



Revision of rock fossils of Dryinidae and Embolemidae (Hymenoptera: Chrysidoidea)

MASSIMO OLMI¹, ALEXANDER P. RASNITSYN² & ADALGISA GUGLIELMINO¹

¹Department of Plant Protection, University of Tuscia, Viterbo, Italy

²A. A. Borissiak Paleontological Institute, Academy of Sciences, Moscow, Russia and Natural History Museum, London, UK

Abstract

New fossil taxa of Embolemidae and Dryinidae (Hymenoptera: Chrysidoidea) are described. For Embolemidae, *Embolemopsis baissensis* **n. gen. n. sp.** and *Baissobius minutus* **n. sp.**, are described from Central Siberia, West Transbaikalia, left bank of Vitim River (facing downstream), Baissa, lake deposits from earlier Early Cretaceous (Neocomian stage) (130–140 mybp). For Dryinidae, *Anteonopsis antiquus* **n. gen. n. sp.**, *Bocchus ? cenomanianus* **n. sp.** and *Gonatopus ? cretacicus* **n. sp.**, are described from Siberia, Magadan Region, Obeschchayushchiyi, tuffaceous deposits from Upper Cretaceous (Cenomanian) (90–95 mybp); *Deinodryinus ? aptianus* **n. sp.**, is described from Central Mongolia, Bayanhongor Aimag, 5–8 Km N Bon Tsagan Nuur Lake, from impressed in lake deposits of the Khurilt rock unit probably of Aptian (Early Cretaceous) (100–115 mybp). In addition, an unidentified fossil belonging to *Deinodryinus ?* or *Dryinus ?* is recorded from Russian Far East, Maritime Province, Velikaya Kema (later Earlier or early Middle Miocene) (about 30 mybp). The known species of *Baissobius* Rasnitsyn are reviewed and a key is presented.

Key words: new fossil taxa, Cretaceous, Tertiary, Mongolia, Siberia

Introduction

Fossil Embolemidae (Hymenoptera: Chrysidoidea) are known from both the Cenozoic and the Cretaceous from amber (Brothers & Rasnitsyn, 2003; Olmi, 1995; Rasnitsyn & Matveev, 1989) and from marl (Rasnitsyn, 1975, 1996). Fossil Dryinidae (Hymenoptera: Chrysidoidea), however, are known exclusively from both Cenozoic and Cretaceous amber (Engel, 2003; Olmi, 2005; Olmi & Bechly, 2001; Peinado et al., 2006; Ponomarenko N., 1975, 1981, 1988; Rasnitsyn & Kulicka, 1990; Zherikhin et al., 2009) from the following zoogeographical regions: Palaearctic (Baltic, Oise, Lebanese and Taimyr amber), Nearctic (Medicine Hat amber), Neotropical (Dominican Republic and Chiapas amber) and Oriental (Burmese amber).

For the most part, Dryinidae and Embolemidae fossils from the Tertiary show only specific differences with extant species, because many genera of this period are extant. On the contrary, fossils of these two families from Cretaceous should be very important, because of the possible presence of extinct supraspecific taxa.

In recent years, we have studied some new fossils of the above families from various rocks of Mongolia and Siberia, deposited in the A. A. Borissiak Paleontological Institute, Russian Academy of Sciences. This study is resulted in the discovery of new genera and new species described as follows.

Material and methods

The descriptions follow the terminology used by Olmi (1984, 1994, 1999). The measurements reported are relative, except for the total length (head to abdominal tip, without the antennae) and the length of some parts of the body, which are expressed in millimetres.

The characteristics of the fossil sites described in the present paper are reported by Rasnitsyn & Quicke (2002).

The material studied in the present paper is deposited in the following institution:

PIN: A. A. Borissiak Paleontological Institute, Russian Academy of Sciences, Moscow (Russia).

In the following descriptions, the names of some extant genera are followed by a question mark. This mark is justified because the presence of extant genera as early as deep in the Cretaceous is known to be a rare occasion in insects. However, the authors had to place some species in extant genera, because of the lack of evident differences justifying the creation of new genera.

Results

Embolemidae

Embolemopsis Olmi, Rasnitsyn & Guglielmino, n. gen.

Type species: *Embolemopsis baissensis* Olmi, Rasnitsyn & Guglielmino, n. sp.

MALE (Fig. 1): macropterous; dorsal side of head swollen; palpal formula unknown; pronotum not distinctly visible, so that it is not possible to see if it has a strong median longitudinal furrow; forewing with 3 basal cells (CC, BC, SBC) + 1DC and 1SDC enclosed by pigmented veins; stigmal vein forming right angle with pterostigma; tibial spurs unknown.

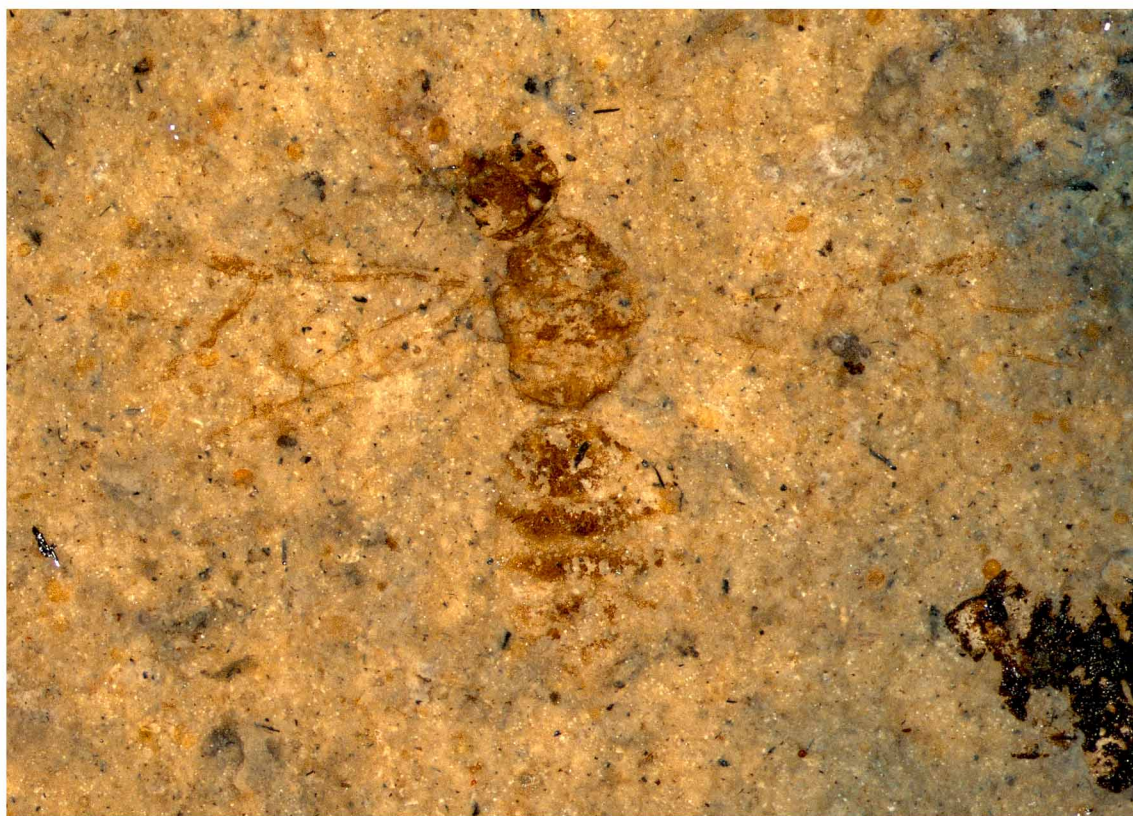


FIGURE 1. *Embolemopsis baissensis* n. gen. n. sp. (length 2.6 mm).

FEMALE: unknown.

Remarks: in *Embolemopsis* n. gen. the forewing has 3 basal cells + 1DC and 1SDC cells enclosed by pigmented veins as in extant and fossil species of *Ampulicomorpha* Ashmead, 1893 (Olmi, 1996). *Embolemopsis* is different from *Baissobius* Rasnitsyn, 1975, because in *Baissobius* 1DC and 1SDC cells are

not enclosed by pigmented veins. In addition, the new genus has a stigmal vein forming a rectangular angle with pterostigma. In the extant and fossil Embolemidae the stigmal vein forms always an acute angle with the pterostigma.

***Embolemopsis baissensis* Olmi, Rasnitsyn & Guglielmino, n. sp.**

Material examined: male holotype, PIN no. 4210/7095 from Central Siberia, West Transbaikalia, left bank of Vitim River, 3 km downstream from the former lodge Baissa, marls of Zaza formation, earlier Early Cretaceous (Neocomian stage) (130–140 mybp).

MALE (Fig. 1): macropterous; length 2.6 mm; dorsal side of head swollen; palpal formula unknown; pronotum short, not distinctly visible; median longitudinal furrow of pronotum not visible; forewing with 3 basal cells (CC, BC, SBC) + 1DC and 1SDC enclosed by pigmented veins; stigmal vein regularly curved, forming right angle with pterostigma, composed by distinct proximal and distal parts; petiole very short; tibial spurs unknown.

FEMALE: unknown.

***Baissobius* Rasnitsyn**

Baissobius Rasnitsyn 1975: 128; Rasnitsyn 1980: 109, 152 ; Rasnitsyn 1996: 183.

Type species: *Baissobius parvus* Rasnitsyn 1975, monotypic and orig. desig.

MALE (Figs 2–6): fully winged; dorsal side of the head swollen; palpal formula unknown; pronotum not distinctly visible; median longitudinal furrow of pronotum not visible; forewing with 3 basal cells completely enclosed by pigmented veins; 1DC and 1SDC cells not enclosed by pigmented veins; stigmal vein forming acute angle with pterostigma; tibial spurs unknown.

FEMALE: unknown.

SPECIES: four (all fossils).

***Baissobius minutus* Olmi, Rasnitsyn & Guglielmino, n. sp.**

Material examined: male holotype, PIN no. 4210/1203 from Central Siberia, West Transbaikalia, left bank of Vitim River, 3 km downstream from the former lodge Baissa, marls of Zaza formation, earlier Early Cretaceous (Neocomian stage) (130–140 mybp).

FEMALE: unknown.

MALE (Fig. 2): fully winged; length 1.7 mm. Antennae and head missing. Pronotum not distinctly visible. Notauli present, not distinctly visible, apparently incomplete. Forewing with 3 basal cells completely enclosed by pigmented veins; 1DC and 1 SDC cells not enclosed by pigmented veins. Length/breadth ratio of pterostigma: 24:12 (2.0). Ratios between body regions: scutum (14): scutellum (8): metanotum (2): propodeum (18): gaster (57): forewing (70). Legs almost completely invisible (only a hind leg is partly visible). Maxillary palpi and tibial spurs not visible.

Remarks: because of the characters of the forewing, *Baissobius minutus* n. sp. is similar to *B. carolianus* Rasnitsyn, 1996. However, the pterostigma has a different shape and the 2r-rs vein is shorter. Unluckily, the antennae of *B. minutus* are missing, so that it is impossible to compare them with the very characteristic antenna of *B. carolianus*.

***Baissobius minimus* Rasnitsyn**

Baissobius minimus Rasnitsyn, 1996: 186.

Material examined: male holotype, PIN no. 4210/1195 from Central Siberia, West Transbaikalia, left bank of Vitim River, 3 km downstream from the former lodge Baissa, marls of Zaza formation, earlier Early Cretaceous (Neocomian stage) (130–140 mybp).

MALE (Figs 3, 4): fully winged; length 3.12 mm. Antennae very thick; antennal segments 7–10 in following proportions: 7:6.5:6:11 (rest of antennae not visible); length/breadth ratio of antennal segments 7–10: 7th: 7:6; 8th: 6.5:6; 9th: 6:5; 10th: 11:6. Notauli not visible. Forewing only partly visible. Length/breadth ratio of pterostigma: 12:5 (2.4). Ratios between the body regions: head (28): eyes (11): pronotum (2.5): scutum (16): scutellum + metanotum (18): propodeum (14): gaster (51).

FEMALE: unknown.

Remarks: the authors present the above and the following redescriptions of *Baissobius* species to make the original descriptions homogeneous with respect to the morphological characters described in the revision of world Embolemidae by Olmi (1996). In addition the authors believe that it is useful to have a complete treatment of all known rock fossils.



FIGURE 2. *Baissobius minutus* n. sp. (length 1.7 mm).

***Baissobius parvus* Rasnitsyn**

Baissobius parvus Rasnitsyn, 1975: 128.

Material examined: male holotype, PIN no. 1989/2597 from Central Siberia, West Transbaikalia, left bank of Vitim River, 3 km downstream from the former lodge Baissa, marls of Zaza formation, earlier Early Cretaceous (Neocomian stage) (130–140 mybp).

MALE (Fig. 5): fully winged; length 4.6 mm. The holotype can be seen only laterally, so many characters are not visible. Forewing only partly visible. Length/breadth ratio of pterostigma: 25:8 (3.12). Ratios between the body regions: head (50): mesosoma (90): gaster (85). Legs completely not visible.

FEMALE: unknown.



FIGURES 3–4. *Baissobius minimus* Rasnitsyn (length 3.1 mm) from ventral (Fig. 3) and dorsal (Fig. 4) side.

***Baissobius carolianus* Rasnitsyn**

Baissobius carolianus Rasnitsyn, 1996: 186.



FIGURE 5. *Baissobius parvus* Rasnitsyn (length 4.6 mm).

Material examined: male holotype, PIN no. 3559/4523 from Central Mongolia, Bayanhongor Aimag, 5–8 km N Bon Tsagan Nuur Lake, outcrop 87, bed 8, impressed in marl of the Khurilt rock unit probably of Aptian (Early Cretaceous) (100–115mybp).

MALE (Figs 6–7): fully winged; length 3.7 mm. Antennae filiform, slightly geniculated, slender; antennal segments in following proportions: 9:3:7:8:8:7:6:6:5.5:6; length/breadth ratio of antennal segment 8th: 6:3; 9th: 5.5:3; 10th: 6:3. Head anteriorly narrowed; eyes possibly half as long as head. Pronotum not visible. Notauli complete; minimum distance between notauli longer than antennal segment 2: 7:3. Length/breadth ratio of pterostigma: 21:5 (4.2). Ratios between body regions: head (27): scutum (15): scutellum (10): metanotum (5): propodeum (20): gaster (95): forewing (100). Legs almost completely invisible (only the left fore leg is partly visible). Maxillary palpi and tibial spurs not visible.

FEMALE: unknown.

Remarks: The known species of *Baissobius* can be identified by the following key:

- | | | |
|---|---|--|
| 1 | Pterostigma less than three times as long as broad (Figs 2, 4) | 2 |
| - | Pterostigma more than three times as long as broad (Figs 5, 6) | 3 |
| 2 | Forewing with 2r-rs vein very long (Fig. 4) | 3. <i>minimus</i> Rasnitsyn |
| - | Forewing with 2r-rs vein very short (Fig. 2) | 4. <i>minutus</i> Olmi, Rasnitsyn & Guglielmino, n. sp. |
| 3 | Forewing with 2r-rs vein and stigmal vein showing an angle between proximal and distal parts (Fig. 5) | 1. <i>parvus</i> Rasnitsyn |
| - | Forewing with 2r-rs vein regularly curved (Fig. 6) | 2. <i>carolianus</i> Rasnitsyn |

Dryinidae

Bocchinae

The only known fossil species belonging to Bocchinae subfamily is *Bocchus vetustus* Olmi 1991, found in amber from Dominican Republic.

However, in recent years a rock fossil from Siberia was demonstrated to be a new species of *Bocchus* Ashmead 1893 described as follows.



FIGURES 6–7. *Baissobius carolianus* Rasnitsyn (length 3.7 mm).

***Bocchus* Ashmead**

Bocchus Ashmead, 1893: 91.

Type species: *Bocchus flavicollis* Ashmead, 1893, orig. desig.

FEMALE: fully winged, or brachypterous, or micropterous; occipital carina complete; palpal ratio: 6/3; in fully winged adults, forewing with three cells enclosed by pigmented veins (CC, BC, SBC) and with stigmal vein and pterostigma present; fore tarsus chelate; segment 5 of fore tarsus usually with inner membranous band, occasionally without inner membranous band, but in this case with one only preapical lamella; tibial spurs 1, 1, 1.

MALE: fully winged; occipital carina complete; mandibles with 1–4 teeth; quadridentate mandibles always with intermediate rudimentary tooth; palpal ratio: 6/3; forewing with three cells enclosed by pigmented veins (CC, BC, SBC) and with stigmal vein and pterostigma present; occipital carina complete; parameres without inner branch wrapping penis; tibial spurs 1, 1, 2.

SPECIES: 91 extant species + two fossil species (*Bocchus vetustus* Olmi, 1991, from Dominican amber, and *Bocchus ? cenomanianus* Olmi, Rasnitsyn & Guglielmino, **n. sp.**).



FIGURE 8. *Bocchus ? cenomanianus* **n. sp.** (length of propodeum and gaster 3.7 mm)

Bocchus ? cenomanianus* Olmi, Rasnitsyn & Guglielmino, **n. sp.*

Material examined: female holotype, PIN no. 3901/133 from Eastern Siberia, Magadan Region, Obeschchayushchiyi fossil site, Upper Cretaceous (Cenomanian), Ola Formation (90–95 mybp).

FEMALE (Fig. 8): length 3.7 mm (only propodeum + gaster; rest of body missing); length of propodeum: 1.06 mm; length of gaster: 2.68 mm. Head, protohorax, mesothorax and metathorax missing. Propodeum with very large areolae, typical of modern *Bocchus* species. Petiole very short. Wings missing (but the specimen can be apterous or winged). Legs missing, except part of hind legs (coxa (0.50 mm), trochanter (0.12), femur (1.06 mm) and part of tibia are present). Ovipositor present. Tibial spurs not visible.

MALE: unknown.

Remarks: the head, thorax, antennae, wings, fore legs, mid legs and part of hind legs of this fossil are missing. However, it is possible to identify tentatively this specimen as a female belonging to *Bocchus* Ashmead, 1893, because of the large areolae present on the propodeum. Among the extant Dryinids only

females of *Bocchus* may have so large areolae. Of course, large areolae exist also in other groups (mainly among Terebrantia, more rarely in the Aculeates). On the other hand, the shape of the propodeal areolae of *B. cenomanianus* is typical of *Bocchus*.

Gonatopodinae

Gonatopus Ljungh

Gonatopus Ljungh, 1810: 161.

Type species: *Gonatopus formicarius* Ljungh, 1810, monotypic.

FEMALE: apterous or fully winged; palpal formula: 3/2, 4/2, 4/3, 5/2, 5/3, 6/3; pronotum crossed or not by transverse furrow; enlarged claw with distal apex pointed and with a large or small subapical tooth (occasionally subapical tooth absent, but then enlarged claw with distal group of lamellae); in fully winged forms, segment 5 of fore tarsus with more than 20 lamellae; tibial spurs 1, 0, 1.

MALE: fully winged; occipital carina absent or incomplete; in this last case, only present behind and shortly on sides of posterior ocelli; occiput concave; temples present; palpal formula: 3/2, 4/2, 4/3, 5/2, 5/3, 6/3; tibial spurs 1, 1, 2.

SPECIES: 129 extant species + one fossil species (*Gonatopus* ? *cretacicus* Olmi, Rasnitsyn & Guglielmino, **n. sp.**).



FIGURE 9. *Gonatopus* ? *cretacicus* **n. sp.** (length 4.5 mm)

Gonatopus ? *cretacicus* Olmi, Rasnitsyn & Guglielmino, **n. sp.**

Material examined: male holotype, PIN no. 3901/132 from Eastern Siberia, Magadan Region, Obeschchayushchiyi fossil site, Upper Cretaceous (Cenomanian), Ola Formation (90–95 mybp).

FEMALE: unknown.

MALE (Fig. 9): length 4.5 mm; length of the main regions: head: 0.56 mm; mesosoma: 3.94 mm; prothorax: 0.25 mm; mesothorax + metathorax + propodeum: 3.69 mm; gaster: 2.50 mm. Antennae missing. Head only visible from lateral side. Eyes large (eyes length shorter than head in lateral view (0.37:0.56)). Temples very reduced. Occiput not visible. Palpi not visible. Mesosoma normal (as in the extant males of *Gonatopus*). Forewing hyaline, with three basal cells completely enclosed by pigmented veins. Marginal cell open (distal extremity of stigmal vein reaching the wing margin, but narrower than rest of vein). Pterostigma very narrow, with the following length/breadth ratio: 11:2.5. Petiole absent. Legs only partly visible. Tibial spurs not visible.

Remarks: *Gonatopus cretacicus* **n. sp.** is tentatively attributed to *Gonatopus* Ljungh, 1810, though it is only visible from lateral side. However, the head shape, pterostigma shape, forewing venation and general shape of the body are typical of *Gonatopus* males. No further fossil species of *Gonatopus* are known. N. Ponomarenko (1981) described *Laberius antiquus* from Taimyr amber. It was included in the genus *Laberius* Kieffer, 1914, that now is considered junior synonym of *Gonatopus* Ljungh. However, this species is now attributed to *Dryinus* Latreille, 1804 (Olm, 1984; Olm & Bechly, 2001).

Anteoninae

Deinodryinus R. Perkins

Deinodryinus R. Perkins, 1907: 45.

Type species: *Deinodryinus paradoxus* R. Perkins, 1907, desig. by Muesebeck & Walkley, 1951.

FEMALE: macropterous or micropterous; palpal ratio: 6/3; in macropterous females forewing usually with distal part of stigmal vein longer than proximal part, less frequently as long as, or shorter than proximal part; occipital carina complete; vertex of head frequently with two strong oblique keels connecting posterior ocelli to occipital carina; pronotum with distinct anterior collar and posterior disc; enlarged claw with inner proximal prominence not bearing bristles, with 1–2 bristles or peg-like hairs located further distally than proximal prominence; tibial spurs 1, 1, 2.

MALE: always macropterous (even if the female is micropterous); palpal ratio: 6/3; forewing usually with distal part of stigmal vein longer than proximal part, less frequently as long as, or shorter than proximal part; forewing usually with pterostigma four or more than four times as long as broad; antennal hairs usually much longer than breadth of segments, less frequently shorter than breadth of segments; vertex of head frequently with two strong oblique keels connecting the posterior ocelli to the occipital carina; parameres without dorsal process, usually with more or less large inner branch wrapping penis, less frequently with reduced inner branch; tibial spurs 1, 1, 2.

SPECIES: 146 extant species + two fossil species (*Deinodryinus areolatus* (N. Ponomarenko, 1975), from Baltic amber, and *Deinodryinus ? aptianus* Olm, Rasnitsyn & Guglielmino, **n. sp.**).

Deinodryinus ? aptianus Olm, Rasnitsyn & Guglielmino, **n. sp.**

Material examined: female holotype, PIN no. 3559/4586 from Central Mongolia, Bayanhongor Aimag, 5–8 km N Bon Tsagan Nuur Lake, outcrop 87, bed 8, impressed in marl of the Khurilt rock unit probably of Aptian (Early Cretaceous) (100–115 mybp).

FEMALE (Fig. 10): length 6.2 mm; length of main regions: head: 0.87 mm; antennae: 3.06 mm; mesosoma: 1.37 mm; prothorax: 0.87 mm; mesothorax + metathorax + propodeum: 1.37 mm; gaster: 3.12 mm. Antennae filiform; antennal segments in following proportions: 14:12:14:12:13:17:15:13:12:15; length/breadth ratio of antennal segments 8–10: 8th: 13:3; 9th: 12:3; 10th: 15:3. Head only visible from ventral side. Occiput very deeply excavated, with hypostomal bridge short (in ventral side, length of occiput: 0.62 mm; hypostomal bridge: 0.62 mm; oral fossa: 0.43 mm). Palpi not visible. Propleura normal (as in extant dryinids).

Fore femora very large, covering ventral side of mesothorax. Forewing hyaline, with three basal cells completely enclosed by pigmented veins. Marginal cell closed. Stigmal vein regularly curved, with distal part much longer than proximal part. Pterostigma very narrow, with the following length/breadth ratio: 35:7. Petiole very short. Ovipositor present. Legs only partly visible. Fore femora very large (length/breadth ratio: 39:18), as in extant chelate female of dryinids. Chelae present, hardly visible. Rest of fore legs, partly missing. Mid and hind legs partly missing. Length of mid coxae: 0.62 mm. Length of hind coxae: 0.81 mm. Tibial spurs not visible.

MALE: unknown.



FIGURE 10. *Deinodryinus* ? *aptianus* n. sp. (length 6.2 mm)

Remarks: this fossil is only visible in the ventral view and, as such, is difficult to place in a specific genus. In addition, the legs are partly missing and the chela is hardly visible. However, it is possible to identify tentatively this specimen as a new species belonging to the extant genus *Deinodryinus* R. Perkins, 1907 (Anteoninae), because of the shape of pterostigma and stigmal vein and for the presence in forewing of three basal cells completely enclosed by pigmented veins. Among Anteoninae, the above characters may also place this specimen in *Lonchodryinus* Kieffer, 1905, but because *Lonchodryinus* has the hypostomal bridge much shorter than in *Deinodryinus* and in the species above described, we placed it in *Deinodryinus*. Among Dryinidae, the above characters of the forewing may also place this specimen in Dryininae and Gonatopodinae, but because the occiput is less excavated in Dryininae and Gonatopodinae than in *Deinodryinus* and in the above described species, we placed it in *Deinodryinus*. Another unusual character of the new species above described is the shape of antennae: they are filiform, as in males of Dryinidae, whereas in females usually they are clavate.

Deinodryinus areolatus (N. Ponomarenko, 1975), from Baltic amber, is the only known fossil of *Deinodryinus*. The type of this species, easily visible from all sides (Fig. 2 in Ponomarenko, 1975; fig. 71 in Olmi, 1984), is a female with clavate antennae and eyes larger than in *D. aptianus*.

The above fossils are the only species of *Deinodryinus* known in Palaearctic region, with the only exception of *D. tussaci* Olmi, 1991, from Morocco. The genus *Deinodryinus* is mainly spread in tropical and subtropical regions, with a supposed centre of origin in South America. The presence of fossil species in Baltic amber and Mongolia marl should mean that in the past these areas were characterized by warm climate and the genus had much wider distribution.

Anteonopsis Olmi, Rasnitsyn & Guglielmino, n. gen.

Type species: *Anteonopsis antiquus* Olmi, Rasnitsyn & Guglielmino, **n. sp.**

FEMALE (Figs 11–12): apparently without wings; palpi not visible; pronotum long, less broad at anterior margin than at posterior; propodeum apparently reticulate rugose, with areolae very large; petiole very short; sting present; chela not visible; legs only partly visible; tibial spurs not visible.

MALE: unknown.

Remarks: *Anteonopsis* Olmi, Rasnitsyn & Guglielmino, **n. gen.** is similar to *Lonchodryinus* Kieffer, 1905, and *Anteon* Jurine, 1807, but with areolae of propodeum larger (no extant *Lonchodryinus* and *Anteon* have so large areolae).

***Anteonopsis antiquus* Olmi, Rasnitsyn & Guglielmino, n. sp.**

Material examined: female holotype, PIN no. 3901/130 from Eastern Siberia, Magadan Region, Obeschchayushchiyi fossil site, Upper Cretaceous (Cenomanian), Ola Formation (90–95 mybp).

FEMALE (Figs 11–12): apparently without wings; length 7.2 mm; antennae clavate; number of antennal segments not distinct; head subspheroidal, with eyes small and clypeus and mandibles projecting in front of head; pronotum long, less broad at anterior margin than at posterior; pronotal tubercles apparently reaching tegulae; mesothorax and metathorax not clearly distinct; propodeum apparently reticulate rugose, with areolae very large; petiole very short; chela not visible; legs only partly visible; sting present; palpi not visible; tibial spurs not visible.

MALE: unknown.

Remarks: this specimen is only partly visible. However, the shape of the head and pronotum, the very large areolae of the propodeum and the general shape of the body suggest that it belongs to Dryinidae and not to another family of Chrysidoidea. Because of the above characters as a whole, the authors attribute tentatively this specimen to Dryinidae.

Uncertain subfamily***Deinodryinus* ? or *Dryinus* ? sp.**

Material examined: a specimen of uncertain sex, PIN no. 3135/5 from Russian Far East, Maritime Province, Velikaya Kema, Kizi Formation, later Earlier or early Middle Miocene (about 16 mybp).

Remarks: this specimen is reduced only to a forewing (Fig. 13). The body, head, legs and antennae are missing. The forewing (length 3.8 mm) has 3 basal cells enclosed by pigmented veins and a pterostigma much longer than broad as in extant and fossil *Dryinus* and *Deinodryinus* species. It is impossible to attribute this fossil to one of the above genera, because the specimen is strongly incomplete.

Conclusions

After the previous descriptions of new taxa, the known fossil species of Dryinidae and Embolemidae are the following:



FIGURES 11–12. *Anteonopsis antiquus* n. gen. n. sp. (length 7.2 mm).

Cretaceous

Transbaikalian Marl (Russia): 130–140 mybp.

Embolemidae

Baissobius minimus Rasnitsyn, 1996

Baissobius parvus Rasnitsyn, 1975

Baissobius minutus **n. sp.**

Embolemopsis baissensis **n. gen. n. sp.**



FIGURE 13. *Deinodryinus* ? or *Dryinus* ? sp. (length of forewing 3.8 mm).

Lebanese amber (Lebanon): 120–136 mybp.

Dryinidae: Aphelopinae

Aphelopus palaeophoenicius Olmi, 2000

Bon Tsagan marl (Mongolia): 110–115 mybp.

Embolemidae

Baissobius carolianus Rasnitsyn, 1996

Dryinidae: Anteoninae

Deinodryinus aptianus **n. sp.**

Taimyr amber (Siberia): 78–115 mybp.

Dryinidae: Dryininae

Cretodryinus zherichini N. Ponomarenko, 1975

Dryinus antiquus (N. Ponomarenko, 1981)

Burmese amber (Myanmar): about 100 mybp.

Dryinidae: Anteoninae

Burmanteon olmii Engel, 2003

Obeschchayushchiy marl (Siberia): 90–95 mybp.

Dryinidae: Anteoninae

Anteonopsis antiquus **n. gen. n. sp.**

Dryinidae: Bocchinae

Bocchus cenomanianus **n. sp.**

Dryinidae: Gonatopodinae

Gonatopus cretacicus **n. sp.**

Medicine Hat amber (Alberta, Canada): 70–75 mybp.

Dryinidae: Dryininae:

Dryinus canadensis (N. Ponomarenko, 1981)

Tertiary

Baltic amber (Northern Europe): 40–50 mybp.

Dryinidae: Dryininae:

Dryinus mortuorum (Brues, 1933)

Dryinus vetus (Brues, 1933)

Dryinus bruesi (Olmi, 1984)

Dryinus balticus (Olmi, 1984)

Dryinus janzeni Olmi, 2000

Dryinus muenchi Olmi & Bechly, 2001

Dryinus reifi Olmi & Bechly, 2001

Dryinus wunderlichi Olmi & Bechly, 2001

Palaeodryinus groehni Olmi & Bechly, 2001

Harpactosphēcion filicorne (Brues, 1933)

Harpactosphēcion gracile (Brues, 1933)

Harpactosphēcion deletum (Brues, 1933)

Dryinidae: Anteoninae

Deinodryinus areolatus (N. Ponomarenko, 1975)

Janzeniola baltica (Olmi, 2000)(= *Janzenia baltica*)(new comb. and *Janzeniola* new gen., new name for *Janzenia* Olmi, 2000, non *Janzenia* Marsh, 1993)

Dryinidae: Palaeoanteoninae

Palaeoanteon janzeni Olmi, 2000

Dryinidae: Gonatopodinae

Neodryinus somniatus Brues, 1933

Dryinidae: Ponomarenkoinae

Ponomarenkoa polonica (N. Ponomarenko, 1988)

Embolemidae

Ampulicomorpha succinalis Brues, 1933

Embolemus breviscapus Brues, 1933

Rovno amber (Ukraine): 40–50 mybp.

Embolemidae

Ampulicomorpha succinalis Brues, 1933 (new record for Rovno amber: to be described soon)

Oise amber (France): about 50 mybp.

Dryinidae

Pseudodryinus parisiensis Peinado, Nel & Waller, 2006

Mexican amber (Chiapas): 22–26 mybp.

Dryinidae: Dryininae:

Dryinus palaeomexicanus Olmi, 1995

Velikaya Kema marl (Maritime Province, Russia): about 16 mybp.

Deinodryinus or *Dryinus* sp.

Dominican Republic amber: 15–20 mybp.

Dryinidae: Dryininae:

Dryinus palaeodominicanus Currado & Olmi, 1983

Dryinus hymenaeaphilus Olmi, 1995

Dryinus grimaldii Olmi, 1995

Dryinus poinari Olmi, 1998

Dryinus priscus Olmi, 1998

Dryinus pristinus Olmi, 1998

Dryinus vetustus Olmi, 1995

Harpactosphēcion scheveni Olmi, 2005

Harpactosphēcion sucinum (Olmi, 1987)

Thaumatodryinus miocenicus Olmi, 1995

Dryinidae: Bocchinae

Bocchus vetustus Olmi, 1991

Dryinidae: Aphelopinae

Aphelopus poinari Olmi, 1998

In addition, there is a further not studied embolemid specimen in amber from Orapa deposits in Botswana (Brothers & Rasnitsyn, 2003).

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References

- Ashmead, W.H. (1893) Monograph of the North American Proctotrypidae. *Bulletin of the United States National Museum*, 45, 1–472.
- Brothers, D.J. & Rasnitsyn, A. P. (2003) Diversity of Hymenoptera and other insects in the Late Cretaceous (Turonian) deposits at Orapa, Botswana: a preliminary review. *African Entomology*, 11 (2), 221–226.
- Brues, C.T. (1933) The Parasitic Hymenoptera of the Baltic Amber. Part I. *Bernstein-forschungen (Amber Studies)*, 3, 4–178.
- Currado, I. & Olmi, M. (1983) Primo reperto di Driinide fossile in ambra della Repubblica Dominicana (Hymenoptera Dryinidae). *Bollettino del Museo Regionale di Scienze Naturali di Torino*, 1, 329–334.
- Engel, M.S. (2003) An Anteonine Wasp in Cenomanian-Albian Amber from Myanmar (Hymenoptera: Dryinidae). *Journal of the Kansas Entomological Society*, 76 (4), 616–621.
- Jurine, L. (1807) *Nouvelle méthode de classer les Hyménoptères et les Diptères*, 1. *Hyménoptères*. Paschoud, Genève, 320 pp.
- Kieffer, J.J. (1905) Description de nouveaux Proctotrypidae exotiques. *Annales de la Société scientifique de Bruxelles*, 29, 95–142.
- Kieffer, J.J. (1914) *Bethylidae*. Das Tierreich 41, R. Friedlander und Sohn, Berlin, 595 pp.
- Ljungh, S. J. (1810) *Gonatopus*, novum insectorum genus. *Beiträge zur Naturkunde*, 2, 161–163.
- Muesebeck, C.F.W. & Walkley, L.M. (1951) Family Dryinidae. In: Muesebeck C. F. W., Krombein K. V. & Townes H. K. (Eds.), *Hymenoptera of America North of Mexico. Synoptic catalogue*. U.S. Department of Agriculture, Agriculture Monograph, 2, Washington, pp. 1034–1043.
- Olmi, M. (1984) *A revision of the Dryinidae (Hymenoptera)*. Memoirs of the American Entomological Institute, 37, I–XII + 1913pp.
- Olmi, M. (1987) New species of Dryinidae, with description of a new subfamily from Florida and a new species from Dominica amber (Hymenoptera, Chrysidoidea). *Bollettino del Museo Regionale di Scienze Naturali di Torino*, 5, 211–238.
- Olmi, M. (1991) Supplement to the revision of the world Dryinidae (Hymenoptera Chrysidoidea). *Frustula entomologica* (1989), N.S., XII (XXV), 109–395.
- Olmi, M. (1994) *The Dryinidae and Embolemidae (Hymenoptera: Chrysidoidea) of Fennoscandia and Denmark*. Fauna Entomologica Scandinavica 30, E.J. Brill, Leiden, 100 pp.
- Olmi, M. (1995) Dryinids and Embolemids in amber (Hymenoptera Dryinidae et Embolemidae). *Redia*, 78, 253–271.
- Olmi, M. (1996) A revision of the world Embolemidae (Hymenoptera Chrysidoidea). *Frustula entomologica* (1995), N.S., XVIII (XXXI), 85–146.
- Olmi, M. (1998) New Embolemidae and Dryinidae (Hymenoptera Chrysidoidea). *Frustula entomologica* (1997), N. S., XX (XXXIII), 30–118.
- Olmi, M. (1999) *Hymenoptera Dryinidae–Embolemidae*. Fauna d'Italia XXXVII, Edizioni Calderini, Bologna, I–XVI + 425pp.
- Olmi, M. (2000) New fossil Dryinidae from Baltic and Lebanese amber (Hymenoptera Chrysidoidea). *Frustula entomologica* (1998), N.S. XXI (XXXIV), 48–67.
- Olmi, M. (2005) A new fossil dryinid in amber from the Dominican Republic: *Harpactosphecion scheveni* n. sp. (Hymenoptera Dryinidae). *Frustula entomologica*, N.S., XXVI–XXVII (XXXIX–XL), 15–19.
- Olmi, M. & Bechly, G. (2001) New parasitic wasps from Baltic amber (Insecta: Hymenoptera: Dryinidae). *Stuttgarter Beiträge zur Naturkunde, Serie B*, Nr. 306, 1–58.
- Peinado, J., Nel, A. & Waller, A. (2006) A dryinid wasp in Early Eocene amber from the Paris basin (Hymenoptera: Dryinidae). *Zootaxa*, 1168, 31–41.
- Perkins, R.C.L. (1907) Parasites of leaf-hoppers. *Report of Work of the Experiment Station of the Hawaiian Sugar Planters' Association, Division of Entomology*, Bulletin No. 4, 5–59.
- Ponomarenko, N.G. (1975) A new hymenopteran species from Baltic amber. *Paleontologicheskii Zhurnal*, (1), 126–128 (in Russian; English translation: *Paleontological Journal*, 9 (1): 124–126).
- Ponomarenko, N.G. (1981) New Dryinidae (Hymenoptera) from the Late Cretaceous of the Taimyr and Canada. *Paleontologicheskii Zhurnal*, (1), 139–143 (in Russian; English translation: *Paleontological Journal*, 15 (1): 115–120).
- Ponomarenko, N.G. (1988) The first discovery of a male dryinid (Insecta) from Baltic amber. *Paleontologicheskii Zhurnal*, (4), 107–108 (in Russian; English translation: *Paleontological Journal*, 22 (4): 105–107).
- Rasnitsyn, A.P. (1975) *Hymenoptera Apocrita of Mesozoic*. Transactions of Paleontological Institute, Academy of Sciences of U.S.S.R., 147. Publications House Nauka Press, Moscow, 134 pp. (in Russian).
- Rasnitsyn, A.P. (1980) *Origin and evolution of Hymenoptera*. Transactions of the Paleontological Institute, Academy of Sciences of U.S.S.R., 174. Nauka Press, Moscow, 192 pp. (in Russian).

- Rasnitsyn, A.P. (1996) New early cretaceous Embolemidae (Vespida = Hymenoptera: Chrysidoidea). *Memoirs of the Entomological Society of Washington*, 17, 183–187.
- Rasnitsyn, A.P. & Kulicka, R. (1990) Hymenopteran insects in Baltic amber with respect to the overall history of the order. *Prace Muzeum Ziemi*, 41, 53–64.
- Rasnitsyn, A. P. & Matveev, D. G. (1989). First Palaearctic representative of the genus *Ampulicomorpha* Ashmead. *Entomologicheskoe Obozrenie*, 68, 657-661 (in Russian; English translation: *Entomological Review*, (1990) 69 (3), 133-137).
- Rasnitsyn, A.P. & Quicke, D.L.J. (2002) *History of Insects*. Kluwer Academic Publishers, Dordrecht, I–XII + 517pp.
- Zherikhin, V.V., Sukacheva, I.D. & Rasnitsyn, A.P. (2009) Arthropods in Contemporary and Some Fossil Resins. *Paleontological Journal*, 43 (9), 987–1005.