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THE CURRENT STATE OF THE STUDY OF THE LARVAE OF SCARAB BEETLES OF THE PLEUROSTICTI GROUP (COLEOPTERA, SCARABAEIDAE) OF THE FAUNA OF RUSSIA

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Summary. The data available in the literature about the larvae of the Pleurosticti group of scarab beetles occurring in Russia are summarized. The majority of taxa (all subfamilies and tribes and 56 genera of 61) include species that have described larvae. However, the revision of these descriptions is needed for many taxa because the descriptions were based on the limited set of characters, and the method of identification of the species was not stated.

Key words: Scarabaeoidea, scarab beetles, chafers, larvae, Russia.

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Резюме. В статье обобщены имеющиеся в литературе данные о личинках пластинчатоусых жуков группы Pleurosticti, обитающих в России. Большинство таксонов (все подсемейства и трибы, а также 56 родов из 61) включают виды, для которых личинки описаны. Однако для многих таксонов требуется ревизия этих описаний, поскольку они основаны на ограниченном наборе признаков, а метод определения видовой принадлежности личинок не указан.

INTRODUCTION

Scarab beetles (family Scarabaeidae) are the largest, most widespread group of insects, which includes important agricultural pests. Like other insects with complete metamorphosis, scarab beetles spend most of their life cycle in the larval stage, and it is the larva that is of greatest economic importance. The small number of Scarabaeidae species for which the structure of their preimaginal stages has been thoroughly studied hinders the refinement of Scarabaeidae classification and makes it impossible to determine the species identity of the larvae, which are typically the primary damaging stage. The lack of even primary information

on the life cycles of many species makes it impossible to fully use scarab beetles for monitoring and analyzing the biodiversity of ecosystems, complicates the organization of pest control in agriculture and forestry, the development of environmental measures, and the selection of agents for biological control.

In the present contribution, we summarize the data available in the literature about the larval stages of the scarab beetles occurring in Russia. We also analyze how well are different pleurostict taxa known from larvae.

MATERIAL AND METHODS

This work is based on the review of the literature that includes data about larval stages of the species registered from Russia. The classification of taxa follows the latest edition of the Palaearctic catalogue of beetles (Löbl & Löbl, 2016) and Catalogue of the insects of Russian Far East (Shabalin, 2025). The group Pleurosticti is treated in the strict sense. It includes the following subfamilies: Dynamopodinae, Melolonthinae, Rutelinae, Dynastinae, and Cetoniinae. The list of Pleurosticti taxa occuring in Russia is based on the above mentioned catalogues and additional sources (Shokhin 2007, 2016). Figures after the names of the genera in the list below mean the total number of species of the fauna of Russia and, in the parentheses, the number of taxa for which larval stages are known.

LIST OF SPECIES

Subfamily Melolonthinae Leach, 1819

The subfamily comprises six tribes in Russia, of them the larvae are known for all tribes.

Tribe Diplotaxini Kirby, 1837

The tribe comprises one genus in the fauna of Russia, the larva of which is known: *Apogonia* 1(1).

***Apogonia cupreoviridis* Kolbe, 1886**

Apogonia cupreoviridis: Murayama, 1931: 33, fig. 19, 29, 43 (a-d), 56 (a, b), 72 (a, b), 96 (b); Böving, 1942: 173; Medvedev, 1951: fig. 52; Medvedev, 1952b: 108, fig. 217, 218; Zhang, 1984: 87, fig. XX (296-299); Shabalin, 2014: 94, fig. 33.

Tribe Heptophyllini S.I. Medvedev, 1951

The tribe comprises two genera in the fauna of Russia, the larvae of which are known: *Heptophylla* 1(1) and *Hilyotrogus* 1(1).

***Heptophylla picea* Motschulsky, 1858**

Heptophylla picea: Sawada, 1991: Pl. XV (5), XXVI (6), XXX (3), XXXIX (2), LVI (2), LXII (2), LXIII (2), LXX (3), LXXIV (7), LXXXIV, CXXV (7), CXXXI (7), CXLII (1); Shabalin, 2014: 91, fig. 32.

***Hilyotrogus bicoloreus* (Heyden, 1887)**

Hilyotrogus bicoloreus: Kalinina, 1983: 732, fig. 1-5; Fang et al., 2001: 184, fig. 3 (A-C); Shabalin, 2014: 88, fig. 31.

Tribe Hopliini Latreille, 1829

The tribe comprises two genera in the fauna of Russia, the larvae of which are known: *Ectinohoplia* 1(1) and *Hoplia* 11(5).

***Ectinohoplia rufipes* (Motschulsky, 1860)**

Ectinohoplia rufipes: Murayama, 1931: 30, fig. 18, 28, 55, 71, 89 (a-c), 95; Medvedev, 1951: fig. 80; Medvedev, 1952a: 200, fig. 277; Medvedev, 1952b: 155, fig. 327, 328; Ilyinskiy, 1962: 197, fig. 485; Zhang, 1984: 92, fig. II (23), III (35), XXI (312-315); Shabalin, 2014: 124, fig. 45.

***Hoplia* (*Decamera*) *cincticollis* (Faldermann, 1833)**

Hoplia cincticollis: Zhang, 1984: 93, fig. XXI (316-319); Shabalin, 2014: 129, fig. 47.

***Hoplia* (*Euchromoplia*) *aureola* (Pallas, 1781)**

Hoplia aureola: Murayama, 1931: 26, fig. 17, 54, 70, 88 (a-c), 94; Medvedev, 1951: fig. 82; Medvedev, 1952b: 158, fig. 336; Shabalin, 2014: 127, fig. 46. *Hoplia* (*Euchromoplia*) *aureola*: Medvedev, 1952a: 240, fig. 410.

***Hoplia* (*Hoplia*) *parvula* Krynicki, 1832**

Hoplia parvula: Medvedev, 1951: fig. 81; Medvedev, 1952b: 155, fig. 329-334; Ilyinskiy, 1962: 197, fig. 496, 497; Ghilarov, 1964: 320, fig. 246 (4, 5); Medvedev, 1976: 530, fig. 130 (4, 5); Klausnitzer & Krell, 1996: 75, fig. 75, 87. *Hoplia* (*Hoplia*) *parvula*: Medvedev, 1952a: 253, fig. 415.

***Hoplia* (*Hoplia*) *zaitzevi* Jacobson, 1914**

Hoplia zaitzevi: Ghilarov, 1964: 320.

***Hoplia* (*Hyperis*) *paupera* Krynicki, 1832**

Hoplia (*Xenoplia*) *paupera*: Medvedev, 1956a: 149, fig. 5-8. *Hoplia paupera*: Medvedev, 1976: 530. *Hoplia averini*: Skopin, 1957: 1093, fig. 1-7.

Tribe Melolonthini Leach, 1819

The tribe comprises four genera in the fauna of Russia, the larvae are known for three of them: *Anoxia* 2(2), *Melolontha* 6(5), *Polyphylla* 4(4) and *Cyphonotus* 1(0).

***Anoxia* (*Anoxia*) *pilosa* (Fabricius, 1792)**

Anoxia pilosa: Golovianko, 1913: 14, Tab. I, fig. 23-24; Golovianko, 1936: 26, fig. 8б 48; Schaerffenberg, 1941: 34, fig. 20; Böving, 1942: 174 Pl. 18, fig. 4, 6, 7; Ilyinskiy, 1948: 222, fig. XXXVIII (1); Medvedev, 1952b: 105, fig. 214-216; Ilyinskiy, 1962: 193, fig. 489; Ghilarov, 1964: 314, fig. 243 (8); Medvedev, 1976: 521, fig. 127 (3); Klausnitzer & Krell, 1996: 68, fig. 46a. *Anoxia* (*Anoxia*) *pilosa*: Medvedev, 1951: 168, fig. 51, 297.

***Anoxia* (*Protanoxia*) *orientalis* (Krynicki, 1832)**

Anoxia orientalis: Golovianko, 1936: 26, fig. 49; Ilyinskiy, 1948: 222; Medvedev, 1952b: 104; Ghilarov, 1964: 313; Ilyinskiy, 1962: 193; Medvedev, 1976: 521; Klausnitzer & Krell, 1996: 68. *Anoxia* (*Protanoxia*) *orientalis*: Medvedev, 1951: 157.

***Melolontha aceris* Faldermann, 1835**

Melolontha (*Apropyga*) *aceris*: Medvedev, 1951: 126, fig. 50; Medvedev, 1952b: 99, fig. 205-206. *Melolontha aceris*: Ilyinskiy, 1962: 196; Medvedev, 1976: 519, fig. 126 (12).

***Melolontha hippocastani* Fabricius, 1801**

Melolontha hippocastani: Golovianko, 1913: 8, Tab. I, fig. 18; Golovianko, 1936: 22; Korschefsky, 1940: 48; Emden, 1941: 125; Schaerffenberg, 1941: 28, fig. 5; Ilyinskiy, 1948: 227; Medvedev, 1952b: 103; Ilyinskiy, 1962: 196; Ghilarov, 1964: 313; Zhang, 1982: 91, fig. 7, 22, 48; Zhang, 1984: 64, fig. XIV (207-209); Klausnitzer & Krell, 1996: 68; Shabalin, 2014: 85, fig. 30. *Melolontha* (*Melolontha*) *hippocastani hippocastani*: Medvedev, 1951: 139, fig. 49, 247-250.

***Melolontha incana* (Motschulsky, 1854)**

Melolontha incana: Murayama, 1931: 48, fig. 22, 33, 46 (a-d), 59 (a, b), 76 (a, b), 99; Shabalin, 2014: 83, fig. 29. *Hoplosternus incanus*: Medvedev, 1951: 113, fig. 48; Medvedev, 1952b: 98, fig. 203-204; Kalinina, 1979b: 113, fig. 6; Zhang, 1984: 63, fig. II (20), III (37), XIV (200-202b).

***Melolontha melolontha* (Linnaeus, 1758)**

Melolontha melolontha: Golovianko, 1913: 8, Tab. I, fig.10-17, Tab. III, fig.17; Golovianko, 1936: 22; Korschefsky, 1940: 48; Emden, 1941: 125, fig. 17; Böving, 1942: 173, Pl. 18, fig. 1-3, 5; Janssens, 1947: fig. 19; Ilyinskiy, 1948: 227; Medvedev, 1952b: 101, fig. 207-213; Ilyinskiy, 1962: 196, fig. 494; Ghilarov, 1964: 313, fig. 243 (6, 7); Medvedev, 1976: 519, fig. 126 (14); Klausnitzer & Krell, 1996: 68, fig. 44. *Melolontha* (*Melolontha*) *melolontha*: Medvedev, 1951: 136.

***Melolontha* (*Melolontha*) *pectoralis* Megerle von Mühlfeld, 1812**

Melolontha pectoralis: Golovianko, 1936: 22; Ilyinskiy, 1962: 196; Medvedev, 1952b: 100; Ghilarov, 1964: 313; Klausnitzer, Krell, 1996: 68, fig. 37d. *Melolontha* (*Melolontha*) *pectoralis*: Medvedev, 1951: 135.

***Polyphylla* (*Polyphylla*) *fullo* (Linnaeus, 1758)**

Polyphylla fullo: Golovianko, 1913: 10, Tab. I, fig. 21-22; Golovianko, 1936: 23, fig. 7; Korschefsky, 1940: 49, fig. 16; Janssens, 1947: fig. 20; Schaerffenberg, 1941: 32, fig. 16; Ilyinskiy, 1948: 227, fig. XXXIX (5); Medvedev, 1952b: 94, fig. 196-201; Ilyinskiy, 1962: 194, fig. 490, 491; Ghilarov, 1964: 313, fig. 243 (1, 2, 5); Medvedev, 1976: 520, fig. 127 (2); Klausnitzer & Krell, 1996: 68, fig. 39, 43, 45. *Polyphylla* (*Polyphylla*) *fullo*: Medvedev, 1951: 92, fig. 25-29, 47.

***Polyphylla* (*Polyphylla*) *olivieri* (Laporte, 1840)**

Polyphylla olivieri: Archangelsky, 1918: 251, fig. 1-5; Golovianko, 1936: 23; Medvedev, 1952b: 96; Ilyinskiy, 1962: 194; Ghilarov, 1964: 313. *Polyphylla* (*Polyphylla*) *olivieri*: Medvedev, 1951: 98.

***Polyphylla (Xerasiobia) adspersa* Motschulsky, 1854**

Polyphylla adspersa: Ilyinskiy, 1962: 194. *Polyphylla (Xerasiobia) adspersa*: Medvedev, 1951: 101.

***Polyphylla* (*Xerasiobia*) *alba* (Pallas, 1773)**

Polyphylla alba: Golovianko, 1936: 23; Medvedev, 1952b: 97; Ilyinskiy, 1962: 194; Ghilarov, 1964: 313, fig. 243 (3, 4); Medvedev, 1976: 520. *Polyphylla alba vicaria*: Fang et al., 2001: 183, fig. 1 (A-C). *Polyphylla (Xerasiobia) alba alba*: Medvedev, 1951: 104.

Tribe Rhizotrogini Burmeister, 1855

The tribe comprises 16 genera in the fauna of Russia, for 14 of which the larvae are known: *Amphimallon* 3(3), *Brahmina* 5(3), *Chioneosoma* 5(4), *Eotrichia* 1(1), *Holochelus* 6(5), *Lachnota* 1(1), *Lasiopsis* 3(1), *Monotropus* 2(1), *Nigrotrichia* 3(3), *Pedinotrichia* 2(2), *Rhizotrogus* 1(1), *Sophrops* 1(1), *Testeceitrichia* 1(1), *Trematodes* 1(1), *Holotrichia* 1(0), *Schismatocera* 1(0).

***Amphimallon altaicum* (Mannerheim, 1825)**

Amphimallon altaicus: Medvedev, 1952b: 132, fig. 269; Ilyinskiy, 1962: 202, fig. 511; Ghilarov, 1964: 318, fig. 245 (2); Medvedev, 1976: 524, fig. 128 (7). *Amphimallon* (*Amphimallon*) *altaicus*: Medvedev, 1951: 454, fig. 69.

***Amphimallon solstitiale* (Linnaeus, 1758)**

Amphimallon solsitiale: Golovianko, 1936: 28, fig. 15; Schaerffenberg, 1941: 28, fig. 6; Klausnitzer & Krell, 1996: 67, fig. 34-36. *Amphimallon solstitialis*: Emden, 1941: 125, fig. 16; Ilyinskiy, 1948: 230, fig. XL (3); Medvedev, 1952b: 133, fig. 270-281; Ghilarov, 1964: 318, fig. 245 (3-7); Medvedev, 1976: 523, fig. 128 (6); Zhang, 1982: 93, fig. 11, 26, 52; Zhang, 1984: 83, fig. XIX (280-283). *Amphimallon* (*Amphimallon*) *solstitialis solstitialis*: Medvedev, 1951: 460, fig. 68, 924-926. *Amphimallus* (*Rhizotrogus*) *solstitialis*: Golovianko, 1913: 17, Tab. I, fig. 33, 33a. *Amphimallon solstitialis grossatus*: Maltzev, 1966: 146, fig. 13-16. *Rhizotrogus solstitialis*: Böving, 1942: 175 Pl. 18, fig. 10-12; Janssens, 1947: fig. 17. *Amphimallon* (*Rhizotrogus*) *solstitialis*: Korschefsky, 1940: 46, fig. 9. *Rhizotrogus solsticialis*: Ilyinskiy, 1962: 204, fig.513.

***Amphimallon volgense* (Fischer von Waldheim, 1823)**

Amphimallon volgensis: Medvedev, 1952b: 135, fig. 282-286; Ilyinskiy, 1962: 204, fig. 514. *Lasiopsis caninus* auct.: Ilyinskiy, 1948: 231, fig. XLI (1).

***Brahmina* (*Brahmina*) *crenicollis* (Motschulsky, 1854)**

Brahmina crenicollis: Zhang, 1984: 89, fig. XXI (300-303); Shabalin, 2014: 99, fig. 35.

***Brahmina* (*Brahminella*) *agnella* (Faldermann, 1835)**

Brahmina agnella: Galkin, 1958: 11, fig. 2 (2); Ilyinskiy, 1962: 204; Galkin, 1966: 1728, fig. A 1-3; Medvedev, 1976: 523, fig. 128 (3); Shabalin, 2014: 97, fig. 34.

***Brahmina* (*Brahminella*) *faldermanni* Kraatz, 1892**

Brahmina faldermanni: Zhang, 1984: 84, fig. XIX (284-287); Shabalin, 2014: 101, fig. 36.

***Chioneosoma* (*Aleucolomus*) *porosum* (Fischer von Waldheim, 1823)**

Chioneosoma (*Aleucolomus*) *porosum*: Medvedev, 1951: 408, fig. 56, 822, 823. *Chioneosoma porosum*: Ilyinskiy, 1962: 198, fig. 500.

***Chioneosoma* (*Aleucolomus*) *vulpinum* (Gyllenhal, 1817)**

Chioneosoma vulpinum: Medvedev, 1967: 1105, fig. 1-8; Medvedev, 1976: 528, fig. 129 (13).

***Chioneosoma* (*Chionotrogus*) *astrachanicum* (Semenov, 1902)**

Chioneosoma astrachanicum: Skopina, 1966: 300, fig. 1, 2.

***Chioneosoma* (*Chionotrogus*) *pulvereum* (Knoch, 1801)**

Chioneosoma pulvereum: Golovianko, 1936: fig. 47; Ilyinskiy, 1948: 228, fig. XL (2); Medvedev, 1952b: 116, fig. 231-234; Ilyinskiy, 1962: 198, fig. 501; Ghilarov, 1964: 315, fig. 244 (1, 2); Medvedev, 1976: 530, fig. 130 (1), 132 (7). *Chioneosoma* (*Chionotrogus*) *pulvereum*: Medvedev, 1951: 415, fig. 57, 824-826.

***Eotrichia niponensis* (Lewis, 1895)**

Eotrichia titanis: Medvedev, 1951: 309, fig. 55; Medvedev, 1952b: 111, fig. 225-226; Kalinina, 1979b: 114, fig. 7-11; Shabalin, 2014: 106, fig. 38. *Holotrichia* (*Eotrichia*) *titanis*: Zhang, 1984: 79, fig. XVIII (262-265). *Holotrichia titanis*: Murayama, 1931: 45, fig. 32, 58, 75 (a, b), 98. *Ancylonycha titanis*: Böving, 1942: 175.

***Holochelus* (*Miltotrogus*) *aequinoctialis* (Herbst, 1790)**

Rhizotrogus aequinoctialis: Schaerffenberg, 1941: 29, fig. 8; Ilyinskiy, 1948: 230, fig. XL (4); Medvedev, 1952b: 125, fig. 255-259; Ilyinskiy, 1962: 200, fig. 508; Ghilarov, 1964: 318, fig. 244 (6). *Rhizotrogus* (*Rhizotrogus*) *aequinoctialis*: Medvedev, 1951: 365, fig. 64, 663. *Miltotrogus aequinoctialis*: Medvedev, 1976: 527, fig. 129 (5), 132 (5); Klausnitzer & Krell, 1996: 65, fig. 30.

***Holochelus* (*Miltotrogus*) *brenskei* (Reitter, 1888)**

Rhizotrogus brenskei: Medvedev, 1952b: 127; Ilyinskiy, 1962: 200.

***Holochelus* (*Miltotrogus*) *tataricus* (Faldermann, 1835)**

Rhizotrogus arcilabris: Medvedev, 1952b: 125, fig. 254; Ilyinskiy, 1962: 200, fig. 506. *Rhizotrogus* (*Miltotrogus*) *arcilabris*: Medvedev, 1951: 359, fig.62.

***Holochelus* (*Miltotrogus*) *vernus* (Germar, 1823).**

Rhizotrogus vernus: Ilyinskiy, 1948: 230, fig.XL (5); Medvedev, 1952b: 124, fig. 253; Ilyinskiy, 1962: 200, fig. 505; Ghilarov,1964: 317, fig. 244 (5). *Rhizotrogus* (*Miltotrogus*) *vernus*: Medvedev, 1951: 357, fig. 63. *Miltotrogus vernus*: Medvedev, 1976: 526, fig.129 (7); Klausnitzer & Krell, 1996: 65, fig. 31.

***Holochelus* (*Miltotrogus*) *vulpinus* (Burmeister, 1855)**

Rhizotrogus (*Miltotrogus*) *tauricus*: Maltzev, 1966: 145, fig. 7-12. *Rhizotrogus tauricus*: Medvedev, 1952b: 127; Ilyinskiy, 1962: 200; Ghilarov, 1964: 317.

***Lachnota henningii* (Fischer von Waldheim, 1823)**

Lachnota henningii: Galkin, 1958: fig. 2 (1); Ilyinskiy, 1962: 204; Galkin, 1966: 1727, fig. Б (1-3); Medvedev, 1976: 523, fig. 128 (4).

***Lasiopsis canina* (Zoubkov, 1829)**

Lasiopsis caninus: Ghilarov, 1964: 315, fig.245 (8); Medvedev, 1976: 526, fig. 129 (4). *Lasiopsis* (*Lasiopsis*) *caninus*: Skopin, 1958: 304, fig. 3 (1, 2).

***Monotropus nordmanni* (Blanchard, 1851)**

Monotropus nordmanni: Golovianko, 1936: 28, fig. 16; Ilyinskiy, 1948: 231, fig. XL (7); Medvedev, 1951: 501, fig. 7 1, 952, 953; Medvedev, 1952b: 137, fig. 289-294; Ilyinskiy, 1962: 202, fig. 509; Ghilarov, 1964: 316, fig. 245 (9, 10); Medvedev, 1976: 524, fig. 129 (3).

***Nigrotrichia gebleri* (Faldermann, 1835)**

Holotrichia diomphalia: Murayama, 1931: 38, fig. 20, 30, 44 (a, b), 57 (a, b), 78 (a, b), 90 (a-c), 97; Medvedev, 1952b: 110, fig. 221-224; Ilyinskiy, 1962: 197, fig. 498; Medvedev, 1976: 522, fig. 127 (5); Zhang, Sun, 1983: 91, fig. A (1-3); Shabalin, 2014: 109, fig. 39. *Holotrichia* (*Holotrichia*) *diomphalia*: Medvedev, 1951: 301, fig. 54, 558, 559; Zhang, 1984: 78. *Holotrichia* (*Holotrichia*) *oblita*: Zhang, 1984: 77, fig. II (18), III (33), XVIII (258-261b). *Ancylonycha diomphalia*: Böving, 1942: 174.

***Nigrotrichia ernesti* (Reitter, 1902)**

Holotrichia ernesti: Zhang & Sun, 1983: 92, fig. B (1-3); Shabalin, 2014: 111, fig. 40.

***Nigrotrichia kiotonensis* (Brenske, 1894)**

Lachnosterna kiotonensis: Sawada, 1991: Pl. I (upper), X, XIV (2), XXVI (1), XXIX (2), XXXVII (7), LV (2), LXI (6), LXIII (1), LXX (1), LXXII (1), LXXIV (1), LXXXI, CXXV (1), CXXXI (1), CXL (1). *Holotrichia kiotonensis*: Shabalin, 2014: 113, fig. 41.

***Pedinotrichia parallela* (Motschulsky, 1854)**

Holotrichia parallela: Medvedev, 1952b: 109, fig. 219-220; Ilyinskiy, 1962: 198, fig. 499; Zhang & Sun, 1983: 92, fig. D (1-3); Shabalin, 2014: 118, fig. 43. *Holotrichia morosa*: Murayama, 1931: 41, fig. 7, 14, 21, 31, 45 (a, b), 74 (a, b). *Holotrichia* (*Holotrichia*) *parallela*: Medvedev, 1951: 297, fig. 53; Zhang, 1984: 76, fig. 5, I (7), XVII (255-257). *Lachnosterna morosa*: Sawada, 1991: Pl. XV (2), XXVI (4), XXIX (5), XXXVIII (3), LV (3), LXI (9), LXIV (4), LXXI (1), LXXII (2), LXXIV (4), LXXXII, CXXV (4), CXXXI (4), CXLI (1). *Ancylonycha morosa*: Böving, 1942: 174.

***Pedinotrichia picea* (Waterhouse, 1875)**

Holotrichia picea: Zhang & Sun, 1983: 92, fig. C (1-3); Shabalin, 2014: 116, fig. 42. *Lachnosterna picea:* Sawada, 1991: Pl. XV (3), XXVI (5), XXX (1), XXXVIII (4), LVII (2), LXI (10), LXIV (3), LXXIV (5), CXXV (5), CXXXI (5), CXLI (2).

***Rhizotrogus aestivus* (Olivier, 1789)**

Rhizotrogus aestivus: Schaerffenberg, 1941: 29, fig. 7; Janssens, 1947: fig. 18; Ilyinskiy, 1948: 230, fig. XL (6); Medvedev, 1952b: 122, fig. 246-252; Ilyinskiy, 1962: 199, fig. 504; Ghilarov, 1964: 317, fig. 244 (3, 4); Medvedev, 1976: 526, fig. 129 (5); Klausnitzer & Krell, 1996: 67, fig. 32, 33. *Rhizotrogus* (*Rhizotrogus*) *aestivus*: Medvedev, 1951: 346, fig. 61.

***Sophrops heydeni* (Brenske, 1892)**

Sophrops heydeni: Zhang, 1984: 80, fig. XVIII (266-269b); Shabalin & Vas'ko, 2011: 45, fig. 1-6; Shabalin, 2014: 105, fig. 37.

***Testeceitrichia sichotana* (Brenske, 1897)**

Holotrichia sichotana: Shabalin, 2014: 121, fig.44.

***Trematodes tenebrioides* (Pallas, 1781)**

Trematodes tenebrioides: Zhang, 1984: 80, fig. XVIII (270-272).

Tribe Sericini Kirby, 1837

The tribe comprises five genera in the fauna of Russia, for four of which the larvae are known: *Maladera* 9(7), *Nipponoserica* 2(1), *Omaloplia* 3(2), *Serica* 4(1), *Sericania* 3(0).

***Maladera* (*Amaladera*) *euphorbiae* (Burmeister, 1855)**

Amaladera euphorbiae: Medvedev, 1952b: 236, fig. 529-532; Ilyinskiy, 1962: 205, fig. 517; Medvedev, 1976: 532, fig. 130 (12).

***Maladera* (*Cephaloserica*) *formosae* (Brenske, 1898)**

Maladera japonica: Medvedev, 1952b: 150, fig.319; Ilyinskiy, 1962: 205, fig. 516; Medvedev, 1976: 532, fig. 130 (9). *Maladera castanea*: Sawada, 1991: Pl. III (upper), XVII (4), XXXI (5), XLII (2, 4), XCIV, CXXXVII (1), CXXXIII (2), CXLVI (3); Shabalin, 2014: 73, fig. 25. *Maladera* (*Aserica*) *japonica*: Medvedev, 1952a: 137.

***Maladera* (*Cycloserica*) *arenicola* (Solsky, 1876)**

Leucoserica arenicola: Medvedev, 1956b: 558, fig. 2 (1-4).

***Maladera* (*Macroserica*) *punctatissima* (Faldermann, 1835)**

Maladera (*Aserica*) *punctatissima*: Medvedev & Dzhambazishvily, 1974: 717.

***Maladera* (*Maladera*) *holosericea* (Scopoli, 1772)**

Maladera holosericea: Golovianko, 1936: 29, fig. 20; Korschefsky, 1940: 47; Janssens, 1947: fig. 16; Ilyinskiy, 1948: 233, fig. XLI (3); Medvedev, 1951: fig. 76; Medvedev, 1952b: 148, fig. 316-317; Ilyinskiy, 1962: 206, fig. 518; Ghilarov, 1964: 320, fig. 246 (2); Medvedev, 1976: 532, fig. 130 (10); Klausnitzer & Krell, 1996: 62, fig. 28. *Maladera* (*Maladera*) *holosericea*: Medvedev, 1952a: 132, fig. 194.

***Maladera* (*Maladera*) *renardi* (Ballion, 1871)**

Maladera renardi: Medvedev, 1952b: 150, fig. 317; Medvedev, 1976: 532, fig. 130 (11); Shabalin et al., 2013: 272, fig. 1-5; Shabalin, 2014: 77, fig. 27.

***Maladera* (*Omaladera*) *orientalis* (Motschulsky, 1858)**

Maladera (*Aserica*) *orientalis*: Medvedev, 1952a: 136, fig. 195. *Serica orientalis*: Murayama, 1931: 20, fig. 16, 27, 42 (a, b), 53 (a, b), 69 (a, b), 87 (a-c), 93 (a, b); Zhang, 1984: 91, fig. 16, II (22), III (36), XXI (308-310b). *Maladera orientalis*: Medvedev, 1951: fig. 77; Medvedev, 1952b: 150, fig. 320-321; Medvedev, 1976: 532; Sun & Zhang, 1982: 323, fig. 1 (a-c); Sawada, 1991: Pl. XVII (3), XLII (1), LVIII (1), LXIII (6), LXXV (6), XCII, CXXVI (7), CXXXII (8), CXLVI (1); Shabalin, 2014: 74, fig. 26.

***Nipponoserica koltzei* (Reitter, 1897)**

Serica koltzei: Kalinina, 1979b: 111, fig. 1, 2. *Nipponoserica koltzei*: Shabalin, 2014: 80, fig. 28.

***Omaloplia* (*Acarina*) *spiraeae* (Pallas, 1776)**

Homaloplia spiraeae: Medvedev, 1951: fig. 78; Medvedev, 1952a: 174, fig. 242, 243; Medvedev, 1952b: 152, fig. 322-325; Ilyinskiy, 1962: 206, fig. 520; Ghilarov, 1964: 320, fig. 246 (3); Medvedev, 1976: 533, fig. 130 (13). *Homaloplia adulta*: Medvedev, 1951: fig. 79.

***Omaloplia* (*Omaloplia*) *ruricola* (Fabricius, 1775)**

Homaloplia ruricola: Ilyinskiy, 1948: 233, fig. XLI (4); Medvedev, 1952b: 152; Ghilarov, 1964: 320.

***Serica* (*Serica*) *brunnea* (Linnaeus, 1758)**

Serica brunnea: Golovianko, 1913: 18, Tab. I, fig. 36, 37; Golovianko, 1936: 29, fig. 19; Korschefsky, 1940: 47, fig. 10; Emden, 1941: 125; Janssens, 1947: fig. 15; Ilyinskiy, 1948: 233, fig. XLI (2); Medvedev, 1952a: 105, fig. 138; Medvedev, 1952b: 146, fig. 309-315; Ilyinskiy, 1962: 205, fig. 515; Ghilarov, 1964: 319, fig. 246 (1); Medvedev, 1976: 532, fig. 130 (8). *Serica brunna*: Klausnitzer & Krell, 1996: 62, fig. 25-27.

Subfamily Rutelinae W.S. Macleay, 1819

The subfamily comprises two tribes in Russia, the larvae are known for all of them.

Tribe Adoretini Burmeister, 1844

The tribe comprises one genus in the fauna of Russia, the larva of which is known: *Adoretus* 2(2).

***Adoretus (Adoretus) discolor* (Faldermann, 1835)**

Adoretus discolor: Medvedev, 1952b: 86, fig. 177-181; Ilyinskiy, 1962: 208, fig. 525, 526; Ghilarov, 1964: 307, fig. 241 (7, 8); Medvedev, 1976: 512, fig. 124 (8, 9). *Adoretus* (*Adoretus*) *discolor*: Medvedev, 1949: 320, fig. 530, 531, 540.

***Adoretus (Adoretus) nigrifrons* (Steven, 1809)**

Adoretus nigrifrons: Medvedev, 1952b: 87; Ilyinskiy, 1962: 208; Ghilarov, 1964: 307.

Tribe Anomalini Streubel, 1839

The tribe comprises 11 genera in the fauna of Russia, the larvae are known for all of them: *Anisoplia* 10(4), *Brancoplia* 6(1), *Chaetopteroplia* 1(1), *Anomala* 13(11), *Blitopertha* 2(2), *Cyriopertha* 2(1), *Exomala* 3(3), *Mimela* 6(4), *Phyllopertha* 2(1), *Proagopertha* 1(1), *Popillia* 4(4).

***Anisoplia* (*Anisoplia*) *agricola* (Poda, 1761)**

Anisoplia agricola: Golovianko, 1936: 24; Medvedev, 1952b: 83; Ilyinskiy, 1962: 216; Ghilarov, 1964: 310; Medvedev, 1976: 518; Klausnitzer & Krell, 1996: 71. *Anisoplia* (*Anisoplia*) *agricola*: Medvedev, 1949: 299.

***Anisoplia* (*Anisoplia*) *deserticola* Fischer von Waldheim, 1824**

Anisoplia deserticola: Golovianko, 1913: 12, Tab. I, fig. 27, 28; Golovianko, 1936: 24, fig. 11, 12; Ilyinskiy, 1948: 225, fig. XXXIX (1, 2); Medvedev, 1952b: 85, fig. 175-176; Ilyinskiy, 1962: 216, fig. 534, 535; Ghilarov, 1964: 310, fig. 241 (5, 6); Medvedev, 1976: 518, fig. 126 (9, 10). *Anisoplia* (*Ammanisoplia*) *deserticola*: Medvedev, 1949: 306, fig. 546, 547.

***Anisoplia* (*Anisoplia*) *signata* Faldermann, 1835**

Anisoplia signata: Dzhambazishvily & Medvedev, 1974: 16, fig. 3 (1-6).

***Anisoplia* (*Autanisoplia*) *austriaca* (Herbst, 1783)**

Anisoplia austriaca: Golovianko, 1936: 24; Golovianko, 1936: 24, fig. 9, 10; Schaerffenberg, 1941: 30, fig. 10; Ilyinskiy, 1948: 225, fig. XXXIX (3, 4); Medvedev, 1952b: 81, fig. 165-169; Ilyinskiy, 1962: 216, fig. 536, 537; Ghilarov, 1964: 310, fig. 241 (3, 4); Medvedev, 1976: 518, fig. 126 (7, 8); Klausnitzer & Krell, 1996: 73, fig. 67-69. *Anisoplia* (*Autanisoplia*) *austriaca*: Medvedev, 1949: 265, fig. 526, 548, 549.

***Brancoplia leucaspis* (Laporte, 1840)**

Anisoplia leucaspis: Medvedev, 1952b: 78, fig. 154-158; Ilyinskiy, 1962: 216, fig. 533, 550; Medvedev, 1976: 516, fig. 126 (3, 4).

***Chaetopteroplia segetum* (Herbst in Fuessly, 1783)**

Anisoplia segetum: Golovianko, 1913: 12, Tab. I, fig. 25, 26; Golovianko, 1936: 25, fig. 13, 14; Korschefsky, 1940: fig. 13; Schaerffenberg, 1941: 33, fig. 17; Janssens, 1947: fig. 26; Ilyinskiy, 1948: 225, fig. XXXVIII (5, 6); Medvedev, 1952b: 80, fig. 159-164; Ilyinskiy, 1962: 216, fig. 548, 549; Ghilarov, 1964: 310, fig. 241 (1, 2); Medvedev, 1976: 517, fig.1 26 (5, 6). *Anisoplia segetum syriaca*: Maltzev, 1966: 149, fig. 22-25. *Anisoplia* (*Chaetopteroplia*) *segetum segetum*: Medvedev, 1949: 260, fig. 550, 551. *Chaetopteroplia segetum*: Klausnitzer & Krell, 1996: 73, fig. 65, 66.

***Anomala aulax* (Wiedemann, 1823)**

Anomala aulax: Zhang, 1984: 49, fig. XII (175-175b).

***Anomala cuprea* (Hope, 1839)**

Anomala cuprea: Sawada, 1991: Pl. XVIII (2), XXIV (2), XLIII (2), LXIII (8), LXXII (6), LXXVI (2), XCVI, CXXXIII (5), CXLVII (1); Shabalin, 2014: 57, fig. 18.

***Anomala dubia abchasica* Motschulsky, 1854**

Anomala abchasica: Medvedev, 1952b: 65, fig. 115-117; Ilyinskiy, 1962: 211, fig. 531, 532; Ghilarov, 1964: 309, fig. 239 (2, 3).

***Anomala dubia* (Scopoli, 1763)**

Anomala dubia aenea: Golovianko, 1936: 26, fig. 6; Janssens, 1947: fig. 24; Medvedev, 1952b: 64, fig. 114; Ilyinskiy, 1962: 211, fig. 553. *Anomala dubia*: Korschefsky, 1940: fig. 12; Ghilarov, 1964: 307, fig. 239 (1); Medvedev, 1976: 515, fig. 125 (5); Klausnitzer & Krell, 1996: 69, fig. 59, 60; Micó, Galante, 2005: 187, fig. 1-11. *Anomala* (*Anomala*) *dubia*: Medvedev, 1949: 161, fig. 552. *Anomala aenea*: Golovianko, 1913: 14, Tab. I, fig. 32; Böving, 1921: 53; Emden, 1941: 125, fig. 19; Schaerffenberg, 1941: 32, fig. 15; Ilyinskiy, 1948: 224, fig. XXXVIII (2).

***Anomala errans* (Fabricius, 1775)**

Anomala errans: Golovianko, 1936: 26, fig. 4; Schaerffenberg, 1941: 32, fig. 14; Medvedev, 1952b: 65, fig. 118-123; Ilyinskiy, 1962: 211, fig. 551, 552; Ghilarov, 1964: 309, fig. 239 (4-7);

Medvedev, 1976: 515, fig. 125 (6, 7). *Anomala* (*Psammoscaphaeus*) *errans*: Medvedev, 1949: 192, fig. 562, 563. *Anomala praticola*: Golovianko, 1913: 13, Tab. I, fig. 30, 31; Ilyinskiy, 1948: 224, fig. XXXVIII (3, 4).

***Anomala gudzenkoi* Jacobson, 1903**

Anomala gudzenkoi: Zhang, 1984: 53, fig. X (146, 148), XI (170-170a); Shabalin, 2014: 64, fig. 22.

***Anomala lucens* Ballion, 1871**

Anomala lucens: Sawada, 1991: Pl. XVIII (1), XVIII (5), XXXII (7), XLIV (2), XLIX (3), LXIII (9), LXXVI (5), XCIV, CXXXIV (3, 4), CXLVIII (2); Shabalin, 2014: 48, fig. 15.

***Anomala luculenta* Erichson, 1847**

Anomala luculenta: Medvedev, 1952b: 237, fig. 533-537; Ilyinskiy, 1962: 210, fig. 529, 530; Medvedev, 1976: 515, fig. 125 (4); Zhang, 1984: 52, fig. XII (181); Shabalin, 2014: 51, fig. 16.

***Anomala mongolica* Faldermann, 1835**

Anomala mongolica: Medvedev, 1952b: 60, fig. 105-108; Ilyinskiy, 1962: 211, fig. 554; Medvedev, 1976: 514, fig. 125 (2); Zhang, 1984: 52, fig. XI (156, 154), XII (180-180a); Shabalin, 2014: 58, fig. 19. *Anomala* (*Euchronomala*) *mongolica*: Medvedev, 1949: 138, fig. 542, 559, 561.

***Anomala ogloblini* Medvedev, 1949**

Anomala ogloblini: Kalinina, 1979b: 112, fig. 3-5; Shabalin, 2014: 61, fig. 20.

***Anomala rufocuprea* Motschulsky, 1861**

Anomala rufocuprea: Sawada, 1991: Pl. XVIII (1), XXVIII (1), XXXII (1), XLIII (1), XLIX (1), LVIII (3), LXIII (7), LXX (6), LXXVI (1), XCV, CXXVII (2), CXXXIII (4), CXLVIII (1); Shabalin, 2014: 53, fig. 17.

***Anomala viridana* (Kolbe, 1886)**

Anomala viridana: Murayama, 1931: 61, fig. 80 (a, b), 103; Medvedev, 1952b: 62, fig. 109; Ilyinskiy, 1962: 211; Medvedev, 1976: 515, fig. 125 (3); Sawada, 1991: Pl. XVIII (3), XLIII (3), CXXVII (3), CXXXIV (1), CXLVII (2); Shabalin, 2014: 63, fig. 21. *Anomala* (*Euchronomala*) *viridana*: Medvedev, 1949: 137, fig. 534.

***Blitopertha lineata* (Fabricius, 1798)**

Blitopertha lineata: Medvedev, 1952b: 71, fig. 134-139; Ilyinskiy, 1962: 212; Ghilarov, 1964: 309, fig. 240 (3-5); Medvedev, 1976: 515, fig. 125 (8, 9); Klausnitzer & Krell, 1996: 71, fig. 71-72; Micó, Galante, 2005: 190, fig. 22-32.

***Blitopertha nigripennis* (Reitter, 1888)**

Blitopertha majuscula: Medvedev, 1976: 515.

***Cyriopertha* (*Pleopertha*) *arcuata* (Gebler, 1832)**

Cyriopertha arcuata: Zhang, 1984: 57, fig. XI (153, 165), XII (172), XIII (195).

***Exomala* (*Exomala*) *pallidipennis* Reitter, 1903**

Phyllopertha pallidipennis: Murayama, 1931: 67, fig. 25, 37, 64 (a, b), 82 (a, b), 92 (a-c), 105. *Blithopertha pallidipennis*: Medvedev, 1952b: 69, fig. 130-131; Ilyinskiy, 1962: 212, fig. 556; Kalinina, 1979b: 116, fig. 12-16; Zhang, 1984: 58, fig. XIII (197). *Blithopertha* (*Exomala*) *pallidipennis*: Medvedev, 1949: 212, fig. 535, 538. *Exomala pallidipennis*: Shabalin, 2014: 68, fig. 24.

***Exomala* (*Taxipertha*) *arenicola* (Mulsant, Pellet, 1870)**

Blitopertha arenicola: Medvedev, 1952b: 73, fig. 140-145; Ilyinskiy, 1962: 212; Ghilarov, 1964: 309, fig. 240 (6-8); Medvedev, 1976: 516, fig. 125 (10, 11); Klausnitzer & Krell, 1996: 71, fig. 73.

***Exomala* (*Taxipertha*) *conspurcata* (Harold, 1878)**

Phyllopertha conspurcata: Murayama, 1931: 64, fig. 24, 36, 49, 63 (a, b), 81, 104. *Blithopertha conspurcata*: Medvedev, 1952b: 70, fig. 132-133; Ilyinskiy, 1962: 214; Zhang, 1984: 58, fig. XIII (196). *Anomala conspurcata:* Sawada, 1991: Pl. XX (3), XXIV (8), XXXIII (3), XLVII (3), LXXVII (6), CVIII, CXXVII (5), CXXXVII (2), CLII (1). *Blithopertha* (*Blithopertha*) *conspurcata*: Medvedev, 1949: 215, fig. 529, 537. *Exomala conspurcata*: Shabalin, 2014: 67, fig. 23.

***Mimela flavilabris* (Waterhouse, 1875)**

Anomala flavilabris: Sawada, 1991: Pl. XIX (4), XXIV (5), XXXII (5), XLV (2), LXXVII (1), CIV, CXXXVI (1), CXLIX (3). *Mimela flavilabris*: Shabalin, 2014: 34, fig. 10.

***Mimela holosericea* (Fabricius, 1787)**

Rhombonyx holosericea: Medvedev, 1949: 107, fig. 541, 558, 560; Medvedev, 1952b: 57, fig. 101-104; Galkin, 1961: 1041, fig. *а*, *б*, *в*; Ilyinskiy, 1962: 208, fig. 524; Ghilarov, 1964: 305, fig. 229 (1-2); Medvedev, 1976: 513, fig. 125 (1). *Anomala holoserica:* Sawada, 1991: Pl. XI, XIX (5), XLV (3), LXXVII (2), CV, CXXVII (4), CXXXVI (2), CL (1). *Mimela holosericea*: Zhang, 1984: 55, fig. XIII (192); Shabalin, 2014: 36, fig. 9.

***Mimela splendens* (Gyllenhal, 1817)**

Anomala splendens: Sawada, 1991: Pl. XIX (6), XXXII (4), XLV (4), LXIII (10), LXXVII (3), CVI, CXXXVI (3), CL (2). *Mimela splendens*: Zhang, 1984: 56, fig. XIII (193); Shabalin, 2014: 42, fig. 13.

***Mimela testaceipes* (Motschulsky, 1861)**

Anomala testaceipes: Murayama, 1931: 56, fig. 6 (a-e), 35, 61, 78, 91 (a-c), 101; Sawada, 1991: Pl. IV (upper), XIX (2), XXIV (4), XXXII (3), XLV (1), XLIX (2), LXXVI (8), CII, CXXXV (3), CXLIX (1). *Rhombonyx testaceipes*: Medvedev, 1949: 103, fig. 545. *Rhombonyx ussuriensis*: Medvedev, 1952b: 57, fig. 99, 100; Ilyinskiy, 1962: 208, fig. 522. *Rhombonyx testaceipes ussuriensis*: Kalinina, 1979a: 582, fig. 1-3. *Mimela testaceipes*: Shabalin, 2014: 39, fig. 12 (a-o).

***Phyllopertha horticola* (Linnaeus, 1758)**

Phyllopertha horticola: Golovianko, 1913: 11, Tab. I, fig. 19, 20; Böving, 1921: 53; Golovianko, 1936: 23, fig. 3; Korschefsky, 1940: 49, fig. 15; Emden, 1941: 125, fig. 4, 10, 18; Schaerffenberg, 1941: 30, fig. 11; Janssens, 1947: fig. 25; Ilyinskiy, 1948: 228, fig. XL (1);

Medvedev, 1949: 80, fig. 544; Medvedev, 1952b: 67, fig. 124-129; Ilyinskiy, 1962: 212, fig. 555; Ghilarov, 1964: 306, fig. 240 (1, 2); Medvedev, 1976: 519, fig. 126 (11); Zhang, 1984: 59, fig. XIII (199); Klausnitzer & Krell, 1996: 71, fig. 62-64; Micó & Galante, 2005: 194, fig. 44-53; Shabalin, 2014: 45, fig. 14.

***Proagopertha lucidula* (Faldermann, 1835)**

Proagopertha lucidula: Zhang, 1984: 60, fig. XI (166), XIII (188-190); Shabalin, 2014: 31, fig. 9.

***Popillia flavosellata* Fairmaire, 1886**

Popillia atrocoerulea: Murayama, 1931: 73, fig. 2, 13 (a, b), 39, 50 (a, b), 66 (a-c), 84 (a, b); Medvedev, 1949: 48, fig. 527, 528, 539; Medvedev, 1952b: 55, fig. 95-98; Ilyinskiy, 1962: 210, fig. 527, 528; Medvedev, 1976: 513, fig. 124 (11, 12); Zhang, 1984: 46, fig. 9, 10, 13, X (141-143). *Popillia flavosellata*: Shabalin, 2014: 26, fig. 7.

***Popillia japonica* Newmann, 1838**

Popillia japonica: Böving, 1921: 53, Pl. V: fig. 1-16, Pl. VI: fig. 17, 18, 21, 23-25; Nikritin & Shutova, 1969: 1889, fig. 1, 2 (1-4); Medvedev, 1976: 513, fig. 124 (13, 14); Sawada, 1991: Pl. V (upper), XX (4), XXV (1), XXXIII (4), XLVII (4), XLIX (4), LIX (1), LXII (4), LXIII (11), LXX (7), LXXII (7), LXXVII (7), CIX, CXXVII (6), CXXXVII (3), CLII (2); Shabalin, 2014: 24, fig. 6.

***Popillia mutans* Newman, 1838**

Popillia mutans: Zhang, 1984: 47, fig. 9, 10, 13, X (144-145).

***Popillia quadriguttata* (Fabricius, 1787)**

Popilla uchidai: Murayama, 1931: 71, fig. 38 (a), 65 (a-c), 83, 106. *Popillia quadriguttata:* Zhang, 1984: 47, fig. X (149-150); Shabalin, 2010: 35, fig. 2 а-д; Shabalin, 2014: 28, fig. 8.

Subfamily Dynastinae W.S. Macleay, 1819

The subfamily comprises two tribes in Russia of them the larvae are known.

Tribe Dynastini W.S. Macleay, 1819

The tribe comprises one genus in the fauna of Russia, the larva of which is known: *Trypoxylus* 1(1).

***Trypoxylus dichotomus* (Linnaeus, 1771)**

Allomyrina dichotoma: Zhang, 1984: 34, fig. 6, 7, I (8), VIII (100-103), IX (118); Sawada, 1991: P1. IV (upper), XXI (1), XXVIII (2), XXXIV (1), XLVIII (3), XLIX (7), LXVI (3), LXIX (4), LXXI (6), LXXIII (3), LXXX (3), CXI, CXXVII (8), CXXXVIII (1), CLIII (1).

Tribe Oryctini Mulsant, 1842

The tribe comprises one genus in the fauna of Russia, the larva of which is known: *Oryctes* 1(1).

***Oryctes nasicornis* (Linneus, 1758)**

Oryctes nasicornis: Golovianko, 1913: 15, Tab. II, fig. 1-7; Golovianko, 1936: 27, fig. 25, 26; Korschefsky, 1940: 47, fig. 11; Schaerffenberg, 1941: 34, fig. 21; Janssens, 1947:

fig. 21, 23; Ilyinskiy, 1948: 222, fig. XXXVII (5, 6); Medvedev, 1952b: 91, fig. 190-195; Ilyinskiy, 1962: 193, fig. 481, 482; Ghilarov, 1964: 311, fig. 242 (4, 5); Medvedev, 1976: 512, fig. 124 (2, 3); Klausnitzer & Krell, 1996: 77, fig. 88-90. *Oryctes* (*Oryctes*) *nasicornis nasicornis*: Medvedev, 1960: 70, fig. 30-34, 107-111. *Oryctes punctipennis*: Krivosheina, 1983: 541, fig. 1 (1, 3, 5, 8, 9), 2 (1, 4, 6, 7,10), 3 (1, 3, 6); Zhang, 1984: 35, fig. VIII (107-109).

Tribe Pentodontini Mulsant, 1842

The tribe comprises two genera in the fauna of Russia, the larvae are known for all of them: *Pentodon* 1(1) and *Phyllognathus* 1(1).

***Pentodon bidens* (Pallas, 1771)**

Pentodon dubius: Medvedev, 1952b: 90; Ilyinskiy, 1962: 192.

***Pentodon idiota* (Herbst, 1789)**

Pentodon idiota: Golovianko, 1936: 27, fig. 23, 24; Ilyinskiy, 1948: 222, fig. XXXVII (7); Medvedev, 1952b: 89, fig. 182-189; Medvedev, 1960: 118, fig. 230-237; Ilyinskiy, 1962: 192, fig. 483, 484; Ghilarov, 1964: 311, fig. 242 (1-3); Medvedev, 1976: 512, fig. 124 (4, 5); Klausnitzer & Krell, 1996: 77, fig. 91-93.

***Phyllognathus excavatus* (Forster, 1771)**

Phyllognathus excavatus: Maltzev, 1966: 147, fig. 17-21; Medvedev, 1976: 512, fig. 124 (6, 7).

Tribe Phileurini Burmeister, 1847

The tribe comprises one genus in the fauna of Russia, the larva of which is known: *Eophileurus* 1(1).

***Eophileurus chinensis* (Faldermann, 1835)**

Eophileurus chinensis: Zhang, 1984: 36, fig. VIII (112-114); Sawada, 1991: P1. XXI (2), XXV (3), XXXIV (2), XLVIII (4), XLIX (4), XLIX (8), LX (1), LXII (7), LXIII (14), LXXII (10), LXXVIII (6), CXII, CXXVIII (1), CLIII (2); Shabalin, 2014: 19, fig. 5.

Subfamily Cetoniinae Leach, 1815

The subfamily comprises six tribes in Russia, the larvae are known for all of them.

Tribe Cetoniini Leach, 1815

The tribe comprises six genera in the fauna of Russia, the larvae are known for all of them: *Cetonia* 5(4), *Gametis* 1(1), *Glycyphana* 1(1), *Protaetia* 16(14), *Tropinota* 4(1), *Oxythyrea* 3(2).

***Cetonia* (*Cetonia*) *aurata* (Linnaeus, 1761)**

Cetonia aurata: Golovianko, 1913: 18, Tab. II, fig. 12-18, Tab. III, fig. 15; Golovianko, 1936: 30, fig. 27, 28б 51, 52; Korschefsky, 1940: 50 fig. 23, 23a; Emden, 1941: 126, fig. 5, 8; Schaerffenberg, 1941: 31, fig. 12; Janssens, 1947: fig. 7, 29; Ilyinskiy, 1948: 221, fig. XXXVII (3); Medvedev, 1952b: 176, fig. 376-385; Ghilarov, 1964: 325, fig. 251 (1-5); Medvedev, 1976: 535, fig. 131 (5); Klausnitzer & Krell, 1996: 79, fig. 100-107. *Cetonia* (*Cetonia*)

aurata: Medvedev, 1964: 140, fig. 272-278. *Valgus hemipterus* auct.: Medvedev, 1952b: 165, fig. 354-357; Ghilarov, 1964: 324, fig. 247 (4-6); Medvedev, 1964: 352, fig. 838-841.

***Cetonia* (*Eucetonia*) *magnifica* Ballion, 1871**

Cetonia magnifica: Medvedev, 1952b: 178; Fang et al., 2000: 512, Pl. 1, fig. 1-3; Shabalin, 2014: 154, fig. 56.

***Cetonia* (*Eucetonia*) *roelofsi* Harold, 1880**

Cetonia roelofsi: Sawada, 1991: Pl. VI (lower), XII, XXI (3), XXV (4), XXXIV (3), L (1), LII (4), LXI (2), LXII (8), LXIII (15), LXXVIII (2), CXIII, CXXVIII (2), CXXXVIII (2), CLIV (1); Shabalin, 2014: 156, fig. 57.

***Cetonia* (*Eucetonia*) *viridiopaca* (Motschulsky, 1858)**

Cetonia viridiopaca: Shabalin, 2014: 158, fig. 58.

***Gametis jucunda* (Faldermann, 1835)**

Oxycetonia jucunda: Murayama, 1931: 79, fig. 41 (a, b), 52 (a, b), 68 (a, b), 86 (a, b), 108 (a-c); Medvedev, 1952b: 174, fig. 374, 375; Medvedev, 1964: 321, fig. 761-762; Zhang, 1984: 28, fig. VI (74-76); Sawada, 1991: Pl. XXI (4), XXVIII (3), XXXIV (4), L (2), LXII (9), LXVII (1), LXVIII (3), LXXI (7), LXXIII (4), LXXX (1), CXIV, CXXVIII (3), CXXXVIII (3), CLIV (2). *Gametis jucunda*: Shabalin, 2014: 164, fig. 60.

***Glycyphana* (*Glycyphana*) *fulvistemma* Motschulsky, 1858**

Glycyphana fulvistemma: Medvedev, 1952b: 173, fig. 370-373; Medvedev, 1964: 314, fig. 747-750; Zhang, 1984: 29, fig. VI (77-79); Shabalin, 2014: 162, fig. 59.

***Protaetia* (*Calopotosia*) *orientalis* (Gory et Percheron, 1833)**

Protaetia orientalis: Sawada, 1991: Pl. VII (upper), XII, XXI (5), XXVIII (4), XXXIV (5), L (3), LXVII (2), LXVIII (4), LXIX (5), LXXI (8), LXXIII (5), LXXX (2), CXV, CXXVIII (4), CXXXVIII (4), CLV (1); Shabalin, 2014: 169, fig. 61. *Protaetia orientalis submarmorea*: Kim et al., 2003: 232, fig. 3-9, 11, 14, 18, 19.

***Protaetia* (*Cetonischema*) *speciosissima* (Scopoli, 1786)**

Potosia (*Cetonischema*) *aeruginosa*: Medvedev, 1952b: 185, fig. 406-410; Medvedev, 1964: 197, fig. 395-399. *Potosia aeruginosa*: Korschefsky, 1940: 51 fig. 22, 22a; Ghilarov, 1964: 329, fig. 251 (11-13). *Protaetia aeruginosa*: Klausnitzer & Krell, 1996: 81, fig. 111-114.

***Protaetia* (*Cetonischema*) *speciosa* (Adams, 1817)**

Potosia (*Cetonischema*) *speciosa speciosa*: Shabalin & Tsarkov, 2020: 21, fig. 1-11.

***Protaetia* (*Chrysopotosia*) *mandschuriensis* (Schürhoff, 1933)**

Calopotosia nitididorsis: Medvedev, 1952b: 182, fig. 400-405. *Protaetia mandschuriensis*: Kim et al., 2003: 234, fig. 12, 15, 20, 21; Shabalin, 2014: 177, fig. 64. *Potosia* (*Calopotosia*) *nitididorsis*: Medvedev, 1964: 192, fig. 375-380.

***Protaetia* (*Eupotosia*) *affinis* (Andersch, 1797)**

Potosia (*Eupotosia*) *affinis*: Medvedev, Dzhambazishvily, 1974: 719. *Protaetia affinis*: Klausnitzer & Krell, 1996: 82, fig. 126b. *Protaetia* (*Eupotosia*) *affinis affinis*: Vasko, 2007: 344, fig. 1-12.

***Protaetia* (*Liocola*) *brevitarsis* (Lewis, 1879)**

Liocola brevitarsis: Murayama, 1931: 75, fig. 9, 10, 26, 40, 51 (a-e), 67 (a-c), 85 (a, b), 107, 109; Medvedev, 1952b: 180, fig. 392-399. *Potosia* (*Liocola*) *brevitarsis*: Medvedev, 1964: 186, fig. 356-363; Zhang, 1984: 27, fig. I (9), II (15), III (29), VI (70-73d). *Protaetia brevitarsis seulensis*: Kim et al., 2003: 232, fig. 1, 2, 10, 13, 16, 17. *Protaetia brevitarsis*: Shabalin, 2014: 179, fig. 65.

Protaetia (*Liocola*) *insperata* (Lewis, 1879)

Protaetia (*Liocola*) *insperata*: Shabalin, 2022: 18, fig. 1-11.

***Protaetia* (*Liocola*) *marmorata* (Fabricius, 1793)**

Liocola lugubris: Medvedev, 1952b: 179, fig. 386-391; Ghilarov, 1964: 327, fig. 251 (7-10). *Protaetia marmorata*: Shabalin, 2014: 172, fig. 62. *Protaetia lugubris*: Klausnitzer & Krell, 1996: 81, fig. 108-110. *Potosia* (*Liocola*) *lugubris*: Medvedev, 1964: 181, fig. 341-346.

***Protaetia* (*Netocia*) *karelini* (Zoubkov, 1829)**

Potosia (*Netocia*) *karelini*: Medvedev, 1952b: 194, fig. 436-440; Medvedev, 1964: 289, fig .664-668. *Potosia karelini*: Ghilarov, 1964: 330, fig. 253 (1-3); Medvedev, 1976: 536, fig. 131 (8).

***Protaetia* (*Netocia*) *trojana* (Gory et Percheron, 1833)**

Potosia (*Netocia*) *trojana:* Medvedev, 1952b: 193, fig. 431-435. *Potosia* (*Netocia*) *trojana godeti*: Medvedev, 1964: 265, fig. 591-595.

***Protaetia* (*Philhelena*) *ungarica* (Herbst, 1790)**

Potosia (*Netocia*) *hungarica*: Medvedev, 1952b: 191, fig. 425-430. *Potosia* (*Netocia*) *hungarica hungarica*: Medvedev, 1964: 269, fig. 612-617. *Potosia hungarica*: Ghilarov, 1964: 330, fig. 252 (7-9); Medvedev, 1976: 536, fig. 131 (7). *Protaetia ungarica*: Klausnitzer & Krell, 1996: 81, fig. 115-117.

***Protaetia* (*Potosia*) *cuprea (*Fabricius, 1775)**

Potosia (*Potosia*) *metallica*: Medvedev, 1952b: 188, fig. 414-419; Medvedev, 1964: 220, fig. 459-464. *Potosia metallica*: Ghilarov, 1964: 329, fig.252 (1-3); Medvedev, 1976: 535, fig. 131 (6). *Protaetia metallica*: Shabalin, 2014: 174, fig. 63. *Protaetia cuprea metallica*: Klausnitzer & Krell, 1996: 82, fig. 118-121, 125, 126.

***Protaetia* (*Potosia*) *famelica (*Janson, 1878)**

Protaetia (*Potosia*) *famelica*: Shabalin, 2018: 397, fig. a-m.

***Protaetia* (*Potosia*) *fieberi* (Kraatz, 1880)**

Protaetia fieberi: Klausnitzer, Krell, 1996: 82. *Potosia fieberi borystenica*: Medvedev, 1952b: 190, fig. 420-424; Ghilarov, 1964: 329, fig. 252 (4-6). *Potosia* (*Potosia*) *fieberi borystenica*: Medvedev, 1964: 240, fig. 510-514. *Protaetia fieberi borystenica*: Klausnitzer & Krell, 1996: 82, fig. 122-124.

***Tropinota* (*Epicometis*) *hirta* (Poda, 1761)**

Tropinota hirta: Janssens, 1947: fig. 31; Ilyinskiy, 1948: 221, fig. XXXVII (4); Klausnitzer & Krell, 1996: 79, fig. 97-99. *Epicometis hirta*: Golovianko, 1913: 18, Tab. II, fig. 19-21; Golovianko, 1936: 31, fig.29; Korschefsky, 1940: 50, fig. 19; Medvedev, 1952b: 169, fig. 358-361; Ilyinskiy, 1962: 218, fig. 560; Ghilarov, 1964: 325, fig. 250 (1, 2); Medvedev, 1976: 534, fig. 131 (1). *Tropinota* (*Epicometis*) *hirta*: Schaerffenberg, 1941: 33, fig. 18. *Epicometis* (*Epicometis*) *hirta*: Medvedev, 1964: 92, fig. 150-153.

***Oxythyrea cinctella* (Schaum, 1841)**

Oxythyrea cinctella: Golovianko, 1936: 31; Medvedev, 1952b: 172, fig. 366-369; Ilyinskiy, 1962: 220, fig. 562, 564; Ghilarov, 1964: 328, fig. 250 (5, 6); Medvedev, 1964: 119, fig. 211-214; Medvedev, 1976: 535, fig. 131 (4); Vondráček et al., 2018:417, fig. 3C; 4C, L; 5C, L; 6C, L; 7C, I; 8F, L; 10C, L; 11C, K; 12C, L.

***Oxythyrea funesta* (Poda, 1761)**

Oxythyrea funesta: Korschefsky, 1940: 50, fig. 18; Janssens, 1947: fig. 30; Ilyinskiy, 1948: 221; Medvedev, 1952b: 171, fig. 362-365; Ilyinskiy, 1962: 220, fig. 561, 563; Ghilarov, 1964: 328, fig. 250 (3, 4); Medvedev, 1964: 110, fig. 183-186; Medvedev, 1976: 535, fig. 131 (3); Klausnitzer & Krell, 1996: 79, fig. 94-96; Micó & Galante 2003: 96, fig. 14–26; Vondráček et al., 2018: 418, fig. 3E; 4E, N; 5E, N; 6E, N; 7E, K; 9B, H; 10E, N; 11E, M; 12E, N. *Oxythyrea stictica*: Golovianko, 1913: 19, Tab. II, fig. 22.

Tribe Cremastocheilini Burmeister & Schaum, 1841

The tribe comprises one genus in the fauna of Russia, the larva of which is known: *Clinterocera* 1(1).

***Clinterocera scabrosa* (Motschulsky, 1854)**

Clinterocera scabrosa: Shabalin, 2019: 15, fig. a-j.

Tribe Diplognathini Burmeister, 1842

The tribe comprises one genus in the fauna of Russia, the larva of which is known: *Anthracophora* 1(1).

***Anthracophora rusticola* Burmeister, 1842**

Poecilophilides rusticola: Zhang, 1984: 29, fig. VI (80-83); Kalinina & Shabalin, 2004: 95, fig. 1-3. *Anthracophora rusticola*: Kalinina & Shabalin, 2008: 422, fig. 1-4; Shabalin, 2014: 183, fig. 66.

Tribe Osmodermatini Schenkling, 1922

The tribe comprises one genus in the fauna of Russia, the larva of which is known: *Osmoderma* 5(4).

***Osmoderma barnabita* Motschulsky, 1845**

Osmoderma eremita: Golovianko, 1936: 31, fig. 30, 50; Korschefsky, 1940: 50; Schaerffenberg, 1941: 35, fig. 22; Janssens, 1947: fig. 22, 28; Medvedev, 1952b: 160, fig. 337-341; Medvedev, 1960: 380, fig. 980-984; Ghilarov, 1964: 321, fig. 247 (1, 2); Klausnitzer & Krell, 1996: 85, fig. 134, 136. *Osmoderma eremitum*: Tauzin, 1994: 224, fig. 57-60.

***Osmoderma caeleste* (Gusakov, 2002)**

Osmoderma caeleste: Shabalin, 2014: 150, fig. 55.

***Osmoderma davidis* Fairmaire, 1887**

Osmoderma davidis: Shabalin & Bezborodov, 2009: 1202, fig. 1 *a-e*; Shabalin, 2014: 148, fig. 54.

***Osmoderma opicum* Lewis, 1887**

Osmoderma opica: Sawada, 1991: Pl. VIII (upper), XXII (5), XXVIII (6), XXXV (5), LI (4), LII (2), LXVIII (5), LXIX (7), LXXI (10), LXXIII (8), LXXIX (1), CXVIII, CXXVIII (8), CXXXVIII (8), CLIV (3).

Tribe Trichiini Fleming, 1821

The tribe comprises three genera in the fauna of Russia, the larvae are known for all of them: *Gnorimus* 5(5), *Lasiotrichius* 1(1), *Trichius* 3(3).

***Gnorimus bartelsi* Faldermann, 1835**

Gnorimus bartelsi: Kurtsheva, 1958: 366, fig. 6; Ghilarov, 1964: 323, fig. 249 (1-5). *Aleurostictus bartelsi*: Tauzin, 2000: 263, fig. 45.

***Gnorimus nobilis* (Linnaeus, 1758)**

Gnorimus nobilis: Golovianko, 1913: 20, Tab. III, fig.1-9; Golovianko, 1936: 32, fig. 31; Korschefsky, 1940: 49 fig. 21; Emden, 1941: 126; Schaerffenberg, 1941: 31, fig. 13; Janssens, 1947: fig. 27; Medvedev, 1952b: 161, fig. 342-346; Kurtsheva, 1958: 367; Medvedev, 1960: 332, fig. 825-829; Ghilarov, 1964: 323, fig. 248 (1-4); Klausnitzer & Krell, 1996: 85, fig. 137-141. *Aleurostictus nobilis*: Tauzin, 2000: 263, fig. 43.

***Gnorimus subopacus* Motschulsky, 1860**

Gnorimus subopacus: Zhang, 1984: 32, fig. VII (94-95); Shabalin & Bezborodov, 2009: 1202, fig. 2; Shabalin, 2014: 135, fig. 49.

***Gnorimus variabilis* (Linnaeus, 1758)**

Gnorimus octopunctatus: Korschefsky, 1940: 49, fig. 20; Medvedev, 1952b: 163, fig. 347-349; Kurtsheva, 1958: 367; Medvedev, 1960: 336, fig. 841, 842; Ghilarov, 1964: 323, fig. 248 (5, 6). *Gnorimus variabilis*: Emden, 1941: 126; Klausnitzer & Krell, 1996: 86, fig. 141-144. *Aleurostictus variabilis*: Tauzin, 2000: 263, fig. 44.

***Gnorimus viridiopacus* (Lewis, 1887)**

Gnorimus viridiopacus: Sawada, 1991: Pl. XXIII (5), Pl. XXV (9), XXXVI (5), LII (3), LIV (2), LX (3), LXII (16), LXIII (18), LXX (9), CXXIII, CLVII (3); Shabalin, 2014: 137, fig. 50.

***Lasiotrichius succinctus* (Pallas 1781)**

Lasiotrichius succinctus: Zhang, 1984: 32, fig. II (16), III (30), VII (96-99); Shabalin & Bezborodov, 2009: 1203, fig. 2 *a-e*; Shabalin, 2014: 140, fig. 51. *Trichius succinctus:* Sawada, 1991: Pl. XXII (6), XXVIII (7), XXXV (6), LIII (1), LXII (11), LXVIII (6), LXIX (1), LXXIII (9), LXXIX (2), CXIX, CXXIX (1), CXXXIX (1), CLVI (1).

***Trichius fasciatus* (Linnaeus, 1758)**

Trichius fasciatus: Emden, 1941: 126; Medvedev, 1952b: 163, fig. 350-353; Medvedev, 1960: 357, fig. 906-909; Ghilarov, 1964: 322, fig. 247 (3); Klausnitzer & Krell, 1996: 87, fig. 145; Shabalin, 2014: 142, fig.52 (а-г).

***Trichius japonicus* Janson, 1885**

Trichius japonicus: Sawada, 1991: Pl. XXIII (1), XXVIII (8), XXXVI (1), LIII (2), LXII (12), LXXIX (3), CXX, CXXIX (2), CXXXIX (2), CLVI (2); Shabalin, 2014: 145, fig. 53.

***Trichius orientalis* Reitter, 1894**

Trichius orientalis: Golovianko, 1913: 20, Tab. III, fig. 10-14; Golovianko, 1936: 32, fig. 32; Medvedev, 1952b: 165; Ghilarov, 1964: 322.

Tribe Valgini Mulsant, 1842

The tribe comprises one genus in the fauna of Russia, the larva of which is known: *Valgus* 2(1).

***Valgus hemipterus* (Linnaeus, 1758)**

Valgus hemipterus: Medvedev, 1969: 173, fig. 1-15; Klausnitzer & Krell, 1996: 84, fig. 127-132; Shabalin, 2014: 131, fig. 48.

DISCUSSION

In total, five subfamilies, 19 tribes, and 61 genera of the Pleurosticti scarab beetles occuring in Russia are registered. In the literature, the preimaginal stages of the majority of these taxa are treated, either as formal descriptions or in diagnostic keys. Only Dynamopodinae, represented in Russia by the tribe Dynamopodini and genus *Orubesa*, is unknown from larvae. All other subfamilies and tribes include taxa which larvae are mentioned in the literature. Regarding the genera, of the 61 genera known from the fauna of Russia, 56 of them include species for which larvae have been described. However, the analysis of the literature available demonstrates that our knowledge about preimaginal stages is still very limited. The major issues related to this are listed below.

The large part of the larval descriptions is based on a few, or a small set of characters. The most widely used are the setation of the anal sternite ("raster") and the size of spiracles. Other characters, specifically those of mouthparts, are not described for most species.

In few publications, the method of the association of larvae and adults is explicitly described. Kalinina (1983), Shabalin (2014, 2018, 2019) and Shabalin and Bezborodov (2009) wrote that their works were based on the immatures obtained in captivity from the identified adults. In other cases the authors seem to identify the larvae species based on the scarab species recorded from the region studied or collected in the same place. This method is potentially prone to errors in the case of insufficiently known local faunas or if a number of closely related

species occur in the same place. No authors of the listed works used molecular methods for the larvae identification. This is not surprising, however, because most of the works were done before the diagnostic value of genetic markers, notably the COI mitochondrial gene, was recognized and the methods of utilizing DNA "barcodes" became readily available.

The deposition of the voucher specimens is not mentioned in any of the publications. This makes confirmation of the identification of the larvae by future researchers effectively impossible. The problem is exacerbated by the fact that larval collections are more difficult to curate than the beetle collections, and few organizations maintain larvae collections.

CONCLUSION

We suggest that attempts should be made to re-examine the preimaginal stages of scarabs, in the first place the 3-instar larvae, based on the material identified through molecular or other direct methods. The larvae of most species should then be re-described based on the expanded set of characters, including mouthparts, and illustrated with digital images. This allows comparison of the species and designing reliable diagnostic keys. This conclusion is relevant not only to the species of Russian fauna but also to the world fauna in general.

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