First Palaeozoic arachnid from Iberia: Aphantomartus areolatus
Pocock (basal Stephanian; prov. León, N.W. Spain),
with remarks on aphantomartid taxonomy(*)

PAUL A. SELDEN (**), MICHAEL ROMANO (***)

ABSTRACT

A specimen of Aphantomartus areolatus Pocock is described from middle-upper Cretaceous (lower Stephanian) strata of the Prado Formation. The carapace is well preserved, and is an almost exclusively terrestrial interm. The specimen described herein, whilst belonging to a known species, is particularly important in Petrovich's taxonomy of Phalangiodasites (Krabbe & Warming 1978, & in press). Trigonomartidae are also in need of review, which may result in the reappraisal of genera referred to Trigonomartidae by Petrunkevitch in press). Emended diagnosis: Carapace subtriangular; opisthosoma of ?11 segments (8 tergites, the 2nd of which are in the median plate of most tergites. The early Stephanian age of the specimen is the youngest record for the family Aphantomartidae. The Guardo Coalfield constitutes the western part of the post-Lower Ordovician marine basin which extends from north-eastern León into northern Palencia (Wagner et al. 1977).

1. INTRODUCTION

Discovery of an extinct arachnid is always noteworthy, owing to their relative scarcity as fossils. The specimen described herein, whilst belonging to a known species, is particularly important in being the first described pre-Tertiary arachnid from Iberia, as far as the authors are aware. It is a trigonomartid, an order which ranges from Lower Emsian (Stormer 1970) to middle Stephanian (Prado). As the two family names are synonyms, the older, Aphantomartidae, should be used.

On evidence presented herein (discussion below), the abdomen of Aphantomartus bears 8 dorsal plates, but these belong to 9 somites, and 2 more are probably present in the anal pygidium. The family diagnosis is therefore emended below. In view of the extensive revision required to Petrunkevitch's taxonomy of Phalangiodasites (Krabbe & Warming 1978, & in press), Trigonomartidae are also in need of review, which may result in the reappraisal of genera referred to Trigonomartidae by Petrunkevitch in press).

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2. SYSTEMATIC DESCRIPTION

Aphantomartus areolatus Pocock, 1911
Type specimen Aphantomartus areolatus Pocock, 1911
POCOCK (1911) for Trigonomartus areolatus Pocock, 1911

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First Palaeozoic arachnid from Iberia: Aphantomartus areolatus Pocock (basal Stephanian; prov. León, N.W. Spain), with remarks on aphantomartid taxonomy (*). Paul A. Selden (**), Michael Romano (***)

ABSTRACT
A specimen of Aphantomartus areolatus Pocock is described from middle-upper Cantabrian (lower Stephanian) strata of the Prado Formation, recovered from the borehole Prado 1 drilled in the IGME project «Investigación en el área carbonífera de León-Palencia» north of Cerezal in the western part of the Guardo Coalfield, province of León, Cantabrian Mountains, N.W. Spain. A literature survey revealed that errors in interpretation had resulted in the separation of two genera, Trigomartus and Aphantomartus, which are synonymous. The latter name takes precedence, as does Aphantomartidae over Trigomartidae.

RESUMEN
Se describe el primer ejemplar de una araña fossil del Paleozoico español encontrado en una lutita limolítica de la Formación Prado (cantábrico medio a superior), en el yacimiento denominado Prado 1 excavado en el proyecto del IGME «Investigación en el área carbonífera de León-Palencia» al norte de Cerezal, en la parte occidental de la cuenca de Guardo (León). Se trata de Aphantomartus areolatus. Las referencias anteriores indican que el género Trigomartus es sinónimo de Aphantomartus, al igual que ocurre con la familia Aphantomartidae, que sustituye a Trigomartidae.

1. INTRODUCTION
Discovery of an extinct arachnid is always noteworthy, owing to their relative scarcity as fossils. The specimen described herein, whilst belonging to a known species, is particularly important in the separation of two genera, Trigomartus and Aphantomartus, which are synonymous. The latter name takes precedence, as does Aphantomartidae over Trigomartidae.

The specimen was obtained from borehole C22 (Prado 1), 1 km north of the village of Cerezal in the western part of the Guardo Coalfield in northeastern León Province, Cantabrian Mountains, N.W. Spain. This borehole was sunk in strata of the Prado Formation in the southern flank of the Tarantalla Syncline (Wagner and Fernández-García in press). The Prado Formation is of middle to late Cantabrian (early Stephanian) age, and is an almost exclusively terrestrial inter-ival between two substantial marine formations. The early Stephanian age of the specimen is the youngest record for the family Aphantomartidae.

The Guardo Coalfield constitutes the western part of the post-Leonian sedimentary basin which extends from north-eastern León into northern Palencia (Wagner et al. 1977).

2. SYSTEMATIC DESCRIPTION
Phylum Chelicerae
Class Arachnida
Order Trigonotarbida
Suborder Aphantomartidae
Trigomartus areolatus

Type specimens, Aphantomartus areolatus Pocock, 1911

Remarks
Trigomartus was erected by Pocock (1911) for Anthracomartus (scutifer) scutifer (Schultze 1844). Three specimens of this species (including the holotype), excellently preserved in ironstone nodules of Pennsylvanian age from Illinois, U.S.A., were described and figured by Pocock (1911). Like many Carboniferous arachnids, and Recent Ricinuleids, on death the dorsal surface of the abdomen becomes concave and the subsegmental nodules of Pennsylvanian age from Illinois, U.S.A., were described and figured by Pocock (1911). Recent Ricinuleids, on death the dorsal surface of the abdomen becomes concave and the subsegmental nodules of Pennsylvanian age from Illinois, U.S.A., were described and figured by Pocock (1911). Recent Ricinuleids, on death the dorsal surface of the abdomen becomes concave and the subsegmental nodules of Pennsylvanian age from Illinois, U.S.A., were described and figured by Pocock (1911). Recent Ricinuleids, on death the dorsal surface of the abdomen becomes concave and the subsegmental nodules of Pennsylvanian age from Illinois, U.S.A., were described and figured by Pocock (1911).
martus areolatus nor one of Petrunkevitch's own figures, as stated, but a copy of Pruvost's (1919) figure 42 of A. pococki with 'eyes drawn on incorrectly.

The following species are referred provisionally to Aphantomartus: areolatus Pocock, dordlodoti (Pruvost), pococki Pruvost, prvosti (Van der Heide), villeti (Pruvost) and woodruffi (Scudder). It would be unwise to suggest synonymy of the constituent species without an examination of the type specimens. However, on the basis of published photographs, Trigonomartus (?) dordlodoti Pruvost (1930) (Van der Heide 1951) and Aphantomartus pococki Pruvost (1912, 1919) appear to be conspecific with A. areolatus (Petrunkevitch 1953, p. 92 also suggested the latter synonymy). Trigonomartus woodruffi (Scudder) (1893) (Petrunkevitch 1913) and T. (?) villeti (Pruvost) (1912, 1930) are poorly preserved and their identification may be uncertain. Trigonomartus (?) prvosti Van der Heide (1951) is probably not an Aphantomartus but an eophrynid. Aphantomartus areolatus and Trigonomartus pustulatus would appear to be distinct on the basis of the more prominent tuberosity and indistinct median transverse groove on the carapace of the latter, but both of these features may be preservational artefacts. It is important to realise that some specimens are preserved three-dimensionally in ironstone nodules whilst others are flattened in siltstones; these factors can enhance or diminish the tuberosity.

Diagnosis: as in Pocock, 1911, p. 79) but emended and augmented as follows: opisthosoma with 8 tergites, 1st differs from the rest but commonly concealed beneath the carapace. Lateral parts of median plate of 3rd to 7th tergites ornamented with large subtriangular tubercle which may be divided. A similar tubercle on posterior part of 2nd (macro-) tergite, the anterior part of which bears a row of large tubercles which diminish in size adaxially.

Aphantomartus areolatus Pocock, 1911. (Plate 1, fgs. 14; Text-fig. 1).


Material.

Internal and external moulds of dorsal surface of prosoma and opisthosoma, ocular tubercle inferred. b, ventral surface of posterior opisthosoma. Numbers refer to presumed opisthosomal somites.

Fig. 1.—Aphantomartus areolatus Pocock, reconstruction based on specimen described herein. a, dorsal surface of prosoma and opisthosoma, ocular tubercle inferred. b, ventral surface of posterior opisthosoma. Numbers refer to presumed opisthosomal somites.

Fig. 2.—Aphantomartus areolatus Pocock (x 8B), lit from NW. a, b, internal mould. c, d, external mould. a, c, whitened with ammonium chloride sublimate. b, d, under paraffin.
Figura 2.—Aphantomartus areolatus Pocock (×8), lit from NW. a, b, internal mould. c, d, external mould. a, c, whitened with ammonium chloride sublimate. b, d, under paraffin.
Horizon and locality.

Middle to upper Cantabrian (basal Stephanian), Carboniferous. Borehole in the Prado Formation (WAGNER and FERNÁNDEZ-GARCÍA in press), near Cerezo (León Province), Cantabrian Mountains, N.W. Spain. 

Measurements. Dimensions in mm.

Length of carapace .......... 4.75
Width of carapace across posterior margin.... 5.5
Length of abdomen .......... 6.5
Width of abdomen at midlength ....... 6.5
Width of abdomen at mideight ....... 6.5

Description.

The carapace is slightly wider than long and subtriangular in outline. The lateral borders are scalloped into wide embayments, and the anterior apex of the carapace terminates in two acute cusps. The carapace is divided into 4 regions. Posteriorly, a transverse rib, about 10 times as wide as long, occupies the full width of the carapace. This rib is ornamented with 6 posteriorly-directed tubercles with minor tubercles inbetween. The remainder of the carapace is divided into 3 segments with the median part forming a raised ridge running down the length of the carapace. The ridge is gently convex dorsally with steeply sloping sides and is divided into 3 segments of unequal length by 2 transverse furrows. The anterior segment is subtriangular in outline and carries 4 prominent tubercles forming the corners of a square. The anterior tubercles are the largest and are forwardly-directed, and between them a lower, forwardly-directed, bercle is present. The surface of this area is otherwise quite smooth. The second segment is slightly shorter than the anterior one and although the surface is not preserved, two notches on the anterior margin possibly represent the anterior end of the longitudinally elliptical ocular tubercle. The third segment is divided by a median furrow which is deep and angular; the segment bears an ornament of low, irregularly-shaped tubercles. The lateral fields of the carapace are flatter, though with steeply sloping sides, and bear a similar but more subdued ornament as the median part of the third segment. The lateral fields are divided by furrows which run forwards and outwards from the median ridge to the scalloped lateral margins. The most posterior of these furrows starts just anterior to the midlength of the third median segment; the second furrow starts at the junction between the second and third median segments. Furrows also separate the lateral fields from the median part of the carapace, and the posterior rib from the remainder of the carapace.

The abdomen is elliptical in outline with a nearly straight anterior margin. The surface bears tergites which consist of a median plate with a lateral plate on each side. The plates are separated by furrows which extend from the anterior-lateral borders of the abdomen to the posterior border. At the midlength of the abdomen the median plate is just under half the abdominal width. The longitudinal furrows converge backwards in a gentle sinuous curve and at about their midlength turn adaxially. The anterior tergite (see discussion) is only visible at the outer margins of the abdomen as wedge-shaped plates which appear to thin towards, and die out before reaching, the midline. The second tergite is considerably longer than the other tergites and probably represents two fused tergites. The position of the large tubercles (see below) indicates that fusion has probably occurred. The next 4 tergites (i.e. segments 4-7) are similar in shape and ornament and are about 8 times as wide as long. The seventh tergite (see above) is narrower than the remainder of the opisthosoma, and the surface is not preserved. However, study of the extremely well preserved Devonian Palaocharinidae, and of Hirst's (1923) excellent figures of them, has greatly aided interpretation of the abdominal anatomy in Aphantomartidae. In the Rhynie palaeochari- nids, the tergite belonging to the first abdominal segment is commonly partly concealed beneath the posterior edge of the carapace, and may form part of a locking device between prosoma and opis- tosome. In Aphantomartidae, the tergites are particularly well in sagittal sections, but can also be seen in Hirst's (1923) Text-fig. 4. A similar arrangement in Aphantomartidae would explain the first abdominal tergite appearing only as wedge-shaped pieces emerging from beneath the carapace, and also the contracted («locked») positions of proso- ma and opisthosoma in Aphantomartus puscula- tus seen in PETRUNKEVITCH (1913, Text-fig. 4).

Nine sternites are present in Palaeocharinidae, but no thoracic sternites (Hirst 1923) and STORMER (1970) only 8 tergites. It is possible that the second tergite is fused 2+3 as suggested herein in Aphantomalidae, in which case perhaps the latter family may eventually be found synonymous with the former. The segmentation of the opisthosoma, upon which much of PETRUNKEVITCH's familial taxonomy is based, is very difficult to discern from dorsal tergites, particularly if the anterior sternite is not preserved. However, study of the extremely well preserved Devonian Palaocharinidae, and of Hirst's (1923) excellent figures of them, has greatly aided interpretation of the abdominal anatomy in Aphantomartidae. In the Rhynie palaeochari- nids, the tergite belonging to the first abdominal segment is commonly partly concealed beneath the posterior edge of the carapace, and may form part of a locking device between prosoma and opis- tosome. In Aphantomartidae, the tergites are particularly well in sagittal sections, but can also be seen in Hirst's (1923) Text-fig. 4. A similar arrangement in Aphantomartidae would explain the first abdominal tergite appearing only as wedge-shaped pieces emerging from beneath the carapace, and also the contracted («locked») positions of proso- ma and opisthosoma in Aphantomartus puscula- tus seen in PETRUNKEVITCH (1913, Text-fig. 4).

Two segments are present in the anal pygidium of Palaeocharinidae, and these (Hirst 1923, Text-figs. 9 & 10, pl. 12, fig. c) where this organ is everted. It would not be unreasonable to suppose that where the anus appears in Aphantomartus (and other tricorythorids) as 2 concentric circles that 2 segments are also present. This brings the number of opisthosomal somites to 11 in both Palaocharinidae and Aphantomar- tidae. In which case, perhaps the latter family is directly descended from the former, and the two could be united. It may eventually be found that the segmentation described above is characteristic of the whole order Acarina, and that this is much more advanced than the present specimen corresponds most closely to A. areolatus. Comparison with A. (Trigonomartus) doroldoí (PUVOSOIR (1930) (VAN DER HEDDE 1951) may also be made, but as suggested above, this species may prove to be synonymous with the type. The main difference between the present specimen and A. areolatus is the less prominent tuberculation on the tergites. This can be explained by differences in preservation. However, in the holotype of A. areolatus (PETRUNKEVITCH 1953, pl. 48, fig. 167) and POPOC's drawing of it (1911, fig. 41) a rosette of tubercles on the second tergite is emphasised. Interestingly, POVOUS (1930, 208) also mentions «une rosace» of tubercles in his description of doroldoí. Nei- ther the present specimen nor other specimens referred to areolatus (e.g. PETRUNKEVITCH 1953, pl. 48, fig. 167) mention a rosette of tubercles quite so well, and so preservational differences are suspected.

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The abdomen is elliptical in outline with a nearly straight anterior margin. The posterior margin is scalloped into three segments of unequal length by 2 transverse ribs. The posterior face bears tergites which consist of a median plate with a lateral plate on each side. The plates are separated by furrows which extend from the antero-lateral borders of the abdomen to the posterior border. At the midlength of the abdomen the median plate is just under half the abdominal width. The longitudinal furrows converge backwards in a gentle sinuous curve and at about their midlength turn adaxially. The anterior tergite (see discussion) is only visible at the outer margins of the abdomen as wedge-shaped plates which appear to thin towards, and die out before reaching, the midline. The second tergite is considerably larger than the other tergites and probably represents two fused tergites. The position of the large tubercles (see below) indicates that fusion has probably occurred. The next 4 tergites (i.e. of segments 4-7) are similar in shape and ornament and are about 8 times as wide as long. The seventh tergite, which is the posterior part of a locking device between prosoma and opisthosoma, is narrower. This can be explained by differences in preservation. However, in the holotype of A. areolatus (Petrunkevitch 1953, pl. 48, fig. 167) and Peacock's drawing of it (1911, fig. 41) a rosette of tergites on the second tergite is emphasized. Interestingly, Peacock (1930, 208) also mentions «une roseau» of tubercles in his description of doroloid. Neither the present specimen nor other specimens referred to areolatus (e.g. Petrunkevitch 1953, pl. 48, fig. 167, and Peacock's drawing of it) have a rosette of tubercles quite so well, and so preservational differences are suspected.

The segmentation of the opisthosoma, upon which much of Petrunkevitch's familial taxonomy is based, is very difficult to discern from dorsal tergites, particularly if the anterior sternites are not preserved. However, study of the extremely well preserved Devonian Palaeocharinidae, and of Hirst's (1923) excellent figures of them, has greatly aided interpretation of the abdominal anatomy in Aphantomartidae. In the Rhynie palaeocharinids, the tergite belonging to the first abdominal segment is commonly partly concealed beneath the posterior edge of the carapace, and may form part of a locking device between prosoma and opisthosoma. This can be revealed, however, particularly well in sagittal sections, but can also be seen in Hirst's (1923) Text-fig. 4. A similar arrangement in Aphantomartidae would explain the first abdominal tergite appearing only as wedge-shaped pieces emerging from beneath the carapace, and also the contracted («locked») positions of prosoma and opisthosoma in Aphantomartus postulatus seen in Petrunkevitch (1930) fig. 47-50.

Nine sternites are present in Palaeocharinidae, but so far in Aphanomartus (Hirst 1923) and Stormer (1970) only 8 tergites. It is possible that the second tergite is fused 2-3 as supposed herein in Aphantomartidae, although the anterior (segment 2) part of this macrotergite is quite narrow in both Alke- nie (Stormer 1970, Text-fig. 7) and the Rhynie species (Hirst 1923, Text-fig. 4). This would explain the supernumerary sternites. Note however that the fusion of tergites does not imply the fusion of segments, and that this is much more advanced for example in Phalangiotoriabida (Kielleslev-Warring in press) and Ricinuleida.

Two segments are present in the anal pyggidium of Palaeocharinidae, and these (Hirst 1913) figs. 47-50) where this organ is everted. It would not be unreasonable to suppose that where the anus appears in Aphantomartus (and other trigonotarbid) as a concentric circles which 2 segments are also present. This brings the number of opisthosomal somites to 11 in both Palaeocharinidae and Aphantomar- tidae. In which case, perhaps the latter family is directly descended from the former, and the two could be united. It may eventually be found that the segmentation described above is characteristic only of this suborder and differences reliant on dorsal abdominal scle- rotization and other characters. Of related interest, the subtriangular carapace with scalloped edges, raised median ridge, and furrowed flanks is found in a number of genera scattered throughout the TrigonotaBida, in for example, Aphantomartus, Alke- nie, Phrynornarius, Eophrynus, Kreische- ris and other Eophrynidae.
4. CONCLUSIONS

The first recorded Palaeozoic arachnid from the Iberian region is of note. The taxonomy of Aplunotomus, to which the specimen belongs, is in some confusion which has been resolved in part herein. It is obvious however, in the light of previous interpretative errors and the recent, major, taxonomic revision necessary to another fossil arachnid group, Phalangiotarbidida (Kilelvensig-Waering in press), that a full revision of the Tri- gonotarbida, perhaps in conjunction with Anhydroarachnida, is needed.

ACKNOWLEDGEMENTS

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REFERENCES


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MINERIA

El yacimiento de Sepiolita-Paligrorskita de Sacramenca, Segovia

Por J. M. MARTIN POZAS (*), J. MARTIN-VIVALDI (**), Y M. SANCHEZ CAMAZANGO (**)

RESENUE

En este trabajo se presentan las investigaciones llevadas a cabo sobre un deposit de arcillas fibrosas relacionado a una cuenca sedimentaria de caracter continental.

El deposito se encuentra ubicado en el norte de la provincia de Segovia, en la region suroriental de la cuenca del Duero.

En el techo del corte estudiado, existe un nivel de sepiolita, muy oscura, de un espesor entre uno y dos metros. Hacia el muro de la formacion, se puede ver que el nivel de sepiolita por unos seis o ocho metros de materiales marginales, aparece un nivel de unos cuatro metros de potencia de paligorskita casi pura, con illita y cuarzo como minerales accessorios.

A lo largo de todo el perfil se han estudiado los minerales de la arcilla asociados a los materiales marginales, encontrandose, en casi todos los casos, ademas de sepiolita y paligorskita, minerales esmectiticos muy degrados en un estado tipo intergrad.

Parece claro que el proceso de gnesis de este deposito responde a una neoformacion en un medio sedimentario de alta actividad quimica de magnesio y que debe incluir el proceso de recristalizacion y posterior crecimiento de minerales fibrosos a partir de espeques de esmectitas altamente transformados.

ABSTRACT

This work presents the research carried out on a new deposit of fibrous clays which is related to a continental sedimentary basin.

The deposit may be found to the north of the province of Segovia, in the southeastern region of the Duero Basin. On the top of the deposit studied there is a layer of sepiolite, very dark, with a thickness of between one and two meters. Towards the bottom of formation, separated from the sepiolite by lime-marl materials of six-eight meters in thickness, appears a layer of almost pure paligorskite. West to it, illite and quartz are associated in smaller amounts. Along the whole of the profile, the clay minerals associated to the sepiolite apart of sepiolite and paligorskite, smectite materials have been found in a very degraded intergrade-type state.

In this deposits fibrous clay minerals seems clear that the genetic process that have led to the formation of these materials corresponds to a neoformation in sedimentary media of high chemical activity rich in magnesiu and includes the recrystallization and later growth of fibrous minerals from highly transformed smectite skeletons.

1. INTRODUCCION

El presente trabajo resume las investigaciones efectuadas en un yacimiento de materiales fibrosos (sepiolita y paligorskita) situado en la provincia de Segovia en las proximidades con la de Valladolid. Tanto la sepiolita como la paligorskita son minerales absorbentes que con frecuencia componen las denominadas «Fuller’s earth». Su importancia tecnica radica en su aplicacion como decolorantes, absorbentes, material ceramico y lodos para sondeos. Recientemente se ha diversificado su utilizacion, p. ej., como absorbente en lodos para sondeos. Recientemente se ha diversificado su utilización, p. ej., como absorbente en lodos para sondeos.

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