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DIGGER WASPS OF THE SUBFAMILY PEMPHREDONINAE (*HYMENOPTERA, SPHECIDAE*) FROM THE BALTIC AND TAIMYR AMBER

E. Budrys

Introduction. Six up to now described fossi species of *Sphecidae* belong undoubtedly or nearly to *Pemphredoninae:* Upper Cretaceous *Lisponema singularis* Evans [5] and *Pittoecus pauper* Evans [6], Eocene *Passaloecus microceras* Sorg [24], Miocene *Passaloecus scuderi* Cockerell [3], *P. fasciatus* Rohwer [22] and *P. minax* Sorg [24]. Only one of them, *P. microceras*, was described from the Baltic amber. The study of inclusion collections of the Palanga Amber Museum (Palanga, Lithuania) and of the Palaeontological Institute (Moscow, Russia) made it possible to find 23 inclusions representing 14 species (13 new ones) of *Pempehredoninae* wasps. 13 of them belong to apparently rich *Pemphredoninae* fauna of the Upper Eocene amber pine (*Pinus succinifera* Coepp.) forests distributed over the recent Scandinavia territory [27]. 11 species come from the tribe *Pemphredonini* and belong to the genus *Passaloecus* Shuckard (4 species) and 3 related new genera: *Eoxyloecus* gen. n. (4 species), *Eopinoecus* gen. n. (2 species) and *Succinoecus* gen. n. (1 species). One of the other genera being described, *Palanga* gen. n. (1 species) belongs to the tribe *Ammoplanini* st. n. (generic taxonomy of the group will be discussed in a later paper) and is related to the recent genus *Spilomena* Shuckard. *Eomimesa* gen. n. (1 species) is the first fossil representative of the tribe *Psenini* closely related to the recent genus *Mimumesa* Malloch. The amber with inclusions of the listed genera comes partly from Jantarnyj (Palmniken), Kaliningrad reg., Russia; the rest is collected on the Baltic sea shore between Šventoji and Klaipėda, Lithuania; in the descriptions the location is designated as Palanga. One new genus, *Cretoecus* gen. n. (1 species) is described from the inclusion in the Upper Cretaceous (Cenomane) Taimyr retinite (for the locality stratigraphy see [27] : 81).

Methods. The inclusions were polished, some of them sawed up beforehand. They were studied by using concentrated sugar solution and objective slide.

Morphological terms and abbreviations. In decriptions, the term "adlateral lines" is proposed for designation of the structures, which after Tulloch [25] are usually called "parapsidal lines". The real parapsidal furrows separate the areas of attachment of the dorsolongitudinal and dorsoventral indirect flight muscles and they are homologous in all pterygote insects as well as *Hymenoptera*.These furrows, which are correctly called in *Symphyta*, are usually called "notauli" in *Apocrita* (the term was proposed by Kokuyev [8]). The use of the term "parapsidal lines" for designation of quite different and peculiar to *Apocrita* structures leads to confusions in the morphological terminology. The term "adlateral lines" is composed by analogy with admedian lines ("anteroadmedian lines" sensu Gibson [17]), which are of similar morphology and origin (markings of initial sites of attachment of the indirect flight muscles - [4]).

The term "episcrobal area of mesopleuron" is used instead of morphologically inexact "hypoepimeral ("being under the epimeron") area". Since the scrobal furrow is marked inside by the upper part of the area of attachment of pleuro=axillar muscle (t=p 12 or T=p 15 after Matsuda [19]; 75 after Snodgrass [23]), it corresponds at least approximately to the upper part of pleural sulcus.Accordingly, episcrobal area corresponds completely or mostly to anepimeron, but is not under it.

The term "subspiracular area of mesopleuron" is used for designation of the area under the pronotal lobe between the lower part of postspiracular carina, epicnemial carina (omaulus) or the place of it, and episternal sulcus. It is marked inside by the area of attachment of the 1st muscle of the 3rd axillar sclerite (t=p 13 after Matsuda [19]; 76b after Snodgrass [23]).

In the descriptions the following abbreviations were used:

WH - width of head;

LF - lenght of frons (distance between the fore margin of front occelus and the middle of the lower margin of clypeus);

LV - length of vertex (the shortest distance between the hind margin of front ocellus and occipital carina);

IOD - interocular distance (the shortest distance between the inner margins of eyes);

POD - postocellar distance (the shortest distance between the inner margins of hind ocelli);

OOD - oculoocellar distance (the shortest distance between the margins of hind ocellus and eye);

IMD - intermandibular distance (distance between the outer margins of fore mandibular condyles, frontal view);

LCL - length of clypeus (distance between the middle of frontoclypeal suture and the middle of the lower margin of clypeus);

WCA - width of clypeal apex (distance between the lateral corners or teeth of clypeal apex);

LSC - length of scape;

3FL - combined length of the first three flagellomeres (without pedicel);

COL - width of collar of pronotum (distance betweet the lateral corners of transverse carina of collar, anterodorsal view);

PRN - width of pronotum (distance between the tops of pronotal lobes, anterodorsal view).

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Systematics

Key to *Pemphredoninae* from the Baltic amber

1. a. Forewing with 3 submarginal cells.....2
b. Forewing with 2 submarginal cells (Maxillar palpus consisting of 6 segments) (*Pemphredonini*).....3

2 (1a). a. Gaster with a long entire (consisting of indivisible acrotergite II and acrosternite II) petiolus. Maxillar palpus consisting of 6 segments (*Psenini*). Mesopleuron without hypersternal sulcus (hypersternaulus) (Fig. 29).....6. *Eomimesa*, gen. n.
b. Gaster without entire petiolus. Maxillar palpus consisting of segments (Fig. 3) (*Ammoplanini*). Mesopleuron with a short but distinct hypersternal sulcus (Fig. 1).....1. *Palanga*, gen. n.

3 (1b). a. Episternal sulcus separated from postspiracular carina by narrow but noticeable smooth space. Hypersternal sulcus absent (Fig. 24). Head is strongly transverse, WH : LF = 1.8. Mandibles with bidentate inner lobe (Fig. 28). Hindwing with 5 distal hamuli. (~~Frontal~~ line indistinct. Forewing with 2 distal hamuli. (Frontal line indistinct. Forewing with 2 discoidal cells. Hind tibiae with distinct spines.).....5. *Succinoecus*, gen. n.
b. Episternal sulcus approached to postsspiracular carina. Hypersternal sulcus well developed, areolate. Head is rounded, WH : LF does not exceed 1.5; mandibles with simple, acute or arcuate inner lobe (Figs. 10-17, 25). Hyndwing (? always) with 6 distal hamuli.....4

4 (3b). a. Second recurrent vein absent, forewing with 1 discoidal cell (Fig. 22). Mandibles with an acute hind lobe: their apex tridentate, the middle tooth longer than the inner and the hinder one (Fig. 23). Frontal line distinct, shining. (Hypersternal sulcus present, short, not broadened posteriorly. Hindtibiae without noticeable spines).....4. *Eopinoecus*, gen. n.
b. Second recurrent vein present, forewing with 2 discoidal cells. Mandibles without visible hind lobe, their apex bidentate. Frontal line indistinct.....5

5 (4b). a. Occipital carina entirely surrounding the occipital cavity, ventrally joining the midventral line of head. Hindtibiae of female with not more than 2-3 spines on their outer surface or without them (Figs. 5-8). Clypeal apex without a distinct row of thick setae (Figs. 10-13).....2. *Passaloecus* Shuckard.
b. Occipital carina only dorsally and laterally surrounding the occipital cavity, ventrally it disappears on the lower part of genae and reaches neither midventral line nor hypostomal carina (Fig. 20). Hind tibiae of female with a few short but distinct spines scattered on their outer surface (Figs. 18-21). Clypeal apex with a more or less distinct row of thick setae, directed ventrad (Figs. 14-17).....3. Eoxyloecus, gen. n.

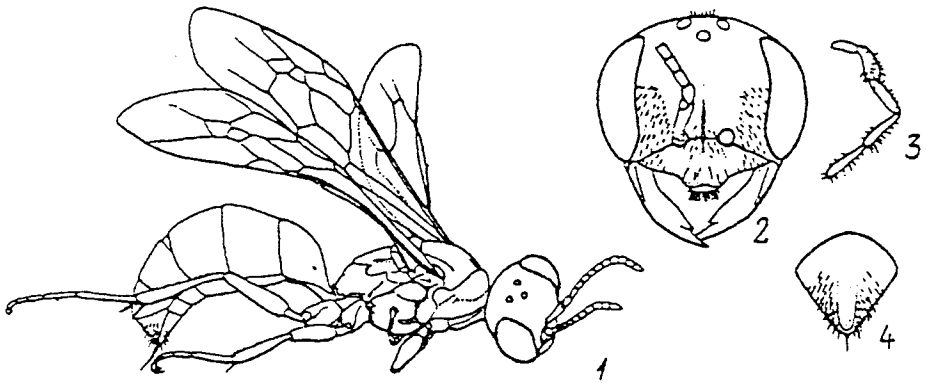
1. *Palanga* Budrys, gen. n.

Type species *Palanga succinea* Budrys, sp. n.

Related to recent genera *Arpactophilus* Smith and *Spilomena* Shuckard. Differing in complete forewing venation.

Frontal line evanescent. Frontal foveae absent. Lower frons with distinct longitudinal carina. Malar spaces very narrow. Clypeus with weakly bilobate apex. Labrum short, broadly rounded, with a row of setae on the apical margin. Mandibles bidentate, with acute inner lobe. Palpal formula 5 + 4 (maxillar palpus - Fig. 3). Occipital carina entirely surrounding the occiput, merging the midventral line of head.

Pronotal collar without transverse carina. Admedian lines distinct; adlateral lines long, slightly impressed. Parapsidal sulci undeveloped. Scrubal sulcus distinct, smooth. Episcrobal area smooth, strongly bulging. Episteral sulcus areolate, defined anteriorly by distinct carina, posterioly by rounded edge. Hypersternal sulcus present. Epicnemial and acetabular carinae absent. Mid and hind tibiae with spines posterolaterally and apically. Tarsi without tarsal rakes; aroliae large, approximately equal to claws. Forewing with 3 submarginal and 2 discoidal cells. Hindwing with 1 subbasal and 6 distal hamuli. Hindwing media diverging before cu=a. Gaster witout entire petiolus. 6th tergum of female with a weakly outlined pygidial plate (Fig. 4).



Figs. 1-4. *Palanga succinea:*
1 - general view; 2 - head; 3 - maxillar palpus; 4 - 6th tergum.

Palanga succinea Budrys, sp. n.
Holotypus: ♀, No 364/225, Palaeontological Institute, Moscow.
Locus Typicus: Palanga, Lithuania.

Stratum typicum: Upper Eocene.

Female (Fig. 1). Body length 4.2 mm. Head (Fig. 2) weakly transverse, WH : LF = 1.42. Face moderately broad, IOD : LF = 0.85. Vertex weakly developed, LV : LF = 0.37. POD: OOD = 0.85. IMD : WH = 0.65. Lower part of frons with a distinct longitudinal keel, ventrally continuing on the basal part of clypeus. LCL : LF = 0.34. Clypeal apex weakly bilobate, slightly notched in the middle. Labrum short, with broadly rounded, nearly straight lower margin, bearing a row of setae. Pedicel large, only about twice shorter than scape; flagellum comparatively long, 3FL : LSC = 1.05. Pronotal collar rounded, without transverse carina or distinct lateral angles. Hypersternal sulcus short, consisting of 2 or 3 hardly delimited areolae. Metapleuron behind transmetapleural sulcus nearly smooth, with weak rugae anteroventrally. Gaster weakly narrowed between the 1st and 2nd segment. Pygidial plate narrow=subelliptic (Fig. 4).

Several long setae are present near the lower margin of clypeus. Lateral parts of frons and clypeus with pale pilosity directed ventrad; the similar thin pilosity is developed on all parts of thorax. Vertex, lateral parts of propodeum and most of gaster are covered with more short, inconspicuous piles. Ocellar area of vertex with several long straight hairs. The 6th segment of gaster, especially the tergum, bearing long and dense pilosity. Head, mesopleuron, metapostnotum and propodeum smooth, shining, weakly microsculptured. The upper part of pronotum, scutum, scutellum and metanotum with granulose microsculpture. Gaster shining, finely shallowly punctate.

Body dark. Scape reddish; pronotal lobes, tibiae and tarsi, apparently, dark brownish.

Male unknown.

2. *Passaloecus* Shuckard, 1837

Type species *Pemphredon insignis* Linden, 1829.

The recent fauna of the genus has exclusively Holarctic distribution and is restricted to the boreal and subtropic regions. It consists of 33 described species: 4 Holarctic, 17 Palaearctic and 12 Nearctic.

All species from the Baltic amber lack scutal patches and epicnemial carina (omaulus), they have areolate scrobal sulcus and smooth subspiracular area of mesopleuron. Probably this state of the characters could be considered as plesiomorphic within the genus. According to the species group classification of Vincent [26], all amber species seem to be related to *P. relativus* Fox - group. The latter is represented in recent fauna by 3 species distributed in the western part of North America.

Key to species of the Baltic amber fauna

1. a. Clypeal apex weakly tridentate, with two shallow notches (Fig. 13). mandibles comparatively widely separated, IMD : WH = 0.7. Hypersternal sulcus curved dorsad posteriorly (Fig. 5). Hindtibiae without distinct spines on their lateral surface. (Metapleuron smooth behind the transmetapleural sulcus).....1. *P. zherichini* Budrys, sp. n.

b. Clypeal apex bidentate, with one shallow semicircular notch. Mandibles comparatively weakly separated, IMD : WH = 0.6. Hypersternal sulcus not curved dorsad. Hindtibiae with 2-3 noticeable spines on their lateral surface (in *P. electrobius* hindtibiae damaged).....2

2 (1b). a. The posterior areola of hypersternal sulcus distinctly larger than the anterior ones (Fig. 6). Scrobal sulcus with comparatively large areolae. The hind part of mesopleuron and the metapleuron behind transmetapleural sulcus more or less distinictly obliquely rugose. Rugosity of propodeum with rather large areolae.....4. *P. microceras* Sorg, 1986

b. The posterior areola of hypersternal sulcus of the same size as the anterior ones. Scrobal sulcus with comparatively small areolae. The hind part of mesopleuron and the metapleuron behind transmetapleural sulcus smooth. Rugosity of propodeum with rather small areolae.....3

3 (2b). a. Lateral margins of scutum with hardly visible areolae (Fig. 7). Teeth of clypeal apex rather widely separated (Fig. 11), WCA : IOD = 0.4...3. *P. electrobius* Budrys, sp. n.

b. Lateral margins of scutum distincly areolate [(Fig. 9). Teeth of clypeal apex rather weakly separated] (Fig. 12), WCA : IOD = 0.3.....2. *P. piletskisi* Budrys, sp. n.

1. *Passaloecus zherichini* Budrys, sp. n.

Holotypus: ♀, No 964/645 - Palaeontological Institute (Moscow).

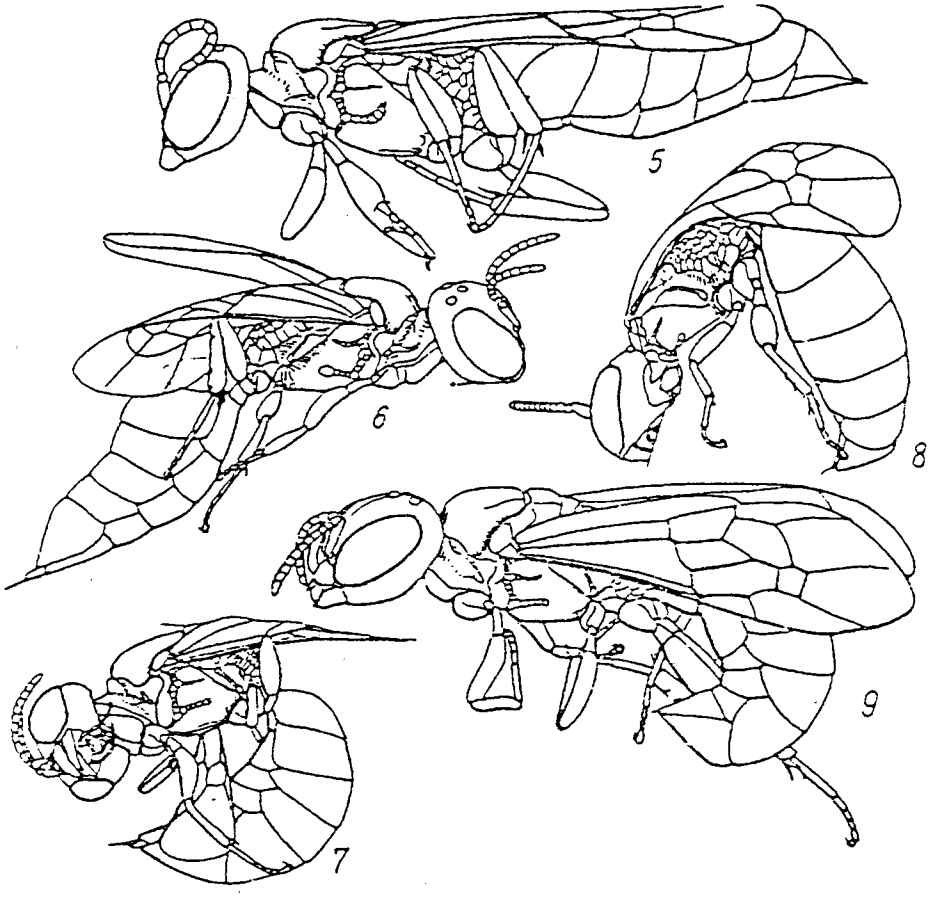
Locus typicus: Jantarnyj (Palmniken), Kaliningrad reg., Russia.

Stratum typicum: Upper Eocence.

The species is named after Dr. W. W. Zherichin, a well-known Russian palaeoentomologist.

Female (Fig. 5). Body length 6.9 mm. Head (Fig. 13) noticeably transverse, WH : LF = 1.41. Face rather broad, IOD : LF = 0.76. Vertex comparatively weakly developed, LV: LF = 0.40. POD : OOD = 1.52. Mandibles widely separated, IMD : WH = 0.72. Clypeus rather high, LCL : LF = 0.27. Clypeal apex weakly tridentate, its width 1.25 times smaller than the distance between its lateral corner and the margin of eye; WCA : IOD = 0.35, WCA: POD = 1.20. Frontal process small, acute, flattened ventrally. Labrum triangular, with rounded apex. Mandibles bidentate, with arcuate inner lobe. Flagellum comparatively long, 3FL : LSC =0.84. Pronotal collar with short obtuse angles, COL : PRN = 0.63.

The lower part of frons and clypeus with thin and rather dense pilosity directed ventrad; apex of clypeus with several long setae. Upper part of frons with rather dense short pilosity directed dorsad. Vertex and genae finely punctate. Scutum, scutellum and metanotum very densely and finely punctate, with very short straight pilosity. Scutum without scutal patches; parapsidal sulci weakly impressed, not longer than admedian lines. Lateral margins of scutum areolate. Scrobal sulcus impressed, finely areolate. Episternal sulcus with large areolae. Subspiracular area of mesopleuron smooth. Hypersternal sulcus areolate, posteriorly curved dorsal and increasing in size of areolae. Mesopleuron between sulci smooth, finely evenly punctate. Metapleuron behind transmetapleural sulcus smooth, shining. Rugosity of metapostnotum and propodeum forming large areolae. Tibiae without noticeable spines on their outer surface. Gaster very finely and densely punctate; lateral parts of the first tergum with scattered punctation.



Figs. 5-9. *Passaloecus*, general view:
5 - *P. znerichuni*; 6 - *P. microceras*; 7 - *P. electrobius*; 8-9 - *P. piletskisi*.

Body black. Pale are: apex of labrum, scapes anteriorly, mandibles basally, maxillar and labial palpi, pronotal lobes, fore tibiae anteriorly, mid and hind tibiae basally and apparently tarsi.

Male unknown.

2. *Passaloecus piletskisi* Budrys, sp. n.

Holotypus: ♀, No Ap 18468. Paratypus: ♀ No Ap 3046 (FO 11254) - both in the Palanga Amber Museum (Palanga).

Locus typicus: Palanga, Lithuania.

Stratum typicum: Upper Eocene.

The species is dedicated to Simonas Pileckis (1927), a well-known Lithuanian entomologist, notable for beetle researches.

Female (Fig. 8). Body length 5.6-6.2 mm. Similar to the female of the preceding species. LC : LF = 1.23-1.29. IOD : LF = 0.54-0.57. LV : LF = 0.46-0.47. POD : OOD = 1.12-1.19. IMD : WH = 0.60-0.61. LCL : LF = 0.24-0.25. Clypeal apex weakly semicircularly notched, its width is 1.33 times smaller than the distance between its lateral corner and the margin of eye (Fig. 12); WCA : IOD = 0.31, WCA : POD = 0.84-0.93. Flagellum relatively long, 3FL : LSC = 0.80-0.85.

Punctation rather dense, body less shining than of other species. Pilosity weakly developed. Parapsidal sulci hardly impressed, shorter than admedian lines. Scutal patches absent. Lateral margins of scutum areolate, with distinct transverse rugae. Hypersternal sulcus with areolae of equal size, without larger ones posteriorly. Hind part of mesopleuron nearly smooth, with hardly visible short rugae. Metapleuron behind the transmetapleural sulcus smooth, shining. Rugosity of metapostnotum and propodeum with moderately large areolae (Fig. 9). Hind tibiae with three recognizable spines on their outer surface and a row of short ones on the apex.

Body black. Apparently brownish are: scape anteriorly, apex of labrum, maxillar and labial palpi, femora apically, tibiae and tarsi.

Male unknown.

3. *Passaloecus electrobius* Budrys, sp. n.

Holotypus: ♀, No 964/646 - Palaeontological Institute (Moscow).

Locus typicus: Jantarnyj (Palmniken), Kaliningrad reg., Russia.

Startum typicum: Upper Eocene.

Female (Fig. 7). Body length 4.9 mm. Very similar to the female of the preceding species. IOD : LF = 0.66. IMD : WH = 0.60. LCL : LF = 0.23. Clypeal apex very weakly notched, its width is 1.12 times larger than the distance between its lateral corner and the margin of eye (Fig. 11); WCA : IOD = 0.40. Labrum triangular, with a weakly stretched apex. Flagellum relatively short, 3FL : LSC = 0.71.

Punctation of body less developed than in preceding species, pilosity is similar to that of it. Scutum without scutal patches. Parapsidal sulci indistinct. Lateral margins of scutum weakly areolate. Hypersternal sulcus with equal in size areolae. Hind part of mesopleuron very weakly obliquely rugose. Metapleuron behind transmetapleural sulcus smooth, shining. Rugosity of metapostnotum and propodeum with moderately large areolae.

Body black. Pale brownish are: scape anteriorly, maxillar and labial palpi, pronotal lobes, tibiae and tarsi.

Male unknown.

4. *Passoloecus microceras* Sorg, 1986

Material: ♀, No Ap 18464; ♀, No Ap 19810 - both Palanga Amber Museum.

Female (Fig. 6). Body length 5.7-6.1 mm. Similar to the preceding species. WH : AF = 1.27-1.38. IOD : LF = 0.57-0.59. LV : LF = 0.44- 0.49. POD : OOD = 1.14-1.20. IMD: WH = 0.60. LCL : LF = 0.20-0.23. Clypeal apex shallowly semicircularly notched, WCA 1.33-1.5 times smaller than the distance between its corner and the margin of eye (Fig. 10); WCA : IOD = 0.31-0.33, WCA : POD = 0.80-0.88. 3FL : LSC = 0.76.

Scutum without scutal patches. Parapsidal sulci weakly impressed, not longer than admedian lines. The lateral margins of scutum and scrobal sulcus areolate. Subspiracular area of mesopleuron smooth. Hypersternal sulcus areolate, with the posterior areola especially large, 2-3 times exceeding the other ones. Mesopleuron posteriorly obliquely rugose. Metapleuron behind the transmetapleural sulcus finely obliquely strigose, weakly shining. Rugosity of metapostnotum and propodeum forming large areolae. Hind tibiae with three noticeable spines on their outer surface and a row of short ones on the apex.

Body black. Maxillar and labial palpi and pronotal lobes probably dark brownish.

Male unknown.

3. *Eoxyloecus* Budrys, gen. n.

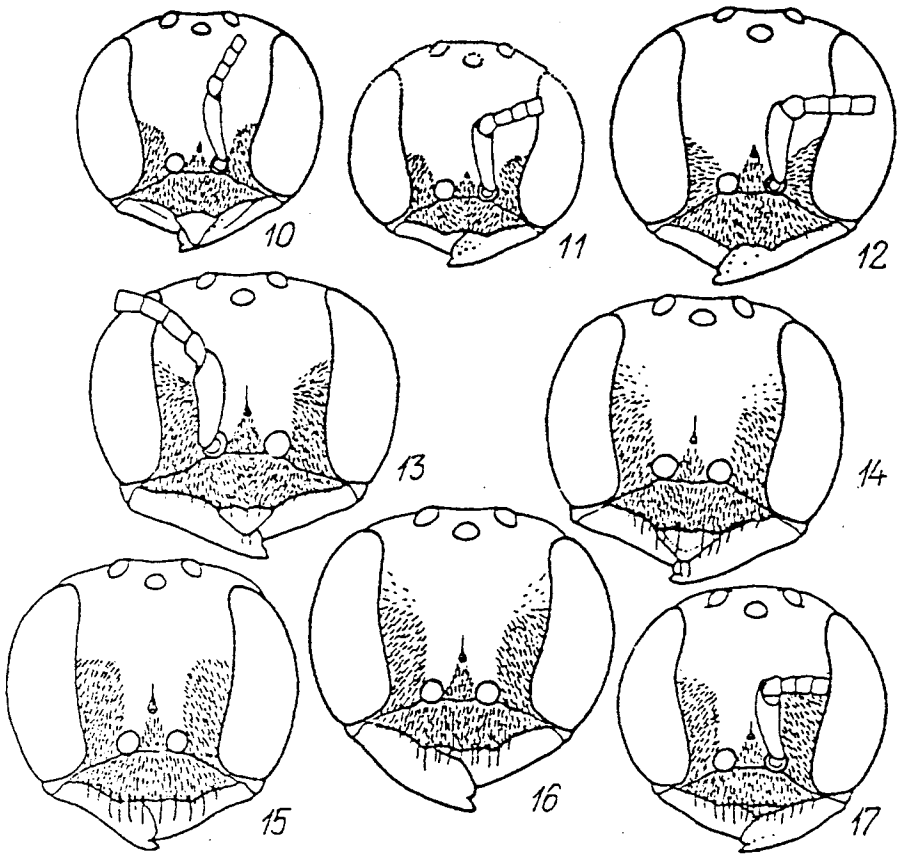
Type species *Eoxyloecus albipalpis* Budrys, sp. n.

Closely related to *Passaloecus*. Differing in occiput not delimited ventrally by occipital carina, clypeal apex bearing more or less distinct row of thick setae and spinose outer surface of hindtibiae.

Frontal line evanescent. Frontal foveae absent. Occipital carina does not surround occiput entirely, it disappears in the middle part of genae distantly from hypostomal carina and the midventral line of head. Malar spaces very narrow. Pilosity of genae short, even, without long setae. Clypeus, besides short pilosity, with numerous long setae, some of them forming more or less distinct row near the apical margin. Clypeal apex comparatively broad, weakly tridentate or nearly straight. Labrum triangular. Mandibles bidentate, with simple arcuate inner lobe, without hind lobe. Palpal formula 6 + 4.

Pronotal collar weakly developed. Admedian and adlateral lines not impresssed. Parapsidal sulci distinctly impressed, areolate, not longer than admedian lines. Scrobal sulcus distinctly areolate. Mesopleuron without coarse rugosity. Episternal and hypersternal sulci areolate. Epicnemial and acetabular carinae absent. Subspiracular area smooth. Scutum, scutellum and metanotum finely, densely, evenly punctate, with very short straight pilosity. Metapostnotum and propodeum with an areolate rugosity. Legs thicker than in *Passaloecus* and *Eopinoecus*: hind femora 2.5-2.8 times longer than broad (in representatives of mentioned genera - about 3.5 times longer than broad). Tibiae rather thick; hindtibiae with short and stout spines on their outer surface and a row of ones on their apex; midtibiae with a few spines apically. Tarsomeri with spines apically and ventrally; fore tarsi with recognizable tarsal race consisting of short spines. Forewings with two submarginal and two discoidal cells. Hindwings with 6 distal hamuli.

Gaster finely punctate, with visible microsculpture between punctures. Petiolus short,



Figs. 10-17. Head of *Passaloecus* (10-13) and *Eoxyloecus* (14-17):
10 - *P. microceras*; 11 - *P. electrobius*; 12 - *P. piletskisi*; 13 - *P. zherichini*; 14 - *E. albipalpis*; 15 - *E. seticeps*; 16 - *E. palionisi*; 17 - *E. succinicola*.

dorsally flat. The 6th tergum without pygidial plate.

Key to species of *Eoxyloecus*

1. a. Clypeal apex bearing, in addition to thin long setae, a row of 8 thick spinelike ones near the margin (Fig. 15). (Hind areola of hypersternal sulcus noticeably larger than the rest of them. Metapleuron behind the transmetapleural sulcus strigose. Propodeum rather finely areolate. POD : OOD = 1.5. Maxillar and labial palpi and pronotal lobes dark).....
.....2. *E. seticeps* Budrys, sp. n.

b. Clypeal apex with more or less numerous thin long setae, without spinelike ones (Figs. 14,16-17).....2

2 (1b). a. Labrum, maxillar and labial palpi and pronotal lobes pale. Metapleuron behind the transmetapleural sulcus strigose (Fig. 18). (Hind areola of hypersternal sulcus noticeably larger than the rest of them. Rugosity of propodeum with relatively large areolae. POD : OOD = 1.9).....1. *E. albipalpis* Budrys, sp. n.

b. Labrum, maxillar and labial palpi and pronotal lobes dark. Metapleuron behind the transmetapleural sulcus nearly smooth.....3

3 (2b). a. Hind areola of hypersternal sulcus noticeably larger than the rest of them. Rugosity of propodeum with relatively large areolae (Fig. 20). Occipital carina rising ventrally. POD: OOD = 1.4. Body length 7 mm.....3. *E. palionisi* Budrys, sp. n.

b. Hind areola of hypersternal sulcus equal to or hardly larger than the rest of ones. Rugosity of propodeum with relatively small areolae (Fig. 21). Occipital carina does not rise ventrally. POD : OOD = 1.5- 1.7. Body length 5-6 mm.....4. *E. succinicola* Budrys, sp. n.

1. *Eoxyloecus albipalpis* Budrys, sp. n.

Holotypus: ♀. No 964/644 - Palaeontological Institute (Moscow).

Locus typicus: Jantarnyj (Palmniken), Kaliningrad reg., Russia.

Stratum typicum: Upper Eocene.

Female (Fig. 18). Body length 6.7 mm. Head (Fig. 14) weakly transverse, WH : LF = 1.43. Face rather narrow, IOD : LF = 0.67. Vertex weakly developed, LV : LF = 0.34. POD : OOD = 1.91. IMD : WH = 0.65. Clypeus rather short, LCL : LF =0.23. Clypeal apex weakly tridentate, its width 1.47 times larger than the distance between its lateral corner and the margin of eye. WCA : IOD = 0.49, WCA : POD = 1.24. Frontal process short, acute, laterally flattened. Mandibles with rounded inner lobe. Flagellum rather short, 3FL : LSC = 0.73. COL : PRN = 0.61.

Frons between the antennal socket and eye with pilosity directed ventrad; upper part of frons with similar pilosity directed dorsad. Clypeus with several long setae near the apical margin. Vertex, genae and mesopleuron between sulci smooth, finely punctate. The posterior areolae of hypersternal sulcus larger than the anterior ones. Metapleuron behind the transmetapleural sulcus finely obliquely strigose. Metapostnotum and propodeum with large areolae.

Body black. Labrum, scape anteriorly, maxillar and labial palpi and propotal lobes whitish or pale yellow. Fore and mid femora apically, foretibiae anteriorly, mid and hind tibiae basally, apparently, yelowish.

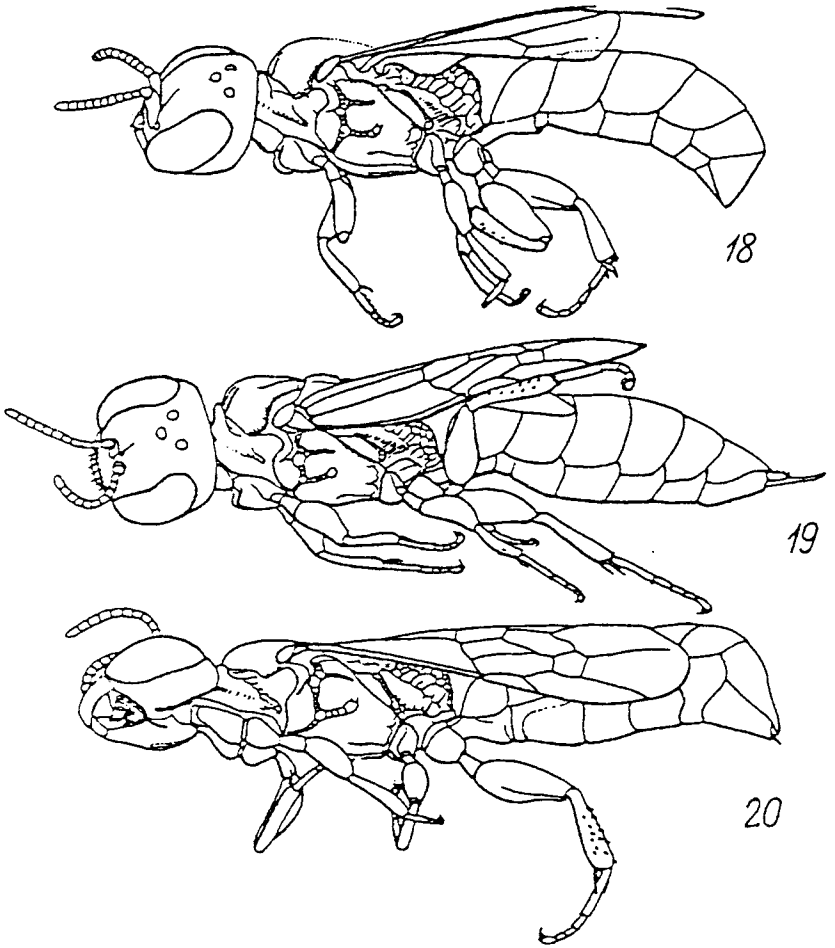
Male unknown.

2. *Eoxyloecus seticeps* Budrys, sp. n.

Holotypus: ♀, No Ap 18455 - Palanga Amber Museum.

Locus typicus: Palanga, Lithuania.

Stratum typicum: Upper Eocene.



Figs. 18-20. Eoxyloecus, general view:
18 - *E. albipalpis*; 19 - *E. seticeps*; 20 - *E. palionisi*.

Female (Fig. 19). Body length 6.7 mm. Similar to a female of the preceding species. LC : LF = 1.34. IOD : LF = 0.62. LV : LF = 0.36. POD : OOD = 1.46. IMD : WH =0.63. LCL : LF = 0.22. Apex of clypeus weakly tridentate, nearly straight; its width 1.39 times larger than the distance between its lateral corner and the margin of eye (Fig. 15); WCA:

IOD = 0.51, WCA : POD = 1.32. Frontal process short, acute. 3FL : LSC = 0.79.

Punctation and pilosity similar to those of the preceding species. Clypeus, beside of several scattered setae, bearing a distinct row of 8 more long spinelike setae along the apical margin. The posterior areolae of hypersternal sulcus larger than the anterior ones. Metapostnotum and propodeum more finely areolate than in the preceding species.

Body black. Scape anteriorly and pronotal lobes dark. Femora apically, tibiae and tarsi apparently brownish.

Male unknown.

3. *Eoxyloecus palionisi* Budrys, sp. n.

Holotypus: ♀, No Ap 3824 - Palanga Amber Museum.

Locus typicus: Palanga, Lithuania.

Startum typicum : Upper Eocene.

The species is dedicated to Alfonsas Palionis (1905-1957), the first Lithuanian entomologist.

Female (Fig. 20). Body length 7.0 mm. Similar to the preceding species. Distinguished by noticeably rising ventral parts of occipital carina. WH : LF = 1.29. IOD : LF = 0.62. POD: OOD = 1.43. IMD : WH = 0.66. LCL : LF = 0.22. Clypeal apex nearly straight, its width 1.47 times larger than the distance between its lateral corner and the margin of eye (Fig. 16); WCA : IOD = 0.48, WCA : POD = 1.23.

Punctation and pilosity similar to those of the preceding species. Clypeus with scattered thick setae on its disc and an uneven row of similar setae along its apical margin. Metapleuron behind the transpleural sulcus, contrary to the preceding species, smooth, shining. The posterior areolae of hypersternal sulcus larger than the anterior ones. Metapostnotum and propodeum with large areolae, similar to that of E. albipalpis.

Body black. Mandibles, scape anteriorly, maxillar and labial palpi, pronotal lobes and legs dark.

Male unknown.

4. *Eoxyloecus succinicola* Budrys, sp. n.

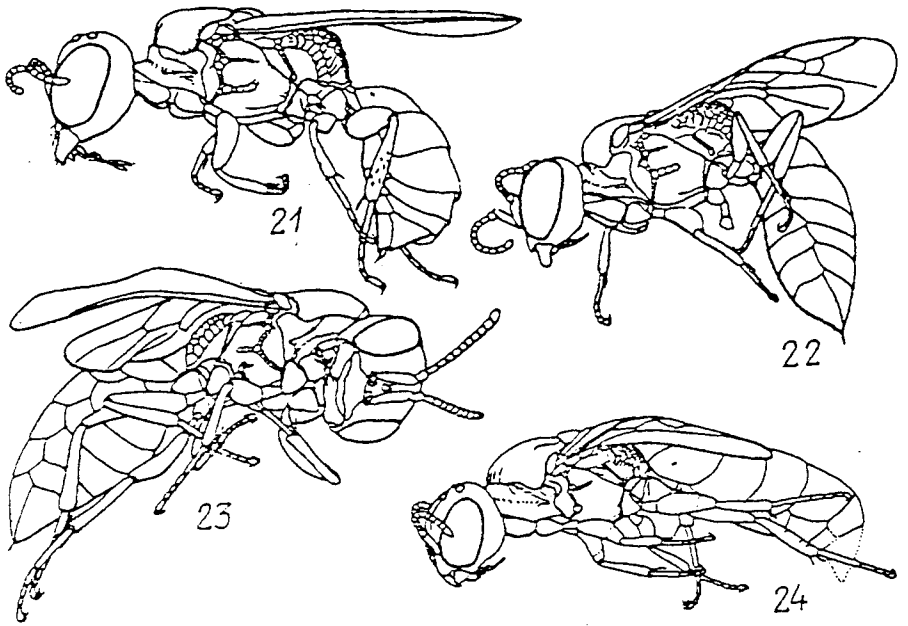
Holotypus: ♀, No 964/641 - Palaeontological Institute (Moscow). Paratypi: 2 ♀, [No 964/642, 964/643 - Palaeontological Institute (Moscow); 2 ♀,] No Ap 17621, Ap 11206 - Palanga Amber Museum.

Locus typicus: Jantarnyj (Palmniken), Kaliningrad reg., Russia.

Stratum typicum: Upper Eocene.

Female (Fig. 21). Similar to the preceding species, but body length is 4.9-6.0 mm only. WH : LF = 1.29-1.36. IOD : AF = 0.62-0.65. LV : LF = 0.37-0.40. POD : OOD = 1.56-1.68. IMD : WH = 0.64-0.66. LCL : LF = 0.20-0.21. Clypeal apex straight, its width 1.67 times larger than the distance between its lateral corner and the margin of eye (Fig. 17); WCA: IOD = 0.46-0.49, WCA : POD = 1.05-1.28. 3FL : LSC = 0.63-0.65.

Punctation and pilosity similar to those of the preceding species. Clypeus with scatte-



Figs. 21-24. *Eoxyloecus* (21), *Eopinoecus* (22-23) and *Succinoecus* (24), general view: 21 - *E. succinicola*; 22 - *Eop. truncifrons*; 23 - *Eop. samogiticus*; 24 - *S. lituanicus*.

red setae on its disc and with an uneven row of them near the apical margin. The posterior areolae of hypersternal sulcus nearly equal to the anterior ones. Metapleuron behind the transmetapleural sulcus nearly smooth or weakly strigose, shining. Rugosity of metapostnotum and propodeum with moderately large areolae.

Body black. Scape anteriorly, maxillar and labial palpi and, probably, pronotal lobes reddish-brown.

Male unknown.

Possibly a combined species. Some specimens have a smooth hind part of metapleuron behind the transmetapleural sulcus, the others - a weakly obliquely strigose one.

4. *Eopinoecus* Budrys, gen. n.

Type species *Eopinoecus truncifrons* Budrys, sp. n.

Closely related to *Passaloecus*. Differing in absence of the second recurrent vein of forewing and presense of acute hind lobe of mandible.

Frontal line distinct, shining. Frontal foveae absent. Frons between the antennal soc-

ket and eye with pilosity directed ventrad. Pilosity of genae short, even, without long setae. Occipital carina entirely surrouding occiput, merging midventral line of head. Malar spaces very narrow. Clypeus rather high, covered by even pilosity directed ventrad, with a few more long setae near the apical margin. Labrum triangular. Mandibles tridentate, with protruding apex and acute inner and hinder lobes. Palpal formula 6 + 4.

Pronotal collar weakly developed, with rounded lateral angles. Admedian and adlateral lines not impressed. Parapsidal sulci weakly marked, hardly impressed, not longer than admedian lines. Scrobal sulcus distinctly areolate. Mesopleuron without coarse rugosity. Episternal sulcus merging in the fore margin of mesopleuron near the midventral line, areolate, with enlarged areolae near the scrobal and hypersternal sulci. Epicnemial and acetabular carinae absent. Subspiracular area smooth. Metapostnotum and propodeum areolate, separated from smooth posterior part of metapleuron by distinct carina. Tibiae without visible spines. Tarsi without tarsal rake, tarsomeri with weak spines apically and ventrally. Forewings with two submarginal and one discoidal cells, the second recurrent vein absent. Hindwings with 6 distal hamuli.

Gaster very finely punctate, shining. Petiolus short, dorsally flat. The 6th tergum of female without pygidial plate.

Key to species of *Eopinoecus*.

1. a. Upper frons distinctly convex laterally from the frontal line, lower frons flat, vertically abrupt (Fig. 26). Lateral margins of scutum with rather large areolae. POD : OOD = 1.6-1.9. Clypeal apex narrow, WCA : POD = 0.4-0.6.....1. *E. truncifrons* Budrys, sp. n.
b. Upper and lower frons weakly evenly convex laterally from frontal line (Fig. 27). Lateral margins of scutum more finely areolate. POD : OOD = 1.4. Clypeal apex broader, WCA: POD = 0:7.....2. *E. samogiticus* Budrys, sp. n.

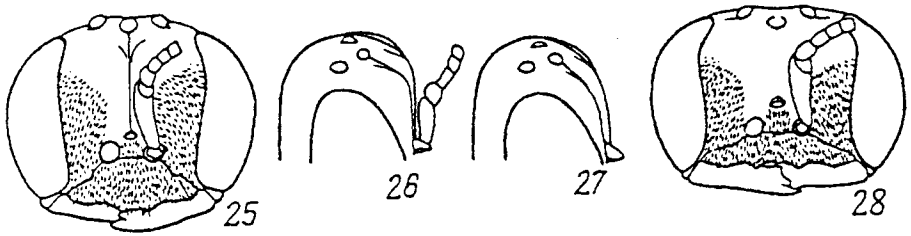
1. *Eopinoecus truncifrons* Budrys, sp. n.

Holotypus: ♀, No Ap 15936. Paratypus: 1 ♀, No Ap 18438 - both in Palanga Amber Museum.

Locus typicus: Palanga, Lithuania.

Stratum typicum: Upper Eocene.

Female (Fig. 22). Body length 4.5-4.8 mm. Head (Fig. 25) weakly transverse, WH: AF = 1.41. Face moderately broad, IOD : LF = 0.71. Vertex weakly developed, LV : LF = 0.44. POD : OOD = 1.65-1.94. IMD = WH = 0.56-0.60. The upper part of frons laterally from frontal line distinctly convex; the rest of it flat, vertically abrupt (Fig. 26). Frontal process rather high, acute, with flat lower surface. Clypeus compartively high, LCL : LF = 0.25. Clypeal apex narrow, very shallowly notched, nearly straight. Distance between the lateral corners of clypeal apex 1.9 times smaller than the distance between the corner and the margin of eye; WCA : IOD = 0.17-0.20, WCA : POD = 0.45-0.55. Lateral parts of the lower margin of clypeus weakly arcuately protruding. Mandibles tridentate, with acute inner and hinder lobes. Flagellum very short, 3FL : LSC = 0.55-0.57.



Figs. 25-28. Head of *Eopinoecus* (25-27) and *Succinoecus* (28), frontally (25, 28) and laterodorsally (26-27): 25-26 - *Eop. truncifrons*; 27 - *Eop. samogiticus*; 28 - *S. lituanicus*.

The lateral margin of scutum distinctly areolate. Scutum, scutellum and metanotum finely, densely punctate, with short straight pilosity. Hypersternal sulcus areolate, not broadened posteriorly. Mesopleuron finely punctate, without distinct rugosity. Metapleuron behind the transmetapleural sulcus very finely longitudinally rugose, shining. Metapostnotum and propodeum irregularly rugose.

Body black. Tarsi dark brown.

Male unknown.

2. *Eopinoecus samogiticus* Budrys, sp. n.

Holotypus: ♀, No Ap 3825 - Palanga Amber Museum.

Locus typicus: Palanga, Lithuania.

Stratum typicum : Upper Eocene.

The species epithet is derived from Samogitia, the old geographical name of western Lithuania.

Female (Fig. 23). Body length 5.3 mm. Very similar to the female of the preceding species. Separated by weakly, evenly convex upper frons (Fig. 27), slightly convex, not abrupt lower frons, finely and indistinctly areolate lateral margins of scutum. WH : LF = 1.50. IOD: LF = 0.73. LV : LF = 0.44. POD : OOD = 1.41. IMD : WH = 0.61. AC : LF = 0.25. Clypeal apex broader than in the preceding species, the distance between its lateral corners is 1.8 times smaller than the distance between the corner and the margin of eye, WCA : IOD = 0.23, WCA : POD = 0.71. 3FL : LSC = 0.63. COL : PRN = 0.58.

Body black. Tarsi reddish brown.

Male unknown.

5. *Succinoecus* Budrys, gen. n.

Type species *Succinoecus lituanicus* Budrys, sp. n.

Probably related to *Passaloecus*. Differing in serapated from postspiracular carina by smooth space upper part of episternal sulcus and absent hypersternal sulcus.

Head strongly transverse, face very broad. Frontal line evanescent, frontal foveae absent. Occipital carina entirely surrounding occiput, merging in the midventral line of head.

Malar spaces very narrow. Clypeal apex with broad medial notch delimited laterally by distinct teeth. Labrum triangular. Mandibles tridentate: hind lobe absent, but inner lobe bidentate apex. Palpal formula 6 + 4.

Pronotal collar weakly developed. Admedian ad adlateral lines appreciably impressed. Parapsidal sulci weakly marked, not longer than admedian lines. Scrobal sulcus finely areolate. Mesopleuron without coarse rugosity. Episternal sulcus dorsally separated from postspiracular carina by smooth space, reaching the fore margin of mesopleuron near the midventral line, areolate, with an enlarged areola on the place of the beginning of hypersternal sulcus; the latter is absent. Epicnemial and acetabular carinae absent. Fore and mid tibiae without visible spines; hind tibiae with a few short but distinct ones on their outer surface. Tarsomeri with weak spines apically and ventrally, without distinct tarsal rake. Forewings with two submarginal and two discoidal cells. Hindwings with 5 distal hamuli.

Gaster finely and densely punctate, weakly shining. Petiolus short, dorsally flat. The 6th tergum of female without pygidial plate.

Succinoecus lituanicus Budrys, sp. n.

Holotypus: ♀, No Ap 18453 - Palanga Amber Museum.

Locus typicus: Palanga, Lithuania.

Stratum typicum: Upper Eocene.

Female (Fig. 24). Body length 5.1 mm. Head (Fig. 28) strongly transverse, WH : LF= = 1.82. Face very broad, IOD : LF = 1.05. Vertex moderately developed, LV : LF = 0.53. POD : OOD = 2.0. IMD : WH = 0.65. Clypeus rather short, LCL : LF = 0.21. Clypeal apex with angulate lateral teeth, delimiting broad semicircular notch with a very small obtuse tooth in the middle. Distance between the lateral teeth of clypeal apex is 1.33 times smaller than the distance between the lateral tooth and the margin of eye; WCA : IOD = 0.30, WCA: POD = 0.88. Lateral parts of the lower margin of clypeus weakly angulately protruding. Frontal process rather high, acute. Mandibles with bidentate inner lobe. Flagellum short, 3FL : LSC = 0.70. Pronotal collar with short rounded angles, COL : PRN = 0.54.

The lower frons, clypeus and genae covered by compartively dense pilosity directed ventrad, without remarkable long setae. The upper frons, vertex, scutum, scutellum and metanotum finely, densely, evenly punctate, with very short straight, probably brownish pilosity. Metapostnotum and propodeum rather finely irregularly rugose. Episcrobal area of mesopleuron smooth, finely punctate; the surface below the scrobal sulcus more densely punctate, with a very fine obliquely strigose microsculpture. Metapleuron behind the transmetapleural sulcus nearly smooth, shining.

Body black. Mandibles reddish. Scape anteriorly yellow; flagellum ventrally pale reddish. Pronotal lobe and marking below the anterodorsal bulging of metapleuron yellowish. Coxae reddish. Femora dark, with yellow apex. Tibiae and tarsi yellow.

Male unknown.

6. *Eomimesa* Budrys, gen. n.

Type species *Eomimesa rasnitsyni* Budrys, sp. n.

Closely related to the recent genus *Mimumesa*. Distinguished by lacking ventral carina of hind coxae and weakly defined pygidial plate of female.

Head anteriorly damaged. Occipital carina entirely surrouding occiput and merging hypostomal carina near the midventral line of head. Malar spaces very narrow. Clypeus with thin, weakly notched apex. Labrum short, apically broadly rounded, bearing a row of setae. Antennae of usual structure, with weakly broadend apex, the last flagellomere only a little larger than the rest of ones. Palpal formula 6 + 4.

Pronotal collar with transverse carina. Admedian and adlateral lines weakly impressed. Parapsidal sulci noticeably impressed, smooth, hardly longer than admedian lines. Scrobal sulcus compratively narrow and shallow. Episcrobal area smooth, weakly convex. Episternal sulcus areolate, reaching the anterior margin of mesopleuron in appreciable distance from the midventral line. Epicnemial carina present; subepicnemial (subomaulus) and acetabular carinae absent. Propodeum with coarse rugosity forming large areolae. Forewing with 3 submarginal and 2 discoidal cells, the 2nd recurrent vein (2m=cu) beginning from the 2nd submarginal cell. Hindwings in the only specimen invisible. Coxae rounded, without developed carinae. Foretibiae without distinct spines. Midtibiae with short scattered spines laterally. The outer surface of hindtibia with several acute tubercles, without spinose basitibial plate. Fore tarsi with tarsal rake, combined of thin and rather short setae. Aroliae present.

The 1st segment of gaster with comparatively long and thick entire petiolus, dorsally bearing longitudinal keel. The 6th tergum of female with weakly defined smooth pygidial plate lacking large punctures.

Eomimesa rasnitsyni Budrys, sp. n.

Holotypus: ♀, No 964/647 - Palaeontological Institute (Moscow).

Locus typicus: Jantarnyj (Palmniken), Kaliningrad reg., Russia.

Stratum typicum: Upper Eocene.

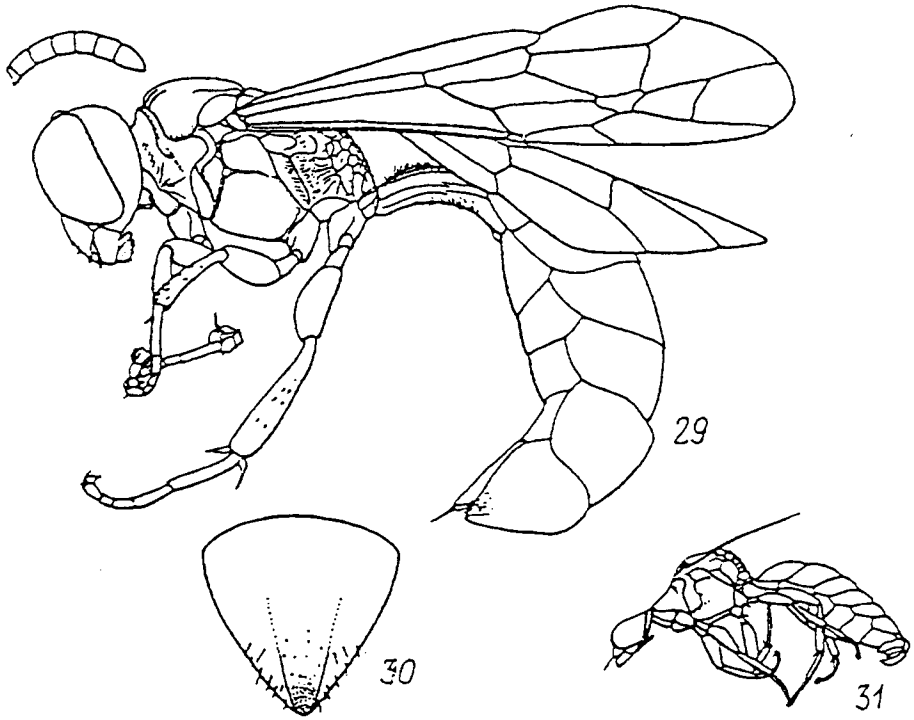
The species is dedicated to Dr. A. P. Rasnitsyn, a well-known Russian palaeoentomologist.

Female (Fig. 29). Body length ca. 8.0 mm. Head of holotype damaged. Vertex and genae rather weakly developed, vertex behind ocelli noticeably declined. Clypeal apex weakly semicircularly notched. Carina of pronotal collar with rounded lateral angles. The length of petiolus approximately equal to the length of the 1st tergum.

Vertex, genae, scutum, scutellum, metanotum, mesopleuron and gaster smooth, finely and densely punctate, with very short, inconspicuous pilosity. Sculpture of metapleuron in holotype invisible. Pygidial plate (Fig.30) defined by very weak carina, narrowly triangular, weakly shining, microsculptured, with several scattered fine punctures, without noticeable pilosity. Lateral parts of the 6th tergum with numerous straight hairs.

Colour of body unrecognizable.

Male unknown.



Figs. 29-31. *Eomimesa rasnitsyni* (29-30) and *Cretoecus spinicoxa* (31), general view (29, 31) and 6th tergum (30).

7. *Cretoecus* Budrys, gen. n.

Type species *Cretoecus* spinicoxa Budrys, sp. n.

In the inclusion, on the basis of which the genus is described, the fore part of head, dorsal part of thorax and wings are damaged. Since the features of them are lacking, the ascription of it to the subfamily *Pemphredoninae* is relative. It is supported by the presence of one mesotibial spur (in contrast to *Ampulicinae*, *Astatinae* and *Nyssoninae*) and by the upper part of episternal sulcus being approached to postspiracular carina (in contrast to *Larrinae* and *Crabroninae*). The genus is distinguished from *Pittoecus* Evans (6) by lack of hypersternal sulcus and tibial spinosity.

Head strongly damaged; eye is large, vertex weakly developed. Malar spaces very narrow. Occipital carina entirely surrouding the occiput, merging the midventral line of head near the hypostomal carina. Palpal formula 6 + 4.

Dorsal surface of thorax damaged. Scrobal sulcus weakly impressed, but distinct.

Postspiracular carina well developed, with approached posteriorly episternal sulcus, which is continuing from its lower part posteroventrad, then curving toward the anterior margin of mesopleuron and merging it near the midwentral line. Episternal sulcus with sparse transverse rugae, it is anteriorly distinctly, posteriorly weakly defined. Hypersternal sulcus absent. Coxae rounded, without distinct carinae; mid coxae of the type species with a long acute spine ventrally. Tibiae with very short spine on the apex. Tarsal rake absent. Aroliae present. Gaster slender, similar to that of the recent *Passaloecus*. The petiolar part of it damaged; petiolus, if present, very short. Gonostyli lobe-like, with triangular, narrowly rounded apex, similar in shape to that of the recent genera *Passaloecus* and *Diodontus*. Penial valves comparatively short, laterally flattened, volsellae small.

Cretoecus spinicoxa Budrys, sp. n.

Holotypus: ♂, No 3426/189 - Palaeontological Institute (Moscow).

Locus typicus: Taimyr peninsula, Nizhnyaya Agapa, lens 3.

Stratum typicum: Upper Cenomane.

Male (Fig. 31). Body length ca. 3.5 mm. Features of head and thorax are listed in the description of the genus. The surface of meso-and metopleuron smooth, with a weak microsculpture and very short, hardly visible pilosity. propodeum with areolate rugosity. Legs with very short pilosity. Midcoxae ventrally with a distinct acute spine. Tibiae without distinct spines. Ventral surface of the mid and hind basitarsi with several short setae, apex of each tarsomere bearing one short stout spine ventrally.

Gaster smooth, with fine granulose microsculpture, without visible pilosity.

Colour of thorax unrecognizable. Gaster apparently dark; femora laterally darker than medially; tibiae and tarsi pale.

Female unknown.

Analysis of the species diversity of the Baltic amber

Pemphredonini. The species diversity of the Baltic amber *Pemphredonini* fauna (species of the genera *Passaloecus*, *Eoxyloecus*, *Eopinoecus* and *Succinoecus*) was approximately estimated by using the index of polydominance $S_e = 1/C$ (Gibson, 1966, cited after [29]), where C is the unbiased estimator of Simpson's index of dominance, $C = \Sigma\, n_i(n_i - 1) / N(N - 1)$; n_i - number of specimens of *i*th species, N - number of specimens of the whole collection. The results of evaluation were compared with the species diversity data of some recent local faunas of related genera (representatives of *Passaloecus* and *Polemistus*), namely: Lithuanian (original data), Spanish [7-16, 21], Turkish [1], Western United States and Eastern United States [20, 26]. The following results were received (N - number of specimens, S - number of species):

Lithuania (N = 75, S = 7): $S_e = 4.179 \pm 0.011$.

Spain (N = 129, S = 5) : $S_e = 3.305 \pm 0.003$.

Turkey (N = 48, S = 6) : $S_e = 3.178 \pm 0.036$.

Western U.S. (N = 1150, S = 12) : $S_e = 4.3356 \pm 0.0014$.
Eastern U.S. (N = 1275, S = 6) : $S_e = 4.2653 \pm 0.0007$.
Baltic amber (N = 20, S = 11) : $S_e = 10.560 \pm 0.216$.

Obviously, the species diversity of *Passaloecus* and related genera of the Baltic amber fauna has been approximately 2.5-3 times greater than that of any recent local fauna.

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PEMPHREDONINAE POŠEIMIO ŽIEDVAPSVĖS (*HYMENOPTERA, SPHECIDAE*) IŠ BALTIJOS IR TAIMYRO GINTARO

E. Budrys

Reziumė

Ištyrus žiedvapsvių (Sphecidae) inkliuzų kolekcijas, saugomas Palangos gintaro muziejuje ir Paleontologijos institute (Maskva), buvo aptikta 14 Pemphredoninae pošeimiui priklausančių rūšių, iš jų 13 Baltijos gintare (viršutinis eocenas) ir 1 Taimyro gintare (viršutinė kreida). Visos jos, išskyrus 1 (*Passaloecus microceras* Sorg), aprašomos kaip naujos mokslui. Iš Baltijos gintare aptiktų rūšių 4 priklauso recentinei *Passaloecus* Shuckard genčiai, kitos - naujai aprašomoms gentims *Palanga* gen. n. (1 rūšis), *Eoxyloecus* gen. n. (4 rūšys), *Eopinoecus* gen. n. (2 rūšys), *Succinoecus* gen. n. (1 rūšis) ir *Eomimesa* gen. n. (1 rūšis). Taimyro gintare aptikta rūšis priklauso naujai genčiai *Cretoecus* gen. n.

Įvertinus polidominavimo indekso pagalba *Passaloecus* ir artimų genčių Baltijos gintaro faunos rūšinę įvairovę ir palyginus ją su 5 recentinių šios grupės žiedvapsvių lokalių faunų įvairove, nustatyta, kad gintaro fauna yra apytikriai 2.5-3 kartus įvairesnė už bet kurią iš recentinių lokalių faunų.

РОЮЩИЕ ОСЫ ПОДСЕМЕЙСТВА PEMPHREDONINAE (HYMENOPTERA, SPHECIDAE) ИЗ БАЛТИЙСКОГО И ТАЙМЫРСКОГО ЯНТАРЯ

Э. Будрис

Резюме

В результате исследования коллекций инклюзов роющих ос, хранящихся в Палангском музее янтаря (Паланга, Литва) и Палеонтологическом институте (Москва, Россия), обнаружено 14 видов подсемейства Pemphredoninae, из них 13 в балтийском янтаре (верхний эоцен) и 1 в Таймырском янтаре (верхний мел). Все они, за исключением одного (Passaloecus microceras Sorg), описываются как новые для науки. Среди видов из балтийского янтаря 4 относятся к рецентному роду Passaloecus Shuckard, остальные - к новым родам Palanga gen. n. (1 вид), Eoxyloecus gen. n. (4 вида), Eopinoecus gen. n. (2 вида), Succinoecus gen. n. (1 вид) и Eomimesa gen. n. (1 вид). Вид из таймырского янтаря относится к новому роду Cretoecus gen. n.

В результате оценки посредством индекса полидоминантности разнообразия фауны Passaloecus и близких к нему родов из балтийского янтаря и его сравнения с разнообразием 5 рецентных локальных фаун этих ос установлено, что фауна балтийского янтаря приблизительно в 2.5-3 раза разнообразнее любой из рецентных локальных фаун.