Bollettino della Società Paleontologica Italiana	28 (2-3)	1989	295-306	4 pls.	Modena, Ottobre 1989

Prolagus sorbinii n. sp., a new Ochotonid (Mammalia, Lagomorpha) from the Messinian of Italy

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KEY WORDS — Mammalia, Lagomorpha, Systematics, Late Miocene, Northern Apennines, Italy.

ABSTRACT — Recently, new finds of Prolagus *have been recovered from Messinian sediments of the Central-Northern Apennines. The most complete one is an articulated skeleton enclosed in a thin marly bed, that was collected by Dr. L. Sorbini (Museum of Natural History, Verona) at Monte Castellaro (Pesaro, Italy), from the "Marne Bituminose" of the Gessoso-solfifera Fm. Some specimens of* Prolagus, *consisting mainly of isolated teeth, have also been found in the infilled karst fissures of the Monticino Quarry (Brisighella, Faenza, Italy). The associated mammal fauna shows that the fossil assemblage belongs to the MN13 zone. The enclosing sediments are from the Colombacci Fm., and therefore the Brisighella finds are younger than the fossil from Monte Castellaro. Some of the derived features of the dention of the M. Castellaro find, as well as the large premolar foramen, are similar to those of* Prolagus michauxi. *It differs, however, from the type specimen of* P. michauxi *(Early Pliocene, MN15b, Sète) in some significant ways: it has a more elongated muzzle with a longer premaxillar bone, a divided incisive foramen, and a low and wide ascending mandibular branch. These features, combined with the significant time span separating the two finds, indicate that the specimens from M. Castellaro represent a distinct species for which the name* Prolagus sorbinii *n. sp. is proposed. The teeth from the Monticino Quarry have several derived characteristics in common with* P. sorbinii *n. sp., but are smaller. The dental morphology by itself is not sufficient to demonstrate the conspecificity of the two finds, but does not contrast it. Taking into account also the fact that the two sites are stratigraphically and geographically close to each other, it is reasonable to refer the form from Monticino to* Prolagus *cf.* sorbini. *A group of poorly known forms from some late Turolian localities of Spain (Venta del Moro, Arquillo, Alcoy), whose affinities are somewhat uncertain, and have been previously grouped in* P. michauxi, *may belong to this new Messinian species.* Prolagus sorbinii *n. sp. may also be related to the Pliocene finds identified as* P. figaro depereti *(Perpignan, MN15b), and to* P. savagei *from Cascina Arondelli (Asti, MN16a).*

RIASSUNTO — [Prolagus sorbinii n. sp.: un nuovo Ochotonide (Mammalia, Lagomorpha) del Messiniano italiano] — *Recentemente nuovi resti di* Prolagus *sono stati raccolti in depositi Messiniani dell' Appennino centro settentrionale. Il reperto più completo è uno scheletro in connessione, incluso in un sottile straterello marnoso, rinvenuto dal dott. L. Sorbini (Museo Civico di Storia Naturale di Verona) nelle "Marne Bituminose" della Formazione Gessoso-solfifera a Monte Castellaro (Pesaro). I riempimenti del sistema di fessure carsiche di Cava Monticino (Brisighella, Faenza) hanno restituito altri resti isolati di* Prolagus *associati ad una fauna della zona MN 13. I sedimenti appartengono alla Formazione a Colombacci e dimostrano che i resti del Monticino sono più recenti dell'esemplare di Monte Castellaro. Alcuni dei caratteri derivati della dentatura di questo ultimo reperto e il grande forame premolare assomigliano a* Prolagus michauxi. *L'esemplare di Monte Castellaro differisce tuttavia dal cranio tipo della specie* michauxi *(Sète, MN15b) in alcuni caratteri evidenti: il muso più allungato con il forame incisivo suddiviso ed il ramo ascendente basso e largo della mandibola. Questi caratteri sono sufficienti a dimostrare che i resti di M. Castellaro appartengono ad una nuova specie per la quale viene proposto il nome* Prolagus sorbinii. *I denti di Cava Monticino condividono diversi caratteri derivati con* P. sorbinii *ma sono più piccoli. La morfologia dentaria non è sufficiente a nostro avviso a dimostrare la conspecificità dei due ritrovamenti, ma non la contraddice. Riteniamo pertanto opportuno riferire questi resti a* Prolagus *cf.* sorbinii. *A questa nuova specie potrebbero appartenere anche alcune forme, rappresentate essenzialmente da denti isolati, di alcune località del Turoliano superiore della Spagna (Venta del Moro, Arquillo, Acoy ecc.) che sono state precendentemente riferite a* P. michauxi. *Anche alcuni ritrovamenti pliocenici di* Prolagus *come* P. figaro depereti *di Perpignan e* P. savagei *(Cascina Arondelli) potrebbero avere relazioni filogenetiche con* P. sorbinii.

FOREWORD

In recent years, new finds of *Prolagus* have been recovered from Messinian sediments of the Gessoso-solfifera Fm.. The most complete find is an articulated skeleton enclosed in a thin marly bed. The fossil was recovered in 1983 by Dr. Lorenzo Sorbini (Museum of Natural History, Verona) from the Messinian "Marne Bituminose" of the Gessoso-solfifera Fm. that outcrops in the Monte Castellaro area (Pesaro, Italy). Sorbini (1988) gives an account of the geologic section; the exact spot the fossil was found is given in Text-fig. 1. The "Marne Bituminose" belong to the Messinian evaporitic phase, and regionally underlie the latest Messinian Colombacci Formation. Since no other terrestrial mammal remains have been recovered in the area to date, this fossil appears to be a sporadic find from a brackish coastal hypereurhyaline environment.

BRS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	18	19	20
Galerix sp.		?	+	+	+						+		+					+	
Postpalaerinaceus sp.					+				+										
Episoriculus aff. *gibberodon*		+	+	+	+	+		+	+		+	+							+
Soricidae indet. (small size)																			+
Megaderma gr. *vireti-mediterraneum*			+		+														
Rhinolophidae indet.		+			+	+													+
Vespertilionidae indet.			+		+														
Chiroptera indet.							+												
Colobinae cf. *Mesopithecus*	+																		
cf. Gomphotheriidae																		+	
Plioviverrops faventinus n. sp.		+	+	+	+					+						+		+	
Hyaenidae indet.			+		?														?
Canidae indet.					+														
Orycteropus sp.				?	+														?
Dicerorhinus cf. *megarhinus*	+																		
Hipparion sp.	+		+		+				+						+				
Samotragus occidentalis n. sp.	+	+		?	+	?		+	+	+					+	+	+	+	?
Bovinae cf. *Parabos*	+				+											+		+	
Bovidae indet.			+	+															
Cervidae indet. (small size)				+															
Suidae indet.	+																		
Hystrix sp.					+	?						+							
Stephanomys debruijni n. sp.	+	+	+	+	+	+	+	+	+		+	+		+	+	+	+		+
Paraethomys anomalus	+	+	+		+	+			+		+	+				+	+		+
Castillomys benericettii n. sp.	+	+		+	+	+		+	+		+	+					+		+
Occitanomys sp.								+									+		
Apodemus cf. *gudrunae*			+	+	+	+	+	?									+		+
Cricetus cf. *barrierei*			+			+													
Ruscinomys cf. *lasallei*				+	+	+			+								+		
Myomimus sp.						?													
Atlantoxerus cf. *rhodius*			+			+													
Hylopetes sp.						+													
Trischizolagus cf. *maritsae*		+		+	+	+		+	+						+		+	+	+
Prolagus cf. *sorbinii*	+		+	+	+	+		+	+					+			+		+

Tab. 1 - Distribution of taxa in the sites of the Monticino quarry.

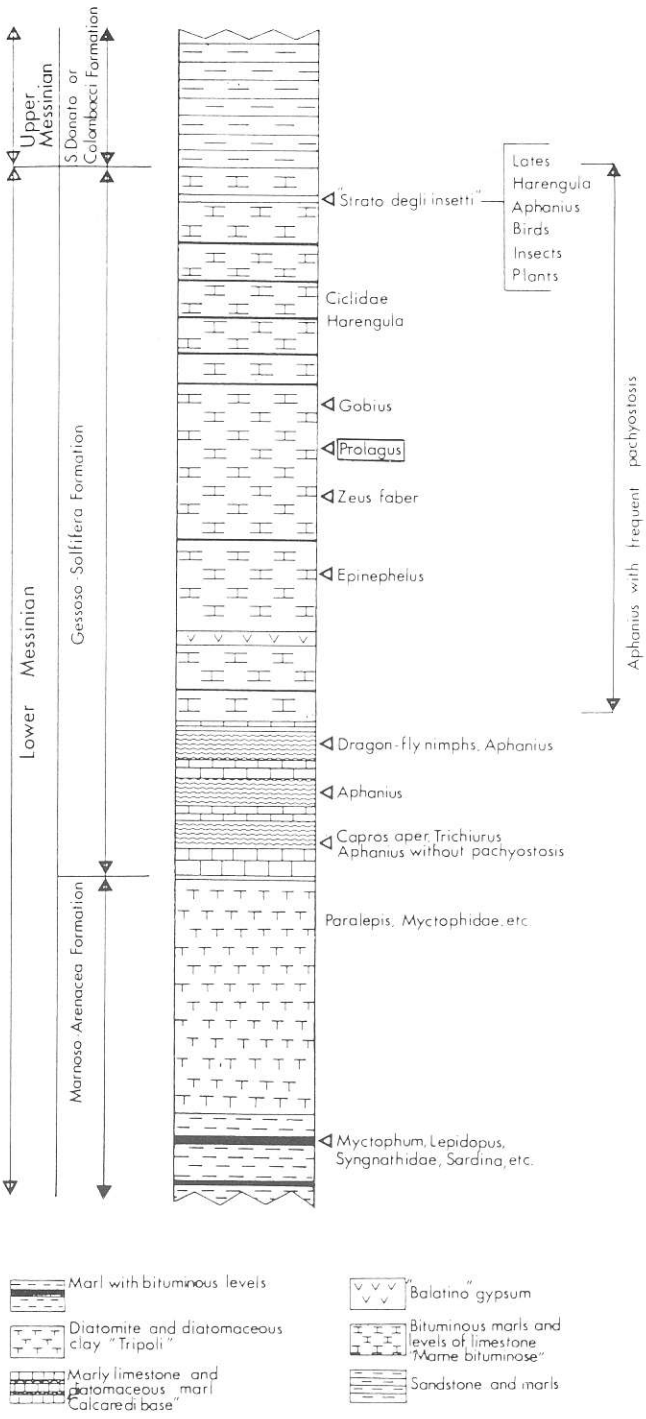
Other specimens of *Prolagus* have been found in infilled karst fissures of the Monticino Quarry (Brisighella, Faenza, Italy). (Costa *et al.*, 1986; De Giuli *et al.*, 1988). The fissures, which have yielded a fairly rich mammal fauna, are part of a karst system that intersects the Messinian gypsum layers.

The infilling sediments are from the brackish-continental Colombacci Formation, which uncoformably

EXPLANATION OF PLATE 1

Prolagus sorbinii n. sp., holotype V.7026.


M 7025
0 1 2 3 4 5 6 cm



Text-fig. 1 - Stratigraphic column of the Monte Castellaro deposits, from Sorbini (1988), modified.

overlies the gypsum, and are of late Messinian age. Marine clays of the early Pliocene are superposed upon the Messinian deposits.

A detailed account of the geology of the Monticino section is given in Marabini & Vai (1988); the distribution of taxa in the sites of the Monticino quarry is reported in Tab. 1.

The rodent fauna shows that the fossil assemblage is from the MN13 zone. The specimens of *Prolagus* consist mainly of isolated teeth, and are not very abundant in the Monticino sites.

Prolagus was a widespread genus in Europe that ranged from the early Miocene to the late Pleistocene (Sardegna). According to Lopez-Martinez & Thaler (1975), who made the most recent complete revision of the genus, only the species *Prolagus crusafonti* and *P.* cf. *michauxi* occur in western Europe during the late Miocene, and represent two evolutionary stages of the same lineage.

Data on *Prolagus* from eastern Europe are scant. Lopez & Thaler (1975) referred the specimens from Kohfidisch and from Pikermi to *P. crusafonti*; the *Prolagus* sp. from Polgardi (latest Miocene, Hungary) may represent a different species, distiguished mainly by its strongly developed crochet and a primitively simple P^2. On the other hand, during the Pliocene and the Pleistocene the genus appears to be more differentiated, with the occurrence of at least 4 different lineages that include 5 species (Lopez-Martinez, 1977; Lopez Martinez & Thaler, 1975). Some of them are poorly known (e.g., *P. calpensis*, or *P. bilobus*) while others appear to be mainly insular forms (namely *P. figaro* and *P. sardus*). Recently, Mazza (1987) described two new species from the fissure fillings of Gargano (Early Pliocene, Italy). These endemic forms are quite distinct from both the species of the mainland and those from Corsica and Sardinia. They appear to represent a separate line that probably derived from a Miocene ancestor and evolved in insular conditions (De Giuli *et al.*, 1986, Mazza, 1987).

The latest Miocene representatives of *Prolagus* in western Europe have been referred to as *P. michauxi* (primitive form) or as *P.* cf. *michauxi* by Lopez, and are known mainly from isolated tooth remains. The occurrences of an articulated skeleton and other remains from the Messinian of Italy represent an opportunity to acquire new data on the systematics of the late Miocene representatives of the genus.

EXPLANATION OF PLATE 2

Figs. 1-2 - *Prolagus sorbinii* n. sp., holotype. 1) Left mandible; 2) skull. Scale in centimetres. The photographs are in the same scale.

1

2

0 1 cm

SYSTEMATICS

Genus PROLAGUS Pomel, 1853

PROLAGUS SORBINII n. sp..
Pls. 1-2; Pl. 3, figs. 1-2, 4

Derivatio nominis — The species is dedicated to Dr. Lorenzo Sorbini who recovered the specimen.

Holotype — Articulated skeleton with skull V.7026. (Pls. 1-2; Pl. 3, figs. 1-2, 4)

Horizon — Messinian.

Repository — The specimen is preserved in the Museum of Natural History of Verona.

Diagnosis — A *Prolagus* of fairly large size, slightly larger than *P. michauxi*, with an elongated muzzle, an incisive foramen which tends to be subdivided into posterior and anterior parts, and a large premolar foramen. P^2 is evolved with a well developed anteroflexus. P_3 has very reduced or absent crochet, and lacks the protoisthmus. The upper molars have a reduced or absent enamel islet and an hypoflexus that is not much extended labially.

Description — The skeletal remains are still enclosed in a thin bed of marl, and have been exposed on one side. The specimen was prepared by Museum of Natural History of Verona.

Skull: only the ventral part is accessible to observation. The specimen is deformed, in particular the muzzle on the right side is broken at the sagittal plane and rotated. The occipital region is damaged and somewhat flattened, the occipital condiles are lacking. The muzzle is narrow and fairly elongated, with a long premaxillar bone, a subdivided incisive foramen and a large premolar foramen. The zigomatic arches are narrow and sub-parallel. The bullae are large sized. The palatine suture is almost straight.

Mandibles: the right mandible is fairly complete and is exposed on the lingual side, only the tooth row

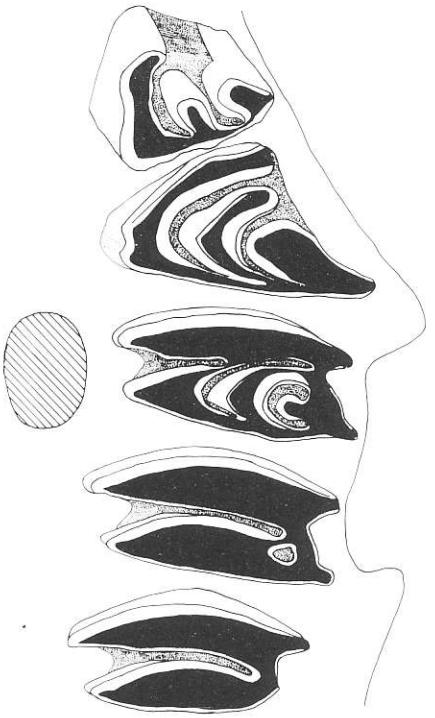
Skull		Mandible	
Total length	~ 50.0	Total length	42.9
Length I^2-M^2	24.5	Length of horizontal branch	34.0
Length I^2 - palatine suture	14.4	Maximum heigth of horizontal branch	9.1
Length I^2-P^2	11.0	Heigth at M^2	8.5
Length of premaxillar	9.4	Heigth of ascending branch	21.8
Breadth of maxillars	~ 16.1	Length of ascending branch	8.5
Length of upper tooth row	8.8	Length of diasteme	7.7
Length of upper premolars	5.1	Length of lower tooth row	8.6
Length of upper molars	3.7	Length of lower premolars	3.8
		Length of lower molars	4.8

Upper teeth	Length	Breadth	Lower teeth	Length	Breadth	CR	PR
P^2	1.40	2.00	P_3	2.20	2.17	a	a
P^3	1.98	3.41	P^4	1.77	2.05		
P^4	1.62	3.09	M_1	1.93	2.16		
M^1	1.71	3.15	M_2	2.60	2.07		
M^2	1.46	3.05					

Tab. 2 - Measurement of the holotype of *Prolagus sorbinii*. n. sp.
CR = Crochet (present / absent); PR = Protoisthmus (p / a); ~ = inferred value.

EXPLANATION OF PLATE 3

Figs. 1-2, 4 - *Prolagus sorbinii*, n. sp., holotype. 1) Upper tooth row; 2) rigth mandible; 4) P_3.
Fig. 3 - *Prolagus savagei*: type mandible IGF 12328.
Figs. 5-11 - *Prolagus* cf. *sorbinii* from Brisighella. P_3: BRS1 (5-7), BRS6 (8), BRS3 (9-10), BRS6 (11).
Scale in millimetres.



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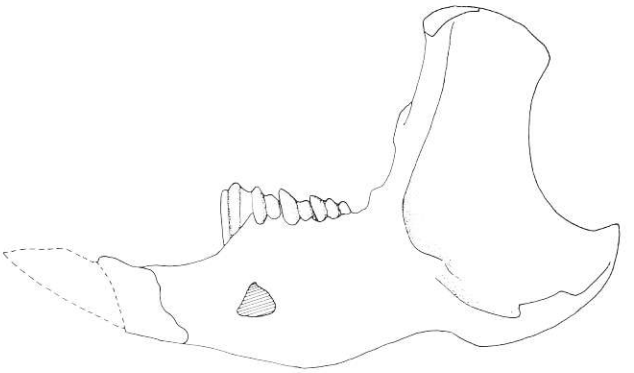

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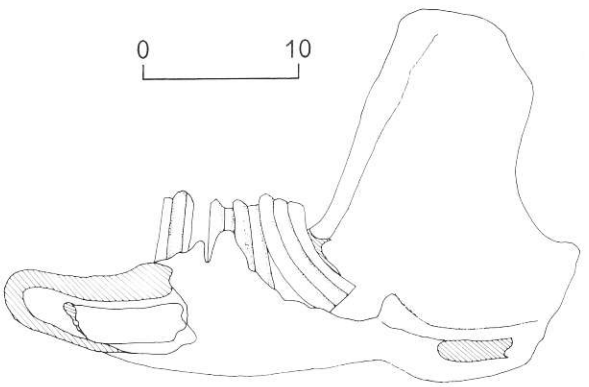

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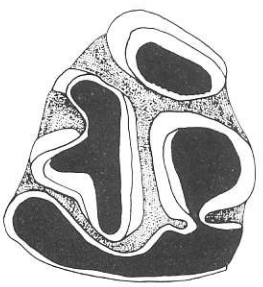

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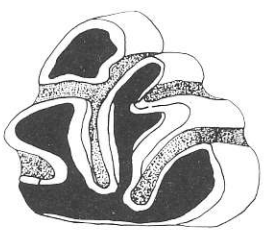

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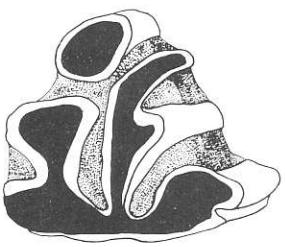

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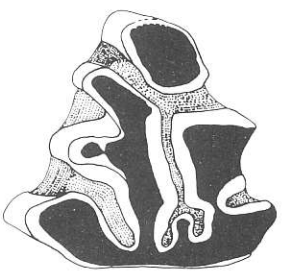

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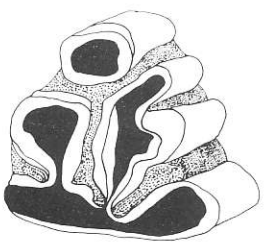

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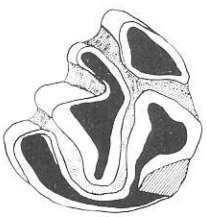


10

11

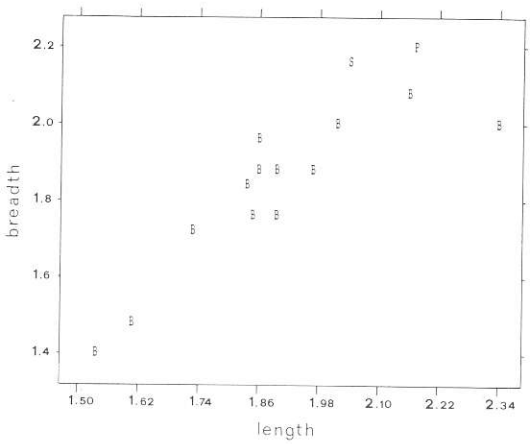
and the anterior part of the left mandible are present. A cast of the left tooth row was made to study the occlusal pattern. The mandibles are stout, with a long diasteme; the ventral edge of the horizontal ramus is curved and inflated. The ascending ramus is relatively low and wide, and is slightly inclined backwards.

Dentition: the upper rows are characterized by a P_2 with a complicated pattern with a well developed anteroflexus and mesially continuous enamel. The upper M^1 has a small enamel islet while the islet is absent in the M^2. The lower P_3 has a very reduced crochet and a isolated protoconid-protoconulid complex. The protoconulid is smaller than the protoconid. The cement is abundant, the anteroconid is of about the same size as the metaconid, and the entoconid is large.

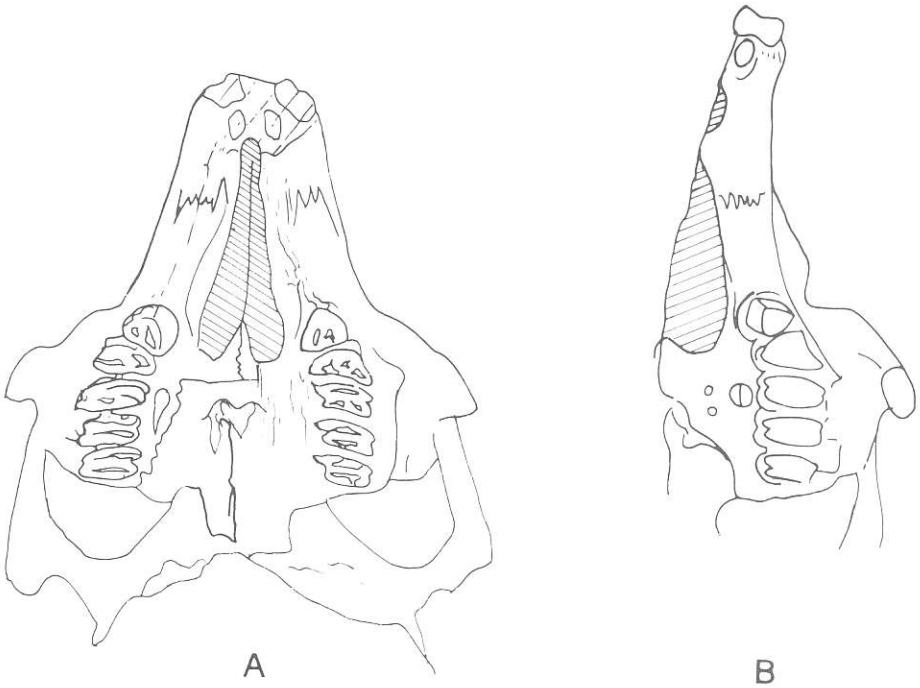
PROLAGUS cf. SORBINII

Pl. 3, figs. 5-11; Pl. 4; Text-fig. 2

Material — All from Brisighella sites. BRS1: 4 lower P_3, 1 upper incisor; BRS3: 11 lower P_3, five of wich fragmented, 2 upper P^2, 5 upper P^3, 4 upper P^4, 11 upper molars; BRS4: 1 upper P^2; BRS5: 1 lower P_3 (fragmented), 1 upper P^4, 1 upper M^2; BRS6: 3 lower P_3, 1 upper P^2, 1 upper P^3, 2 upper P^4, 4 upper molars; BRS8: 1 upper P^2, 1 frag. P_3, 1 upper incisor; BRS9: 1 upper molar; BRS18: 1 upper P^4, 1 upper M^2; BRS19: 1



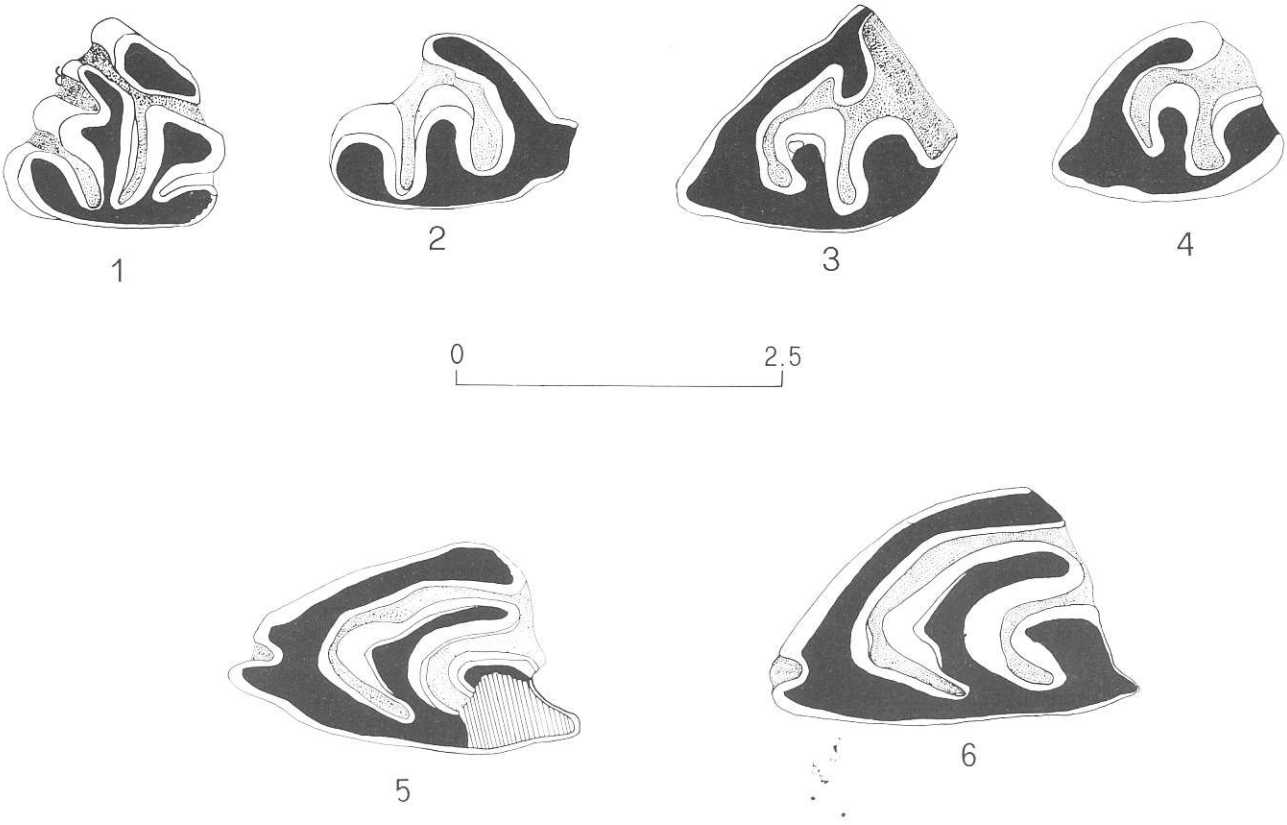
Text-fig. 2 - Diagram of breadth versus length of lower P^3 for *Prolagus sorbinii* n. sp. (P), *P.* cf. *sorbinii* (B) and *P. savagei* (S).



Text-fig. 3 - A) *Prolagus michauxi*, type skull from Sète; B) *Prolagus sorbinii* n. sp., Monte Castellaro; palatal view of the muzzle. Magnification 2.8 (approximately).

EXPLANATION OF PLATE 4

Figs. 1-11 - *Prolagus* cf. *sorbinii* from Brisighella. 1) P_3, BRS3; 2-4) P^2: BRS3 (2), BRS6 (3), BRS8 (4); 5-6) P^3, BRS3; 7) P^4, BRS18; 8, 11) M^1: BRS6 (8), BRS3 (11); 9-10) M^2, BRS3. Scale in millimetres.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10
11

Species	Site	Element	Length	Breadth
Prolagus cf. *sorbinii*	BRS3	P^2	1.31	2.04
	BRS3	P^2	1.36	-
	BRS4	P^2	-	2.17
	BRS6	P^2	1.43	2.03
	BRS8	P^2	1.42	2.01
	BRS3	P^3	1.71	2.54
	BRS3	P^3	1.83	2.94
	BRS3	P^3	1.68	2.82
	BRS3	P^3	1.76	2.65
	BRS6	P^3	1.73	2.52
	BRS3	P^4	1.47	2.64
	BRS3	P^4	1.36	2.52
	BRS3	P^4	1.53	-
	BRS5	P^4	1.63	2.95
	BRS6	P^4	1.38	2.51
	BRS6	P^4	1.32	2.69
	BRS18	P^4	1.37	2.80
	BRS3	M^1	1.42	2.85
	BRS3	M^1	1.49	2.44
	BRS3	M^1	1.31	2.45
	BRS3	M^1	1.48	2.51
	BRS3	M^1	1.53	2.60
	BRS3	M^1	1.53	2.69
	BRS6	M^1	1.43	2.88
	BRS9	M^1	1.41	2.57
	BRS3	M^1	1.40	2.71
	BRS3	M^2	1.40	2.48
	BRS3	M^2	1.31	2.55
	BRS3	M^2	1.30	2.09
	BRS3	M^2	1.19	2.55
	BRS5	M^2	1.24	2.27
	BRS6	M^2	0.93	1.81
	BRS18	M^2	1.27	2.51
	BRS6	M^2	1.25	2.39
	BRS6	M^2	1.25	2.59
P. savagei	ARON	P^2	1.64	2.14
	ARON	P^3	2.02	3.37
	ARON	P^4	1.66	3.26
	ARON	M^1	1.63	3.35
	ARON	M^2	1.53	2.92

Tab. 3 - Measurement of upper teeth from the Monticino sites and from *Prolagus savagei* from Cascina Arondelli

fragment of mandible; BRS20: 1 lower P_3; 1 upper M^1.

Horizon — Late Messinian (MN13 zone).

Description — The description is limited to the significant features of the dentition, measurements are in Tabs. 3-4.

P_3. The morphology and size are fairly variable: it is characterized by a significant number of morphotypes lacking the protoisthmus; the crochet is often completely absent or very reduced. The anteroconid is about the same size as the metaconid, but rare morphotypes with a primitively rounded and smaller anteroconid also occur. The protoconulid is smaller than or about the same size as the protoconid.

P^2 is represented only by three specimens. Two of them are very similar to the homologous element of the type skull. The specimen BRS6 (Pl. 4, fig. 3) differs in some derived features: the anteroflexus is more elongated lingually, more complicated, and lacks the mesial enamel. Few upper molars retain primitive enamel islets. The hypoflexus is not much extended labially.

Comparisons and discussion — The M. Castellaro find is similar, from a general standpoint, to *P. michauxi*. The general features of its dentition, particularely the evolved P^2, the absence of a crochet on the P_3, the sub equal anteroconid and metaconid on the P_3, and the reduced or absent enamel islets in the upper molars resemble those of *P. michauxi*. Its large premolar foramen and the shape of its palatine suture also resembles *P. michauxi*. It differs, however, from the type specimen from Sète (Lopez Martinez, 1974) in some significant ways (Text-fig. 3): its muzzle is more elongate and has a longer premaxillar bone, it has a divided incisive foramen its molar rows do not diverge posteriorly, and it lacks a protoisthmus in the lower P_3. It appears to be more primitive in the smaller protoconulid. Furthermore, the mandible of the M. Castellaro specimen has a lower and wider ascending ramus, while the mandible in *P. michauxi* has a high, narrow, ascending ramus resembling that of *P. sardus*.

Some of the features that distinguish the type specimen of *P. michauxi* from the *Prolagus* of Monte Castellaro must be evaluated cautiously. As a matter of fact, the short muzzle of the former could be a characteristic tied to ontogeny, found in young individuals. On the other hand, Lopez Martinez (1974) and Lopez Martinez & Thaler (1975) considered the short muzzle, the undivided incisive foramen and the mesially converging upper molar rows to be diagnostic features for the species. Thus it seems that the definition of *P. michauxi* is affected by some uncertainities, and a reexamination of the type material would be auspicable. At present, however, I feel it is useful to distinguish the Monte Castellaro form from *Prolagus michauxi* at a species level, since the two finds differ in several characteristics and a discrete time span, not less than 1.5 M.Y., separates them. Furthermore, the greater hight of *P. michauxi*'s ascending mandibular branch with respect to the Monte Castellaro specimen's is a distinctive feature that could hardly be due to ontogenetic variation. This provides futher evidence in favour of keeping the Italian fossil distinct from *P. michauxi*.

The only comparison possible between the finds from Brisighella and the specimen of Monte Castellaro

is their dentition. Both this fact and the fact that the variation in *P. sorbinii* cannot be assessed, limit the conclusions which can be reached. In fact, the major distincitive features of *P. sorbinii* lie in its skull morphology. Several derived characteristics of the specimens from the BRS sites match those of *P. sorbinii*: the tendency to have a reduced or absent crochet, the tendency to lack the protoisthmus in the P_3, the complicated P^2, the upper molars with reduced or absent enamel islets. They seem to be more evolved in the occurence of a single P^2 that lacks the enamel in the anterocone and for the larger P^2. The other teeth are smaller than those of the M.Castellaro individual (Tabs. 3-4; Text-fig. 2).

The above features do not conclusively demonstrate that the BRS finds are conspecific with *P. sorbinii*, but do not contradict this possibility. Some differences are to be expected, since the two samples came from different populations, which were separated by a discrete time span. I therefore prefer to temporarily consider the BRS finds to be closely related to the new messinian species.

The dental remains from Brisighella and from M. Castellaro are comparable with the finds from the latest Turolian localities of Alcoy, La Alberca, (identified as *P. michauxi* by Lopez-Martinez & Thaler, 1975), as well as the finds from Venta del Moro, Arquillo and Librilla, referred to *P.* cf. *michauxi* by the same authors. According to Lopez- Martinez (1977) the teeth from these localities show a fairly large amount of variability and the upper P^2 of the last three localities include plesiomorphic morphotypes, thus posing some doubts on the homogeneity of the populations. However, the dentitions from this group of late Miocene finds has a number of features in common with the Brisighella finds: the reduced or absent crochet in P_3, the tendency to have a reduced or absent enamel islet on the upper molars, the evolved complicated P^2, and the anteroconide as large as the metaconide in the P_3. Since all these features are subject to statistic fluctuation, an accurate evaluation would be necessary. It is however reasonable to suppose that this Turolian group of forms is conspecific with, or very closely related to *P. sorbinii*.

Based on data in the literature, *P. sorbinii* may have relationships with at least two Pliocene forms: *P. figaro depereti* from Perpignan and *P. savagei* from Cascina Arondelli, Piedmont, Italy.

Lopez (1975) described the species *P. figaro* on specimens from Capo Figari (early middle Pleistocene, Sardinia), and also grouped finds from Mandriola (early Pliocene, Sardegna) and from Perpignan (early Pliocene, MN15, France) in the same species, separating the latter with a subspecific name. As a matter of fact, the form from Capo Figari appears to actually be a large sized species closely related to *P. sardus*, with which it agrees in a number of diagnostic features of the dentition (i.e. the very large metaconid, the absence of the crochet, the reduced entoconid in the P_3, the small premolar foramen). On the other hand, the idea that it could be considered conspecific with any form from the continent is questionable and not supported by clear morphologic evidence.

The specimens from Perpignan are characterized by primitive features respect to the type species from Capo Figari: the occurence of a reduced crochet, the large entoconid and anteroconid, the small metaconid in the P_3, the large premolar foramen, and the smaller anterior premolars with respect to the molars. These features are found in the specimens from BRS, M. Castellaro, and other Turolian fossils. It is possible that *P. figaro depereti* could represent a Pliocene form related to *Prolagus sorbinii*.

P. savagei is defined on a mandible and is represented by few other tooth remains. The dentition is slightly larger than that of the Monte Castellaro specimen. The mandible is similar to that of *P. sorbinii* in

Species	Site	Length	Breadth	CR	PR
Prolagus cf.	BRS1	2.16	2.07	p	p
sorbinii	BRS1	2.02	2.00	p	p
	BRS1	1.86	1.95	a	p
	BRS1	-	-	p	p
	BRS3	1.73	1.73	a	–
	BRS3	1.83	1.84	a	p
	BRS3	1.85	1.75	a	a
	BRS3	1.61	1.48	a	p
	BRS3	1.53	1.39	a	p
	BRS3	-	-	p	p
	BRS3	2.34	2.00	p	a
	BRS3	1.51	-	a	a
	BRS3	-	-	a	p
	BRS3	-	-	a	a
	BRS3	-	-	a	a
	BRS3	1.97	1.87	a	p
	BRS3	-	-	a	a
	BRS6	1.89	1.75	a	p
	BRS6	1.86	1.86	a	p
	BRS6	1.90	1.89	a	p
	BRS20	2.00	-	a	p
P. savagei	ARON	2.15	2.04	a	p

Tab. 4 - Measurement lower P_3 from the Monticino sites from *Prolagus savagei*. CR = Crochet (present/absent); PR = Protoisthmus (p/a).

the low and wide ascendig branch. The upper dentition has derived features such as a very deep hypoflexus, absence of enamel islets in the molars, and lacune of enamel in the anterocone of P^2. The P_3 lacks the crochet. The above similarities would support the hypothesis that *P. savagei* is a form derived, or closely related to *P. sorbinii*.

ACKNOWLEDGEMENTS

This work has been supported by a M.P.I. grant. The drawings and photographs were made by Mr. Francesco Landucci.

REFERENCES

Berzi, A., 1967, Lagomorphs from the type Villafranchian of Villafranca d'Asti (Italy): Giorn. Geol., 35 (1): 1-16.

Costa, G.P., Colalongo, M. L., De Giuli, C., Marabini, S., Masini, F., Torre, D. & Vai, G. B., 1986, Latest Messinian vertebrate fauna preserved in a paleokarst- neptunian dyke setting. (Brisighella, Northern Apennines): Le Grotte d'Italia, 12(4), 1984-85: 221-235.

Dawson, M.R., 1969, Osteology of *Prolagus sardus*, a Quaternary ochotonid (Mammalia, Lagomorpha): Palaeovert., 2 (4): 157-191.

De Giuli, C., Masini, F., Torre, D., Benericetti, A., Costa, G.P., Fosella, M. & Sami, M., 1988, The Mammal Fauna of the Monticino Quarry. *In* De Giuli C. & Vai G. B. (eds.). Fossil Vertebrates in the Lamone Valley, Romagna, Apennines. Field Trip Guidebook: 65-69, Faenza.

—, —, — & Valleri, G., 1986, Mammal migration events in emerged areas of the Apulian platform during the Neogene. *In* Boccaletti M., Gelati R. & Ricci-Lucchi F. (eds.). Paleogeography and Geodynamics of the Perityrrhenian area: Giorn. Geol. 48 (1-2): 145-162.

Lopez-Martinez, N., 1974, Evolution de la lignee *Piezodus-Prolagus* (Lagomorpha, Ochotonidae) dans le Cenozoique d'Europe Sud-Occidentale. Unpublished dissertation, Université des sciences et Techniques du Languedoc, pp.1-165, Montpellier.

—, 1977, Revision Sistematica y Biostratigrafica de los Lagomorpha (Mammalia) del Terciario y Cuaternario de Espana. Unpublished dissertation, Fac. of Gelogical Sciences, Madrid University, pp. 1-459.

— & Thaler, L., 1975, Biogeographie, evolution et complements a la systematique du groupe d'Ochotonides *Piezodus-Prolagus* (Mammalia, Lagomorpha): Bull. Soc. Geol. France, 17 (5): 850-866.

Marabini, S. & Vai, G. B., 1988, Geology of the Monticino Quarry, Brisighella Italy. Stratigraphic implications of its Late Messinian Mammal fauna. *In* De Giuli C. & Vai G. B. (eds.): Fossil Vertebrates in the Lamone Valley, Romagna, Apennines. Field Trip Guidebook: 39-52, Faenza.

Mazza, P., 1987, *Prolagus apricenicus* and *Prolagus imperialis*: two new Ochotonids (Lagomorpha, Mammalia) of the Gargano (Southern Italy): Boll. Soc. Paleont. Ital., 26 (3): 233-243.

Sorbini, L., 1988, Biogeography and climatology of Pliocene and Messinian fossil fish of eastern-central Italy: Boll. Mus. Civ. St. nat. Verona, 14: 1-85.

(manuscript received March 30, 1988
accepted April 20, 1988)

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