guérin *et al.* 1969). Remarquons que dès 1954, J. Viret s'était douté qu'il s'agissait d'une espèce particulière qu'il ne désignait plus que comme 'rhinocéros de Vialette'".

In the 21th century different authors seem to prefer the name "*elatus*" (Rădulescu *et al.* 2003; Palombo 2004, 2007; Rădulescu 2005; Masini & Sala 2007) but the nomenclatural issue has not been properly addressed. The only three papers referring to it being the following:

– Lacombat & Mörs (2008: 160) and Lacombat *et al.* (2008: 66) report this identical sentence "without any proper and detailed clarification of the nomenclature we will use *S. jeanvireti*, a species recognized by the ICZN". However they do not provide any references and their statement does not add any helpful information, and it is actually incorrect since the ICZN has never been consulted on this regard (A. Minelli pers. comm. 2014).

– Guérin & Tsoukala (2013) assign to *D. jeanvireti* some specimens from the Greek locality of Mila and put *R. elatus* in the synonymy list with these words: "*Rhinoceros elatus* Croizet & Jobert, 1828: 144-154. In pursuance of the article 23.12 of the International Code of Zoological Nomenclature, *nomen oblitum* because explicitly rejected by Guérin (1972), i.e. between 6th November 1961 and 1st January 1973, following the article 23b then in force between those dates" (Guérin & Tsoukala 2013: 454).

Then they give a more thoughtful picture of the problem declaring: "Croizet & Jobert (1828: 144-154, pl. I, fig. 7, pl. IV, figs 3-6, pl. V, figs 1-4, pl. VI, figs 1, pl. XI, pl. XII, figs 1, 2, 8) had proposed the name of *Rhinoceros elatus* for the Auvergne rhinoceros whose remains belonged to a mixture of several species, including *D. etruscus* and *D. jeanvireti*, according to the dimensions given in the book of Croizet & Jobert (1828). The exact location of that material is unknown. An important part of it was gathered in Perrier-les Étouaires, where *Dicerorhinus etruscus* and *D. jeanvireti* are sympatric. Another part, namely the mandible, which is the first rhino remain described by Croizet & Jobert (1828: 144-146), is from Malbattu, a much more recent site where *D. etruscus* is the sole rhino (Guérin 1980). Such a mixture and the lack of diagnostic characteristics are enough to invalidate the specific name "*elatus*", also completely forgotten for more than a century, but the fact that Croizet & Jobert's name is clearly a nomen oblitum is sufficient to discard it" (Guérin & Tsoukala 2013: 454).

Discussion

The focal problem is to understand whether or not, in 1972, Guérin had the right to consider "*elatus*" as a *nomen oblitum* and to introduce a new name. At that time, the 2nd Edition of The International Code of Zoological Nomenclature (ICZN 1964) was in force and, according to art. 23b: "A name that has remained unused as a senior synonym in the primary zoological literature for more than fifty years is to be considered a forgotten name (nomen oblitum)".

While Depéret *et al.* (1923) and Feru *et al.* (1965) could have refused the old name "*elatus*", since it had not been used after Falconer (1868) and thus for more than fifty years, Guérin (1972) could not. In fact, maintaining an old name is not forbidden, and authors are not forced to abandon a name after any time limit (A. Minelli pers. comm. 2014). On the contrary, after Depéret *et al.* (1923) and Feru *et al.* (1965), the name "*elatus*" could not be considered *oblitum* any more. Thus Guérin (1972) made a mistake considering that he clearly knew and quoted the works of these authors (Guérin 1972: 58, 140). Indeed, Guérin (1972) supported the identity of the rhinoceros species from Vialette (his "*jeanvireti*"), not only with the species from Etouaires (Croizet & Jobert's *R. elatus*), but also with that from the Romanian localities of the lower Villafranchian tentatively assigned to *D. elatus* by Feru *et al.* (1965), and Rădulescu & Kovács (1968). In particular, referring to the localities of Araci-Fintina Fagului, Virghis, Iarăș-Cariera Nouă and Ilieni, Guérin (1972: 140) stated: "la majorité des restes de rhinocéros provenant da ces gisements et désignés *Dicerorhinus* sp., *D.* sp. I et II, *D.* cf. *megarhinus* et *D. elatus* me parait appartenir à *D. jeanvireti*".

However, the present 4th edition of the ICZN (1999) considers the possibility for a younger name not to be re-

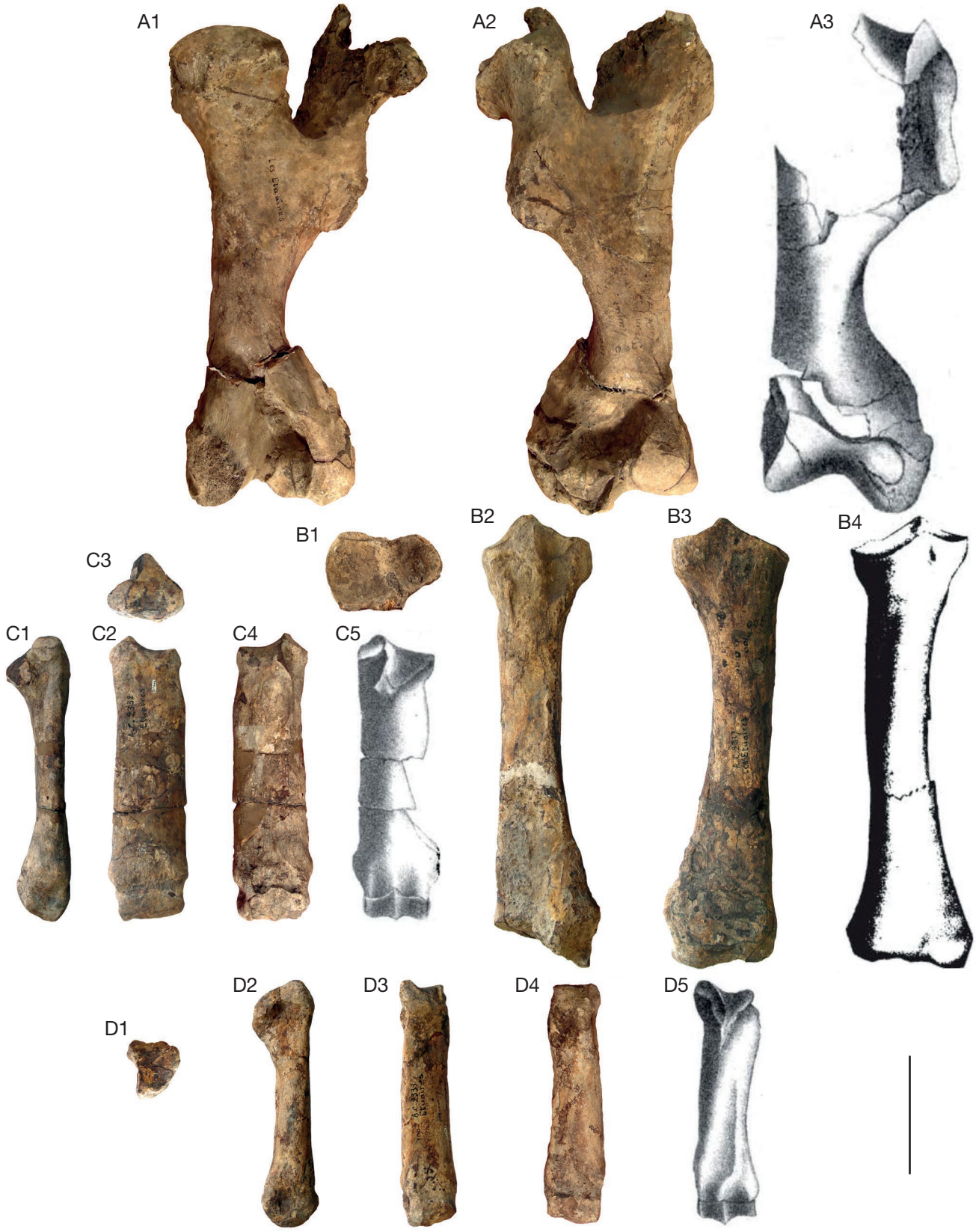

Fig. 1. — Lectotype of *Stephanorhinus elatus* Croizet & Jobert, 1828 from Etouaires and comparison with the corresponding figures by Croizet & Jobert (1828): **A**, humerus MNHN.F.PET2002: caudal (**A1**) and cranial (**A2**) views, mirrored drawing (**A3**) by Croizet & Jobert (1828: fig. 2, pl. XII); **B**, radius MNHN.F 2317: proximal (**B1**), caudal (**B2**) and cranial (**B3**) views, mirrored drawing (**B4**) by Croizet & Jobert (1828: fig. 1, pl. XII); **C**, McIII MNHN.F.PET244: lateral (**C1**), dorsal (**C2**), proximal (**C3**) and palmar (**C4**) views, mirrored drawing (**C5**) by Croizet & Jobert (1828: fig. 5, pl. XI); **D**, McII MNHN.F.PET242: proximal (**D1**), dorsal (**D2**), lateral (**D3**) and palmar (**D4**) views, mirrored drawing (**D5**) by Croizet & Jobert (1828: fig. 6, pl. XI). Scale bar: 10 cm.

placed by an older one, according to art. 23.12: "Names rejected under former Article 23b. A name that was rejected between 6 November 1961 and 1 January 1973, by an author who explicitly applied Article 23b in force between those dates under the then current editions of the Code, on the grounds that it was a *nomen oblitum* is not to be given precedence over a junior synonym in prevailing usage, unless the Commission rules that the older but rejected name is to take precedence".

Guérin & Tsoukala (2013: 454) support the priority of "*jeanvireti*" quoting art. 23.12 because the year of its introduction, 1972, falls in the time lapse considered (6 November 1961-1 January 1973), and because in 2013 it is "a junior synonym in prevailing usage".

But, Guérin (1972) does not make any explicit reference to art. 23b of the 2nd Edition (as requested by current art. 23.12) and the Commission has not pointed out any recommendation regarding this problem.

Moreover Guérin & Tsoukala (2013)'s statements fail in several aspects:

– the exact location of that material is unknown" (Guérin & Tsoukala 2013: 454). This is incorrect since it is clear from the text and plates by Croizet & Jobert (1828) that the rhinoceros material had been mostly collected from the localities of Mount Perrier then considered as Etouaires (after Heintz 1970) with only the mandible having been collected at Malbattu;

– "an important part of it was gathered in Perrier-les Étouaires, where *Dicerorhinus etruscus* and *D. jeanvireti* are sympatric" (Guérin & Tsoukala 2013: 454). It is true that both species were present at Etouaires (Guérin 1972; Heintz *et al.* 1974), but only the specimens collected by Croizet & Jobert (1828) are relevant to the nomenclatural issue and they all belong to *S. elatus* (see Results);

– "another part, namely the mandible, which is the first rhino remain described by Croizet & Jobert (1828: 144-146), is from Malbattu, a much more recent site where *D. etruscus* is the sole rhino (Guérin, 1980)" (Guérin & Tsoukala 2013: 454). The locality of Malbattu is indeed more recent than Etouaires (Pomel 1846; Depéret *et al.* 1923), but Guérin (1980) records a carpal bone of *D. etruscus brachicephalus* (= *S. hundsheimensis*) as the only rhinoceros remain from this locality. Since the mandible is no more available, and from the drawings by Croizet & Jobert (1828) it was quite incomplete and without any diagnostic character, the assertion by Guérin & Tsoukala (2013) cannot be proved.

Finally, we must consider whether the name "*jeanvireti*" could be treated as a *nomen protectum* following art. 23.9 (ICZN, 4th Edition) which rules the case of "reversal of precedence" and moderates the application of the "Principle of Priority" (art. 23.2). But in order to maintain the name in "prevailing usage" (i.e. "*jeanvireti*") the first condition to validate is: "Art. 23.9.1.1. the senior synonym or homonym has not been used as a valid name after 1899". Since "*elatus*" has indeed been used as a valid name by Feru *et al.* (1965), and Rădulescu & Kovács (1968), the name "*jeanvireti*" clearly cannot be considered a *nomen protectum*.

VALIDITY OF THE SPECIES *S. ELATUS* (CROIZET & JOBERT, 1828)

Guérin (1972: 58) gives further reasons to reject "*elatus*": "Le matériel de Croizet et Jobert se trouve dans les collections du Muséum national d'Histoire naturelle mais l'imprécision des descriptions et des figures ne permet pas d'y retrouver le type de l'espèce. L'appellation de *R. elatus* recouvre surtout du matériel appartenant à *D. etruscus*, et aussi très probablement à un ou plusieurs rhinocéros de Pléistocène moyen".

Guérin's (1972) statement is incorrect because Croizet & Jobert's (1828) figures are quite accurate and they give a detailed morphometrical description. Actually it is true that Croizet & Jobert did not designate a holotype (as it was not compulsory at their time), but the syntypes are clearly enumerated and still recognizable, thus the choice of a lectotype, among them, is not difficult. The assessment of the specific identity of the specimens described by Croizet & Jobert, is carried out below.

Results

Even if part of the drawings by Croizet & Jobert (1828) have been flipped to the mirror image of the original specimen (possibly during the print process), and although the authors did not record whether the specimens were left or right, the match between the fracture lines on the drawings and on the specimens makes the identification of most of the bones quite easy (Figs 1; 2). The bones are still preserved, for the most, in the collections of the MNHN (Table 1) in fact Croizet offered his personal collection to the Museum of Paris in 1830 (Grellet 1863). However, only a part of the bones described by Croizet & Jobert (1828) were accessioned at the MNHN and appear in the 1829-1857 catalogue (see Table 1). Some of the specimens have never been accessioned and some others appear in the catalogue but have not been found, so they must have been lost at a later time (C. Argot pers. comm. 2015).

Measurements of the specimens are provided in Table 2.

Mandible

This is the only specimen from Malbattu among the rhinoceroses described by Croizet & Jobert (1828). This specimen is listed in the 1829-1857 catalogue, but it is not present in the collection of the MNHN. Since Guérin (1980) does not record any mandible from Malbattu, probably it was not available already in 1980.

Vertebrae

Croizet & Jobert (1828) described a cervical and dorsal vertebrae and even if they are recorded in the 1829-1857 catalogue, neither of them is present in the MNHN's collection and probably they had been lost before 1972 since neither Guérin (1972) nor Heintz *et al.* (1974) record these bones.

Humerus (Fig. 1A)

Specimen MNHN.F.PET2002 is a very badly restored humerus bearing very few morphological and metrical information. The proximal epiphysis has been almost completely reconstructed

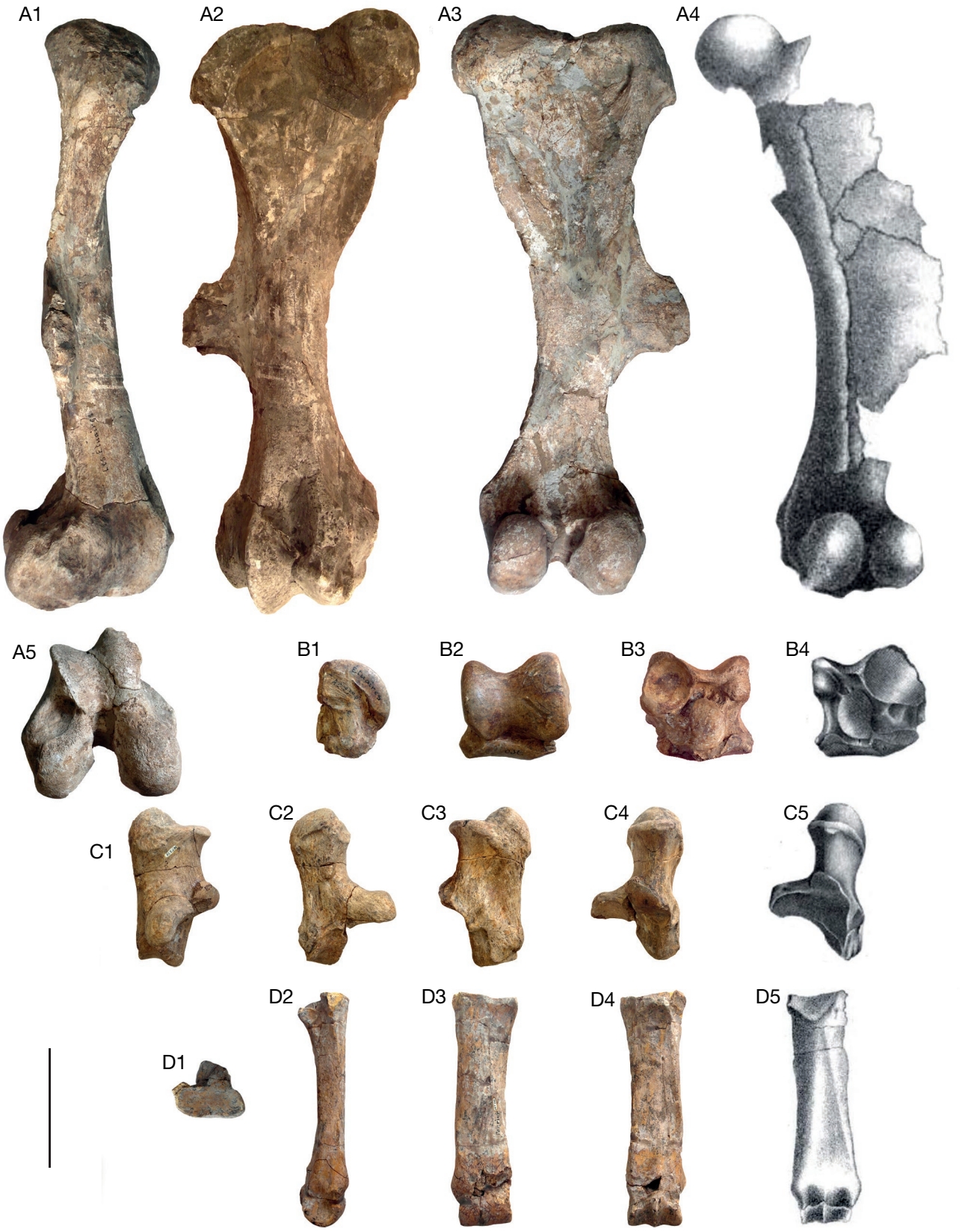

Fig. 2. — Paralectotype of *Stephanorhinus elatus* Croizet & Jobert, 1828 from Etouaires and comparison with the corresponding figures by Croizet & Jobert (1828): **A**, femur MNHN.F.PET2003: lateral (**A1**), cranial (**A2**), caudal (**A3**) views, drawing (**A4**) by Croizet & Jobert (1828: fig. 2, pl. XI) and distal view (**A5**); **B**, astragalus MNHN.F.PET240: medial (**B1**), dorsal (**B2**), plantar (**B3**) views, mirrored drawing (**B4**) by Croizet & Jobert (1828: fig. 5, pl. IV); **C**, calcaneus MNHN.F.PET239: medial (**C1**), plantar (**C2**), lateral (**C3**), dorsal (**C4**) views, drawing (**C5**) by Croizet & Jobert (1828: fig. 2A, pl. V); **D**, MtIII MNHN.F.PET245: proximal (**D1**), medial (**D2**), dorsal (**D3**), palmar (**D4**) views, drawing (**D5**) by Croizet & Jobert (1828: fig. 3, pl. XI). Scale bar: 10 cm.

so that the measurements are not precise. The articular head is original but missing its anatomical edge, no other structures are preserved in original (no greater and lesser trochanter, intertubercolar groove, lateral-caudal tubercle). The diaphysis is original from the middle to the distal part, while the proximal part is not reliable (the position of the deltoid tuberosity is probably incorrect). The distal epiphysis is fragmented in several pieces but they have been well recomposed along the fracture lines: the cranial side is reliable with only the lateral half of the trochlea incomplete; the caudal side, on the contrary, only preserves the lateral epicondyle (incomplete in the portion that connects with the diaphysis) while the medial epicondyle is missing. No diagnostic morphological characters are detectable and the bad preservation makes the few possible measures quite imprecise. However, since the distal trochlea articulates perfectly to the alleged associated radius, we can confidently confirm that they belong to the same individual. As a consequence of this, the specimen is indirectly identified as *S. elatus* (see radius below).

This is the only specimens described by Croizet & Jobert (1828) and still available in the MNHN's collection that has not been mentioned by Guérin (1972) while it is reported by Heintz *et al.* (1974), even if they record it as *S. etruscus*.

Radius (Fig. 1B)

Specimen MNHN.F 2317 is a complete bone. The proximal half of the diaphysis and the proximal epiphysis are in good state of preservation and the ulnar facets are just a little obliterated. The distal half of the diaphysis is poorly preserved, with damages on the plantar side and a broken distal epiphysis. As in the radii from Vialette, the lateral ulnar facet is elongated downward (seen in palmar view) and the proximal articular surface to the humerus is little dorso-palmarly compressed. By a metrical point of view it is closer to the rhinoceros from Vialette than to *S. etruscus* from Senèze. We confidently attribute the specimen to *S. elatus*.

The bone is quoted by Heintz *et al.* (1974) as *D. jeanvireti* and we can assume it corresponds to the single radius listed by Guérin (1972) as *D. jeanvireti*, even if Guérin does not provide the catalogue number.

Mc III (Fig. 1C)

Specimens MNHN.F.PET244 is a complete but partly restored bone in which many details of the articular surfaces have been obliterated but the general shape of the bone is well preserved. As in the specimens from Vialette, the proximal articular surface for the magnum does not show the marked lateral groove sometimes present in *S. etruscus* from Senèze. Metrical correspondence with the rhinoceros from Vialette allows the assignation of the specimen to *S. elatus*.

Guérin (1972) and Heintz *et al.* (1974) record a Mc III belonging to *D. jeanvireti* with the number AC 2339 of the old cataloguing system. Specimen MNHN.F.PET244 corresponds to previous number AC 2332, thus we cannot exclude that handwritten digit "2" has been wrongly transcribed as "9".

Mc II (Fig. 1D)

Specimen MNHN.F.PET242 is a complete bone in rather good state of preservation. On the proximal epiphysis in proximal view, the medial tubercle is strongly stretched (in plantar direction) as in the rhinoceros from Vialette and differently from *S. etruscus* from Senèze. Thus, even if the size is slightly smaller than in the Vialette metacarpals, the specimen more probably pertains to *S. elatus*.

Guérin (1972) reports a Mc II belonging to *D. jeanvireti* with the number AC 2933. Since specimen MNHN.F.PET242 corresponds to previous AC 2333, we hypothesize Guérin (1972) could have done another mistake (replacing the handwritten digit "3" with digit "9"). Heintz *et al.* (1974) record a metacarpal bone with the right number AC 2333.

Magnum

The only carpal bone mentioned (but not pictured) by Croizet & Jobert (1828) is a magnum, apparently associated to the other elements of the articulated anterior limb, and coming from Mount Perrier. Thus, it is rather unlikely that it might correspond to the not better identified "carpien" from Malbattu recorded by Guérin (1980). However, the specimen is not present in the 1829-1857 catalogue so it has probably never been accessioned in the MNHN's collection.

Femur (Fig. 2A)

Specimen MNHN.F.PET2003 is a complete bone, missing only the trochlear medial lip and the third trochanter. Its measures well correspond to those of the femur that Croizet & Jobert (1828) represent in their figure 2, plate XI. It is clear from the drawing that the specimen was in very bad condition and extremely fragile, missing the lateral portion of the proximal epiphysis and diaphysis, which must have been glued later during heavy restoration works that obliterated, with a thin layer of plaster, most of the fracture lines visible in the drawing. The bone is very close to the femurs from Vialette both in the general morphology and measurements (even if the articular head is slightly smaller), and it is thus here attributed to *S. elatus*.

This must be the only femur recorded by Guérin (1972) and Heintz *et al.* (1974) as *D. jeanvireti*. and is the only femur listed in the 1829-1857 catalogue of the MNHN which specifically reports "fémur – pl. XI, fig. 2". Croizet & Jobert described two more femurs: one is the diaphysis of the bone of a young individual (Croizet & Jobert 1828: fig. 3, pl. V), the other is an incomplete adult bone missing the distal epiphysis (Croizet & Jobert 1828: fig. 1, pl. XI). These bones are neither listed in the 1829-1857 catalogue, nor by Heintz *et al.* (1974) and are not present in the MNHN's collection. Guérin (1972), quotes "un fragment de femur" in Clermont-Ferrand which could possibly be one of these.

Astragalus and calcaneus (Fig. 2B,C)

Specimens MNHN.F.PET240 and PET239 are associated astragalus and calcaneus respectively. The astragalus is intact and in perfect preservation state, the calcaneus is fractured but well restored whit just few details missing. The astragalus and calcaneus of *S. elatus* and *S. etruscus* share many morphological characters with a wide intra-specific variability and inter-specific overlap of the character states. From a metrical point of view, both the tarsal bones fit with the rhinoceros

from Vialette, while they are larger than the remains from Senèze, thus can be attributed to *S. elatus*.

Guérin (1972) lists as *D. jeanvireti* one astragalus and two calcanea, all under the number AC 2327 that corresponds to the old catalogue number still written on astragalus PET240. The additional calcaneus (MNHN.F.PET252) must have entered the Museum after the 1829-1857 catalogue and before Guérin's 1972 work (since it was not described by Croizet & Jobert [1828], it is not considered here).

The other associated astragalus and calcaneus of a young individual listed by Croizet & Jobert (1828: fig. 4, 7, pl. XI) have never been accessioned at the MNHN since they are not listed in the 1829-1857 catalogue.

Cuneiform

Croizet & Jobert (1828) quoted and represented (actually in a rather poor drawing) a cuneiform, but the bone was not donated to the MNHN since it has not been listed in the 1829-1857 catalogue.

Mt III (Fig. 2D)

Specimen MNHN.F.PET245 is a complete bone in rather good state of preservation. From a morphological point of view, the proximal articular surface for the cuneiform III, seen in proximal view, is medio-laterally enlarged as in the rhinoceros from Vialette, and differently than in *S. etruscus* from Senèze. The metrical comparison reveals a similarity in size between this specimens and those from Viallette, thus it can be attribute to *S. elatus*.

The specimen was already identified as *D. jeanvireti* by Guérin (1972) and Heintz *et al.* (1974) who report generically two Mt III and five metatarsals respectively. Since they do not list any metatarsal belonging to *D. etruscus*, this specimen was probably one of these.

Discussion

Some of the specimens described by Croizet & Jobert (1828) have been lost but most of them are still stored at the MNHN in Paris and can be recognized from Croizet & Jobert's (1828) plates. All these bones were known to Guérin (1972) who assigned them (humerus excluded) to *D. jeanvireti* improperly refusing the name "*elatus*".

Among the bones described by Croizet & Jobert (1828), namely the syntypes, a lectotype must be selected in accordance to art. 74 of the ICZN, and relevant recommendations (http://www.nhm.ac.uk/hosted-sites/iczn/code/index.jsp?nfv=true&article=74). We thus choose as lectotype, the most complete individual, represented by the associated elements of the articulated anterior leg (Fig. 1), precisely:
– right humerus MNHN.F.PET2002;
– right radius MNHN.F 2317;
– right Mc III MNHN.F.PET244;
– right Mc II MNHN.F.PET242.

The association of these elements in the same articulated limb is maintained by Croizet & Jobert (1828: 148, 149) and supported by a similar color and fossilization. Moreover, humerus and radius can be nicely articulated with each other while it is not possible to confirm the connection between the two metacarpals since they share a single and small articular facet that, unfortunately, is not well preserved.

Although Croizet & Jobert (1828) suggest that femur MNHN.F.PET2003 could belong to the same individual as the anterior leg since it "a été trouvé à côté des débris précédens" (Croizet & Jobert 1828: 150), the association is not clear and it will be here considered a paralectotype together with the other preserved elements of the original description (Fig. 2):
– right femur MNHN.F.PET2003;
– associated left astragalus MNHN.F.PET240 and calcaneus MNHN.F.PET239;
– left Mt III MNHN.F.PET245.

The designed holotype of the species *D. jeanvireti* from Vialette (Guérin 1972), housed at the NMB, is a badly preserved skull with mandible, lacking the occipital region and heavily fragmented (an inconsiderate restoration work hid all the original morphologies thus it is difficult to understand what is original and what was created by the restorers). The paratypes of *D. jeanvireti* are more interesting since their state of preservation is often excellent, with some remains beautifully intact, and others just little incomplete. Therefore the remains from Vialette keep their interest as a references for the species *S. elatus* side by side to the lectotype and paralectotypes from Etouaires here revised.

CONCLUSION

Croizet & Jobert (1828) described the species *Rhinoceros elatus* on fossil material collected from several localities on Mount Perrier (Etouaires after Heintz 1970) and Malbattu, carefully picturing, describing and providing measurements of all the specimens and comparing them to the two fossil species known at that time (*S. megarhinus* and *C. antiquitatis*) and to the five extant species. However, since for a while *R. elatus* was not recognized elsewhere, its name was only sporadically used in the literature. Few exceptions in the 20th century are Depéret *et al.* (1923), Feru *et al.* (1965), and Rădulescu & Kovács (1968). Few years later, Guérin (1972) described the new species *D. jeanvireti* on the remains from Vialette. Although he recognizes it as being the same species described by Croizet & Jobert (1828), and although he quotes the works of the Romanian authors, he refuses the name "*elatus*" incorrectly declaring it a *nomen oblitum* and thus breaking the rules of the International Code of Zoological Nomenclature. Since, in telling that "*elatus*" was *oblitum*, Guérin (1972), did not provide any explicit reference to the ICZN art. 23b (2nd Edition, then in force), the further attempt by Guérin & Tsoukala (2013) of declaring "*elatus*" a *nomen oblitum*, is invalid.

As above demonstrated, most of the remains described by Croizet & Jobert (1828) are still available and easily recognizable at the MNHN in Paris and rightfully represent the type of the species: an anterior leg has been chosen as lectotype and the other remains become the paralectotype of the species *Stephanorhinus elatus*.

Acknowledgements
We thank the curators of the collections who allowed M. Ballatore to study the material: Christine Argot (MNHN, Paris), Loïc Costeur (Naturhistorisches Museum Basel), Emmanuel Robert (Collections de Géologie of the Laboratoire de Géologie de Lyon – Terre Planètes Environnement, Université Claude Bernard Lyon 1), Didier Berthet (Musée des Confluences, Lyon). We also thank the librarians who provided help in retrieving the old literature: Emilia Cianci (Biblioteca Malaroda, Department of Earth Sciences, University of Turin), Baerbel Fiedler (Senckenberg Forschungsstation für Quartärpaläontologie, Weimar), Marie-Astrid Angel (MNHN).

We are grateful to Alessandro Minelli (University of Padova, former member of the International Commission on Zoological Nomenclature), for his helpful advices on the nomenclatural issues, and to Ghislain Thiery (University of Poitiers), for the French translation of the abstract.

M. Ballatore's research trips were financed by two grants of the University of Ferrara: "Giovani Ricercatori" (supported by the 5x1000 tax from individual income tax return 2011) for visiting the MNHN and the UCBL in 2014, and IUSS-Ferrara 1391 for visiting the NMB in 2014.

This research received support from the SYNTHESYS Project (http://www.synthesys.info/) which is financed by European Community Research Infrastructure Action under the FP7 "Capacities" Program (FR-TAF-3273; 2015).

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Submitted on 15 July 2015;
accepted on 24 April 2016;
published on 30 December 2016.

APPENDIX

Appendix 1. — List of the publications reporting the controversial names in chronological order from 1828 to present. When the authors attributed the species to a different genus than *Stephanorhinus*, namely to *Rhinoceros* or *Dicerorhinus*, this is indicated in brackets. The names of all the authors are provided for each quoted work, to allow a counting of the real number of authors using "*elatus*" or "*jeanvireti*" and avoiding replications.
The name *"jeanvireti"* has been used in 53 papers: 29 of them have at least one author in common, while ten papers have been written by Guérin (*) and 14 are works of different authors or authors' groups (°).
The name *"elatus"* has been used in 12 papers published after 1972: six are written by Romanian authors while five are works of authors also using "*jeanvireti*". Indeed Billia, Masini, Martínez-Navarro, Palombo, Rook, Sala & Valli (**bold typed**) used "*jeanvireti*" in earlier publications (Gliozzi *et al*. 1997; Palombo *et al*. 2003; Lacombat *et al*. 2008; Billia & Petronio 2009) and later switched to "*elatus*" (Palombo 2004; Masini & Sala 2007; Rook & Martínez-Navarro 2010; Billia 2011), or later prefer "*jeanvireti*" again (Billia & Sala *in* Persico *et al*. 2015; Palombo & Valli *in* Lacombat *et al*. 2008).

Stephanorhinus jeanvireti	*Stephanorhinus elatus*
	1828 Croizet & Jobert (*Rhinoceros elatus*)
	1837 Knight (*R. elatus*)
	1846 de Blainville (*R. elatus*)
	1848 d'Orbigny (*R. elatus*)
	1854 Pomel (*R. elatus*)
	1858 Scrope (*R. elatus*)
	1859 Gervais (*R. elatus*)
	1868 Falconer (*R. elatus*)
	1923 Depéret, Mayet & Roman (*R. elatus*)
	1965 Feru, Rădulescu & Samson (*Dicerorhinus elatus*)
	1968 Rădulescu & Kovács (*D. elatus*)
1972 Guérin (*Dicerorhinus jeanvireti*) (*)	
1973 Campy, Guérin, Meon-Vilain & Truc (*D. jeanvireti*) (*)	1973 Samson & Rădulescu (*D. elatus*)
	1973 Samson, Rădulescu & Kovács (*D. elatus*)
1974 Heintz, Guérin, Martin & Prat (*)	
1976 Cigala-Fulgosi (*D. jeanvireti*) (°)	
1977 Cuscani-Politi (*Rhinoceros jeanvireti*) (°)	
1978 Guérin & Santafé-Llopis (*D. jeanvireti*) (*)	
1980 Guérin (*D. jeanvireti*) (*)	
1982a Guérin (*D. jeanvireti*) (*)	
1982b Guérin (*D. jeanvireti*) (*)	
1983 Groves ("*D.*" *jeanvireti*) (°)	
1985 Hooijer (*D. jeanvireti*)	1985 Rădulescu & Samson (*D. elatus*)
1989 Prothero, Guérin & Manning (*D. jeanvireti*) (*)	
1993 Fortelius, Mazza & Sala	
1994 Campanino, Forno, Mottura, Ormezzano & **Sala**	
1995 Mazo (°)	
1996 Holec (*D. jeanvireti*)(°)	
1997 Gliozzi, Abbazzi, Argenti, Azzaroli, Calai, Capasso Barbato, Di Stefano, Esu, Ficcarelli, Girotti, Kotsakis, **Masini**, Mazza, Mezzabotta, **Palombo**, Petronio, **Rook**, **Sala**, Sardella, Zanalda & Torre	
1998 Cerdeño (°)	
2002 De Vos, Van der Made, Athanassiou, Lyras, Sondaar & Dermitzakis	
2003 Lacombat	2003 Rădulescu, Samson, Petculescu & Stiucă
2003 Giaocurtsakis	
2003 **Palombo**, Azanza & Alberdi	
2003 Sabol (*D. jeanvireti*)	
2004 Ďurišová (*D. jeanvireti*)	2004 **Palombo**
2004 **Palombo** & **Valli**	
2004 Prado, Alberdi, Azanza & Rodriguez	
2005 Spassov (°)	2005 Rădulescu
2005 Bianucci & Landini (*D. jeanvireti*)(°)	
2005 Vislobokova (°)	
2006 Sabol, Konečný, Vass, Kováčová, Ďurišová & Túnyi (*D. jeanvireti*)	
2006 Billia	
2006 Symeonidis, Giaocurtsakis, Seemann & Giannopoulos	2006 **Palombo**, **Valli**, Kostopoulos, Abelardi, Spassov & Vislobokova
2007 Lacombat	2007 **Palombo**
2007 Brugal & Croitor (°)	2007 **Masini**, **Sala**
2007 Guérin (*D. jeanvireti*) (*)	
2007 Meloro, Raia & Barbera	
2008 **Billia**	2008 Munteanu, Dumitraşcu, Macaleţ & Călin
2008 Lacombat, Mörs	
2008 Lacombat, Abbazzi, Ferretti, **Martínez-Navarro**, Moullé, **Palombo**, **Rook**, Turner & **Valli**	
2008 Vlačiky, Sliva, Tóth, Karol & Zervanová (°)	
2009 Fukuchi, Nakaya, Takai & Ogino (°)	

Appendix 1. — Continuation.

	Stephanorhinus jeanvireti		*Stephanorhinus elatus*
2009	**Billia** & Petronio		
2009	Raia, Carotenuto, Meloro, Piras, Barbera & Kotsakis		
2010	Piras, Maiorino, Raia, Marcolini, Salvi, Vignoli & Kotsakis	2010	**Rook** & **Martínez-Navarro**
2011	Kahlke & Kaiser (°)	2011	Billia
2011	Pandolfi & Petronio		
2011	Petronio, Bellucci, Martinetto, Pandolfi & Solari		
2011	Kotsakis		
2012	Gómez de Soler, Campeny Vall-Llosera, Van der Made, Oms, Agustì, Sala, Blain, Burjachs, Claude, Garcia Catalan, Riba & Rosillo		
2012	Van der Made		
2013	Guérin & Tsoukala (*D. jeanvireti*) (*)		
2013	Pandolfi		
2015	Persico, **Billia**, Ravara & **Sala**		