

Chalcids of the Subfamily Pteromalinae (Hymenoptera, Pteromalidae) as Parasitoids of the Bark Beetles (Coleoptera, Scolytidae) in the Fauna of Russia and Adjacent Territories

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Abstract—Eighteen species of ten genera of bark beetle parasitoids were found in the fauna of Russia and adjacent countries. Sixteen species of the parasitoids are recorded as new to the faunas of Belarus, Ukraine, Azerbaijan, Kazakhstan, Tajikistan, Uzbekistan, Kyrgyzstan, and regions of Russia. An annotated list of nineteen species of pteromalids, with data on the material examined, geographic distribution, and hosts is given. New hosts are reported for five species of the bark beetle ectoparasitoids. An original key to eighteen species and ten genera of Pteromalidae parasitizing bark beetles is provided.

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Pteromalidae (Hymenoptera, Chalcidoidea) is an economically important family regulating the abundance of many insects, including xylophagous ones. Representatives of the subfamily Pteromalinae, parasitizing on bark beetles of the genera *Scolytus* Geoffr., *Ips* DeGeer, *Pityogenes* Bedel, *Tomicus* Latr., *Dryocoetes* Eichh., *Hylesinus* F., *Hylurgops* Le Conte, *Orthotomicus* Ferrari, *Pityophthorus* Eichh., *Phloeotribus* Latr., *Polygraphus* Erich., *Pteleobius* Bedel, and *Carphoborus* Eichh occur in all the zoogeographical regions. A total number of such species exceeds 60 (in 23 genera), among which 19 species of 10 genera are recorded in the fauna of Russia and adjacent countries. The available keys to genera and species of Pteromalidae consider only the European part of Russia (Dzhanokmen, 1978), whereas large territories of the Caucasus, Urals, Siberia, and the Far East have been studied fragmentary (Arefin, 1974; Zharkov and Dzhanokmen, 1976; Ertevsian and Dzhanokmen, 1985; Kolomietz and Bogdanova, 1980).

In the present paper, the data on the pteromalids—bark-beetles parasitoids of the fauna of Russia and adjacent territories are summarized for the first time, a key to all the genera and species is compiled, and an annotated list of the species is given, including references to the fundamental papers on the taxonomy and biology of these ichneumon flies, lists of the mate-

rial examined, and the geographical distribution of the species.

MATERIALS AND METHODS

The study was based on examination of the corresponding large collections of the Zoological Institute, Russian Academy of Sciences (St. Petersburg), mainly including the material reared by S. Shorokhov, V.V. Filippenkova, and G.A. Zinov'eva in Moscow, Ul'yanovsk, and Samara provinces and Perm Territory, and also the material collected by me in Leningrad and Belgorod provinces and Krasnodar Territory in 2007–2009. My material was collected in sample areas with model trees infested with bark beetles, from stubs, timbers, felling waste, and wind-fallen trees. The material was collected by sweeping with an entomological net or directly from the tree bark by means of an exhaustor; parasitoids were also reared from palettes and logs in the laboratory.

The terminology of morphological structures follows that commonly used in chalcidology (Graham, 1969; Dzhanokmen, 1978). The length of ovipositor sheaths was measured on permanent slides. The geographical distribution of pteromalids is mainly cited after Zharkov and Dzhanokmen (1976), Yakaitis et al. (1980), Ertevsian and Dzhanokmen (1985), and Noyes (1998). The territory under study includes predominantly the countries of the former USSR. The

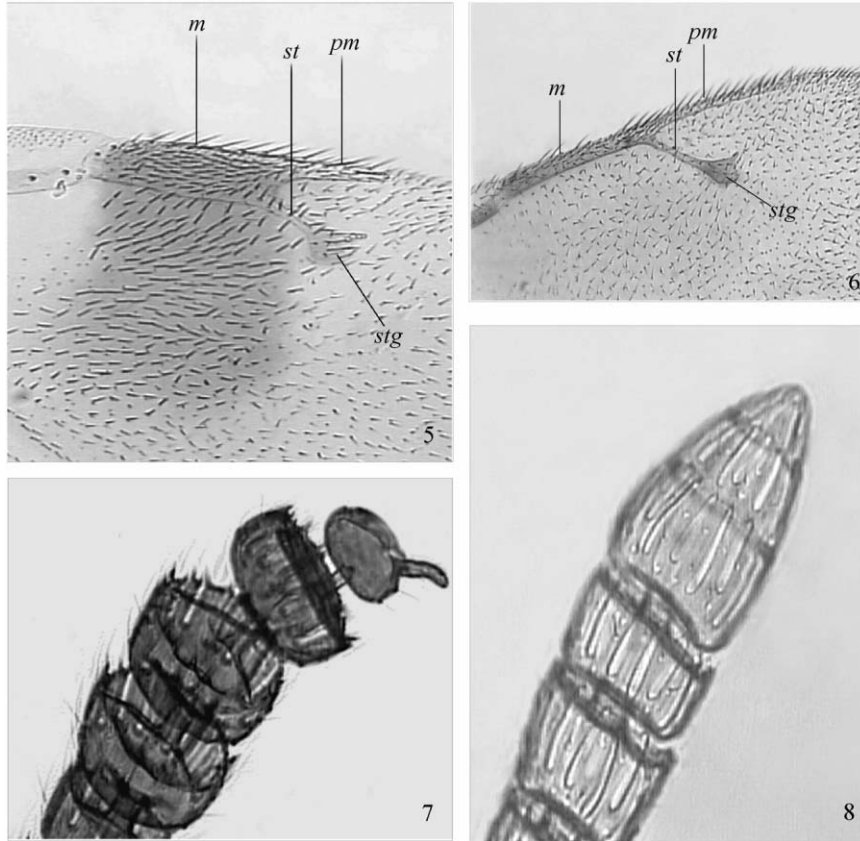


Figs. 1–4. Pteromalidae, head (1), coxa (2), and crenation of 2nd gonapophyses of ovipositor (3, 4): (1, 2) *Nikolskayana mirabilis* Bouček; (3) *Tomicobia pityophthori* (Bouček); (4) *Cheiropachus quadrum* (F.).

countries and administrative regions of Russia, for which a species is indicated for the first time, and also new hosts are marked with an asterisk (*).

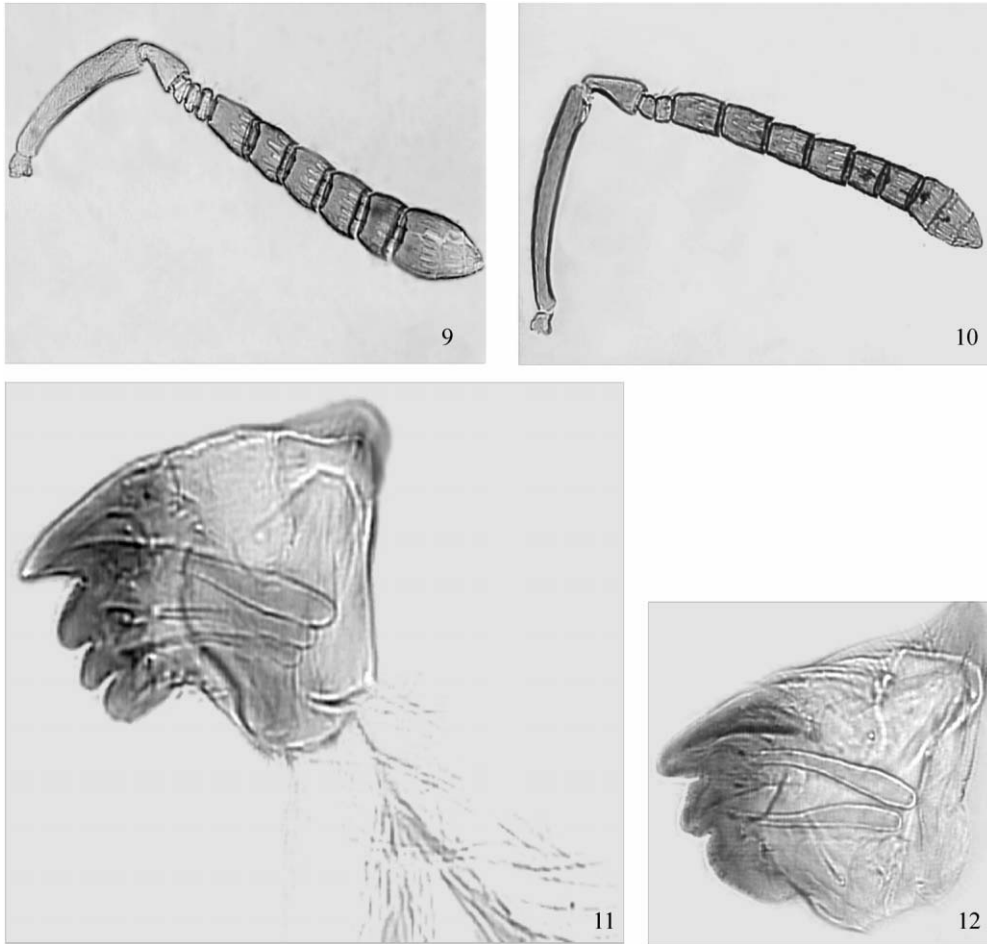
*A Key to Genera and Species of Pteromalidae,
Bark-beetle Parasitoids*

1. Face deeply and widely depressed, frons with median triangular tubercle narrowed from apex of facial depression to anterior ocellus. Sides of face with 1 pair of wide upper tubercles (below and outwards of antennal scrobes) and 1 pair of small tapered lower tubercles above bases of mandibles (Fig. 1) (*Nikolskayana* Bouček).—Hind coxa flattened and widened, as long as wide (Fig. 2). Flagellar segments wider than long. Body dark green; antennae, tibiae, and tarsi rufous 9. *N. mirabilis* Bouček.
 - Face not depressed, sides without tubercles; frons without median tubercle 2.
2. Crenation of 2nd gonapophyses undulate (Fig. 3). Parasitizing on adults (*Tomicobia* Ashmead) 3.
 - Crenation of 2nd gonapophyses distinctly dentate (Fig. 4). Parasitizing on larvae 5.
3. Antenna with 3 anelli. Propodeum with inconspicuous short carina at base.—Head 1.9–2.0 times as wide as long. 1st flagellar segment as long as wide, or wider than long (see also couplet 10) 19. *T. pityophthori* (Bouček).
 - Antenna with 2 anelli. Propodeum with entire longitudinal carina 4.
4. Width of head 2.2 times its length. Proximal flagellar segments as long as wide, distal ones wider than



Figs. 5–8. Pteromalidae, fragment of fore wing (5, 6): *m*, marginal vein; *pm*, postmarginal vein; *st*, stigmatal vein; *stg*, stigma; antennal clava (7, 8) [(5, 8) *Metacolus unifasciatus* Förster; (6) *Mesopolobus typographi* (Ruschka); (7) *Rhaphitelus maculatus* Walker].

- long (see also couplet 15) 18. *T. acuminati* Hedqvist.
- Width of head 2.3–2.4 times its length. Proximal flagellar segments elongate, distal ones as long as wide (see also couplet 15) 20. *T. seitneri* Ruschka.
- 5 (2). Length of marginal vein 3–4 times its width (Fig. 5) 6.
- Length of marginal vein 9–11 times its width (Fig. 6) 9.
- 6. Clava of antenna with baculiform sensillum at apex (Fig. 7). Marginal vein 0.59–0.67 times as long as postmarginal vein, as long as stigmatal vein. Propodeum with longitudinal carina and lateral rugae (*Rhaphitelus* Walker) 7.
- Clava of antenna without baculiform sensillum at apex (Fig. 8). Marginal vein 1.7–2.0 times as long as postmarginal vein, 2.5–2.6 times as long as stigmatal vein. Propodeum without longitudinal carina and lateral rugae (*Metacolus* Foerster) 8.
- 7. Length of marginal vein 3.8–4.0 times its width. Height of stigma much exceeding width of marginal vein. Antenna attached considerably above level of lower margin of eye 10. *Rh. ladenbergi* (Ratzeburg).
- Length of marginal vein 2.8–3.0 times its width. Height of stigma not exceeding width of marginal vein. Antenna attached slightly above level of lower margin of eye 11. *Rh. maculatus* Walker.
- 8(6). Fore wing with transverse dark stripe below marginal vein. Antennal pedicel not longer than 1st flagellar segment. Proximal flagellar segments longer than wide 8. *M. unifasciatus* Foerster.
- Fore wing without dark stripe below marginal vein. Antennal pedicel much longer than 1st flagellar segment. Proximal flagellar segments as long as wide, or slightly wider than long 7. *M. azureus* (Ratzeburg).
- 9(5). Antennal index 2-3-5-3 (Fig. 9) 10.
- Antennal index 2-2-6-3 (Fig. 10) 14.



Figs. 9–12. Pteromalidae, antenna (9, 10) and mandible (11, 12): (9, 12) *Roptrocerus mirus* (Walker); (10) *Metacolus unifasciatus* Förster; (11) *Mesopolobus typographi* (Ruschka).

10. Mesosoma 1.2–1.3 times as long as metasoma.

Apex of metasoma modified: its tergite IX situated perpendicularly to tergite VIII (lateral view). Ovipositor sheaths not projecting beyond apex of metasoma (*Tomicobia* Ashmead).—Width of head 1.9–2.0 times its length. 1st flagellar segment as long as wide, or wider than long. Hind tibia 3.0–3.2 times as long as ovipositor sheaths (see also couplet 3) 19. *T. pityophthori* (Bouček).

—Mesosoma 0.67–0.83 times as long as metasoma. Apex of metasoma not modified: its tergite IX situated in parallel to tergite VIII. Ovipositor sheaths projecting beyond apex of metasoma 11.

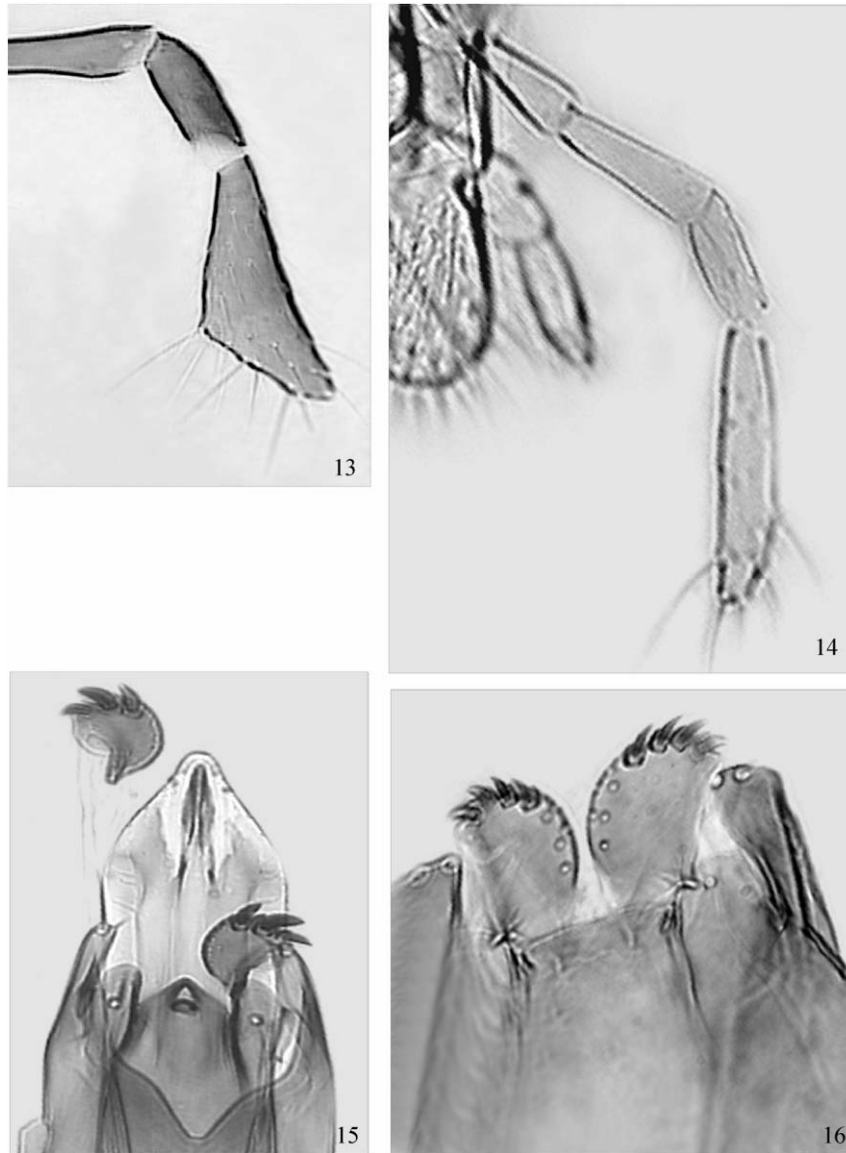
11. Projecting part of ovipositor sheaths approximately half as long as hind tibia. Left mandible with 3 teeth and 2 ducts, right mandible with 4 teeth and 3 ducts (Fig. 11) (*Mesopolobus* Westwood). Clypeus finely rugose, without hairs.—Fore wing without dark

spots. Scutellum with fine reticulation 6. *M. typographi* (Ruschka).

—Projecting part of ovipositor sheaths 1.2–1.5 times as long as hind tibia, mandibles with 3 teeth and 2 ducts (Fig. 12). Clypeus distinctly punctate and with hairs (*Roptrocerus* Ratzeburg) 12.

12. Postmarginal vein of fore wing twice as long as stigmal vein. Marginal vein 2.3–2.7 times as long as stigmal vein. Area between postmarginal and stigmal veins entirely covered with hairs. Speculum of fore wing reaching middle of marginal vein.—Ovipositor sheaths with setae arising at angle of 20–25°. Lower margin of clypeus curved 16. *R. mirus* (Walker).

—Postmarginal vein of fore wing no more than 1.5 times as long as stigmal vein. Marginal vein 1.7–1.9 times as long as stigmal vein. Area between postmarginal and stigmal veins only partly covered



Figs. 13–16. Pteromalidae, maxillary palpus (13, 14) and digiti of male genitalia (15, 16): (13, 15) *Cheiropachus quadrum* (Fabricius); (14, 16) *Dinotiscus eupterus* (Walker).

- with hairs. Speculum of fore wing only reaching base of stigmal vein 13.
- 13. Postmarginal vein of fore wing 1.5–1.6 times as long as stigmal vein. Pedicel not longer than 1st flagellar segment. 3rd anellus of flagellum longer than 1st and 2nd anelli. Lower margin of clypeus convex 17. *R. xylophagorum* (Ratzeburg).
- Postmarginal vein of fore wing subequal in length to stigmal vein. Pedicel much longer than 1st flagellar segment. Anelli of flagellum equal in length. Lower margin of clypeus straight 15. *R. brevicornis* Thomson.
- 14(9). Mesosoma 1.2–1.3 times as long as metasoma. Apex of metasoma modified: its tergite IX situated perpendicularly to tergite VIII (lateral view). Ovipositor sheaths not projecting beyond apex of metasoma (*Tomicobia* Ashmead) 15.
- Mesosoma 0.67–0.77 times as long as metasoma. Apex of metasoma not modified: its tergite IX situated in parallel to tergite VIII. Ovipositor sheaths projecting beyond apex of metasoma 16.
- 15. Width of head 2.2 times its length. Proximal flagellar segments as long as wide, distal ones wider

- than long (see also couplet 4) 18. *T. acuminati* Hedqvist.
- Width of head 2.3–2.4 times its length. Proximal flagellar segments longer than wide, distal ones as long as wide (see also couplet 4) 20. *T. seitneri* Ruschka.
- 16(14). Hind tibia with 2 spurs. Ultimate segment of maxillary palpus subtriangular (Fig. 13) 17.
- Hind tibia with 1 spur. Ultimate segment of maxillary palpus lanceolate (Fig. 14) 18.
17. Width of postspiracular sclerite subequal to its height. Fore wing with 2 dark spots below stigma and postmarginal vein. Length of stigma less than its width. Digitus of male genitalia with 3 spines (Fig. 15) (*Cheiopachus* Westwood).—Lower margin of clypeus shallowly emarginate. Hind tibia with row of short spiniform setae on underside 2. *Ch. quadrum* (Fabricius).
- Width of postspiracular sclerite 0.62–0.71 times its height. Fore wing with 1 dark spot around stigma. Length of stigma subequal to its width. Digitus of male genitalia usually with 4 spines (as in Fig. 16) (*Acrocormus* Foerster).—All flagellar segments longer than wide. Body blue-green. Scape on underside and legs entirely rufous; femora and tibiae darkened 1. *A. semifasciatus* Thomson.
- 18(16). Pronotal carina distinct; its apex sharp, with keel; mandibles with 3 teeth and 2 ducts (as in Fig. 12). Digitus of male genitalia with 4 spines (Fig. 16) (*Dinotiscus* Ghesquière) 19.
- Pronotal carina weak; its upper edging rounded, without keel. Left mandible with 3 teeth and 2 ducts, right mandible with 4 teeth and 3 ducts. Digitus of male genitalia with 3 spines (as in Fig. 12) (*Rhopalicus* Foerster) 21.
19. Lower margin of clypeus without teeth. Fore wing without spots.—Marginal vein 1.7–1.8 times as long as stigmal vein 5. *D. eupterus* (Walker).
- Lower margin of clypeus with 2 teeth. Fore wing with dark spot around stigma of stigmal vein 20.
20. Length of stigma of stigmal vein exceeding its height. Basal vein with 6 hairs. Basal cell with single hairs in distal half 3. *D. aponius* (Walker).
- Length of stigma of stigmal vein less than its height. Basal vein without hairs or with 1–5 hairs. Basal cell entirely glabrous 4. *D. colon* (Linnaeus).

- 21(18). Lower surface of costal cell of fore wing with 2–4 rows of hairs in proximal half. Basal cell with several hairs distally. Abdomen 1.7 times as long as thorax and head combined. Fore wing with dark spot around stigma 14. *Rh. tutela* (Walker).
- Lower surface of costal cell of fore wing with 1 row of hairs in proximal half. Basal cell entirely glabrous. Abdomen not longer than thorax and head combined. Fore wing without spot; when dark spot present, it situated below parastigma 20.
22. Fore wing with dark spot below stigma. Stigma wider than long, or as wide as long. Antennal flagellum filiform. Scutellum (lateral view) weakly convex 12. *Rh. guttatus* (Ratzeburg).
- Fore wing without spot. Stigma longer than wide. Antennal flagellum clavate. Scutellum flat (lateral view) 13. *Rh. quadratus* (Ratzeburg).

An Annotated List of Species

1. *Acrocormus semifasciatus* Thomson, 1878

References. Thomson, 1878 : 34; Bouček, 1957 : 80; Hedqvist, 1963 : 107; Graham, 1969 : 416; Michalski, 1976 : 7; Dzhanokmen, 1978 : 222; 1980 : 85; Ertevsian and Dzhanokmen, 1985 : 673; Noyes, 1998; Dzhanokmen, 2005 : 48.

Material. Russia. *Belgorod Prov.: Baitsury, from *Pteleobius vittatus*, 14.VIII.2008 (Tselikh), 7 ♀, 5 ♂. *Krasnoyarsk Terr.: “Stolby” Nature Reserve, 17.VI.1950, 2 ♀. Moldova. Kishinev, 25.VII.1958 (Talitskii), 1 ♀. Poland. “Bielinek (i. Štětina) Polonia,” from *Scolytus pygmaeus*, 5.VI.1960 (Michalski), 1 ♂.

Biology. A larval ectoparasitoid of the bark beetles *Hylesinus toranio* Danth. [= *oleiperda* (F.)], *Pteleobius vittatus* (F.), *Scolytus ensifer* Eichh., *S. intricatus* (Quer.), and *S. pygmaeus* (F.).

Distribution. Russia (European part, Eastern Siberia); Great Britain, Sweden, Poland, Czechia, Slovakia, Moldova, Armenia, Kazakhstan.

2. *Cheiopachus quadrum* (Fabricius, 1787) (Fig. 17)

References. Fabricius, 1787 : 270; Ratzeburg, 1844 : 190; Foerster, 1856 : 70; Thomson, 1878 : 33; Hedqvist, 1963 : 103; Peck, 1963 : 747; Graham, 1969 : 417; Williams and Brown, 1969 : 1384; Zharkov and Dzhanokmen, 1976 : 186; Dzhanokmen, 1978 : 185; 1980 : 85; Ertevsian and Dzhanokmen,



Figs. 17, 18. *Cheiropachus quadrum* (Fabricius) (17) and *Dinotiscus aponius* (Walker) (18), general view, laterally.

1985 : 674; Vaskov, 1986 : 33; Yang, 1989 : 99; Noyes, 1998; Lozano et al., 2000 : 791; Dzhankmen, 2005 : 49.

Material. Russia. *Karelia*: “Petrozavodsk Distr.,” from *Ips typographus*, 3.VIII.1950 (Shiperovich), 3 ♀, 2 ♂; **Kostroma Prov.*: Kostroma, 19.VIII.1933 and 9.VIII.1934 (Gussakovskij), 3 ♀; *Moscow Prov.*: from *Hylesinus fraxini*, 29.VI.1924 (Shorokhov), 3 ♀, 2 ♂;

from *Scolytus pygmaeus*, 28.III.1961 (Maslov), 7 ♀, 3 ♂; **Orel Prov.*: Spasskoe, 16.VI.1965 (Nikolaeva), 1 ♀, 2 ♂; *Voronezh Prov.*: from *Hylesinus fraxini*, 1951 (Shumakov), 2 ♀; **Belgorod Prov.*: Borisovka, from *Scolytus leavis*, 14.VIII.2008 (Tselikh), 16 ♀, 7 ♂; Baitsury, from *Pteleobius vittatus*, 14.VIII.2008 (Tselikh), 11 ♀, 9 ♂; *Rostov Prov.*: Taganrog, 25.VIII.1922, 1 ♂; *Samara Prov.*: Karagach, 15.IV.1952 (Fatakhov), 4 ♀, 3 ♂; **Volgograd Prov.*:

Tinguta, from *Scolytus pygmaeus*, IX.1957 (Alekseev), 3 ♀, 2 ♂; *Krasnodar Terr.: Lazarevskoe, from *Carphoborus perrisi*, 28.VII.2009 (Tselikh), 42 ♀, 13 ♂; Karachai-Cherkess: Teberda, 6.IV.1939 (Lomakin), 1 ♀, 1 ♂; Perm Terr.: Kungur, from *Scolytus leavis*, 25.VI.1956 (Zinov'ev), 1 ♀, 2 ♂; *Khabarovsk Terr.: Khabarovsk, *Hylesinus* sp., 11.VII.2009 (Yurchenko), 23 ♀, 11 ♂; *Primorskii Terr.: Partizanskii Distr., 15.VI.1968 (Krivolutskaya), 2 ♀, 3 ♂; Vladivostok, Morskoe cemetery, 24.VIII.1988 (Belokobylskij), 2 ♂; Spassk-Dalnii, 3.VII.2001 (Belokobylskij), 1 ♀. Moldova. Kishinev, from *Scolytus rugulosus*, 26.VII.1957, 23.VI and 18.VIII.1958, 20.III.1960 (Talitskii), 4 ♀, 2 ♂; Leovo, 1966 (Kuslitskii), 9 ♀, 10 ♂. Ukraine. Donetsk Prov.: Veliko-Anadol, 10.V.1906 and 28.V.1908, 15 ♀, 2 ♂; *The Crimea: Yalta, from *Hylesinus fraxini*, 2 and 24.V.1925 (Shorokhov), 20 ♀, 7 ♂; Kerchenskii Nature Reserve, 30.IV.1901 (Yatsentkovskii), 1 ♂. Georgia. Kurtskhana, from *Hylesinus fraxini*, 27.VII.1955, 1 ♂. *Azerbaijan. Agdash, 3.VI.1912 (Babadzhanidi), 5 ♀. Kazakhstan. West Kazakhstan Prov.: Dzhanibek, from *Scolytus kirschi*, X.1966 (Lindeman), 3 ♀, 3 ♂; "Semirech'e," 25.V.1907 (Jacobson), 1 ♂. *Uzbekistan. "Zailiiskii Distr.," 5.VI.1947 (Makhnovskii), 9 ♀. *Turkmenistan. Akar-Cheshme, 22.V.1958 (Znamenskii), 9 ♀, 5 ♂. *Kirghizia. Osh Prov.: 10.VI.1964 (Romanenko), 10 ♀, 7 ♂. *Tajikistan. Gandzhina, 29.IX.1966 and 12.V.1967 (Kulinich), 18 ♀, 7 ♂.

Biology. A larval ectoparasitoid of the bark beetles *Tomicus minor* (Hart.), *T. piniperda* (L.), **Carphoborus perrisi* (Chap.), *Dryocoetes aufographus* (Ratz.), *Hylesinus varius* [= *fraxini* (Panz.)], *H. toranio* (Danth.), *H. orni* (Fuchs.), *Ips sexdentatus* (Boern.) *I. typographus* (L.), *Pityogenes chalcographus* (L.), **Pteleobius vittatus* (F.), *Scolytus amygdali* (Ger.), *S. carpini* (Ratz.), *S. ensifer* Eichh., *S. intricatus* (Quer.), *S. japonicus* Chap., *S. kirschi* Skal., *S. leavis* (Chap.), *S. mali* (Bech.), *S. multistriatus* (Marsh.), *S. pygmaeus* (F.), *S. rugulosus* (Müll.), *S. schevyrevi* Sem., and *S. scolytus* (F.).

Distribution. Russia (European part, North Caucasus, southern Far East); Great Britain, France, Spain, Norway, Sweden, Germany, Switzerland, Italy, Poland, Czechia, former Yugoslavia, Ukraine, Moldova, Georgia, Armenia, *Azerbaijan, Turkey, Kazakhstan, *Uzbekistan, *Turkmenistan, *Tajikistan, *Kirghizia, China (Tsinghai, Gansu, Shandong, Heilongjiang), North Africa, Egypt, Israel, Pakistan, India, Canada, USA, Argentina.

3. *Dinotiscus aponius* (Walker, 1848) (Fig. 18)

References. Walker, 1848 : 127; Thomson, 1878 : 39; Bouček, 1957 : 80; Hedqvist, 1963 : 85; Graham, 1969 : 411; Pettersen, 1976 : 57; Zharkov and Dzhanokmen, 1976 : 186; Dzhanokmen, 1978 : 222; Yakaitis et al., 1980 : 48; Ertevtsian and Dzhanokmen, 1985 : 675; Askew, 1992 : 83; Noyes, 1998; Doganlar, 2007 : 47.

Material. Russia. *Leningrad Prov.: Strugi, 20.VI.1918 (Jacobson), 1 ♀; Lisino, from *Ips typographus*, 12.VII.2008 (Tselikh), 4 ♀, 3 ♂; Kostroma Prov.: Kostroma, 19.VIII.1933 (Gussakovskij) 1 ♀; Yaroslavl Prov.: Berditsyno, 1.IX.1890 (Jakovlev), 1 ♀, 1 ♂; Moscow Prov.: from *Scolytus mali*, 26.V. 6 and 29.VI.1924 (Shorokhov), 11 ♀, 1 ♂; *Ryazan Prov.: Gremyachka Vill., 15.VII.1893 (Semenov), 1 ♀; Voronezh Prov.: Ternovka, Savalskoe forestry, from *Scolytus ratzeburgi*, 9.VII.1952 and 7.VI.1954 (Stark), 6 ♀, 14 ♂; *Belgorod Prov.: Baitsury, from *Pteleobius vittatus*, 14.VIII.2008 (Tselikh), 3 ♀, 5 ♂; *Karachai-Cherkess: Teberda, Teberdinskii Nature Reserve, from *Hylesinus fraxini*, 9.VIII.1938 (Zagaikevich), 1 ♀, 1 ♂; same locality, 23.IV.1939 (Lomakin), 1 ♀; *Perm Terr.: "Kynovskoe forestry," 27.VII.1953 (Zinov'ev), 1 ♀; Kungur, "Predural'e forestry," from *Scolytus leavis*, 12.VI.1956 (Zinov'ev), 4 ♀, 1 ♂; *Primorskii Terr.: Spassk-Dalnii, 26.IX.1988 (Belokobylskij), 1 ♀; Lazovskii Nature Reserve, 3.VI.2001 (Belokobylskij), 1 ♀; Shkotovskii Distr., Maikhinskii forestry, 25.IV.1930 (Shabliovskii), 7 ♀, 9 ♂. *Ukraine. The Crimea: Yalta, from *Hylesinus fraxini*, 2.V.1925 (Shorokhov), 2 ♀. *Kazakhstan. East Kazakhstan Prov.: Kalbinskii Mt. Range, 6.VI.1978 (Dzhanokmen), 1 ♀. Hungary. "Hungaria bor. Marmoros" (Brenske), 6 ♀, 2 ♂.

Biology. A larval ectoparasitoid of the bark beetles *Tomicus piniperda* (L.), *Hylesinus varius* (Panz.), *Ips typographus* (L.), *Pityogenes chalcographus* (L.), **Pteleobius vittatus* (F.), *Scolytus ensifer* Eichh., *S. leavis* (Chap.), *S. mali* (Bech.), *S. multistriatus* Marsh., *S. ratzeburgi* Jans., *S. rugulosus* (Müll.), and *S. scolytus* (F.).

Distribution. Russia (European part, North Caucasus, southern Far East); Great Britain, Norway, Sweden, Latvia, *Ukraine, Georgia, *East Kazakhstan, China (Tsinghai, Heilongjiang), Japan.



Figs. 19, 20. *Dinotiscus colon* (Linnaeus) (19) and *Metacolus unifasciatus* Förster (20), general view, laterally.

4. *Dinotiscus colon* (Linnaeus, 1758) (Fig. 19)

References. Linnaeus, 1758 : 571; Thomson, 1878 : 40; Bouček, 1957 : 80; Hedqvist, 1963 : 84; Graham, 1969 : 411; Filippenkova, 1971 : 764; Dzhankmen, 1978 : 222; Kolomietz and Bogdanova, 1980 : 219; Yakaitis et al., 1980 : 48; Askew, 1992 : 83; Noyes, 1998; Doganlar, 2007 : 47.

Material. Russia. *Karelia:* "Petrozavodsk Distr.," 9.VIII.1950 (Shipirovich), 1 ♀; *Moscow Prov.:* Lo-

sinyi Island, 29.VII.1924 (Shorokhov), 6 ♀, 5 ♂; **Kirov Prov.:* Kirov, 12.VII.1946 (Telov), 1 ♀; **Bryansk Prov.:* environs of Bryansk, 18.VII.1967 (Kharitonova), 4 ♀; *Ul'yanovsk Prov.:* Dimitrovgrad (Melekess), from *Ips acuminatus* and *Blastophagus minor*, 10.VIII.1968 (Filippenkova), 1 ♀; *Samara Prov.:* Zaglyadovka, from *Ips acuminatus*, 16.VIII.1968 (Filippenkova), 2 ♀, 2 ♂; *Karachai-Cherkess:* Teberda, from *Ips acuminatus*, 11.V.1939

(Lomakin), 2 ♀, 1 ♂; *Bashkortostan*: “Kizlyar-Bergan Locality, Irgizly,” 16.VI.1899 (Jacobson, Schmidt), 4 ♀; *Novosibirsk Prov.*: Kourak, from *Blastophagus minor*, 11.VII.1964 (Tarasova), **Krasnoyarsk Terr.*: “Stolby” Nature Reserve, from *Ips typographus*, 7.VII.1950, 7 ♀, 1 ♂. **Ukraine*. *The Crimea*: Alushta, Crimean Nature Reserve, 28.VII.1928 and 25.VII.1934, 3 ♀. *Georgia*. Borzhomi, from *Ips acuminatus*, 3.VII.1957, 1 ♂.

Biology. A larval ectoparasitoid of the bark beetles *Tomicus minor* (Hart.), *T. piniperda* (L.), *Hylesinus imitator* (Reitt.), *H. toranio* (F.), *Ips acuminatus* (Gyll.), *I. sexdentatus* (Boern.), *I. typographus* (L.), *Orthotomicus proximus* (Eichh.), *Scolytus intricatus* (Quer.), *S. rugulosus* (Müll.), and *S. scolytus* (F.).

Distribution. Russia (European part, North Caucasus, Siberia); Great Britain, France, Spain, Norway, Sweden, Finland, Germany, Italy, Poland, Czechia, Slovakia, Latvia, Romania, Bulgaria, Belarus, *Ukraine, Georgia, Turkmenistan, China (Heilongjiang), North Africa, Canada, USA, Argentina.

5. *Dinotiscus eupterus* (Walker, 1836)

References. Walker, 1836 : 482; Ratzeburg, 1848 : 204; Thomson, 1878 : 40; Hedqvist, 1963 : 84; Graham, 1969 : 411; Pettersen, 1976 : 49; Zharkov and Dzhankmen, 1976 : 186; Dzhankmen, 1978 : 222; 1980 : 85; Kolomietz and Bogdanova, 1980 : 220; Yakaitis et al., 1980 : 48; Ertevtsian and Dzhankmen, 1985 : 675; Noyes, 1998; Hougardy and Gregoire, 2001 : 163; Dzhankmen, 2005 : 51; Doganlar, 2007 : 48.

Material. *Russia*. *Karelia*: “Petrozavodsk Distr.,” from *Ips typographus*, 13.III.1951 (Shiperovich), 2 ♀, 1 ♂; **Leningrad Prov.*: Lisino, from *Polygraphus poligraphus*, 12.VII.2008 (Tselikh), 14 ♀, 13 ♂; *Yaroslavl Prov.*: Berditsino, 4.VIII.1989 (Kokueva), 1 ♀; *Moscow Prov.*: from *Polygraphus poligraphus*, 29.VI.1924 (Shorokhov), 4 ♂; Losinyi Island, 29.VII.1924 (Shorokhov), 1 ♀, 1 ♂; Razumovskoe, from *Polygraphus poligraphus*, 12.VII.1924 (Shorokhov), 1 ♀; Moscow, 28.VI.1927 (Shorokhov), 1 ♀; *Perm Terr.*: Kungur, 20.VI.1955 (Zinov’ev), 4 ♀, 1 ♂; *Novosibirsk Prov.*: Kourak, 2.VII.1974 (Tarasova), 1 ♀, 1 ♂; **Krasnoyarsk Terr.*: Nature Reserve “Stolby,” from *Pityogenes chalcographus*, 17.VI.1950, 8 ♀, 5 ♂; *Khabarovsk Terr.*: Vyazemskoe, from *Ips acuminatus*, 31.VII.1965, 1 ♀, 1 ♂; **Sakhalin Prov.*: Kuril Islands, Shikotan Island, 15.VI.1946 (Konakov),

1 ♀. *Belarus*. *Minsk Prov.*: Borisov Distr., 16.VII.1929, 4 ♀, 6 ♂; Borisov (Barysau), 27.VII.1929 (Zakreiski), 1 ♀. *Ukraine*. *Ivano-Frankovsk Prov.*: Vorokhta, 16.VIII.1952 (Zagaikevich), 4 ♀; *the Crimea*: Alushta, Crimean Nature Reserve, 3.IX.1932 (Bukovskii), 6 ♀, 5 ♂. *Georgia*. Kurtskhana, 20.VIII.1955, 2 ♀. *Armenia*. Dilizhan, 19.VII.1950, 2 ♀, 1 ♂. *Kazakhstan*. *Akmolinskii Prov.*: Kokshetau, 10.VII.1932 (Popov), 1 ♀.

Biology. A larval ectoparasitoid of the bark beetles *Dryocoetes autographus* Ratz., *D. baicalicus* (Reitt.), *Cryphalus abietis* (Ratz.), *C. orientalis* (Ratz.), *Ips acuminatus* (Gyll.), *I. typographus* (L.), *Orthotomicus proximus* (Eichh.), *Phthorophloeus spinulosus* Rey, *Pityophthorus lichtensteini* Ratz., *Pityogenes bidentatus* (Hbst.), *P. chalcographus* (L.), *P. quadridens* Hart., **Polygraphus poligraphus* (L.), **Pteleobius vittatus* (F.), *Scolytus intricatus* (Quer.), *S. morawitzi* (Sem.), and *S. scolytus* (F.).

Distribution. Russia (European part, Caucasus, Siberia); Great Britain, Norway, Sweden, Germany, Latvia, Belarus, Ukraine, Georgia, Armenia, Kazakhstan, China (Tsinghai, Heilongjiang), Japan, New Zealand.

6. *Mesopolobus typographi* (Ruschka, 1924)

References. Ruschka, 1924 : 13; Graham, 1969 : 673; Pettersen, 1976 : 49; Dzhankmen, 1978 : 191; Noyes, 1998.

Material. *Russia*. *Karelia*: from *Pityogenes chalcographus*, 17.XII.1951 (Shiperovich), 2 ♂; **Leningrad Prov.*: from *Ips typographus*, 31.VIII.1947 (Shiperovich), 2 ♀, 1 ♂; Lisino, from *Polygraphus poligraphus*, 12.VII.2008 (Tselikh), 3 ♀; **Perm Terr.*: Kungur, 26.V.1955 (Zinov’ev), 3 ♂; *Tuva*: Kyzyl, from *Ips typographus*, 7.VIII.1958 (Kolomietz), 1 ♂; Khendergei, 16 II, 1965 (Tarasova), 3 ♀, 1 ♂.

Biology. This species is reliably known to be a hyperparasitoid of *Tomicobia seitneri* Ruschka (Pteromalidae), can also be reared from the pteromalids infesting the bark beetles *Tomicus piniperda* (L possible and.), *Ips acuminatus* (Gyll.), *I. typographus* (L.), *Pityogenes chalcographus* (L.), *P. quadridens* (Hart.), and *Polygraphus poligraphus* (L.).

Distribution. Russia (European part, Eastern Siberia); Great Britain, Norway, Sweden, Germany, Poland, Czechia, Slovakia, Afghanistan.

7. *Metacolus azureus* (Ratzeburg, 1844)

References. Ratzeburg, 1844 : 203; Hedqvist, 1963 : 97; Graham, 1969 : 419; Zharkov and Dzhankokmen, 1976 : 187; Dzhankokmen, 1978 : 148; 1980 : 86; Yakaitis et al., 1980 : 48, Ertevtsian and Dzhankokmen, 1985 : 676; Mendel, 1986 : 115; Askew, 1992 : 81; Noyes, 1998; Dzhankokmen, 2005 : 53.

Material. Russia. **Moscow Prov.*: Razumovskoe, 14.III.1925 (Shorokhov), 1 ♀; **Krasnodar Terr.*: Lazarevskoe, from *Carphoborus perrisi*, 28.VII.2009 (Tselikh), 16 ♀, 7 ♂; *Karachai-Cherkess*: Teberda, 26.IV.1936 (Lomakin), 1 ♀. Czechia. Smečno, from *Pteleobius vittatus*, IX.1944 (Pfeffer), 2 ♀.

Biology. A larval ectoparasitoid of the bark beetles *Tomicus minor* (Hart.), *T. piniperda* (L.), **Carphoborus perrisi* (Chap.), *Orthotomicus erosus* (Woll.), *Pityogenes bidentatus* (Hbst.), *P. calcaratus* (Eichh.), *P. quadridens* (Hart.), and *Pteleobius vittatus* (F.).

Distribution. Russia (European part, North Caucasus); Great Britain, Spain, Norway, Sweden, Finland, Germany, Poland, Czechia, Slovakia, former Yugoslavia, Latvia, Ukraine, Israel, Kazakhstan, Afghanistan.

8. *Metacolus unifasciatus* Foerster, 1856 (Fig. 20)

References. Foerster, 1856 : 32; Thomson, 1878 : 36; Bouček, 1957 : 81; Hedqvist, 1963 : 97; Peck, 1963 : 655; Graham, 1969 : 419; Filippenkova, 1971 : 764; Zharkov and Dzhankokmen, 1976 : 187; Dzhankokmen, 1978 : 148; Kolomietz and Bogdanova, 1980 : 221; Yakaitis et al., 1980 : 49; Mendel and Halperin, 1981 : 377; Ertevtsian and Dzhankokmen, 1985 : 676; Mendel, 1986 : 391; 1988 : 294; Noyes, 1998; Dzhankokmen, 2005 : 53.

Material. Russia. *Karelia*: "Petrozavodsk Distr.," from *Ips acuminatus*, 9.VIII.1950 and from *Orthotomicus proximus*, 29.III.1951 (Shipervich), 3 ♀, 2 ♂; *Leningrad Prov.*: Gatchina, 2.VII.1922 (Barovskii), 1 ♀; **Moscow Prov.*: Losinyi Island, from *Blastophagus minor*, 14.V.1925 (Shorokhov), 1 ♀; *Bryansk Prov.*: Bryansk, from *Ips typographus*, 14.VII.1967 (Kharitonova), 4 ♀; *Samara Prov.*: Robin, from *Ips acuminatus*, 16.VIII.1968 (Filippenkova), 2 ♂; Zaglyadovka, from *Ips acuminatus*, 16.VIII.1968 (Filippenkova), 5 ♂; Malaya Malyshevka, from *Ips acuminatus*, 18.VIII.1968 (Filippenkova), 1 ♂; **Krasnodar Terr.*: Sochi, 11.IX.1948 (Sutures), 1 ♀, 1 ♂; *Karachai-Cherkess*: Teberda, from *Ips acuminatus*,

15.IV.1939 (Lomakin), 1 ♂; **Bashkortostan*: Usen-Ivanovskoe, 24.VII.1904 (Somon), 1 ♂; *Novosibirsk Prov.*: Kourak, from *Blastophagus minor* and *B. piniperda*, 11.VII.1964 (Tarasova), 1 ♂; *Khabarovsk Terr.*: from *Ips acuminatus*, 31.VII.1965 (Yurchenko), 1 ♂; **Primorskii Terr.*: Shkotovskii Distr., from *Ips acuminatus*, 12.VII.1971 (Arefin), 1 ♀, 2 ♂. Ukraine. *The Crimea*: Alushta, 14.VII.1955 (Rudkov), 2 ♀, 4 ♂. Armenia. Dilizhan, from *Pityophthorus glabratus*, 17.VI.1950 (Mimoian), 2 ♀, 2 ♂. *Uzbekistan. "Zailiiskii Distr., Zailiiskoe forestry," 5.VI.1947 (Makhnovskii), 1 ♂.

Biology. A larval ectoparasitoid of the bark beetles *Tomicus minor* (Hart.), *T. piniperda* (L.), *Dryocoetes autographus* (Ratz.), *Hylurgops palliatus* (Gyll.), *Ips acuminatus* (Gyll.), *I. sexdentatus* (Boern.), *I. typographus* (L.), *Orthotomicus erosus* (Woll.), *O. proximus* (Eichh.), *Pityophthorus glabratus* Eich., *P. lichtensteinii* Ratz., *Pityogenes bidentatus* (Hbst.), *P. chalcographus* (L.), *P. quadridens* (Hart.), and *Scolytus morawitzi* (Sem.).

Distribution. Russia (European part, North Caucasus, Western Siberia, southern Far East); Great Britain, Belgium, France, Spain, Norway, Sweden, Finland, Germany, Italy, Poland, Czechia, Slovakia, Croatia, Greece, Latvia, Ukraine, Georgia, Armenia, Israel, Kazakhstan, *Uzbekistan, China (Heilongjiang), North Africa, India.

9. *Nikolskayana mirabilis* Bouček, 1965

References. Bouček, 1965 : 378; Graham, 1969 : 429; Dzhankokmen, 1978 : 153; Noyes, 1998.

Material. Turkmenistan. Serakhsii Distr., from *Carphoborus perrisi*, VI.1958 (Znamenskii), 1 ♀, 2 ♂. Tajikistan. Gandzhina, 29.VIII.1966, 1.X.1966 and 7.VI.1967 (Kulinich), 4 ♀, 2 ♂.

Biology. An ectoparasitoid of larvae of *Carphoborus perrisi* (Chap.).

Distribution. Turkmenistan, Tajikistan.

10. *Rhaphitelus ladenbergi* (Ratzeburg, 1844)

References. Ratzeburg, 1844 : 208; Rudow, 1886 : 268; Bouček, 1957 : 76; Graham, 1969 : 421; Dzhankokmen, 1978 : 148; Noyes, 1998; Xiao and Huang, 2001 : 342.

Biology. A larval ectoparasitoid of the bark beetles *Tomicus piniperda* (L.), *Hylesinus fraxini*

(Panz.), *Scolytus carpini* Ratz., and *S. intricatus* (Quer.).

Distribution. Great Britain, France, Germany, Italy, Poland.

Note. *Rhaphitelus ladenbergi* has not been recorded in this region, but may well be found there.

11. *Rhaphitelus maculatus* Walker, 1834 (Fig. 21)

References. Walker, 1834 : 179; Bouček, 1957 : 80; Hedqvist, 1963 : 94; Peck, 1963 : 654; Krombein and Burks, 1967 : 261; Graham, 1969 : 421, Michalski, 1976 : 7; Zharkov and Dzhankmen, 1976 : 188; Dzhankmen, 1978 : 148; 1980 : 86; Mendel and Halperin, 1981 : 378; Mendel, 1986 : 115; Vaskov, 1986 : 33; Askew, 1992 : 83; Noyes, 1998; Xiao and Huang, 2001 : 343; Dzhankmen, 2005 : 57.

Material. Russia. *Kostroma Prov.*: Kostroma, 30.VII.1933 (Gussakovskij), 2 ♀; *Moscow Prov.*: from *Scolytus pygmaeus*, X.1925 (Shorokhov), 4 ♀; from *Scolytus pygmaeus*, 16.VII.1960 (Maslov), 2 ♀, 5 ♂; Losinyi Island, 29.VII.1924 (Shorokhov), 7 ♀, 12 ♂; *Voronezh Prov.*: Tellerman, 1951 (Shumakov), 1 ♀, 2 ♂; **Belgorod Prov.*: Baitsury, from *Pteleobius vittatus*, 14.VIII.2008 (Tselikh), 5 ♀, 11 ♂; **Volgograd Prov.*: Tinguta, IX.1951 (Alekseev), 5 ♀, 4 ♂; **Krasnodar Terr.*: Lazarevskoe, from *Carphoborus perrisi*, 24.VII.2009 (Tselikh), 24 ♀, 18 ♂; **Stavropol Terr.*: Goncharov, Chernorechenskoe forestry, from *Scolytus pygmaeus*, 12.VI.1956, 1 ♀; **Primorskii Terr.*: Vladivostok, Morskoe cemetery, 24.VIII.1988 (Belokobylskij), 1 ♀. Moldova. Ivanča, XI, 1959 (Plugar'), 7 ♂; Kishinev, from *Scolytus rugulosus*, 2–20.III.1960 (Talitskii), 5 ♀, 5 ♂; Leovo, 1966 (Kuslitskii), 10 ♀, 9 ♂. Ukraine. *Lvov Prov.*: Bryukhovichi, 30.V.1961 (Zagaikevich), 5 ♂; "Transcarpathia:" from *Scolytus rugulosus*, 2.VI.1952 (Zagaikevich), 1 ♀, 1 ♂; **Lugansk Prov.*: Derkulscoe forestry, from *Scolytus kirschi*, 4.X.1954 (Belgovskii), 2 ♀, 1 ♂; *the Crimea*: Yalta, from *Hylesinus oleiperda*, 20.V and 13.VIII.1925 (Ivanov), 9 ♀, 16 ♂; same locality, III.1945 (Rudnev), 3 ♂. Georgia. Borzhomi, 1.VI.1912 (Vinogradov), 1 ♀, 1 ♂. Kazakhstan. *West Kazakhstan Prov.*: Dzhanybek, X.1966 and III.1967 (Lindeman), 5 ♀, 6 ♂; *Almaty Prov.*: Bakanas, Ili River, X.1950 (Parfent'ev), 1 ♀. *Uzbekistan. Samarkand, 14.VII.1948 (Fatakhov), 2 ♀, 4 ♂. *Tajikistan. Dushanbe, 21.X.1961 (Kulinich), 4 ♂.

Biology. A larval ectoparasitoid of the bark beetles **Carphoborus perrisi* (Chap.), *Hylesinus varius* (F.),

H. toranio (Danth.), **Pteleobius vittatus* (F.), *Scolytus intricatus* (Quer.), *S. ensifer* Eichh., *S. kirschi* Skal., *S. multistriatus* Marsh., *S. pygmaeus* (F.), *S. rugulosus* (Müll.), and *S. scolytus* (F.).

Distribution. Russia (European part, North Caucasus, southern Far East); Great Britain, France, Spain, Sweden, Germany, Italy, Poland, Czechia, Slovakia, Hungary, the former Yugoslavia, Romania, Bulgaria, Ukraine, Moldova, Georgia, Turkey, Egypt, Israel, Southern Kazakhstan, *Uzbekistan, *Tajikistan, China (Gansu, Yunnan, Shandong, Heilongjiang), Japan, New Zealand, Canada, USA, Argentina.

12. *Rhopalicus guttatus* (Ratzeburg, 1844)

References. Ratzeburg, 1844 : 29; Bouček, 1957 : 79; Graham, 1969 : 415; Dzhankmen, 1978 : 223; 1980 : 85; Yakaitis et al., 1980 : 48; Noyes, 1998.

Material. Russia. *Voronezh Prov.*: Savalskoe forestry, 4.VI.1951 (Stark), 2 ♀; *Perm Terr.*: environs of Gubakh, 29.VIII.1952 (Zinov'ev), 1 ♀; **Primorskii Terr.*: Shkotovskii Distr., from *Ips acuminatus*, 30.VII.1971 (Arefin), 2 ♀. Ukraine. *Lvov Prov.*: Lvov, 2.VIII.1957 (Zagaikevich), 2 ♀.

Biology. A larval parasitoid of the bark beetles *Tomicus piniperda* (L.), *Ips acuminatus* (Gyll.), *I. typographus* (L.), and *Orthotomicus laricis* (F.).

Distribution. Russia (European part, southern Far East); Great Britain, France, Sweden, Germany, Czechia, Slovakia, Hungary, Latvia, Ukraine, Kazakhstan, China (Tsinghai, Yunnan).

13. *Rhopalicus quadratus* Ratzeburg, 1844

References. Ratzeburg, 1844 : 203; Thomson, 1878 : 43; Bouček, 1957 : 79; Hedqvist, 1963 : 79; Graham, 1969 : 414; Filippenkova, 1971 : 764; Petersen, 1976 : 49; Yanovskii, 1976 : 89; Dzhankmen, 1978 : 223; Kolomietz and Bogdanova, 1980 : 223; Yakaitis et al., 1980 : 47; Noyes, 1998; Hedgren, 2007 : 159.

Material. Russia. *Karelia*: "Petrozavodsk Distr.," from *Ips typographus*, 15 VII and 9.VIII.1950, from *Hylurgops palliates*, 10.IX.1951, 22.III.1957 (Shiperovich), 4 ♀, 5 ♂; *Leningrad Prov.*: from *Ips typographus*, II.1947 (Shiperovich), 2 ♀, 1 ♂; *Yaroslavl Prov.*: Berditsyno, 18.VII.1889, 1 ♀; **Moscow Prov.*: Losinyi Island, from *Blastophagus minor*, 14.V.1925 (Shorokhov), 1 ♂; Ostankino, 4.VII.1926, 1 ♀; Moscow Nature Reserve, from *Ips sexdentatus*,



Figs. 21, 22. *Rhaphitelus maculatus* Walker (21) and *Roptrocerus mirus* (Walker) (22), general view, laterally.

13.VII.1948 (Lomakin), 1 ♂; *Bryansk Prov.*: Bryansk, from *Ips typographus*, 14.VII.1967 (Kharitonova), 11 ♀; *Voronezh Prov.*: 20.VI.1989 (Gusev), 2 ♀, 1 ♂; *Samara Prov.*: Morevskii, from *Ips acuminatus*, 16.VII.1967 (Filippenkova), 3 ♀; Zaglyadovka, from *Ips acuminatus*, 16.VIII.1968 (Filippenkova), 2 ♀; *Perm Terr.*: Kungur, 4.VIII.1950, 31.VIII.1954, and 21.VI.1955 (Zinov'ev), 6 ♀, 1 ♂; *Novosibirsk Prov.*: Kourak, from *Orthotomicus proximus*, 6–9 VII and

from *Ips acuminatus*, 12.VIII.1964 (Tarasova), 2 ♀, 1 ♂; Mirnyi, from *Ips acuminatus*, 13.VIII.1964 (Tarasova), 5 ♀, 4 ♂; **Krasnoyarsk Terr.*: "Stolby" Nature Reserve, from *Ips typographus*, 2.VII.1950, 3 ♀; *Primorskii Terr.*: Shkotovskii Distr., from *Ips acuminatus*, 12.VI.1971 (Arefin), 3 ♀. **Belarus*. Gomel, from *Ips sexdentatus*, 13.VII.1955 (Mashnina), 1 ♀. *Ukraine*. *Ivano-Frankovsk Prov.*: Vorokhta, 16.VII.1952 (Zagaikevich), 1 ♀, 1 ♂; *the Crimea*:

Alushta, Crimean Nature Reserve (Bukovskii), 8 ♀, 7 ♂. *Kazakhstan. Karaganda Prov.: Kzyl-Tau, from *Ips sexdentatus*, 19.VI.1968 (Filippenkova), 1 ♀.

Biology. A larval ectoparasitoid of the bark beetles *Tomicus minor* (Hart.), *T. piniperda* (L.), *Dryocoetes baicalicus* (Reitt.), *D. hectographus* Reitt., *Hylurgops palliatus* (Gyll.), *Ips acuminatus* (Gyll.), *I. amitinus* Eichh., *I. duplicatus* (Sahlb.), *I. typographus* (L.), *I. sexdentatus* (Boern.), *I. subelongatus* (Motsch.), *Orthotomicus proximus* (Eichh.), *O. suturalis* (Gyll.), *Pityogenes bidentatus* (Hbst.), *P. chalcographus* (L.), *P. irkutensis* Egg, *P. monacensis* Fuchs, *P. quadridens* (Hart.), *Scolytus morawitzi* (Sem.), and *S. ratzeburgi* Jans.

Distribution. Russia (European part, North Caucasus, Western Siberia, southern Far East); Great Britain, France, Norway, Sweden, Finland, Germany, Poland, Czechia, Slovakia, Austria, Hungary, Latvia, *Belarus, Ukraine, Armenia, *Central Kazakhstan.

14. *Rhopalicus tutela* (Walker, 1836)

References. Walker, 1836 : 14; Ratzeburg, 1844 : 189; Bouček, 1957 : 79; Peck, 1963 : 657; Krombein and Burks, 1967 : 261; Graham, 1969 : 414; Arefin, 1974 : 172; Pettersen, 1976 : 49; Zharkov and Dzhanokmen, 1976 : 186; Dzhanokmen, 1978 : 223; Kolomietz and Bogdanova, 1980 : 227; Yakaitis et al., 1980 : 48; Askew, 1992 : 83; Noyes, 1998; Pettersson, 2001 : 92; Hougardy and Gregoire, 2001 : 166; Hougardy et al., 2003 : 3; Dzhanokmen, 2005 : 57; Hedgren, 2007 : 159.

Material. Russia. Kaliningrad Prov.: Kaliningrad, from *Ips typographus*, II.1948 (Shiperovich), 2 ♀; Karelia, "Petrozavodsk Distr.," from *Ips typographus*, 15.VII.1950, 27.III and 5.IV.1951 (Shiperovich), 5 ♀, 3 ♂; Leningrad Prov.: St. Petersburg, 28.VI.1919 (Barovskii), 1 ♂; from *Ips typographus*, 7.I, II, and 31.VIII.1947 (Shiperovich), 8 ♀, 6 ♂; *Tver Prov.: Central Forest Reserve, 21.VIII.1931, 3 ♀; *Vologda Prov.: Nikolskoe, 28.V.1983 (Krov.) 2 ♀; Moscow Prov.: from *Ips typographus*, 20.VI.1925 (Shorokhov), 13 ♀; Razumovskoe, "Lesnaya Dacha," from *Polygraphus poligraphus*, 20.VI.1925 (Shorokhov), 1 ♀; same locality, 11.I.1971 (Maslov), 1 ♂; Tula Prov.: Shatilovskaya Experimental Agricultural Station, from *Ips duplicatus*, 3.IX.1924, 1 ♀, 1 ♂; Bryansk Prov.: Bryansk, from *Ips duplicatus* and *I. typographus*, 18.VII.1967 (Kharitonova), 8 ♂; *Krasnoyarsk Terr.: "Stolby" Nature Reserve, from *Ips typographus*,

20.VI.1950 and 12.II.1951, 3 ♀, 2 ♂. Belarus. Minsk Prov.: Borisovo Distr., 20.VIII.1929, 7 ♀; Borisov (Barysau), 19.VIII.1929 (Zakreiski), 1 ♀, 2 ♂. Ukraine. Ivano-Frankovsk Prov.: Morshin, 3.VII.1951 (Zagaikevich), 3 ♀; Vorokhta, 16.VIII.1952 (Zagaikevich), 3 ♀; Bryazskoe forestry, 25.VI.1957 (Zagaikevich), 14 ♀; Transcarpathian Prov.: Tyachevskii, from *Ips typographus*, 5.IX.1952 (Girits), 2 ♀. Georgia. Kurtskhana, 25.VIII.1955, 4 ♀, 3 ♂. Kirghizia. Osh Prov.: Lake Sary-Chilek, 1955 (Makhnovskii), 6 ♀, 1 ♂.

Biology. A larval ectoparasitoid of the bark beetles *Tomicus minor* (Hart.), *T. piniperda* (L.), *Hylurgops palliatus* (Gyll.), *Ips acuminatus* (Gyll.), *I. duplicatus* (Sahlb.), *I. sexdentatus* (Boern.), *I. typographus* (L.), *Orthotomicus laricis* (F.), *Polygraphus poligraphus* (L.), *Scolytus ratzeburgi* Jans., and *S. rugulosus* (Müll.).

Distribution. Russia (European part, Eastern Siberia); Great Britain, France, Norway, Sweden, Finland, Germany, Switzerland, Poland, Czechia, Slovakia, Austria, Hungary, Latvia, Belarus, Ukraine, Georgia, Armenia, Turkey, Kazakhstan, Kirghizia, China (Gansu, Sichuan, Yunnan, Guizhou, Hunan, Heilongjiang), Japan, New Zealand, Canada, USA.

15. *Roptrocerus brevicornis* Thomson, 1878

References. Thomson, 1878 : 85; Hedqvist, 1963 : 61, 62, 64; Graham, 1969 : 426; Pettersen, 1976 : 48; Zharkov and Dzhanokmen, 1976 : 188; Dzhanokmen, 1978 : 217; Kolomietz and Bogdanova, 1980 : 234; Yakaitis et al., 1980 : 47; Askew, 1992 : 82; Noyes, 1998.

Material. Russia. Karelia: "Petrozavodsk Distr.," from *Pityogenes chalcographus*, 31.VII.1951 (Shiperovich), 2 ♀, 1 ♂; *Leningrad Prov.: 7.VII.1947 (Shiperovich), 1 ♀; Moscow Prov.: from *Pityogenes bidentatus*, 24.VI.1924 (Shorokhov), 2 ♀; Bryansk Prov.: Bryansk, 18.VII.1967 (Kharitonova), 2 ♀; *Krasnodar Terr.: Lazarevskoe, from *Carphoborus perrisi*, 25.VII.2009 (Tselikh), 8 ♀, 3 ♂; Karachai-Cherkess: Teberda, 10.VI.1965 (Gur'yanova), 3 ♀; *Perm Terr.: Gubakha, from *Ips typographus*, 10.IX.1956 (Zinov'ev), 1 ♀, 1 ♂; Kungur, 21.VI.1956 (Zinov'ev), 3 ♀; Khabarovsk Terr.: from *Ips acuminatus*, 31.VII.1965 (Yurchenko), 1 ♀. Georgia. Kurtskhana, 20.VIII.1955, 3 ♀, 1 ♂.

Biology. A larval ectoparasitoid of the bark beetles *Tomicus minor* (Hart.), *T. piniperda* (L.), *Carphoborus*

perrisi (Chap.), *Ips acuminatus* (Gyll.), *I. typographus* (L.), *Pityogenes bidentatus* Htg., *P. chalcographus* (L.), *P. quadridens* (Hart.), and *P. pityographus* (Ratz.).

Distribution. Russia (European part, North Caucasus, Far East); Great Britain, Norway, Sweden, Finland, Latvia, Greece, Georgia.

16. *Roptrocerus mirus* (Walker, 1834) (Fig. 22)

References. Walker, 1834 : 351; Thomson, 1878 : 84; Györfy, 1952 : 116; Hedqvist, 1963 : 61, 62; Graham, 1969 : 425; Dzhankmen, 1978 : 217; Yakaitis et al., 1980 : 47; Noyes, 1998; Hougardy and Gregoire, 2001 : 163.

Material. Russia. *Karelia:* "Petrozavodsk Distr.," from *Ips typographus*, 7.II.1951 (Shiperovich), 1 ♀; **Arkhangelsk Prov.:* Nyandomskii Distr., 6.VI.1967 (Pryakhina), 2 ♀, 1 ♂; **Leningrad Prov.:* from *Ips typographus*, 7.VII.1947 (Shiperovich), 2 ♀; Lisino, from *Polygraphus poligraphus*, 12.VII.2008 (Tselikh), 3 ♀, 4 ♂; **Moscow Prov.:* 20 and 29.IX.1924 (Shorokhov), 16 ♀; Losinyi Island, from *Ips typographus*, 22.VI.1924 and 10.VIII.1925 (Shorokhov), 8 ♀, 3 ♂; Razumovskoe, from *Polygraphus poligraphus*, 10.VIII.1924 (Shorokhov), 3 ♀; *Bryansk Prov.:* Bryansk, 18.VII.1967 (Kharitonova), 2 ♂; *Perm Terr.:* Kungur, from *Ips typographus*, 13.VII.1955 (Zinov'ev), 2 ♀; **Krasnoyarsk Terr.:* "Stolby" Nature Reserve, from *Ips typographus*, 2.VI.1950, 1 ♀; *Primorskii Terr.:* Shkotovskii Distr., from *Ips typographus*, 21.VII.1971 (Arefin), 2 ♀. Belarus. Borisov (Barysau), 19.VII.1929 (Zakreiski), 2 ♀, 1 ♂.

Biology. A larval ectoparasitoid of the bark beetles *Tomicus minor* (Hart.), *T. piniperda* (L.), *Dryocoetes autographus* (Ratz.), *Ips sexdentatus* (Boern.), *I. typographus* (L.), *Pityogenes chalcographus* (L.), *Polygraphus poligraphus* (L.), and *Scolytus intricatus* (Quer.).

Distribution. Russia (European part, Siberia, southern Far East); Great Britain, Sweden, Switzerland, Poland, Czechia, Slovakia, Hungary, Latvia, Belarus, China (Tsinghai, Gansu, Heilongjiang), Japan.

17. *Roptrocerus xylophagorum* (Ratzeburg, 1844)
(Fig. 23)

References. Ratzeburg, 1844 : 218; Ashmead, 1894 : 335; Hedqvist, 1963 : 61; Graham, 1969 : 425;

Filippenkova, 1971 : 764; Arefin, 1974 : 172; Pettersen, 1976 : 48; Yanovskii, 1976 : 88; Dzhankmen, 1978 : 217; 1980 : 86; Kolomietz and Bogdanova, 1980 : 230; Yakaitis et al., 1980 : 47; Mendel and Halperin, 1981 : 378; Samson, 1984 : 287; Mendel, 1988 : 293; Noyes, 1998; Hougardy and Gregoire, 2001 : 166; Pettersson, 2001 : 93; Hedgren, 2007 : 159.

Material. Russia. *Karelia:* from *Ips typographus*, 1949 (Shiperovich), 1 ♀; **Moscow Prov.:* from *Ips typographus*, 20.IX.1924 (Shorokhov), 2 ♀, 11 ♂; Losinyi Island, from *Pityogenes bidentatus*, 22.VI.1924 (Shorokhov), 2 ♀, 1 ♂; environs of Moscow, 31.V.1924 (Karpov), 2 ♂; *Samara Prov.:* Tolyatti, from *Ips acuminatus* and *Blastophagus minor*, 6.VI.1967 (Filippenkova), 1 ♀; Kurumach, from *Ips sexdentatus*, 11.V.1968 (Filippenkova), 1 ♀; Zaglyadovka, from *Ips acuminatus*, 16.VIII.1967 (Filippenkova), 2 ♀, 1 ♂; **Karachai-Cherkess:* Teberda, 12.VI.1965 (Gur'yanova), 2 ♀; *Perm Terr.:* Kungur, from *Ips duplicatus*, 23.VI.1956 (Zinov'ev), 3 ♀, 1 ♂; **Krasnoyarsk Terr.:* "Stolby" Nature Reserve, from *Blastophagus minor*, 7.VI.1950, 8 ♀; *Irkutsk Prov.:* Maloe Golousnoe, from *Ips subelongatus*, 28.VII.1965 (Pleshakov), 3 ♀, 1 ♂. Ukraine. *Ivano-Frankovsk Prov.:* Vorokhta, 16.VIII.1952 (Zagaikovich), 7 ♀, 3 ♂; *Transcarpathian Prov.:* "Tyachevsky okr.," 20.VII.1952 (Girits), 4 ♀, 10 ♂; "Volynskaya Prov., okr. Kiveruov," from *Orthotomicus proximus*, VI.1954 (Zagaikovich), 6 ♂. Kazakhstan. *Pavlodar Prov.:* Pavlodar, from *Ips sexdentatus*, 7.VIII.1956 (Rafes), 3 ♀.

Biology. A larval ectoparasitoid of the bark beetles *Tomicus minor* (Hart.), *T. piniperda* (L.), *Hylurgops palliatus* (Gyll.), *Ips acuminatus* (Gyll.), *I. duplicatus* (Sahlb.), *I. sexdentatus* (Boern.), *I. subelongatus* (Motsch.), *I. typographus* (L.), *Orthotomicus erosus* (Woll.), *O. proximus* (Eichh.), *O. suturalis* (Gyll.), *Pityogenes baicalicus* Egg., *P. bidentatus* (Hbst.), *P. chalcographus* (L.), *P. quadridens* (Hart.), *Pityophthorus micrographus* (L.), *Polygraphus poligraphus* (L.), *P. punctifrons* Thoms., *Scolytus intricatus* (Quer.), and *S. rugulosus* (Müll.).

Distribution. Russia (European part, North Caucasus, Eastern Siberia); Great Britain, France, Spain, Norway, Sweden, Finland, Belgium, Germany, Switzerland, Poland, Czechia, Slovakia, Austria, Hungary, Latvia, Ukraine, Greece, Israel, Northern Kazakhstan, China (Tsinghai, Gansu, Yunnan, Heilongjiang), Japan, India, Australia, Canada, USA, Mexico.



Figs. 23, 24. *Roptrocerus xylophagorum* (Ratzeburg) (23) and *Tomicobia pityophthori* (Bouček) (24), general view, laterally.

18. *Tomicobia acuminati* Hedqvist, 1959

References. Hedqvist, 1959 : 179; Graham, 1969 : 786; Filippenkova, 1971 : 765; Dzhankomen, 1978 : 184; Kolomietz and Bogdanova, 1980 : 234; Noyes, 1998.

Material. Russia. *Samara Prov.*: Malyshevka, from *Ips acuminatus*, 18.VIII.1958 (Filippenkova), 1 ♂; Ekaterinovka, from *Ips acuminatus*, 28.VIII.1958

(Filippenkova), 1 ♂; **Primorskii Terr.*: Shkotovskii Distr., 17.VIII.1971 (Arefin), 1 ♀.

Biology. An endoparasitoid of adults of *Ips acuminatus* (Gyll.).

Distribution. Russia (European part, southern Far East); Norway, Sweden, Poland.

Note. This species is very closely related to *Tomicobia seitneri* Ruschka and may be conspecific with it.

19. *Tomicobia pityophthori* (Bouček, 1955) (Fig. 24)

References. Bouček, 1955 : 87; Graham, 1969 : 633; Pettersen, 1976 : 49; Dzhanokmen, 1978 : 218; Askew, 1992 : 82; Noyes, 1998.

Material. Russia. *Perm Terr.*: Kungur, “Predural’e” forestry, from *Pityophthorus micrographus*, 25.VI.1956 (Zinov’ev), 1 ♀; **Krasnoyarsk Terr.*: “Stolby” Nature Reserve, from *Pityogenes quadridens*, 14.IV.1951, 5 ♀, 4 ♂.

Biology. An endoparasitoid of adults of *Pityophthorus micrographus* (L.), *P. polonicus* (Karp.), *Pityogenes quadridens* (Hart.), and *P. chalcographus* (L.).

Distribution. Russia (European part, Eastern Siberia); Great Britain, Norway, Sweden, Finland, Germany, Poland.

20. *Tomicobia seitneri* Ruschka, 1924

References. Ruschka, 1924 : 7; Hedqvist, 1959 : 178; Graham, 1969 : 786; Dzhanokmen, 1978 : 185; Kolomietz and Bogdanova, 1980 : 235.

Material. Russia. *Kaliningrad Prov.*: Kaliningrad, from *Ips typographus*, II.1948 (Shipervich), 3 ♀, 2 ♂; “Petrozavodsk Distr.,” from *Ips typographus*, 1.VI.1951 (Shipervich), 2 ♂; *Leningrad Prov.*: from *Ips typographus*, 9.II.1947 (Shipervich), 1 ♀. Ukraine. *Transcarpathian Prov.*: “Tyachevskii okr.,” 12.VIII.1952 (Girits), 6 ♂.

Biology. An endoparasitoid of adults of *Ips acuminatus* (Gyll.), *I. amitinus* Eichh., *I. duplicatus* (Sahlb.), *I. subelongatus* (Motsch.), *I. typographus* (L.), and *Pityogenes chalcographus* (L.).

Distribution. Russia (European part); Norway, Sweden, Germany, Poland, Czechia, Slovakia, Austria, Hungary, Mongolia, China (Hunan), Japan.

DISCUSSION

As the result of the study, 10 genera and 19 species of pteromalids parasitizing on bark beetles have been found in the fauna of Russia and adjacent territories. The data on the distribution in Russia and a number of other countries are supplemented for 17 species from this list (except for *Nikolskayana mirabilis* and *Tomicobia seitneri*).

According to the degree of food specialization, pteromalids are subdivided into the two groups: specialized endoparasitoids (oligophagous insects) and

unspecialized ectoparasitoids (polyphagous insects). Endoparasitoids of adult bark beetles (*Tomicobia acuminati*, *T. pityophthori*, and *T. seitneri*), usually associated with one genera or even one species of the host, are strictly oligophagous, or may be even monophagous insects. Some particular morphological characters of the genus *Tomicobia* seem to be related to the specificity of oviposition into the host body: tergites VIII and IX perpendicular to each other (lateral view), short ovipositor sheaths, and undulate crenation of the 2nd gonapophyses (Fig. 3).

Weakly specialized ectoparasites can produce different generations on different hosts. The maximum number of hosts was recorded for *Cheipopachus quadrum* (24 species of the genera *Tomicus*, *Carphoborus*, *Dryocoetes*, *Hylesinus*, *Ips*, *Pityogenes*, *Pteleobius*, and *Scolytus*), for *Roptrocerus xylophagorum* (21 species of the genera *Tomicus*, *Hylurgops*, *Ips*, *Orthotomicus*, *Pityogenes*, *Pityophthorus*, *Polygraphus*, and *Scolytus*) and for *Rhopalicus quadratus* (20 species of the genera *Tomicus*, *Dryocoetes*, *Hylurgops*, *Ips*, *Orthotomicus*, *Pityogenes*, and *Scolytus*).

Nearly half of pteromalid species (*Mesopolobus typographi*, *Metacolus azureus*, *M. unifasciatus*, *Rhopalicus brevicornis*, *Rh. guttatus*, *Rh. tutela*, *Roptrocerus brevicornis*, *Tomicobia acuminati*, and *T. pityophthori*) parasitize on the bark beetles developing exclusively on coniferous trees, and two species (*Rhaphitelus ladenbergi* and *Rh. maculatus*), on those developing only on deciduous trees. *Roptrocerus mirus* infects bark beetles mainly on coniferous trees, but has also been indicated as a parasitoid of *Scolytus intricatus* on the oak (Györfy, 1952; Hedqvist, 1959). I have reared *R. mirus* only from the hosts developing on coniferous trees; therefore, the data on its parasitizing on the bark beetles associated with deciduous trees should be verified. In my opinion, the data on infestation of bark beetles developing on both coniferous and deciduous trees by some other pteromalids (*Acrocormus semifasciatus*, *Cheipopachus quadrum*, *Dinotiscus aponius*, *D. colon*, *D. eupterus*, *Roptrocerus xylophagorum*) (see the literature on the biology of the species) also require verification.

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