

## A new species of the family Hybotidae in the Lower Cretaceous amber of El Caleyú (Asturias, Spain); *Alavesia prietoi* n. sp.

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### ABSTRACT

A new species of the genus *Alavesia* Waters & Arillo 1999, belonging to the family Hybotidae, is described from a specimen found in Lower Cretaceous amber from El Caleyú outcrop (Asturias Province, North of Spain): *Alavesia prietoi* n. sp. The monospecific genus *Alavesia* was described from Cretaceous amber of Peñacerrada, in the North of Spain as well. Interestingly, this genus has been found in Cretaceous amber from Myanmar (Burma), thus El Caleyú is the third Cretaceous locality with representation of *Alavesia*. The holotype of the new species is a complete, very well preserved female specimen into a small, transparent yellowish amber piece. *Alavesia prietoi* n. sp. differs from *A. subiasi* Waters & Arillo 1999 having a clearly bigger body size, a basal flagellomere subtriangular and slightly longer than twice the length of the arista, a globular palpus and a vein Rs arising from R<sub>1</sub> at level of the crossvein h.

**KEY WORDS :** Diptera. Hybotidae. New species. Amber. Lower Cretaceous. Spain.

### INTRODUCTION

The family Hybotidae (*sensu* Chvála 1983) constitutes the lineage [Ocydromiinae+ Hybotinae+ Tachydromiinae], into Empidoidea. The three subfamilies had differentiated by the Early Cretaceous (Waters & Arillo 1999). The phylogeny of Hybotidae, basal Eremoneura (empidoids and Cyclorrhapha), is available in Grimaldi & Cumming (1999) and Grimaldi & Engel (2005). The Cretaceous fossil record of the hybotid lineage is very scarce, and for this reason the description of new taxa is of the greatest interest. Up to the monograph of the Cretaceous brachyceran Diptera by Grimaldi & Cumming (1999), the only known hybotid genera were *Electrocyrtoma* Cockerell 1917, *Trichinites* Hennig 1970, *Archiplatypalpus* Kovalev 1974, *Cretoplatypalpus* Kovalev 1978, *Ecomocydromia* Schlüter 1978 and *Pseudoacarterus* Waters 1989 (Cockerell 1917, Hennig 1970, Kovalev 1974, 1978, Schlüter 1978, Waters 1989). Grimaldi & Cumming (1999) reviewed the previously record in Cretaceous amber and described some species and the genus *Mesoplatypalpus*. The same year was published the ocydromid genus *Alavesia* from Peñacerrada amber in the North of Spain (Waters & Arillo 1999), which possesses a combination of the characteristics of two of the ocydromid tribes. The genus was also mentioned and figured but not described from Burmese amber (Grimaldi *et al.* 2002). Cretaceous genera, including *Alavesia*, are described as monotypic. Here we report the second known species of this uncommon genus from El Caleyú amber (North of Spain). The well preservation of the holotype provides us a more complete description of the morphological characteristics and chaetotaxy of the genus.

### MATERIAL AND METHODS

The piece of amber was found in El Caleyú outcrop of the Ullaga Formation (see Arbizu *et al.* 1999, more information about the Cretaceous amber in Asturias Province is available in González-Fernández *et al.* 2004). It lacks internal fissures containing air and it was carefully cutted by hand with a blade and polished with a fine paper. The dipteran specimen was studied using sugar gel applied between the amber surface and a slide, which reduces the optical distortion caused by the imperfections of some of the amber surfaces. The fossil fly was drawn with a Wild 308700 camera lucida and examined using a Leica Wild M1 stereoscope. Some of the measurements were impossible to obtain due to the position of some body parts respect to the polished planes.

### SYSTEMATIC PALAEONTOLOGY

**Order:** Diptera Linnaeus, 1758

**Superfamily:** Empidoidea (*sensu* Chvála, 1983)

**Family:** Hybotidae Chvála, 1983

**Subfamily:** Ocydromiinae (*sensu* Chvála, 1983)

GENUS: *Alavesia* Waters & Arillo 1999

Type species: *Alavesia subiasi* Waters & Arillo 1999, pp. 60-62, figs. 1-3.

*Alavesia prietoi* sp. nov.

Figures 2-3

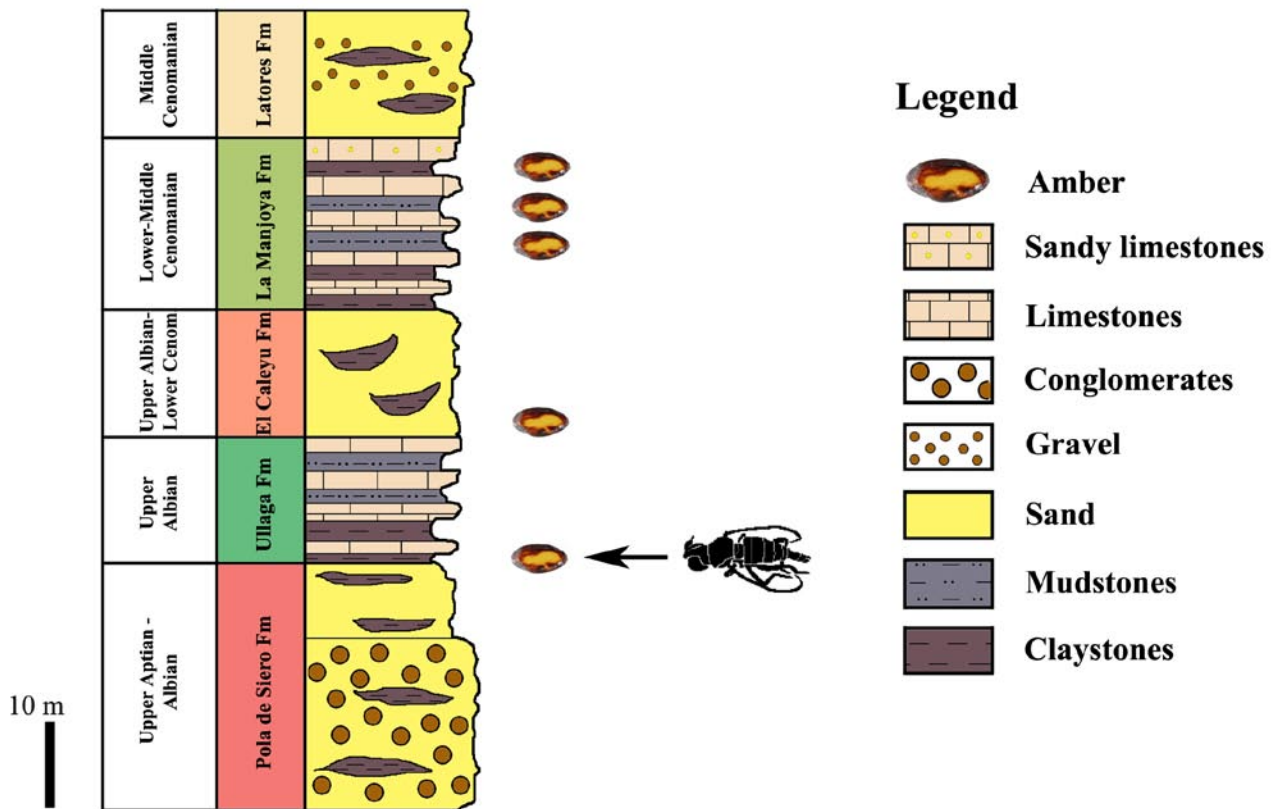


Figure 1. Synthetic stratigraphic log of the Cretaceous of Asturias (Upper Aptian to Middle Cenomanian); arrow indicates the level where the hybotid specimen was found (modified from González-Fernández *et al.* 2004).

1999 Hybotidae, Arbizu *et al.*, p. 251.

2007 *Alavesia*, Delclòs *et al.*, p. 12, fig. 4J.

**Etymology.** The species is named after Mr. Miguel Ángel Prieto who discovered the type specimen.

**Holotype.** Almost complete and well preserved female adult DGO-3502 (DGO = Department of Geology in Oviedo) stored in the lithothèque of Department of Geology (Oviedo University), C/J. Arias de Velasco s/n, 33005 Oviedo, Asturias, Spain. The holotype is in a small piece (0.6 x 0.4 x 0.4 mm) of clear and yellowish amber and only some terminal tarsomeneres have been lost.

**Type locality.** El Caleyú outcrop, near Oviedo city (ca. 5 Km south), Asturias, Spain.

**Stratum typicum.** Specimen discovered in amber associated to claystones-mudstones from the Upper Albian (Lower Cretaceous) of the Ullaga Formation (Asturias, Spain) (see Arbizu *et al.* 1999, González-Fernández *et al.* 2004).

**Diagnosis.** Bigger than the type species (ca. 40% bigger), with basal flagellomere twice the length of the arista, palpus globular, and vein Rs arising from R1 at level of the humeral crossvein.

**Description.** Female (Figs. 2-3). Body robust, total body length 2.05 mm (from head to the evaginated distal part of the abdomen). Head big, ca. 0.25 mm length and ca. 0.33 mm height, with three ocelli well visible and without ocellar setae. Bare, dichoptic eyes well developed (0.32 x 0.29 mm) (Fig. 2.3). Antenna aristate, 0.67 mm long, with fine, dense setae (Fig. 2.4). Scape and pedicel subcylindrical. Pedicel slightly bigger than scape, and with a distal ring of setae. Basal flagellomere subtriangular, bilaterally symmetrical, elongate, basally swollen, 0.38 mm length, 0.06 mm width, 0.13 mm greatest height. Arista terminal and short, 0.18 mm length, and 3-articulated, being basal 2 articles very small (the length of both together is 0.03 mm). Proboscis short with labellum small. Palpus not prominent and globular, with few short setae near tip. Thorax slightly arched upward, 0.61 mm long and 0.45 mm approx. wide. Notum with five regular rows constituted by two lines of short, fine setae (big setae on posterior position) (Figs. 3.2, 3.3). Scutellum subtriangular with fine striate sculpturation and with only an apical pair of setae, equal to posterior setae of the notum. Notopleuron with strong setae (2 to 3). Wing is 1.59 mm long, ca. 0.56 mm broad, with 1-2 strong basal setae (Fig. 2.2). Membrane entirely covered with microtrichia. Costal vein ending beyond apex of M1. Vein Sc does not reach wing margin but ends freely in wing membrane. Vein Rs arising from R1 at level of the humeral

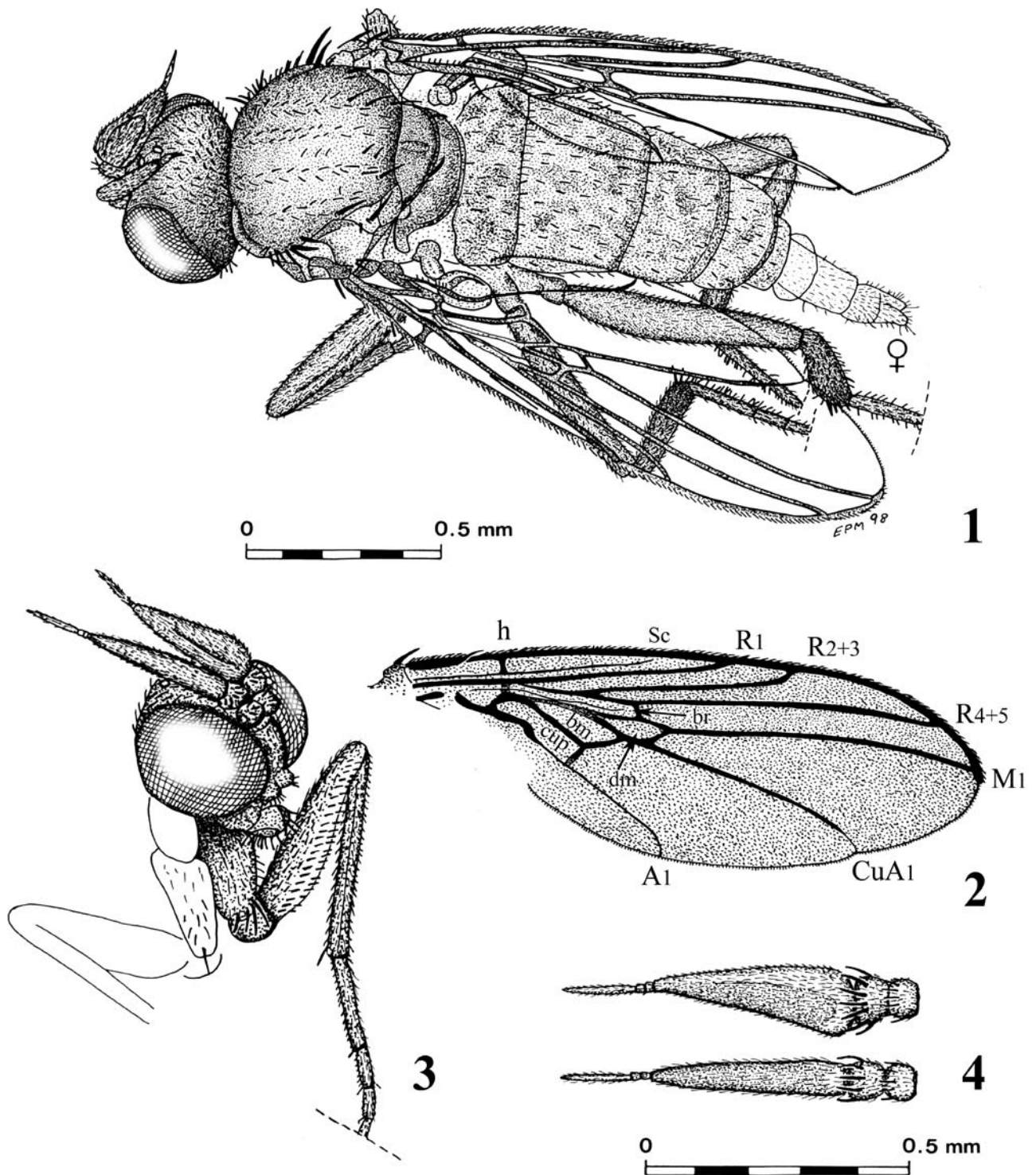


Figure 2. Camera lucida drawings of *Alavesia prietoi* n. sp. (Diptera, Hybotidae, Ocydromiinae), holotype DGO-3502 (Coll. Department of Geology, Oviedo University). 1) general habitus in latero-dorsal view, 2) wing (cell bm distorted in this view), 3) head and fore legs in anterior view, 4) antennae in lateral and ventral view. 1 to 3 drawings to the same scale.

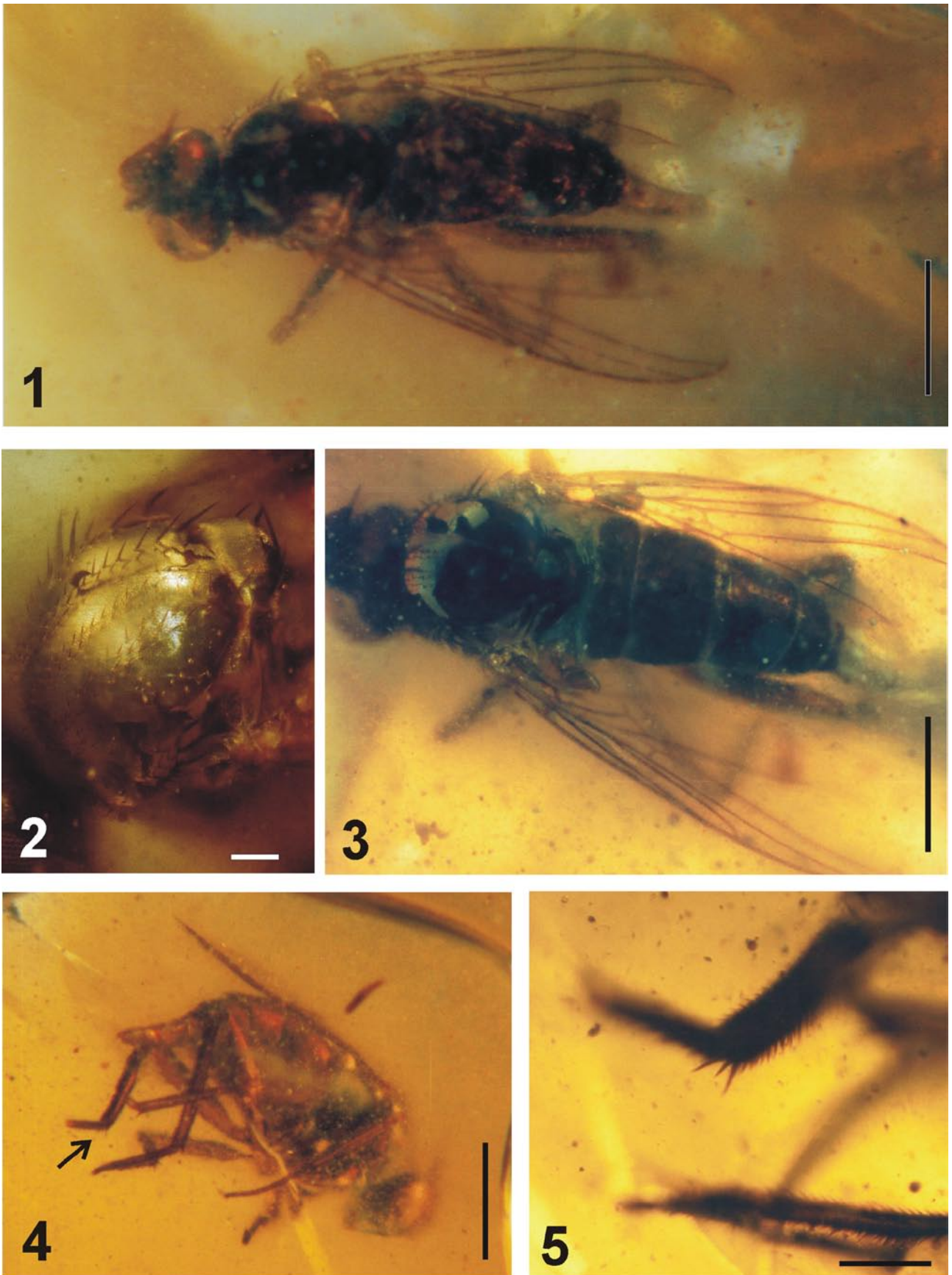


Figure 3. *Alavesia prietoi* n. sp. (Diptera, Hybotidae, Ocydromiinae), holotype DGO-3502 (Coll. Department of Geology, Oviedo University). 1) general habitus in latero-dorsal view, 2) detail of the chaetotaxy of the thorax, 3) partial latero-dorsal view of the body showing details of the thorax, wing venation and abdomen, 4) general habitus in latero-ventral view (arrow indicates the detail in fig. 3.5), and 5) detail of the apical spines in fore tibia. Vertical scale bars = 0.5 mm, horizontal scale bars = 0.1 mm.

crossvein. Cell dm very small (with distinct dm-cu vein) emitting two veins M1 and CuA1, which are long (greater than half wings length) and reaching wing margin. Vein M not evanescent. Cells br, bm and cup short. Cell cup as long as cell bm, with its outer angle right, and with CuA2 forming right angle with basal part of A1. Cell bm approximately twice the width of cell br. Anal vein (A1) reaching wing margin. Vein R4+5 is not forked, straight and parallel to M1. Veins R1 and R2+3 are short as they curve approximately midway along wing length. Capitulum of the halter is 0.15 x 0.09 mm. Fore coxa (ca. 0.25 length) with four distal setae on inner side (Fig. 2.3). Fore femur 0.48 mm length, 0.13 mm greatest width (basally swollen), with two longitudinal rows of setae on ventral surface. Fore tibia 0.53 mm length, 0.05 mm width, with at least one distal spine (Fig. 2.3). Tarsomere I 0.24 mm length, II = 0.09 mm, and III = 0.08 mm. Mid femur 0.52 mm length, 0.08 mm width. Mid tibia with at least two distal spines. Hind femur (0.63 mm length, 0.10 mm width) is slightly thickened. Hind tibia with three distal spines (Fig. 3.5). Abdomen cylindrical and terminal segments of female telescoping (genitalia well visible). Cerci moderately long (Fig. 2.1). Male unknown.

## DISCUSSION

The new species clearly belongs to the genus *Alavesia* described from Peñacerrada-I amber. The type species *Alavesia subiasi* is very close to the new species, for example has practically identical wing venation. In *Alavesia subiasi* the basal flagellomere is 2.5-3 times longer than arista and the palpus is elongate and thin. In *Alavesia prietoi* n. sp. the basal flagellomere is twice the length of the arista and the palpus is globular. It seems that the shape of the basal flagellomere is slightly different, leaf shaped in *A. subiasi* and subtriangular in *A. prietoi* n. sp. The main difference present in wing venation is that in *A. subiasi* the vein Rs arising from R<sub>1</sub> clearly apical in relation to the humeral crossvein. The new species is clearly bigger than *A. subiasi* (e.g. body length 2.05 vs. 1.5 mm, wing length 1.59 vs. 1.1 mm, length of the head+thorax 0.86 vs. 0.55 mm [erroneously as 5.5 mm in the original description]). *Alavesia subiasi* is known from three specimens, two of which are probably males and the third is female, and for this reason the differences between the two species would not be by sexual dimorphism.

The peculiar presence of two, not one, small basal articles in the arista is possibly present in *Trichinites* as well (Hennig 1970). This character is very difficult to see, including the well preserved specimens in clear amber, due to the very small size of the two articles, and for this reason a revision of the previously described Cretaceous genera of the hybotid lineage is necessary. Possibly, the presence of a 3-segmented arista is a plesiomorphic character in this group.

Based on several taxa represented in Burmese amber and in other well dated outcrops, for example the genus *Alavesia*, Grimaldi *et al.* (2002) indicated approximately a Cenomanian to Turonian age for this amber. Peñacerrada

and El Caleyú outcrops, with representatives of the genus *Alavesia*, are Lower-Middle Albian and Upper Albian respectively. According this, *Alavesia* existed around Early/Late Cretaceous boundary.

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## REFERENCES

- ARBIZU, M., BERNÁRDEZ, E., PEÑALVER, E. & PRIETO, M.A. 1999. El ámbar de Asturias (España). Estudios del Museo de Ciencias Naturales de Álava, 14(núm. esp. 2): 247-256.
- CHVÁLA, M. 1983. The Empidoidea (Diptera) of Fennoscandia and Denmark. II. Fauna entomologica scandinavica, Klampenborg: Scandinavian Science Press Ltd., 12: 1-279.
- COCKERELL, T.D.A. 1917. Arthropods in Burmese amber. *Psyche*, 24: 40-44.
- DELCLÒS, X., ARILLO, A., PEÑALVER, E., BARRÓN, E., SORIANO, C., LÓPEZ DEL VALLE, R., BERNÁRDEZ, E., CORRAL, C. & ORTUÑO, V.M. 2007. Fossiliferous amber deposits from the Cretaceous (Albian) of Spain. *Comptes Rendus Paleovol*, 6: 135-149.
- GONZÁLEZ-FERNÁNDEZ, B., MENÉNDEZ-CASARES, E., GUTIÉRREZ-CLAVEROL, M. & GARCÍA-RAMOS, J.C. 2004. Litoestratigrafía del sector occidental de la cuenca cretácica de Asturias. *Trabajos de Geología*, Universidad de Oviedo, 24: 43-80.
- GRIMALDI, D.A. & CUMMING, J. 1999. Brachyceran Diptera in Cretaceous ambers and Mesozoic diversification of the Eremoneura. *Bulletin of the American Museum of Natural History*, 239: 124 pp.
- GRIMALDI, D.A. & ENGEL, M. 2005. *Evolution of the Insects*. Cambridge University Press, New York: 755 pp.
- GRIMALDI, D.A., ENGEL, M.S. & NASCIBENE, P.C. 2002. Fossiliferous Cretaceous Amber from Myanmar (Burma): Its Rediscovery, Biotic Diversity, and Paleontological Significance. *American Museum Novitates*, 3361: 71 pp.
- HENNIG, W. 1970. Insektenfossilien aus der unteren Kreide. II. Empididae (Diptera, Brachycera). *Stuttgarter Beiträge zur Naturkunde*, 214: 1-12.
- KOVALEV, V.G. 1974. A new genus of the family Empididae (Diptera) and its phylogenetic relationships. *Paleontological Journal*, 8(2): 196-204.

- KOVALEV, V.G. 1978. A new fly genus (Empididae) from late Cretaceous retinites of the Taimyr. *Paleontological Journal*, 12(3): 351-356.
- SCHLÜTER, T. 1978. Zur Systematik und Palökologie harzkonservierter Arthropoda einer Taphozönose aus dem Cenomanium von NW-Frankreich. *Berliner geowissenschaftliche Abhandlungen*, 9: 1-150.
- WATERS, S.B. 1989. A new hybotine dipteran from the Cretaceous of Botswana. *Palaeontology*, 32(3): 657-667.
- WATERS, S.B. & ARILLO, A. 1999. A new genus of Hybotidae (Diptera, Empidoidea) from Lower Cretaceous amber of Alava (Spain). *Studia dipterologica*, 6(1): 59-66.

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