

Fossil ichneumon wasps (Hymenoptera: Ichneumonidae) from Biamo (Russia), Oligocene

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ABSTRACT

Almost 100 fossils of ichneumon wasps from Oligocene Biamo (Russian Far East) from the collection of the Palaeontological Institute RAS (Moscow) were studied. Two new genera and six new species are described in this paper: *Biamosa barachek* gen. et sp. nov., *Xanthopimpla biamosa* sp. nov., *Pimpla* (?) *bibosa* sp. nov., *Zabrachypus tumidus* sp. nov., *Metopiosa fossiliata* gen. et sp. nov., and *Triclistus ventrator* sp. nov. The subfamilies Cryptinae and Mesochorinae are registered. The Biamo assemblage can be possibly closest to the Florissant as both include only recent subfamilies, including Pimplinae and Mesochorinae, and lack any fossil ones. Presence of *Xanthopimpla* indicates warm-temperate or subtropical forests. Types of the new species are deposited in the collection of the Palaeontological Institute RAS in Moscow.

KEY WORDS: Insecta. Hymenoptera. Ichneumonidae. Tryphoninae. Pimplinae. Metopiinae. Biamo. Oligocene.

INTRODUCTION

Ichneumonidae is one of the largest animal families including over 30,000 recent described species and having a world-wide distribution. The oldest known representatives of Ichneumonidae belong to the fossil subfamily Tanychorinae and were recorded from the uppermost Jurassic or Lower Cretaceous (Zhang & Rasnitsyn 2003). In the Eocene and Oligocene the family Ichneumonidae began to flourish, the fossil subfamilies Townesitinae and Pheromobinae, and recent subfamilies and genera appeared.

About 100 Oligocene fossils from the Biamo assemblage of the collection of the Palaeontological Institute RAS in Moscow have been studied. This material was collected by V.V. Zherikhin on the river Bolshaya Svetlovodnaya (former Biamo) in the Russian Far East during 1974 and 1976. The insectiferous lake diatomites are exposed on the left bank of Barachek creek, 3 km upstream of its mouth at Bolshaya Svetlovodnaya (former Biamo) river, Pozharskiy distr., north of Primorskiy region of Russia. The insect assemblage is characteristic of a woodland in a moderately thermophilous climate (Zherikhin 1998). Study of plant and palynological imprints also evidences that the climate was warm-temperate, close to subtropical (Lopatina 2004). Biamo assemblage is evidently younger than Baltic amber and can be possibly correlated to Florissant, Colorado (Zherikhin 1998), and is dated by the latest Eocene or Early Oligocene (Zherikhin 1998; Rasnitsyn & Quicke 2002; Lopatina 2004). Study of Ichneumonidae of Biamo may give an additional data for future reconstruction of climatic conditions and to better understand the evolution of this family. Taxonomic data may be used for

comparison with other Late Eocene – Early Oligocene ichneumonid faunas.

Ichneumonid specimens are represented most often by isolated fore wings and their fragments. Wings are flat or sometimes more or less crumpled. The body, if present, is almost always badly preserved, and usually strongly deformed, its morphological structures often indiscernible. Even in very well preserved complete samples only the general habitus and most coarse structures are observable. Only distinct and well preserved ichneumonid specimens are considered in this paper, therefore this list very coarsely reflects the real taxonomic composition of the assemblage.

Six new species and two new genera belonging to the subfamilies Tryphoninae (*Biamosa barachek* gen. et sp. nov.), Pimplinae (*Xanthopimpla biamosa* sp. nov., *Pimpla* (?) *bibosa* sp. nov., *Zabrachypus tumidus* sp. nov.) and Metopiinae (*Metopiosa fossiliata* gen. et sp. nov., *Triclistus ventrator* sp. nov.) are described, and undescribed species of the subfamilies Cryptinae and Mesochorinae are registered.

MATERIAL AND METHODS

Morphological structures and wing venation are given predominantly after Townes (1969). Taxonomy is accepted as in the catalogue TaxaPad (Yu et al. 2005).

Photos were taken with Canon Powershot S50 camera and Leica MZ16 stereomicroscope. The captured images were assembled with Helicon Focus software and edited in Adobe Photoshop CS2.

All types are kept in the collection of the Palaeontological Institute of the Russian Academy of Sciences (Moscow).

SYSTEMATIC PALAEOONTOLOGY

Order: Hymenoptera Linnaeus, 1758
 Family: Ichneumonidae Latreille, 1802
 Subfamily: Tryphoninae Shuckard, 1840
 Tribe: Phytodietini Hellén, 1915

This is a recent group of ichneumonids, distributed world wide and parasitic on lepidopterous larvae. Only one fossil species *Netelia memorialis* (Brues 1910) from Florissant has been previously described.

Type species: *Biamosa barachek* sp. nov.

Etymology. After the river Biamo in the type locality.

Diagnosis. This new genus belongs to the tribe Phytodietini from the body large, characteristic habitus and wing venation, and resembles the genus *Netelia* in having the body predominantly ferrugineous and the metasoma compressed. *Biamosa* gen. nov. differs clearly from the other genera of Phytodietini by the simple tarsal claws and completely areolated propodeum. *Biamosa* gen. nov. also is characterized by the large body size, the compressed metasoma, the comparatively big areolet of the fore wing, and by the nervellus of the hind wing being intercepted near its middle.

GENUS: *Biamosa* Khalaim, gen. nov.

***Biamosa barachek* Khalaim, sp. nov.**

Figure 1; Plate 1, figures 1–3

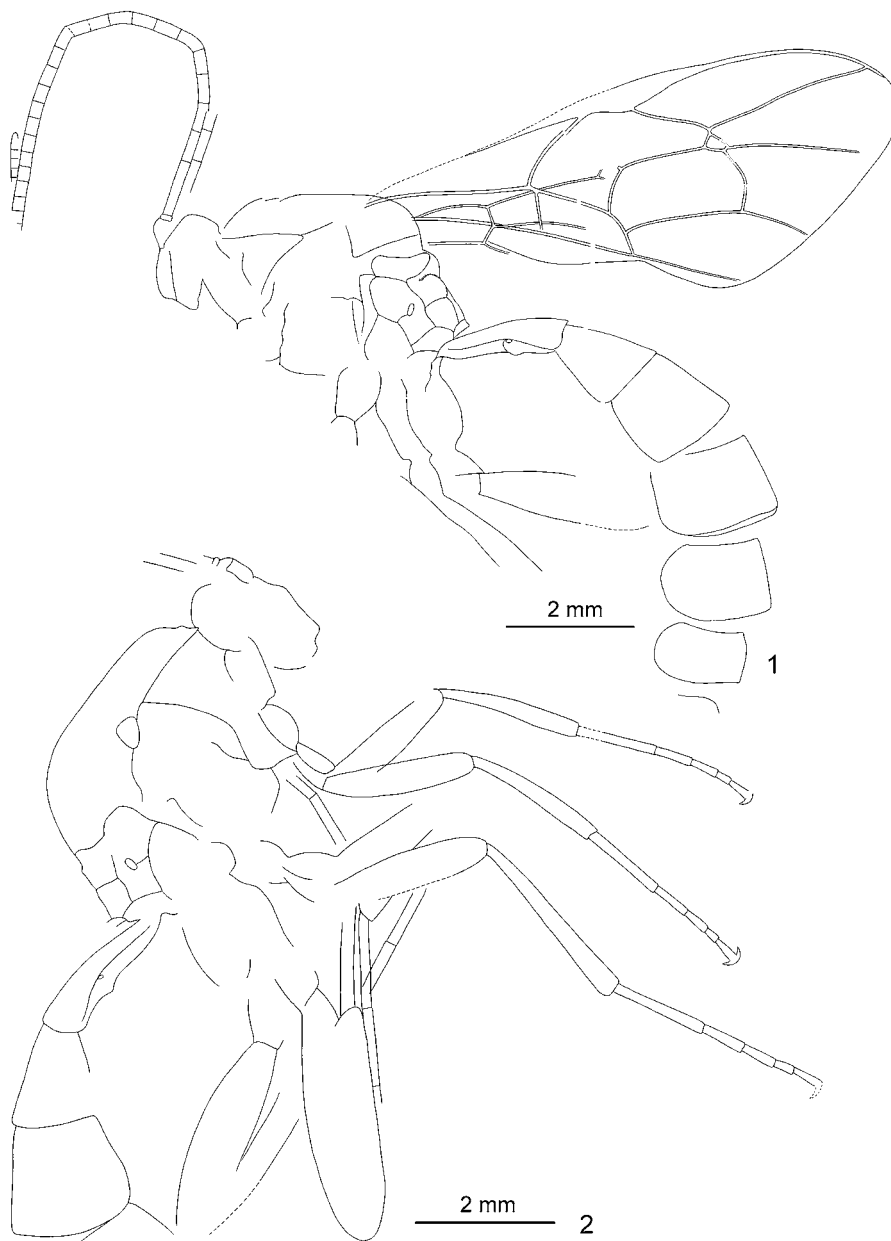


Figure 1. *Biamosa barachek* gen. et sp. nov., holotype no. 3429/882, part (1) and counterpart (2, metasoma and wings not figured), Oligocene deposit in Biamo, Russia.

Material. Holotype: probably ♂, 3429/882, part and counterpart. Russia, Primorskiy reg., Pozharskoe distr., upper flow of Barachek stream, right tributary of Biamo river. Pg₃-N₁, layer N 1. Coll. V.V. Zherikhin, 1976. Lateral aspect of complete and well preserved large wasp.

Etymology. After the stream Barachek in the type locality.

Diagnosis. See generic diagnosis.

Description. Body length about 16 mm. Fore wing length 9.6 mm. Mesosoma length about 4.0 mm. Hind

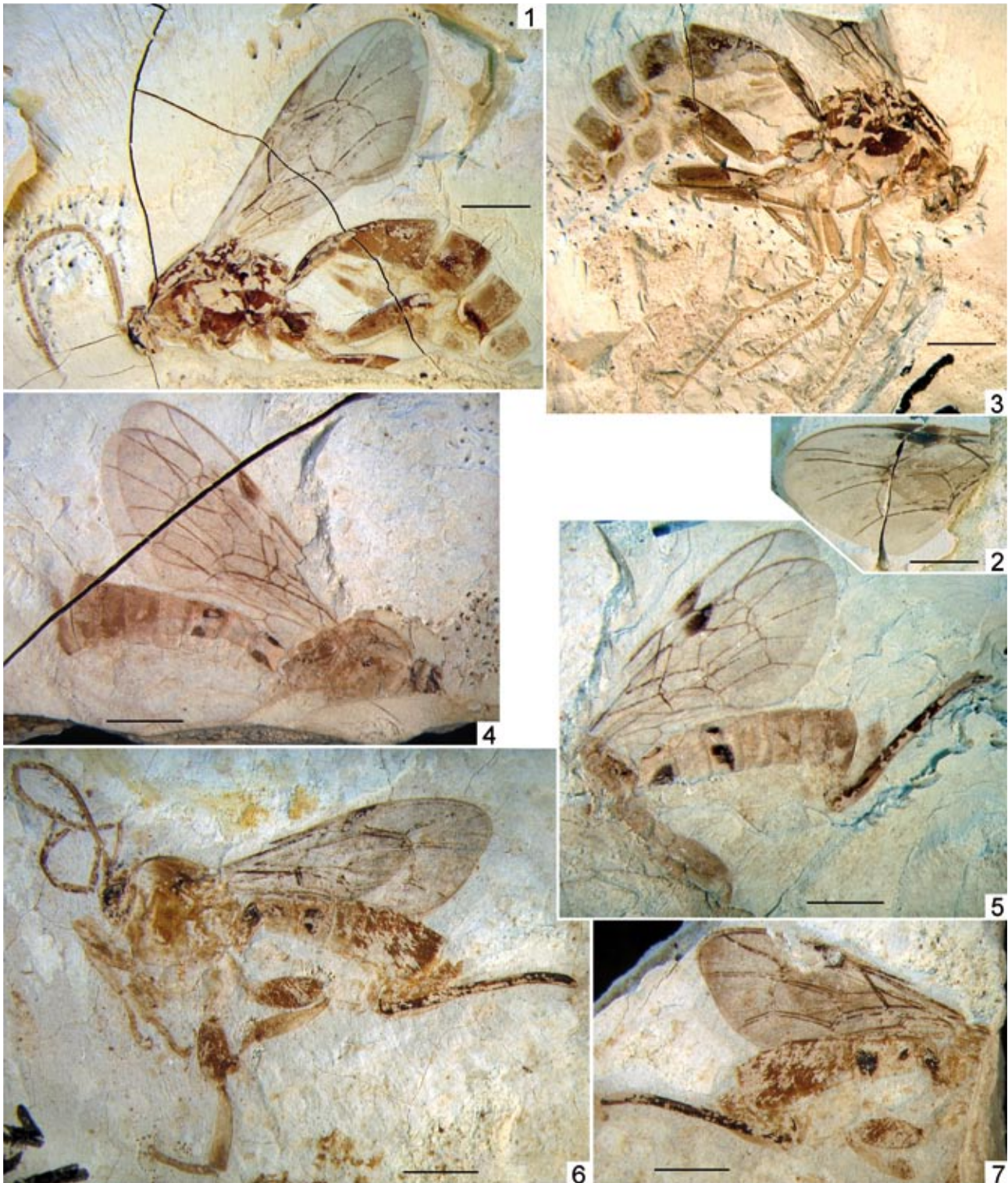


Plate 1. Figures 1-3. *Biamosa barachek* gen. et sp. nov., holotype no. 3429/882, part and counterpart, Oligocene deposit in Biamo, Russia. Figures 4-7. *Xanthopimpla biamosa* sp. nov., holotype no. 3429/899, part and counterpart (4, 5); paratype no. 3429/875, part and counterpart (6, 7), Oligocene deposit in Biamo, Russia. All scale bars 2.0 mm.

femur length 3.3 mm. Hind tibia length 3.3 mm. First tergite length 2.1 mm. Second tergite length 1.5 mm.

Head badly preserved, indistinct. Antenna long, scape and pedicel more or less oval. Flagellum with more than 30 segments; basal segments 2–3 almost 3.0 times, middle segments 1.8–1.4 times longer than broad. Prepectal carina present, ending far from anterior margin of mesopleuron. Sternaulus and postpectal carina absent. Propodeum with big oval spiracle, completely areolated, carinae distinct.

Pterostigma narrow, receiving radius near its middle. Second section of radius 2.3 times as long as first section. Both sections of radius slightly curved. Areolet relatively large, oblique, petiolate above, receiving second recurrent vein somewhat basad of its outer angle. Second recurrent vein distinctly arcuate, with two bullae. Discocubitus

strongly curved, with ramulus. Nervulus distinctly postfurcal and slightly inclivous. Basal vein evenly curved. Postnervulus intercepted in its middle, almost straight, strongly inclivous (subtending 50° angle with brachius). Second brachial cell with long vein paralleling its hind edge (like in Ophioninae). Nervellus of hind wing intercepted scarcely below its middle.

Legs rather slender. Hind femur and tibia about the same length. Ratio of segments 1–5 of fore tarsus 48 : 22 : 15 : 9 : 14, of mid tarsus 54 : 27 : 20 : 12 : 16. Tarsal claws simple (not pectinate).

Metasoma compressed. First segment with distinct petiole and postpetiole, dorsolateral carinae complete; spiracle a little distad (0.55) of the middle.

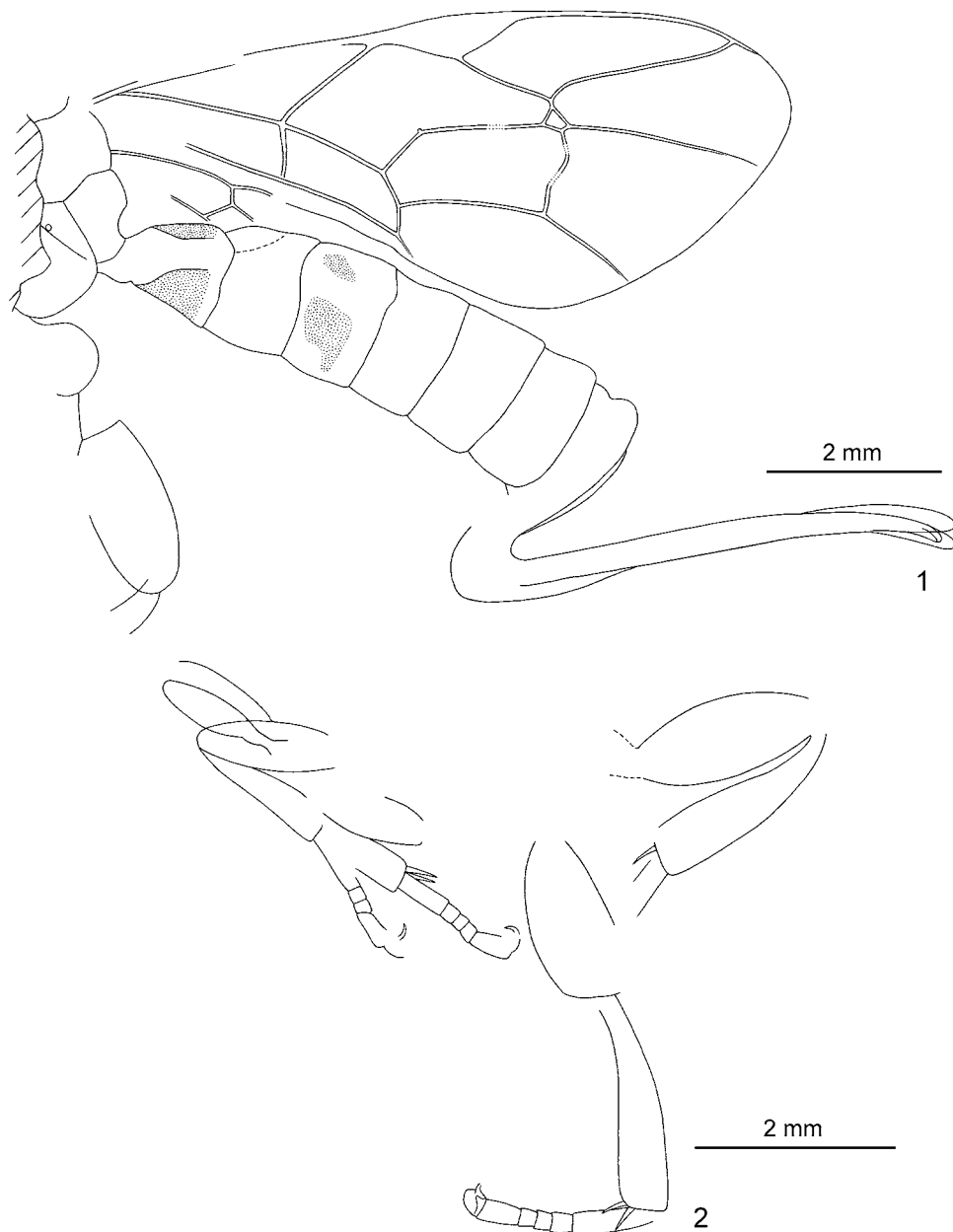


Figure 2. *Xanthopimpla biamosa* sp. nov., holotype no. 3429/899 (1); paratype no. 3429/875 (2, legs only), Oligocene deposit in Biamo, Russia.

Colour pattern of the fossil. Antenna, mesosoma, legs and metasoma yellow-brown to brown (mesosoma predominantly brown). Veins and pterostigma (excepting light area basally) dark brown.

Subfamily: Pimplinae Wesmael, 1845

Pimplinae are distributed world-wide, and abundant in most Cenozoic deposits, including Bembridge (Cockerell 1921), Biamo and Florissant (Brues 1910).

GENUS: *Xanthopimpla* Saussure, 1892

Large genus, most of the species occur in the Old World tropics and subtropics. Fossil representatives were unknown until now.

Xanthopimpla biamosa Khalaim, sp. nov.

Figure 2; Plate 1, figures 4–7

Material. Holotype: ♀, 3429/899, part and counterpart. Russia, Primorskiy reg., Pozharskoe distr., upper flow of Barachek stream, right tributary of Biamo river. Pg₃-N₁, layer N 5 (lower). Coll. V.V. Zherikhin, 1976. Lateral aspect of well preserved wasp; head and legs incomplete. Paratype: ♀, 3429/875, part and counterpart. The same label as in holotype, but layer N 1. Lateral aspect of complete well preserved wasp.

Etymology. After the river Biamo in the type locality.

Diagnosis. This new species belongs to the genus *Xanthopimpla* from the characteristic light colour pattern of the body, wing venation (second recurrent vein S-curved, second section of radius curved near areolet), robust legs, areolated propodeum, and shape of the ovipositor. Differs from recent species of this genus by the combination of the discocubitus distinctly curved and with ramulus, the first metasomal segment with long dorsal median carinae, the

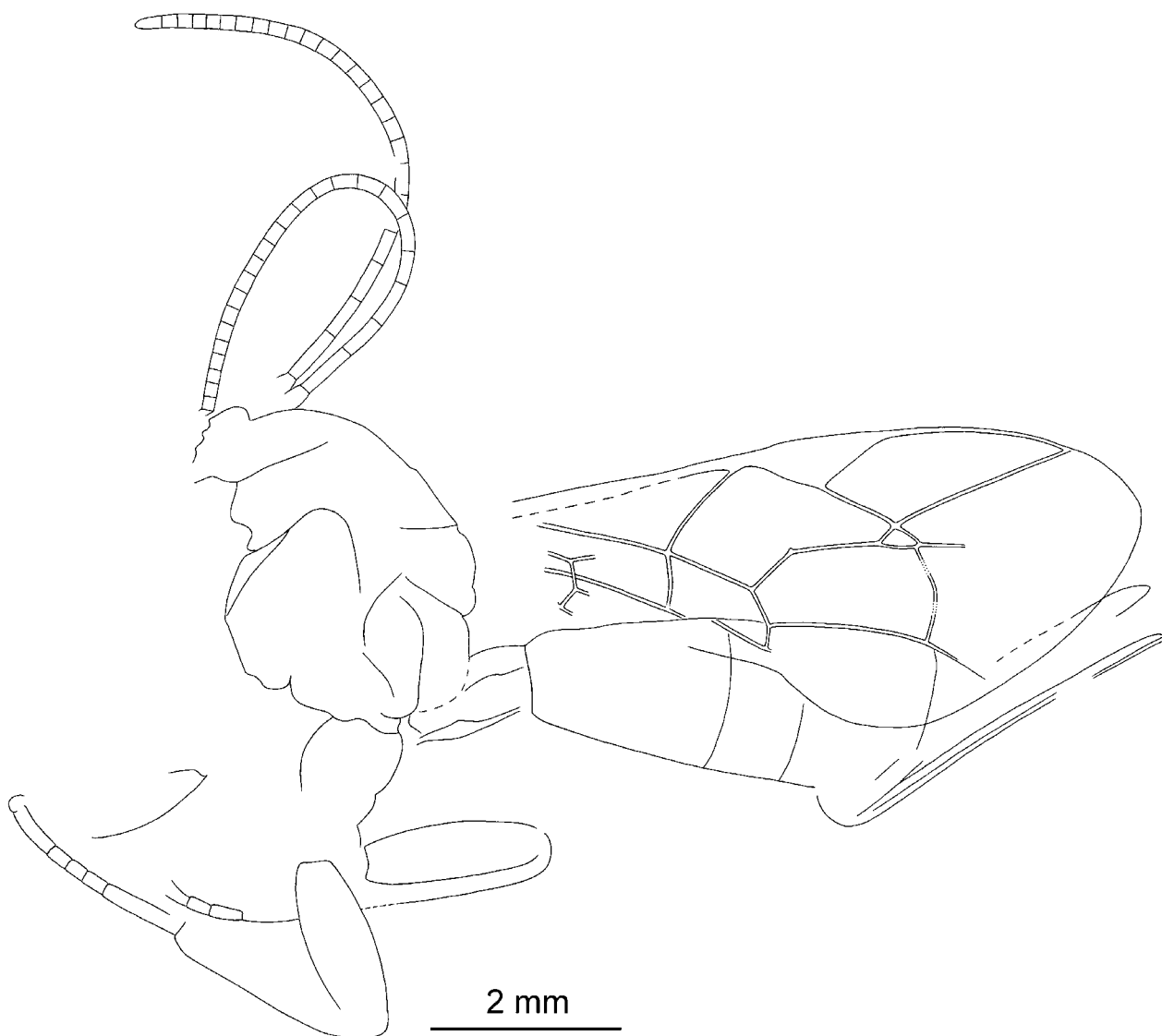


Figure 3. *Pimpla (?) bibosa* sp. nov., holotype no. 3429/93, Oligocene deposit in Biamo, Russia.

short basal tergites, and the ovipositor 0.83 times as long as metasoma.

Description. Body length about 10.5 mm. Fore wing length 8.0 mm. Mesosoma length about 3.2 mm. Hind femur length 2.0 mm, width 0.9 mm. Hind tibia length 2.2 mm (paratype). Metasoma length 6.5 mm. First tergite length 1.0 mm. Ovipositor length 5.4 mm.

Head badly preserved, indistinct. Scape and pedicel of antenna more or less oval. Flagellum with more than 35 segments. Ratio of flagellar segments 1–4 in paratype 2.5 : 1.4 : 1.3 : 1.2; first segment 4 times longer than broad, segments 2–4 about twice longer than broad; middle segments about as long as broad; apex of flagellum unclear.

Notaulus deep and long. Prepectal carina present. Sternaulus absent. Propodeum with oval spiracle, areolated, carinae distinct.

Pterostigma moderately wide, receiving radius near its middle. Second section of radius 1.8 times as long as first section, strongly curved near areolet. Areolet subtriangular, petiolate above, receiving second recurrent vein before its outer angle. Second recurrent vein S-curved, with two bullae. Discocubitus curved on its basal third, with ramulus in its basal 0.32. Nervulus interstitial, slightly inclivous. Basal vein almost straight. Postnervulus intercepted scarcely below its middle, arcuate, distinctly inclivous. Nervellus of hind wing intercepted distinctly above the middle (0.65).

Legs very thick. Hind femur 2.2 times as long as broad. Ratio of segments 1–5 of hind tarsus 30 : 9 : 7 : 5 : 19. Tarsi short and thick, 2nd segment of hind tarsus as long as broad, 3rd and 4th segments distinctly transverse. Tarsal claws simple.

Metasoma cylindrical. First segment depressed, short and wide; its median longitudinal carinae distinct, reaching from basolateral corners of tergite to its posterior edge. Second tergite with basolateral grooves. Ovipositor strong, distinctly decurved, about 0.8 times as long as metasoma.

Colour pattern of the fossil. Body predominantly yellow to brown. Antenna darkened. Hind femur and tarsus brown. Hind tibia brown basally and apically, and yellow medially. First and second tergites dorsolaterally with pair of dark brown areas. Veins and pterostigma brown to almost black; pterostigma light basally.

GENUS: *Pimpla* Fabricius, 1804

Large world-wide genus; about 16 fossil species were previously described. One new species probably belonging to this genus is described below.

***Pimpla* (?) *bibosa* Khalaim, sp. nov.**

Figure 3; Plate 2, figure 1

Material. Holotype: ♀, 3429/93. Russia, Primorskiy reg., Pozharskoe distr., upper flow of Barachek stream,

right tributary of Biamo (Svetlovodnaya) river. Pg₃-N₁. Coll. V.V. Zherikhin, 1974. Lateral aspect of well preserved wasp.

Etymology. From Latin *bibosus* (addicted to drink).

Diagnosis. The new species belongs to Pimplinae from the characteristic wing venation (second recurrent vein arcuate, with two bullae; areolet subtriangular, pointed above, receiving second recurrent vein before its outer angle), depressed metasoma with short tergites, and weakly decurved ovipositor, and corresponds best to the genus *Pimpla* (ovipositor moderately long, weakly decurved). Differs from all known species of *Pimpla* by the nervellus of the hind wing being intercepted somewhat below the middle.

Description. Body length about 9.0 mm. Antenna length 6.5 mm. Fore wing length 8.0 mm. Hind femur length 1.85 mm. Hind tibia length 2.4 mm. Metasoma length about 5.8 mm. First tergite length about 1.25 mm. Ovipositor length 4.0 mm.

Head indistinct. Scape and pedicel of antenna oval. Flagellum with 24 segments, filiform. First flagellar segment 3.8, 2nd – 3.2, 3rd – 3.0, 4th – 2.8 times as long as broad. Ratio of flagellar segments 1–4 equal to 19 : 16 : 15 : 14.

Prepectal carina present, reaching anterior margin of mesopleuron. Sternaulus absent. Propodeum with longitudinal ridges, not areolated.

Pterostigma triangular, moderately wide, receiving radius near its middle. Second section of radius almost straight, 2.26 times as long as first section. Areolet subtriangular, rather wide, pointed above, receiving second recurrent vein before its outer angle. Second recurrent vein arcuate, with two bullae. Discocubitus curved in its basal 0.38, with ramulus. Basal vein very weakly curved. Nervulus interstitial, inclivous. Postnervulus inclivous, intercepted in its lower 0.4. Nervellus of hind wing intercepted somewhat below the middle.

Hind femur robust, 3.0 times as long as broad. Hind tibia 1.3 times as long as hind femur. Claws probably simple.

Metasoma cylindrical. First tergite short, depressed, with distinct median longitudinal carinae. Second and following segments distinctly transverse. Ovipositor strong, very weakly decurved, its lower valve with scarcely discernible teeth.

Colour pattern of the fossil. Head, mesosoma, first tergite and ovipositor sheath black. Antenna, legs and metasoma behind first segment predominantly brown. Hind coxa darkened basally. Pterostigma mostly dark brown, yellow basally.

GENUS: *Zabrachypus* Cushman, 1920

Recent genus with 9 species distributed predominantly in Holarctic and Oriental regions. Fossil representatives were not recorded until now.

***Zabrachypus* *tumidus* Khalaim, sp. nov.**

Figure 4; Plate 2, figure 2

Material. Holotype: ♀, 3429/873, part and counterpart. Russia, Primorskiy reg., Pozhar distr., upper flow of Barachek stream, right tributary of Biamo river. Pg₃-N₁, layer N

1. Coll. V.V. Zherikhin, 1976. Ventral aspect of well preserved wasp, legs absent; counterpart contains fragment of fore wing only.

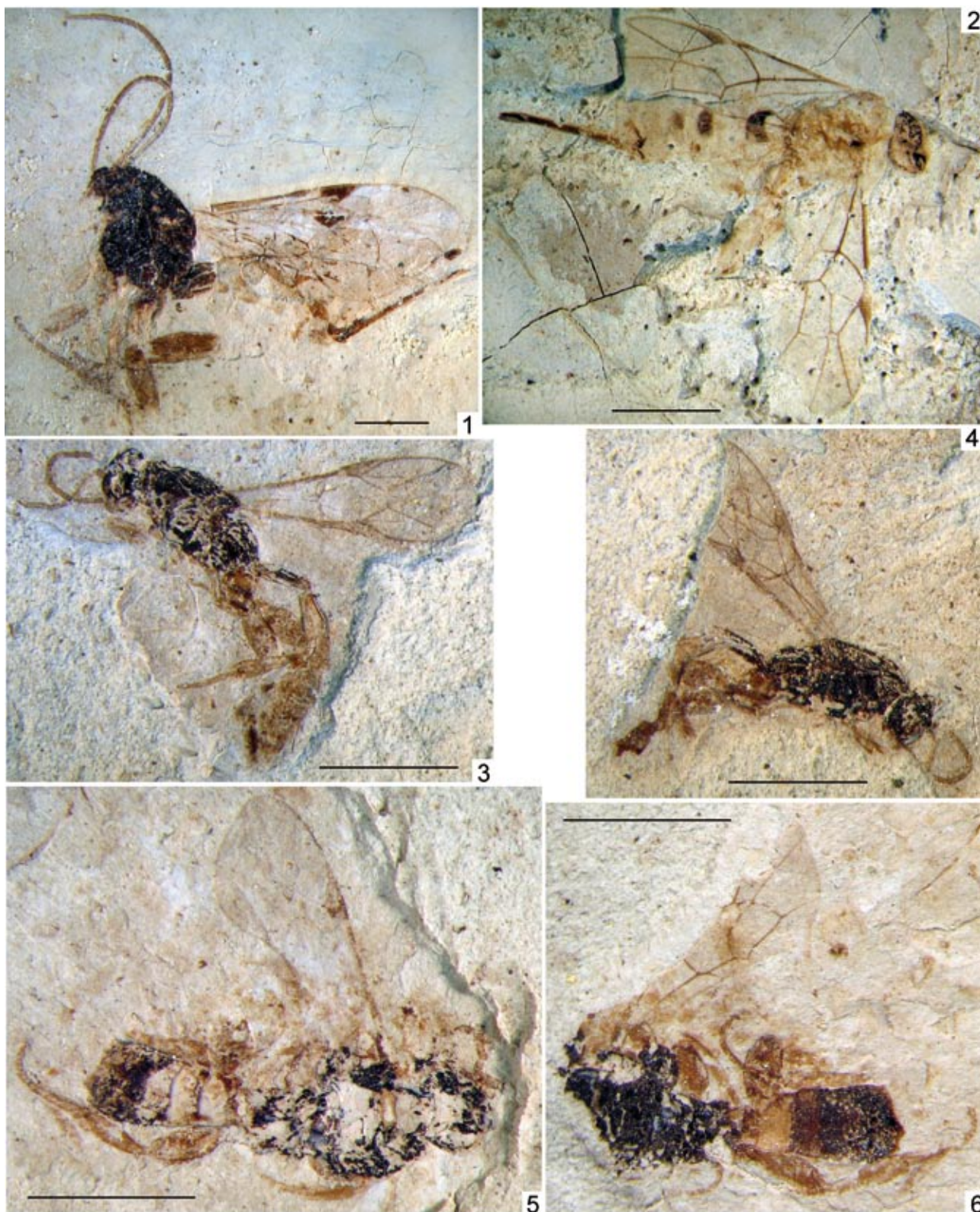


Plate 2. Figure 1. *Pimpla* (?) *bibosa* sp. nov., holotype no. 3429/93, Oligocene deposit in Biamo, Russia. Figure 2. *Zabrachypus tumidus* sp. nov., holotype no. 3429/873, Oligocene deposit in Biamo, Russia. Figures 3, 4. *Metopiosa fossiliata* gen. et sp. nov. holotype no. 3429/892, part and counterpart, Oligocene deposit in Biamo, Russia. Figures 5, 6. *Triclistus ventrator* sp. nov., holotype no. 3429/896, part and counterpart, Oligocene deposit in Biamo, Russia. All scale bars 2.0 mm.

Etymology. From Latin *tumidus* (elated, arrogant, swollen).

Diagnosis. This new species belongs to the genus *Zabrachypus* from the characteristic wing venation (lack of areolet, intercubitus almost as long as second abscissa of cubitus, interstitial nervulus), and evenly tapered and moderately long ovipositor. Differs from known species of this genus by the second recurrent vein having one bulla.

Description. Body length 6.4 mm. Fore wing length 5.0 mm. Mesosoma length 2.0 mm. Hind femur length 1.5 mm. Hind tibia length 1.5 mm. Metasoma length 3.7 mm. First tergite length 0.7 mm. Ovipositor length 2.6 mm.

Distance between ocelli 0.4 times diameter of ocellus. Distance from hind ocellus to eye subequal to one maximal diameter of ocellus. Inner margin of eye weakly concave at antennal socket.

Notaulus distinct in anterior part of mesonotum.

Pterostigma moderately wide, receiving radius in its middle. Second section of radius straight, 1.7 times as long

as first section. Areolet absent. Intercubitus almost as long as second abscissa of cubitus. Second recurrent vein very weakly curved, almost vertical, with one bulla in the middle. Discocubitus abruptly curved along basal 0.35, with short ramulus in its basal 0.35. Basal vein very weakly curved. Nervulus interstitial, inclivous. Postnervulus distinctly inclivous, almost straight, intercepted in the middle.

Legs moderately thick. Hind femur about 3.0 times as long as wide, as long as hind tibia.

Metasoma probably depressed. First segment short and wide, with longitudinal median carinae reaching from basolateral corner of tergite towards its posterior edge. Second and following segments strongly transverse. Ovipositor strong, evenly tapered, very slightly decurved.

Colour pattern of the fossil. Head black. Mesosoma, metasoma and legs pale, more or less yellowish. Apical half of first tergite, and third and fourth tergites anteromedially dark brown. Veins and pterostigma pale, more or less brownish; pterostigma with light area basally.

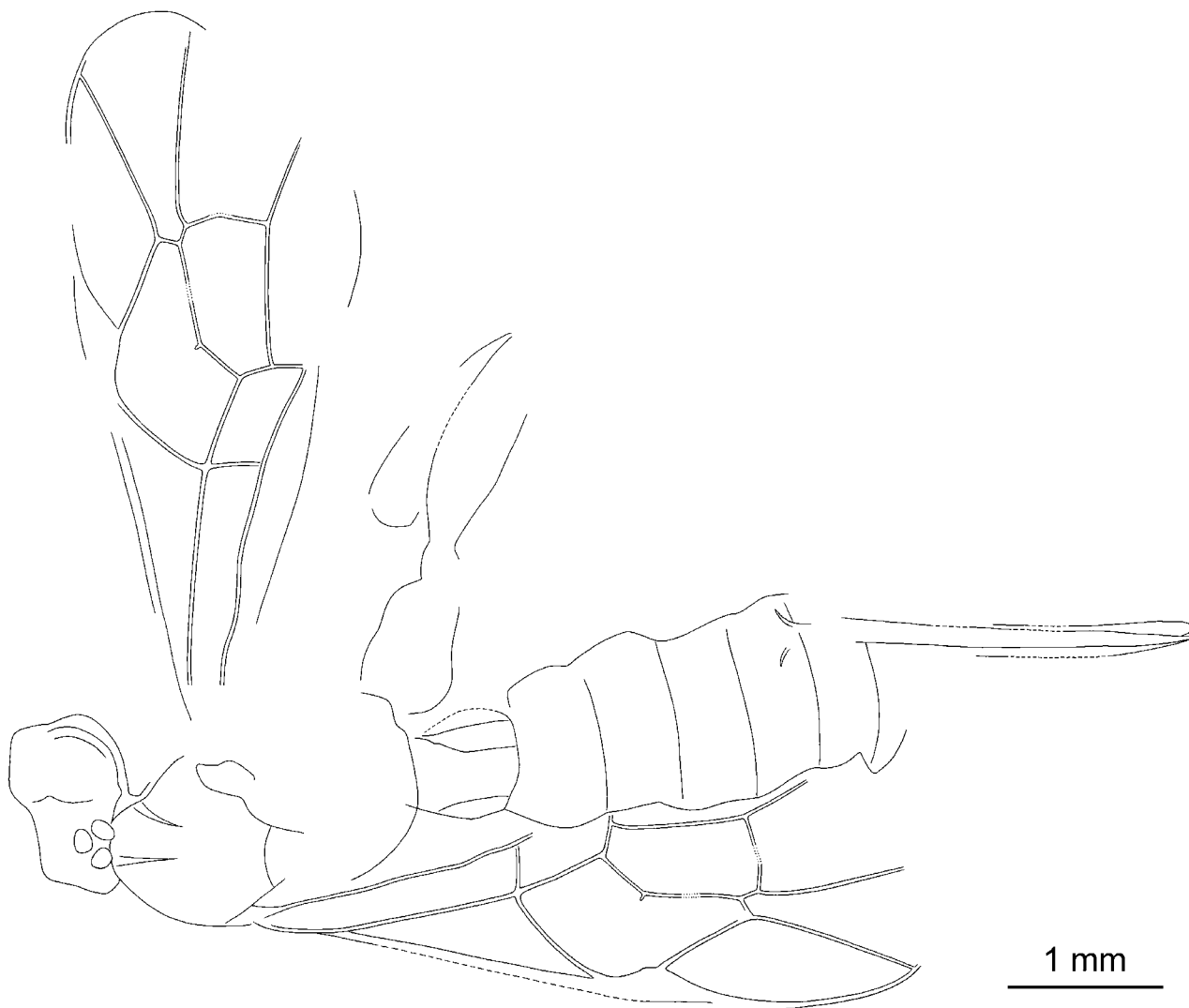


Figure 4. *Zabrachypus tumidus* sp. nov., holotype no. 3429/873, Oligocene deposit in Biamo, Russia.

Subfamily: Metopiinae Förster, 1869

Fossil Metopiinae are registered in some Cenozoic deposits, such as the lowermost Eocene Oise amber (Menier et al. 2004), upper Oligocene Bembridge (Cockerell 1921, Khalaim in press.), Florissant (Brues 1910) and Miocene Brick Yard in U.S.A. (Lewis et al. 1990). Two new species of Metopiinae are described below.

GENUS: *Metopiosa* Khalaim gen. nov.

Type species: *Metopiosa fossiliata* sp. nov.

Etymology. After the type species of the subfamily, *Metopius*.

Diagnosis. The new genus differs from other genera of the subfamily in the strongly postfurcal second recurrent vein, and the second and third tergites with complete sublateral longitudinal carinae. A similar second recurrent vein is present in the genus *Lapton* Nees, 1816, containing one

recent and probably one fossil (Brues 1910) species, but *Lapton* lacks sublateral longitudinal carinae on the second and third tergites, and also strongly differs from the new genus in habitus. *Metopiosa* gen. nov. is also characterized by the long straight tibial spurs.

***Metopiosa fossiliata* Khalaim sp. nov.**

Figure 5; Plate 2, figures 3-4

Material. Holotype: ♀, 3429/892, part and counterpart. Russia, Primorskiy reg., Pozhar distr., upper flow of Barachek stream, right tributary of Biamo river. Pg₃-N₁, layer N 5 (lower). Coll. V.V. Zherikhin, 1976. Lateral aspect of moderately well preserved complete wasp.

Etymology. From Latin *fossilis* (fossil).

Diagnosis. See generic diagnosis.

Description. Body length 5.8 mm. Fore wing length 4.0 mm. Mesosoma length 2.1 mm, height 1.1 mm. Hind

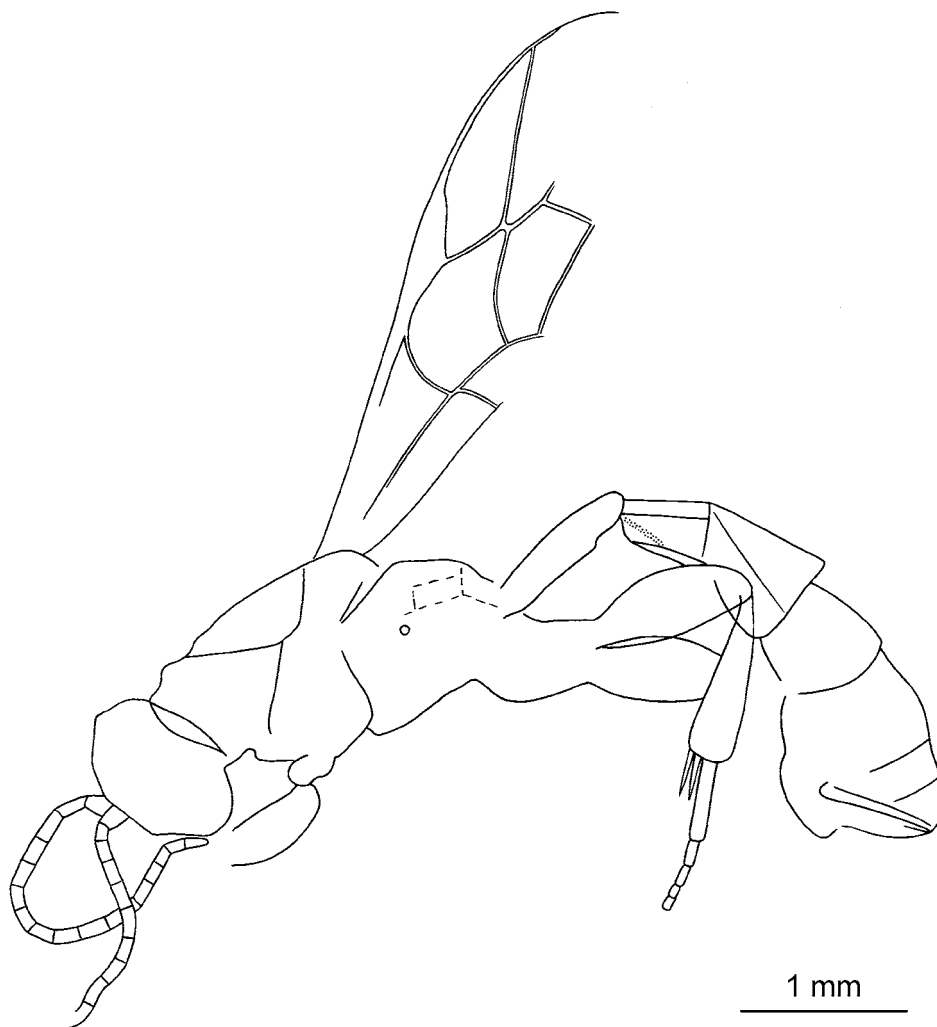


Figure 5. *Metopiosa fossiliata* gen. et sp. nov., holotype no. 3429/892, Oligocene deposit in Biamo, Russia.

femur length 0.95 mm, width 0.4 mm. Hind tibia length 1.05 mm. First tergite length 0.9 mm.

Scape and pedicel suboval. Flagellum filiform, with about 16 segments, all segments distinctly elongate.

Mesosoma stout, elongate. Propodeum areolated, spiracle round.

Metacarp not reaching apex of fore wing. Pterostigma relatively narrow, receiving radius near its middle. Second section of radius 2.4 times as long as first section. Areolet absent. Second recurrent vein strongly postfurcal, almost straight, very slightly inclivous, with two bullae. Discocubitus weakly and evenly curved, without ramulus. Basal vein strongly arcuate. Nervulus distinctly postfurcal, weakly inclivous. Postnervulus strongly inclivous.

Legs thick. Hind femur almost 2.4 times as long as wide, and somewhat shorter than hind tibia. Hind tibia with two straight spurs of about the same length and almost half as long as hind basitarsus. Claw of hind tarsus probably simple (fragment with claws lost).

First tergite probably strongly depressed. Metasoma behind first segment cylindrical or depressed. Second and third tergites with complete sublateral longitudinal carinae.

Second tergite with basolateral groove; epipleura completely separated from tergite by a crease. Ovipositor short, not projecting beyond tip of metasoma.

Colour pattern of the fossil. Head, mesosoma and first tergite black. Antenna, legs, pterostigma, veins, and metasoma behind first segments brownish.

GENUS: *Triclistus* Förster, 1869

Medium-sized genus, world-wide in distribution. Fossil representatives were not recorded until now.

Triclistus ventrator Khalaim sp. nov.

Figure 6; Plate 2, figures 5-6

Material. Holotype: 3429/896, part and counterpart. Russia, Primorskiy reg., Pozhar distr., upper flow of Barachek stream, right tributary of Biamo river. Pg₃-N₁, layer N 5 (lower). Coll. V.V. Zherikhin, 1976. Dorsal and ventral aspects of almost complete wasp. Sex unknown.

Etymology. From Latin *ventralis* (being or located on lower surface).

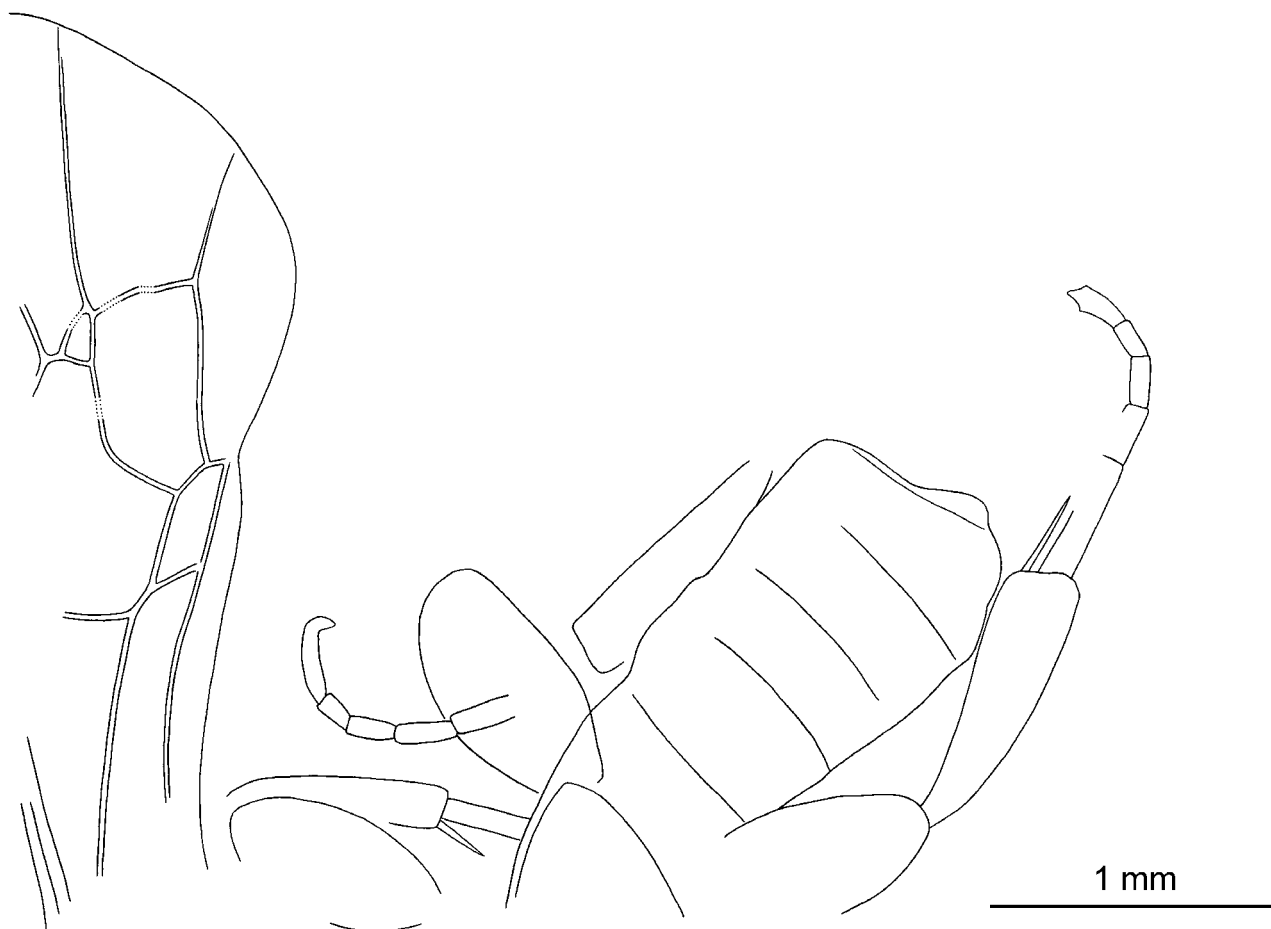


Figure 6. *Triclistus ventrator* sp. nov., holotype no. 3429/896, Oligocene deposit in Biamo, Russia.

Plates

Diagnosis. *Triclistus ventrator* sp. nov. differs from all recent species by the relatively large areolet with long petiole above, and by the long straight spurs (only one spur is discernible) of the hind tibia. The new species is also characterized by the nervellus of the fore wing being strongly postfurcal.

Description. Body length (metasoma incomplete) 4.8 mm. Fore wing length 4.0 mm. Mesosoma length 1.65 mm. Hind femur length about 0.86 mm, width 0.44 mm. Hind tibia length 1.0 mm. First tergite length 0.5 mm.

Basal flagellar segments distinctly elongate.

Pterostigma moderately wide, receiving radius at its middle. Second section of radius straight, 2.7 times as long as first section. Areolet relatively large, receiving second recurrent vein somewhat basad of its outer angle. Second recurrent vein very weakly curved, very slightly inclivous, with two bullae. Discocubitus strongly curved, without ramulus. Basal vein strongly arcuate. Nervulus very strongly postfurcal, strongly inclivous. Postnervulus distinctly inclivous, intercepted below its middle.

Legs very thick. Hind femur twice as long as wide, somewhat shorter than hind tibia. Spurs (only one spur discernible) of hind tarsus somewhat longer than half of hind basitarsus. Claws of hind tarsus simple.

First tergite short, strongly depressed, with complete dorsolateral carinae. Metasoma behind first segment depressed. Second and following segments strongly transverse, without dorsal longitudinal carinae.

Colour pattern of the fossil. Head and mesosoma black. Antenna, legs, pterostigma and veins brownish. Metasoma strongly darkened (to black); second, and probably third and forth tergites brownish.

Subfamily: Cryptinae Kirby, 1837

Large and very diverse subfamily of worldwide distribution. Cryptinae are registered in any Cenozoic deposits with minimally diverse Ichneumonidae, and are also most numerous in Biamo assemblage. All fossil Cryptinae probably belong to the tribe Phygadeuontini Förster, 1869 because of having the second recurrent vein inclival and the propodeum completely areolate. Generic identification of Phygadeuontini is very difficult. I have seen four well preserved specimens of Cryptinae in the Biamo material (no. 3429/867, 3429/872, 3429/876, 3429/916), and a number of poorly preserved and doubtful ones.

Subfamily: Mesochorinae Förster, 1869

Moderately large cosmopolitan subfamily, all are secondary parasites. Eight species of Mesochorus were described from Florissant by Brues (1910), and two specimens are recorded in this paper from Biamo (no. 3429/85, 3429/90).

DISCUSSION

Five ichneumonid subfamilies, Tryphoninae, Pimplinae, Metopiinae, Cryptinae and Mesochorinae, are recor-

ded from Biamo assemblage. This deposit lacks the fossil subfamilies Townesitinae Kasparyan, 1994 constituting an appreciable part of Bembridge (Khalaim in press.) and Baltic amber (Kasparyan 1994), and Pherhombinae Kasparyan, 1988 which is abundant in the Baltic amber (Kasparyan 1994). Biamo assemblage also lacks the rare recent subfamily Paxylommatinae Förster, 1862 which is abundant in Baltic amber (Kasparyan 1994) and has been recorded in Bembridge (Khalaim in press.). Moreover the Baltic amber differs strikingly from the rest deposits by the absence of Pimplinae (Kasparyan 1994). Lack of Townesitinae, Pherhombinae and Paxylommatinae in the Biamo may testify its younger age than Bembridge marls and Baltic amber.

The Biamo assemblage can be possibly closest to the Florissant (Brues 1910) as both include only recent subfamilies, including Pimplinae and Mesochorinae, and lack any fossil ones. Florissant material deserves revision before using in more detailed comparison. This conclusion well corresponds with data on other insects (Zherikhin 1998).

Generally taxonomic composition of Ichneumonidae of Biamo gives a little information about ecological and climatic conditions. Only *Xanthopimpla* is particularly indicative of warm-temperate or subtropical forests. The rest ichneumonid taxa doesn't show any ecological affinities.

ACKNOWLEDGEMENTS

I am very thankful to Dr. A.P. Rasnitsyn (Palaeontological Institute RAS, Moscow) for the loan of valuable material, and to Dr. S.A. Belokobylskij and Dr. D.R. Kasparyan (Zoological Institute RAS, St. Petersburg) for their help in preparation of this paper. The present work is supported by the Russian Foundation for Basic Research (grant no. 07-04-00454), and the programme of the Russian Academy of Sciences "The Origin and Evolution of Biosphere, Subprogramme II".

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Received: 5th May 2007
Accepted: 26th March 2008