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AKADEMIIA NAUK SSSR

SIBIRSKOE OTDELENIE

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Biological Institute

CERAMBYCIDAE OF NORTHERN ASIA

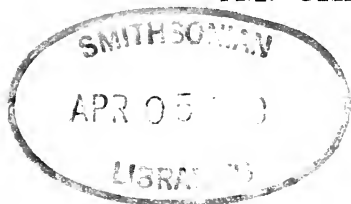
VOLUME 2

Cerambycinae

Part I

[*Usachi Severnoi Azii (Cerambycinae)*]

A.I. CHEREPANOV



Translated from Russian

Amerind Publishing Co. Pvt. Ltd., New Delhi

1988

Nauka Publishers, Siberian Division
Novosibirsk, 1981

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Translated and published under an agreement for the United States
Department of Agriculture, Washington, D.C., by
Amerind Publishing Co. Pvt. Ltd., 66 Janpath, New Delhi 110 001

Translator: P.M. Rao
General Editor: Dr. V.S. Kothekar

Printed at Gidson Printing Works, New Delhi, India

This monograph presents keys for the identification of the tribes, genera, and species of the subfamily Cerambycinae (tribes Hesperophanini, Cerambycini, Callidiopini, Graciliini, Obriini, Nathriini, Molorchini, Dilusini, Callichromini, Rosaliini, and Callidiini). The morphology, biology, characteristics of development, host relationships, and other specific features are described and the role of each species in the conservation of nature assessed. The system of ecological concomitants of cerambycid beetles inhabiting widely separated regions is analyzed and the evolutionary processes in the subfamily Cerambycinae of northern Asia during the post-Tertiary period are traced.

This monograph is intended for entomologists, ecologists, and workers engaged in the control of forest pests. It can also be used as a field guide by biology students in universities, forestry and educational institutes, and specialized technical schools.

Editor-in-Chief

N.A. VIOLOVICH

Doctor of Biological Sciences

CONTENTS

FOREWORD	ix
SYSTEMATIC LIST OF SPECIES	xi
V. Subfamily Cerambycinae	1
12. Tribe Hesperophanini	15
13. Tribe Cerambycini	20
14. Tribe Callidiopini	24
15. Tribe Graciliini	27
16. Tribe Oabriini	31
17. Tribe Nathriini (= Psebiini)	54
18. Tribe Molorchini	61
19. Tribe Dilusini	105
20. Tribe Callichromini	113
21. Tribe Rosaliini	148
22. Tribe Callidiini	155
SUPPLEMENT	279
INDEX OF LATIN NAMES OF CERAMBYCID BEETLES	288

FOREWORD

3 This book is a continuation of the study of the species composition, geographic distribution, morphological identification of preimaginal stages, and biology of northern Asian cerambycid beetles (Cerambycidae). In 1979 the first volume of *Usachi Severnoi Azii* (Cerambycidae of Northern Asia) was published and covered four subfamilies (Prioninae, Disteniinae, Lepturinae, and Aseminae). This volume included 124 species, of which the preimaginal stages of 99 were identified, the characteristic features of biology described, general features of phenology elucidated, and host specificity determined. The taxonomic position of some species was clarified and some genera were revised (*Evodinus* and *Brachyta*).

The present monograph is devoted to the subfamily Cerambycinae.

This book includes the results of investigations conducted at various times over vast territories—from the Urals (inclusive) to the coast of the Pacific Ocean, and from northern Kazakhstan, Altai, Amur, and Lake Khasan in the south to the forest tundra in the north. I have presented descriptions of 105 species, identified the preimaginal stages of 86, determined the calendar periods of population growth under field conditions, assessed many ecological aspects, elucidated characteristics of development, recorded variations in weight indices of insects during metamorphosis, presented the duration of the life cycle of each species, given information on the role of each in the biocenose, and other aspects.

Of the 19 species whose biology was not studied by me, only the type specimens are known for some (*Xylotrechus pavlovskii* Plav., *X. mixtus* Plav., *Clytus hypocrita* Plav., *Chlorophorus ubsanurensis* Tsher., and *Amarysius grallator* Baeckm.) and stray finds for others (*Stenygrinum quadrinotatum* Bat., *Xylotrechus rufilius* Bat., *X. capricornis* Gebl., *X. villioni* Vill., *Clytus nigrutilus* Kr., *C. venustus* Plav., *Chlorophorus sartor* Müll., *Purpuricenus petasifer* Fairm.). Thus all these species are very rarely found in northern Asia. Information on the range of some species in northern Asia (*Xylotrechus chinensis* Chevr., *Chlorophorus figuratus* Scop.) needs to be confirmed.

The biology of some species [*Gracilia minuta* (F.), *Nathrius brevipennis* (Muls.), *Molorchus umbellatarum* (Schreb.), and *Clytus arietis* (L.)], distributed only from Europe up to the southern Urals, has been traced by me into the forests of northern Caucasus (Kislovodsk and Sochi).

I also succeeded in identifying monotypic development among some proximate species. For example, *Clytus arietoides* Reitt., growing on coniferous species, is widely distributed in Siberia. *Clytus arietis* (L.), colonizing the shoots of deciduous species, is more often found in the forests of northern Caucasus. However, pupation is completed in both these species by the end of summer, the pupae enter diapause and remain in hibernation, and adults emerge in May-June.

- 4 This monograph is a continuation of the first book, devoted to the subfamilies Prioninae, Disteniinae, Lepturinae, and Aseminae. The classification adopted here is the same as that by several present-day researchers (Gressitt, 1951; Kojima and Hayashi, 1960; Linsley, 1962-1964). In describing the genera and species, publications after 1940 are cited. I did not consider it necessary to cite all the references given in the major compilation of N.N. Plavil'shchikov (1940).

I will consider my task fulfilled if this book provides relatively complete and up-to-date information not only on the species composition and geographic distribution, but also the bionomics of the subfamily Cerambycinae inhabiting northern Asia as a whole, and if this monograph long serves as a reference work for naturalists and in solving the problems of conservation of nature.

N.E. Cherepanova conducted laboratory and field investigations with extraordinary zeal and scrupulous precision and made significant contributions to the biology of long-horned beetles. Without her assistance, this monograph could not have assumed its present comprehensive form.

V.K. Stroganova, V.I. Ostanin, A.Yu. Kharitonov, A.V. Barkalov, A.L. Pakhotskaya, and other colleagues at the Biological Institute participated in the collection of field material from time to time.

I am sincerely grateful to artist A.Z. Ermolenko who not only drew the illustrations for this monograph, but also assisted in the collection of field material. I likewise sincerely thank all those who rendered assistance and extended cooperation in the completion of this work.

All the illustrations are original; some have been published earlier in various journals.

This monograph, devoted to the subfamily Cerambycinae, has been published in two parts. Part I provides a list of long-horned beetles, keys to the tribes based on different stages of development, and information on the taxonomy, geography, and biology of the tribes Hesperophanini to Callidiini. Part II gives keys to the genera and species of the tribes Clytini and Stenaspini based on the adult, larval, and pupal stages, and provides information on the morphology, geographic distribution, and biology of each species.

SYSTEMATIC LIST OF SPECIES

Family CERAMBYCIDAE

V. Subfamily Cerambycinae

12. Tribe Hesperophanini

1. Genus *Trichoferus* Woll.

1. *T. campestris* (Fald.) 15

13. Tribe Cerambycini

1. Genus *Mallambyx* Bat.

1. *M. raddei* (Bless. and Sols.) 21

14. Tribe Callidiopini

1. Genus *Stenygrinum* Bat.

1. *S. quadrinotatum* Bat. 25

15. Tribe Graciliini

1. Genus *Gracilia* Serv.

1. *G. minuta* (F.) 28

16. Tribe Obriini

1. Genus *Obrium* Curt.

1. *O. cantharinum* (L.) 34

2. *O. brevicorne* Plav. 39

3. *O. gracile* Plav. 44

2. Genus *Stenhomalus* White

1. *S. vulcanus* Tsher. 49

17. Tribe Nathriini (= Psebiini)

1. Genus *Nathrius* Bréth. (= *Leptidea* Muls.)

1. *N. brevipennis* (Muls.) 55

18. Tribe Molorchini

1. Genus *Molorchus* F.

1. <i>M. minor</i> (L.)	65
2. <i>M. ussuriensis</i> Plav.	71
3. <i>M. umbellatarum</i> (Schreb.)	75
4. <i>M. kiesenwetteri</i> Muls. and Rey	80
5. <i>M. heptapotamicus</i> Plav.	86
6. <i>M. kobotokensis</i> Ohb.	91
7. <i>M. incognitus</i> Tsher.	95

2. Genus *Nadezhdiana* Tsher.

1. <i>N. villosa</i> Tsher.	100
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19. Tribe Dilusini

1. Genus *Deilus* Serv.

1. <i>D. fugax</i> (Oliv.)	106
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20. Tribe Callichromini

1. Genus *Aromia* Serv.

1. <i>A. moschata</i> (L.)	116
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2. Genus *Chloridolum* Thoms.

1. <i>C. sieversi</i> Ganglb.	122
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3. Genus *Chelidonium* Thoms.

1. <i>C. zaitzevi</i> Plav.	128
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4. Genus *Leontium* Thoms.

1. <i>L. viride</i> Thoms.	134
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5. Genus *Polyzonus* Cast.

1. <i>P. fasciatus</i> (F.)	140
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21. Tribe Rosaliini

1. Genus *Rosalia* Serv.

1. <i>R. coelestis</i> Sem.	149
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22. Tribe Callidiini

1. Genus *Hylotrupes* Serv.

1. <i>H. bajulus</i> (L.)	160
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2. Genus *Rhopalopus* Muls.

1. <i>R. clavipes</i> (F.)	166
2. <i>R. signaticollis</i> Sols.	173
3. <i>R. speciosus</i> Plav.	178
4. <i>R. aurantiicollis</i> Plav.	183
5. <i>R. ruficollis</i> Mats.	184

3. Genus *Pronocera* Motsch.

1. <i>P. brevicollis</i> (Geb.)	185
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4. Genus *Semanotus* Muls.

1. <i>S. undatus</i> (L.)	192
2. <i>S. bifasciatus</i> (Motsch.)	199

5. Genus *Oupyrrhidium* Pic

1. <i>O. cinnabarinum</i> (Bless.)	204
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6. Genus *Callidium* F.

1. <i>C. violaceum</i> (L.)	212
2. <i>C. aeneum</i> Deg.	217
3. <i>C. coriaceum</i> Payk.	222
4. <i>C. chlorizans</i> (Sols.)	225

7. Genus *Phymatodes* Muls.

1. <i>P. testaceus</i> (L.)	236
2. <i>P. zemlinae</i> Plav. and Anufr.	242
3. <i>P. ussuricus</i> Plav.	245
4. <i>P. vandykei</i> Gress.	249
5. <i>P. abietinus</i> Plav. and Lur.	254
6. <i>P. mediofasciatus</i> Pic.	258
7. <i>P. maaki</i> (Kr.)	263
8. <i>P. alni</i> (L.)	268
9. <i>P. ermolenkoi</i> Tsher.	273

V. Subfamily Cerambycinae

- 7 Adult insect characterized by elongate body, usually with parallel sides, rather large (Cerambycini) or very small (Graciliini). Head narrows gradually but insignificantly posterior to eyes, without sharp cervical constriction. Temples taper gently, do not project, and well distinguished in this respect from adult insects of the subfamily Lepturinae. Frons broad or narrow, with median longitudinal suture (Hesperophanini, Callidiini, many Clytini, Stenaspini) or with longitudinal carinae (*Xylotrechus*) dipping markedly or almost upright (some Clytini). Genae long, broad (Clytini, Rosaliini, Callichromini) or extremely short (Hesperophanini). Eyes large, with large (Hesperophanini, Cerambycini, Obriini) or minute (Molorchini, Callidiini, Clytini), sometimes rather sharp or smoothened facets, very intensely and deeply (Callidiini, Rosaliini, Callichromini, Molorchini) or moderately (many Clytini, Obriini) emarginate, or almost not emarginate but highly convex and reniform (Nathriini). Antennae long, considerably (especially among males) longer than body (Cerambycini, many Callichromini, Rosaliini, some Clytini) or short, with apices not reaching (especially among females), or just reaching middle of elytra (Dilusini, many Clytini) or their hind clivus.

Pronotum barely longer, or not longer, or even shorter than wide, rounded on sides (Hesperophanini, Callidiini, Clytini), more rarely extended tubercularly, or even spinelike (Callichromini and some Stenaspini), or with conical tubercle dorsally receding inward from lateral margin (Rosaliini), broadly stretched anteriorly and posteriorly (Obriini and Molorchini), or with distinct recurved margins (Cerambycini), narrow transverse groove posteriorly with uniform, deep (many Clytini, Stenaspini) or rugose (some Clytini) punctation; in some (Callidiini, Molorchini) with smooth prominent shields or with large transverse sinuous grooves on disk (Cerambycini—genus *Mallambyx*).

Elytra markedly (Dilusini, Clytini—genus *Rhaphuma*) or moderately (Clytini—genus *Xylotrechus*) elongate, or considerably shortened (Molorchini, Nathriini), individually or jointly rounded apically (Hesperophanini, Callichromini, Rosaliini, Callidiini, Obriini), obtuse or truncate (many Clytini), monochromatic, with dark brown or black (Cerambycini, some Callidiini), metallic blue or bronze (some Callichromini, Callidiini), or rusty or rusty-brown (Obriini and Graciliini) tone, often with pattern or spots and transverse bands (Clytini, Rosaliini, some Callidiini,

Callichromini), more rarely red with black pattern on suture (Stenaspini).

Legs moderately or very long. Forecoxae elongate, contiguous (Molorchini and Nathriini), or not elongate and not contiguous but wide set (Dilusini, Callichromini). Femora thicken gradually toward apex, not clavate (Cerambycini, Callichromini, Clytini, Stenaspini), or thicken abruptly and distinctly clavate (Callidiopini, Obriini, Nathriini, Molorchini, Callidiini). Hind femora short, extend only beyond middle of elytra (Dilusini), or comparatively long and reach or just reach elytral apex (many Clytini, Callidiini, Rosaliini, Callichromini) or even, especially among males, extend beyond it (some Clytini, Callichromini).

Metasternum with fine dense punctation and median longitudinal groove, with aromatic pores (Callichromini, Rosaliini, Stenaspini) or without them (Molorchini, Clytini). Mes- and metepisterna with sparse hairs, almost glabrous (Callidiopini, Callichromini, Obriini) or with very dense discontinuous or continuous (Rosaliini, many Clytini) hairy cover. Abdomen comparatively elongate; abdominal sternites convex, with fine, rather dense or sometimes sparse punctation, with sparse adherent or semierect setaceous hairs, or sometimes very dense tomentose to dense hairy cover (Rosaliini, some Clytini).

Egg: Usually white, rarely greenish (*Plagionotus floralis* Pall.), or yellowish [*Polyzonus fasciatus* (F.)], highly (Dilusini), moderately (Clytini, Callidiini), or slightly elongate or oval (Stenaspini). Chorion smooth, lustrous, semihyaline (majority of Clytini, Callidiini), more rarely with fine reticulate sculpture and matte (Dilusini).

Larva: Unlike larvae of other subfamilies, readily recognized by structure of maxillae, epistoma, and hypostoma. Half or more of head retracted into prothorax. Anterior margin of epistoma with brownish or rusty-brown border, lustrous or with transverse narrow grooves here; fuses laterally with parietals or slightly demarcated from them by faint frontal sutures; posterior to transverse brownish border stray piliform setae form transverse row, or innumerable setae form transverse band. Median epistomal suture distinct or, more often (Clytini), discernible only at apex, or not visible. Hypostoma divided medially by gula into two triangular sclerites, its anterior margin smooth or with minute transverse grooves (Clytini, Callidiini) or deep longitudinal ones (Stenaspini, some Clytini). Anterior half of parietals with short or long hairs (piliform setae), anterior margin with rusty-brown or brownish border partially or entirely covering ocellar-antennal area. One (Clytini, Obriini, Callichromini, Stenaspini), two (Dilusini), or three (Rosaliini, Cerambycini, some Callidiini—*Rhopalopus*) ocelli located around each antennal base. Clypeus small, trapezoid, in some species flattened basally, almost in form of strip. Labrum very small, convex, overlies only mandibular joint, with

short light-colored setae in anterior half or along margins. Mandibles short, convex outside, concave inside (as though hollowed), broadly rounded apically, apposed with cultrate edge end to end. Labial submentum broad, usually tetragonal, with two troughlike grooves, rarely (genus *Teratoclytus*) hexagonal, longitudinally striate in posterior half.

Pronotum moderately or insignificantly slopes toward head, in anterior third with transverse yellow or rusty band usually separated medially and laterally by light-colored gaps into four spots, of which two median
9 on anterior margin (among many Clytini) with white alveolate notch. Sides and disk of pronotum anterior to scutum with dense or sparse rusty or light rusty hairs. Pronotal scutum coriaceous, white, squarrose, coarsely rugose or rugulose (Callichromini), or lustrous, with fine longitudinal, sometimes very dense streaks, matte silvery only at base, without streaks (genus *Phymatodes*), or yellowish and sclerotized, with minute spinules (some species of the genus *Xylotrechus*), bound laterally by short deep longitudinal grooves. Prothoracic presternum laterally with long, on disk short or uniform hairs. Eusternum glabrous, lustrous, sometimes notably rugose, in anterior half with hairy gap or without it, usually without lateral grooves, merging there with general surface of presternum, rarely demarcated from it by shallow grooves. Thoracic legs comparatively long, distinctly (Callichromini, Rosaliini) or poorly (some genera of Clytini) developed or lacking (*Xylotrechus*, some species of Clytini).

Abdomen moderately elongate, usually narrows insignificantly toward posterior end, with dense or sparse rusty or light-colored hairs along sides. Locomotory ampullae developed on abdominal segments I to VII, comparatively uniform, identically convex, only in some (Obriini, Nathriini) protrude notably on abdominal segments III to VI in form of knobs or lumpy bulges, usually coriaceous, rarely (some species of *Xylotrechus*) sclerotized, with barely visible spinules, even more rarely (Dilusini) with granulations in two transverse rows. Abdominal tergite IX longitudinal or transverse, rounded posteriorly, without urogomphi, and without spinules here; innumerable spinules on disk form an extensive field only in one genus (*Nadezhdiana*). Anal pore triradial. Interstadial variations among larvae of different tribes or even genera manifested variously. Among I-instar larvae, head and prothorax relatively large, some species with long sharp spinules laterally along abdomen. For example, in larvae of *Aromia moschata* (L.) and *Leontium viride* Thoms. such spinules seen laterally on segments III to V and in *Rhopalopus clavipes* (F.) and *Phymatodes ermolenkoi* Tsher.* on VI and VII. These spinules disappear after molt.

*Spelling of author names in taxonomic divisions sometimes differs from spelling in text and bibliography since the Israeli orthography has been followed in this translation—General Editor.

Pupa: Characterized by comparatively convex pronotum, arrangement of spinules on abdominal tergites, and other features. Head moderately bent under, eyes shifted toward base of jaws (Hesperophanini) or notably removed from jaws. Antennae long, directed forward and looplike (Callichromini) or arcuate (some Clytini, Rosaliini), or short and pressed to sides, with apices directed backward or bent ventrad (Clytini).

Pronotum convex, distinctly longitudinal, with flanges on anterior and posterior margins (Obriini), or slightly elongate, sometimes even somewhat transverse, without anterior flange, posteriorly with narrow transverse groove (Clytini, Stenaspini), rounded laterally (Hesperophanini, Clytini), or with conical lateral tubercle (Callichromini). Mesonotum bulges forward, posterior to middle with transverse, saddle-shaped dent, with angularly extended or rounded scutellum on posterior margin. Metanotum insignificantly convex, medially with or without longitudinal troughlike groove, sometimes flattened laterally, with minute dent, usually broadly rounded at posterior margin.

Abdomen moderately or markedly elongate, usually tapers slightly toward anterior end and notably toward posterior end. Abdominal tergites convex, with common median longitudinal groove, with minute spinules forming distinct transverse row or band in posterior half. Abdominal tergite VII more elongate, triangular (Obriini, Callichromini, Clytini) or tetragonal, transversely truncate along posterior margin, upright (Stenaspini), with large spinules in posterior half close to posterior margin bent forward and forming posterior transverse row, with two pairs of large incurved spinules in front of this row forming two medial transverse rows, and minute spinules in anterior half forming anterior transverse row; in some (Molorchini) anterior row of spinules lacking, and only posterior row comprising two to four curved spinules directed forward present; more often (Clytini) posterior row with four to six, rarely (Stenaspini) eight to 12 spinules; sometimes (Callichromini) spinules on tergite VII smaller than those on anterior tergites. Abdominal tergite VIII short, with four to six small erect spinules on posterior margin, rarely without them. Tip of abdomen (ventral view) obtuse, without lateral spinules. Valvifers of female large, rarely minute, hemispherical, with small apical sometimes conical, tubercle. Hind femora pressed to abdomen laterally, long, slender (Callichromini), or distinctly clavate (Molorchini, some Clytini, Callidiini).

Biology: Most species of the subfamily Cerambycinae have a two-year life cycle, with development from egg to adult requiring one or three years in only a few species. Adult insects of the genera *Chlorophorus*, *Clytus*, *Leontium*, *Molorchus*, *Obrium*, *Polyzonus*, and others feed on pollen for gonadal maturation and then begin to reproduce. Adult insects of many species of *Xylotrechus*, *Rhopalopus*, *Plagionotus*, and other

genera do not require supplementary feeding; beetles emerge with developed gonads, mate immediately, and oviposit. In some species (some Clytini, Callidiini) beetles commence flight in May and stop in July, while in others (Callichromini, many Clytini, Stenaspini) flight occurs from early July through August or even the end of September [*Polyzonus fasciatus* (F.)].

The fertility of beetles varies widely. For example, among Obriini (*Obrium gracile* Plav., *Stenhomalus vulcanus* Tsher.) a single female lays 18 to 20 eggs during her lifetime, while some Clytini [*Xylotrechus altai-cus* (Geb.), *X. rusticus* (L.)] lay 30 to 108 eggs. Eggs are laid on woody and shrub species and only a few beetles [*Xylotrechus arnoldi* Kost. and *Plagionotus floralis* (Pall.)] oviposit on grass, Compositae, Leguminosae (*Medicago*), and other vegetation. Most beetles (Callidiini, Clytini) lay eggs singly in bark crevices, spacing them out. Rarely (Obriini, Stenaspini) the female initially glues the egg to the bark and covers it later with small scales scraped earlier from the bark surface by means of a special brush on the ovipositor (Stenaspini) or on the posterior margin of abdominal sternite II (Obriini). Some species [*Polyzonus fasciatus* (F.)] glue the egg to the bark and cover the top with secretions that harden on exposure to air and form a stable shell. Larvae hatch in the same summer eggs are laid. Embryonic development is completed in nature in two to four weeks in various species. Newly hatched larvae bore shoots and make galleries under bark or in wood, plugging them compactly with frass. Larvae of some genera (*Polyzonus*, *Chelidonium*, *Purpurice-nus*, *Amarysius*) nibble ventilation holes in the shoot surface through which frass is discarded. As a result, the galleries are cleared of frass and the larvae able to move rather rapidly from one end to the other.

- 11 The larval period varies in different species. Some live no more than one year and some two to three years. Mature larvae make cells and pupate. Based on the prepupal period and pupal development, the subfamily Cerambycinae can be divided into four groups. The first, more abundant group comprises species (many Clytini, Callidiini, Stenaspini) whose larvae pupate at the end of May and in June. Beetles emerge from pupae in the last 10 days of June and in July. The second group includes *Molorchus minor* (L.), *M. kobotokensis* Ohb., *Semanotus undatus* (L.), *Deilus fugax* (Oliv.), *Aglaophis colobotheoides* Bat., and others whose larvae pupate in the latter half of July and in early August; young beetles emerge from pupae in the latter half of August and in early September. The third, very small group comprises species [*Clytus arietoides* Reitt., *C. arietis* (L.)] in which pupation occurs at the end of July and in August; the pupae enter diapause, hibernate, and beetles emerge after hibernation. The fourth group comprises species (*Leontium viride* Thoms.) whose larvae make pupal cells at the end of August, enter diapause, hibernate in that state,

later molt, and pupate the next spring when the weather warms up.

In some species (Callichromini, Obriini, Callidiini, most Clytini, Stenaspini) the pupal stage continues for two to four weeks and beetles emerge the same summer; in others [*Clytus arietoides* Reitt., *C. arietis* (L.), and possibly some others] pupae diapause for a long time and adults appear after nine to ten months of pupation. In many species (Obriini, Callichromini, Callidiini, Clytini, Stenaspini) emerging adults abandon the pupal cell the same summer and soon commence reproduction. Only in some species (*Deilus*, some *Molorchus*, *Semanotus*) do the beetles emerging from pupae enter diapause and remain in hibernation, usually in pupal cells, abandoning the latter only in the following spring.

Most species (Callidiini, Clytini) develop on physiologically weakened, drying, and newly fallen trees; rarely [*Rosalia coelestis* Sem., *Rhaphuma acutivittis* (Kr.)] development occurs on desiccated trees. A goodly number of species [*Chelidonium zaitzevi* Plav., *Aromia moschata* (L.), *Xylotrechus altaicus* (Gehl.)] inhabit growing trees. These species are generally monophagous in the larval stage. For example, *Xylotrechus altaicus* (Gehl.) develops only on larch (*Larix*), *Chelidonium zaitzevi* Plav. on maple (*Acer*), *Aromia moschata* (L.) on willow (*Salix*), and *Chloridolum sieversi* Ganglb. on walnut (*Juglans*). Species of Cerambycinae, unlike those of Lepturinae, usually do not inhabit dead fallen trees with decomposing wood.

Long-horned beetles of the subfamily Cerambycinae are ecologically associated mainly with deciduous trees; only an insignificant number colonize coniferous vegetation. During forest inspections we collected over 6,000 species of this subfamily from various trees, shrubs, semi-shrubs, and herbaceous plants. A large number of beetles were raised in the laboratory from larvae collected in nature. It was established that, of the 105 species (Table 1) inhabiting northern Asia, 14 habitually develop on coniferous species, 83 on deciduous, and two on herbaceous. *Chlorophorus gracilipes* (Fald.) usually inhabits deciduous trees, but sometimes migrates to coniferous; *Asias tuvensis* Tsher. inhabits semi-arid steppes and develops on semishrubs (*Nanophyton erinaceum*). These facts indicate that Cerambycinae fauna originated mainly on deciduous vegetation, with only a few species adapting later in the course of evolution to coniferous and vary rarely to herbaceous plants.

- 12 The cerambycid fauna of broad-leaved forests revealed a series of species forming a complex of ecological concomitants characterized by monotypic ecological characteristics, discontinuity of geographic range, and common phylogenesis. For example, south of the Urals broad-leaved forests are inhabited by *Phymatodes alni* (L.), *Xylotrechus antilope* (Schönh.), *X. arvicola* (Oliv.), *Chlorophorus herbsti* (Brahm), *C. varius* (Müll.), *Plagionotus detritus* (L.), *P. arcuatus* (L.), and other species

Table 1. Distribution of Cerambycinae larvae based on host plants

Tribe	Total species	Percentage on			
		Coniferous trees	Deciduous trees	Herbaceous plant	Semishrubs Unidentified
12. Hesperophanini	1	—	100	—	—
13. Cerambycini	1	—	100	—	—
14. Callidiopini	1	—	100	—	—
15. Gracilini	1	—	100	—	—
16. Obrtini	4	—	100	—	—
17. Nathriini	1	—	100	—	—
18. Molorchini	8	25	75	—	—
19. Dilusini	1	—	100	—	—
20. Callichromini	5	20	80	—	—
21. Rosalini	1	—	100	—	—
22. Callidiini	23	34.8	65.2	—	—
23. Clytini	48	6.2	79.1	4.3	10.4
24. Stenaspini	10	—	90	—	10
Total	105	13.3	79.1	1.9	0.9 4.8

Note: Host plants of 86 species were determined in our own investigations and of 14 species taken from data available in literature. Host plants of five species could not be determined.

ecologically associated to some extent or the other with oak. Their concomitants living in broad-leaved forests of Ussuri-Primor'e region are *Phymatodes ermolenkoi* Tsher., *Xylotrechus cuneipennis* Kr., *Chlorophorus sexmaculatus* (Motsch.), *Plagionotus christophi* Kr., *P. pulcher* Bless., and others. Some inhabit trunks and others crowns of thin shoots. This tendency for occupying niches has been preserved in several recently formed species (within the genus) even with a change in host plants. For example, in northern Asian fauna the genus *Phymatodes* comprises nine species, of which five develop on grapevine (*Vitis*), three on oak (*Quercus*), and one on Siberian fir (*Abies sibiricus*). But all of the species generally inhabit crowns of thin shoots. Such a conservatively topological (levelwise) distribution is observed even in other beetles, reflecting the general system of ecological concomitants inhabiting different regions, as can be seen from the following scheme:

- | | | |
|------------------------|---|--|
| 1. <i>Xylotrechus</i> | { | <i>X. antilope</i> (Schönh.)—mainly oak trunks.
Southern Urals, Europe. |
| | { | <i>X. altaicus</i> (Gebl.)—larch trunks.
Siberia. |
| | { | <i>X. cuneipennis</i> Kr.—oak trunks.
Ussuri-Primor'e region. |
| 2. <i>Plagionotus</i> | { | <i>P. detritus</i> (L.)—oak trunks.
Southern Urals, Europe. |
| | { | <i>P. pulcher</i> Bless.—oak trunks.
Ussuri-Primor'e region |
| 13 | { | <i>P. alni</i> (L.)—thin shoots of oak.
Southern Urals, Europe. |
| | { | <i>P. ermolenkoi</i> Tsher.—thin shoots of oak.
Ussuri-Primor'e region. |
| 3. <i>Phymatodes</i> | { | <i>P. abietinus</i> Plav. and Lur.—thin shoots of Siberian
fir. Salair range. |
| | { | <i>P. ussuricus</i> Plav.—thin shoots of Amur vine.
Ussuri-Primor'e region. |
| 4. <i>Purpuricenus</i> | { | <i>P. kaehleri</i> (L.)—oak shoots in crown zone.
Southern Urals, Europe. |
| | { | <i>P. tsherepanovae</i> Tsher.
Ob' region. |
| | { | <i>P. petasifer</i> Fairm.—shoots of fruit trees in crown
zone. Eastern Asia. |

The fact that ecological concomitants inhabit widely separated regions in nature indicates that many ecological groups of long-horned beetles in forest formations evolved in the Tertiary period in broad-leaved forests and have preserved their form to date. Their evolution proceeded generally along the course of renewal (changeover) of species composition.

This could explain the fact that most species of *Phymatodes*, *Xylotrechus*, *Plagionotus*, and others are trophically associated in the larval stage with deciduous trees, and only some [*Xylotrechus altaicus* (Gebl.) and *P. abietinus* Plav. and Lur.] have adapted to growth on conifers.

Economic importance: Long-horned beetles of the subfamily Cerambycinae constitute a vital link in forest biocenoses. Some of them (Obrini, Molorchini, *Chelidonium zaitzevi* Plav., *Phymatodes ermolenkoi* Tsher.) colonize thin shoots of growing trees, weaken them physiologically, and affect their resistance to secondary pests and fungal diseases. Others [*Aromia moschata* (L.), *Chloridolum sieversi* Ganglb., *Semanotus undatus* (L.), *Xylotrechus altaicus* (Gebl.), *X. adspersus* (Gebl.), *X. pantherinus* (Sav.), *Plagionotus christophi* Kr., *P. pulcher* Bless., *P. detritus* (L.)] colonize trunks of physiologically weakened or healthy trees, damage the bast, and transport fungal spores which cause wood damage. Such trees consequently die. In recent years shoots of goat willow in strip forests on river banks in southern Tuva have been severely damaged by *Xylotrechus pantherinus* (Sav.), maple plantations by *Chelidonium zaitzevi* Plav., Manchurian walnut stocks near Partizansk in the Far East by *Chloridolum sieversi* Ganglb., and spruce plantations in the Salair foothills by *Semanotus undatus* (L.) and *Pronocera brevicorne* (Gebl.).

In the 1930's deciduous plantations in many regions of Trans-Baikal (Undinsk, Baleisk, Aleksandrov-Zavodsk, Gazimuro-Zavodsk, and others) were severely attacked by the Altai long-horned beetle [*Xylotrechus altaicus* (Gebl.)]. Wood damaged by larvae is totally useless for commercial purposes and hence preparing marketable timber is fraught with difficulties. In the southern Urals oak forests are greatly damaged by *Rhopalopus clavipes* (F.), *Purpuricenus kaehleri* (L.), *Plagionotus detritus* (L.) and others. Beetles damaging Amur vine in the Far East fall into a special group comprising species of the genus (*Phymatodes*, *Brachyclytus singularis* Kr., *Teratoclytus plavilstshikovi* Zaitz.,¹ and others. From 1971 to 1973 these pests destroyed 30% or more of the vine in some forests (Cherepanov and Cherepanova, 1974).

Long-horned beetles cause great losses in forest lumber. *Plagionotus*
 14 *pulcher* Bless., *P. arcuatus* (L.), *P. detritus* (L.), *Chlorophorus sexmaculatus* (Motsch.), *Xylotrechus rusticus* (L.), *X. cuneipennis* Kr., and others inhabit freshly prepared deciduous species of wood. *Clytus arietoides* Reitt., more rarely *Semanotus undatus* (L.) and other species often infest logs of conifers. Forests littered with wind-fallen trees or damaged by fire serve as sites of en masse proliferation for many species of beetles.

¹These species should be placed under strict surveillance by the quarantine services. Their accidental import into Central Asia, the Caucasus, Crimea, and Moldavia could result in devastating consequences for viticulture.

Overmature deciduous woodstocks serve as latent reproduction centers for *Xylotrechus altaicus* (Geb.). With the onset of favorable conditions, this beetle infests extensive mature deciduous plantation. A significant increase in reproduction centers of this pest was recorded in Trans-Baikal from 1932 to 1946.

KEY TO TRIBES

Adult Insects

- 1 (2). Eyes notably proximate to mandibular base; genae very short, their least length equal to 2.0 times diameter of ocular sclerite. Hind femora thicken gradually toward apex, not clavate. Body length 11 to 20 mm. 12. **Hesperophanini.**
- 2 (1). Eyes not proximate to mandibular base; genae long, at least several times diameter of ocular sclerite. If genae short, hind femora clavate.
- 3 (4). Anterior margin of pronotum with broad distinct flange, about 0.66 width at base; disk with large sinuous grooves [*Mallambyx raddei* (Bless. and Sols.)]. Body length 33 to 54 mm. 13. **Cerambycini.**
- 4 (3). Anterior margin of pronotum without broad distinct flange, in any case not narrower or only slightly narrower than base; disk without large sinuous grooves, at most with coarse punctation forming transverse wrinkles (some species of *Xylotrechus*).
- 5 (6). Pronotum markedly elongate, 0.25 times longer than maximum width, with almost parallel sides, and broadly but indistinctly rounded laterally. Hind femora clavate. Body length 8.0 to 13.5 mm. 14. **Callidiopini.**
- 6 (5). Pronotum less elongate, rounded or with tubercle projecting laterally.
- 7 (8). Body small. Elytra elongate, markedly flattened in anterior half, with deep, not very dense punctation, matte; hind clivus more convex, smooth, without punctation. Hind femora with elongate clava. Body length 4.0 to 6.0 mm [*Gracilia minuta* (F.)]. 15. **Gracilini.**
- 8 (7). Body very large. If small, elytra lustrous not matte, distinctly shorter, and hind femora sharply clavate.
- 9 (10). Abdominal sternite I highly elongate, almost not shorter or even longer than all sternites together. 16. **Oabriini.**
- 10 (9). Abdominal sternite I moderately elongate, shorter than remaining sternites together.

- 11 (14). Elytra short, do not cover top of abdomen. Membranous wings fall open on abdomen. Forecoxae elongate, cylindrical or conical, contiguous on inner side.
- 12 (13). Elytra cover most of abdominal segment I. Cavities of hind coxae open from behind. Body length 3.0 to 6.0 mm. 17. **Nathriini** (= **Psebiini**).
- 15 13 (12). Elytra much shorter, cover only base of abdominal segment I. Cavities of hind coxae closed from behind. Body length 4.0 to 16.0 mm. 18. **Molorchini**.
- 14 (11). Elytra long, cover top of abdomen. Membranous wings fold on abdomen under elytra. Forecoxae not elongate, not contiguous on inner side.
- 15 (16). Legs very short; apices of hind femora barely extend beyond 0.66 of elytra. Elytral disk with longitudinal groove near suture extending from base almost up to hind clivus. Body length 6.0 to 11.5 mm. 19. **Dilusini**.
- 16 (15). Legs very long; hind femora reach hind clivus of elytra or extend beyond their apex. Elytral disk convex or flat.
- 17 (18). Pronotum laterally with sharp spinelike tubercle. Elytra with metallic bronze, bluish or greenish iridescence, or with two transverse yellow bands (genus *Polyzonus*). 20. **Callichromini**.
- 18 (17). Pronotum laterally without sharp spinelike tubercle; if tubercle present, elytra not metallic toned (some species of *Stenaspini*), or tubercle conical, extends upward, its edge dorsal (*Rosaliini*).
- 19 (20). Elytra with bright turquoise-blue and velvet-black dense hairy cover that forms pattern of broad transverse bands. Antennal segments apically with dense black brush of hairs. 21. **Rosaliini**.
- 20 (19). Elytra with varied hairy cover or without it. Antennal segments apically without dense brush of hairs.
- 21 (24). Metasternum without aromatic pores. Pronotum laterally without tubercle, rounded, at most broadens angularly.
- 22 (23). Antennae more wide set; distance between them at base more than gap between upper lobes of eyes on vertex. Femora clavate. 22. **Callidiini**.
- 23 (22). Antennae proximate; distance between them at base less than gap between upper lobes of eyes on vertex. Femora not clavate. 23. **Clytini**.
- 24 (21). Metasternum with aromatic pores. Pronotum laterally with minute or large sharp tubercle or without it. Elytra usually red with black pattern on suture or without it, or black with reddish base. 24. **Stenaspini**.

Larvae

- 1 (2). Posterior half of abdominal sternite VIII laterally with yellowish oval spot obliquely disposed in depression surrounded by stray hairs. 12. **Hesperophanini**.
- 2 (1). Posterior half of abdominal sternite VIII laterally without yellowish spot.
- 3 (4). Body very large (length of mature larvae up to 65 mm and width of head 8.0 mm). Dorsal locomotory ampullae separated by two transverse grooves converging laterally, with deep lateral rugose folds. Ventral locomotory ampullae coarsely rugose. Thoracic legs developed. Three ocelli on each side of head. 13. **Cerambycini**.
- 4 (3). Body less large or small, short (length of mature larvae not more than 6.0 to 40.0 mm and width of head 1.0 to 5.0 mm). Structure of dorsal and ventral locomotory ampullae different.
- 5 (6). Sides of head (dorsal view) with minute round black spot resembling an ocellus shifted far away from brownish margin (long genus *Gracilia* Serv.). 15. **Gracillini**.
- 16 6 (5). Sides of head without minute round black spot resembling an ocellus, at most with one to three hyaline or pigmented ocelli near antennal bases ventrally.
- 7 (10). Abdominal segments III to VI with highly protuberant locomotory ampullae in form of nodular or lumpy bulges.
- 8 (9). Parietals (sides of head) in anterior half with long dense hairs forming tufts bent down and backward sharply. Prothoracic eusternum coriaceous, without silvery reticulate sculpture. Hairs on pronotal disk directed backward or upright. . . . 16. **Obrini**.
- 9 (8). Parietals (sides of head) in anterior half with sparse hairs that do not form dense tuft. Prothoracic eusternum with minute silvery reticulate sculpture. Hairs on pronotal disk anterior to scutum directed forward. 17. **Nathriini** (= **Psebiini**).
- 10 (7). Abdominal segments III to VI with ordinary locomotory ampullae, not in form of nodular or lumpy bulges.
- 11 (12). Parietals (sides of head) in anterior half with long dense setaceous hairs bent backward (as though broken). 18. **Molorchini**.
- 12 (11). Parietals (sides of head) in anterior half with usual hairs, not bent backward (as though not broken).
- 13 (14). Anterior third of pronotum with narrow transverse yellowish-rust band extending laterally and interrupted medially by narrow indistinct gap. Locomotory ampullae separated by transverse groove from which short grooves originate and form

granular prominences in two transverse rows. Two hyaline or pigmented ocelli on each side of head. Thoracic legs well developed. 19. **Dilusini**.

14 (13). Anterior third of pronotum with two yellow or rusty transverse spots on disk interrupted medially by broad gap.

15 (16). Body of live larvae yellow. Dorsal locomotory ampullae separated by two transverse grooves, with shallow grooves between them in form of cells. One transparent ocellus on each side of head. Thoracic legs long, well developed. . . . 20. **Callichromini**.

16 (15). Body of live larvae white. Structure of dorsal locomotory ampullae different; if same in structure (*Rosaliini*), then three ocelli on each side of head. Thoracic legs either developed or lacking.

17 (18). Dorsal locomotory ampullae with two transverse grooves, with fine grooves forming network. Three transparent ocelli on each side of head. Thoracic legs well developed. 21. **Rosaliini**.

18 (17). Structure of dorsal locomotory ampullae different, with grooves not forming fine network or without grooves.

19 (22). Anterior margin of hypostoma smooth, without longitudinal striation.

20 (21). Pronotal scutum lustrous, with fine longitudinal striation, matte silvery only at base. One (*Phymatodes* and others) or three (*Rhopalopus*) ocelli on each side of head. Thoracic legs developed. 22. **Callidiini**.

21 (20). Pronotal scutum sclerotized (many *Xylotrechus*) or coriaceous (*Clytus*, *Chlorophorus*, and others), matte or lustrous, at most with large longitudinal striations. One (*Xylotrechus*, *Clytus*, *Chlorophorus*) or two (*Epiclytus*) ocelli on each side of head. Thoracic legs developed (many *Clytus*, *Chlorophorus*) or lacking (*Xylotrechus*, some *Clytus*, and others). 23. **Clytini**.

22 (19). Anterior margin of hypostoma not smooth, with distinct longitudinal striation. One ocellus on each side of head. Thoracic legs developed. 24. **Stenaspini**.

Pupae

1 (2). Head short, eyes proximate to mandibular base. Posterior third of abdominal tergite VII lustrous, glabrous, without spinules; bulges notably in front, with prominent spinules on protuberant coriaceous base. Antennae bent ventrad, semicircular. Body length up to 14 mm. 12. **Hesperophanini**.

2 (1). Head usually more elongate, eyes not proximate to mandibular base. If short (*Nathriini*), pronotum glabrous, without setae.

Posterior third of abdominal tergite VII with spinules, only sometimes (Obriini male) projects conically and without spinules.

- 3 (6). Pronotum elongate, basally (sometimes at anterior margin) with flange; long acicular setae anterior to base form indistinct transverse row or two independent tufts. Posterior margin of abdominal tergite VII conically produced in male, rounded in female. Second half of antennae bent ventrad, in form of ring (female) or loop (male). Hind femora clavate, with long shaft.
- 4 (5). Anterior margin of pronotum with setaceous spinules. 15. **Graciliini**.
- 5 (4). Anterior margin of pronotum glabrous, without setaceous spinules. 16. **Obriini**.
- 6 (3). Pronotum barely elongate or transverse, without flange at anterior margin, glabrous anterior to base, without setae (Nathriini), only sometimes with setae or spinules that do not form transverse row from inner side of posterior angles. Posterior margin of abdominal tergite VII not conically produced in male; if produced (Nathriini), pronotum without setae or spinules.
- 7 (10). Hind femora sharply clavate, markedly dilated apically, with long shaft.
- 8 (9). Abdomen with parallel sides, does not narrow toward base. Pronotum without setae or spinules. 17. **Nathriini**.
- 9 (8). Abdomen not laterally parallel, narrows sharply toward base, appears petiolate. Pronotum usually with setae or spinules. 18. **Molorchini**.
- 10 (7). Hind femora not clavate, broaden gradually from base toward apex; if notably clavate (Callidiini), with short shaft.
- 11 (12). Spinules on pronotum and abdominal tergites bent down and forward. Antennae bent ventrad, semicircular. Body length up to 10 mm. 19. **Dilusini**.
- 12 (11). Spinules on pronotum and abdominal tergites bent down and mostly backward; if bent forward, body dimensions considerably larger.
- 13 (16). Pronotum with produced large or small lateral tubercle. Abdominal tergite VII with minute spinules, smaller than tergites in front. Antennae bent ventrad, looplike. Hind femora long, slender, not clavate.
- 18 14 (15). Lateral tubercle on pronotum large projects conically sideways. 20. **Callichromini**.
- 15 (14). Lateral tubercle on pronotum small, projects tubercularly upward, slightly recessed from lateral margin. . . . 21. **Rosaliini**.

- 16 (13). Pronotum without lateral tubercle. Abdominal tergite VII at least partly with large spinules; if with minute spinules, femora clavate.
- 17 (18). Femora clavate. Abdominal tergite VII with minute spinules. Antennae bent ventrad, looplike. 22. **Callidiini**.
- 18 (17). Femora not clavate, thicken gradually toward apex. Abdominal tergite VII with large spinules on posterior margin bent forward, forming transverse row.
- 19 (20). Abdominal tergite VII triangular, rounded posteriorly, posterior margin not upright; spinules on disk form three or four transverse rows; spinules of posterior row bent forward, of two medial rows (each consisting of two spinules) bent inward toward middle. Antennae short, pressed to sides, with apices directed backward or bent ventrad, or long, bent ventrad or arcuate and directed forward. 23. **Clytini**.
- 20 (19). Abdominal tergite VII tetragonal, transversely truncate posteriorly, posterior margin upright, with large spinules there bent forward (eight to 12 spinules each), forming distinct transverse rows; minute spinules on disk in posterior half form tuft. Antennal apices bent ventrad and directed forward.
. 24. **Stenaspini**.

12. Tribe HESPEROPHANINI

Adult insect with elongate body, with parallel sides, rounded at elytral apex and on sides of pronotum; antennae long, with numerous hairs.

Larva characterized by poorly developed thoracic legs, and rather convex, coriaceous (not sclerotized) locomotory ampullae on abdominal segments I to VII.

Pupa recognized by presence of transverse wrinkles (striation) on vertex and pronotal disk, and minute spinules on abdominal tergites I to VI and large spinules on tergite VII.

The tribe Hesperophanini is abundantly represented in the warm tropical zone. Represented in northern Asia by a single genus with a lone species.

1. Genus *Trichoferus* Woll.

Wollaston, 1854, *Yns. Maderens*, p. 427; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 62-64.

Adult: Distinguished from adult insects of other genera of the tribe Hesperophanini by poorly produced, rounded tubercles near articulate

antennal sockets, less spherical pronotum, absence of hairy band on 3rd antennal segment, and spotty pubescence on elytra.

Larva: Head slightly compressed dorsoventrally, with three transparent ocelli laterally near antennal bases forming transverse band. Anterior third of pronotum with transverse rusty band in which innumerable whitish dots occur in posterior half.

- 19 *Pupa*: Head glabrous, without setae, transversely rugose on vertex. Antennae arcuate. Pronotum laterally rounded, transversely rugose on disk, with spinules here forming transverse band, and small tuft in anterior half. Abdominal tergites I to VI with sharp minute spinules, VII with large spinules, VIII with few fine setae.

Only one species known in the fauna of northern Asia, three in China, and no more than five in Europe, including the Mediterranean region.

Type species: Cerambyx cinereus Villers, 1789.

1. *Trichoferus campestris* (Fald.)

Faldermann, 1825, *Mém. Acad. St. Pétersb.*, vol. 2, p. 435 (*Hesperophanes*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 69-71; Kostin, 1973, *Zhuki-dendrofagi Kazakhstana*, p. 102.

- Adult* (Figure 1): Readily recognized by uneven, spotty hairy cover on elytra. Head with dense punctation and tightly adherent hairs directed forward and inward posterior to eyes, and sideways from midline between antennae. Frons bulges gently, tubercularly near antennal bases, with deep median longitudinal suture. Genae short, barely visible. Eyes highly convex, coarsely and sharply faceted, deeply emarginate. Antennae comparatively long, with apices reaching posterior third of elytra (female) or extending beyond 0.75 their length (male), with short tightly adherent hairs and on inner side (basally) (especially on 1st to 6th segments) with long erect setaceous hairs. Third antennal segment longer than 4th, equal to 5th; 11th segment short, obtusely rounded apically (female) or elongate, slender, pointed (male). Pronotum narrows abruptly anteriorly, gently posteriorly, broadens roundly in anterior third, with dense large punctation, tightly adherent light-colored hairs directed toward middle of disk, sometimes with smooth wartlike tubercles, of which two anterior to middle and one medial in posterior half. Scutellum with dense gray hairs, broadly or narrowly gently rounded apically. Elytra elongate, with parallel sides, convex, somewhat flattened on disk along suture, rounded apically, with coarse punctation and tightly adherent gray hairs forming dense, more or less distinct spots, with stray
20 erect setaceous hairs. Hind femora markedly fall short of elytral apex; hind tarsi shorter than tibiae, their 1st segment not longer than two successive segments together. Abdominal sternite V broad and broadly

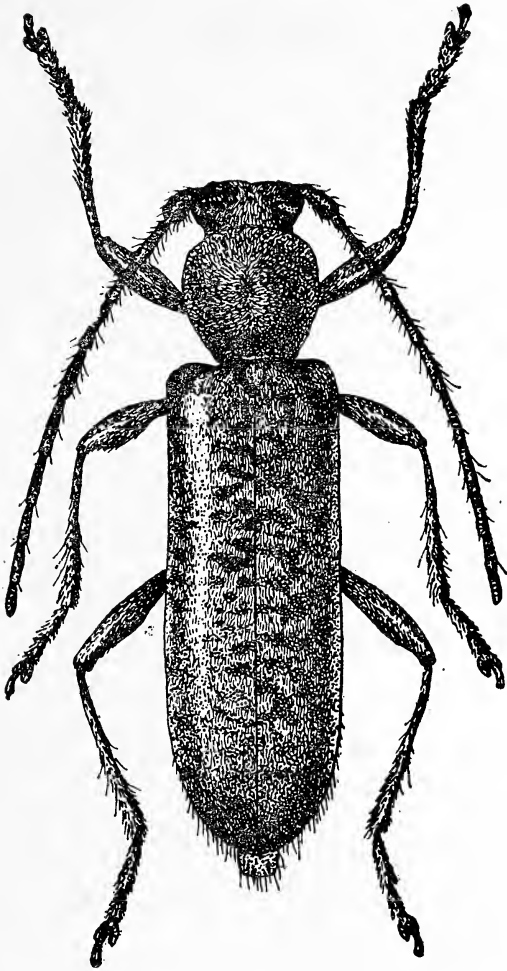


Figure 1. *Trichoferus campestris* (Fald.).

rounded posteriorly (female) or comparatively elongate and narrowly rounded posteriorly (male). Entire body, elytra, antennae, and legs rusty-brown. Length 13 to 20 mm.

Egg: White, slightly elongate, narrows notably toward poles, narrowly rounded at poles. Chorion finely sculptured, matte. Length 1.9 mm, width 0.6 mm.

Larva (Figure 2): Head highly retracted into prothorax. Anterior margin of epistoma distinctly emarginate at level of clypeus. Hypostoma slightly convex, almost flat. Gula broad between sclerites of hypostoma. Parietals (sides of head) narrow anteriorly; three distinct transparent ocelli near antennal bases form transverse band. Antennae long, with

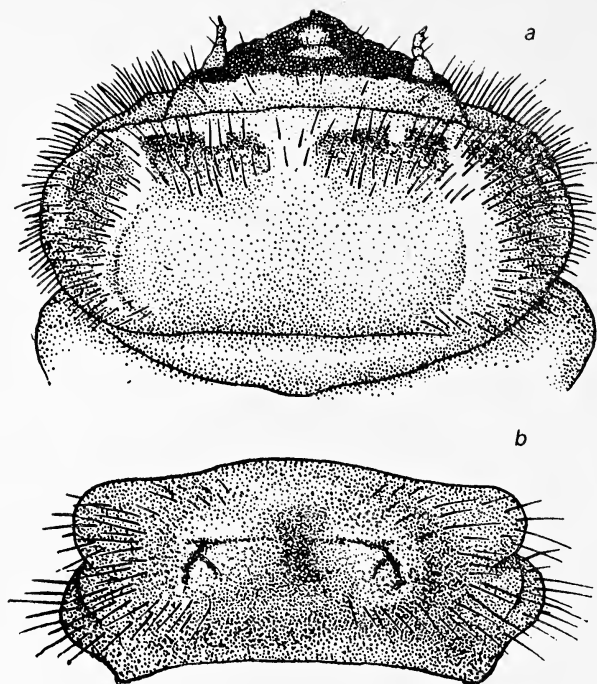


Figure 2. Larva of *Trichoferus campestris* (Fald.).
a—head and pronotum; b—abdominal tergite IV
with dorsal locomotory ampulla.

four segments; 1st antennal segment thick, narrows markedly toward apex, longer than almost all successive segments. Clypeus short, base broadens markedly. Labrum convex, narrows sharply anteriorly, with short lateral setae. Inner masticatory lobes of maxillae digitate, apically with thin piliform setae. Maxillary palps long, project forward markedly beyond apex of inner lobes. Mandibles massive, broadly rounded apically; transverse basal ridge demarcated from rest of surface by narrow groove, with faint median longitudinal groove.

Prothorax barely longer than meso- and metathorax together. Pronotum 2.0 times wider than long, narrowly rounded anteriorly, with rounded anterior margin, in anterior third with transverse rusty band interrupted medially and laterally by broad white gap, with long hairs forming two transverse fields, of which one on anterior margin of rusty band (hairs here bound by sclerotized ringlet) and second before scutum (hairs not bound). Posterior margin of transverse rusty band glabrous, with whitish dots. Pronotal scutum bulges slightly, without hairs, demarcated laterally by longitudinal grooves. Prothoracic presternum with uniformly dense rusty hairs; eusternum glabrous, lustrous. Thoracic legs short, claws poorly developed, setaceous.

Abdomen narrows posteriorly, with fine light-colored hairs laterally. Abdominal segments I to VI with lateral transverse flange in anterior third. Dorsal locomotory ampullae moderately convex, coriaceous, anterolaterally with oblique pitlike depression, with short transverse posterior grooves originating from it. Ventral locomotory ampullae slightly convex, smooth, coriaceous, laterally with pitlike depression demarcated by faint transverse grooves. Abdominal sternite VIII laterally with dull spot in posterior half that looks like oblique dent. Body length up to 25 mm, width of head 3.0 mm.

Pupa (Figure 3): Body moderately elongate. Head narrows uniformly posterior to eyes, glabrous, bulges transversely between antennae, with longitudinal, transversely rugose band between upper lobes of eyes, short longitudinal dent medially on anterior margin adjoining two sutures, and laterally arcuate. Antennae pressed to sides, bend round midfemora, with apices touching midtibiae.

Pronotum narrows gradually toward base, rounded anteriorly, slightly convex on disk, with transverse grooves and short obtuse spinules forming median (in rugose field) transverse band and small tuft in

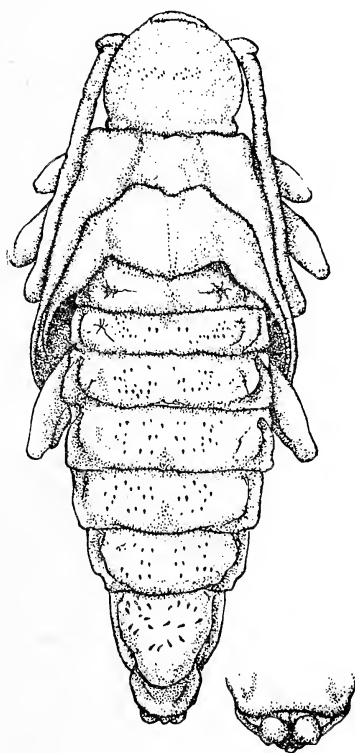


Figure 3. Pupa of *Trichoferus campestris* (Fald.).

anterior third. Mesonotum smooth, bulges (rhomboidal) on posterior margin in region of scutellum. Metanotum with median, longitudinal, transversely slightly rugose band, with three inconspicuous setae laterally.

Abdomen narrows slightly toward base and more toward tip. Abdominal tergite I short, with transverse rugose dent laterally, with inconspicuous stray spinules. Abdominal tergites II to VI slightly convex, with minute sharp spinules that usually form three transverse rows; posterior row with four to eight paramedial spinules, middle row two spinules, and anterior row three to five spinules. Abdominal tergite VII elongate, rounded posteriorly, with large spinules on disk, falcate toward middle of disk. Tergite VIII with barely discernible stray setae. Valvifers of female large, adjacent, apically obtuse. Body length up to 20 mm, width of abdomen 4.5 mm.

Material: Collected in Ussuri-Primor'e region. Adult insects six, larvae three, pupa—one female.

Distribution: Tadzhikistan, Uzbekistan, southern Kazakhstan, Ussuri-Primor'e region; northern Mongolia, northern China, North Korea.

Biology: Inhabits broad-leaved and mixed vegetation. Flight of beetles from end of June to early August; insects sometimes fly to light. Under laboratory conditions female laid eggs singly on birch shoots 2.5 to 3.0 cm in diameter under scaly remnants of bark, rarely two eggs simultaneously. Newly hatched larvae bore bark and plug chorion with frass. Larvae make galleries along shoot under bark and plug them with frass. Galleries usually faintly, rarely significantly impressed on sapwood. Due to larval activity much of bark, except outer layer, damaged. Width of gallery made by mature larvae 5.0 to 12.0 mm. Mature larva raised in laboratory weighed 171.5 mg. Pupae formed on April 29, 1974 from larvae that had hatched in August, 1972, suggesting that one generation of *Trichoferus campestris* (Fald.) lives for not less than two years. According to observations by Samoilov (1938), this species colonizes *Micromeles alnifolia* in nature.

13. Tribe CERAMBYCINI

Adult insect differs from those of other tribes of the subfamily in large massive body. Pronotum narrows more anteriorly, with distinct flange near anterior margin, transverse groove at base, convex on disk, coarsely rugose (quite often grooves transverse, sinuous), and rounded (*Mallambyx*) or with acute spine (*Plocaederus*, *Cerambyx*) laterally. Elytra elongate, smooth (*Mallambyx*) or coarsely rugose, especially in anterior half (*Cerambyx*).

Larva characterized by large body, inconspicuous hairy cover on abdominal pleura, large spiracles laterally on abdominal segment I, which are not smaller than on mesothorax.

The greatest diversity of the tribe Cerambycini is seen in Southeast Asia. Comparatively large number of species known in Mediterranean fauna. Represented in northern Asia by a single genus with a lone species.

1. Genus *Mallambyx* Bat.

Bates, 1873, *Ann. Mag. Nat. Hist.*, 4, 12, 152; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 79; Gressitt, 1951, *Longicorn Beetles of China*, vol. 2, p. 135; Cherepanov and Cherepanova, 1973, *Nov. i maloizv. vidy fauny Sibiri*, 6th ed., p. 52

Adult: Body large. Antennae longer (male) or shorter (female) than body, thin markedly toward apex. Pronotum transversely coarsely rugose, rounded laterally, narrows more anteriorly, less posteriorly. Elytra elongate, smooth, narrowly rounded apically and there, on side of suture, with acutely produced small spinule.

Larva: Body of mature larva massive, thick. Half of head retracted into prothorax. Pronotal scutum, prothoracic basisternum, and locomotory ampullae coriaceous, not sclerotized. Pronotum with sparse large setaceous hairs forming two transverse bands in anterior third and behind middle before scutum; bands interlinked laterally and along median longitudinal suture.

Pupa: Not known.

Only one species known in the fauna of northern Asia; inhabits southeastern forests.

Type species: *Neocerambyx raddei* Blessing and Solsky, 1872 (= *japonicus* Bates, 1873).

1. *Mallambyx raddei* (Bless. and Sols.)

Blessing and Solsky, 1872, *Horol. Soc. Entom. Ross.*, vol. 9, p. 170 (*Neocerambyx*); = *japonicus*, Bates, 1873, *Ann. Mag. Nat. Hist.*, 4, 12, 152; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 80-82; Kupyanskaya, 1968, *Fauna ekologiya nasekomykh D. Vostoka*, p. 101; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, pp. 47-48; Cherepanov and Cherepanova, 1973, *Nov. i maloizv. vidy fauny Sibiri*, 6th ed., pp. 52-53.

23 *Adult* (Figure 4): Well distinguished from other species of the subfamily Cerambycinae by large body size, elongate smooth elytra, and transversely rugose pronotum. Head narrower than pronotum, barely elongate, with tightly adherent hairs directed forward, genae shorter than wide, frons near antennal bases clavately convex, with narrow

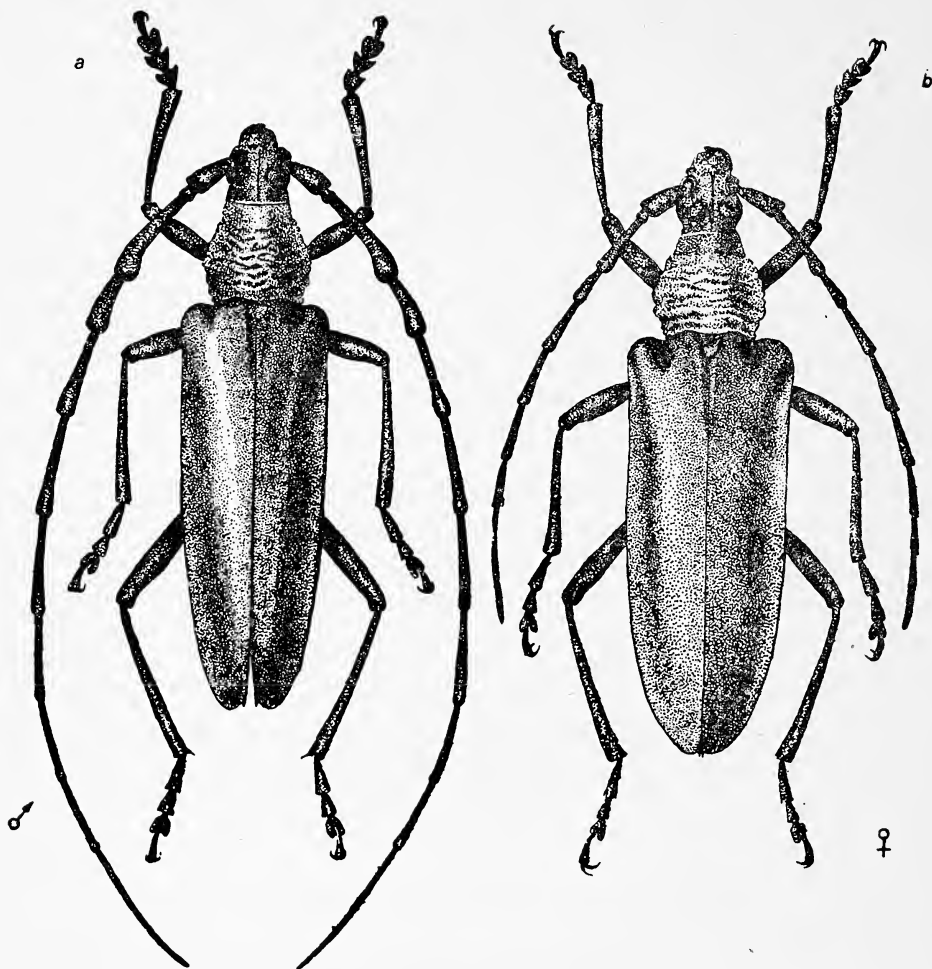


Figure 4. *Mallambyx raddei* (Bless. and Sols.).

median suture extending into parietal area, and occiput with fine dense punctation. Eyes large, broad, very deeply emarginate; upper lobes minute, less than half size of lower lobes. Antennae considerably longer (male) or slightly shorter (female) than body; 3rd segment 2.0 times longer than 1st, slightly shorter than 4th and 5th together.

Pronotum narrows sharply in anterior half, slightly in posterior half, with distinct flange near anterior margin, transverse groove at base, and deep transverse furrows, tightly adherent grayish-yellow pubescence directed forward in posterior half and backward in anterior half, and sparse erect setae laterally. Scutellum flat, narrowly rounded apically, with fine adherent hairs.

- 24 Elytra long, smooth, with parallel sides (female) or narrow slightly toward apex, narrowly rounded apically, with sharp projecting spinule

on inner margin of suture, and minute tightly adherent grayish-yellow hairs. Abdominal sternite V posteriorly narrowly emarginate (male) or broadly rounded (female). Legs relatively long; femora with parallel sides, flat; hind tarsi shorter than tibiae. Body, antennae, elytra, and legs brownish, with rusty tone. Body length 35 to 52 mm.

Larva (Figure 5): Mature larvae characterized by large body, locomotory ampullae on abdominal segments I to VII, and poorly developed thoracic legs. Head markedly retracted into prothorax, almost 0.50 width of prothorax. Epistoma divided by well-developed, median, longitudinal, dark brown suture, in middle third with numerous short setaceous hairs forming transverse band, weakly demarcated laterally, frontal sutures inconspicuous, almost imperceptible. Hypostoma with stray short hairs on inner anterior margin of sclerites, demarcated laterally by sutures diverging forward. Gula trapezoid, flat or slightly convex. Sides of head (parietals) narrowly rounded anteriorly, in anterior half with sparse thick setaceous hairs. Antennae short, project slightly beyond anterior margin of parietals; 1st segment notably thicker than 2nd. Clypeus lustrous, white, trapezoid or almost rectangular, 2.0 times wider than long. Labrum convex, narrows angularly toward front, with narrowly rounded anterior margin, dense setae laterally and anteriorly, glabrous and smooth at base and in middle. Mandibles massive, rounded apically, with extended cultrate edge, smooth on outer side. Inner lobes of maxillae and labial ligula with dense setae. Maxillary palps with three segments and labial palps two segments, short.

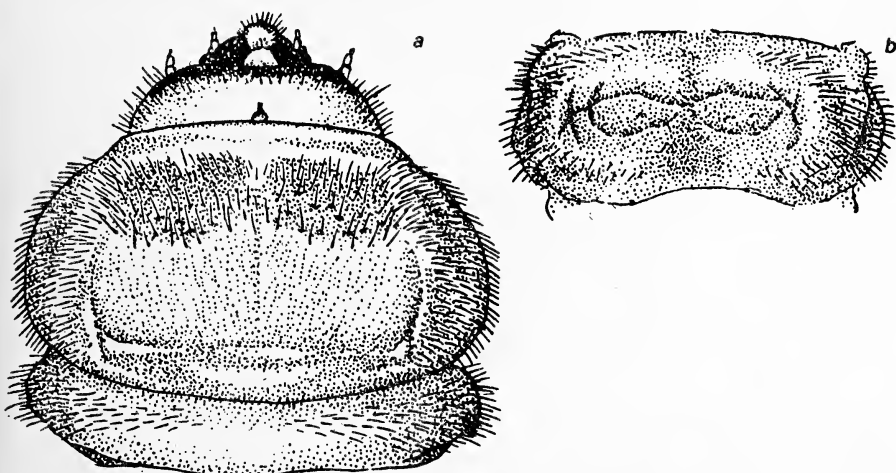


Figure 5. Larva of *Mallambyx raddei* (Bless. and Sols.).

a—head and pronotum; b—abdominal tergite IV with dorsal locomotory ampulla.

Prothorax notably wider than mesothorax. Pronotum slopes toward head, with short setaceous hairs in anterior half and laterally. Pronotal scutum convex, demarcated laterally by straight longitudinal groove, with thin longitudinal furrows, sometimes with minute sparse hairs laterally near posterior angles. Prothoracic presternum in young larvae with dense thin, in mature larvae with sparse thick setaceous hairs bound
 25 basally by sclerotized rusty ringlet; eusternum bulges insignificantly, coriaceous, broadly rounded apically, with sparse setaceous hairs laterally; base of prosternum (basisternum*) coriaceous, rugulose. Thoracic legs short, poorly developed, with short pointed claw.

Abdomen thick, narrows insignificantly toward tip, with sparse short thin hairs laterally. Dorsal locomotory ampullae slightly convex, coriaceous, with fairly developed furrows (sometimes forming reticulate granulation, especially in mature larvae) separated by median longitudinal groove and two transverse grooves joined laterally, with lateral longitudinal groove diverging posteriorly. Ventral locomotory ampullae in young larvae slightly rugose, in mature larvae distinctly granular, demarcated by transverse groove adjoining lateral longitudinal groove, which in mature larvae looks like deep dent with furrows diverging from it.

Body white. Anterior margin of head dark brown, almost black, with rusty tinge. Mandibles black. Anterior third of pronotum with yellowish-rust band interrupted medially and laterally by white gap, sometimes with whitish notch on anterior margin close to lateral gap. Body length of mature larvae up to 65 mm, width of head up to 8.0 mm.

Pupa: Not known.

Material: Collected in Ussuri-Primor'e region. Adult insects four, larvae seven.

Distribution: Ussuri-Primor'e region; northern China, Korea, Japan.

Biology: Inhabits broad-leaved forests. Flight of beetles end of July and in August; insects sometimes fly to light at night. Lives in trunks of stunted oak trees up to 52 cm in diameter (Kupyanskaya, 1968). Larvae live initially under bark, then in wood, usually make longitudinal galleries in latter. Mature larva makes pupal cell along trunk (Kojima and Hayashi, 1969) and pupates in it. Pupae evidently appear end of June and in July. Beetles mainly emerge in July.

14. Tribe CALLIDIOPINI

Adult insect characterized by elongate body with parallel sides. Head not wider or narrower than pronotum. Eyes highly emarginate.

*Strictly speaking, the sternellum—General Editor.

Antennae do not reach (female) beyond elytral apex. Pronotum elongate, slightly oval. Femora clavate. Outer side of tibiae with sharp edge.

This tribe consists of a lone genus in the fauna of northern Asia.

1. Genus *Stenygrinum* Bat.

Bates, 1873, *Ann. Mag. Nat. Hist.*, 4, 17, 154; Plavil'shchikov, *Fauna SSSR*, 22, 2, 120; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 158.

Adult: Characterized by the following features in addition to those listed above. Apices of maxillary palps markedly broad, dolabriform. Third antennal segment shorter than 5th, equal to 1st, distinctly longer than 4th. Pronotum slightly rounded laterally, and slightly narrower or not narrower anteriorly than at base. Femora apically sharply convex, with thin shaft at base.

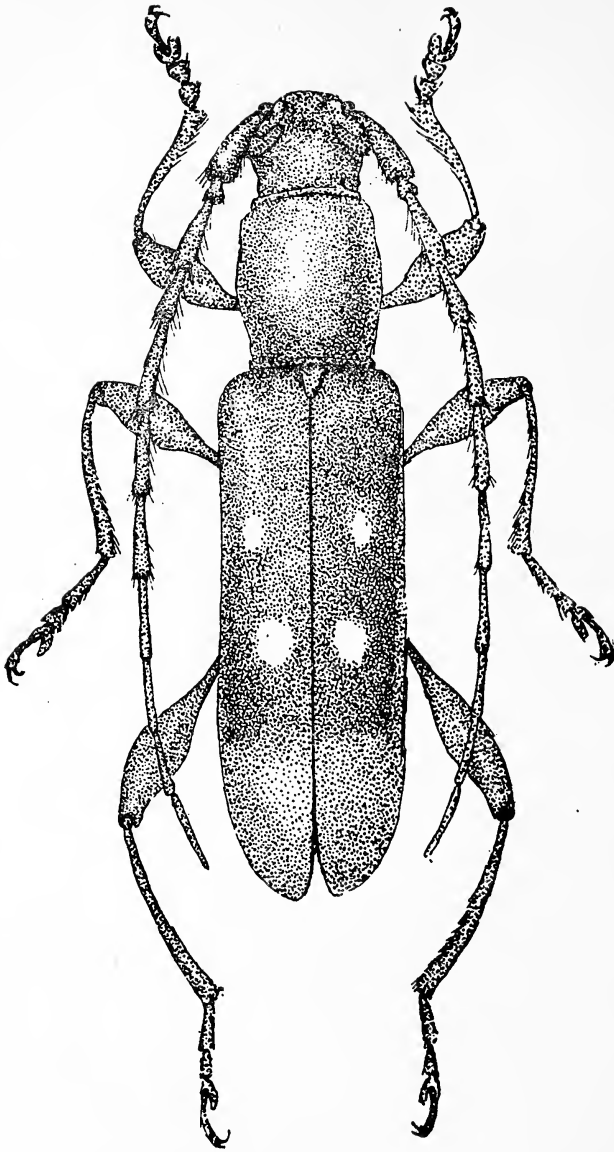
This genus consists of a lone species, widely distributed in Southeast Asia.

Type species: Stenygrinum quadrinotatum Bates, 1873.

26 1. *Stenygrinum quadrinotatum* Bat.

Bates, 1873, *Ann. Mag. Nat. Hist.*, 41, 17, 154; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 121-122; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 54.

Adult (Figure 6): Body elongate. Head not wider than pronotum, appears elongate posterior to eyes. Frons with large deep punctation, with narrow median longitudinal suture, with sharp tubercle lateral to antennal bases protruding upward, spinelike. Vertex with uneven, sometimes large deep, sometimes smooth punctation. Occiput uniformly rounded, with transversely rugulose punctation. Eyes moderately convex, coarsely faceted, broadly emarginate on inner side, bordered here with dense golden hairs. Antennae narrow toward apex, reach elytral apex or notably shorter than elytra. First antennal segment with fine punctation, laterally smooth at apex, lustrous; 3rd segment almost equal to or slightly longer than 5th, 1.5 times longer than 4th. Pronotum almost 2.0 times longer than width at base, broadens insignificantly and ovally anterior to middle or in middle, uniformly convex on disk, with sometimes fine deep, sometimes smoothened rugose punctation, medially with prominent smooth longitudinal line. Scutellum very small, narrowly rounded posteriorly, with minute inconspicuous hairs. Elytra 4.0 times longer than wide, with gabled suture, posterior to scutellum with broad longitudinal dent, jointly rounded apically, with almost straight, slightly rounded inner angle, and lustrous; deep punctation in anterior half, especially at base, coarse punctation in posterior half, fine

Figure 6. *Stenygrinum quadrinotatum* Bat.

punctuation otherwise, especially at apex, with delicate light-colored pubescence and sparse stray erect setae. Femora slender at base, clavately convex at apex. Tarsi short, with distinctly broadened segments; 1st segment of hind tarsi not longer than two successive segments. Body chestnut-reddish-rust, pronotum usually red, antennae and legs light rust or reddish-rust. Elytra on disk dark brown, at base (narrow band) and apex (in last third) light reddish or light rust with two light yellow-

ish spots; one spot anterior to middle and second posterior to it (f. *typica*), sometimes spots fuse longitudinally (ab. *conjectum* Matsusch.), or only posterior spot present, anterior one lacking (ab. *binotatum* Flav.). Body length 8.0 to 13.5 mm.

Distribution: All of Southeast Asia, including southern part of Ussuri-Primor'e region, Korea, China, Indochina, and Japan. Described from specimens from Korea and Japan (collection of Moscow State University). We did not find it.

15. Tribe GRACILIINI

Adult insect characterized by small body, elongate elytra with parallel sides, comparatively long slender antennae, and distinctly emarginate eyes.

Larva with white, moderately elongate body, short thoracic legs, anterior half of pronotal scutum with sharp longitudinal striation, and locomotory ampullae developed on abdominal segments I to VII.

Three genera of this tribe reported in USSR fauna. Of them, only one species of the genus *Gracilia* Serv. found in the southern Urals. Not reported elsewhere in northern Asia.

1. Genus *Gracilia* Serv.

Serville, 1834, *Ann. Soc. Entom. France*, vol. 1, p. 81; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 125; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 160; Mamaev and Danilevskii, 1975, *Lichinki zhukov-drovosekov*, pp. 181-182.

Adult: Body comparatively narrow, slightly flattened. Head short, with short adherent hairs and stray long setae. Genae short. Antennae comparatively widely separated, antennal sockets in ocular notch; distance between antennal bases more than gap between upper lobes of eyes. Pronotum elongate, flattened dorsally, angularly broadened laterally. Elytra with parallel sides, matte, with short pubescence, sharply rounded apically, matte. Femoral clava highly flattened from sides.

Larva: Head markedly retracted into prothorax, narrowly rounded anteriorly, with distinct minute black spot laterally. Prosternum with reticulate sculpture.

Pupa: Abdominal tergites with fine setae forming transverse row.

28 This genus consists of a lone species inhabiting Europe, western Asia, northern Africa, North America, and Japan.

Type species: *Callidium pygmaeum* Fabricius, 1834 [= *Callidium minuta* (F.)].

1. *Gracilia minuta* (F.)

Fabricius, 1781, *Spec. Insect.*, vol. 1, 235 (*Saperda*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 127; Duffy, 1952, *Monograph Beetles*, pp. 194-195; Linsley, 1962, *Cerambycidae of North America*, 20, 3, 49-50; Demelt, 1966, *Tierwelt Deutschlands*, vol. 2, pp. 52-64; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, pp. 56-57.

Adult (Figure 7): Body small, elongate. Head short. Frons broad, with minute punctation, very sparse light-colored hairs, median longitudinal suture, and convex around antennal bases. Eyes coarsely faceted, very deeply notched, with narrow gap between lobes. Antennae widely

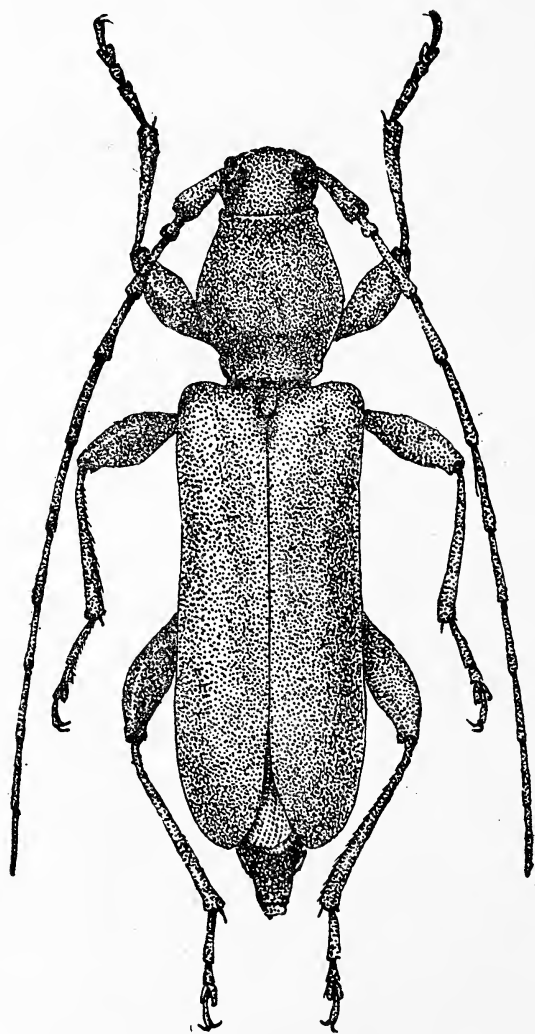


Figure 7. *Gracilia minuta* (F.).

separated at base, gap between them more than between upper lobes of eyes, longer than body. First antennal segment shorter than 5th, barely longer or not longer than 4th.

Pronotum slightly elongate, angularly broadened mediolaterally, somewhat narrower toward base and less anteriorly, with less distinct flange on anterior margin, more distinct one on posterior margin, flattened on disk, with fine dense punctation and highly minute light-colored pubescence not forming dense cover. Scutellum elongate, with parallel sides, broadly rounded apically, medially with broad groove.

Elytra elongate, with parallel sides, individually rounded apically, with longitudinal, not very long dent on suture behind scutellum, broad depression on anterior third of disk, with large punctation in anterior half and indistinct punctation in posterior half (especially on hind clivus), with minute light-colored adherent hairs directed laterally from suture. Femora clavate, markedly flattened on sides. Hind tarsi 0.66 length of tibiae; 1st segment of hind tarsi distinctly longer than two successive together. Body, antennae, elytra, and legs monochromatic, rusty. Body length 4.0 to 6.0 mm.

Larva (Figure 8): Characterized by small body, presence of minute black spot on each side of head, and longitudinal striation on pronotal scutum. Body white, moderately elongate. Head narrowly rounded anteriorly, with broadly rounded anterior margin, highly retracted into prothorax. Epistoma bulges slightly, lustrous. Hypostoma narrows insignificantly toward front. Parietals with broad rusty-brown border on anterior margin that does not encompass antennal sockets from behind, in anterior half with short setaceous light-colored hairs, on sides (dorsal view), behind rusty border, with sharply projecting small black spot resembling ocellus. Clypeus short, flattened, translucent. Labrum convex, lustrous, with rounded anterior margin, short light-colored setae.

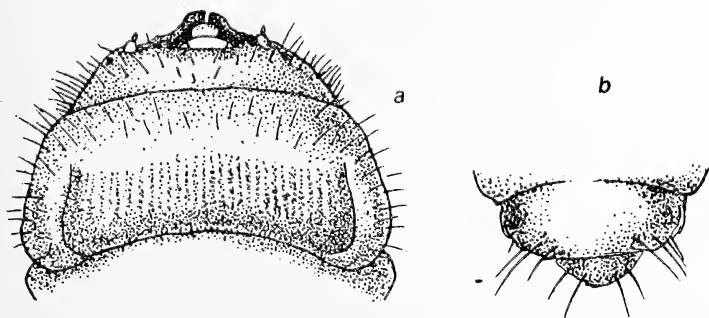


Figure 8. Larva of *Gracilia minuta* (F.)

a—head and pronotum; b—tip of abdomen, dorsal view.

Mandibles thick, reddish-brown, in second half almost black, broadly rounded apically, with cultrate mesal surface.

Pronotum narrows anteriorly, with very minute (just visible under high magnification) light-colored hairs anterior to scutum and on sides. Pronotal scutum white, moderately convex, bound laterally by short longitudinal grooves, in anterior half with longitudinal parallel streaks forming fairly distinct striation. Prothoracic presternum bulges, with just visible sparse light-colored hairs; eusternum glabrous, indistinctly bound by shallow groove with reticulate sculpture. Thoracic legs short.

Abdomen moderately elongate, narrows insignificantly from thorax toward tip, with very sparse minute light-colored hairs laterally. Abdominal tergites transverse. Dorsal locomotory ampullae on tergites I to VII insignificantly convex, coriaceous, with shagreen sculpture, separated by common median longitudinal groove. Ventral locomotory ampullae divided by transverse groove. Body length up to 6.0 mm.

Pupa: Body elongate. Head moderately bent under, with stray setae near antennal bases. Antennae pressed to sides, bent ventrad in second half. Pronotum elongate, gently rounded laterally, with short setaceous spinules on anterior margin forming transverse band, setae anterior to middle forming transverse row, and thin minute setae on hind clivus forming one small tuft on each side. Posterior margin of mesonotum with fully extended scutellum. Abdominal tergites with four to six setae forming transverse row on posterior margin. Tip of abdomen rounded, with long setae forming transverse row. Body length 3.5 to 7.0 mm (Duffy, 1953).

Material: Collected in the Caucasus. Adult insects (collection of the Zoological Museum, Moscow State University) several specimens, larva one.

30 *Distribution:* West from Atlantic Ocean coast east to the Urals, north from Sweden and Finland south to northern Africa, Japan, North America. Reported from the southern Urals, but we did not find it there.

Biology: According to information available in literature (Plavil'shchikov, 1940; Romadina, 1954; and others), ecologically associated with deciduous species. Larvae live under bark and make longitudinal sinuous galleries deeply imprinted in wood. Mature larva bores wood, makes cell there, and pupates in it. Beetles emerge from pupae the same summer, nibble an opening in shoot surface, and exit through it. One generation per year. *Gracilia minuta* (F.) inhabits slender dried shoots of willow (*Salix*), blackthorn (*Prunus spinosa*), hawthorn (*Crataegus*), dog rose (*Rosa*), oak (*Quercus*), birch (*Betula*), and other deciduous species. Damages hoops of wine barrels. According to some investigators, imported from Europe into North America and Japan with wine barrels.

16. Tribe OBRIINI

Adult insect characterized by elongate body, long slender antennae, highly convex, coarsely faceted, and highly emarginate eyes. Pronotum elongate, with laterally produced tubercle. Elytra with parallel sides, notably convex on disk (*Obrium*) or flat (*Stenhomalus*). Femora clavate. Ventral side of abdomen with dense setaceous brush performing function of scraper during oviposition.

Larva characterized by slender elongate body. Half of head retracted into prothorax; anterior half of parietals with long dense hairs on sides, bent backward; epistoma with barely perceptible median longitudinal suture merging laterally with parietals; frontal sutures not visible. Pronotal scutum coriaceous, not sclerotized, white. Thoracic legs lacking, rudiment faintly visible just before pupation. Abdominal segments I, II, and VII with poorly developed locomotory ampullae; segments III to VI with highly convex, widely separated locomotory ampullae projecting nodularly; anterior and posterior to ampullae deep transverse constrictions form secondary pseudoannuli, as a result of which abdomen appears multiannulate.

Pupa with short head; antennae long, bent ringlike (*Obrium*) or loop-like (*Stenhomalus*) in posterior half. Pronotum elongate, with more (*Obrium*) or less (*Stenhomalus*) projecting tubercle laterally, setae or acicular spinules in posterior half forming one or two transverse bands. Abdomen elongate, narrows sharply posteriorly and notably toward anterior end; abdominal tergites with minute spinules; tip of abdomen with (*Stenhomalus*) or without (*Obrium*) urogomphi.

Two genera of the tribe Obriini found in the USSR, of which *Obrium* Curt. inhabits almost the entire Holarctic while *Stenhomalus* White is distributed mainly in Southeast Asia. Species of these genera are ecologically associated with deciduous vegetation. Inhabit trunks and branches of trees with thin smooth bark. Characteristic behavior of female seen during oviposition. First, by means of a very small brush on ventral side of abdomen, she scrapes minute fibrous scales from bark, lays a sticky egg (which adheres to shoot surface), then covers top of egg with scales scraped earlier. A laid egg looks like a tiny mound and merges with the general background of bark.

KEY TO GENERA

Adult Insects

- 1 (2). Episterna of metathorax with deep longitudinal groove. Forecoxae elongate, conical 1. **Obrium** Curt.

- 2 (1). Episterna of metathorax uniform, without longitudinal groove. Forecoxae not elongate, spherical 2. **Stenhomalus** White.

Larvae

- 1 (2). Prothoracic eusternum convex, distinctly demarcated from presternum by groove. Anterior margin of hypostoma around inner angles of sclerites with spinelike outgrowth or deep notch. 1. **Obrium** Curt.
 2 (1). Prothoracic eusternum not convex, not demarcated from presternum by groove, merges with it to form common surface. Anterior margin of hypostoma smooth around inner angles of sclerites, without spinelike outgrowth, with only inconspicuous notch. 2. **Stenhomalus** White

Pupae

- 1 (2). Posterior end of abdominal tergite VII narrowly rounded conically, not produced; abdominal tergite VIII not bent dorsad 1. **Obrium** Curt.
 2 (2). Posterior end of abdominal tergite VII conically produced to a point; abdominal tergite VIII bent dorsad (lateral view) 2. **Stenhomalus** White.

1. Genus *Obrium* Curt.

Curtis, 1825, *Brit. Entom.*, vol. 2, p. 91; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 133-134; Linsley, 1963, *Cerambycidae of North America*, vol. 21, pp. 136-137.

Adult: Readily recognized by structure of forecoxae, long abdominal sternite I, presence of deep longitudinal groove on metepisternum, and other features. Body elongate. Head short, with deep or indistinct punctation and sparse long thin hairs. Eyes large, convex, coarsely faceted, highly angularly emarginate or saccate. Antennae long, slender; 10th or 11th (female) or even 9th (male) segment generally extends beyond elytral apex. Pronotum elongate, with distinct tubercle laterally, broad flange anteriorly and especially at base, with long light-colored hairs. Elytra parallel, apically with rounded inner and significantly truncate outer angle, with more (*O. gracile* Plav.) or less [*O. cantharinum* (L.)] large punctation. Forecoxae elongate, not spherical. Femora clavate. Hind tarsi significantly shorter than tibiae. Abdominal sternite I long, equal to rest of sternites together (female) or markedly shorter (male). Sternite II posteriorly emarginate in female and here setae broaden terminally and form dense brush.

Larva: Body elongate, slender. Pronotal scutum coriaceous, demarcated laterally by deep longitudinal grooves, glabrous, without hairs. Prothoracic eusternum convex, coriaceous, usually glabrous, without hairs. Locomotory ampullae on abdominal segments I, II, and VII poorly developed, markedly produced nodularly on segments III to VI, widely separated. Abdominal segments anterior and posterior to latter ampullae with deep transverse grooves forming secondary pseudoannuli.

- 32 *Pupa:* Antennae slender, bent angularly. Head narrowly rounded on occiput, without setae, glabrous. Pronotum longitudinal, with distinct tubercle on each side, with setae or acicular spinules forming one (at base) or two (at base and middle) transverse bands in posterior half, glabrous in anterior half. Abdominal tergites with well-developed or weak spinules.

Four species are known in the fauna of the USSR; of these, one is distributed in Europe up to the Urals, one widespread in the Palearctic, and two in the Far East, mainly in Ussuri-Primor'e region. Up to six species are known in Southeast Asia and 10 in North America. All species of this genus found in northern Asia inhabit forests and are ecologically associated with only deciduous woody species.

Type species: Cerambyx cantharinum Linnaeus, 1767.

KEY TO SPECIES

Adult Insects

- 1 (4). Body and elytra rusty, entire abdomen light or dark rust.
- 2 (3). Pronotum smooth, without large deep punctation. Europe and Asia 1. **O. cantharinum** (L.).
- 3 (2). Pronotum not smooth, with large deep punctation. Eastern Asia. 2. **O. brevicorne** Plav.
- 4 (1). Body and elytra blackish-brown, abdomen rusty-red only at tip. Eastern Asia 3. **O. gracile** Plav.

Larvae

- 1 (4). Ocelli near antennal bases distinct, pigmented, black.
- 2 (3). Anterior margin of hypostoma near inner angles of sclerites with sharply produced spinelike projections, posterior to which lie articulate spinelike maxillary processes. Found on poplar and asp. 1. **O. cantharinum** (L.).
- 3 (2). Anterior margin of hypostoma near inner angles of sclerites with notch accommodating articulate maxillary processes. Found on ash 2. **O. brevicorne** Plav.

- 4 (1). Ocelli not perceptible near antennal bases. Pigmentation lacking. Found on ash 3. **O. gracile** Plav.

Pupae

- 1 (4). Abdominal tergites with large spinules that usually form transverse band in posterior half.
- 2 (3). Pronotum with fine setae forming one or two transverse bands. Spinules on basal adominal tergites broaden markedly 1. **O. cantharinum** (L.).
- 3 (2). Pronotum with long acicular spinules forming single transverse band. Spinules on basal abdominal tergites broaden insignificantly. 2. **O. brevicorne** Plav.
- 4 (1). Abdominal tergites with minute, barely discernible spinules forming transverse row. 3. **O. gracile** Plav.

1. **Obrium cantharinum** (L.).

Linnaeus, 1767, *Syst. Nat.*, 12th ed., vols. 1-2, p. 637 (*Cerambyx*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 134-135; Cherepanov and Cherepanova, 1973, *Nov. i. maloizv. vidy fauny Sibiri*, 6th ed., pp. 47-49.

- 33 *Adult* (Figure 9): Body comparatively large, light rust, with conspicuous black, highly convex eyes, and faintly punctate, lustrous pronotum. Head short, retracted into prothorax almost up to eyes, tubercularly convex around antennal bases from inner side, with broad median longitudinal suture, transversely impressed anteriorly, lustrous, with barely perceptible, minute, very sparse, obliterated punctation. Eyes large, broadly emarginate, coarsely faceted. Antennae widely separated, slender; 10th segment (male) or only 11th (female) extends beyond elytral apex, with minute tightly adherent hairs; 1st to 4th segments (especially in male) with semiadherent long hairs; 3rd segment longer than 4th (male) or equal to it (female).

Pronotum elongate, distinctly narrower than head, with conical tubercle anterolateral to middle, basally and apically with slight transverse flange (first, at base, usually more prominent than one at apex); pronotal disk convex, lustrous, with fine uneven punctation, and long erect rusty hairs directed backward in anterior half, and forward in posterior half. Scutellum elongate, with almost parallel sides, narrows slightly anteriorly, broadly rounded posteriorly (mainly in male) or triangular, pointed anteriorly (mainly in female), with barely perceptible, obliterated punctation, with very minute hairs visible only under high magnification. Elytra with parallel sides, convex, apically with narrowly rounded inner and slightly truncate outer angle, with projecting shoulders; inward to latter with distinct longitudinal impression, with punctation large and

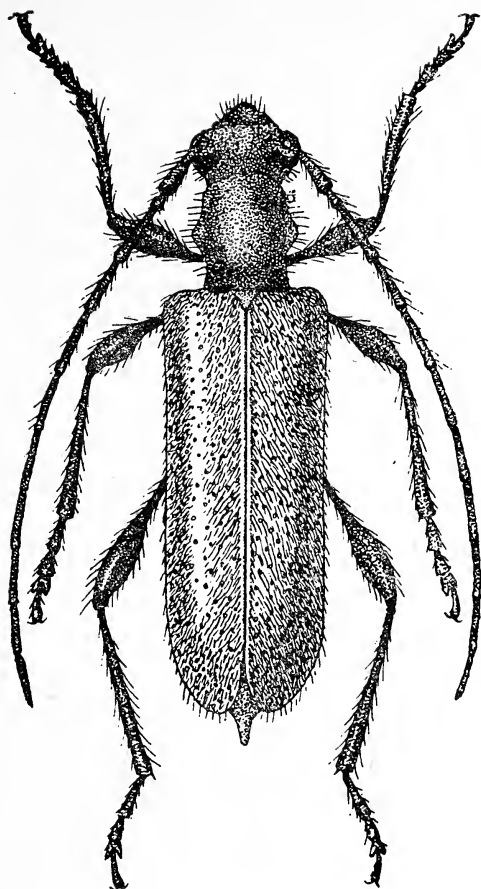


Figure 9. *Obrium cantharinum* (L.).

34

more distinct in anterior half, less distinct in posterior half, and minute semiadherent hairs. Legs moderately long; hind femora dilate gently toward apex. Hind tibiae 1.5 times longer than tarsi; 1st segment of hind tarsi equal to two successive together.

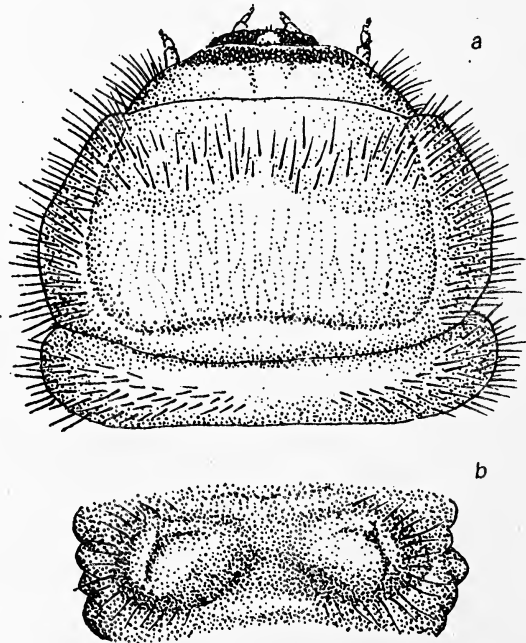
Adomen lustrous, with minute, barely perceptible punctation, and fine rusty hairs; sternite II in female with emarginate posterior margin and here with deep golden setae. Body, antennae, and legs monochromatic, rusty-black. Body length 5.5 to 10.0 mm.

Egg: White, moderately elongate, rounded at poles. Chorion with flat reticulate sculpture, gaps between cells resemble septa, thin. Length 1.0, width 0.4 mm.

Larva (Figure 10): Body elongate, narrows markedly from thorax to posterior end. Half of head retracted into prothorax; head narrows slightly anteriorly. Epistoma with smooth lustrous dark brown border

along anterior margin; fuses laterally with parietals; frontal sutures not visible, median suture dark brown, streaklike. Hypostoma divided by broad gula into two triangular sclerites with one sharp spinelike projection on anterior margin near each inner angle, posterior to which lie posterior articulate maxillary tubercles. Parietals in anterior half laterally with long dense hairs bent backward. Antennae comparatively long, with four segments. Pigmented ocelli present, one on underside of each segment. Clypeus short, white, sometimes masked up to apex by anterior margin of epistoma. Labrum round, convex, glabrous on disk, with tender setae along margins in anterior half. Mandibles narrow insignificantly toward apex, broadly rounded there, with cultrate mesal surface.

Prothorax thick, markedly broader than meso- and metathorax. Pronotum slopes moderately toward head, with coarse light-colored hairs in anterior half and laterally, without perceptible yellow transverse band. Pronotal scutum slightly convex, white, demarcated laterally by deep longitudinal grooves, with thin longitudinal striation. Alar lobes with long light-colored hairs. Prothoracic presternum densely hairy; eusternum convex and coriaceous, glabrous at base, with sparse hairs at apex. Thoracic legs lacking.



35

Figure 10. Larva of *Obrium cantharinum* (L.).

a—head and pronotum; b—abdominal tergite IV with dorsal locomotory ampulla.

Abdomen with thin light-colored hairs laterally; abdominal segments with additional pseudoannuli demarcated by narrow constrictions; locomotory ampullae coriaceous, developed on abdominal segments I to VII. Dorsal locomotory ampullae on tergites III to VI highly convex, widely separated; semicircular groove anterior to sides. Ventral locomotory ampullae with pitlike depression, with radial grooves. In prepupa rudimentary thoracic legs and sclerotized lobes appear laterally on meso- and metathorax. Body length of mature larvae 12 to 15 mm, width of head 1.8 mm.

Pupa (Figure 11): Characterized by sharp spinules on abdominal tergites and long setae on pronotum. Head rounded on occiput, distinctly broadens between antennae, usually with three setae anterior to antennal bases forming transverse row. Antennae slender, bent angularly posterior to midfemora, pressed to legs ventrally, with apices adjoining sides of head.

Pronotum slightly longer than width at base, convex and smooth on disk, with projecting conical tubercle laterally; narrows somewhat toward anterior end, with small flange at base; in some specimens fine setae form transverse row at base anterior to flange; in others an additional transverse band occurs in middle; in still others only transverse bands present in posterior third; and in yet others one sparse tuft occurs on each flank basally. Meso- and metanota convex, with or without stray setae. Hind femora clavate, with apices bent somewhat dorsad.

Abdomen broadens in region of segments III and IV, narrows toward base and tip. Abdominal tergites convex, in posterior half with sharp, usually setaceous spinules that are very broad at base and form transverse row. Spinules generally in pairs on disk, single on sides. Tergite VII elongate, narrowly rounded posteriorly, with three to five spinules forming tuft. Tip of abdomen (ventral view) slightly obtuse, almost rounded. Valvifers of female small, insignificantly separated, project laterally at apex. Body length 7.0 to 10.0 mm, width of abdomen 2.8 to 3.2 mm.

35 *Material*: Collected in Ussuri-Primor'e region, Tuva, Altai, Ob' region, and the southern Urals. Adult insects 26, larvae 49, pupae—10 males and seven females, larval exuviae with beetles from cells 11.

Distribution: West and eastern Europe, northern Asia. More abundant in south, especially in foothills of western Siberia (Tuva, Altai).

Biology: Inhabits forests with viable asp and poplar. Beetles begin to fly from end of June through August. Maximum numbers found in July. Female lays eggs singly on branches and trunks of *Populus*. Colonize sections with smooth, usually thin bark. Embryonic development continues up to three weeks. For example, larvae began hatching on August 28 from eggs laid July 30 through August 4. The atmospheric tempera-

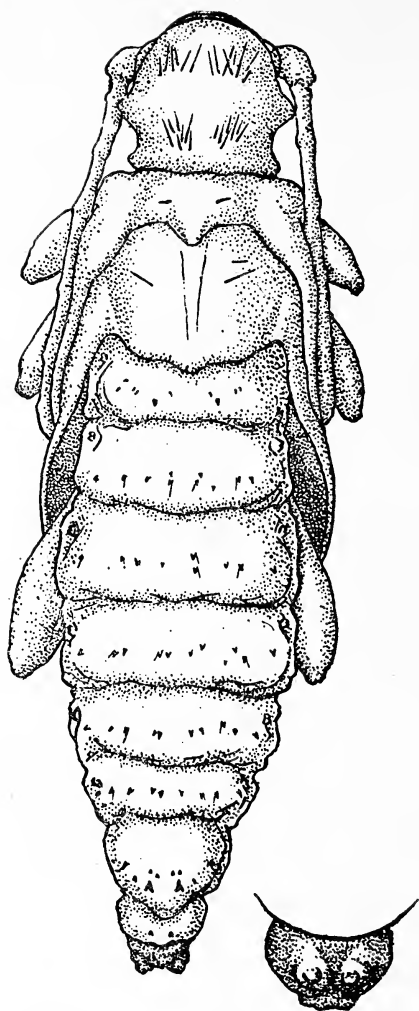


Figure 11. Pupa of *Obrium cantharinum* (L.), female.

ture during this period varied from 10.8 to 28.1°C (average $18.5 \pm 0.6^{\circ}\text{C}$). Newly hatched larvae bore bark and plug eggshell remnant with frass. They make longitudinal galleries under bark from the top downward, which are deeply impressed in sapwood. Galleries are densely sealed with fine frass consisting of wood and partly bark. Mature larva burrows gradually into wood and makes cell there in upper layer along trunk and plugs inlet with frass. Larva then turns around, facing inlet, and pupates with head upward. Length of larval gallery under bark up to 23 cm and width 2.0 to 3.0 mm. Width of inlet 2.5 to 3.0 mm, length of pupal cell up to 13 mm, width up to 4.0 mm, length of plug sealing cell 7.0 mm.

36 Pupation commences in first 10 days of June and ceases by end of the month. Maximum number of pupae seen in middle of last 10 days of June. Duration of pupal stage 2.5 to 3.0 weeks. For example, in Altai beetles began emerging in middle of first 10 days of July from pupae appearing in last 10 days of June, with the first beetles seen on July 4th. Emerging beetles break inlet plug, push back frass, nibble an oval (flight) opening in bark and exit. Flight opening 2.0 mm \times 3.0 mm. Emergence of adults from wood commences end of June and ceases in last 10 days of July. Mass emergence takes place in middle 10 days of this month. Life cycle completed in two years (Table 2).

Weight of larvae before pupation 12.1 to 36.0 mg, of pupae 11 to 33 mg, and of newly developed beetles before emerging from wood 9.0 to 27.5 mg. Females considerably larger. For example, records of 13 specimens (six males and seven females) revealed that male larvae before pupation weighed 13.1 to 21.0 mg, pupae 11 to 19 mg, and adult insects 8.5 to 15.0 mg; respective values for females were 20.8 to 36.0, 19 to 33, and 16.0 to 27.5 mg, i.e., nearly double those of males.

Long-horned beetles of this species colonize mainly mature, often overmature trees. They first colonize the apex, then central section of the crown, and sometimes significant parts of the apex and trunk simultaneously. In 1975 we found a focal point of this species near Lake Telets in Altai. It colonized not only branches but also many trunks of asp up to 30 to 36 cm in diameter. Colonization of the trunk occurred to a height of 2.0 m to the apex. Population density during pupation (June 18) six per dm². Viable trees were colonized. Initially such trees became stag headed, after which desiccation set in. This species was soon followed by *Acanthoderes clavipes* Schr., *Saperda perforata* Pall., *S. scalaris* (L.), and others which colonized the same trees.

2. *Obrium brevicorne* Plav.

Plavilstshikov [Plavil'shchikov], 1940, *Fauna SSSR*, 22, 2, 138-139.

Adult (Figure 12): Proximate to *O. cantharinum* (L.) but differs in more elongate, distinctly punctate pronotum, and deep coarse punctation of elytra. Head with sparse deep punctation, long yellowish hairs,

Table 2. Periods of development of *Obrium cantharinum* (L.)

Year of development	May	June	July	August	September	October
1st	L	LPA	PAE	AEL	EL	L
2nd	L	L	L	L	L	L
3rd	L	LPA	PAE	AEL	EL	L

For explanation of abbreviations used here and elsewhere in the text, see p. 29 of Volume I.

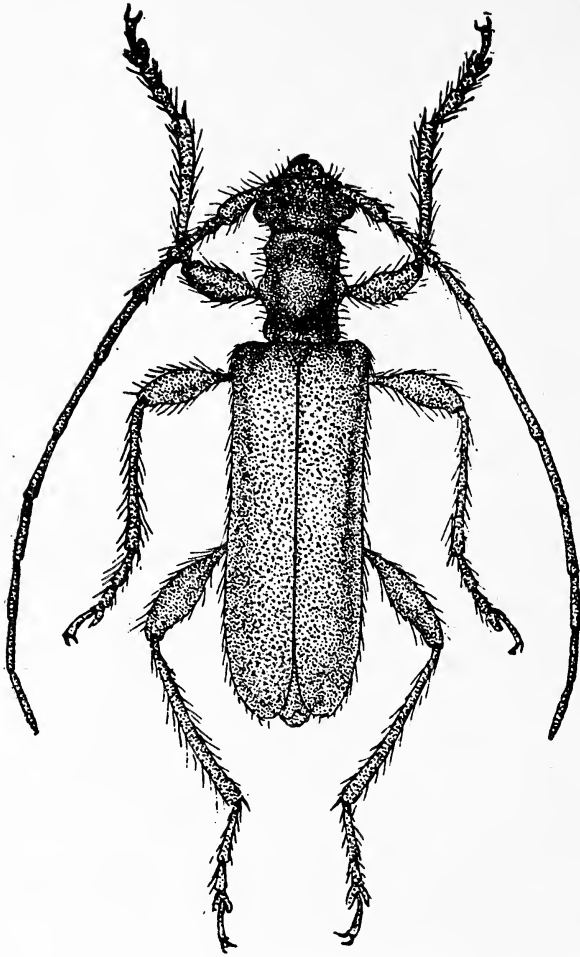


Figure 12. *Obrium brevicorne* Plav.

and smooth longitudinal streaklike suture. Antennae in male and female longer than body; 10th segment (male) or 11th (female) extends beyond elytral apex; 3rd segment longer than 4th, considerably shorter than 5th. Eyes deep, usually angularly emarginate.

Pronotum elongate, longitudinal, 2.0 times longer than width at base: anterior to middle with projecting obtuse tubercle laterally; broad, well-demarcated flange basally and distinct but less demarcated flange anteriorly; moderately convex on disk; with deep distinct punctation and long
 37 light rust erect hairs. Scutellum lustrous, smooth, narrows significantly toward apex, sometimes almost triangular, narrowly rounded or almost pointed at tip. Elytra elongate, with parallel sides, convex, with rounded humeri, with dense deep punctation. Hind tarsi 0.66 length of tibiae; 1st segment slightly longer than two successive together or equal to them.

posterior margin of abdominal sternite II deeply notched, with more extensive setaceous brush in front, with acicular setae and from flanks long piliform setae bent inward. Body, elytra, legs, and antennae monochromatic, brownish or reddish-rust, eyes black. Body length 6.0 to 9.0 mm.

Egg: White, matte, oval, rounded at one pole, extended collarlike at the other, with flat reticulate sculpture. Length 1.2 mm, width 0.45 mm.

Larva (Figure 13): Differs from *O. cantharinum* (L.) in smoothened projections on anterior margin of hypostoma, markedly elongate abdomen, and presence of yellow transverse band on anterior margin of pronotum. Head insignificantly retracted into prothorax, notably narrows anteriorly. Epistoma with narrow lustrous brownish-rust border along anterior margin, divided by faint median longitudinal suture. Sclerite of hypostoma triangular, with sharp inner angle; sharp subulate articulate maxillary process set in notch on anterior margin near sharp inner angle. Parietals with long dense hairs directed backward in anterior half. Antennae short, conical. One pigmented ocellus near each antennal base. Clypeus transparent, hyaline, broadens markedly at base. Labrum very small, transversely oval, with broadly rounded anterior margin, barely perceptible setae along margins. Mandibles black and thick, short, with transverse groove on outer side at base.

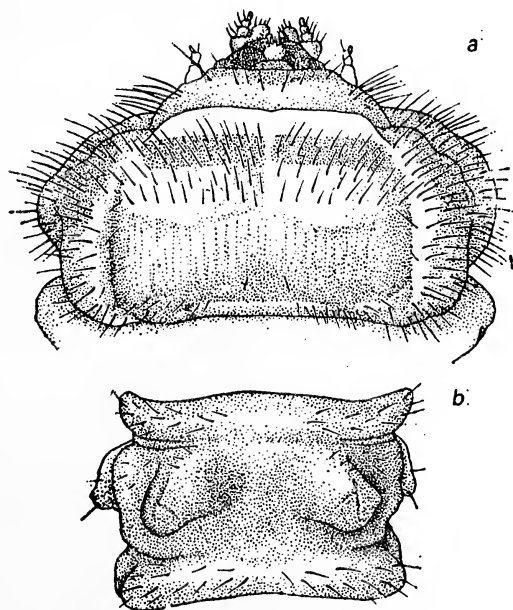


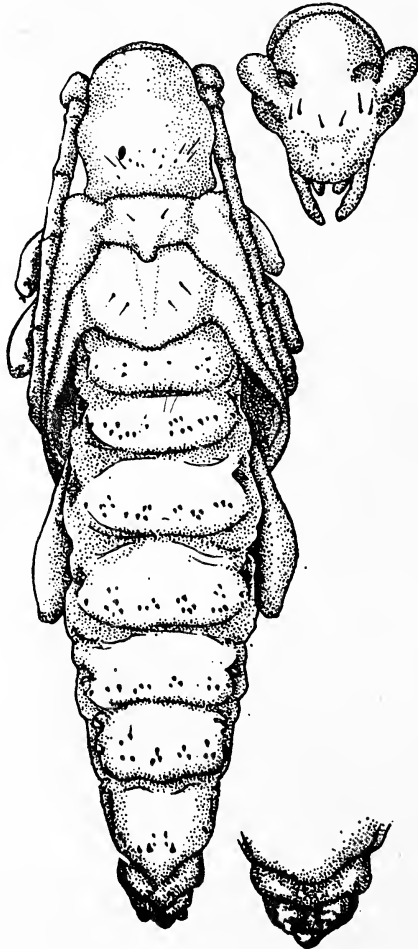
Figure 13. Larva of *Obrium brevicorne* Plav.

a—head and pronotum; b—abdominal tergite IV with dorsal locomotory ampulla.

Prothorax broadens in posterior half, narrows gently in anterior half. Pronotum slopes slightly toward head, with thin tender hairs in anterior half and laterally, transverse yellow band near anterior margin interrupted medially by white longitudinal field. Pronotal scutum white, slightly convex, bound on sides by longitudinal grooves, slightly produced in middle of anterior margin and appears bifurcate here. Prothoracic presternum with dense yellow hairs; eusternum glabrous, coriaceous.

Abdomen finely elongate, with short indistinct light-colored hairs laterally. Abdominal segments III to VI markedly elongate, with sharply (nodular) projecting dorsal and ventral locomotory ampullae, with transverse grooves in front and behind giving impression of pseudoannuli. Body length of mature larvae 13 to 14 mm, width of head 1.6 mm.

Pupa (Figure 14): Readily recognized by acicular spinules on pronotum and large spinules at posterior margin of abdominal tergite VII.



Head flat between upper lobes of eyes, spherically convex on occiput, with or without acicular spinules near antennal bases. Antennae bent angularly ventrad, with apices adjoining sides of head (female) or extending beyond it (male).

Pronotum elongate, laterally with medially projecting obtuse tubercle, basally with more (male) or less (female) distinct transverse flange, with paired acicular spinules forming transverse band in front of it; disk convex, smooth, narrows somewhat anteriorly. Mesonotum convex, with acute projecting tubercle laterally. Scutellum elongate, rounded posteriorly, with fine transverse striation. Metanotum with median longitudinal groove and one to three spinules laterally.

- 38 Abdomen elongate, narrows toward anterior and posterior ends. Abdominal tergites with short spinules directed backward, forming common transverse band of individual tufts (two to five spinules each) in posterior half. Posterior end of tergite VII with group of spinules, of which two large ones bent down and forward, forming transverse row, the rest fine, usually erect. Valvifers of female widely separated, conical, apically resemble mastoid projection, and slightly shifted laterally.

Material: Collected in Ussuri-Primor'e region. Adult insects 195, larvae 46, pupae—four males and two females, larval exuviae with beetles from cells five.

Distribution: Ussuri-Primor'e region, Komarovka and Suvorovka Rivers, Osinovka, Vladivostok.

Biology: Inhabits broad-leaved forests. Ecologically associated with ash (*Fraxinus*). Flight of beetles from end of June to mid-August. In 1971 first beetles sighted on June 25 in Ussuri forest region. Maximum number seen in first half of July. Beetles emerge from cells with developed gonads. Ovaries of one female dissected on emerging from wood contained 32 mature eggs, of another female 36. Beetles mate soon after emergence from cells and oviposit. Larvae hatch from eggs in July and August. They bore bark, make longitudinal, often meandering galleries under it, and plug them with fine frass. Galleries sharply impressed on sapwood. Larva makes cell in upper layer of wood at end of gallery and pupates in it.

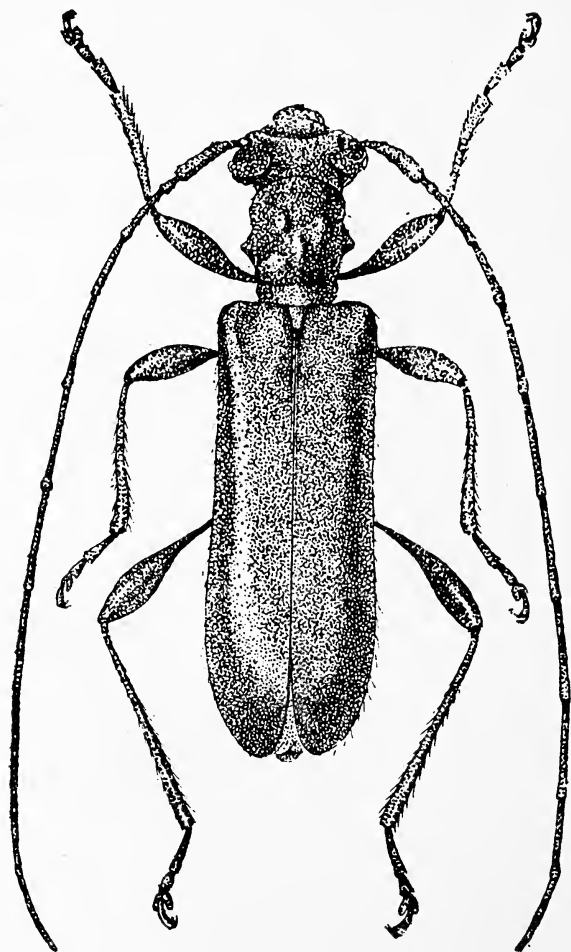
Pupation commences from end of May. Pupae mainly found in June. Young beetles emerge in second half of June. Weight of larvae 13.4 to 25.6 mg, pupae 12.5 to 24.0 mg, and beetles emerging from cells 10 to 19 mg. Average weight of beetles 13.8 mg.

This species generally inhabits tops and branches of drying and physiologically weakened trees. Mainly damages ash. For example, of 169 beetles collected from wood cuttings gathered in a forest, 168 were found in ash and one in maple. *Obrium gracile* Plav. and *Rhopaloscelis bifasciatus* Kr. quite often colonize ash together with *O. brevicorne* Plav.

39 3. **Obrium gracile** Plav.

Plavilstshikov [Plavil'shchikov], 1933, *Entom. Anzeig.*, vol. 13, p. 167; =*graciliforme*, Lipp, 1939, *Entom. Blätt.*, vol. 35, p. 255; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 137-138.

Adult (Figure 15): Differs from other species of this genus in dark brown body and small size. Body moderately elongate. Head broader than pronotum, with large, sometimes obliterated punctation, with smooth median longitudinal suture between antennae, and comparatively long light-colored (gray) hairs. Eyes highly convex, coarsely faceted, deeply emarginate, saccate. Antennae slender, longer than body; 9th segment (male) or 11th (female) extends beyond elytral apex, with minute adherent hairs; underside of 1st to 5th segments with several semi-adherent hairs.



Pronotum 1.5 times longer than width at base, with large conical tubercle laterally in middle, well-developed anterior and posterior flanges, more rarely flanges poorly developed, uniformly convex on disk, sometimes with longitudinal carina, with distinct, rather sparse punctation (gaps between punctures lustrous, 3.0 to 5.0 times larger than punctures themselves), with long light-colored adherent hairs behind anterior half and in front of posterior half. Scutellum elongate, triangular, smooth, narrowly rounded or pointed posteriorly. Elytra convex, with parallel sides, well-developed dents around humeni, large, dense, deep punctation (distance between punctures not more than, or 1.5 times larger than punctures themselves), with semiadherent light-colored fine hairs. Hind femora apically with gradually thickening clava. First segment of hind tarsi almost 1.5 times longer than two successive together.

- 40 Abdomen narrows slightly toward tip. Abdominal sternite I equal to II and III sternites (male) or II to V (female) sternites together; sternite II in female highly emarginate posteriorly and here with unusually dense setae, thickened and scraperlike at apices, forming triangular brush bound in front by short acicular setae, with long setae incurved from flanks that seem to brace brush. Sternite III very short, only sides perceptible, with long light-colored setae. Entire body, antennae, elytra, and legs monochromatic dark brown, with rusty tinge. Body length 5.0 to 6.0 mm.

Egg: White, elongate, pointed at one pole, rounded at the other. Chorion with indistinct sculpture. Length 1.0 mm, width 0.4 mm.

Larva (Figure 16): Very similar to larva of *O. brevicorne* Plav. but differs in faint nonpigmented ocelli, denser setae on abdomen, and smaller mature larva. Half of head retracted into prothorax; head narrowly rounded anteriorly. Epistoma fuses laterally with parietals, divided by barely perceptible median longitudinal suture, with smooth lustrous brownish-rust border along anterior margin, and behind border several tender setae forming transverse row. Anterior margin of hypostoma near inner angles of sclerites with slight notch for articulate maxillary processes. Parietals with dense tuft of long hairs bent backward. Ocelli not seen near antennal bases, pigmentation lacking.

Pronotum broadly rounded anteriorly, with erect light-colored hairs laterally; hairs on disk in anterior half bent down forward and sideways. Pronotal scutum white, slightly convex, bound laterally by deep grooves, outwardly convex, with two slight emarginations along anterior margin, insignificantly produced forward medially but not bifurcate, with fine longitudinal striation. Prosternum with short light-colored hairs bent down and slightly forward.

Abdomen slender, elongate, with sparse short hairs laterally. Abdominal segments III to VI with elongate lateral tubercles and protuberant

locomotory ampullae. Body length of mature larvae 11 to 12 mm, width of head 1.0 mm.

- 41 *Pupa* (Figure 17): Differs from other species of this genus in barely developed spinules on abdominal tergites. Head between upper lobes of eyes not impressed, merges gradually posteriorly with common hemispherically convex occipital surface, and with pair of acicular spinules or without them anterior to antennae. Antennae bent angularly, with apices pressed to sides of head ventrally.

Pronotum with parallel sides, laterally with large conically projecting tubercle; base, especially laterally, with narrow transverse constriction, convex and lustrous on disk, with seven or eight long acicular spinules in posterior third forming transversely elongate tuft. Meso- and metanota with one or two setae laterally.

Abdomen moderately elongate, broadens slightly medially, narrows markedly toward tip. Posterior half of abdominal tergites with barely discernible spinules forming indistinct, at places widely interrupted row. Tergite VII narrowly rounded posteriorly, with pair of widely separated

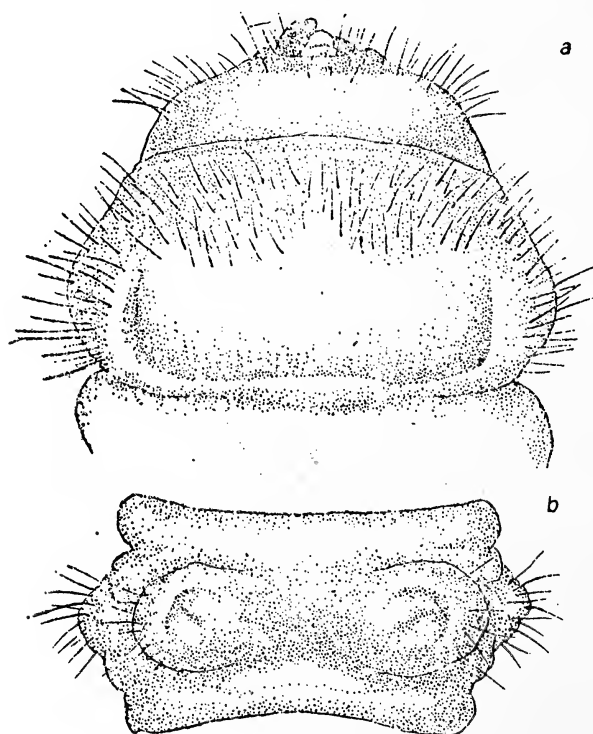


Figure 16. Larva of *Obrium gracile* Plav.
a—head and pronotum; b—abdominal tergite IV
with dorsal locomotory ampulla.

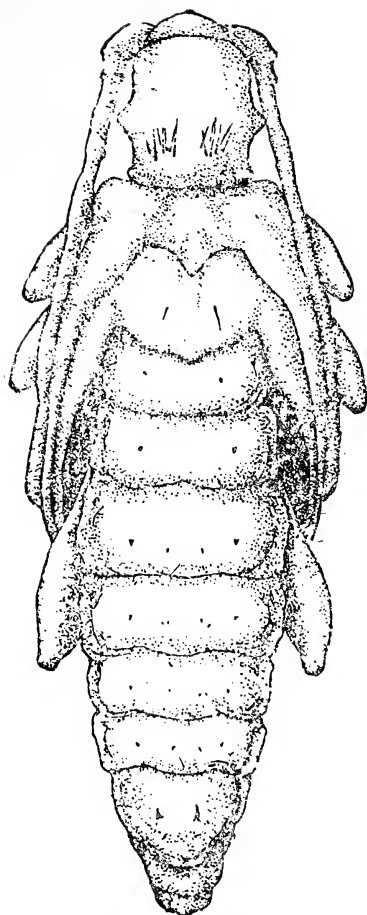


Figure 17. Pupa of *Obrium gracile* Plav.

spinules on posterior margin bent forward. These spinules lacking in some specimens. Valvifers of female very small, hemispherical, slightly separated. Body length 4.0 to 6.5 mm, width of abdomen 1.1 to 1.4 mm.

Material: Collected in Ussuri-Primor'e region and in Sakhalin. Adult insects 294, larvae 113, pupae—eight males and one female, larval exuviae with beetles from cells eight. Two generations of beetles were raised in the laboratory.

Distribution: Ussuri-Primor'e region, Sakhalin. We found large numbers in forests in the Komarovka River basin.

42 **Biology:** Lives in broad-leaved forests. Emergence of beetles from wood commences mid-June and ends in July. Flight of beetles continues up to August inclusive. They avidly feed on flowers of spiraea and other plants and frequently mate while feeding. Gonads mature during

this period. Ovaries of one female dissected eight days after emergence from wood contained 18 mature eggs, of another female 19.

Female lays eggs on thin shoots 0.6 to 3.0 cm in diameter on maturing or mature drying trees. Sometimes undergrowth colonized. Larvae hatch from eggs in three to four weeks by rupturing shell. They immediately bore bark and make longitudinal sinuous or straight galleries underneath it, faintly impressed on alburnum, and plug them with fine frass. Mature larva bores wood and makes cell there along axis of shoot. Sometimes cells are made under bark, in which case impression in alburnum deep. Length of gallery under bark 10.0 to 26.2 cm, in wood up to 1.6 cm; width of gallery 3.0 to 6.0 mm. Length of cell 7.0 to 10.0 mm, width 2.0 to 4.0 mm.

Larvae pupate in May and June after second hibernation. Maximum number of pupae seen in nature from middle of first 10 days to beginning of last 10 days in June. Pupae develop for about two weeks in nature. Beetles nibble oval opening (1.0 mm \times 2.0 mm) in bark surface and exit from cell through it. First beetles recorded in cells on June 3. Found in large numbers in middle 10 days of June. Emergence of beetles from wood commences mid-June. For example, in 1971 field observations recorded 67 beetles emerging from cuttings of ash shoots colonized by this species; of these, 39 (58.2%) emerged in second half of June and 28 (41.8%) in July. First beetles emerged June 15 and last July 26, i.e., emergence of beetles from wood continued for more than a month.

According to records of 16 specimens, larvae before pupation weighed 4.0 to 13.1 (5.8 \pm 0.5) mg, pupae 3.0 to 12.0 (5.1 \pm 0.5) mg, and beetles 1.6 to 9.8 (4.2 \pm 0.4) mg. Population density of this species is comparatively high. For example, a shoot 1.5 cm in diameter and 30 cm long contained four beetles. Similar density recorded for other shoots.

Obrium gracile Plav. is among the monophagous insects inhabiting ash (*Fraxinus rhynchophylla* and *F. mandschurica*). In a three-year period shoots collected from a forest contained 233 beetles, of which 230 were found in ash and three in unidentified shoots. *Obrium brevicorne* Plav. and *Rhopaloscelis bifasciatus* Kr. colonize ash together with this species.

2. Genus *Stenhomalus* White

White, 1855, *Catal. Coleopt. Brit. Mus.*, vol. 8, p. 243; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 139-140; Gressitt, 1951, *Longicorn Beetles of China*, vol. 2, p. 163; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 57.

Adult: Body elongate, flat. Head short. Genae barely perceptible. Antennae slender, longer than body. Pronotum elongate, with small obtuse tubercle laterally. Elytra parallel, flat on disk, individually rounded apically. Metepisternum uniform, without longitudinal groove. Abdominal sternite I in male considerably shorter, in female only slightly shorter than rest of sternites together. Sternite II in female posteriorly emarginate, with setae forming dense brush; sternite III with long incurved setae on posterior margin.

- 43 *Larva*: Very similar to larvae of the genus *Obrium*. Differs in absence of pigmented ocelli, more uniform anterior margin of hypostoma, absence of grooves demarcating prothoracic eusternum, with latter merging into general surface of presternum.

Pupa: In structure of head and pronotum very similar to the genus *Obrium*. Differs markedly in structure of tip of abdomen. Abdominal tergite VII produced conically at posterior margin, projects far beyond tergite VIII (lateral view), with four large spinules forming transverse row in posterior half, of which middle ones bent down, forward, and inward and lateral ones backward and sideways. Tip of abdomen with pair of urogomphi terminating in setaceous sclerotized spinule.

Only one species found in the fauna of northern Asia. Most species of this genus occur in Southeast Asia and the islands of Japan.

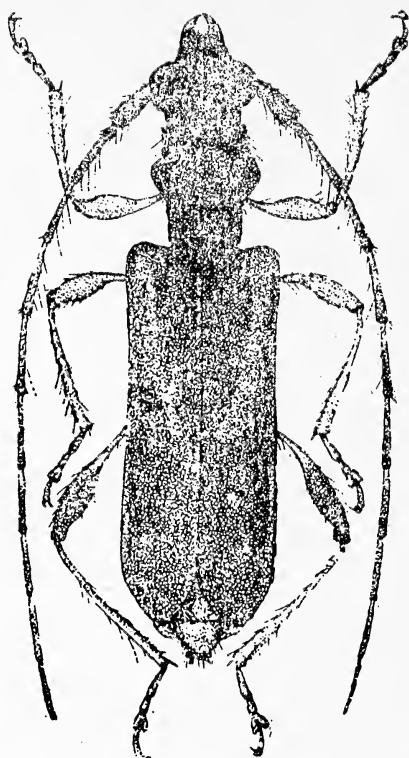
Type species: *Stenhomalus fenestratus* White, 1855.

1. *Stenhomalus vulcanus* Tsher.

Tsherepanov [Cherepanov and Cherepanova], 1976, *Novosti fauny Sibiri* (Nov. i maloizv. vidy fauny Sibiri, 10th ed.), pp. 79-83.

Adult (Figure 18): Body elongate. Head short, directed forward, with uneven, coarse punctation. Genae barely perceptible. Frons slightly elevated around antennal bases, with median longitudinal suture. Antennae long, slender; 9th segment extends beyond elytral apex; 1st to 6th segments with long setaceous hairs on inner side; 3rd segment longer than 4th, shorter than 5th. Eyes convex, coarsely faceted, deeply emarginate on inner side.

Pronotum elongate, 2.0 times longer than wide, anterior margin laterally with projecting tubercle, disk at level of lateral tubercles broadly (but insignificantly) impressed, with coarse punctation, minute white adherent and large brownish erect hairs, posteriorly with more distinct, and anteriorly less distinct flange. Scutellum flat, very small, broadly rounded apically. Elytra parallel, apically broadly rounded individually, with more truncate outer angles, somewhat flat on disk, with sparse deep punctation, minute gray adherent hairs, and sparse, uniformly disposed, semierect, acicular setae. Legs comparatively long; femora clavate. Hind tarsi distinctly shorter than tibiae. First segment of hind



44

Figure 18. *Stenhomalus vulcanus* Tsher.

tarsi markedly shorter than all segments together.

Abdomen of female comparatively broad. Sternite I considerably shorter than remaining sternites together; sternite II broadly emarginate, in posterior half with dense reddish-rust brush of setae broadening apically. Posterior margin of sternite III with row of long piliform setae directed inward, framing brush from behind. Abdomen of male convex, smooth, almost glabrous, with minute hairs not forming compact cover. Tergite II without notches and without brush in posterior half. Body black. Elytra dark brown, with rusty, light-colored band extending obliquely from humeral tubercle to middle. Antennae and legs rusty, hind femora darkened. Sometimes antennae dark brown, with rusty, light-colored ringlets at base of segments. Body length 8.0 to 9.0 mm.

Egg: White, narrowly rounded at poles. Chorion hyaline, without cellular sculpture. Length 0.6 to 0.8 mm, width 0.3 to 0.4 mm.

Larva (Figure 19): Recognized by structure of prothoracic eusternum, absence of pigmented ocelli, and anterior margin of hypostoma. Head
44 markedly retracted into prothorax, narrowly rounded anteriorly. Epistoma along anterior margin with lustrous brownish-chestnut border,

divided by median longitudinal streaklike suture, fuses with parietals laterally. Frontal suture not visible. Hypostoma narrows anteriorly, with straight lateral sutures, smooth anterior margin, with barely discernible notch near inner angles of sclerites. Parietals laterally in anterior half with numerous hairs bent backward. Antennae with four segments. Ocelli not visible. Clypeus hyaline, transparent. Labrum small,

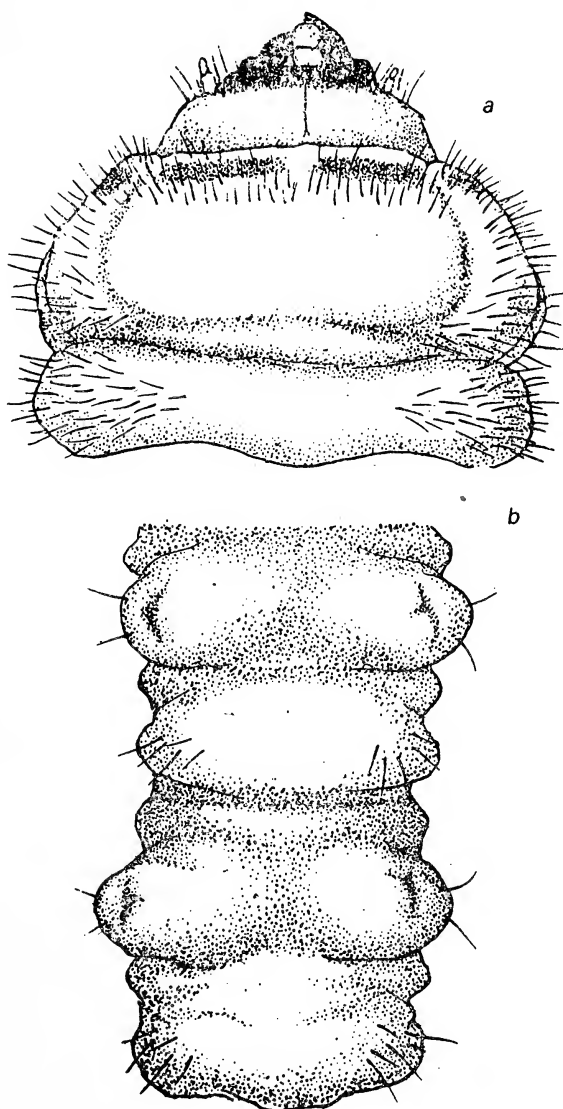


Figure 19. Larva of *Stenhomalus vulcanus* Tsher.
a—head and pronotum; b—abdominal tergites IV and V
with dorsal locomotory ampullae.

with pointed or narrowly rounded anterior margin, with short setae along margins. Mandibles broad, black, basally light rust, as if with frill.

Pronotum narrows slightly anteriorly, with rounded anterior margin, dense light rust hairs on disk anterior to scutum and laterally, with smooth, lustrous, yellowish-rust, transverse band in anterior third interrupted medially by longitudinal white gap. Pronotal scutum white, bulges slightly, demarcated laterally by longitudinal sutures. Prothoracic presternum with uniform, numerous light rust hairs; eusternum coriaceous, glabrous, merges with presternal surface, not demarcated from it by groove.

Abdomen slender, elongate, with barely perceptible light-colored hairs laterally. Locomotory ampullae on segments I, II, and VII poorly developed, on III to VI highly convex, nodular, and project sideways, with barely perceptible longitudinal groove. Tergite VIII hyaline, with parallel sides, elongate, distinctly longer than VII. Tergite IX slightly wider at base, or not wider than long, broadly rounded posteriorly, with sparse minute hairs. Body length of mature larvae 10 to 11 mm, width of head 1.0 mm.

Pupa (Figure 20): Characterized by straight projecting urogomphi on tip of abdomen and four large spinules on posterior margin of tergite VII. Head with uniformly rounded occiput, two or three setae near antennal bases, and with or without minute setae on anterior margin in front of clypeus. Antennae pressed to sides of body, bent ventrad, loop-like, with apices adjoining sides of head.

Pronotum longitudinal, bulges, smooth, lustrous, with barely perceptible or very distinct obtuse tubercle laterally (sometimes looks rounded on sides), tapers somewhat more posteriorly than anteriorly, with long setae forming transverse band or row anterior to hind clivus; in some specimens setae cover entire posterior half. Anterior half of pronotum usually glabrous, rarely with stray setae. Meso- and metanota convex, each with pair of widely separated setae.

Abdomen elongate, narrows markedly toward base. Abdominal tergites slightly convex, with four small sharp setaceous spinules in posterior half forming transverse row. Posterior margin of tergite VII projects conically, rises above tergite VII (lateral view), with four large spinules, of which middle ones directed forward and inward, lateral backward and sideways. Tip of abdomen with pair of straight urogomphi projecting posteriorly and terminating in sharp sclerotized setaceous spinule. Valvifers of female small, tubercular, widely separated. Body length 7.0 to 8.0 mm, width of abdomen up to 1.8 mm.

Material: Collected in Kunashir (Golovnina volcano). Adult insects 32, larvae nine, pupae 10, larval exuviae with beetles from cells eight.

Distribution: Kuril' Islands, Kunashir Island.

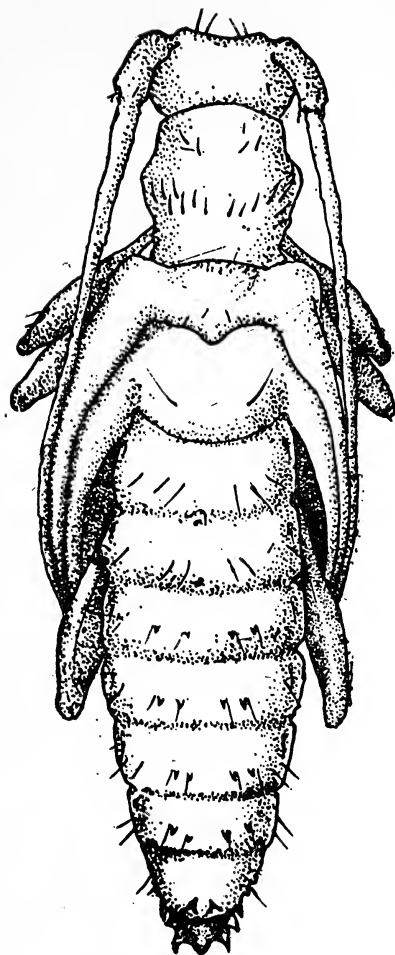


Figure 20. Pupa of *Stenhomalus vulcanus* Tsher.

Biology: First found in broad-leaved forests of Golovnina volcano. Beetles begin flying in first half of summer. Colonize thin shoots of *Phellodendron sachalinense*. Single female can lay up to 20 eggs.

Newly hatched larvae first make galleries in bark, then under bark along shoot, plugging them with fine frass. Galleries under bark deeply 46 impressed on alburnum. Sometimes gallery looplike, longitudinally elongate. Mature larva bores wood at end of gallery, makes cell along shoot at a depth of 4.0 to 10.0 mm, plugs inlet with frass, turns head toward inlet, and pupates. Length of larval gallery under bark up to 16 cm, width 1.0 to 4.0 mm. Size of inlet 1.5 mm \times 2.0 mm. Length of pupal cell up to 9.0 mm, width 3.0 mm.

Pupation commences early August, terminates by September. Young beetles emerge end of August and in September, but hibernate in pupal

cells, abandoning them the following spring. Thus the life cycle is completed in two years (Table 3). Weight of larvae before pupation 5.5 to 18.0 mg, pupae 5.0 to 13.5 mg, and young beetles before hibernation 4.0 to 10.0 mg. Females generally larger than males.

Table 3. Periods of development of *Stenhomalus vulcanus* Tsher.

Year of development	May	June	July	August	September	October
1st	A	AE	AEL	EL	L	L
2nd	L	L	L	LPA	PA	A
3rd	A	AE	AEL	EL	L	L

Population density on some trees comparatively high. For example, on a shoot 52 cm long and 3.4 cm in diameter 19 specimens were found, and on another shoot 24 cm long and 2.3 to 3.1 cm in diameter 11 specimens. Colonize physiologically weakened trees. *Sydonia divaricata* Bat. appears on the same trees a year or two later.

17. Tribe NATHRIINI (= PSEBIINI)

Adult insect similar to beetles of Molorchini in general appearance, but differs in posteriorly open forecoxal cavities. Head short; genae very short, in form of narrow strip anterior to lower lobes of eyes. Elytra short, cover part of segment I or first half of abdomen.

Larva similar to larvae of Oabriini, but characterized by locomotory ampullae protruding markedly laterally and tubercularly on abdominal segments III to VI, and silvery reticulate sculpture of prothoracic eusternum and pronotal scutum.

Pupa without setae on pronotum. Abdominal tergite VII with four spinules. Frons near base of antennae with or without large spinule.

Many genera of this tribe are represented in African fauna. Only one genus inhabits the southern regions of Europe and spread east, apparently up to the southern Urals.

1. Genus *Nathrius* Brèth. (= *Leptidea* Muls.)

Brèthes, 1916, *Rev. Chilena de Hist. Nat.*, vol. 20, p. 76; = *Leptidea*, Mulsant, 1839, *Hist. Nat. Coleopt. France Longicornica*, 1st ed, p. 105; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 141 (*Leptidea*); Linsley, 1963, *Cerambycidae of North America*, 21, 4, 153 (*Nathrius*).

Adult: Body very small, elytra short, Frons short, with median longitudinal suture. Eyes highly convex, reniform, without distinct notches.

Antennae long, slender. Abdominal segment I long, equal to all other segments together.

- 47 *Larva*: Body elongate, very small. Thoracic legs lacking, locomotory ampullae well developed on abdominal segments III to VI, hairs on pronotal disk not very dense, bent down and forward. Monotypic genus.

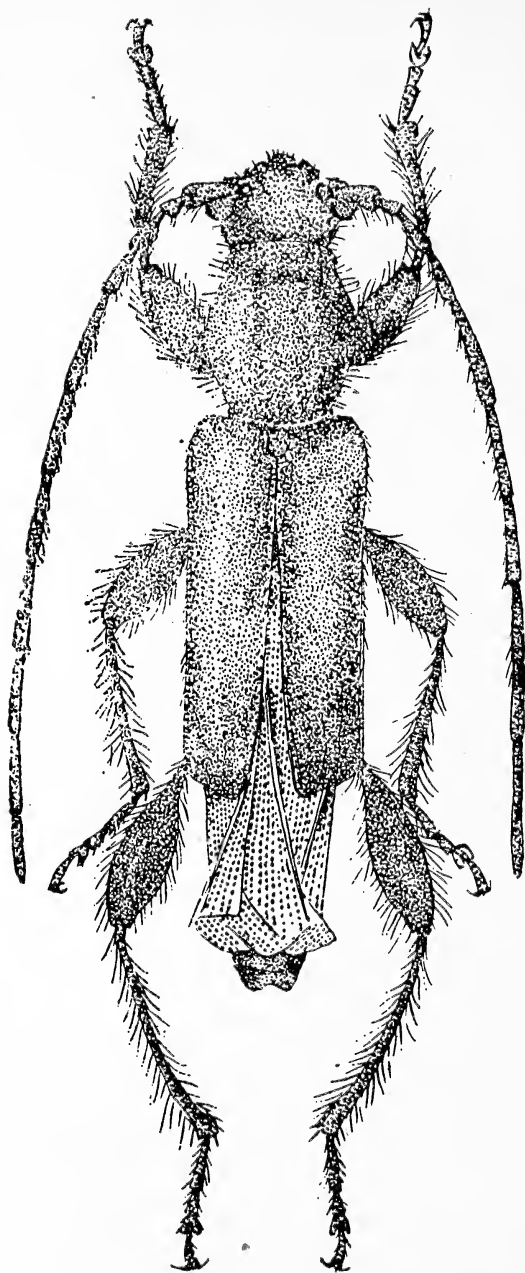
Type species: Nathrius porteri Bréthes, 1916.

1. *Nathrius brevipennis* (Muls.)

Mulsant, 1839, *Hist. Nat. Coleopt. France Longicornica*, 1st ed., p. 105 (*Leptidea*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 142-143 (*Leptidea*); Duffy, 1953, *Monograph Immat. Stages of British and Imported Timber Beetles*, pp. 197-198 (*Leptideella*); Demelt, 1966, *Tierwelt Deutschlands*, vol. 52, pp. 60-61 (*Nathrius*); Linsley, 1963, *Cerambycidae of North America*, 21, 4, 154-156 (*Nathrius*).

Adult (Figure 21): Characterized by small body, short elytra. Head short, broad, with fine punctation, and stray long yellowish hairs. Frons bound laterally by smooth brownish riblike fold, with median longitudinal deep suture. Genae very short. Eyes large, highly convex, coarsely faceted. In antennae 9th or 10th segment extends beyond elytral apex; 1st segment markedly thickens toward apex; 5th longer than 3rd and 4th segments together. Pronotum slightly longer or almost not longer than width in middle, insignificantly narrowly rounded anteriorly and posteriorly, with deep, very broad groove posteriorly and narrow transverse groove anteriorly and with double edge at these sites; flat on disk, with fine, uneven, widely spaced punctation, long erect yellowish hairs, smooth longitudinal prominence laterally in anterior half. Scutellum elongate, smooth, broadly impressed, glabrous, rounded posteriorly. Elytra comparatively short, extend just beyond abdominal base, with gaping, narrowly rounded inner angle and more truncate outer angle at apex in posterior third, flat on disk, with fine sparse punctation, smoothened apically, thin yellowish (very long at base) hairs. Femora broaden notably in distal half, highly flattened laterally. Hind tibiae with long setaceous hairs. Hind tarsi 0.50 length of tibiae. First segment of hind tarsi slightly curved, 2.0 times longer than two successive segments together.

Abdomen of male narrow; abdominal sternites with sparse long hairs, with steeply truncate posterior margin. Abdomen in female broad (in specimens not yet ovipositing appears bulged); sternite II broadly emarginate posteriorly, with dense short setae in notch forming golden-orange, and on anterior margin rounded brush; latter on posterior margin fringed with dense, long, light-colored, piliform setae; sternite III short, emarginate posteriorly, with dense long setae bent down and



backward on posterior margin. Abdominal tergite V emarginate (male) or narrowly rounded (female) posteriorly. Body and elytra chestnut-brown, darker in male, almost black, light colored with rusty tinge in female. Antennae and legs rusty-brown. Body length 3.0 to 6.0 mm.

Egg: Orangish-red, oval, tapers markedly toward poles, narrowly rounded at one pole, pointed at the other. Chorion smooth, lustrous. Length 0.8 mm, width 0.4 mm.

Larva (Figure 22): Very similar to larvae of Oabriini in general appearance and structure of abdominal locomotory ampullae. Differs in sparse (stray) hairs laterally on head, shagreen sculpture on base of prothoracic eusternum and pronotal scutum. Body elongate. Head markedly retracted into prothorax. Epistoma slightly convex, with broadly emarginate anterior margin, its brownish border broadening laterally here and reaching laterally up to antennal bases. Frontal sutures not visible, median suture likewise indistinct. Hypostoma lustrous, tapers
48 anteriorly, with deep notch on anterior margin near inner angles for

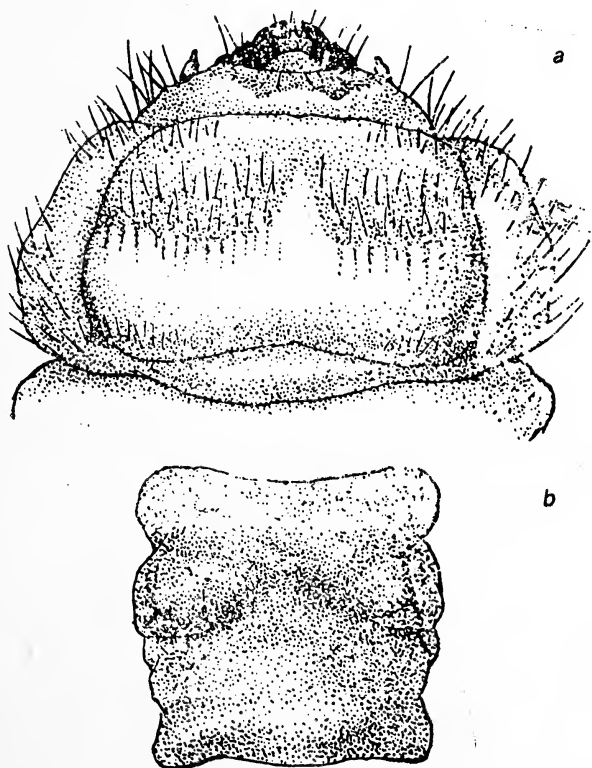


Figure 22. Larva of *Nathrius brevipennis* (Muls.).

a—head and pronotum; b—abdominal tergite IV with dorsal locomotory ampulla.

articulate, spinelike, acutely sclerotized maxillae. Parietals ventrally on anterior margin with broad brownish border that does not cover antennal sockets from behind, in anterior half with stray light-colored hairs that do not form dense tuft (in larvae of Obriini they form tuft bent down and sharply backward). Antennae short; 1st segment thick, whitish; apical segment slender, brownish, more sclerotized. Clypeus broad, trapezoid, convex, narrows markedly anteriorly, lustrous. Labrum convex on disk, broadly rounded apically, with short light-colored setae along margins. Mandibles broad, almost semicircular on mesal surface. Maxillae at base of cardo with sclerotized brown band, and on inner margin of band with sharp basal spinules in marginal notch of hypostoma.

Pronotum transverse, slopes significantly toward head, moderately convex on disk, anterior to scutum with innumerable uniformly spaced hairs bent down and forward, laterally in anterior half with dense long hairs directed backward. Pronotal scutum white and convex, glabrous (without hairs), silvery shagreen, laterally bound by deep longitudinal grooves extending forward almost up to anterior margin of pronotum. Prothoracic presternum convex, with sparse short hairs; eusternum glabrous, convex, with minute silvery reticulate sculpture, broadly rounded apically, demarcated by deep groove. Thoracic legs lacking.

Abdomen elongate, with very small, barely perceptible, light-colored hairs laterally. Dorsal and ventral locomotory ampullae poorly developed or almost not developed on segments I, II, and VII, and well developed (project laterally as tubercles) on segments III to VI, as a result of which abdomen appears nodular. Tergites VIII and IX with deep punctation
49 on disk, gaps between punctures not larger than punctures themselves. Segment X projects conically, with sparse minute light-colored hairs. Anal opening triradial. Body white. Body length 5.5 to 7.0 mm, width of head 0.6 to 0.8. mm.

Pupa (Figure 23): Readily recognized by slender, very small, highly elongate body, absence of setae and spinules on pronotum, presence of four spinules bent down and forward at posterior margin of abdominal tergite VII. Head short, round (ventral view); occiput lustrous, narrowly rounded. Frons broad, with faint median longitudinal groove, laterally near antennal bases with large, sharp (conical), sclerotized spinule or without it. Antennae long, in second half bent ventrad, looplike, with apices adjoining foretibiae.

Pronotum elongate, almost 1.5 times longer than width at base, uniform, convex, and lustrous on disk, with broadly rounded sides, and anterior margin produced angularly in middle. Mesonotum moderately convex, with slightly protruding scutellum on posterior margin, lustrous, with notably rounded posterior margin.

Abdomen elongate, with parallel sides. Abdominal tergites bulge,

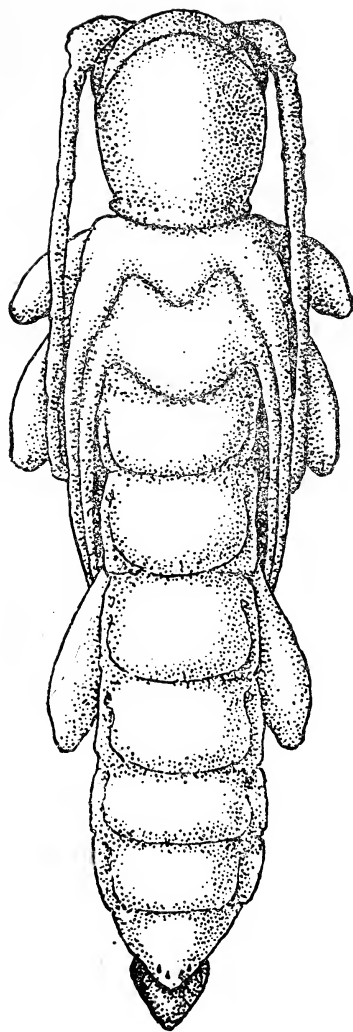


Figure 23. Pupa of *Nathrius brevipennis* (Muls.).

lustrous, medially with faint narrow groove; sides of segments IV to VI
 50 just slightly rounded. Tergite VII narrows markedly in posterior half,
 posterior margin narrowly (angularly) rounded, and near it four sclero-
 tized spinules bent down and forward form transverse row. Tergite VIII
 convex, lustrous, projects conically posteriorly, matte laterally and on
 posterior projection. Pro-, meso-, and metanota, and abdominal tergites
 I to VI and VIII without spinules or setae. Tip of abdomen (ventral
 view) slightly obtuse, laterally without perceptible carina. Valvifers of
 female project, notably separated. Body length 4.6 to 5.1 mm, width of
 abdomen 0.8 mm.

Material: Larvae collected in the Caucasus (Sochi), and pupae and beetles raised from them. Adult insects 15, larvae 18, pupae—14 males and females, larval exuviae from cells with pupae and beetles six.

Distribution: Southern Europe from Atlantic coast to the southern Urals (Ural'sk and Orenburg), northern Africa. Imported into North America (New York, California) and South America (Chile, Argentina). Sightings sporadic. Abundant in the Caucasus. We found them in Sochi region.

Biology: Inhabits deciduous forests, wooded parks, and gardens. Ecologically associated with large number of deciduous woody species. Flight of beetles from June through August. After mating, female oviposits on thin shoots of apple, willow, ash, hazelnut, alder, and other woody and shrub species. In the laboratory, where shoots of apple, lilac, and bird cherry were available, only apple was selected for oviposition. Female first scrapes minute particles from bark surface by means of abdominal setae, lays a sticky egg on shoot, then covers it with minute particles (dust) collected earlier. Egg consequently looks like a small tubercle merging with bark surface. Sometimes eggs are not covered with epidermal bark particles and then are distinctly visible against general background of bark as orange dots. Oviposition is rather intensive. For example, one female laid 38 eggs in one day on an apple shoot. Ovaries of another female just emerging from pupal cell contained 38 eggs. Larvae hatched in the laboratory at 24°C after 15 to 18 days (average 16.1 ± 0.3 days). We had kept 42 eggs under observation.

Newly hatched larvae make longitudinal galleries under bark, deeply impressed in wood, and plug them with fine frass. Walls of galleries steep, acute. Sometimes parallel galleries fuse to form broad striplike niche, which is compactly plugged with frass. Mature larva bores deep into wood (on thin shoots up to pith), makes longitudinal gallery there, then cell at end of gallery in which it pupates with its head toward inlet. Length of gallery under bark up to 17 cm, in wood up to 6.0 cm, width 2.0 to 3.0 mm. Cells often disposed directly around inlet and sometimes under bark. Length of cell 8.0 to 10.0 mm, width 1.8 to 3.0 mm. Pupae develop in two to three weeks. For example, in the laboratory at 16 to 23°C ($18 \pm 0.5^\circ\text{C}$) young beetles emerged 14 to 16 days after pupation. They exited from cells one week later with developed gonads, made an oval flight opening (up to 1.0 mm \times 0.8 mm) on surface of shoot, and emerged. Males emerge before females. Beetles begin to reproduce soon after emergence from wood. Weight of larvae before pupation 1.4 to 3.0 mg (male) to 3.1 to 8.2 mg (female), pupae 1.2 to 2.8 mg (male) to 2.7 to 7.1 mg (female), and beetles before emerging from wood 0.9 to 2.4 mg (male) to 2.3 to 6.0 mg (female).

Nathrius brevipennis (Muls.) inhabits many woody and shrub species, forming very dense populations. Six larvae were once detected on a thin
51 alder shoot 45 cm long and 4.0 to 8.0 mm in diameter. On another shoot, 17 cm long and 12 mm in diameter, 15 specimens (larvae, pupae, and adults) were found. In Sochi region (Caucasus) larvae were found on alder (*Alnus*), ash (*Fraxinus*), and pear (*Pyrus*). In the laboratory they avidly sought out shoots of apple (*Malus*). According to data available in literature (Plavil'shchikov, 1940; Duffy, 1953; Linsley, 1963; Demelt, 1966), this species develops on willow (*Salix*), dog rose (*Rosa*), chestnut (*Castanea*), fig (*Ficus carica*), hazelnut (*Corylus*), walnut (*Juglans*), hawthorn (*Crataegus*), and other woody and shrub species.

18. Tribe MOLORCHINI

Adult insect distinguished by short (*Molorchus*, *Nadezhdiana*, *Epania*) or markedly elongate elytra that fall open at the back (*Stenopterus*, *Calimellum*). Legs comparatively long, femora often clavate, petiolate. Mesosternal process tapers toward apex (*Molorchus*), or flat, broad, almost square (*Stenopterus*, *Nadezhdiana*).

Larva with short transverse head highly retracted into prothorax. Epistoma barely demarcated, frontal suture almost imperceptible. Parietals in anterior half with long replicated hairs.

Pupa characterized by narrow elongate body. Disk of pronotum with long setae, usually forming two transverse bands, of which one anterior to middle and second posterior to it (anterior to posterior flange). Abdominal tergites with minute spinules forming transverse row. Abdominal tergite VII with very large spinules bent forward.

Two genera of this tribe (*Molorchus* and *Nadezhdiana*) are known in northern Asia, of which *Molorchus* is distributed in the Holarctic. The existence of the genus *Molorchus* (Shabliovskii, 1936) needs to be confirmed since the type specimens are lost.

KEY TO GENERA

Adult Insects

- 1 (2). Mesosternal process narrow, sides not parallel, tapers toward apex, usually triangular 1. *Molorchus* F.
- 2 (1). Mesosternal process broad, with parallel sides, almost square 2. *Nadezhdiana* Tsher.

Larvae

- 1 (2). Abdominal tergite IX without spinules, smooth, with sparse fine hairs on apex. 1. *Molorchus* F.

- 2 (1). Abdominal tergite IX with spinules forming sizable tuft on disk.
 2. *Nadezhdiana* Tsher.

Pupae

- 1 (2). Pronotum without anterior flange. Setae on abdominal tergite VIII without sclerotized border at base. 1. *Molorchus* F.
 2 (1). Pronotum with distinct anterior flange. Setae on abdominal tergite VIII with sclerotized border at base. 2. *Nadezhdiana* Tsher.

1. Genus *Molorchus* F.

Fabricius, 1792, *Entom. Syst.*, 1, 2, 366; = *Caenoptera*, Thomson, 1859, *Sknd. Coleopt.*, vol. 1, p. 150; = *Linomius*, Mulsant, 1862, *Col.*
 52 *France Longicornica*, 2nd ed., p. 226; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 152-155; Gressitt, 1951, *Longicorn Beetles of China*, vol. 2, p. 169; Linsley, 1963, *Cerambycidae of North America*, 21, 4, 156-157; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 60; Mamaev and Danilevskii, 1975, *Lichinki zhukov-drovosekov*, pp. 186-188.

Adult: Body elongate. Intercoxal mesosternal process tapers toward apex. Elytra short. Hind (membranous) wings fall open on abdomen. Femora clavate. Antennae usually long, with 12 segments in male (subgenus *Molorchus* s. str.) or 11 segments (subgenus *Linomius* Muls.).

Larva: Head highly retracted into prothorax. Parietals laterally in anterior half with long hairs bent backward. Epistoma poorly demarcated. Frontal suture imperceptible. Hypostomal sclerites widely separated by gula, pointed or rounded at inner angles. Labial submentum uniform, fairly convex, smooth (*Molorchus* s. str.) or longitudinally striate [*M. ussuriensis* Plav., *M. umbellatarum* (Schreb.)]. Dorsal and ventral locomotory ampullae on abdominal segments I to VII slightly convex, shagreen, matte. Thoracic legs lacking.

Pupa: Body elongate. Head short, moderately bent under. Antennae pressed to sides of body, in male bent forward at level of tip of abdomen to form common ellipsoidal ring framing periphery of body from below [*M. umbellatarum* (Schreb.)], or form independent narrow loops with apices adjoining head [*M. minor* (L.)]. Pronotum convex, with fine setae on disk forming two transverse bands separated into individual tufts (*M. ussuriensis* Plav.), or with scutiform spinules on hind clivus (*M. kiesenwetteri* Muls. and Rey). Abdominal tergites with minute setaceous spinules directed backward. Tergite VII rounded posteriorly, with two to six large spinules bent forward. Valvifers of female with thick setae anteriorly (*M. ussuriensis* Plav.) or without setae [*M. umbellatarum* (Schreb.)]

More than ten species of the genus *Molorchus* are known in USSR fauna. Of these, seven inhabit northern Asia, including one species [*M. minor* (L.)] widely distributed in the Palearctic, two [*M. umbellatarum* (Schreb.), *M. kiesenwetteri* Muls. and Rey] from Europe entering the southern Urals and partly northern Asia, one (*M. heptapotamicum* Plav.) distributed in the southern Urals and northern Asia, two (*M. ussuriensis* Plav. and *M. incognitus* Tsher.) in Ussuri-Primor'e region, and one species (*M. kobotokensis* Ohb.) inhabits Kunashir Island and northern Japan. No less than 15 species are known in Southeast Asia, 12 in Japan, and three in North America. Larvae live under bark of trees, mainly in thin shoots. Two species [*M. minor* (L.), *M. kobotokensis* Ohb.] inhabit coniferous trees, while the other species [*M. ussuriensis* Plav., *M. incognitus* Tsher., *M. umbellatarum* (Schreb.) and so forth] inhabit deciduous species. Mature larva bores wood, makes cell along shoot, and pupates in it with its head toward inlet.

Type species: Necydalis minor Linnaeus, 1758.

KEY TO SPECIES

Adult Insects

- 1 (2). Antennae with 12 segments in male, 11 segments in female (subgenus *Molorchus* s. str.). Elytra posterior to middle with white oblique band. Eurasia. 1. **M. minor** (L.).
- 2 (1). Antennae with 11 segments in both male and female (subgenus *Linomius* Muls). Elytra posterior to middle without white oblique band, on disk posterior to scutellum with broad white spot or without it.
- 53 3 (12). Pronotum with simple, deep, indistinct punctation.
- 4 (11). Elytra on disk posterior to scutellum monochromatic, rusty or brownish, or with whitish diffuse spot lacking sharp outline.
- 5 (6). Elytra on disk posterior to scutellum which large light-colored (whitish) spot. Antennae of male longer than body. Ussuri-Primor'e region. 2. **M. ussuriensis** Plav.
- 6 (5). Elytra on disk posterior to scutellum monochromatic, brownish or rusty, sometimes with blackened apex (*M. kiesenwetteri* Muls. and Rey). Antennae of male not longer than body.
- 7 (10). Pronotum with deep distinct punctation; spaces between punctures distinct.
- 8 (9). Elytra elongate, distinctly longer than pronotum. Europe and northern Kazakhstan. 3. **M. umbellatarum** (Schreb.).
- 9 (8). Elytra broaden at shoulders, not longer or only slightly longer than pronotum. Southern and central Europe, southern Urals, Central Asia 4. **M. kiesenwetteri** Muls. and Rey.

- 10 (7). Pronotum with fine, indistinct, very dense punctation forming shagreen sculpture; spaces between punctures barely visible. Northern Kazakhstan, southern Urals. 5. *M. heptapotamicus* Plav.
- 11 (4). Elytra on disk posterior to scutellum with sharp white spot, emarginate at anterior outer angles. Kunashir and Islands of Japan. 6. *M. kobotokensis* Ohb.
- 12 (3). Pronotum with flat cellular punctation; spaces between cells narrow, resemble septa. Ussuri-Primor'e region 7. *M. incognitus* Tsher.

Larvae

- 1 (2). Gula apically broad, 0.66 hypostomal sclerites. Found on coniferous species 1. *M. minor* (L.).
- 2 (1). Gula apically narrow, less than 0.50 hypostomal sclerites.
- 3 (6). Labial submentum with minute longitudinal streaks.
- 4 (5). Pronotal scutum without longitudinal striation, basally matte. Found mainly on maple 2. *M. ussuriensis* Plav.
- 5 (4). Pronotal scutum with longitudinal striation, not matte basally. Found on pear and other deciduous species 3. *M. umbellatarum* (Schreb.).
- 6 (3). Labial submentum without minute longitudinal streaks; at most with three longitudinal smoothened grooves.
- 7 (12). Pronotal scutum with two emarginations on anterior margin, produced forward medially and at anterior angles.
- 8 (11). Hypostomal sclerites pointed at inner angles.
- 9 (10). Pronotum anterior to scutum paramedially roundly impressed, with sparse short hairs there. Found mainly on apple 4. *M. kiesenwetteri* Muls. and Rey.
- 10 (9). Pronotum anterior to scutum uniform paramedially, almost in same plane as scutum, with dense long hairs here. Found mainly on dog rose 5. *M. heptapotamicus* Plav.
- 11 (8). Hypostomal sclerites rounded at inner angles, not pointed. Found on thin shoots of spruce. . . . 6. *M. kobotokensis* Ohb.
- 12 (7). Pronotal scutum not emarginate along anterior margin but transversely truncate, almost straight, and does not project forward at anterior angles. Found on deciduous species 7. *M. incognitus* Tsher.

Pupae

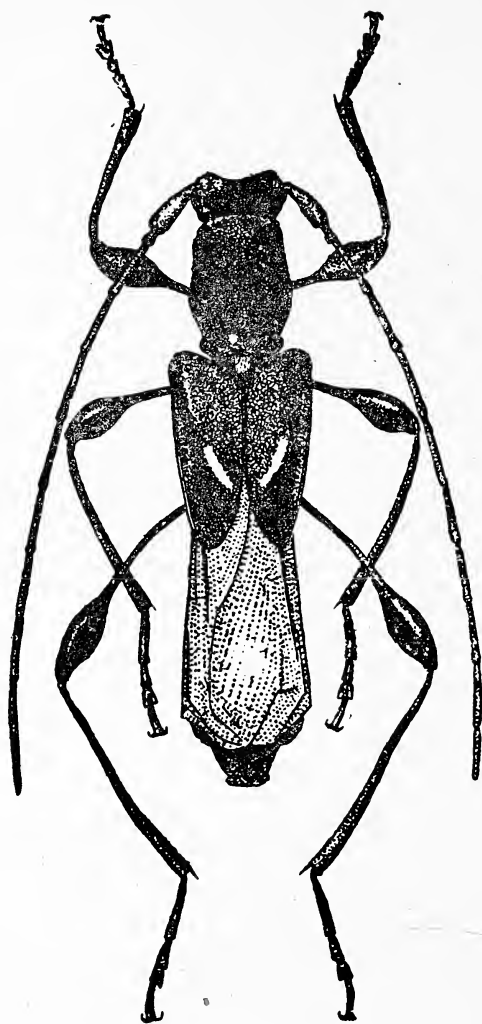
- 1 (2). Antennae long, bent forward, looplike in second half in male, with apices pressed to head; in female antennae arcuate, with apices pressed to middle of elytra. 1. *M. minor* (L.).

- 2 (1). Antennae shorter, bent only at apex in male, with apices short of reaching head; in female antennae bent slightly ventrad, with apices pressed to sides of body.
- 3 (12). Abdominal tergite VII with four spinules bent forward and forming transverse row along posterior margin.
- 4 (11). Abdominal tergite VIII long, not shorter than VII.
- 5 (8). Tip of abdomen (tergites VIII and IX) with long setae.
- 6 (7). Abdominal tergite VII with six sharp spinules bent forward and forming transverse row 2. *M. ussuriensis* Plav.
- 7 (6). Abdominal tergite VII with four spinules bent forward and forming transverse row 3. *M. umbellatarum* (Schreb.).
- 8 (5). Tip of abdomen (tergites VIII and IX) glabrous, without setae.
- 9 (10). Pronotum on hind clivus laterally with innumerable scutiform spinules bearing one seta each, forming two large tufts anterior to posterior angles. 4. *M. kiesenwetteri* Muls. and Rey.
- 10 (9). Pronotum on hind clivus laterally without scutiform spinules, with only stray setae not forming tufts 5. *M. heptapotamicus* Plav.
- 11 (4). Abdominal tergite VIII short, 0.66 length of VII, with dense setae forming two tufts in posterior half 6. *M. kobotokensis* Ohb.
- 12 (3). Abdominal tergite VII with two spinules bent forward on posterior margin 7. *M. incognitus* Tsher.

1. *Molorchus minor* (L.)

Linnaeus, 1758. *Syst. Nat.*, 10th ed., p. 421 (*Necydalis*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 155-158; Cherepanov and Cherepanova, 1973, *Nov. i maloizv. vidy fauny Sibiri*, 6th ed., pp. 46-47.

Adult (Figure 24): Well distinguished from other species of the genus *Molorchus* by oblique white band in posterior half of elytra. Head comparatively broad, slightly narrower than pronotum. Frons broad and flat, with large deep punctation. Antennae slender, with 11 segments (female) or 12 segments (male); 10th segment (female) or 6th (male) extends beyond posterior end of body. Eyes finely faceted, broadly emarginate, with very narrow upper lobes. Pronotum notably elongate, angularly broadens medially, with transverse flanges near anterior and posterior margins, dense, minute, longitudinally elongate punctation, smooth lustrous wartlike elevation on disk paramedially, with long erect, sometimes sessile gray hairs. Scutellum small, narrowly rounded posteriorly, sometimes with adherent gray hairs. Elytra narrow posteriorly, individually rounded apically, taper more from inside, with humeri projecting forward, sparse deep punctation, and white oblique band in posterior half extending diagonally from suture forward. Legs long, with long setae-

Figure 24. *Molorchus minor* (L.).

ceous hairs. Femora clavate; clava of hind femora less than 0.50 length of shaft (slender part of femora). Hind tarsi shorter than tibiae; 1st segment considerably longer than two successive together. Body blackish-brown, antennae rusty, elytra chestnut with rusty tinge and white oblique band in posterior half; femoral clava dark brown, femoral bases (base of shaft) and tibiae light rust (f. *typica*). Sometimes oblique band on elytra yellow, not white (ab. *incarinatus* Plav.); rarely body reddish-rust, oblique band on elytra lacking (ab. *rufescens* Kiesw.), sometimes elytra blackened apically (ab. *apicalis* Plav.). Body length 6.0 to 12.0 mm.

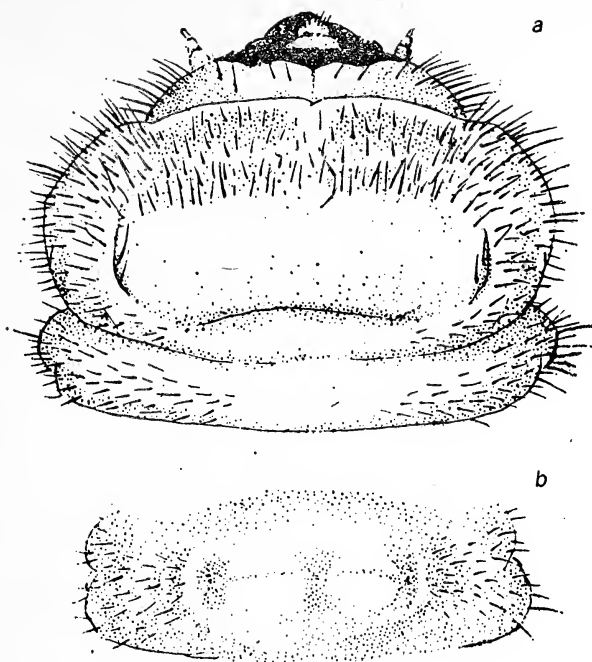


Figure 25. Larva of *Molorchus minor* (L.).
a—head and pronotum; b—abdominal tergite IV
with dorsal locomotory ampulla.

56 **Egg:** White, oval, elongate, rounded at one pole, slightly pointed at the other, lustrous, without cellular sculpture. Length 1.2 mm, width 0.5 mm.

Larva (Figure 25): Differs in structure of hypostoma, mandibular features, and other characteristics. Body tapers from prothorax backward. Head transverse, rounded anteriorly. Epistoma slightly flattened, whitish, at anterior angles with dentate projection, along anterior margin with dark brown smooth border, behind which lie short piliform setae, divided by median longitudinal suture, fuses laterally with parietals. Frontal suture not visible. Hypostoma slightly convex, broadens toward base, with rounded sclerites on inner margin, and widely separated by gula. Parietals rounded anteriorly, in anterior half laterally with dense setaceous hairs bent backward. Antennae conical; 1st segment 2.0 times thicker than 2nd. Clypeus very small, broadly flattened at base. Labrum rounded, with sparse short setae. Mandibles thick, short, broadly rounded apically from inside along cultrate surface, deeply hollowed, transversely sinuous at base, convex on outer side, smooth, with median transverse groove. Inner masticatory lobes of maxillae elongate, digitate, with stray apical setae.

Pronotum in anterior half and laterally with minute setaceous rusty hairs, with narrow white glabrous border on anterior margin. Pronotal scutum convex, coriaceous, laterally demarcated by deep longitudinal groove. Meso- and metanota matte, white, coriaceous, divided by median transverse groove; prothoracic presternum with uniform rusty hairs; eusternum coriaceous, glabrous. Meso- and metasterna coriaceous, shagreen, with stray setaceous, barely visible hairs, divided by median transverse groove.

Abdomen elongate, with sparse tender hairs laterally. Dorsal locomotory ampullae moderately convex, shagreen divided in anterior half by fairly distinct transverse groove joining radial dent on sides. Ventral locomotory ampullae with short longitudinal groove laterally, and short transverse groove extending inward from it. Abdominal tergite IX on posterior margin with setaceous hairs forming indistinct transverse row. Body length 11 to 12 mm, width of head 1.8 to 2.0 mm.

Pupa (Figure 26): Readily recognized by markedly broadened segments IV and V of abdomen, sharp apical thickening of femora, and microscopic setaceous spinules on abdominal tergites. Head glabrous, without setae, spherically rounded on occiput, with faint broad longitudinal groove between antennae, slightly elevated from inside around antennal bases. Antennae of male long, pressed to sides of body, bent forward in middle, looplike at level of abdominal tergite VI, with apices pressed against head in region of frons. Antennae of female short, bent forward in middle at level of tergite III, with apices pressed against underside of forelegs.

Pronotum convex, longer than wide, insignificantly rounded on sides, with narrow flange at base, slopes gradually toward anterior margin, without anterior flange; disk with fine setae forming transverse band before middle and sometimes two small lateral tufts behind middle. Mesonotum faintly convex, glabrous, with posteriorly extended and rounded scutellum. Metanotum with median longitudinal groove, laterally with three to five setae forming one row extending from anterior angles and sloping toward longitudinal groove posteriorly. Apices of femora sharply clavate, dilated. Hind femora extend beyond middle of abdominal tergite VI (male) or only beyond posterior margin of V (female).

Abdominal segments IV and V very broad, narrow sharply anteriorly and posteriorly. Abdominal tergites slightly convex, with faint common median longitudinal groove, on posterior margin (tergites II to VI) with five to seven minute setaceous paramedial spinules forming small tuft (base of each spinule with one seta from posterolateral side). Abdominal tergite VII apically with five or six spinules forming tuft. Tergite VIII with stray setae, sometimes posterior margin with pair of setaceous spinules. Valvifers of female large, almost cylindrical, directed

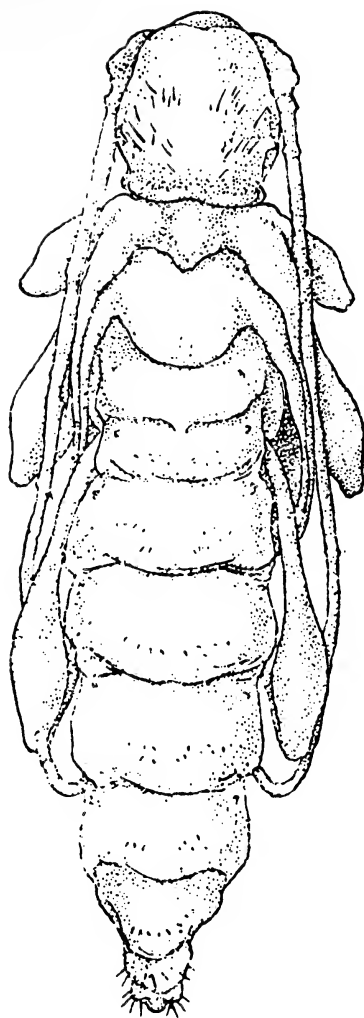


Figure 26. Pupa of *Molorchus minor* (L.).

sideways, with round flat tubercle apically. Body length 9.0 to 13.0 mm, width of abdomen 3.0 to 4.0 mm.

Material: Collected in eastern Ural region, Altai, Ob' region, Tuva, taiga of Yenisey region, Trans-Baikal, Ussuri-Primor'e region, and Kunashir. Adult insects 321, larvae 118, pupae 13, larval exuviae with beetles from cells four.

Distribution: From Atlantic Ocean coast to Pacific Ocean coast. South from Altai, Tuva, Sayan, northern China, and Korea, north to Polar Circle; Sakhalin, Kunashir, Islands of Japan (Honshu and Hokkaido).

Table 4. Periods of development of *Molorchus minor* (L.)

Year of development	May	June	July	August	September	October
1st	A	AE	AEL	EL	L	L
2nd	L	L	LP	LPA	PA	A
3rd	A	AE	AEL	EL	L	L

Biology: Ecologically associated with coniferous vegetation, mainly spruce. Rises in hills to 2,000 m, found in large numbers at Ayukol' (Lake Telets) at a height of 1,000 m. Beetles fly from end of May to July. For example, in Altai during the flight period 102 specimens were collected, with 14 (13.7%) in middle 10 days of June, 81 (79.4%) last 10 days, and seven (6.9%) in July. Flight ceases in second half of July. Beetles found on flowers of Umbelliferae, Rosales, and other plants. After mating, female lays eggs in bark crevices on thin shoots of spruce, fir, and other coniferous species. Colonizes weakened but not yet dried shoots ranging in diameter from 2.0 to 10.0 cm. Drying undergrowth often infested. Ovaries of one female contained 10 mature eggs. Embryonic development completed in about three weeks.

Newly hatched larvae bore bark, then make sinuous longitudinal or transverse galleries underneath it, which are deeply impressed on alburnum. Walls of galleries acute, upright; galleries compactly plugged with fine frass. Sometimes galleries so close together wood looks engraved.

Larva of the first year hibernates under bark (Table 4), the next year bores wood, makes a cell in upper layer along trunk, and pupates inside it with its head toward inlet. Both inlet and pupal cell sealed off from rest of gallery by plug of frass. Gallery between cell and inlet remains
58 hollow, free of frass. Inlet transversely elongate, ellipsoidal (3.5 mm × 1.5 mm). Length of hollow gallery up to 15 mm, length of cell 14 mm, width up to 4.0 mm.

Pupation completed by end of July and in August. Young beetles emerge in second half of August and in September, enter diapause, and hibernate. In spring (May-June) emerging beetles rupture plug sealing cell, nibble oval opening (2.5 mm × 3.0 mm), on shoot surface, and emerge. Emergence of adults from cells commences in first 10 days of June and concludes by end of that month.

Weight of larvae before pupation 16 to 80 mg, pupae 10 to 80 mg, and adult insects 7.5 to 40 mg. One larva weighed 32 mg before pupation, its pupa 31 mg, and beetle 23 mg, i.e., during metamorphosis the insect lost 28.1% of its weight.

Population density of this species is very high on some trees. For example, a fir shoot 25 cm long and 2.0 cm thick contained four larvae, one pupa, and four young beetles. Generally found on spruce shoots, rarely on others. For example, while inspecting various woody species 162 insects comprising larval, pupal, and adult stages were found; of these, 87 were collected from spruce shoots, 55 from fir, six from pine, four from maple, one from larch, and nine from unidentified shoots. *Pogonocherus fasciculatus* Deg., *Saperda interrupta* Gebl., and others sometimes colonize the same shoots as this species, *M. kobotokensis* Ohb. is found in Kunashir.

2. *Molorchus ussuriensis* Plav.

(Plavilstshikov) Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 160-161; Cherepanov and Cherepanova, 1976, *Novostifauny Sibiri* (Nov. i maloizy. vidy fauny Sibiri, 10th ed.), pp. 71-74.

Adult (Figure 27): Differs from the proximate species *Molorchus umbellatarum* (Schreb.) in elongate, densely punctate pronotum, very fine antennae in male, and other features. Head with dense large deep punctation (distance between punctures usually not more than punctures themselves), with broad median longitudinal suture between antennae. Genae short, length 0.50 width. Eyes large, bulge markedly, with broad notch; upper lobes narrow, striplike, narrower than 3rd antennal segment, and markedly fall short of anterior margin of pronotum. Antennae of female notably shorter than body, thicken slightly toward apex commencing from 5th segment, with short adherent hairs, long and numerous on first five segments; 11th segment equal to 5th, tapers conically in posterior half, not bent apically. Antennae of male longer than body, with 10th segment extending beyond tip of abdomen, slender, do not thicken toward apex, with minute adherent hairs, but sparse long hairs at base; 11th antennal segment elongate, markedly longer than 5th, apically falcate.

Pronotum elongate, 2.0 times (male) or almost 2.0 times (female) longer than width at base, posterior margin with sharp broad flange, anterior margin with distinct transverse groove, notably broadens in posterior third, and laterally here in male with distinct, in female barely perceptible smoothened tubercle, with dense punctation, long erect light-colored hairs, with fairly distinct lustrous smooth paramedial ampullae or almost without them. Scutellum broadly rounded posteriorly, with minute gray adherent hairs. Elytra moderate elongately, narrowly rounded apically, with dense deep large punctation, with erect light-colored (long at base and on sides, short on disk) hairs, with rounded, poorly visible humeri. Legs with long light-colored semiadherent hairs. Hind femora gradually thicken apically, clavate; hind tibiae 2.0 times longer than tarsi. First segment of hind tarsi longer than 2nd and 3rd segments together.

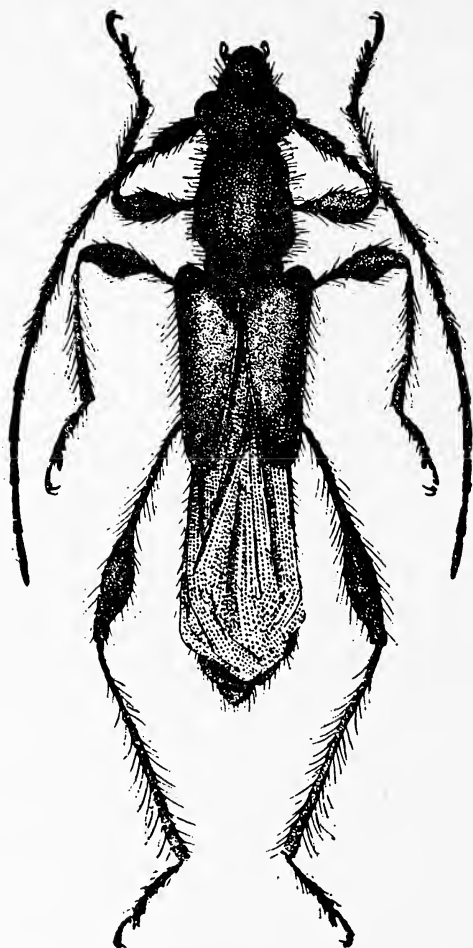


Figure 27. *Molorchus ussuriensis* Plav.

58

Abdomen moderately elongate, narrows slightly toward base but more toward tip. Abdominal sternites lustrous, with sparse punctation, laterally with denser long light-colored hairs. Sternite V broadly rounded, shorter than width at base. Body black, elytra straw-yellow, dark brown laterally and at apex. Antennae and legs dark brown, with rusty tinge. Base of femora lighter colored, apex (at clava) black or blackish-brown. Body length 7.0 to 8.0 mm

Egg: White, elongate, rounded at poles, matte. Length about 1.0 mm, width 0.4 mm.

Larva (Figure 28): Proximate to larva of *Molorchus umbellatarum* (Schreb.) in labial structure. Differs in sparse pubescence on pronotum. 60 Body moderately elongate, narrows from prothorax to abdominal segment IV. Head narrowly rounded anteriorly; highly retracted into prothorax.

Anterior margin of epistoma with broad lustrous brownish border, with four or five widely separated setae behind it, at anterior angles with gently rounded dentate projection slightly produced anteriorly. Median longitudinal suture and frontal sutures smoothened, not perceptible. Hypostoma narrows anteriorly, with straight sutures laterally, without perceptible brownish tentorial pits along sides of gula. Parietals narrowly rounded anteriorly, in anterior half laterally with long setaceous hairs directed backward. Antennae short, with apices not projecting beyond mandibular bases. Clypeus short, broadly flattened. Labrum very small, white, broadly rounded anteriorly, with sparse long setae on anterior margin. Mandibles short, thick, smooth on outer surface in anterior half. Labial submentum transverse, with longitudinal striation and seven longitudinal carinae. Mentum elongate, rectangular. Maxillary palps long, project forward beyond apex of inner masticatory lobe.

Pronotum rounded anteriorly, with sparse short hairs in anterior half on disk and sparse long hairs directed backward on sides. Pronotal scutum slightly convex, white, glabrous, without hairs on anterior margin, extends forward medially and at anterior angles, bound laterally by deep longitudinal grooves. Alar lobes lustrous, with sparse hairs. Prothoracic presternum laterally with very dense hairs and disk with very sparse short hairs; eusternum glabrous, lustrous, bulges moderately; basisternum* narrow, foldlike, with not very dense lateral hairs.

Abdomen laterally with short light-colored hairs. Dorsal locomotory ampullae moderately convex, with common median longitudinal groove and short, outwardly convex, longitudinal folds. Vental locomotory ampullae separated by two transverse grooves joined laterally, demarcating

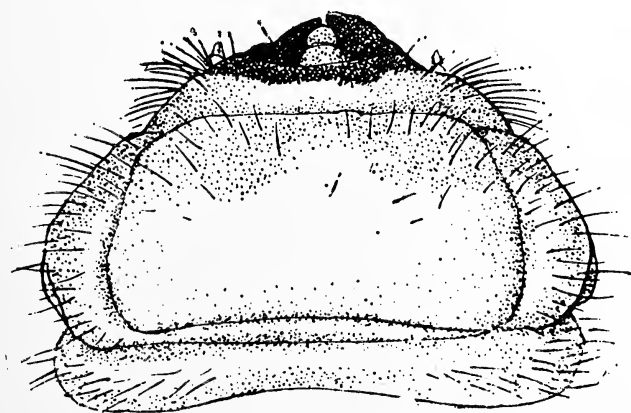


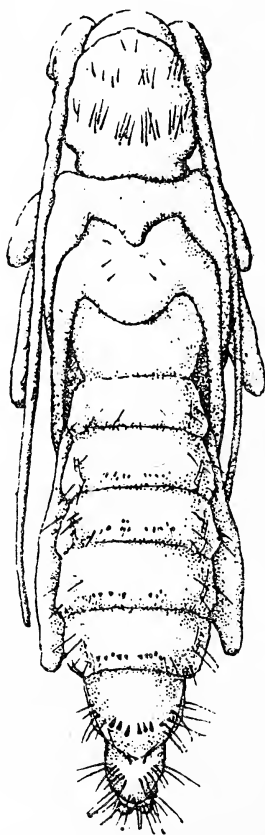
Figure 28. Larva of *Molorchus ussuriensis* Plav., head and pronotum.

*Strictly speaking, the sternellum—General Editor.

ellipsoidal carina between them. Body length 6.0 to 8.0 mm, width of head 0.8 mm.

Pupa (Figure 29): Readily recognized by number of spinules on abdominal tergite VII. Body more (male) or less (female) elongate. Head short, hemispherically rounded on occiput, with three thick setae from inner side of eyes. Antennae pressed to sides of body, with five or six spinelike outer projections, in female medially bent ventrad with apices pressed to hind tibiae; in male bent forward, looplike, with apices pressed to sides of body, forming elongate ellipse (ventral view). Eyes with or without setae in middle.

Pronotum elongate, broader in female, broadly rounded anteriorly, slopes somewhat toward anterior margin, basally with more (female) or less (male) sharp flange, lustrous, convex on disk, with well-developed groups of setae forming two transverse bands, one anterior to middle, the other in posterior third. Mesonotum slightly convex, glabrous. Meta-



notum with median longitudinal groove, with one or two barely perceptible paramedial setae. Apices of hind femora just reach posterior margin of abdominal segment VI.

Abdomen of female broader, narrows anteriorly and posteriorly. Abdominal tergites I and II glabrous, without spinules. Abdominal tergites III to VI posteriorly with minute sharp spinules forming somewhat regular or indistinct row. Abdominal tergite VII with six large spinules directed forward, forming transverse row, with stray long setae along
61 sides of row. Apex of tergite VIII with long fine setae forming transverse row. Valvifers of female hemispherical, apically contiguous, with lateral tubercles and thick seta in front. Body length 6.0 to 6.5 mm, width of abdomen 1.3 to 1.5 mm.

Material: Collected in Ussuri-Primor'e region. Adult insects 19, larvae three, pupae five, larval exuviae with beetles from cells 10.

Distribution: Ussuri-Primor'e region (Sedanka station, Komarovka River, Kedrovaya Pad' sanctuary, Suvorovka River).

Biology: Beetles fly from end of May, early June. Rarely seen on flowers. Eggs laid on thin shoots of Manchurian striped maple (*Acer tegmentosum*). Larvae live under bark, make longitudinal galleries, generally sinuous initially, then straight, well impressed on alburnum, and plug them with fine frass. Mature larva bores wood, extends gallery along shoot, plugs inlet with fine frass, and at end of gallery makes pupal cell 14 mm long, 2.0 mm wide, in which it pupates with head toward inlet. Length of gallery under bark 9.0 cm, maximum width 3.5 mm. Length of gallery in wood with cell up to 3.0 cm. Larvae pupate at end of summer. Young beetles appear August–September, hibernate in cells, and with the onset of warm weather in spring push frass out, nibble round or slightly oval opening in bark, 1.8 mm in diameter, and exit. Emergence of beetles from cells ceases early June. Weight of pupae 5.9 to 8.7 mg, of young beetles on emergence from cells 3.4 to 7.0 mg.

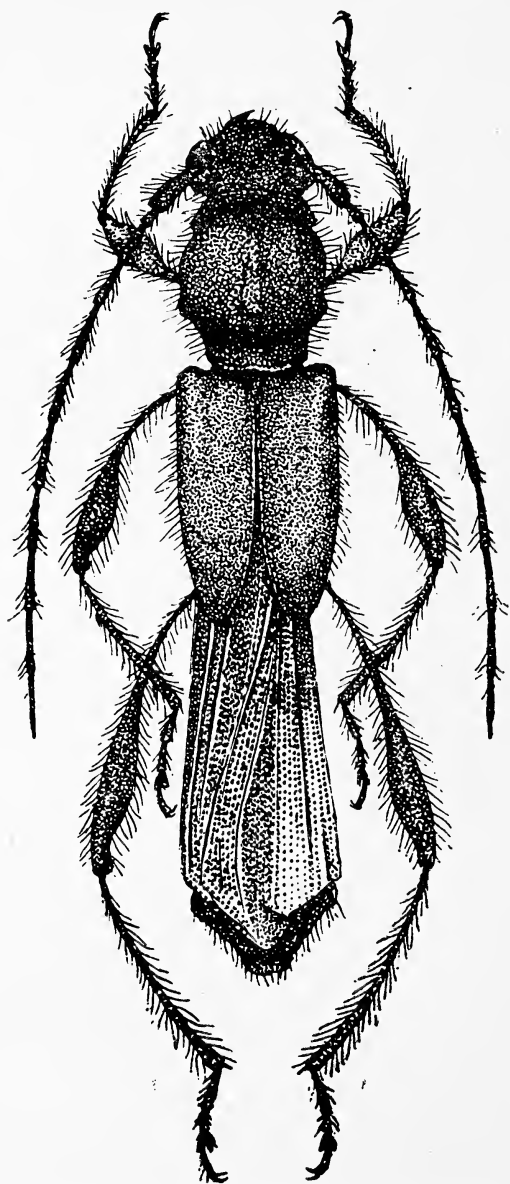
Beetles colonize shoots 2.5 to 4.8 cm in diameter. Population density of shoots varies widely. Two beetles were found on a shoot 56 cm long and 4.7 cm in diameter, while on a shoot 34 cm long and 4.0 cm in diameter five specimens were found; including four pupae and one beetle (Cherepanov and Cherepanova, 1976).

3. *Molorchus umbellatarum* (Schreb.)

Schreber, 1759, *Nov. Spec. Ins.*, p. 9 (*Necydalis*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 159–160.

Adult (Figure 30): Very similar to *Molorchus ussuriensis* Plav. Differs in much shorter, less punctate pronotum, short 1st segment of hind tarsi, and other features. Head not wider or somewhat narrower than pronotum, frons flat, with sparse deep punctation, vertex with median longi-

tudinal smooth band, sinciput with dense punctation. Genae short, coarsely punctate. Eyes broadly emarginate, upper lobe not narrower than basal diameter of 3rd antennal segment. Antennae of male longer than body, with 9th segment extending beyond tip of abdomen; 1st to 4th segments lustrous at base, with numerous long erect hairs, matte from 5th segment, with minute adherent hairs, and 11th segment equal to 5th,



somewhat bent down at apex. Antennae of female shorter than body, reach only posterior margin of abdominal sternite IV, and 11th segment considerably shorter than 5th, equal to 4th.

Pronotum 1.5 times longer than width at base, broadens angularly behind middle where laterally small, sometimes smoothened, indistinct tubercle occurs, with broad sharp posterior flange, anteriorly with transverse groove, with uneven large, sometimes minute punctation, laterally and sometimes medially with smooth, longitudinally elongate, lustrous ampullae, with not very dense erect light-colored hairs. Scutellum narrows apically, with dense punctation, narrowly rounded posteriorly. Elytra moderately elongate, project forward at humeri, individually rounded, sometimes angularly, at apex, somewhat impressed subapically, 62 with uneven punctation; hairs on sides long, on disk short, light-colored and erect. Hind femora almost extend beyond abdominal sternite IV, thicken gradually, clavate apically. First segment of hind tarsi longer (female) than two successive together, or equal to them (male).

Abdomen elongate. Abdominal sternites lustrous, with sparse fine punctation, with dense semierect hairs. Body black or dark brown with rusty tinge, antennae and legs dark brown, bases of femora (up to clava) usually light rust. Elytra straw-yellow, dark brown apically, laterally, and basally. Body length 6.0 to 8.0 mm.

Egg: White, narrows gradually and sharply pointed at one pole, obtusely rounded at the other. Chorion with fine sculpture, imparting matte appearance. Length 1.0 mm, width 0.4 mm.

Larva (Figure 31): Differs from larva of *Molorchus ussuriensis* Plav. in very narrow (not transverse) labial submentum and other features. Body elongate, narrows insignificantly from thorax backward. Head short, transverse, retracted into prothorax up to lateral hairy field on parietals. Epistoma bulges slightly, divided by well-developed, brownish median longitudinal suture, faintly demarcated laterally. Frontal sutures barely visible. Hypostoma flat, narrows sharply anteriorly, with straight lateral sutures. Hypostomal sclerites widely separated by gula. Parietals in anterior half with long hairs directed backward, forming common lateral hairy field with hairs on sides of thorax (ventral view). Clypeus broad, notably flattened at base. Labrum transversely oval or slightly elongate, narrows basally, broadly rounded apically, convex, in anterior half with short setae. Mandibles thick, light red at base, black in second half. Labial submentum rectangular, slightly elongate, with longitudinal striation. Striation more distinct in mature larvae. Labial palps project forward almost up to apex of maxillary palps.

63 Pronotum narrows anteriorly from base, rounded at anterior margin, with dense long hairs laterally, sparse short hairs on disk in anterior half. Pronotal scutum slightly convex, longitudinally rugulose, insigni-

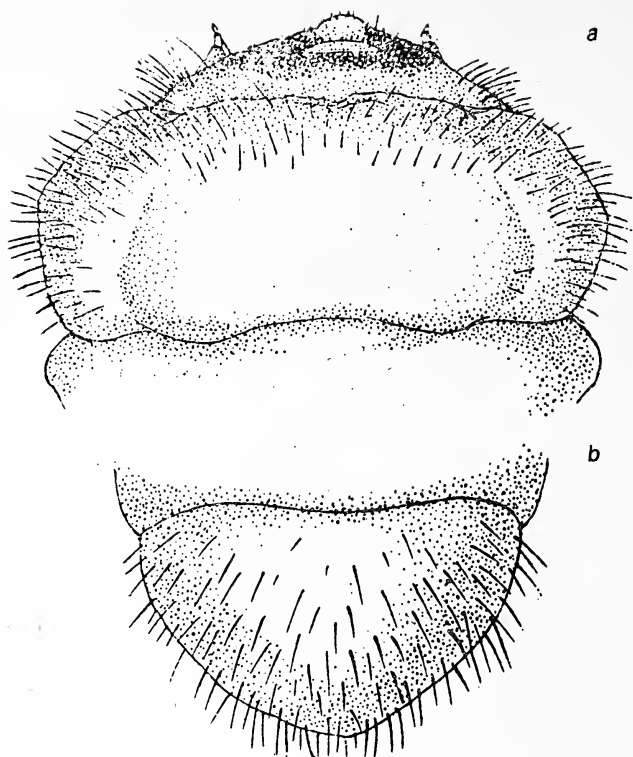


Figure 31. Larva of *Molorchus umbellatarum* (Schreb.)

a—head and pronotum; b—tip of abdomen.

ficantly produced medially at anterior margin, laterally straight, bound laterally by deep longitudinal grooves. Alar lobes glabrous and lustrous, or with stray hairs. Prothoracic presternum with somewhat dense long hairs laterally and sparse short hairs on disk; eusternum insignificantly convex, coriaceous, with distinct furrows.

Abdomen moderately elongate, with sparse short hairs laterally. Dorsal locomotory ampullae divided by common median longitudinal groove, with convex lateral longitudinal fold, with grooves radiating inwardly from fold forming common elongate ellipse. Ventral locomotory ampullae with transverse groove in posterior half, transverse furrows curved forward in anterior half, and lateral dent. Abdominal tergite IX broadly rounded apically, with sparse long erect hairs in posterior half. Body length 8.0 to 11.0 mm, width of head 1.2 mm.

Pupa (Figure 32): Readily recognized by chaetotaxy on frons and pronotum. Head between antennae flat (female) or longitudinally impressed, with 10 setae between lower lobes of eyes, usually arranged in pairs and forming irregular transverse band. Eyes without setae in middle.

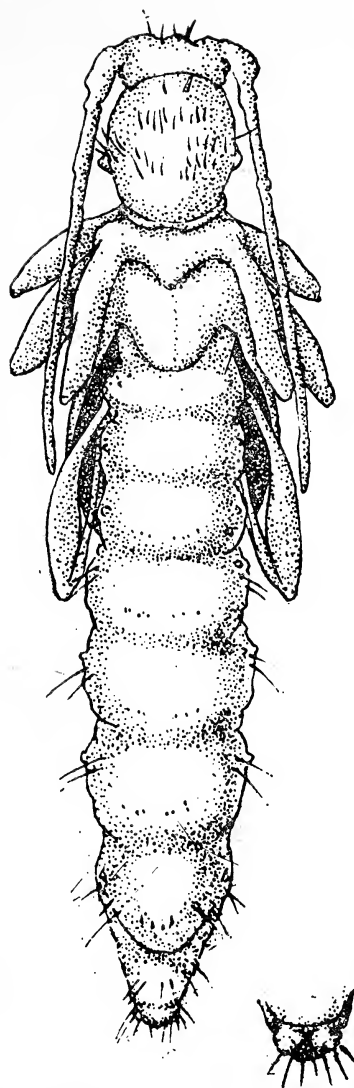


Figure 32. Pupa of *Molorchus umbellatarum* (Schreb.).

Antennnae of male pressed to sides of body, smoothened on outer side, without discernible tubercles, bent ventrad, looplike near abdomen, with apices pressed against each other forming common elliptical ring. Antennae of female pressed to sides of body, with apices somewhat bent ventrad; 5th to 8th segments with barely perceptible spinelike tubercle at apex (in *Molorchus ussuriensis* Plav. tubercles better developed, project notably).

Pronotum bulges, notably longer (male) or almost not longer (female) than width in middle; disk anterior to middle with setae forming trans-

verse continuous band, posterior to middle with setae forming broad interrupted band, in anterior third near anterior margin with stray setae, and basally with narrow transverse flange. Mesonotum slightly convex, glabrous, without setae, with roundly extended scutellum behind. Metanotum with faint median longitudinal groove, laterally with long setae (male) or without them (female).

Abdomen elongate, narrows anteriorly, more so posteriorly (from segment V). Abdominal tergites bulge, lustrous. Tergites I and II without spinules, III to VI with minute setaceous spinules on posterior margin forming transverse row and insignificantly interrupted medially. Tergite VII apically with four large spinules bent down and forward, with two long large setae lateral to them. Tergite VIII in posterior third with six to eight long setae forming transverse row. Tip of abdomen with long thin setae. Valvifers of female small, contiguous, with elongate apical tubercle. Body length 7.0 to 8.0 mm, width of abdomen 1.5 to 1.8 mm.

Material: Collected in northern Caucasus. Adult insects seven, larvae 17, pupae—one male, three females.

Distribution: Europe, northern Turkey, the Caucasus, and the southern Urals.

Biology: Inhabits deciduous forests. Often found on fruit trees in gardens. Ecologically associated with deciduous vegetation. Beetles fly from early May through June. Quite often found on flowers of Rosales and other plants. Female oviposits on shoots 0.4 to 2.0 cm in diameter of drying as well as healthy trees of pear, apple, and other species.

Larvae initially live in bark, later penetrate underneath it, make longitudinal sinuous galleries, and plug them with fine frass consisting mainly of bark particles. Galleries faintly impressed on alburnum. Mature larva bores wood, makes inlet on surface across shoot, and plugs it with fine frass. Width of inlet 2.0 mm. Thereafter it makes a gallery along axis of shoot, scoops out cell at end of it, and isolates cell from rest of gallery with plug consisting of frass. Gallery between cell plug and inlet hollow, free of frass. Length of cell 12 mm, width 1.7 to 1.8 mm. Length of plug 2.0 mm, of hollow gallery before plug 4.0 to 6.0 mm. Width of gallery under bark up to 4.0 mm. Larvae hibernate second time in cells. Pupation occurs in April–May. In the Caucasus (Kislovodsk) pupae seen end of March. Beetles seen in cell from April 4th. Mass emergence of beetles occurs mid-April. Weight of larvae before pupation 5.5 to 12.9 mg, pupae 5.0 to 11.8 mg, and beetles emerging from cells 4.0 to 9.9 mg. *Tetrops praeusta* (L.), *T. gilvipes* Fald., *Acmaeops collaris* (L.), and others found together with this species on shoots of pear.

4. *Molorchus kiesenwetteri* Muls. and Rey

Mulsant and Rey, 1861 *Ann. Soc. Linn. Lyon*, 8, 2, 173; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 164–166.

65 *Adult* (Figure 33): Characterized by dark brown or black body, coarse punctation, more elongate clava of hind femora. Head short, appears round laterally, with light brown hairs, uneven, coarse punctation, broadly impressed between antennae, slightly convex around antennal bases. Genae very short. Eyes deeply emarginate, saccate, finely faceted. Antennae thicken apically, matte from 5th segment, with short, tightly adherent hairs; 3rd antennal segment equal to 4th or slightly shorter, usually shorter than 5th.

Pronotum notably elongate, highly produced basally but slightly apically, somewhat convex on disk, rounded laterally, narrows markedly posteriorly but gradually anteriorly, with coarse deep punctation,

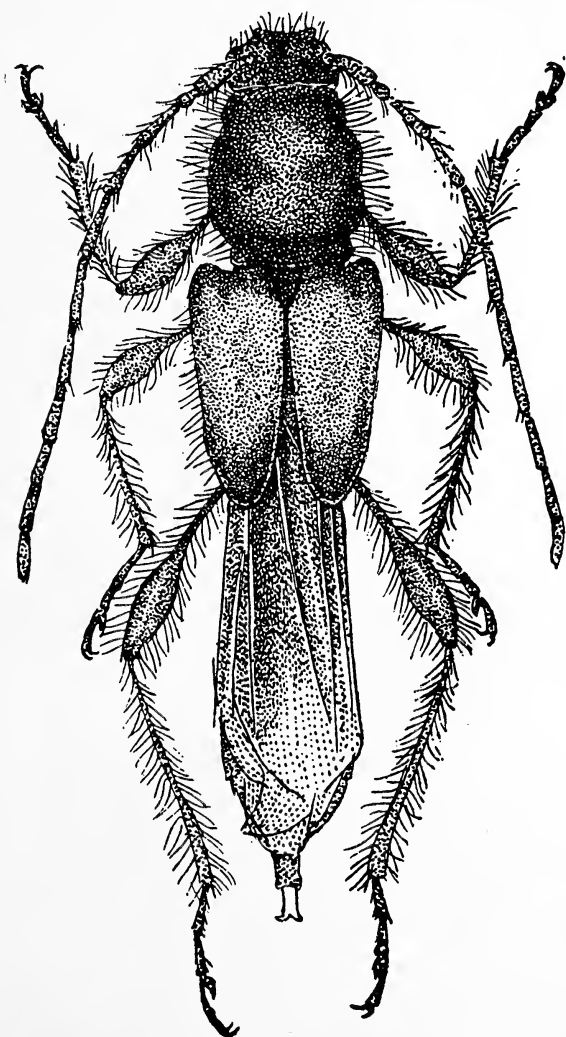


Figure 33. *Molorchus kiesenwetteri* Muls. and Rey.

long dark brown hairs, small smooth ampullae or without them, and lustrous in between punctures. Scutellum small, rounded posteriorly, with fine punctation and sparse adherent hairs.

Elytra short, slightly longer than total width at base, with convex humeri projecting forward, apically individually broadly or somewhat narrowly rounded, faintly or deeply impressed on suture posterior to scutellum, with broad subapical dent on disk, notably convex in posterior quarter, with uniform punctation and short light-colored hairs. Legs with dense light-colored setaceous hairs. Clava of femora moderately dilated, in hind femora markedly shorter than shaft. Hind tibiae 1.5 times longer than tarsi. First segment of hind tarsi equal to two successive together. Body ventrally with long light-colored semiadherent or erect hairs. Entire body black with brown or rusty tinge. Antennae dark or light rust. Legs brownish-rust with chestnut hue. Elytra straw-yellow or light brown, apically usually darkened (f. *typica*) or monochromatic, rusty-brown (ab. *castanipennis* Reitt.) or brownish-yellow (ab. *brunneipennis* Plav.). Body length 5.0 to 7.0 mm.

Egg: White (matte), elongate, rounded at anterior pole, pointed at posterior and narrower. Length 1.1 mm, width 0.4 mm.

Larva (Figure 34): Very similar to that of *Molorchus heptapotamicus* Plav. Differs in more convex pronotal scutum and other minor features. Body minute, elongate. Head rounded anteriorly, thick. Epistoma slightly convex, flat and impressed apically, with broad smooth brownish border on anterior margin, with six minute setae behind it forming transverse row, faint or barely perceptible median longitudinal suture in posterior half, and fuses with parietals laterally. Frontal sutures not visible. Hypostoma flat, markedly narrows anteriorly, with narrow rusty-brown border on anterior margin and around suture; inner angles of sclerites pointed. Apex of gula narrow, whitish (light-colored), without brownish border, markedly broadens toward base. Parietals on anterior margin with broad (sometimes indistinct posteriorly) rusty-brown border that does not cover articulate antennal sockets from behind; numerous long hairs behind border form extensive field. Antennae short, apices barely extend beyond anterior margin of cephalic capsule; 1st segment whitish (light-colored), rest brownish. Clypeus brownish, short, barely visible from behind epistoma. Labrum very small, convex, round, lustrous, whitish or brownish, with very sparse light-colored setae. Mandibles 66 on outer side flattened basally and here with narrow transverse groove, back in apical half, reddish toward base.

Pronotum transversely oval; flat paramedial dents anterior to scutum rounded posteriorly (hence pronotal scutum appears more convex on anterior margin, with two emarginations), laterally and in anterior half in front of scutum with dense thin rusty hairs, in anterior third with

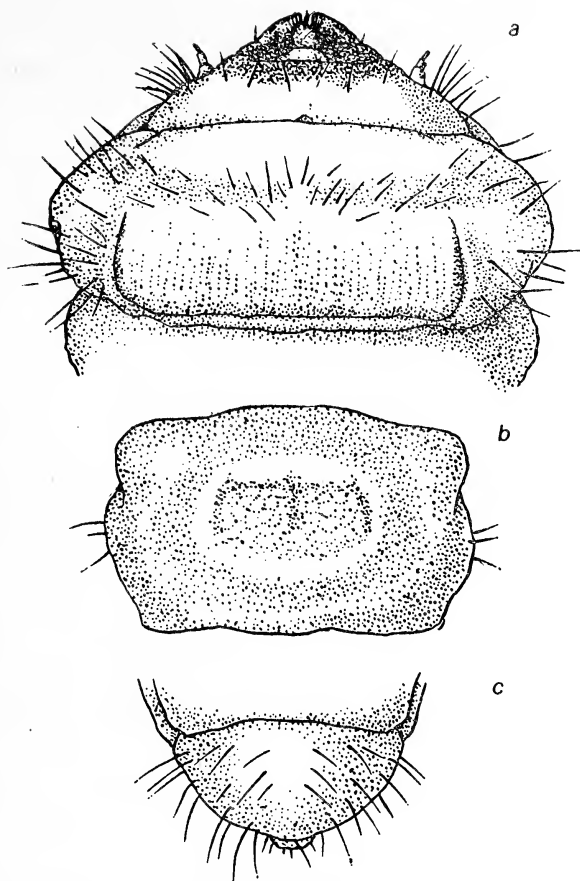


Figure 34. Larva of *Molorchus kiesenwetteri*
Muls. and Rey.

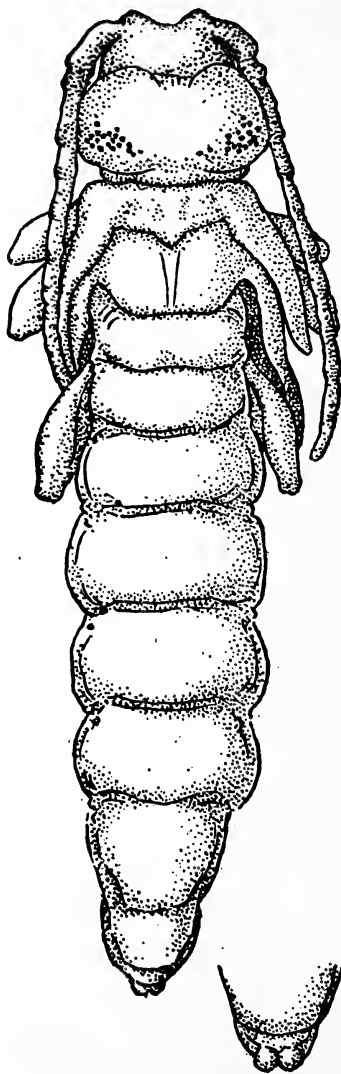
a—head and pronotum; b—abdominal tergite IV with
dorsal locomotory ampulla; c—tip of abdomen.

faint diffuse yellowish-rust transverse band. In some specimens band almost imperceptible. Pronotal scutum convex, white, demarcated laterally by deep longitudinal grooves, often with faint longitudinal smoothened streaks, anterior margin medially rounded, anterior angles sharply produced. Prothoracic presternum convex, laterally with sparse long, on disk short rusty hairs; eusternum glabrous, lustrous. Thoracic legs lacking.

Abdomen elongate, laterally with sparse short light-colored hairs. Dorsal locomotory ampullae moderately convex, with narrow median longitudinal groove, with fine shagreen sculpture, in anterior half with transverse grooves, laterally with short longitudinal distinct or faint grooves. Ventral locomotory ampullae distinct or slightly convex, medially separated by common longitudinal groove; disk with rugulose or

shagreen sculpture and narrow transverse groove. Abdominal tergite IX same length as width at base, narrowly rounded posteriorly, basally glabrous in anterior half, and with minute light-colored hairs in posterior half. Body length of mature larvae up to 7.0 to 8.0 mm, width of head about 1.0 mm.

Pupa (Figure 35): Readily recognized by presence of two tufts of spinules on pronotal base. Body elongate, comparatively narrow. Head short, between antennae flat or with faint longitudinal groove, on vertex



and occiput slopes almost in same plane, very slightly convex, lustrous. Antennae pressed to sides of body, apices set backward (female) or curve gently ventrad (male).

Pronotum transverse (female) or not wider than long (male), broadens roundly or angularly posterior to middle, disk insignificantly convex, with dense fine longitudinal striation, and posterolaterally in front of posterior angles with short, scutiform, setaceous, sclerotized spinules forming two dense, transversely elongate tufts. Mesonotum slightly convex, insignificantly produced angularly or even rounded posteriorly. Metanotum insignificantly convex or flattened, with narrow median longitudinal groove, broadly rounded posteriorly.

Abdomen with parallel sides, narrows posteriorly from segment V, sometimes broadens slightly in region of segments III and IV. Abdominal tergites convex, rounded laterally, with faint median longitudinal groove or without it, without perceptible spinules. Apex of abdominal tergite VII broadly rounded, lustrous, convex; posterior margin with two to four minute spinules, visible only under high magnification. Tergite VIII not shorter than VII, not longer than its own basal width, lustrous, rounded apically. Valvifers of female elongate, proximate, rounded apically. Hind femora thicken gradually toward apex, with apices reaching abdominal tergite II. Body length 5.0 to 5.7 mm.

Material: Collected in broad-leaved forests in the southern Urals. Adult insects 23, larvae 82, pupae—six males and six females, larval exuviae with beetles from cells three.

68 *Distribution:* Southern Europe (from Atlantic Ocean coast), Iran, Asia Minor, Syria, the Caucasus, the southern Urals, Central Asia. Found in large numbers in the southern Urals (from Orenburg to Ural'sk).

Biology: Inhabits deciduous vegetation. Ecologically associated with apple, oleaster, willow, and buckthorn. Beetles fly from May to July. Female oviposits under bark scales on thin drying shoots 4.0 to 12.0 mm in diameter, comparatively very fertile. Ovaries of one female dissected before oviposition contained 30 mature eggs.

Larvae bore bark, later make longitudinal galleries under bark imprinted on alburnum, and plug them with fine frass. Galleries more often made from top downward, rarely otherwise. Length of gallery under bark 6.5 to 13.2 cm, width 1.5 to 3.0 mm, sometimes up to 4.0 mm at end. Mature larva bores deeper into wood, extends gallery there along shoot, plugs inlet densely with frass, makes pupal cell at end of gallery, and seals it with plug of frass. Rarely, cells without plug. Larva hibernates in cell. Length of pupal cell 10 to 16 mm, width up to 2.0 mm. Length of plug sealing cell 3.0 to 4.0 mm, length of hollow gallery between plug and inlet up to 7.0 mm. Width of inlet 1.8 to 2.0 mm.

Pupation completed end of April or in May (Table 5). Pupa lies in cell with head toward inlet and develops for about three weeks. In the laboratory one pupa completed development in 20 days at 15.6 to 20.0°C ($17.6 \pm 0.3^\circ\text{C}$), and another in 18 days at 15.6 to 24.0°C ($19.9 \pm 0.6^\circ\text{C}$). Young adults emerge from pupae in May. Gonads mature while in pupal cell. Young beetles rupture seal, push frass aside, nibble oval flight opening in bark (1.0 mm \times 1.5 mm) and emerge. Mating and oviposition occur soon after emergence from pupal cells. Weight of insects highly variable. For example, records of 28 insects showed: larvae before pupation weighed 3.1 to 11.5 mg, pupae 2.3 to 10.3 mg, and young beetles before emergence from wood 1.8 to 8.4 mg.

Table 5. Periods of development of *Molorchus kiesenwetteri* Muls. and Rey

Year of development	April	May	June	July	August	September
1st	LP	LP AE	AEL	EL	L	L
2nd	L	L	L	L	L	L
3rd	LP	LP AE	AEL	EL	L	L

Molorchus kiesenwetteri Muls. and Rey damages mainly apple shoots, rarely other species. Twenty-three beetles developed from larvae collected in nature in the southern Urals: 14 from apple, four from oleaster, three from willow, and two from buckthorn. Moreover, while inspecting forests, 87 insects were found (larvae, pupae, and adults), of which 70 came from apple shoots, six from blackthorn, five from willow, and two from oleaster.

69 5. *Molorchus heptapotamicus* Plav.

Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 163-164.

Adult (Figure 36): Differs from other species of the genus in monochromatic light or dark rusty body, deeply punctate matte elytra, markedly clavate (dilated) femora, and comparatively long slender antennae. Head not narrower or slightly narrower than prothorax, with erect light-colored hairs. Frons flat, nearly upright, with narrow median longitudinal suture, laterally with narrow parallel longitudinal folds, with flat, barely perceptible reticulate sculpture, tubercularly convex around antennal bases, with broad depression between elevations. Vertex with flat faint punctuation. Eyes sharply faceted, broadly notched in upper part, with very narrow upper lobes bearing just three rows of minute facets. Antennae comparatively long, slender; 8th or 9th segment extends beyond

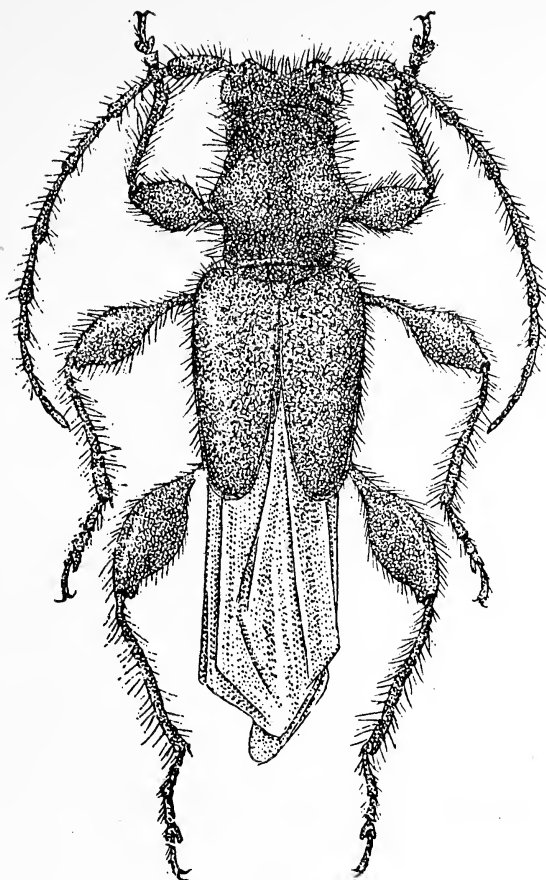


Figure 36. *Molorchus heptapotamicus* Plav.

elytral apex, with dense light-colored hairs; 3rd antennal segment equal to 4th, notably shorter than 5th; 11th segment slender, with parallel sides, pointed apically.

Pronotum elongate, notably longer than wide, broadens angularly on sides, flattened on disk, with basal flange, near anterior margin with or without transverse groove, with median longitudinal impression, elongate paramedial, smooth or coarsely punctate ampullae, light-colored erect hairs, and minute coarse or large flat punctation, appearing almost cellular in some specimens. Scutellum very small, with median longitudinal furrow or without it, broadly rounded posteriorly.

Elytra comparatively elongate, extend far beyond base of hind femora (lateral view), broaden at humeri, narrow somewhat posteriorly and there with parallel sides, apically broadly rounded individually, with notably convex disk, on suture posterior to scutellum with fairly distinct

small impression, matte, with deep, not very dense punctation, and short light-colored semiadherent or erect hairs. Legs with long setaceous hairs. Femora apically markedly dilated, clavate; clava of hind femora of male short, highly dilated, of female less dilated. Body, elytra, antennae, and legs monochromatic, rusty, rusty-brown, or rusty-chestnut. Antennae and legs (especially forelegs) sometimes lighter in color. Body length 4.5 to 7.0 mm.

Egg: White, highly elongate, pointed at poles. Chorion smooth, lustrous. Length 1.0 mm, width 0.2 mm.

Larva (Figure 37): Body elongate. Head markedly narrows anteriorly, and half of it retracted into prothorax. Epistoma without notches on anterior margin, with broad smooth brownish border, produced anterior angles, in posterior half with distinct median longitudinal suture, and fuses laterally with parietals. Frontal sutures not visible. Hypostoma

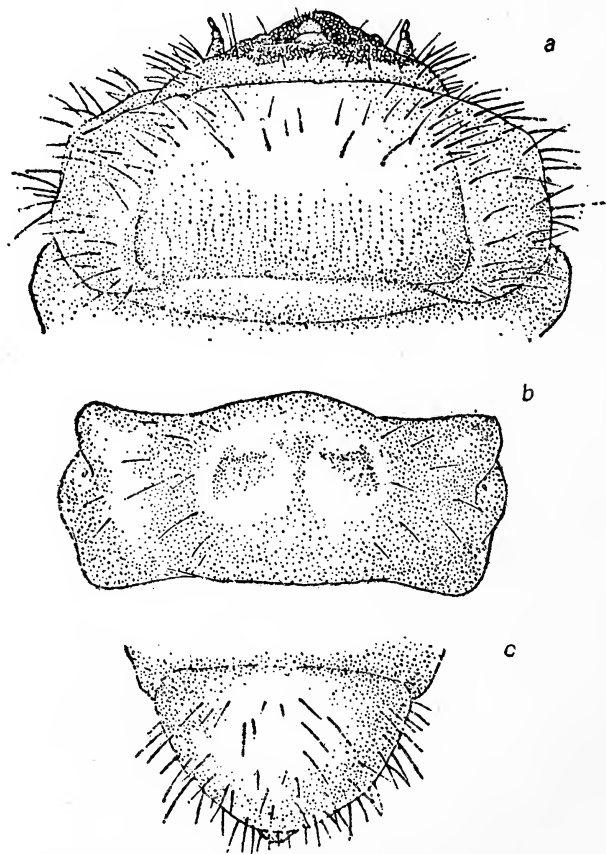


Figure 37. Larva of *Molorchus heptapotamicus* Plav.

a—head and pronotum; b—abdominal tergite IV with dorsal locomotory ampulla; c—abdominal tergite IX.

narrows anteriorly, with rusty-brown border on anterior margin that broadens toward sides and is medially interrupted by narrow gap. Gula narrows apically, light-colored, without border. Parietals with broad rusty-brown border that does not cover antennal sockets, posterior to antennae with long rusty hairs directed backward and forming extensive lateral fields on head. Clypeus short, brown, broadly flattened laterally, resembles transverse band. Labrum slightly transverse, small, broadly rounded apically, brownish and with short setae. Mandibles with outer 70 transverse groove basally, elongate anteromedially, black, dark or light red basally.

Pronotum slopes markedly toward head, narrows anteriorly from base, broadly rounded on anterior margin, with sparse short rusty hairs on sides and in anterior half. Pronotal scutum white, notably convex at base as though elevated, bound laterally by longitudinal grooves, rugose or smooth in anterior half. Sides of prosternum with dense, disk with sparse setaceous hairs; prothoracic eusternum without distinct lateral grooves, merges with presternum, glabrous basally, with stray hairs anteriorly. Thoracic legs lacking.

Abdomen elongate, with short thin light-colored hairs laterally. Dorsal locomotory ampullae slightly convex, transversely elongate, shagreen, laterally with barely perceptible, obliquely longitudinal dent. Ventral locomotory ampullae matte, insignificantly convex, separated by transverse shallow groove. Abdominal tergite IX with uniform light-colored hairs, glabrous only at base. Body length of mature larva 7.0 to 8.0 mm, width of head 1.1 mm.

Pupa (Figure 38): Characterized by glabrous pronotum, presence of apical spinules on abdominal tergite VII, and short, markedly dilated clava of hind femora. Head slightly narrower than pronotum, with broad longitudinal groove between antennae, flatly impressed on vertex, lustrous on occiput, rounded hemispherically. Antennae slender, pressed to sides of body, apically falcate.

Pronotum glabrous, without spinules, flattened on disk, with thin transverse striation, rounded laterally, with narrow flange basally; narrows gradually toward apex, not longer than width in middle, with stray light-colored setae barely visible under high magnification. Mesonotum transversely impressed, with raised, obtusely projecting scutellum on posterior margin. Metanotum flat in posterior half, with median longitudinal groove in anterior half, rounded on posterior margin, with narrow lustrous fringe.

Abdomen narrowly elongate, narrows gradually from segment IV toward tip. Abdominal tergites convex, with narrow median longitudinal groove, in posterior third with one or two faint paramedial spinules or (in region of anterior segments) without them. Abdominal tergite VII

71 narrows posteriorly, rounded on posterior margin, dilated in posterior third and here with pair of sharp spinules set independently on produced coriaceous base. Tergite VIII elongate, not shorter than VII, narrows toward apex, apically 0.50 width at base, smooth, without spinules. Valvifers of female large, short, cylindrical, obtuse apically. Hind femora pressed to sides of body, with long thin shaft and short, highly convex (dilated) clava. Body length up to 6.5 mm, width of abdomen 1.2 mm.

Material: Collected in the southern Urals. Adult insects eight, larvae 35, pupae—two females. Series of adult insects in collections of the Zoological Museum, Moscow State University and the Zoological Institute, USSR Academy of Sciences, Leningrad also studied.

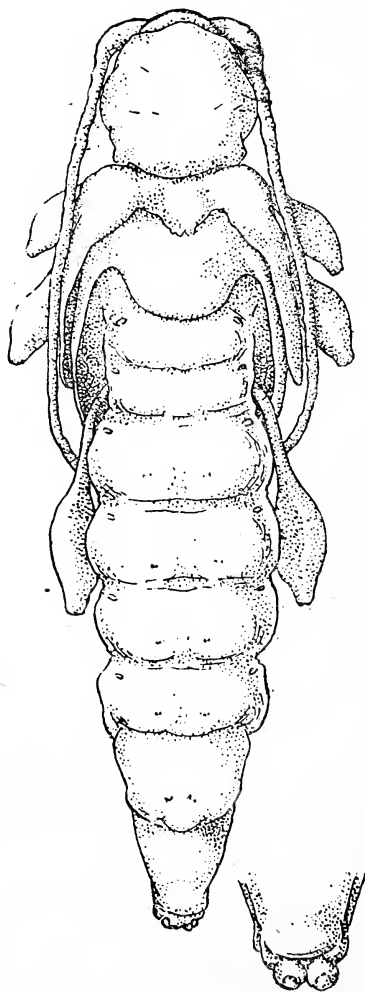


Figure 38. Pupa of *Molorchus heptapotamicus* Plav., female.

Distribution: From the southern Urals to Balkhash, Ili River, and Tien Shan foothills. We found it in Orenburg region, Utvinsk village (Krasnokholmsk forestry).

Biology: Inhabits deciduous woody and shrub vegetation. Develops on buckthorn and dog rose. Beetles fly from May through June. Female oviposits on shoots 0.6 to 1.5 cm in diameter. One female can lay more than 10 eggs in her lifetime.

Young larvae generally appear end of May and in June, live under bark, make longitudinal galleries impressed in wood, and plug them with frass. Walls of galleries gentle or steep. Sometimes larval galleries parallel and merge; as a result the upper layer of wood is so badly damaged that only frass remains under bark. Mature larva bores wood, makes longitudinal pupal cell there along shoot, and seals inlet densely with frass. Length of larval gallery under bark up to 7.5 cm, width 2.0 to 3.0 mm. Length of pupal cell 6.0 to 14.0 mm, width 1.5 to 2.0 mm. Width of inlet up to 2.0 mm. Length of frass plug at inlet 2.5 mm.

Larvae pupate early spring after hibernation. Pupa lies in cell with head toward inlet. Young beetles appear in May, possibly early June, nibble flight opening (1.0 mm \times 1.5 mm to 1.5 mm \times 2.0 mm) on shoot surface through which they exit. Mating and oviposition occur soon after emergence. Ovaries of one female dissected six days after emergence. from wood contained 12 mature eggs. Records of 11 specimens revealed: weight of larvae before pupation 2.8 to 8.2 mg, pupae 2.6 to 8.1 mg, and young beetles before emergence from wood 2.0 to 6.5 mg.

While inspecting vegetation in the southern Urals, 47 specimens were found; of these, 22 came from dog rose and 13 from buckthorn.* Five beetles and two pupae developed from the larvae collected in nature. Population density comparatively high. For example, on a shoot of buckthorn 17 cm long and 6.0 to 9.0 mm in diameter 12 larvae were found.

6. *Molorchus kobotokensis* Ohb. *kunashiricus* Tsher., ssp. nov.

Ohbayashi, 1963, *Syst. Nat. Descript. New Forms Ceramb. of Japan, Fragm. Col.*, vol. 2, p. 710; vol. 3, pp. 11–12; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 60; Nakano, 1970, *Beetles of Japan*, vol. 30, Cerambycidae, no. 25, p. 4; Cherepanov and Cherepanova, 1976, *Novosti Fauny Sibiri (Nov. i maloizv. vidy fauny Sibiri, 10th ed.)*, pp. 74–77; Hayashi and Matsuda, 1976, *Bull. Osaka J. Women's Jr. College*, vol. 11, p. 27.

Adult (Figure 39): Differs from nominal form (*M. kobotokensis* Ohb.) in dark rusty (brown) legs and antennae, and more distinct punc-

*Source of remaining 12 omitted in Russian original—General Editor.

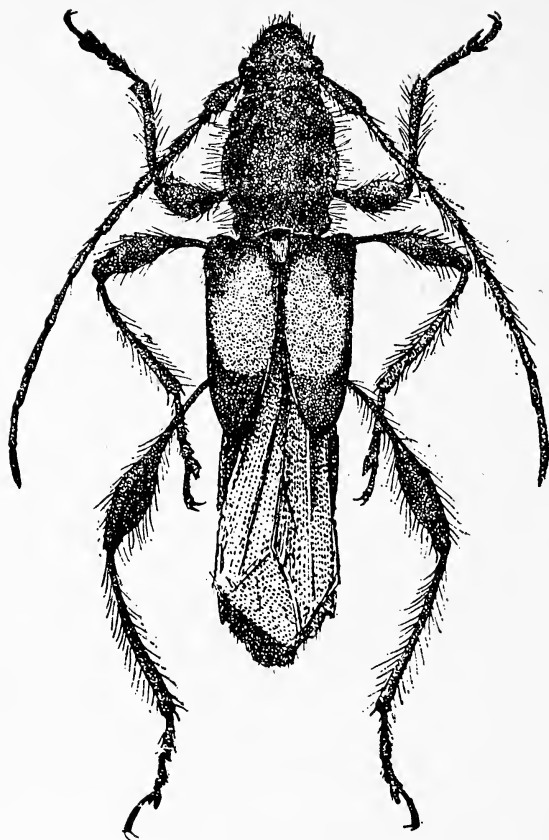


Figure 39. *Molorchus kobotokensis* Ohb.

tation on elytra and pronotum. Head short, retracted into prothorax almost up to eyes. Frons flat and narrow (male) or slightly convex and broad (female), with dense deep punctation, slightly impressed between antennae. Genae very short, look like bands. Eyes deeply and broadly emarginate, upper lobes narrow, cover antennal bases from behind.

- 73 Antennae long in male, distinctly shorter than body in female; 4th antennal segment distinctly longer than 3rd, shorter than 5th.

Pronotum highly convex, rounded laterally, notably longer than width in middle, with broad basal flange, narrow transverse groove near apex, dense large punctation, semiadherent long light-colored hairs directed forward on disk and backward on anterior angles of sides, with small lustrous ampullae (two in anterior half and one elongate medially in posterior half) or without them. Scutellum comparatively large, rounded posteriorly, slightly convex, with dense adherent white hairs. Elytra short and flat, only 1.5 times longer than maximum width, with straight shoulders, individually rounded posteriorly, with fine, not very dense

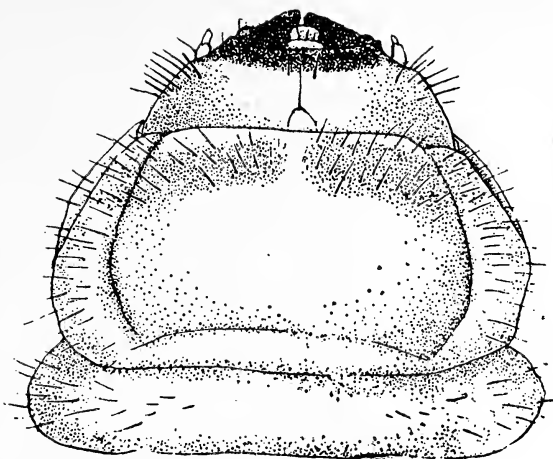


Figure 40. Larva of *Molorchus kobotokensis* Ohb.,
head and pronotum.

punctuation and sparse short erect hairs. Hind femora gradually thicken clavately in second half, with apices reaching posterior margin of sternite III. First segment of hind tarsi equal to two successive segments together or slightly longer.

Abdomen comparatively broad. Abdominal sternites with dense fine punctation, matte, lustrous only on posterior margin, with dense adherent light-colored hairs and stray long erect hairs. Body black. Antennae and legs rusty or rusty-brown. Femoral clava usually blackish-brown, darkened. Elytra light colored (straw-yellow), dark brown basally and apically. Body length 7.0 to 8.0 mm.

Larva (Figure 40): Differs from larvae of other species of this genus in shagreen (matte) locomotory ampullae of abdomen, and presence of only three longitudinal streaks or grooves on labial submentum. Head narrow, slightly flattened dorsoventrally. Epistoma with distinct dark brown median suture, anterior lustrous brownish border with short setaceous hairs forming transverse row. Frontal suture not visible. Hypostoma narrows anteriorly, anterior margin with rusty border, divided into two triangular, widely separated sclerites by gula; inner angles of sclerites obtusely rounded. Parietals in anterior half with long setaceous hairs bent down and backward or straight. Antennae slender, project markedly from antennal sockets. Clypeus small, trapezoid, brownish-rust basally. Labrum slightly elongate, convex, broadly rounded anteriorly, with sparse short setae in anterior half. Mandibles broaden basally, gently rounded apically. Labial submentum not wider or only slightly wider than long, with three longitudinally grooved distinct streaks.

Pronotum slightly convex on disk, almost flat, slopes anteriorly, anterior margin broadly rounded, in anterior third with transverse yellow band with narrow white strip in middle, in anterior half and on disk with sparse short hairs and laterally with dense very long replicate hairs. Pronotal scutum slightly convex, white, laterally with longitudinal grooves. Alar lobes with sparse thin hairs. Prothoracic presternum with regular rusty hairs on disk and laterally; eusternum slightly convex, without hairs.

Abdomen moderately elongate, laterally with sparse, tender, barely perceptible hairs. Dorsal and ventral locomotory ampullae slightly convex, separated by common median longitudinal groove, shagreen, matte. Apex of tergite IX obtusely rounded, with sparse rusty hairs in second half. Body length before pupation up to 11 mm, width of head 1.5 mm.

Pupa (Figure 41): Characterized by short antennae and presence of small number of setae on pronotum. Head short, moderately bent under, broadly impressed between antennae, spherically rounded on occiput,

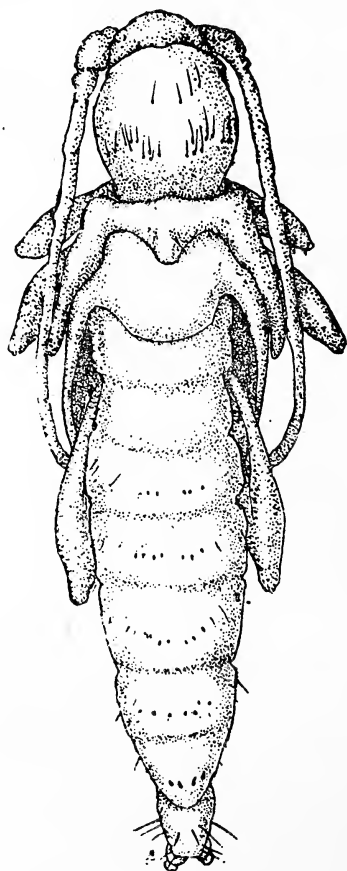


Figure 41. Pupa of *Molorchus kobotokensis* Ohb.

with paired or single sessile setae before antennae between lower ocular lobes. Eyes without setae. Antennae comparatively short, pressed to sides of body, in male bent down and forward at level of hind femora, in female slightly downward, with apices touching hind tibiae.

Pronotum convex, almost square (female) or slightly elongate (male), rounded laterally, with narrow basal flange, slopes gradually toward apex, without transverse grooves on anterior margin, with thin setae on disk forming diffuse transverse tuft anterior to middle and two transverse, slightly oblique tufts posterior to middle displaced laterally. Mesonotum glabrous, without setae, convex, with narrow extended scutellum. Metanotum with median longitudinal groove with pair of contiguous projecting setae along each side.

Abdomen elongate. Abdominal tergites convex, on segments III to VI in posterior half with minute setaceous spinules forming transverse row, usually interrupted medially by fairly wide space. Tergite VII broadly rounded apically, posterior margin with four large and two minute spinules bent down and forward, forming transverse row. Tergite VIII obtusely conical in male, with long hairs bent backward forming semicircle apically, elongate in female, cylindrical, with medial setae forming transverse row. Valvifers of female large, apically with short projecting tubercle. Body length 9.5 to 10.0 mm, width of abdomen 2.1 mm.

Material: Collected on Kunashir Island. Adult insects four, larvae two, and pupae two (male and female).

Distribution: Islands of Japan and Kunashir (Sernovodsk, Alekhino).

- 75 *Biology:* Inhabits coniferous vegetation. Beetles fly in June. Female oviposits on thin drying shoots of growing spruce. Larvae make sinuous irregular galleries under bark and plug them densely with fine frass. Galleries impressed on alburnum. Mature larva bores deep into wood, leaving surface inlet about 2.0 to 3.0 mm wide, and plugging it with frass. Cell at end of gallery 16 mm long and 2.0 to 3.0 mm wide; larva lies in cell with head toward inlet and pupates. Length of gallery with cell in wood about 4.5 cm. Pupation and pupal development completed by October. Beetles hibernate, abandon wood only in the following spring (end of May or in June). Weight of larvae before pupation 10.5 to 19.0 mg, pupae up to 17.0 mg, and beetles after hibernation up to 9.0 to 12.5 mg.

Evidently found rarely. Inhabits shoots 2.0 to 4.0 cm in diameter at lower levels (Cherepanov and Cherepanova, 1976).

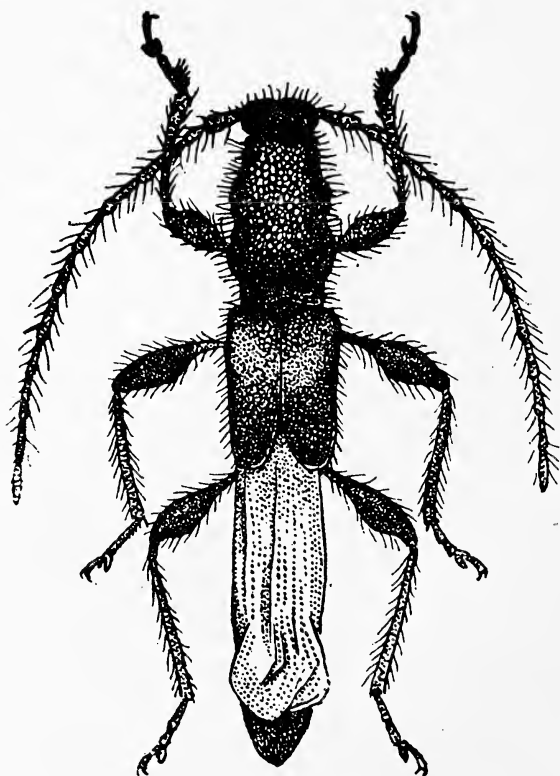
7. *Molorchus incognitus* Tsher.

(Tsherepanov) Cherepanov and Cherepanova, 1975, *Zhuki-drovoseki ivovyykh lesov Sibiri*, pp. 83-86.

Adult (Figure 42): Readily distinguished from other species of the genus *Molorchus* by flat reticulate punctation on pronotum. Body narrow, elongate. Head retracted into prothorax up to eyes, with large dense punctation and erect hairs. Frons broad and flat, raised tubercularly along margins around antennal bases. Eyes markedly and broadly emarginate, distinctly faceted. Antennae slender, with 11 segments, shorter than body, do not reach tip of abdomen; apices of 3rd to 6th segments thickened nodularly, with long hairs slanting slightly backward; 3rd antennal segment longer than 4th, equal to 5th.

Pronotum elongate, 2.0 times longer than width at base, broadens angularly, in posterior third, narrows gradually anteriorly and sharply posteriorly, with straight basal flange, barely perceptible transverse groove or without it near anterior margin, with dense erect rusty hairs, dense reticulate punctation (punctures resemble facets separated by narrow septa). Scutellum very small and narrowly rounded.

Elytra notably shorter than pronotum, in any case not longer, with projecting shoulders, individually rounded apically, flat on disk, with large punctation, and short semiadherent light-colored hairs. Legs with



long erect or semiadherent hairs. Fore- and midfemora markedly dilated and hind femora moderately clavate. Hind tarsi about 0.50 length of tibiae; 1st segment slightly shorter than two successive together.

Body ventrally with erect light-colored hairs. Abdomen narrows slightly anteriorly, more so posteriorly. Abdominal tergites with large punctation. Tergite V in female more elongate, rectangular, in male not longer than width at base. Body black or blackish-brown. Antennae and legs light rusty. Elytra light colored, pale yellow in anterior half, dark brown, almost black at base and in posterior half. Body length 4.5 to 7.5 mm.

Egg: White, elongate, narrows toward one pole. Chorion matte, with fine sculpture. Length 1.0 mm, width 0.4 mm.

Larva (Figure 43): Characterized by sharp inner angle of hypostomal sclerites and uniform anterior margin of epistoma. Head narrowly rounded anteriorly, insignificantly flattened. Epistoma fuses with parietals, frontal sutures barely perceptible. Median suture slightly visible only in
76 posterior half. Anterior margin of epistoma smooth, uniform, with barely visible lateral projection. Hypostoma narrows anteriorly, widely separated medially by trapezoid gula into two sclerites with pointed inner angles. Parietals in anterior half with long setaceous hairs forming

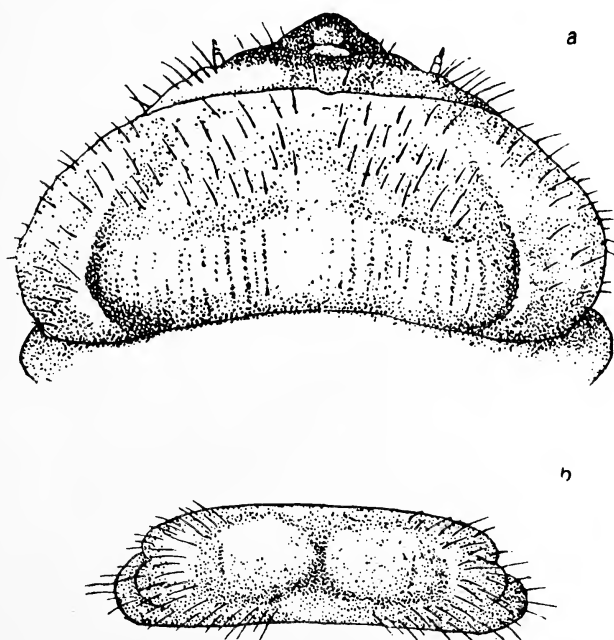


Figure 43. Larva of *Molorchus incognitus* Tsher.
a—head and pronotum; b—abdominal tergite IV
with dorsal locomotory ampulla.

dense replicated tuft. Antennae comparatively long, with apices extending beyond 1st segment of maxillary palps. Clypeus very small, not flattened, rectangular, convex. Labrum convex, broadly rounded apically, and with sparse long setae on anterior margin. Mandibles comparatively short, thick, smooth on outer side, convex, deeply hollowed inside, and broadly rounded apically. Labial submentum with faint longitudinal streaks.

Prothorax broad, 2.0 times wider than long, longer than meso- and metathorax together. Pronotum markedly narrows anteriorly, broadly rounded on anterior margin, with thin, not very dense hairs in anterior half and laterally. Pronotal scutum moderately convex, white, glabrous, demarcated laterally by deep longitudinal grooves. Prothoracic presternum with sparse short hairs; eusternum slightly convex, without perceptible hairs; base of prosternum (basisternum s. sternellum) in form of narrow transverse fold, broadens slightly laterally and narrows medially.

Abdomen narrows posteriorly, broadens in region of segments VII and VIII, with dense short light-colored hairs laterally. Dorsal locomotory ampullae convex and coriaceous, not sclerotized, separated by common broad longitudinal groove, with small longitudinal dent laterally in anterior half. Ventral locomotory ampullae slightly convex, with transverse groove in anterior half joining lateral longitudinal dent. Anal (X) segment with dense long hairs. Body length of mature larvae 6.0 to 8.0 mm, width of head 0.7 to 0.8 mm.

Pupa (Figure 44): Body elongate. Head short, slightly bent under; frons broadly impressed medially. Antennae tightly pressed to sides of body, with apices slightly bent ventrad (toward base of hind femora). Pronotum elongate, 2.0 times longer than wide, smooth, uniformly convex, basally with narrow transverse groove, disk medially with group of short hairs. Meso- and metanota glabrous, lustrous. Abdomen elongate, broadens in region of segments IV and V, narrows anteriorly and 77 posteriorly, appears stretched anteriorly. Abdominal tergites moderately convex, without spinules, only apex of tergite VII with pair of proximate spinules bent forward. Valvifers of female small, slightly elongate. Body length 6.0 mm (Cherepanov and Cherepanova, 1975).

Material: Collected in Ussuri-Primor'e region. Adult insects 24, larvae three, pupa—one female (which developed into adult), larval exuviae with beetles from cells 13.

Distribution: Ussuri-Primor'e region (Kovarovka and Suvorovka Rivers).

Biology: Inhabits deciduous vegetation. Beetles fly in June and July, disappear by mid-August. Rarely seen on flowers. Female oviposits in bark crevices of thin shoots 0.6 to 1.5 cm in diameter. Larvae hatch from eggs in two to three weeks and immediately bore into bark. They

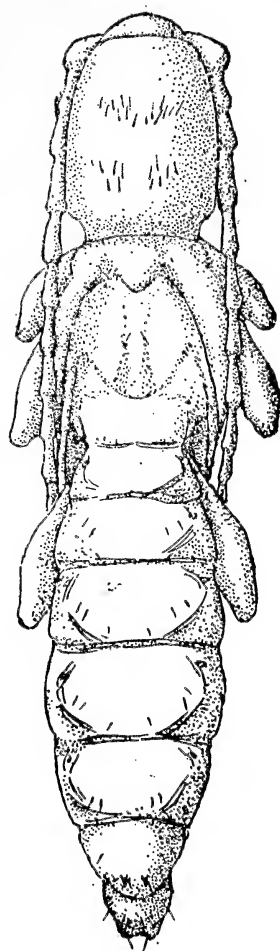


Figure 44. Pupa of *Molorchus incognitus* Tsher.

initially live under bark, make longitudinal sinuous galleries, and plug them with fine frass. Mature larva bores wood, makes longitudinal gallery 6.0 cm long, and at end of gallery scoops out cell along trunk. Length of cell 8.0 to 14.0 mm, width up to 3.0 mm. Pupation of larvae in cells mainly observed in June. Young beetles emerge from pupae in second half of June and early July. Beetles exit from wood end of June and in July through oval openings in shoot surface up to 1.5 mm in diameter. Pupal cell usually oblique to surface of trunk. Weight of larvae before pupation 1.8 to 8.2 mg, pupae 1.5 to 7.2 mg, young beetles 1.2 to 6.0 mg.

Molorchus incognitus Tsher. develops on desiccated (sometimes viable) shoots of various woody species. We raised 14 beetles from willow, one

- 78 from *Euonymus*, one from oak shoots, three from elm, and five larvae and one pupa from Amur maple. *Exocentrus stierlini* Ganglb. was also found with this species on thin willow branches (Cherepanov and Cherepanova, 1975).

2. Genus *Nadezhdiana* Tsher.

(Tsherepanov) Cherepanov and Cherepanova, 1976, *Novosti fauny Sibiri* (Nov. i maloizy. vidy fauny Sibiri, 10th ed.), pp. 66-67.

Adult: Proximate to the genus *Molorchus*. Well distinguished by broad mesosternal process and usually dense pubescence on ventral side of body. Head not broader than pronotum. Antennae with 11 segments, shorter than body in female, reaching only abdominal segment II; longer than body in male, with 9th segment extending beyond tip of abdomen. Forecoxae transversely elongate, forecoxal cavities open, prosternal process long, narrow, cuneiform apically, curved at end. Midcoxae widely separated, mesosternal process between them broad, flat, not narrowing toward apex, almost square. Prosternum with large dense, metasternum with minute, less dense punctation, and medially (slightly closer to posterior margin) with smooth lustrous plate. Body on ventral surface with minute, dense, adherent, silvery pubescence and dense erect light-colored hairs.

Larva: In general appearance and presence of long replicated hairs laterally on parietals of head similar to larvae of the genus *Molorchus*. Readily recognized by tuft of sharp spinules on abdominal tergite IX.

Pupa: Body elongate. Pronotum with anterior and posterior flanges, disk with setae forming two transverse bands interrupted medially by small gap. Abdominal tergites II to VI with minute spinules forming transverse row. Tergite VII with large (five or six) spinules directed forward. Tergite VIII with large setae, framed at base by sclerotized ringlet.

This genus, named after Nadezhda Epifanovna Cherepanova, comprises only a single species to date, and is ecologically associated with broad-leaved forests.

Type species: *Nadezhdiana villosa* Tsherepanov, 1976.

1. *Nadezhdiana villosa* Tsher.

(Tsherepanov) Cherepanov and Cherepanova, 1976, *Novosti fauny Sibiri* (Nov. i maloizv. vidy fauny Sibiri, 10th ed.), pp. 67-71.

- 79 *Adult* (Figure 45): Body elongate, dorsally flat. Head directed forward, slopes slightly downward, barely narrower than pronotum, with dense large punctation and long erect light-colored hairs. Frons broad, flat, with median longitudinal suture, laterally with barely perceptible

longitudinal carina. Eyes large, highly convex, finely faceted, broadly emarginate, lower lobes 3.0 times larger than upper. Antennae of male long, slender, perceptibly longer than body, with elongate cylindrical segments, angularly rounded, not extended on distal outer margin; 3rd segment shorter than 5th, apex of 11th falcate. Antennae of female markedly shorter than body, barely extend beyond abdomen, comparatively thick, with short adherent hairs not forming compact cover; inner side of segments (especially 3rd to 6th) with long hairs; 3rd segment slightly longer than 4th, but definitely shorter than 5th; 5th to 10th

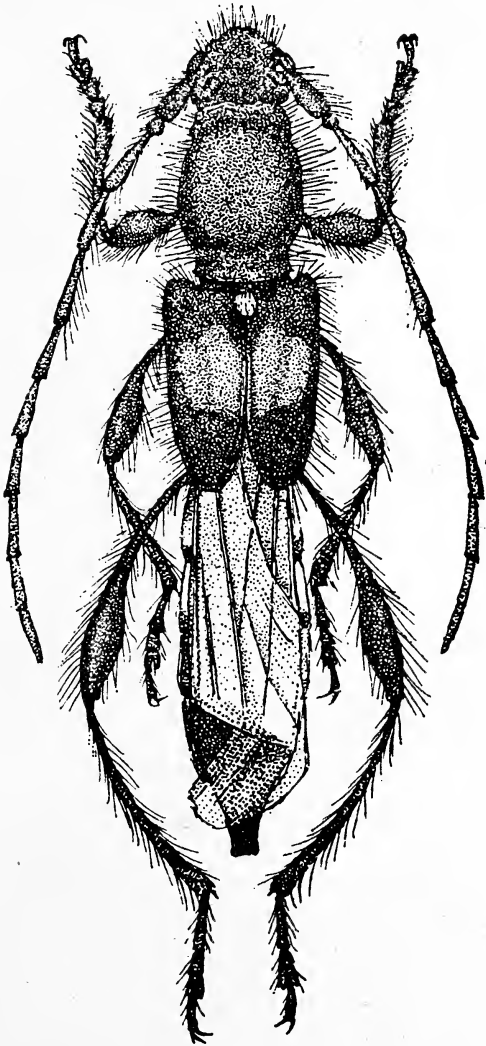


Figure 45. *Nadezhdiana villosa* Tsher.

matte, extended, spinelike, on distal outer margin; 11th segment apically pointed conically.

80 Pronotum elongate, more so in male, broadens medially in female, flattened on disk, near anterior and posterior margins with broad transverse flange, curves angularly on sides, with deep large mamillary punctation; spaces between punctures smaller than punctures; anterior half laterally with dense adherent squamiform hairs forming two whitish-silver (female) or yellowish (male) spots; basally on flange with tender adherent white hairs forming light-colored transverse band; disk and sides with long, erect, setaceous, brownish hairs; anterior half laterally in male with faint longitudinal lustrous elevation. Scutellum elongate, with parallel sides, broadly rounded apically, with dense adherent silvery hairs. Elytra not longer or slightly longer than pronotum, with humeri projecting forward, flat lustrous disk, sparse fine punctation and sparse, short, light-colored, semiadherent hairs, individually rounded apically, with distinct narrow border. Legs long, with long thin setaceous hairs; femora clavate, forefemora apically highly and abruptly dilated, hind ones dilate gradually. Hind tibiae slender, curve slightly, not shorter than hind femora. Hind tarsi 0.40 to 0.50 length of tibiae; 1st segment barely longer than two successive together.

Body ventrally with dense, minute, adherent, silvery and long erect light-colored hairs. Abdomen elongate, with parallel sides, narrows posteriorly. Abdominal sternites bulge, lustrous, with fine punctation. Sternite V short, broad, narrows posteriorly, rounded at end, without squamiform hairs in female. Body black. Antennae rusty, somewhat darkened apically. Elytra black, disk with whitish translucent spot, anterior margin angularly produced, posterior margin slightly rounded. Length 9.0 mm.

Larva (Figure 46): Differs from larvae of all other species in presence of area on tip of abdomen covered with spinules (dorsal view). Body slightly elongate, with almost parallel sides. Half of head retracted into prothorax; head markedly narrows anteriorly. Anterior margin of parietals with short hairs directed backward. Epistoma lustrous, laterally with indistinct frontal sutures, medially divided by distinct longitudinal suture. Hypostoma divided into two triangular sclerites displaced posteriorly by gular plates. Clypeus small. Labrum very small, elongate, with longitudinal streaks on disk, sparse short setae on anterior margin. Mandibles thick, short, broadly rounded apically, hollowed from inside, cultrate, horseshoe shaped. Pronotum narrows slightly (roundly) anteriorly, with long thin hairs forming transverse row on anterior margin close to sides, and tender uneven hairs laterally. Pronotal scutum convex, coriaceous, with minute furrows, bound laterally by long longitudinal folds reaching almost to anterior margin. Thoracic legs lacking.

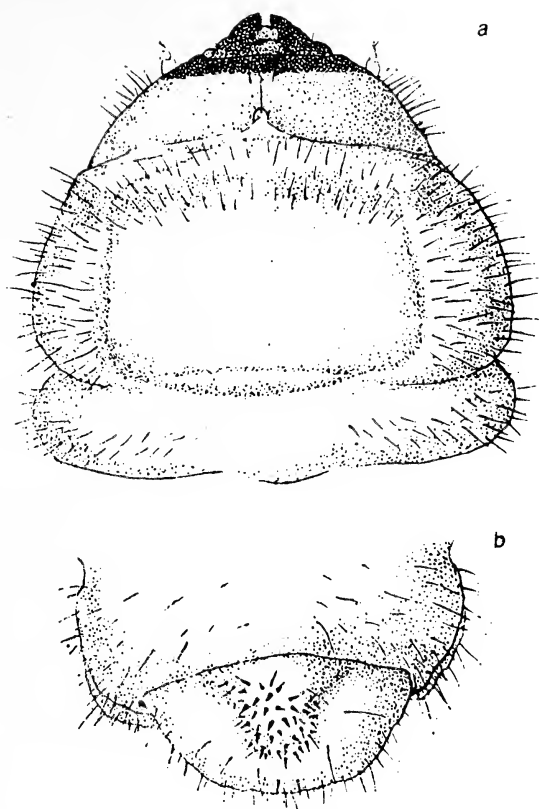
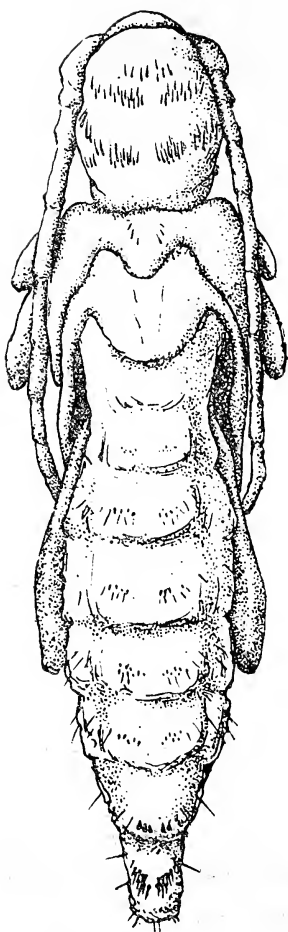


Figure 46. Larva of *Nadezhdiana villosa* Tsher.
a—head and pronotum; b—abdominal tergite IX.

Abdomen with parallel sides, narrows somewhat on segments VIII and IX. Dorsal locomotory ampullae slightly convex, medially divided by common longitudinal groove, laterally with longitudinal fold, on anterior angles with longitudinal groove. Ventral locomotory ampullae almost identical in structure. Tergite IX convex, laterally with long thin hairs, smooth lustrous disk on which sharp acicular erect spinules (about 50) form broad field. Body length 9.0 mm, width of head 1.4 mm.

Pupa (Figure 47): Body elongate, slender. Head bent under. Genae short, 0.33 width of lower ocular lobes. Antennae pressed to sides, bent ventrad; 11th segment adjoins elytral apex. Frons flat, with median longitudinal suture, near antennal bases and medially with three pairs of setae. Occiput smooth, glabrous, spherical. Pronotum elongate, with broad flange on anterior margin and sharp narrow one at base; disk flat, anterior and posterior to middle near base with dense setae forming two transverse bands interrupted medially. Mesonotum medially and metanotum apically with stray minute setae.



79

Figure 47. Pupa of *Nadezhdiana villosa* Tsher.

Abdomen broadens in region of segments IV and V and narrows toward base and apex. Abdominal tergites moderately convex, in posterior half with minute acute spinules forming transverse row (four to six paramedial spinules). Tergite I glabrous, without spinules; II with faint spinules; VII apically with much larger spinules (up to six) bent down and forward and forming transverse row. Tergite VIII narrow, elongate in posterior half, with long setae directed backward forming two tufts (up to 10 setae per tuft) that diverge at an acute angle. Valvifers of female hemispherical, with projecting apical tubercle. Body length 8.5 mm, width of abdomen 1.8 mm.

Material: Collected in Ussuri-Primor'e region (Novomoskovka village). Adult insects three, larvae two, pupa—one female, larval exuviae with beetles from cells two.

Distribution: Ussuri-Primor'e region.

Biology: Inhabits broad-leaved forests. Ecologically associated with Manchurian walnut (*Juglans manshurica*). Female oviposits on decomposing shoots 1.8 to 3.0 cm in diameter. Larvae make longitudinal sinuous galleries under bark, deeply impressed on sapwood, and plug them densely with frass. Larva later bores wood up to 5.0 mm, makes cell there along shoot, turns head toward inlet, and pupates. Length of gallery under bark up to 8.0 cm, width before boring wood 3.5 mm. Width of inlet up to 3.0 mm. Length of pupal cell 16 to 18 mm, width 3.0 to 4.0 mm. Pupae develop at room temperature in about 20 days. Young beetles nibble oval opening (2.0 mm × 3.0 mm to 3.0 mm × 3.5 mm) on shoot surface and exit from pupal cell through it. Weight of larvae before pupation 13 to 18 mg, pupae up to 15 mg, and beetles after exiting from wood 7.0 mg or more. Pupation observed in spring. Young beetles seen in June, fly in July (Cherepanov and Cherepanova, 1976).

19. Tribe DILUSINI

Adult insect characterized by minute narrow body. Differs from proximate tribes (Gracilini, Obriini, Nathriini, and Molorchini) in these features. Eyes highly emarginate. Pronotum elongate, with broad flange along posterior margin. Elytra elongate, cover entire abdomen dorsally, flat on disk. Abdominal sternite I moderately elongate, shorter than rest together.

Larva small, body elongate. Parietals laterally in anterior half with usual hairs, not bent backward, with pair of hyaline or pigmented ocelli near antennae ventrally. Thoracic legs well developed.

Pupa recognized by minute elongate body. Head narrow. Antennae bent ventrad behind midfemora, semicircular there. Spinules on pronotum and abdominal tergites mainly bent forward. Tergite VII narrowly rounded apically, in posterior half with two pairs of spinules forming transverse row.

This tribe is represented in USSR fauna, including northern Asia, by lone monotypic genus.

1. Genus *Deilus* Serv.

Serville, 1834, *Ann. Soc. Entom. France*, vol. 3, p. 73; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 190 (*Dilus*); Mamaev and Danilevskii, 1975, *Lichinki zhukov-drovosekov*, pp. 188-189 (*Dilus*).

Adult: Differs in very narrow, comparatively flat body. Head elongate anteriorly, flat between antennae and upper ocular lobes, with large

longitudinally elongate punctation. Antennae short, thick, just reach (male) or notably fall short of (female) middle of elytra, from 5th segment with distinctly produced outer angle. Pronotum elongate, with narrow flange at base and broad one at apex. Elytra narrow, almost with parallel sides, flat on disk, with lateral carinate streaks extending from ventral side of humeral tubercle to hind clivus. Legs short, femora clavate.

Larva: Characterized by elongate slender body. Head narrows anteriorly, with smooth rusty border on anterior margin of epistoma, narrow notch near clypeus medially. Gula projects beyond anterior margin of hypostoma, broadens here, with anterior angles produced laterally to form, so to speak, common gular-labial complex with labium. Pronotal scutum short, transversely straightly truncate on posterior margin. Prothoracic presternum with sparse setaceous hairs, sharply ringed at base with sclerotized ringlet. Legs short, minute. Locomotory ampullae developed on abdominal segments I to VII, separated by transverse groove, with uneven, finely granular or granulate sculpture forming transverse elongate ellipse with silvery sheen.

Pupa: Readily recognized by a combination of characters. Head narrow, extends narrowly and roundly on occiput. Antennae short, apices bent ventrad. Pronotum medially, hind clivus, and abdominal tergites I to III with several spinules forming transverse row. Meso- and metanota glabrous, lustrous, without spinules. Legs short; femora clavate; apices of hind femora barely reach posterior margin of tergite III.

This genus consists of a single species, distributed sporadically in central and southern Europe.

Type species: Callidium fugax Olivier, 1790.

1. *Deilus fugax* (Oliv.)

Olivier, 1790, *Enc. Meth. Ins.*, vol. 5, p. 253 (*Callidium*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 190-192 (*Dilus*); Demelt, 1966, *Tierwelt Deutschlands*, vol. 2, pp. 63-64.

Adult (Figure 48): Frons slightly tubercularly elevated laterally near antennal bases, with narrow median longitudinal groove extending onto vertex. Eyes sharply faceted, emarginate up to posterior margin; gap between ocular lobes very narrow, only with stray facets in one row.

- 83 First segment of antennae thick, with large flat punctation; remaining segments with fine punctation. Second antennal segment nodular, slightly wider than long; 4th segment barely longer than 3rd, equal to 5th or insignificantly shorter.

Pronotum broadly rounded laterally, 1.5 times longer than width at base, with deep coarse punctation, spaces between punctures markedly

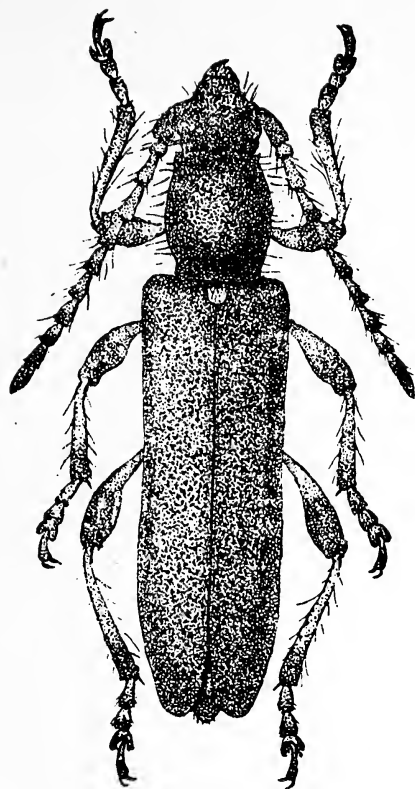


Figure 48. *Deilus fugax* (Oliv.).

82

smaller than punctures, with gray adherent and erect hairs. Scutellum broad, broadly rounded posteriorly, with dense, light-colored, compactly adherent hairs.

84 Elytra with round projecting humeri, inner angle apically produced spinelike or angularly rounded, and outer angle broadly rounded (hence appears slightly emarginate near inner angle), with dense large deep punctation, shagreen coarse sculpture in spaces between punctures, with tender gray hairs combed sideways on disk and from base to apex laterally. Prosternum with dense punctation; prosternal process long, with parallel sides, extends beyond posterior margin of forecoxae and bent down there, with large punctation. Femora clavate, in second half highly thickened as though dilated, with sharp flange apically (ventral view). Ventral surface of body with dense gray adherent hairs. Body black with bronze iridescence. Antennae variegated; 1st antennal segment black, rest reddish-rust, at apex (especially from 5th segment) black. Legs reddish-rust, femoral clava and apex of tibiae black, tarsal segments darkened apically. Body length 7.0 to 10.0 mm.

Egg: White with green tinge, elongate, narrowly rounded at poles, narrower toward posterior pole. Chorion with minute reticulate sculpture, cells deep, flat, with spaces between them somewhat larger than cells. Length 1.0 mm, width 0.3 mm.

Larva (Figure 49): Head slightly retracted into prothorax; general contour appears rounded anteriorly. Epistoma laterally fused with parietals (frontal sutures not visible), divided by faint median longitudinal suture. Hypostoma with rusty border on anterior margin, narrows anteriorly, laterally with straight sutures, obtusely rounded at anterior outer angles, and narrows markedly posteriorly along inner margin of sclerites. Gula broadens markedly toward base, emarginate anterolaterally. Parietals in anterior half with innumerable setaceous hairs, near antennal bases with pair of small proximate pigmented or hyaline ocelli. Antennae short, narrow gradually toward apex; 1st segment of antennae not longer than two successive together. Clypeus very small, trapezoid, brownish-rust. Labrum convex, rounded anteriorly, narrows slightly toward base, with light rust setae in anterior half. Mandibles apically broadly rounded, black, basally rusty-red, with transverse groove on outer side. Inner masticatory lobes of maxillae thick, apically obtuse, with short thin setae. Maxillary palps insignificantly longer than inner lobes, laterally with long setae, with digitate apical segment rounded terminally.

Pronotum almost 3.0 times wider than long, in anterior third with narrow transverse yellow band that is separated medially and laterally by narrow white clearance into four spots, which are either distinct or faint, sometimes quite diffuse. Sides and disk of pronotum anterior to scutum with dense long light rust hairs, anterior margin of yellow band with stray hairs somewhat clustered at base and forming transverse row. Pronotal scutum short, white, 4.0 times wider than long, bound laterally by long longitudinal grooves, straightly truncate on anterior margin, medially and at anterior angles almost not produced forward, basally with minute reticulate squamose sculpture imparting silvery sheen, elsewhere with longitudinal striations; spaces between striations lustrous. Prothoracic presternum with rather sparse setaceous hairs ringed at base with sclerotized ringlet; eusternum glabrous or with stray short hairs, merges with presternum. Grooves between sterna imperceptible, rarely visible. Thoracic legs short, with completely or poorly sclerotized minute apical claw.

Abdomen elongate; segments VI and VII broaden slightly, laterally
85 with short thin light-colored hairs. Abdominal tergites laterally in anterior half with deep flange. Dorsal locomotory ampullae moderately convex, with transverse groove, uneven granular sculpture; some granules very large, lustrous, and form two rather distinct rows separated by transverse groove. Ventral locomotory ampullae similar in structure. Body length of mature larvae 10 to 12 mm, width of head 1.8 mm.

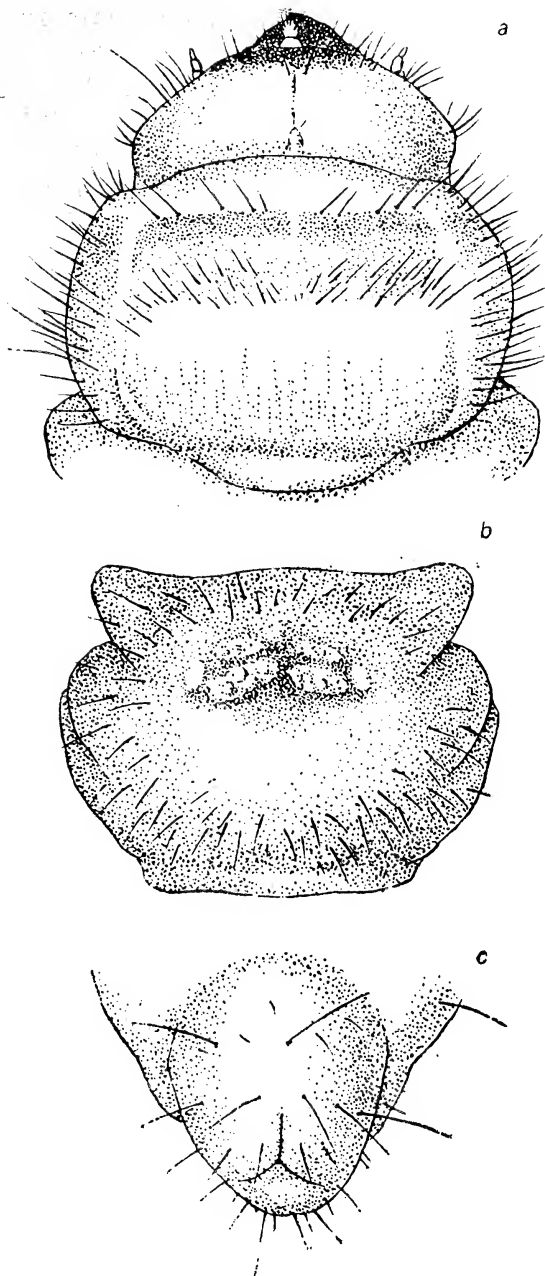
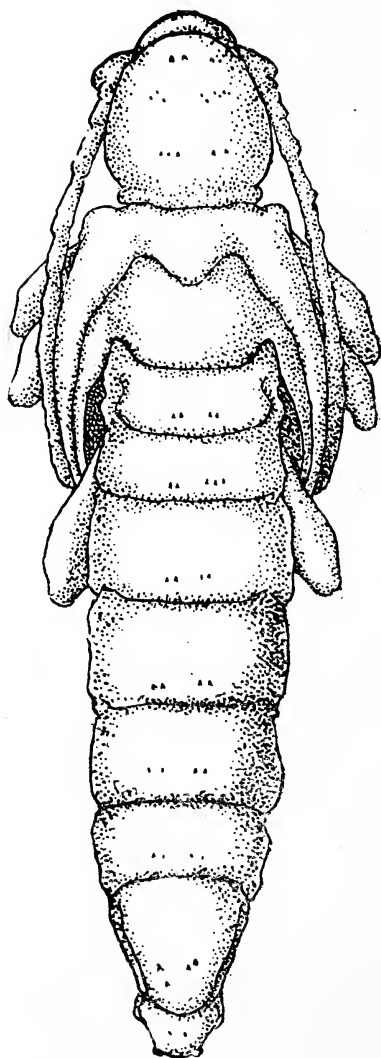


Figure 49. Larva of *Deilus fugax* (Oliv.).

a—head and pronotum; b—abdominal tergite IV with locomotory ampulla;
c—tip of abdomen (ventral view).

Pupa (Figure 50): Body elongate, narrow. Head small, markedly narrower than pronotum, near antennal bases slightly convex from inner side, with median longitudinal groove, narrowly (as though produced) rounded on occiput, lustrous, without hairs and without spinules. Antennae short, apices bent ventrad posterior to midfemora.

Pronotum 1.5 times longer than width at base, posterior to middle broadly rounded laterally, narrows more anteriorly, less posteriorly, basally with narrow flange; disk convex, with faint tender transverse streaks, medially with more, sometimes less distinct spinules forming two



paramedial tufts; hind clivus with very large sharp spinules forming indistinct transverse row broadly interrupted medially (usually four paramedial spinules). Mesonotum convex, lustrous, glabrous, with slightly hollow scutellum projecting posteriorly. Metanotum broad, with indistinct median longitudinal groove, with faint transverse streaks, posterior margin broadly rounded, glabrous, without spinules. Legs short; hind femora just reach or do not reach posterior margin of tergite III.

Abdomen markedly elongate, broadens slightly in region of segment IV, narrows from there gently anteriorly, more distinctly posteriorly. Abdominal tergites uniformly convex, in posterior half with well-developed minute or barely perceptible acute spinules directed backward; these spinules form broad transverse row interrupted medially (three paramedial spinules). Tergite VII not longer than width at base, tapers angularly in posterior quarter, narrowly rounded apically, convex and lustrous on disk; posterior to middle with two pairs of very large sharp spinules directed forward and forming transverse row. Tergite VIII lustrous, semitransparent, rounded apically, near posterior margin with thin transverse furrows and deep longitudinal furrows posterolaterally. Valvifers of female hemispherical, small, apically resemble lateral mastoid projections. Body length 7.0 to 10.0 mm, width of abdomen 2.1 mm.

Material: Collected in the southern Urals, north of Ural'sk (Embulatovka River). Adult insects 39, of which 26 raised in laboratory from larvae, larvae 41, pupae—five males and six females, larval exuviae with pupae from cells two.

Distribution: From Sverdlov, Upper Volga to the Caucasus, from the Urals to the Ukraine inclusive, central and southern Europe, Turkey, northern Africa. Sporadic everywhere.

Biology: Inhabits arid sections of forest-steppe zone. Ecologically associated with shrub (mainly legumes) vegetation. Beetles fly from May to mid-July, seen on flowers of Umbelliferae, spiraea, and other plants. Later colonize shoots of *Cytisus*, *Sarathamnus*, and other shrubs. We found them in the steppe zone 80 km north of Ural'sk (Embulatovka Rivers) on Russian broom (*Cytisus ruthenicus*).

Larvae live under bark of thin shoots 0.3 to 2.5 cm in diameter, make longitudinal sinuous galleries, plug them densely with frass, which remains covered externally by thin bark film. Galleries under bark on thin shoots up to 1.0 cm in diameter, deeply impressed in wood; walls steep, sometimes acute. On very thick shoots up to 2.5 cm in diameter, especially near root zone, galleries faintly impressed in alburnum, with smooth walls. Length of gallery under bark 15.4 to 23.5 cm, width 0.2 to 0.5 cm. Mature larva gradually bores deeper into wood and makes hollow gallery 2.5 to 4.5 cm long in upper layer along shoot, with cell at end; gallery sealed with plug of coarse fibrous frass. Width of inlet 0.2 to 0.3

cm, length of smooth gallery anterior to cell up to 2.4 cm, length of plug sealing cell from gallery 0.2 to 0.7 cm; length of cell 1.2 to 2.0 cm, width 0.25 to 0.30 cm. In a shoot 0.9 to 1.0 cm in diameter, one larva made a gallery 23.5 cm long under bark from top downward, widened it at end from 0.3 to 0.6 cm, turned back, bored deeper gradually from bottom upward in wood, made there a hollow gallery along shoot, prepared cell at its end, and sealed it from smooth gallery with plug of fibrous frass. Larva pupates with head toward inlet, facilitating beetle's exit from wood later.

Pupation commences after first hibernation in middle 10 days of July and ends in first half of August. On July 19 broom shoots cut open yielded 24 insects, of which nine (37.5%) were larvae before pupation and 15 (62.5%) pupae. Duration of pupal stage in nature at 14.4 to 31.4°C ($23.0 \pm 0.7^\circ\text{C}$) 17 to 19 days, average 18.1 ± 0.1 days. Young beetles sighted in first 10 days of August, enter diapause, hibernate in cell. Emergence of young adults from wood completed in spring with the onset of warm weather. By this time gonads have matured. Ovaries of one female dissected after emergence from wood contained 36 mature eggs. Weight of insects in larval stage before pupation 10.0 to 26.5 mg (19.0 ± 0.8), pupae 9.0 to 24.0 mg (16.9 ± 0.7), and adult insects before hibernation 8.0 to 20.0 mg (13.7 ± 0.6). Weight of insects decreased by an average of 27.8% during metamorphosis, more in some individuals. Generation completed in two years (Table 6). Hibernates first time in second larval instar under bark or in wood (weight of larvae at this time 8.4 to 14.0 mg, average 12.0 ± 0.6 mg) and second time as adult in wood. In 1978 we collected a large number of dead beetles from pupal cells subsequent to hibernation. This indicates that during hibernation the population is considerably reduced in the adult stage.

Table 6. Periods of development of *Deilus fugax* (Oliv.)

Year of development	April	May	June	July	August	September
1st	A	AE	AEL	AEL	EL	L
2nd	L	L	L	LP	LPA	A
3rd	A	AE	AEL	AEL	EL	L

Population density in broom shoots was comparatively high. We found four hibernating beetles in shoots 4.5 cm long, 1.0 cm in diameter. Wood between pupal cells was preserved in form of narrow septae. Broom shoots damaged by larvae of *Deilus fugax* (Oliv.) have withered by the time the second or even first hibernation takes place. *Chlorophorus varius*

- 87 (Müll.) is often found together with this species on the same shoots; the latter species colonizes the upper and lower parts of broom and the former only the lower parts near the roots. The larvae of *C. varius* live mainly under bark, penetrating wood only for pupation, while *D. fugax* lives in wood and makes long galleries there. For example, in autumn seven larvae of *Deilus fugax* (Oliv.) and four larvae of *Chlorophorus varius* (Müll.) were recovered from a section of broom root (length 24.0 cm, diameter 2.25 cm). Larvae of the latter were found under bark and in wood and of the former only in wood.

20. Tribe CALLICHROMINI

Adult insect distinguished by elongate, notably flat (*Aromia*, *Chelidonium*) or cylindrical (*Polyzonus*) body. Antennae long, extend beyond tip of abdomen (*Aromia*, *Chelidonium*) or slightly shorter than body (*Chloridolum*). Pronotum laterally with sharp (*Aromia*, *Chelidonium*) or obtusely rounded (*Chloridolum*) tubercle; disk with obliterated (*Aromia*) or sharp and deep (*Polyzonus*) punctation, or thin transverse furrows (*Leontium*). Metasternum posterolaterally with projecting ellipsoidal aromatic pore. Elytra monochromatic, metallic green, blue, or violet, with partly bronze iridescence (*Chloridolum*, *Aromia*) or blue with broad transverse bands (*Polyzonus*).

Larva with half or more of head retracted into prothorax. Epistoma medially divided by narrow longitudinal suture, merges laterally with parietals, frontal sutures imperceptible or faint. Pronotum with dense (*Aromia*, *Chelidonium*, *Leontium*) or sparse setaceous (*Chloridolum*) hairs, forming two transverse fields, one just anterior to scutum, the other in anterior third. Pronotal scutum convex, coriaceous, demarcated laterally by deep groove. Prothoracic eusternum glabrous, coriaceous merges with general surface of presternum, not demarcated from it by groove. Thoracic legs small, with minute claw. Locomotory ampullae coriaceous, not sclerotized, developed on abdominal segments I to VII, separated dorsally by two and ventrally by one transverse groove.

Pupa with glabrous, lustrous head, with longitudinal groove between antennae. Antennae in second half looplike, pressed to sides ventrally. Pronotum laterally with large (*Aromia*, *Chloridolum*) or minute (*Leontium*) tubercle, in posterior half with paramedial setae set on protuberances and forming transverse band, medially on disk with setae arranged in transverse row or narrow transverse band, on anterior margin with setaceous tubercle (*Chelidonium*), transverse glabrous carina (*Chloridolum*), or flat and without setae (*Aromia*). Meso- and metanota glabrous, lustrous (*Aromia*, *Chloridolum*, *Leontium*), or with large setae forming two tufts on each (*Chelidonium*). Abdominal tergites with very small spinules generally bent down and forward.

Callichromini are abundantly represented in Southeast Asia but impoverished in northern Asia. They occur here only in the southern regions, with five genera represented by one species each. Most species are ecologically associated with deciduous species; only one species (*Leontium viride* Thoms.) lives on spruce shoots and preferentially colonizes viable trees.

KEY TO GENERA

Adult Insects

- 88 1 (8). Body slightly flat. Pronotum broad, uneven on disk, with sparse smoothened or dense highly minute punctation, or fine transverse furrows sometimes forming concentric circles. Elytra monochromatic, metallic blue, green, or violet.
 - 2 (3). Hind femora short, far from reaching elytral apices, maximally extend up to 0.66 their length. Palearctic. 1. **Aromia** Serv.
 - 3 (2). Hind femora long, extend beyond elytral apices or slightly short of them (*Chelidonium* Thoms.).
 - 4 (7). Body large, 22 to 35 mm long.
 - 5 (6). Pronotum red, laterally with large, smooth, lustrous, conical tubercle pointed at end. Mainly Southeast Asia. 2. **Chloridolum** Thoms.
 - 6 (5). Pronotum green, laterally with obtuse, densely punctate tubercle; disk with dense, highly minute punctation. Southeast Asia. 3. **Chelidonium** Thoms.
 - 7 (4). Body 14 to 18 mm long. Pronotum with fine transverse furrows. Body and elytra bright green. Southeast Asia. 4. **Leontium** Thoms.
 - 8 (1). Body cylindrical. Pronotum comparatively narrow, distinctly elongate, evenly and highly convex on disk, with dense large deep punctation. Elytra with broad transverse yellow bands. East Asia. 5. **Polyzonus** Cast.

Larvae

- 1 (8). Abdominal sternite X entirely covered with hairs. Apex of gula narrow, about 0.25 width of hypostomal sclerite on anterior margin.
- 2 (7). Dorsal locomotory ampullae reticulately rugose, not matte. Found on deciduous species.
- 3 (6). Hairs on pronotum fine, not dispersed; distance between hairs less than their length. Hairs on pronotum equally dense posterolaterally and in anterior half.

- 4 (5). Abdominal tergite IX glabrous on disk, laterally and on posterior margin with sparse hairs. Found on willow. 1. **Aromia** Serv.
- 5 (4). Abdominal tergite IX with sparse hairs on disk but dense hairs laterally and on posterior margin. Found on Manchurian walnut. 2. **Chloridolum** Thoms.
- 6 (3). Hairs on pronotum setaceous, thick, dispersed; distance between them not less than or even more than their length. Hairs on pronotum dense posterolaterally, sparse in anterior half. Found on maple shoots at crown of thick-trunked viable trees. 3. **Chelidonium** Thoms.
- 7 (2). Dorsal locomotory ampullae not reticulately rugose, smooth, matte. Found on coniferous species. 4. **Leontium** Thoms.
- 8 (1). Abdominal sternite X glabrous, with thick acicular setae only on posterior margin forming transverse row. Apex of gula broad, 0.33 anterior width of hypostomal sclerite. Found on dog rose. 5. **Polyzonus** Cast.

Pupae

- 1 (8). Abdominal tergites with spinules forming transverse band that does not curve forward laterally and is not circular.
- 2 (7). Hind femora reach large abdominal tergite VII (Male *Chloridolum sieversi* Ganglb.), do not extend beyond its apex.
- 3 (4). Pronotum without tubercle and without carina on anterior margin, uniform or sometimes slightly elevated there, glabrous, without setae. 1. **Aromia** Serv.
- 89 4 (3). Pronotum with tubercle or carina on anterior margin.
- 5 (6). Pronotum with well-developed carina on anterior margin. Meso- and metanota glabrous, without setae. 2. **Chloridolum** Thoms.
- 6 (5). Pronotum with sharply projecting setaceous tubercle on anterior margin. Meso- and metanota laterally with large acicular setae forming tuft. 3. **Chelidonium** Thoms.
- 7 (2). Hind femora reach abdominal tergite VII (female) or extend beyond its apex (male). 4. **Leontium** Thoms.
- 8 (1). Abdominal tergites with spinules forming transverse band that curves forward laterally or is circular 5. **Polyzonus** Cast.

1. Genus *Aromia* Serv.

Serville, 1833, *Ann. Soc. Entom. France*, vol. 2, p. 359; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 196-197; Gressit, 1952, *Longicorn Beetles of China*, vol. 2, p. 200; Mamaev and Danilevskii, 1975, *Lichinki zhukov-drovosekov*, pp. 189-191.

Adult: Body large, somewhat flat. Antennae not longer (female) or markedly longer than body. Pronotum laterally with large conically produced tubercle. Elytra elongate, with parallel sides, narrowly rounded apically, glabrous (subgenus *Aromia* s. str.) or with short hairs (subgenus *Tomentaromia* Plav.). Apex of sternite V emarginate (male) or rounded (female).

Larva: Characterized by presence of hyaline, nonpigmented ocellus at antennal bases, short rusty hairs on pronotum forming two transverse fields anterior to scutum, and developed nonsclerotized locomotory ampullae on abdominal segments I to VII.

Pupa: Body large, flat. Antennae long, looplike, curving forward at level of middle or beyond apex of hind femora. Abdominal tergites with innumerable short spinules directed mainly anteromedially. Apex of abdominal tergite VII with minute spinules forming tuft.

Genus widely distributed in Eurasia. One species inhabits northern Asia, its areal covering almost the entire Palearctic.

Type species: *Cerambyx moschatus* Linnaeus, 1758.

1. *Aromia moschata* (L.)

Linnaeus, 1758, *Syst. Nat.*, 10th ed., p. 39 (*Cerambyx*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 198-204; Cherepanov and Cherepanova, 1975, *Zhuki-drovoseki ivovykh lesov Sibiri*, pp. 87-90.

Adult (Figure 51): Characterized by large body and elytra long, with parallel sides. Head glabrous, lustrous, without hairs, with uneven coarse punctation, bulges transversely between antennae, and with median longitudinal suture. Eyes finely faceted, broadly emarginate. Antennae slender; 9th segment extends beyond apex of elytra (male) or does not reach it (female); longitudinal groove on outer side commences from 4th segment. First antennal segment thick, considerably shorter than 3rd, with acutely projecting outer distal angle.

Pronotum transverse, laterally with large tubercle that projects acutely, spinelike, narrows to same degree anteriorly and posteriorly, near anterior and posterior margins with faint transverse groove; disk convex, uneven, with rugose punctation, glabrous, with stray, slightly obliterated, minute hairs laterally. Scutellum triangular, acutely or narrowly rounded apically, with minute, sometimes rugose punctation. Elytra elongate, almost 4.0 times longer than wide, with dense rugulose punctation; with faint longitudinal carinae or without them, disk slightly convex, almost flat, apically with narrowly rounded inner angle and tapering outer, glabrous, without hairs. Metasternum with sparse deep punctation, dense adherent light-colored hairs and sparse semiadherent brownish hairs. Aromatic pores open, metepisternum around them distinctly impressed. Legs long, slender. Hind femora curve notably. Hind tarsi shorter than

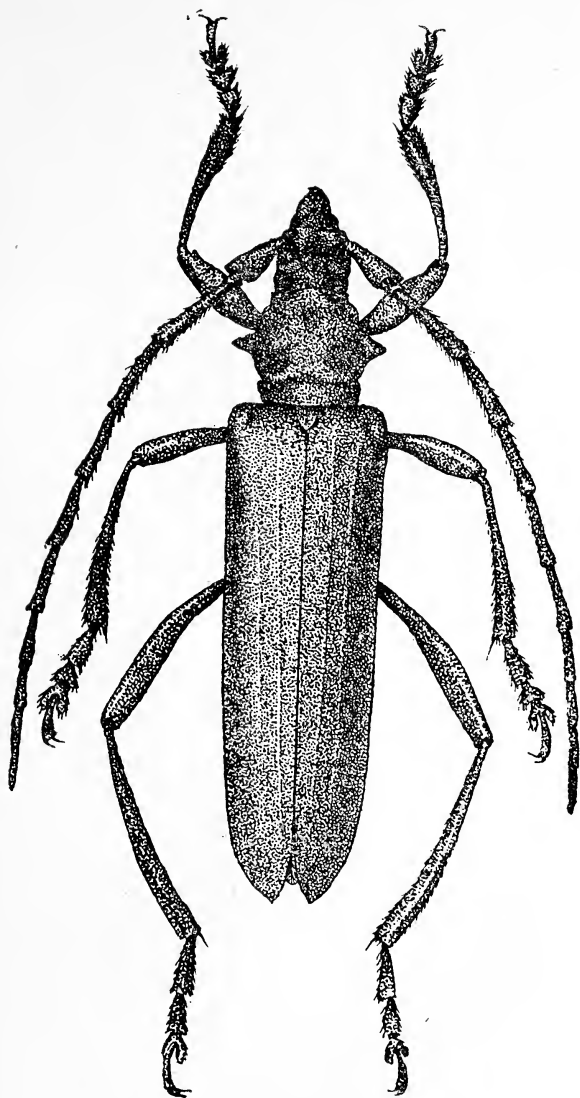


Figure 51. *Aromia moschata* (L.).

tibiae; 1st segment not longer than two successive together, arolia with broad median longitudinal groove. Abdominal sternite V emarginate (male) or narrowly rounded (female) at apex. Entire body and elytra bluish or greenish with bronze metallic iridescence [*A. m. moschata* (L.)] or pronotum red, and dark transversely rugose border present at base and apex (*A. m. orientalis* Plav.). Body length 23 to 34 mm.

Egg: White, comparatively thick, obtusely rounded at poles. Chorion with fine cellular-reticulate sculpture. Cells flat, fringed with thin lines. Length 2.8 mm, width 1.0 mm.

Larva (Figure 52): Readily recognized by short rusty hairs on pronotum, structure of dorsal locomotory ampullae, and abdominal tergite IX. Head narrows moderately anteriorly. Anterior margin of epistoma with broad rusty-brown border, behind which pair of long setae occur, laterally with single long seta, medially with longitudinal sharp suture, laterally with faint frontal sutures. Hypostoma slightly convex, on anterior margin around inner angles with sharp, highly extended projections, and inward to them deep notch accommodating spinelike articulate

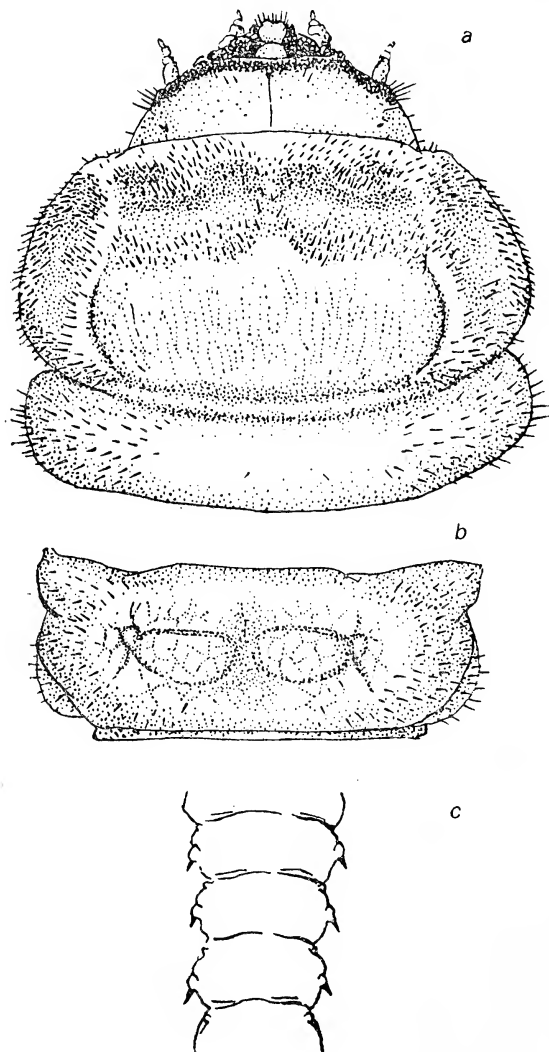


Figure 52. Larva of *Aromia moschata* (L.).

a—head and pronotum; b—abdominal tergite IV with dorsal locomotory ampulla; c—abdominal segments III to V of I-instar larva.

process of maxillae. Clypeus small, narrowly trapezoid, white. Labrum convex, narrowly or broadly rounded apically, white, along margins with dense rusty setae. Mandibles massive, basally flat on outer side or with longitudinal groove. Parietals in anterior half with sparse, near frontal
 91 sutures short hairs forming single row. Antennae with four segments. One hyaline ocellus near each antennal base.

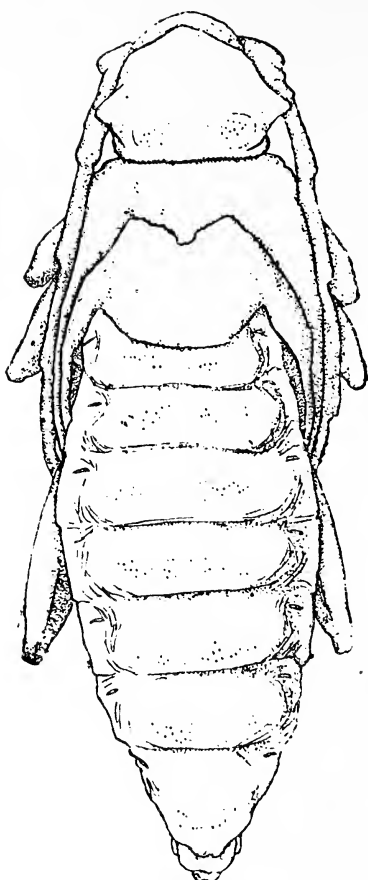
Pronotum slopes markedly toward head, rounded laterally, with white glabrous (hairless) border on anterior margin, behind which transverse yellow band occurs (with two deep saccate white notches anterolaterally and longitudinal white clearance medially), with short rusty hairs on sides and disk forming two transverse fields, one anterior to scutum, the other on anterior edge of yellow transverse band. Pronotal scutum convex, with two emarginations on anterior margin, with short lateral longitudinal groove, white, coriaceous, with stray setaceous hairs. Alar lobes with dense rusty hairs. Prothoracic presternum and disk with sparse hairs, laterally with dense very long hairs; eusternum glabrous, merges with general surface of presternum. Legs fully developed, with sharp claws.

Abdomen laterally with short rusty hairs. Dorsal locomotory ampullae slightly convex, coriaceous, with faint furrows, separated by two transverse grooves (anterior one usually straight, posterior one notably
 92 convex), with longitudinal groove medially and longitudinal folds laterally. Ventral locomotory ampullae demarcated laterally by short longitudinal grooves joined by transverse replicate groove. Abdominal tergite IX glabrous on disk. Body length of mature larva 30 to 43 mm, width of head 3.2 mm. I-instar larva with one spinule laterally on each side of abdominal segments III to V, which disappear after first molt.

Pupa (Figure 53): Readily recognized by large body and smooth anterior pronotal margin devoid of setae. Body comparatively flat. Head glabrous, between antennae transversely convex, with broad transverse fold on vertex, and broadly rounded on occiput. Antennae pressed to sides of body, bent ventrad, looplike in female at level of middle of hind femora, beyond apex of hind femora in male.

Pronotum slightly convex on disk, uneven, on anterior margin without tubercle or carina, laterally with large conically produced tubercle and near it, closer to base, with tubercular elevation bearing spinules; inward to latter spinules form small tuft (sometimes tuft dispersed into band adjoining spine-bearing tubercular elevation). Mesonotum convex, glabrous, with transversely rugose scutellum produced posteriorly. Metanotum broad, almost flat, glabrous.

Abdomen slightly convex, broadens in region of segments III and IV, narrows insignificantly anteriorly and more abruptly posteriorly. Abdominal tergites medially with longitudinal groove, laterally in pos-



91

Figure 53. Pupa of *Aromia moschata* (L.).

terior half with sharp short spinules bent anteromedially. Apex of tergite VII narrowly rounded, with spinules usually forming broad transverse field. Tip of abdomen (dorsal view) with perceptible fork (female) or narrowly rounded, without fork (male). Valvifers of female hemispherical, proximate. Body length 25 to 35 mm, width of abdomen 8.0 to 10.0 mm.

Material: Collected in Altai, Ob' region, Tuva, Trans-Baikal, Ussuri-Primor'e region, and Sakhalin. Adult insects 48, larvae 43, pupae—one male, nine females, larval exuviae with beetles from cells three.

Distribution: From Atlantic to Pacific Ocean coasts, south from northern Africa, northern Kazakhstan, Altai, northern Mongolia, northern China, and Japan, north almost up to and inclusive of taiga zone. Two subspecies inhabit northern Asia: Range of *A. m. moschata* (L.) extends from Europe to Baikal, of *A. m. orientalis* Plav. expanse east of Baikal.

Biology: Inhabits willow and mixed forest plantations containing willows. Covers mainly river valleys, terraces of hill rivers, hill sections along rivers, etc. Beetles fly in July and first half of August. Sighted in maximum numbers in second half of July on flowers of Umbelliferae, Rosales, and other plants. In 1968 and 1969 in Salair 123 beetles were collected: 97 (78.9%) in July and 26 (21.1%) in August. Beetles feed on flowers, then fly to viable willows, mate there, and oviposit in bark crevices on lower part of trunk. Ovaries of one female contained 25 eggs. Weight of freshly laid eggs 1.5 mg. According to our observations, one female can lay up to seven eggs in 25 minutes. Oviposition selective; in gardens only freshly cut willows were chosen and all other plant species rejected. Eggs are laid in nature from July to early October. Incubation period at 18.5°C continued for 20 to 26 days, average 22.3 days; at much higher temperatures incubation period reduced to two weeks.

Larvae rupture chorion to hatch, bore into bark, and live under it 93 for sometime. Later bore deeper into wood, make long longitudinal, sometimes sinuous galleries from bottom upward. Here bark surface moistened with dark brownish spots of exuding sap. Gallery length 40 cm, width up to 13 to 18 mm. Upper, larger part of gallery not plugged with frass, remains hollow. Larvae live in moist wood of growing trees. Later, not before third hibernation, each larva nibbles cell in wood along trunk, demarcates it from hollow part of gallery by plug of fibrous frass, and pupates with its head downward. Length of pupal cell up to 50 mm, width 10 to 15 mm.

Pupation mainly in June. Pupae found up to first few days of July. Three weeks later young beetles emerge from pupae. Emergence of young adults from wood commences in first 10 days of July and ends in early August. For example, we raised 96 beetles in the forest. Of these, two (2.0%) emerged from wood in first 10 days of July, 16 (16.7%) in second 10 days, 62 (64.6%) in last 10 days, and 16 (16.7%) in early August. Weight of larvae before pupation 667 to 825 mg, pupae 516 to 750 mg, and young beetles before emerging from cells 336 to 525 mg. One larva (male) before pupation weighed 605 mg (100%), pupa developing from it 526 mg (86.9%), and beetle before emerging from wood 362 mg

Table 7. Periods of development of *Aromia moschata* (L.)

Year of development	May	June	July	August	September	October
1st	L	LP	PAE	AEL	EL	L
2nd-3rd	L	L	L	L	L	L
4th	L	LP	PAE	AEL	EL	L

(59.8%). Corresponding weights in another case (female): 766 mg (100%), 718 mg (93.7%), and 460 mg (60.0%). Generation completed in three years (Table 7). *Aromia moschata* (L.) inhabits only trunks of viable trees, mainly root section with diameter up to 10 cm and above. Not seen on desiccated trees.

2. Genus *Chloridolum* Thoms.

Thomson, 1864, *Syst. Ceramb.*, vol. 174, p. 420; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 207-208.

Adult: Body large. Antennae markedly longer than body. Pronotum laterally with large conical tubercle, in posterior half with pair of widely separated, transversely elongate, smooth tubercles; disk with deep furrows arranged in whorl. Elytra long, with parallel sides (female) or narrow somewhat anteriorly (male), with dense fine punctation. Legs long, slender; hind femora extend beyond apex of elytra (male) or just reach it (female).

Larva: Disk of pronotum with dense rusty hairs forming two transverse fields. Distance between hairs less than length of hairs. Abdominal tergite IX with sparse hairs on disk and denser hairs laterally.

Pupa: Distinguished from pupae of other genera by carina on anterior margin of pronotum without hairs. Meso- and metanota glabrous, lustrous, without hairs.

Inhabits mainly regions of Southeast Asia within the Indo-Malayan zone. Only one species in northern Asia.

Type species: *Callichroma bivittatum* White, 1853.

94 1. *Chloridolum sieversi* Ganglb.

Ganglbauer, 1886, *Horae Soc. Entom. Ross.*, vol. 20, p. 135; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 209-211; Cherepanov and Cherepanova, 1977, *Taksony fauny Sibiri (Nov. i maloizv. vidy fauny Sibiri)*, pp. 142-146.

Adult (Figure 54): Body elongate, large. Head small, distinctly narrower than pronotum. Frons between antennae transversely convex, smooth, with sparse fine punctation, with narrow longitudinal suture. Vertex slightly impressed, with deep furrows diverging posteriorly. Occiput with dense deep punctation. Eyes large, broadly emarginate. Antennae 2.0 times (male) or almost 1.5 times (female) longer than body; 6th segment in male extends beyond apex of elytra, 8th segment in female; from 3rd segment with sharp groove on outer side. First antennal segment thick, matte, with sparse punctation, with light yellow articulate tubercle at base; rest of segments with fine notchlike punctation.

Pronotum slightly longer than width at base, medially broadens moderately, laterally with large smooth conical tubercle, apically with

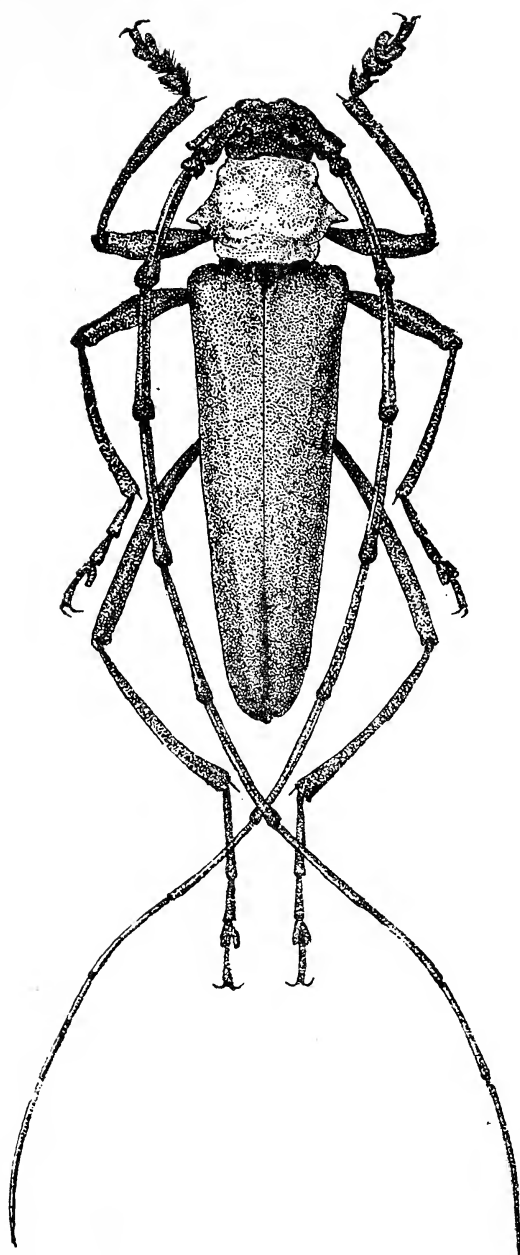


Figure 54. *Chloridolum sieversi* Ganglb.

acutely produced, spinelike tubercle; disk convex, uneven; in anterior half with two proximate rugose tubercles; in posterior half with two widely spaced, transversely elongate, smooth tubercles; near apex and at base with broad transverse flange and there with transverse furrows; disk with deep whorled furrows. Scutellum triangular, broad, with dense fine punctation, pointed apically. Elytra elongate, narrow slightly posteriorly, individually rounded apically; disk insignificantly convex, smooth, without visible carinae, with unusually dense fine punctation and minute light-colored hairs not forming compact cover. Legs long, slender; hind femora almost reach apex of elytra. First segment of hind tarsi notably longer than two successive together. Body ventrally with iridescent golden hairy cover. Abdominal sternites laterally with pitlike dents. Sternite V
 95 transverse, notched apically (male), or elongate, narrowly rounded apically (female). Ventral side of body and pronotum yellowish-red. Head and elytra blue or bluish-green with metallic sheen. Antennae, scutellum, and legs bluish-brown or almost black; articulate tubercle at base of 1st antennal segment light yellow. Body length 24 to 32 mm.

Egg: White with greenish iridescence, narrower toward one pole, broadly rounded at both poles. Chorion smooth, without cellular sculpture, matte. Length 3.0 mm, width 1.0 mm.

Larva (Figure 55): Body massive. Half of head retracted into prothorax. Epistoma slightly convex, rusty-yellow, on anterior margin with rusty-brown border sloping roundly forward, medially with sharp, slightly impressed longitudinal suture, bound laterally by faint frontal sutures; disk with innumerable short hairs. Hypostoma convex, uniform along anterior margin, without notches, around inner angles of sclerites with spinelike projection. Parietals laterally in anterior half with several short hairs. Clypeus white, broadly flattened. Labrum convex, along margins with short coarse brown setae, glabrous and white on disk, with brownish transverse band at base. Mandibles massive, outer side with broad dent, black, basally with red border. Inner masticatory lobes apical, maxillary stipes on outer side, and labial mentum posterolaterally with coarse rusty setae. Labial submentum with large elongate rusty spot at base, rounded apically.

96 Pronotum narrowly rounded anteriorly, slopes markedly toward head, with pitted sculpture in anterior half, white border on anterior margin, behind which broad rusty-yellow transverse band occurs (with white longitudinal clearance medially and two paramedial alveolar white notches on anterior margin); sides and disk with short thick hairs forming two transverse fields interrupted medially, one on anterior margin of transverse rusty-yellow band, the other anterior to scutum. Pronotal scutum white, coriaceous, convex, with longitudinal furrows demarcated laterally by longitudinal grooves; at base and on disk with stray setae or

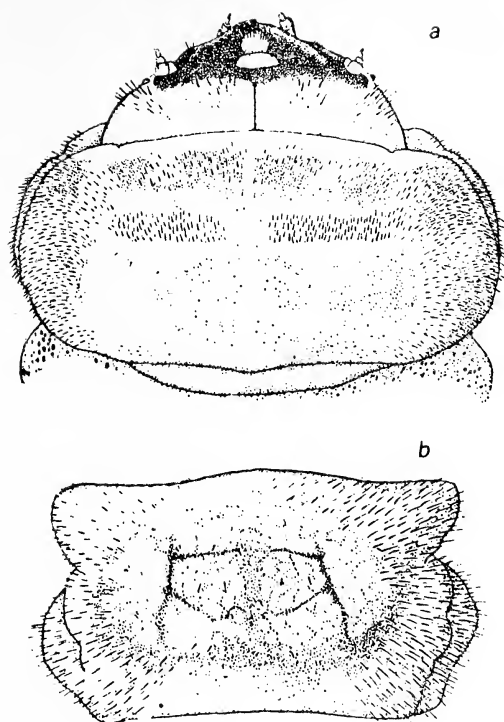


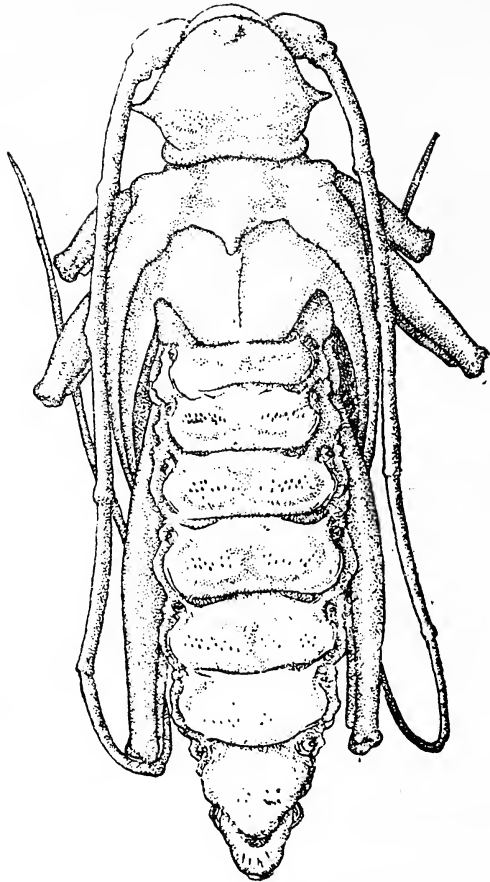
Figure 55. Larva of *Chloridolum sieversi* Ganglb.
a—head and pronotum; b—abdominal tergite IV
with dorsal locomotory ampulla.

95

without them, near posterior angles with innumerable minute hairs. Alar lobes with dense rusty hairs. Apparently hairy field covering sides of pronotum and alar lobes proceeds from there onto posterior angles of scutum. Prothoracic presternum laterally with dense hairs and medially with sparse rusty hairs, paramedially with brownish-rust streaks; eusternum coriaceous, rugose, merges with general presternal surface. Thoracic legs short, poorly developed, claws minute, spinelike.

Abdomen laterally with dense rusty hairs. Dorsal locomotory ampullae quite convex, rugose, separated by two transverse grooves merging laterally with longitudinal grooves. Ventral locomotory ampullae with lateral longitudinal groove and transverse band diverging from it, which often merges with transverse band on opposite side. Abdominal sternites VIII and IX entirely covered with rusty hairs. Tergite IX with sparse hairs on disk and denser hairs on sides.

Pupa (Figure 56): Readily recognized by large body, long looplike antennae, and pronotum. Head glabrous, without setae, transversely convex between antennae, with broad longitudinal groove, broadly



95

Figure 56. Pupa of *Chloridolum sieversi* Ganglb., male.

impressed on vertex, and broadly rounded on occiput. Antennae long, posterior to apices of hind femora bent forward, looplike.

Pronotum transverse, wider at base than long, mediolaterally with sharp protuberance, near anterior margin without flange but with medial setaceous tubercle sloping forward uniformly, near base with narrow transverse groove; disk convex, medially with minute setae forming transverse row, laterally anterior to transverse groove with basal, transversely elongate, setaceous elevation (setae thin, with small reddish sclerotized tubercle at bases). Mesonotum convex, lustrous, posteriorly with narrowly extended, transversely rugose scutellum. Metanotum glabrous, convex, with transverse fine striation on disk, and median longitudinal groove.

Abdomen elongate, barely broadens in middle, narrows gradually posteriorly. Abdominal tergites quite convex, with common median

longitudinal groove, in posterior half with sharp paramedial spinules bent down and forward forming transverse band of two or three rows. Tergite VII not rounded apically; spinules in posterior third form small tuft. Hind femora pressed to sides, almost reach middle of abdominal tergite VII. Body length 25 to 36 mm, width of abdomen 7.0 to 8.0 mm.

Material: Collected in Ussuri-Primor'e region. Adult insects 11, larvae 21, pupae—two males, larval exuviae with beetles from cells one.

Distribution: Ussuri-Primor'e region, northeast China, North Korea.

- 97 *Biology:* Inhabits broad-leaved forests. Ecologically associated with Manchurian walnut (*Juglans manshurica*). Beetles fly in August and first half of September. After mating, female oviposits in crevices of thick bark (usually on bast); eggs laid singly or in pairs. In gardens up to eight eggs have been laid in one batch on plywood planks. One female can lay as many as 68 eggs in her lifetime.

Colonizes trunks of susceptible trees up to 36 cm or more in diameter. Development of eggs takes two to three weeks. Larva nibbles opening in bark, makes gallery along trunk under bark, and plugs it behind with fine frass. Gallery weakly impressed on alburnum, quite often with step-like flexure at right angle. Length of gallery under bark 17 to 20 cm, width 1.2 to 2.8 cm. Mature larva bores wood up to 6.0 to 7.0 cm, later makes longitudinal gallery 12 cm long, 1.1 cm wide. Inlet (1.1 cm × 0.6 cm) visible on sapwood surface, extends along trunk, and is plugged with frass. Gallery in wood hollow, only anterior to pupal cell plugged with coarse fibrous and fine frass; plug 2.0 to 2.5 cm long. Length of pupal cell 3.2 to 4.0 cm, width 0.7 to 1.5 cm. Pupation of larvae occurs after second hibernation in July and first half of August. Beetles sighted end of July and in August. Flight openings (5.0 mm × 10.0 mm to 6.0 mm × 12.0 mm) of young beetles visible on surface of trees.

Weight of mature larvae prior to readying for pupation 370 to 1,520 mg. Weight of larvae before pupation 259.0 to 885.5 mg, pupae 218 to 805 mg, and beetles 191.0 to 609.9 mg. Larval population density on Manchurian walnut trunks comparatively low. For example, on one trunk (length of populated zone 6.3 m, diameter of cutting 18.0 cm) 19 larvae were detected. We inspected habitats of *Chloridolum sieversi* Ganglb. in 1971 near Partizansk in Primor'e region (First Kamenka River). Manchurian walnut stock was damaged to the extent of 15 to 20%.

3. Genus *Chelidonium* Thoms.

Thomson, 1864, *Syst. Cerambycidae*, vol. 175, p. 420; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 213–215; Gressitt, 1951, *Longicorn Beetles of China*, vol. 2, p. 196.

Adult: Characterized by very short antennae not extending beyond elytral apices. Disk of pronotum with dense, very minute punctation, with rounded protuberances laterally.

Larva: Head highly retracted into prothorax. Disk of pronotum with very sparse thick setae forming two transverse fields. Distance between setae more than length of setae. Anal segment (X) of abdomen with sparse thick setaceous hairs.

Pupa: Well distinguished from pupae of other genera of this tribe by presence of setaceous tubercle on anterior margin of pronotum. Meso- and metanota with long acicular setae forming paramedial tufts, one on each side.

The genus *Chelidonium* belongs mainly to Southeast Asian fauna and comprises over 10 species. Only one species penetrates Central Asia.

Type species: *Cerambyx argentatus* Dalman, 1817.

1. *Chelidonium zaitzevi* Plav.

Plavilstshikov [Plavil'shchikov], 1933, *Entom. Nachrbl.*, vol. 7, p. 107; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 215-216; Cherepanov and Cherepanova, 1976, *Taksony fauny Sibiri (Nov. i maloizy. vidy fauny Sibiri)*, pp. 138-142.

- 98 *Adult* (Figure 57): Readily recognized by its bright green body and fine dense punctation on pronotal disk. Head short, highly retracted into prothorax, bulges wartlike between antennae, with smooth median longitudinal suture, deeply impressed between upper lobes of eyes, more finely punctate on occiput. Genae broad, deep, sparsely punctate. Eyes broadly emarginate, very small but distinctly faceted. Antennae shorter than body, apices extend beyond 0.66 length of elytra; from 3rd segment with outer troughlike longitudinal groove; 5th to 10th segments apically with spinelike extended outer angles; 4th segment equal to 5th, about 0.50 length of 3rd.

Pronotum narrows more anteriorly, less posteriorly, not longer than width at base, with obtusely extended rounded protuberance laterally, very fine punctation on disk imparting matte appearance, laterally with large punctation, medially with longitudinal uneven band, more distinct on anterior and posterior margins, basally and apically with transverse lustrous nonpunctate groove. Scutellum elongate, triangular, pointed apically, with uneven punctation. Elytra markedly elongate, narrows slightly posteriorly, individually rounded apically (inner angle narrowly rounded and outer gently tapered), with dense very fine punctation, and hairs barely perceptible under high magnification. Hind femora not long, do not reach elytral apices. Hind tibiae straight, broaden gradually toward apex. Hind tarsi somewhat shorter than tibiae; 1st segment considerably longer than two successive. Body ventrally with compactly

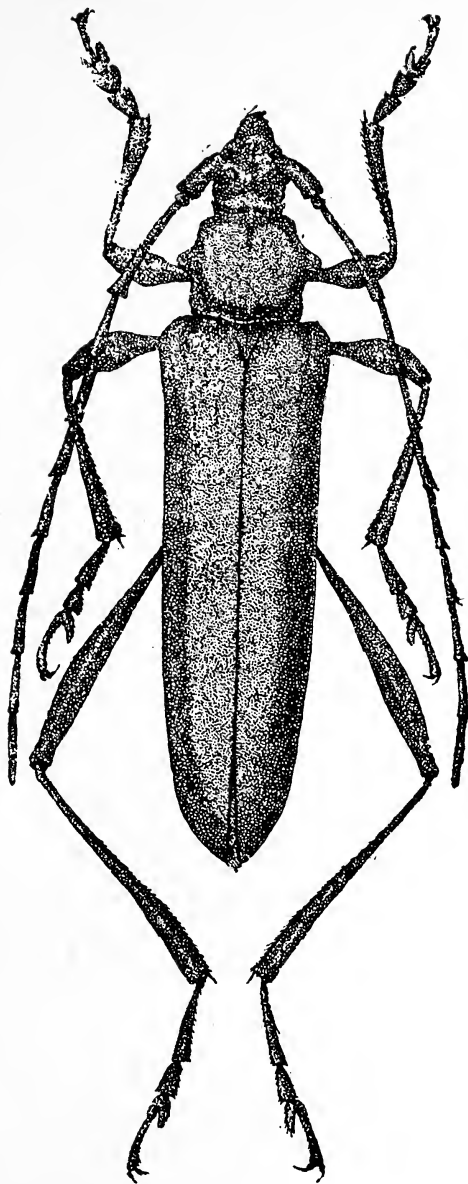


Figure 57. *Chelidonium zaitzevi* Plav.

adherent minute silvery hairs not forming dense hairy cover. Abdominal sternite V of female transverse, broadly rounded apically. Entire body and elytra bright green with metallic sheen. Legs dark violet. Antennae dark brown. Elytra laterally with golden-bronze border. Body length 17 to 25 mm.

Egg: Yellow, oval, thick. Chorion with minute cellular sculpture. Septa between cells thin. Length 2.0 mm, width 1.1 mm.

- 99 *Larva* (Figure 58): Characterized by arrangement of coarse setaceous hairs on pronotum and abdominal tergite IX. Head highly retracted into prothorax. Epistoma slightly convex, almost flat, with narrow, median, longitudinal, brownish suture, laterally with faint frontal sutures, on anterior margin with dark brown border, with long and short setaceous hairs posteriorly. Hypostoma smooth, uniform, without spinelike projec-

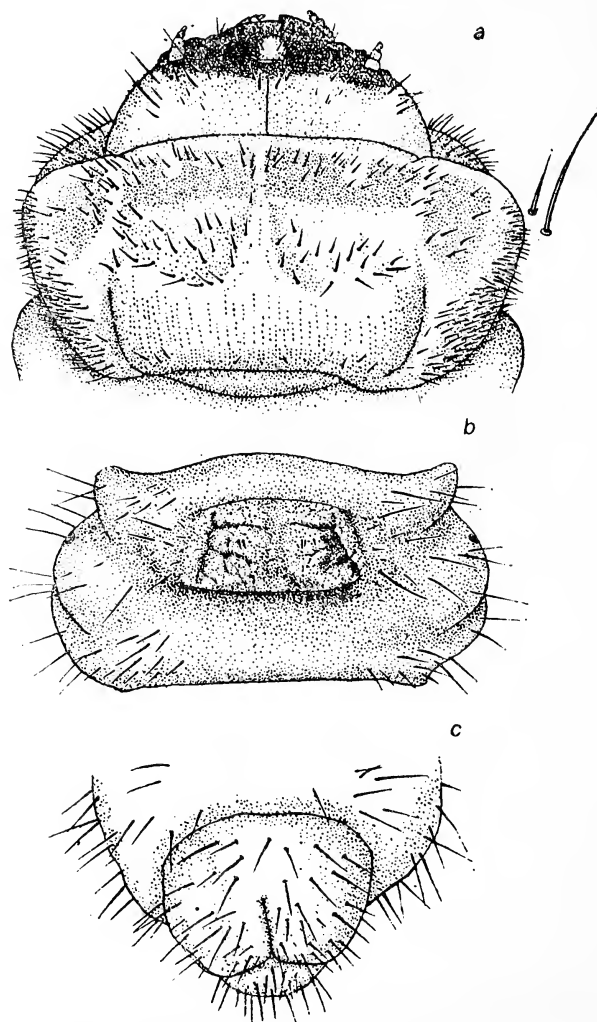


Figure 58. Larva of *Chelidonium zaitzevi* Plav.
a—head and pronotum; b—abdominal tergite IV
with dorsal locomotory ampulla; c—tip of abdo-
men (ventral view).

tions and notches along anterior margin, narrows slightly anteriorly, without hairs. Anterior half of parietals with stray hairs, with one faint pigmented ocellus below. Clypeus small, trapezoid, white. Labrum white, notably elongate, slightly pointed apically, with minute light-colored setae laterally. Mandibles massive, outside base with wide median longitudinal groove. Maxillary stipes on outer side with four setae; masticatory lobes of maxillae elongate, digitate, glabrous, with deep sparse setae only at apex. Labial submentum with sharply prominent brownish-yellow triangular spot pointed at apex and pair of thick setae; mentum with two and ligula with eight thick setae forming transverse row.

- 100 Pronotum narrows anteriorly, broadly rounded on anterior margin, in anterior third with yellowish-rust transverse band with narrow longitudinal white clearance medially, white alveolar paramedial notch on anterior margin, one white spot on each side; disk with sparse coarse setaceous hairs forming two transverse fields, laterally closer to base with dense setaceous hairs. Pronotal scutum convex, white, coriaceous, with longitudinal striations (longitudinal streaks or furrows) extending forward medially on anterior margin, bound laterally by deep straight or flexed longitudinal grooves, at base with stray setae forming transverse row. Setae more distinct in mature larvae. Prothoracic presternum laterally with dense thick hairs, on disk with sparse stray hairs, in anterior half with two large spots. Eusternum coriaceous, glabrous, merges with presternum. Thoracic legs short, with very short sclerotized claw.

Abdomen elongate; two anterior segments laterally with dense hairs, remainder with very sparse coarse hairs. Dorsal locomotory ampullae on tergites III to VII more convex, divided by common longitudinal groove, two transverse grooves merging with short lateral ones. Ventral locomotory ampullae divided by single transverse groove merging laterally with lateral grooves. Abdominal segment X large, hemispherical, with sparse coarse setaceous hairs. Body length of mature larvae up to 35 mm, width of head 4.0 mm.

Pupa (Figure 59): Characterized by extended setaceous tubercle on anterior margin of pronotum and development of setae on meso- and metanota. Head glabrous, transversely convex between antennae, broadly impressed between upper lobes of eyes, broadly rounded on occiput. Antennae pressed to sides, in second third ventrally arcuate.

Pronotum bulges, broadens angularly on sides, narrows anteriorly slightly more than posteriorly, with biapical protuberance medially on anterior margin bearing two tufts of short setae, with short setae on disk anterior to middle forming transversely elongate tuft, posterolaterally with similar setae forming one tuft on each side. Mesonotum convex, laterally with setae forming one tuft on each side reaching toward anterior angles in anterior half, and one transverse row on each side in pos-

terior half. Scutellum triangularly produced on posterior margin of mesonotum, transversely rugose, matte. Metanotum posteriorly with rounded angles, medially with longitudinal groove, with fine transverse striation, anterolaterally with setae forming one small tuft on each side (ten setae per tuft).

Abdomen elongate, almost with parallel sides, narrows posteriorly from segment VI. Abdominal tergites convex, medially with transverse dent, divided by common longitudinal groove, paramedially posterior to transverse dent with several large spinules forming transverse band, anterior to transverse dent with stray, sometimes paired, fine spinules. Abdominal tergite VII broad, gently rounded apically, with minute spinules, of which anterior ones form transverse row, posterior ones (usually paired) dispersed tuft. Apex of tergite VIII narrowly rounded, with stray minute acicular setae. Tip of abdomen (ventral view) obtuse, without setae. Valvifers of female large, hemispherical, widely separated. Body white, with yellowish tinge. Body length 25 mm, width of abdomen 6.0 mm.

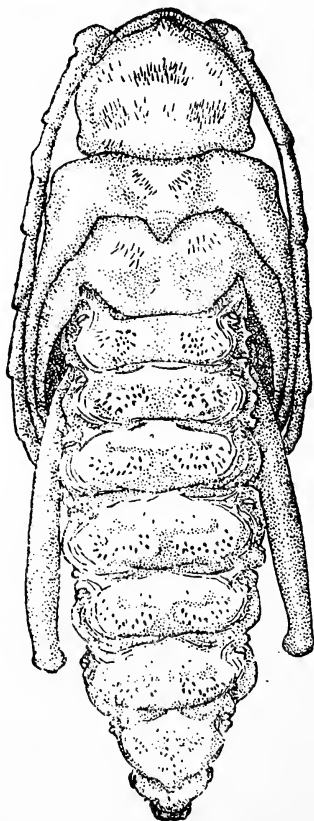


Figure 59. Pupa of *Chelidonium zaitzevi* Flav.

101 *Material:* Collected in Ussuri-Primor'e region (Kamenka River near Partizansk). Adult insects—four females, larvae five, pupa—one female, larval exuviae from cells with beetles five.

Distribution: Ussuri-Primor'e region from Partizansk to Vladivostok. Sporadic.

Biology: Inhabits broad-leaved forests of Ussuri-Primor'e region. Beetles fly in July and August. Female oviposits on thin adventitious shoots of growing maple (*Acer pictum*, *A. mono*, *A. mandschuricum*). Diameter of shoots 3.0 to 5.0 mm. One female can lay up to 36 eggs. Newly hatched larva bores shoot, makes longitudinal gallery toward base in pith, and cuts ventilation opening through which frass is ejected. Migrates from thin adventitious shoot into very thick main shoots 1.5 to 7.5 cm in diameter, continuing to make gallery from top downward. As they move larvae make lateral branches that terminate in round or oval ventilation openings. Width (size) of ventilation openings in galleries made by I-instar initially 1.0 to 3.0 mm and later 6.0 to 12.0 mm. Former usually round, latter more elongate, oval. Distance between ventilation openings at commencement of gallery 0.8 to 2.0 cm, at end 6.0 to 17.0 cm. Quite often larval galleries penetrate shoots of tertiary and secondary order, and terminate in shoots of primary order. Termination of larval gallery in trunk zone has also been recorded. Total length of gallery 1.2 to 2.4 m, width 8.0 to 12.0 mm. Gallery hollow throughout, free from frass. Larvae move rapidly from one end of gallery to the other and thus elude woodpeckers. Mature larva makes additional gallery from bottom upward, parallel to main gallery, forms cell, and closes it off from rest of gallery with parchmentlike stopper before pupating. Length of cell 38 to 54 mm, width 6.0 to 8.0 mm.

Pupa lies in cell with head down (toward parchmentlike stopper). At room temperature develops in about three weeks. Young beetle ruptures stopper, penetrates larval gallery up to ventilation opening, and emerges through it. Weight of mature larvae 232 to 639 mg, pupae 211.0 to 581.8 mg, and beetles 191 to 523 mg. Larvae pupate after third hibernation. After second hibernation infested shoots shed leaves, wither in August, their leaves turning reddish-yellow, and stand out distinctly against general background of green crowns of trees. In 1973 we detected a small zone sparsely infested with *Chelidonium zaitzevi* Plav. near Partizansk in mature, growing woodland on terraces of the First and Second Kamenka Rivers. Lower and middle zones of shoots of mature woodland were damaged more often than upper. Usually the upper zone was left untouched.

4. Genus *Leontium* Thoms.

Thomson, 1864, *Syst. Cerambycidae*, vol. 175, p. 420; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 212; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 207.

Adult: Body elongate, bright green. Antennae barely longer than body. Pronotum laterally with small sharp tubercle, transversely rugose on disk. Elytra markedly elongate, with dense fine punctation. Legs very long, slender; hind femora extend beyond elytral apices.

- 102 *Larva*: Body elongate, slender. Pronotum with dense hairs forming two transverse bands on disk, one (broader) anterior to scutum and second in interior third. Pronotal scutum white and convex, with longitudinal striation.

Pupa: Distinguished from pupae of other genera of this tribe by elongate body and long femora extending beyond tip of abdomen.

The genus *Leontium* is mainly found in the Indo-Malayan region; about ten species inhabit Southeast Asia. One species is known in northern Asia and represents an insular relict.

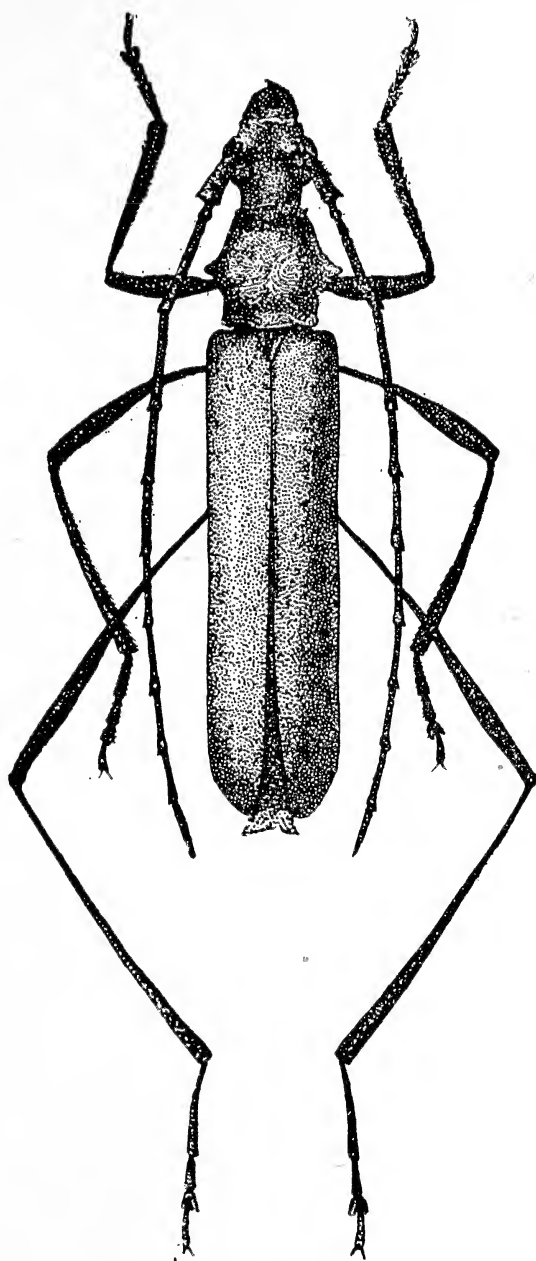
Type species: *Leontium viride* Thomson, 1864

1. *Leontium viride* Thoms.

Thomson, 1864, *Syst. Cerambycidae*, vol. 175, p. 420; Plavi'shchikov, 1940, *Fauna SSSR*, 22, 2, 213; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 207; Kojima and Okabe, 1960, *Food Plants of Japan. Cerambycidae*, p. 120; Cherepanov and Cherepanova, 1977, *Taksony fauny Sibiri (Nov. i maloizv. vidy fauny Sibiri)*, pp. 146-150.

Adult (Figure 60): Readily recognized by slender elongate body, long slender legs, and bright green coloration. Head between antennae transversely convex, with narrow median longitudinal suture, uneven, simple, longitudinally rugose punctation, but medially smooth on vertex, without punctation, with dense deep punctation on occiput. Eyes narrow but deeply notched, very finely and sharply faceted. Antennae slender; 11th segment extends beyond apex of elytra; outer side of 6th to 10th segments produced apically, spinelike.

- 103 Pronotum slightly longer or even shorter than width at base, laterally with small sharp projecting tubercle, near anterior and posterior margins with transverse flange, and here with transverse girdling furrows (folds), disk convex, with short median grooves from which transverse furrows radiate. Scutellum triangular, smooth, slightly impressed, with fine uneven punctation. Elytra narrow, markedly elongate, with parallel sides, 4.0 to 5.0 times longer than general width, moderately convex on disk, finely and densely punctate (almost shagreen), apically with narrowly rounded inner and gently tapered outer angle. Legs long, very slender.



Hind femora thicken gently toward apex, extend beyond elytral apex. Hind tarsi slender; 1st segment 2.0 times (male) or 1.5 times (female) longer than two successive together.

Abdomen elongate, slender, with tender gray hairs not forming compact cover. Abdominal sternite V broadly notched at apex (male) or narrowly rounded, sometimes even angularly elongate, almost pointed (female). Entire body, scutellum, and elytra bright green. Legs and antennae dark brown. Body length 14 to 18 mm.

Egg: White, after oviposition acquires greenish hue, elongate, thickened in one half and narrows gradually in the other, broadly rounded at one pole and narrowly at the other. Chorion smooth, lustrous, without perceptible cellular sculpture. Length 1.4 mm, width 0.6 mm.

104 *Larva* (Figure 61): Distinguished from larvae of other species of the tribe Callichromini by broad hairy field on pronotum and slender but not very long body. Head narrows insignificantly anteriorly. Epistoma almost flat, on anterior margin with lustrous brownish border, whitish on disk, behind brownish border (especially laterally) with short thin hairs divided by distinct median longitudinal suture, laterally with barely perceptible frontal sutures. Hypostoma almost with parallel sides, with rounded anterior outer angles, medially separated into two triangular sclerites by broad flat gula on anterior margin uniform, smooth, without projection. Parietals in anterior half with short hairs; hairs around frontal sutures dense, laterally and ventrally sparse. Antennae long, slender, with four segments. Ocelli not visible near antennal bases. Outer side of mandibles with longitudinal groove basally, sometimes here with stray setae forming longitudinal row. Labial submentum with pair of widely separated setae, faint brownish spot at base.

Pronotum slopes forward, in anterior half with broad rusty-yellow transverse band, with longitudinal clearance medially and laterally, and also with white alveolar paramedial notch on anterior margin; antero-laterally with yellow transverse band and especially before scutum with dense hairs forming two transverse fields. Prescutal hairy field broad, with median longitudinally elongate clearance broadening posteriorly, on posterior margin uniform, as though bound by a scale. Pronotal scutum slightly convex, markedly transverse on anterior margin, projects slightly anteromedially, with longitudinal groove laterally, and dense thin longitudinal striation throughout surface. Prothoracic presternum laterally with dense hairs, anteriorly on disk with less dense (sometimes sparse) hairs, in some specimens with brownish specks; eusternum coriaceous, lustrous, glabrous, merges with common surface of presternum. Legs short, with small acute light-colored claw.

Abdomen markedly elongate, slender, laterally with short thin hairs. Locomotory ampullae rather convex, coriaceous, dorsally with two trans-

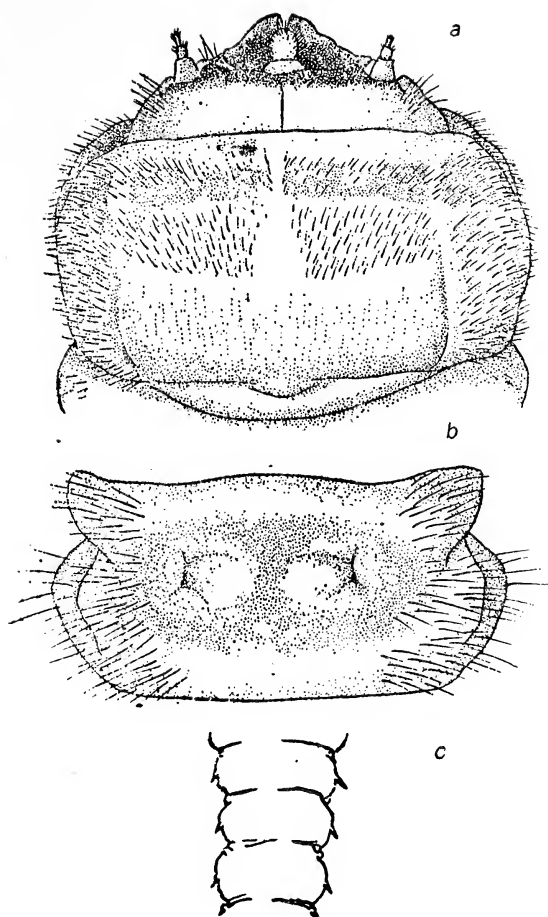


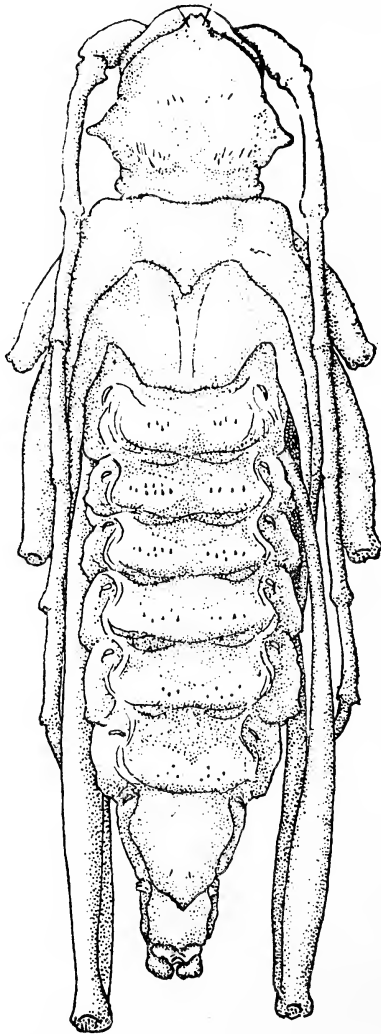
Figure 61. Larva of *Leontium viride* Thoms.

a—head and pronotum; b—abdominal tergite IV with dorsal locomotory ampulla; c—abdominal segments III to V of 1-instar larva.

verse grooves fusing laterally, and medially with ventral alveolar depression from which short furrows radiate; three to six short setae on inner clivus form independent tuft. I-instar larvae on abdominal segments III to V laterally with sharp spinules that slough after molt. Body length of mature larvae 16 to 18 mm, width of head 2.5 mm.

Pupa (Figure 62): Characterized by slender elongate body and long hind femora that extend beyond tip of abdomen. Head glabrous, without setae, lustrous, around antennal bases tubercularly convex, uniformly rounded hemispherically on occiput. Antennae long, pressed to sides, in middle bent ventrad and forward, looplike, with second half pressed to body ventrally.

- Pronotum elongate, basally with narrow transverse flange, with projecting posterior angles, convex on disk, lustrous, narrows gradually anteriorly, laterally in posterior half with distinctly produced protuberance, anteromedially sometimes with minute setae forming very small tuft on tubercular elevation, posterolaterally with transverse setaceous band, medially sometimes with several thin setae forming transverse row. Mesonotum convex, lustrous, with sharp scutellum posteriorly cuneiform, laterally in posterior half with stray, barely visible setae.
- 105 Metanotum slightly convex, straightly truncate posteriorly, with distinct posterior angles. Hind femora pressed to sides; extend beyond tip of



abdomen. Abdomen quite elongate, in region of segments III and IV slightly enlarged. Abdominal tergites posterior to middle or on posterior margin with minute spinules directed forward. Abdominal tergite VII elongate, narrowly produced posteriorly, glabrous in anterior half, with minute spinules or setae forming faint tuft in posterior half. Valvifers of female hemispherical, insignificantly separated. Body length 10 to 18 mm, width of abdomen 3.0 to 3.5 mm.

Material: Collected on Sakhalin and Kunashir. Adult insects 12, larvae 81, pupae—two males and six females, larval exuviae with beetles from cells two.

Distribution: In the USSR southern regions of Sakhalin, Kuril' Islands (Kunashir and Shikotan); Japan, Taiwan.

Biology: Inhabits coniferous and coniferous-broad-leaved forests, and ecologically associated with spruce. Beetles fly in second half of summer, seen on flowers of Umbelliferae and other plants, usually in meadows. Maximum number sighted in second half of July and in August. Beetles feed on flowers, mate, and then fly to trees. Female lays eggs in bark crevices singly or three to four in the same place. In gardens female sometimes glues eggs to bark surface or to panes of greenhouses. Colonizes shoots 2.5 to 7.2 cm in diameter on viable, drying, and felled trees until resin supply exhausted. Does not inhabit shoots in which bast has dried. Larvae appear two to three weeks after oviposition. Larvae hatched from August 24 to 30 from eggs laid on July 20 to 28. Mass hatching of larvae is observed in nature in last 10 days of August.

Newly hatched larva bores bark, makes sinuous gallery under bark, deeply impressed on alburnum, and plugs it with fine frass. Width of gallery 1.5 to 10.0 mm. Galleries fuse at places forming cells 1.5 to 2.0 cm wide. Mature larva bores wood up to 3.0 cm, makes longitudinal gallery there, and does not close it with frass. Length of longitudinal galleries in wood 5.0 to 9.0 cm, width up to 5.0 mm. Inlet plugged with fine frass remains on bark surface, its size 1.8 mm \times 3.0 mm to 3.5 mm \times 6.0 mm. At end of longitudinal gallery pupal cell 2.2 to 2.5 cm long, 4.0 to 5.0 mm wide. Cell sealed with small plug of fine frass. Larva molts in cell and enters diapause by autumn. Pupates after hibernation. Pupa lies with head toward plug sealing cell from hollow larval gallery. Pupation of larvae after hibernation in May and June. Adults develop from pupae in July and August. Young beetle breaks frass plug, pushes it aside, moves into hollow larval gallery toward shoot surface, nibbles
106 round opening in bark (3.5 to 4.0 mm), and emerges. Emergence of beetles from wood commences early July and extends up to early August inclusive. Weight of larvae before pupation 65 to 140 mg, pupae 52 to 112 mg, and beetles 39 to 92 mg. Generation completed in two years (Table 8).

Table 8. Periods of development of *Leontium viride* Thoms.

Year of development	May	June	July	August	September	October
1st	LP	LP	PAE	PAEL	AEL	L
2nd	L	L	L	L	L	L
3rd	LP	LP	PAE	PAEL	AEL	L

Population density comparatively high. For example, in a spruce shoot 15.5 cm long, 5.0 cm in diameter from Kunashir Island (Alekhino) three larvae were found under bark and seven in wood (10 specimens). Similar larval population density of *Leontium viride* Thoms. observed on other shoots. Massive reproduction zones of this species have been found in unkept forests containing cut, wind-fallen, and snow-crushed trees.

5. Genus *Polyzonus* Cast.

Castelnau, 1840, *Hist. Nat.*, Vol. 2, p. 438; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 216-217; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 209.

Adult: Characterized by elongate cylindrical body. Antennae extend slightly beyond apex of elytra. Pronotum laterally with small sharp tubercle, convex on disk, with large deep punctation. Elytra convex, with dense fine punctation, and broad light-colored bands.

Larva: Similar to larva of *Chelidonium zaitzevi* Plav. in structure of hairy cover and yellow body; resembles larva of *Leontium viride* Thoms. in structure of locomotory ampullae. Differs from both these species in very broad gula and arrangement of corase setae on posterior margin of abdominal sternite X, which form transverse row. Anterior half of sternite X glabrous, without hairs.

Pupa: Well distinguished from pupae of other genera of the tribe Callichromini in semiannular or annular arrangement of spinules on abdominal tergites.

Areal of genus extends toward Indo-Malayan region. Over ten species known in Southeast Asia, one in southeastern part of northern Asia.

Type species: *Cerambyx fasciatus* Fabricius, 1781.

107 1. *Polyzonus fasciatus* (F.)

Fabricius, 1781, *Syst. Entom.*, p. 232 (*Cerambyx*); *sibiricus*, Gmelin 1790, *Syst. Nat.*, 1, 4, 1840 (*Cerambyx*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 218-219.

Adult (Figure 63): Differs from other species of the tribe Callichromini inhabiting the Palearctic in almost cylindrical body and presence of broad transverse bands on elytra. Head retracted into prothorax almost up to eyes, with coarse rugose punctation, and narrow median longitudinal suture. Eyes large, finely faceted, inner side with broad deep notch, often adjoins anterior margin of pronotum. Antennae slender; 6th to 108 10th segments with projecting outer apical angle, 10th segment extends beyond apex of elytra (male) or just reaches it (female).

Pronotum distinctly (male) or slightly (female) elongate, convex, with flange at base, barely perceptible broad transverse groove around anterior margin or without it, sharp tubercle mediolaterally, with large fused punctation on disk and minute uneven punctation laterally on anterior and posterior fourth. Scutellum narrows posteriorly, pointed or narrowly rounded apically, flat, sometimes with smooth median longitudinal groove. Elytra elongate, convex, with parallel sides, apically with narrowly rounded inner angle, with very dense fine punctation and minute adherent hairs. Legs slender, not very long. Hind femora just short of elytral apex (male) or slightly shorter, reaching only 0.75 length of elytra (female).

Abdomen elongate, narrows insignificantly posteriorly, almost cylindrical, with minute light-colored hairs. Abdominal sternite V transverse, apically truncate or slightly emarginate (male) or slightly elongate, narrowly rounded (female). Body and legs dark blue or violet-blue. Antennae, especially apically, brownish. Elytra dark blue with two broad, continuous, yellow transverse bands, one anterior, the other posterior to middle (f. *typica*). Sometimes only anterior band widely interrupted on suture by septum (ab. *anticeinterruptus* Plav.), or only posterior (ab. *posticeinterruptus* Plav.), or both anterior and posterior bands interrupted (ab. *biinterruptus* Plav.); sometimes yellow bands slightly broader than dark blue clearance between them (ab. *latefasciatus* Plav.). Body length 14 to 20 mm.

Egg: Yellow, oval, rounded at poles, narrows more toward posterior end. Chorion with minute noncellular sculpture, slightly matte. Length 2.8 mm, width 1.2 mm.

Larva (Figure 64): Body yellow. Head with parallel sides. Epistoma lustrous, with coarse punctation subapically (especially laterally), smooth posteriorly, with diffuse yellowish-rust border in front; behind border long coarse setaceous hairs form indistinct transverse row, and behind this row short setaceous hairs form extensive paramedial triangular field with apex directed backward. Frontal sutures not visible. Epistoma fuses with parietals, median longitudinal suture distinct in posterior half. Hypostoma divided into two widely separated, slightly convex, triangular sclerites with rounded anterolateral angles; near inner angles with stray short setae, with very narrow brownish border on anterior margin, with

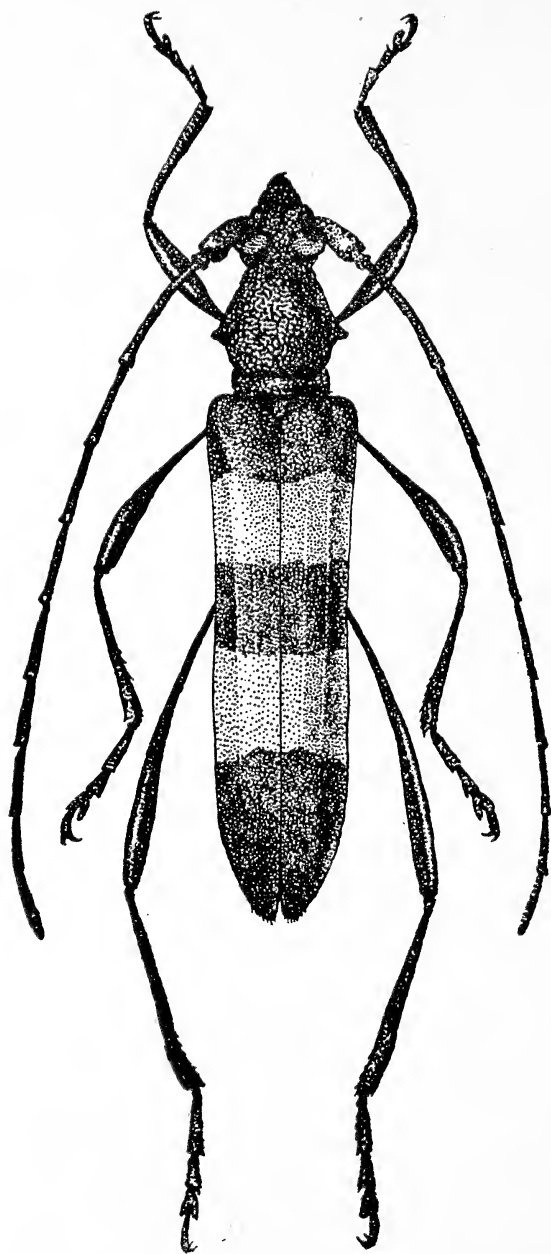


Figure 63. *Polyzonus fasciatus* (F.).

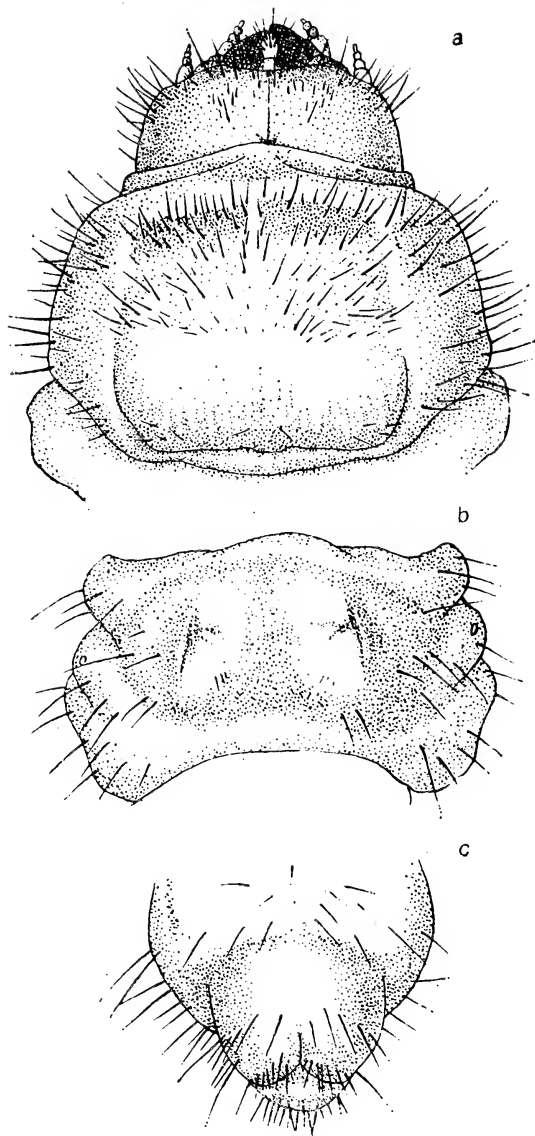


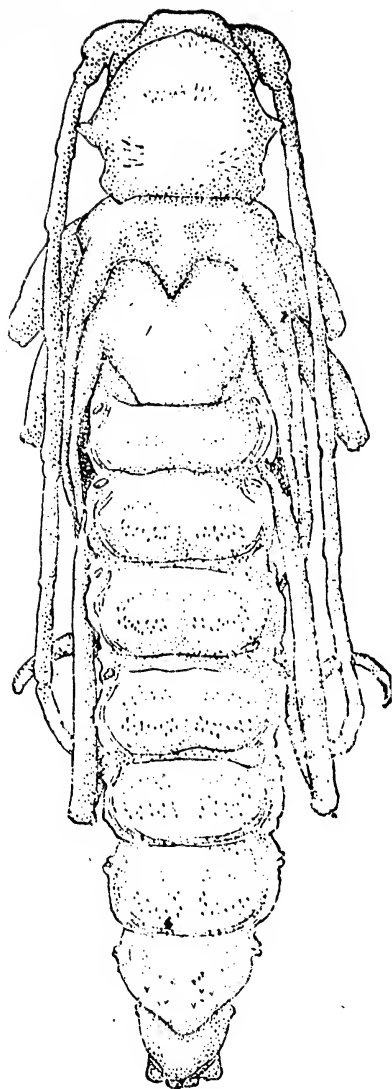
Figure 64. Larva of *Polyzonus fasciatus* (F.).
 a—head and pronotum; b—abdominal tergite IV with
 dorsal locomotory ampulla; c—tip of abdomen
 (ventral view).

supporting spinelike projection near inner angles. Gula broad, without brownish border along anterior margin. Parietals in anterior half with sparse setaceous hairs, near antennal bases with small black pigmented ocellus. Antennae comparatively long, apices project notably beyond anterior margin of cephalic capsule; 1st antennal segment long, just slightly thicker than 2nd, rusty-brown apically; base of 2nd and 3rd segments same shade as apex of 1st. Clypeus narrow, trapezoid, semitransparent. Labrum oval, narrows slightly toward base, narrowly rounded at apex, convex, with hyaline sheen, and long acicular semierect setae. Apices of mandibles broadly rounded, smooth on outer side, lustrous black, basally reddish-rust or whitish, sometimes with rusty tinge on cultrate edge. Maxillary
 109 stipes with nine or ten acicular setae on outer side, inner masticatory lobes thick, obtuse apically, with innumerable short setae. Maxillary palps slightly longer than inner lobes, their segments basally rusty-brown, transversely oval. Labial submentum with pair of widely separated acicular setae, mentum with squarrose setae forming tuft on each side.

Pronotum slopes markedly from base toward head, broadly rounded on anterior margin, in anterior third with transverse yellow band interrupted medially and laterally by longitudinal white strip into four transversely elongate spots; two spots on disk and one on each side. Disk anterior to scutum and pronotum laterally with coarse, uniform, setaceous, rusty-red hairs forming common field interrupted by very narrow clearance medially and in region of lateral longitudinal grooves. Pronotal scutum convex, coriaceous, bound laterally by long deep longitudinal grooves, anterior margin almost straightly truncate, with thin longitudinal furrows. Prothoracic presternum laterally and on disk with rusty setaceous hairs; eusternum not demarcated from presternum, merges with it, glabrous basally, lustrous. Thoracic legs well developed, with thin acicular claw.

Abdomen elongate, laterally with several thin hairs. Dorsal locomotory ampullae coriaceous, highly convex, divided by common median longitudinal groove, laterally with oblique longitudinal grooves that merge with transverse groove in anterior half. Ventral locomotory ampullae similar in structure. Abdominal tergites VIII and IX in anterior half glabrous, lustrous, in posterior half with sparse rusty hairs. Sternite VIII glabrous, only on posterior margin with stray setae; sternite X in posterior half with 10 reddish-rust setae forming transverse row. Body length of mature larvae 24 to 25 mm, width of head 2.5 to 3.0 mm. Body of I-instar larva yellowish, comparatively thick, only 2.5 times longer than width in prothoracic region. Abdomen without spinules laterally.

Pupa (Figure 65): Characterized by elongate body, antennae apically falcate, tubercularly extended spiracles, presence of innumerable sharp spinules on abdominal tergites, and other features. Head elongate, nar-



107

Figure 65. Pupa of *Polyzonus fasciatus* (F.).

rows anteriorly, cuneiform, transversely convex between antennae, impressed on anterior margin and vertex, uniformly rounded on occiput. Antennae pressed to sides, apically falcate, turning forward from 9th to 11th segments.

Pronotum wider (female) or narrower (male) than long, laterally with more (male) or less (female) projecting conical tubercle, narrows anteriorly and posteriorly, moderately convex on disk, with transverse streaks, basally with narrow transverse groove, laterally on hind clivus with large

or minute setae forming one well-developed tuft on each side, sparse (stray) short setae on foreclivus, which sometimes form small tuft only in middle of anterior margin. Mesonotum in anterior half insignificantly convex, transversely impressed posterior to middle, with triangularly projecting scutellum elevated apically on posterior margin, laterally with stray minute setae. Metanotum with median longitudinal groove, laterally gently impressed, with stray dispersed short setae or without them, produced trapezoidally on posterior margin.

Abdomen elongate, with parallel sides or, in region of segments III and IV broadens insignificantly, narrows posteriorly. Abdominal tergites in posterior third convex, impressed like a facet anteriorly, with narrow, sometimes sharp median longitudinal groove; innumerable sharp spinules in posterior third form broad transverse band that curves laterally around facetlike impression in form of semiannular or circular strip. Tergite VII triangular or almost semicircular, broadly or, more often, narrowly rounded angularly, convex on disk, in posterior half with small (smaller than in preceding tergites) spinules forming one common or several small tufts. Tergite VIII 0.50 length of VII, angularly rounded posteriorly, convex on disk, with sparse very minute spinules or without them. Hind femora slender, pressed tightly to sides of abdomen, with apices extending beyond abdominal tergite V. Valvifers of female hemispherical, widely separated, bent laterally, with small apical tubercle. Body length 18 to 20 mm, width of abdomen 4.0 to 4.5 mm.

Material: Collected in eastern Siberia (Nerchinsk, Shakhtoma, and Ussuri-Primor'e region). Adult insects 53, of which 46 raised in the laboratory from larvae collected in nature, larvae 68, pupae—three males and six females, larval exuviae more than 10.

Distribution: Southern regions of eastern Siberia from Baikal to Vladivostok, northern Mongolia, northern China, and Korea. Sporadic.

Biology: Inhabits forest-steppe zone and ecologically associated with dog rose. Beetles fly end of June to last ten days of September. In 1978 numerous beetles were collected around Lake Khasan in the first few days of August and in mid-September, but disappeared by September 24. Beetles require supplementary feeding and are seen on flowers of Umbelliferae, Rosales, Compositae, and other plants. During this period their gonads mature. Female lays eggs 10 to 14 days after mating on shoots of dog rose and smooth root portion devoid of thorns. Oviposited eggs are covered with a sticky exudate that readily adheres to smooth bark of shoots and hardens into rugose yellowish crust. Thus each egg looks like a yellowish, slightly elongate seed. Eggs usually laid singly on shoots. One female can lay more than 20 eggs in her lifetime.

Two females fed on honey in the laboratory lived for 28 and 35 days and laid 42 eggs. An unlaidd egg was found in the ovaries of both

upon dissection. Egg development continued for not less than six weeks. The laboratory females oviposited on April 13 to 14. Larvae hatched by May 21 to 23, i.e., 38 to 40 days after oviposition. Atmospheric temperature during this period ranged from 19 to 33°C (average $23 \pm 0.4^\circ\text{C}$). Larvae bore bark without leaving the eggshell. Fine frass is discarded through opening priorly cut in eggshell. Frass is observed on egg surface for three to five days after commencement of larval activity.

Larvae live in shoots, make longitudinal galleries, plug them loosely with frass or, more often, discard it through ventilation opening. Damage almost entire tree so that sometimes only bark remains. Frass discarded by larvae collects on soil around shoots. Shoots damaged by larvae wither and break easily. Diameter of shoots colonized by larvae 0.3 to 1.0 cm. Length of gallery in aerial part of shoot 5.0 to 36.0 cm. Mature larvae penetrate underground section of stalk or root, make longitudinal galleries there, and plug them with frass. Length of gallery in underground section of stalk and root 10.5 cm, width 0.7 to 0.9 cm. Before or after hibernation in May–June mature larva makes cell in basal part of shoot, demarcates it above and below with plugs of coarse fibrous frass, and sometimes makes parchmentlike partition before exiting. Pupa lies with head upward. Length of cell 2.8 to 3.0 cm, width 0.5 to 0.6 cm. Length of lower plug 1.5 to 3.5 cm, of upper one 0.6 to 0.7 cm.

Pupae develop in June–July for not less than three weeks. For example, in the laboratory at 22.7°C ($\pm 0.2^\circ\text{C}$) pupae developed in 21.9 (± 0.3) days, and at 21.9°C ($\pm 0.6^\circ\text{C}$) in 23.8 (± 0.4) days. In the first case eight, in the second six insects were kept under observation. Young beetles break the upper plug of fibrous frass, nibble round flight opening (5.0 to 6.0 mm in diameter) in shoot, and emerge. Records of 29 insects revealed weight of larvae before pupation 101 to 314 mg (183.2 ± 7.4), pupae 80 to 277 mg (161 ± 6.9), and adult insects 76 to 201 mg (126.1 ± 4.3). Weight of insects during metamorphosis dropped by an average of 30.7%. Generation completed in two years (Table 9). Larvae of I- and possibly II-instar hibernate once and mature larvae a second time before pupation.

Table 9. Periods of development of *Polyzonus fasciatus* (F.)

Year of development	April	May	June	July	August	September	October
1st	L	LP	LPA	PAE	AEL	AEL	L
2nd	L	L	L	L	L	L	L
3rd	L	LP	LPA	PAE	AEL	AEL	L

Polyzonus fasciatus (F.) inhabits viable shoots of dog rose (*Rosa maxmowicziana*, *R. rugosa*, *R. dahurica*) usually growing in well-warmed soil. One larva develops on each inhabited shoot. Basal section of shoots damaged.

21. Tribe ROSALIINI

Adult insect, unlike adults of the tribe Callidiini, characterized by more convex, cylindrical body and presence of piliform setae on inner side of antennae. It differs from adults of the tribe Callichromini in laterally rounded pronotum and absence of aromatic pores on metasternum.

Larva characterized by distinct transverse rusty-yellow band in anterior third of pronotum and reticulate furrows on abdominal locomotory ampullae.

Pupa characterized by laterally rounded pronotum, with small tubercle recessed from margin inward, uniformly convex on disk, with piliform setae forming medial tuft or transverse band. Abdominal tergites with short, not very prominent spinules.

The tribe Rosaliini (Compsocerini) is rather small. In Europe, northern Asia, and North America represented by a single genus (*Rosalia*), and in southern Asia by two other genera (*Pseudocallidium* and *Mausaridaeus*).

1. Genus *Rosalia* Serv.

Serville, 1833, *Ann. Soc. Entom. France*, vol. 2, p. 561; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 220-222; Gressitt, 1951, *Longicorn Beetles of China*, vol. 2, p. 212; Linsley, 1964, *Cerambycidae of North America*, 5, 22, 4-5; Mamaev and Danilevskii, 1975, *Lichinki zhukov-drovosekov*, pp. 191-193.

Adult: Antennae apically on 3rd to 6th or 3rd to 8th segments with dense tuft of hairs on inner side forming brush. Pronotum laterally rounded, recessed from lateral margin, with conical lateral tubercle extending upward (in Callichromini this tubercle extends sideways, forming lateral margin of pronotum). Body and elytra densely covered with flat adherent squamiform hairs.

Larva: Head short, markedly retracted into prothorax. Inner masticatory lobes of maxillae thick, cylindrical, with parallel sides, apically almost straightly truncate, with short setae only at this place. Pronotum with dense uniform hairs almost covering entire disk between anterior white margin and scutum. Thoracic legs lacking.

Locomotory ampullae coriaceous, rugose-reticulate, developed on abdominal segments I to VII.

Pupa: Head glabrous, without setae, gently rounded to occiput, flat between antennae and upper lobes of eyes. Antennae curved, looplike. Pronotum on disk broadly convex, laterally rounded, with very minute piliform setae forming medial transverse band. Abdominal tergites with not very large spinules forming transverse rows. Spinules on tergite VII small, not different from spinules on other tergites.

The genus *Rosalia* is ecologically associated with broad-leaved forests prevailing in the Tertiary period. It presently faces extinction. Some stray species have been preserved: *R. alpina* (L.) in West and eastern Europe, *R. coelestis* Sem. in Ussuri-Primor'e region, *R. funebris* Motsch. on the Aleutian Islands and west coast of North America, *R. batesi* Har. on Islands of Japan, and over 10 species (*R. lameerei* Br., *R. lateritia* Hope, *R. decempunctata* West., and others) in the south, especially Southeast Asia.

Type species: Cerambyx alpina Linnaeus, 1758.

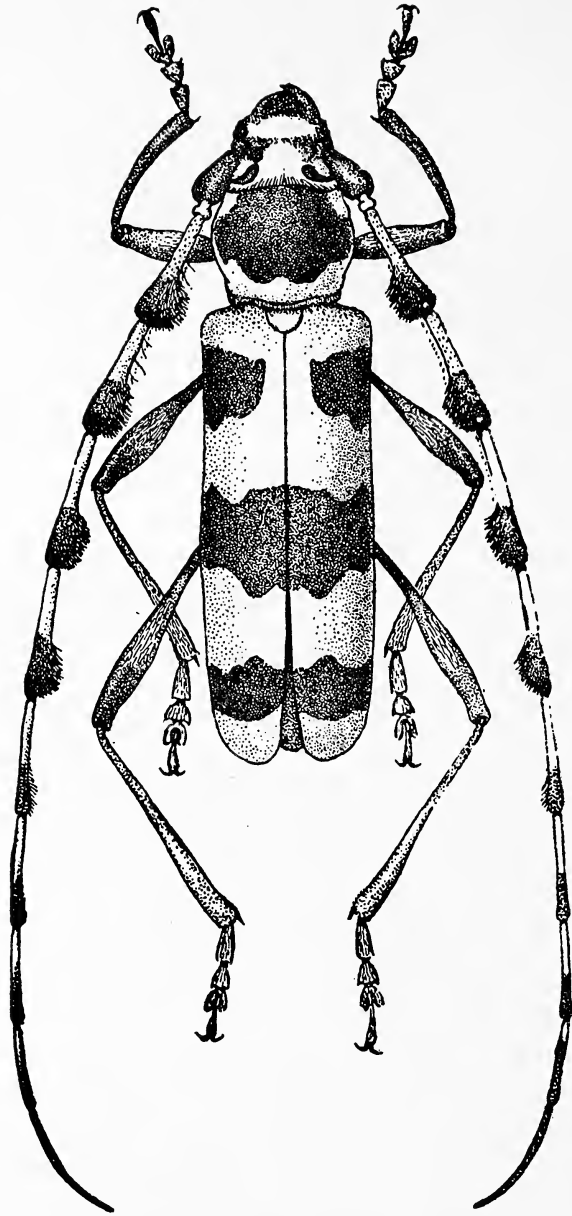
1. *Rosalia coelestis* Sem.

Semenov-Tjan-Shanski, 1911, *Rev. Russ. d'Entom.*, vol. 11, p. 118; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, [228-230; Cherepanov and 113 Cherepanova, 1977, *Taksony fauny Sibiri* (Nov. i maloizv. vidy fauny Sibiri), pp. 150-155.

Adult (Figure 66): Characterized by blue or turquoise pubescence, black piliform setae on inner side of antennae, and black transverse bands on elytra. Head short, slightly longer than wide, transversely convex between antennae, with narrow median longitudinal suture, broad genae, and sparse punctation. Eyes slightly convex, finely faceted, broadly emarginate, between upper and lower lobes with narrow septum. Antennae longer than body, thin markedly toward apex, with 7th (male) or 9th (female) segment extending beyond elytral apex, and 3rd to 6th (male) or 3rd to 8th (female) segments with short dense black hairs at apex forming brush on inner side.

Pronotum not longer than width at base, uniformly rounded laterally, uniformly convex on disk, with dense fine punctation, matte, close to flanks dorsally with small pointed tubercle, its apex projecting upward. Scutellum almost semicircular, flat, or slightly broadly impressed. Elytra with parallel sides, slightly convex on disk, apically with narrowly rounded inner angle, gently tapering outer angle, with fine punctation and dense hairs, and minute glabrous granular tubercles, better developed at base. Legs slender, comparatively long; hind femora elongate, clavate, reach hind clivus or almost elytral apex. Hind tarsi 0.50 length of tibiae; 1st segment equal to two successive together or somewhat shorter.

114 Abdomen convex, narrows gradually posteriorly. Abdominal sternites posteriorly with narrow black lustrous border. Sternite V transverse,

Figure 66. *Rosalia coelestis* Sem.

slightly impressed at posterior margin (male) or notably elongate, gently rounded posteriorly (female). Body black, with dense compactly adherent blue or turquoise hairs forming common background against contrasting black pattern. Head turquoise-blue, genae and underside of head black. Antennae variegate; 3rd to 11th segments with blue ringlets basally,

black apically. Pronotal disk with large tetragonal or rounded black spot, often joining septum with lateral, minute, round black spot. Scutellum entirely covered with turquoise-blue hairs. Elytra with three transverse black bands, of which first in anterior third interrupted on suture, rounded on inner margin, broadening laterally; second in middle of elytra broad, quite often rounded or angularly produced posteriorly; third in posterior third, its anterior margin on either side of suture usually projects forward triangularly. Body ventrally entirely covered with dense adherent hairs; legs with sparser bluish hairy cover. Coxae, apices of femora, and bases of tibiae glabrous, black. Body length 1.5 to 2.0 mm.

Egg: White, markedly elongate, narrows slightly more toward one pole than the other, rounded at poles. Chorion with minute coarsely shagreen sculpture visible under high magnification. Sculpture at poles prominent. Length 2.8 to 3.1 mm, width 0.7 to 1.0 mm.

Larva (Figure 67): Characterized by transverse rusty-yellow band and dense hairy cover on pronotum, and reticulate-rugose locomotory ampullae. Head markedly retracted into prothorax. Anterior margin of epistoma broadly emarginate, with lustrous rusty-brown border; anterior angles wartlike, project forward, and here (frontal view) with deep horizontal groove; apex with longitudinal streaklike brownish suture, with hairy setae in anterior half forming transverse band. Frontal sutures not visible. Hypostoma consists of two triangular sclerites separated trapezoidly by gula, broadens anteriorly, lustrous on anterior margin and here with short fine setae forming transverse row. Parietals in anterior half with short erect hairs, behind antennae with three hyaline contiguous ocelli. Clypeus white, hyaline, trapezoid. Labrum convex, narrowly or broadly rounded apically, in anterior half and laterally with dense short setae. Mandibles massive, smooth on outer side in anterior half, rugose or with usual punctation in posterior half. Maxillary stipes laterally and cardo basally with dense long setae. Inner masticatory lobes of maxillae thick, with short setae apically. Labial submentum with pair of thick, widely separated setae; mentum with setae forming tuft on each side.

Posterior half of pronotum broadens roundly, anterior margin with white border behind which transverse rusty band medially and laterally interrupted by white clearance; anterior margin with two deep longitudinal notches; hairs on disk and laterally dense, uniform, and form compact field between white border on anterior margin and scutum at base. Pronotal scutum convex, white, bound laterally by long deep grooves, with two emarginations on anterior margin, medially bifurcate there, with longitudinally elongate dots sometimes looking like longitudinal streaks. Alar lobes with dense hairs. Prothoracic presternum uni-

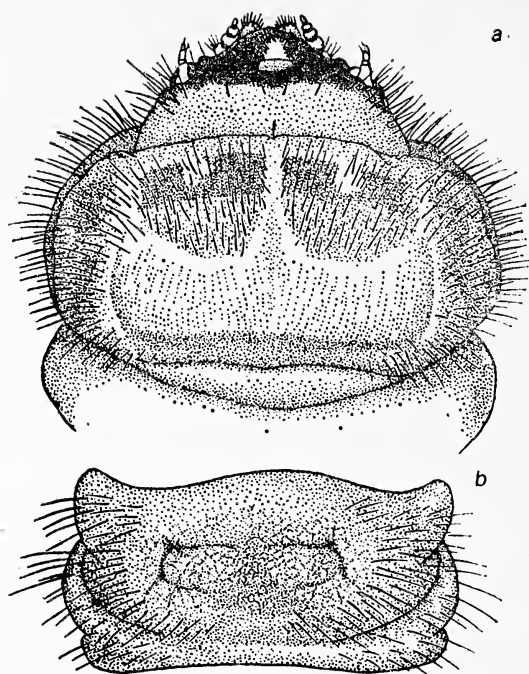


Figure 67. Larva of *Rosalia coelestis* Sem.

a—head and pronotum; b—abdominal tergite IV with dorsal locomotory ampulla.

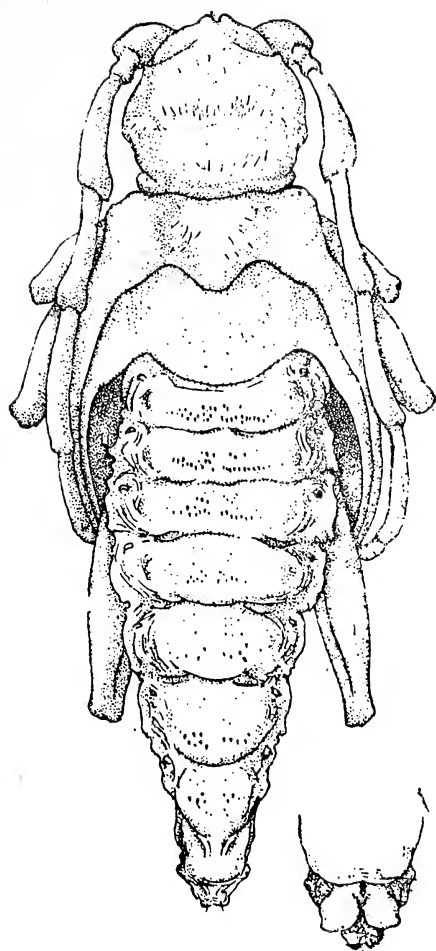
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formly convex, laterally and on disk with dense uniform rusty hairy
 115 cover; eusternum glabrous, coriaceous, laterally and anteriorly inconspicuously demarcated from presternum, almost merges with it. Thoracic legs small, with rusty tinge, and slender claw.

Abdomen narrows insignificantly posteriorly, laterally with rusty uneven hairs. Dorsal locomotory ampullae divided by common median longitudinal groove, coriaceous, with wrinkles forming delicate reticulate pattern, with two transverse grooves joining laterally with lateral longitudinal grooves. Tergite IX transverse, with sparse hairs; tergite X small, rounded posteriorly, glabrous, with stray long hairs only along posterior margin. Body length 30 to 35 mm, width of head 3.0 to 3.5 mm.

Pupa (Figure 68): Body large, moderately elongate. Head glabrous, without setae, broadly rounded on occiput, flat between antennae. Antennae pressed to sides, in second half bent forward, looplike, with apices at level of head (male) or level of elytral shoulder (female), and pressed to underside of thorax.

Pronotum laterally rounded, uniformly convex on disk, medially with minute piliform setae forming transverse band. Mesonotum slightly

Figure 68. Pupa of *Rosalia coelestis* Sem., female.

convex, almost flat, with stray faint setae or without them, on posterior margin with gentle, slightly produced scutellum. Metanotum broad and glabrous, slightly convex, with median longitudinal groove. Hind femora extend beyond middle of abdominal tergite VII.

Abdomen elongate, narrows from segment IV posteriorly. Abdominal tergites with large spinules forming transverse row (six to ten paramedial spinules), minute spinules anterior and posterior to these forming independent tufts or transverse rows. Tergite VII elongate, rounded posteriorly, in posterior half with dispersed minute spinules. Body length 21 to 28 mm, width of abdomen 6.0 to 7.0 mm.

Material: Collected in Ussuri-Primor'e region. Adult insects 140 (of which 117 raised in laboratory), larvae 19, pupae—three males and four

females, larval exuviae with beetles from cells 20. Two generations raised in the laboratory.

Distribution: Partizansk to Khasan in Ussuri-Primor'e region; north-east China, North Korea.

Biology: Inhabits broad-leaved forests. Ecologically associated with dried maple, mainly *Acer tegmentosum*. Beetles fly early July to early August. Found in large numbers beginning of last 10 days of July. For example, we collected 23 beetles in two hours on July 21st from trunks of Manchurian striped maple. Beetles generally found only on trees, not seen on flowers. Most active in clear warm weather from 12:00 noon to 2:00 p.m. During intense activity beetles respond to rustling caused by their own movement as well as by extraneous objects. For example, we attracted beetles resting at a height of up to 5.0 m or more by stroking the tree trunk. They rapidly moved to the stroked area. With the onset of overcast skies and especially during rains, beetles remain concealed. Mating diurnal. Female oviposits in bark crevices and openings made by beetles under intact bark. Colonizes only trunks of dry but upright trees. Does not colonize felled or wind-fallen trees.

Eggs laid singly or in batches of two to five, one after the other. Duration of egg development three to four weeks. Larvae hatched from eggs laid in nature in last 10 days of July in second half of August.

116 Larvae live in wood, make longitudinal galleries, and plug them densely with fine frass. Width of gallery made by mature larva 6.0 to 9.0 mm. After third hibernation mature larva makes cell along trunk at a depth of 5.0 cm, nibbles exit to trunk surface, plugs it with coarse fibrous frass, and pupates with head toward exit. Often nibbles two openings on trunk surface and plugs them with frass. Distance between two openings 0.5 to 1.0 cm. Size of each opening plugged with frass 4.0 mm × 6.0 mm to 6.0 mm × 10.0 mm.

Pupation of larvae occurs in June. Pupae at room temperature develop in 12 to 27 days, average 18 days (± 1.3). Resultant adult insect remains in cell for not more than one week. It then pushes out frass from exit, widens opening, and emerges. Sometimes pupal cells are made in upper layer of wood without exit, in which case beetle nibbles flight opening in wood and bark (if it remains) and abandons cell through it. Size of flight opening 4.0 mm × 7.0 mm to 6.0 mm × 12.0 mm. En masse emergence of beetles from wood occurs in first half or middle of July. Beetles do not feed, not seen on flowers. Begin to reproduce immediately after emergence. Longevity of beetles, on the average, two weeks, some living for 24 days or more. One female can lay up to 100 eggs. Ovaries of three females raised in the laboratory contained 64, 84, and 84 eggs. Gonads of beetles mature in first week after pupal molt.

Weight of larvae before pupation 283 to 637 mg, pupae 194.9 to

613.3 mg, and adult insects 130.8 to 453.8 mg. Weight variation during metamorphosis comparatively small. For example, seven larvae weighed 2,823.5 mg (100%) before pupation, their pupae 2,639.1 mg (93.5%); another 16 pupae weighed 6,835.3 mg (100%) and their beetles immediately after emerging from wood 4,812 mg (70.4%); i.e., total weight reduction during metamorphosis 36.1%. Life cycle completed in two years (Table 10). Young and mature larvae hibernate.

Table 10. Periods of development of *Rosalia coelestis* Sem.

Year of development	May	June	July	August	September	October
1st	L	LP	PAE	AEL	EL	L
2nd	L	L	L	L	L	L
3rd	L	LP	PAE	AEL	EL	L

Rosalia coelestis Sem. develops in trunks of large diameter at a height of 0.5 to 10.0 m. A single tree is often colonized for two to three consecutive years and hence populations of different generations found simultaneously. *Rhaphuma acutivittis* (Kr.) and *Necydalis morio* Kr. colonize with this species.

22. Tribe CALLIDIINI

Adult insect with elongate (*Pronocera*) or slightly broadened, rather flat body (*Callidium*). Head short, between antennae with longitudinal suture. Eyes broadly, often markedly emarginate, almost up to posterior margin. Antennae longer (especially in male) or shorter than body. Pronotum laterally rounded, sometimes angularly produced, often transverse, with dense large (*Callidium*) or minute (*Phymatodes*) punctuation, frequently with smooth shields (*Rhopalopus*, *Semanotus*). Elytra elongate, with minute (*Pronocera*, *Phymatodes*) or large rugose punctuation (*Callidium*), sometimes longitudinal ribs (*Oupyrrhidium*). Forecoxae widely separated (*Hylotrupes*), more often proximate (*Rhopalopus*, *Pronocera*). Prosternal process long, narrow, extends beyond middle or even beyond posterior margin of forecoxae (*Rhopalopus*, *Semanotus*, *Pronocera*, *Oupyrrhidium*) or short, not extending beyond middle of forecoxae (*Phymatodes*), rarely broad and flat (*Hylotrupes*). Femora clavate; hind femora thicken gradually in second half (*Pronocera*) or markedly as though dilated (*Oupyrrhidium*, many *Phymatodes*).

Larva distinguished from larvae of some tribes by white body. Half of head retracted into prothorax. Epistoma laterally fused with parietals,

frontal sutures not visible, median longitudinal suture faint only in posterior half, anterior margin usually with sharply projecting dark brown border and oblique longitudinal striation (*Rhopalopus*, *Semanotus*) or with faint narrow indistinct border devoid of longitudinal striation (*Hylotrupes*). Pronotum in anterior half with two transverse tetragonal yellow, yellowish-rust, or bright rusty spots, alveolarly emarginate (*Hylotrupes*) or not emarginate (remaining genera) on anterior margin, laterally and on disk with rusty hairs usually forming two transverse bands anterior to scutum. Pronotal scutum white, bound laterally by deep longitudinal grooves, with minute sharp or faint longitudinal striation, rarely without it. Prothoracic presternum laterally with dense very long hairs, on disk with short hairs; eusternum basally in form of two round glabrous plates separated anteriorly by quite distinct hairy clearance. Prothoracic eusternum distinct, demarcated laterally by deep groove (*Hylotrupes*) or without groove and merges with presternum (remaining genera). Thoracic legs short and poorly developed, often with faint claw; legs in some species present only in II-instar and mature larvae. Locomotory ampullae moderately convex, developed on abdominal segments I to VII, with reticulate-squamiform or shagreen sculpture, matte, often with silvery sheen.

Pupa characterized by moderately elongate white, sometimes somewhat flat body. Head short and glabrous, without spinules, transversely convex between antennae, rarely flat. Antennae pressed to sides, in second half arcuate or bent angularly ventrad and forward. Pronotum laterally rounded, on disk and base (*Rhopalopus*) or only base with spinules (*Pronocera*, *Oupyrrhidium*), quite often altogether without spinules (*Semanotus*, *Phymatodes*). Meso- and metanota glabrous, lustrous, or with minute spinules forming in posterior half one or two tufts each. Abdominal tergites uniformly convex, with large (*Oupyrrhidium*) or minute (some *Phymatodes*, *Semanotus*) spinules. Femora clavate.

In northern Asia this tribe is represented by seven genera, of which six are Holarctic. This indicates that the taxa of the tribe Callidiini were widely distributed in the pre-Glacial epoch and the evolution of some (*Callidium*, *Semanotus*, *Pronocera*) proceeded in favor of adaptation to coniferous vegetation, of others (*Rhopalopus* and most *Phymatodes*) to deciduous woody formations. The ecological associations formed then continued not only at the level of species but also of genera. Many are serious forest pests. *Rhopalopus clavipes* (F.) severely damages oak in the Urals, and *Semanotus undatus* (L.) and *Pronocera brevicollis* (Geb.) spruce-fir forests in the southern regions of Siberia. Many species of the genus *Phymatodes* [*P. maaki* (Kr.), *P. ussuricus* Plav.] are serious pests of grapes. For example, in 1971 and 1972, in some forest of Ussuri-Primor'e region, 30% of more of the grape crop was damaged by

these species. Vines colonized by them usually wither while forming secondary shoots (Cherepanov and Cherepanova, 1974). These species should be placed under quarantine for regions of Central Asia, the Caucasus, Crimea, and Moldavia engaged in viniculture.

KEY TO GENERA

Adult Insects

- 1 (2). Third segment of antennae almost 2.0 times longer than 4th, 1.5 times longer than 5th. Prosternal process broad, flat, equal in width to forecoxae. Base of claw elongate, spinelike. 1. **Hylotrups** Serv.
- 2 (1). Third segment of antennae less than 2.0 times longer than 4th or even not longer, quite often equal to 5th or slightly longer. Prosternal process narrow, narrows markedly toward apex, significantly less in width than forecoxae. Base of claw smooth, not spinelike.
- 3 (8). Prosternal process long, extends beyond posterior margin of forecoxae.
- 4 (7). Elytra monochromatic, without white transverse bands.
- 5 (6). Antennae setaceous, basally thickened; apices of antennal segments with minute projecting denticle. Body dorsally glabrous. 2. **Rhopalopus** Muls.
- 6 (5). Antennae slender, acicular, not thickened basally; apices of antennal segments without projecting denticle. Body dorsally with hairy cover 3. **Pronocera** Motsch.
- 7 (4). Elytra with white transverse bands. 4. **Semanotus** Muls.
- 8 (3). Prosternal process short, does not extend beyond middle of forecoxae; if it does, elytra red with longitudinal ribbing.
- 9 (10). Elytra vermilion. Third antennal segment not longer than 4th. 5. **Oupyrrhidium** Pic
- 10 (9). Elytra not vermilion. Third antennal segment not longer than 4th.
- 11 (12). Pronotal disk with large, rather uniform punctation. Elytra monochromatic, with metallic sheen. 6. **Callidium** F.
- 12 (11). Pronotal disk with dense minute (*P. mediofasciatus* Pic) or sparse uneven [*P. testaceus* (L.)] punctation. Elytra monochromatic [*P. testaceus* (L.), *P. abietinus* Plav. and Lur.] or with white transverse bands (*P. mediofasciatus* Pic and others) 7. **Phymatodes** Muls.

Larvae

- 119 1 (2). Prothoracic eusternum laterally demarcated from presternum by distinct groove, triangular, rounded apically. Found on dry shoots of dead trees and in buildings 1. **Hylotrupes** Serv.
- 2 (1). Prothoracic eusternum not demarcated from presternum, merges laterally with it, without distinct groove, basally in form of two round glabrous plates separated anteriorly by hairy clearance.
- 3 (8). Locomotory ampullae of abdomen with minute reticulate-squamiform sculpture (imparting silvery sheen), with transverse grooves.
- 4 (7). Parietals medially without hairy transverse band, only with sparse stray hairs near brown border on anterior margin.
- 5 (6). Head near antennal bases without flat projection, rounded here; ocelli (one on each side) oriented laterally. Found on deciduous trees. 2. **Rhopalopus** Muls.
- 6 (5). Head around antennal bases with flat projection, not rounded here (lateral view), with parallel sides. Ocelli oriented anteriorly on flat projection. Found on coniferous trees. 3. **Pronocera** Motsch.
- 7 (4). Parietals medially with transverse hairy band between hypostoma and epistoma. Found on coniferous trees. . . . 4. **Semanotus** Muls.
- 8 (3). Locomotory ampullae of abdomen without minute reticulate-squamiform sculpture, coriaceous, smooth, rugulose, or shagreen; if reticulate-squamiform sculpture present, then without transverse grooves.
- 9 (10). Head laterally near antennal bases with flat projection (as in *Pronocera*), with parallel sides here. Ocelli (one on each side) oriented anteriorly. Pronotal scutum with sharp thin longitudinal striation. Found on deciduous trees. 5. **Oupyrrhidium** Pic.
- 10 (9). Head laterally near antennal bases without flat projection, narrows roundly here. Pronotal scutum without striation, or with very distinct striation, in which case ocelli poorly developed and oriented laterally or totally imperceptible.
- 11 (12). Dorsal locomotory ampullae of abdomen with transverse groove on anterior margin that arcs posterolaterally. Found on coniferous trees. 6. **Callidium** F.
- 12 (11). Dorsal locomotory ampullae without transverse groove, or with straight transverse groove that laterally joins lateral longitudinal grooves. Found on grapes and other deciduous species, rarely (*P. abietinus* Plav. and Lur.) on coniferous species. 7. **Phymatodes** Muls.

Pupae

- 1 (2). Anterior half of abdominal tergite VII with spinules on disk.
 1. **Hylotrupes** Serv.
- 2 (1). Anterior half of abdominal tergite VII without spinules on disk, with spinules only posterior to middle forming small tuft, or without spinules.
- 3 (4). Pronotum with innumerable spinules at base and on disk. . . .
 2. **Rhopalopus** Muls.
- 4 (3). Pronotum with several spinules at base or without them, glabrous.
- 5 (6). Spinules on pronotum sharp, acicular, form transverse row or narrow transverse band at base. 3. **Pronocera** Motsch.
- 120 6 (5). Spinules on pronotum acicular, short and thick, or lacking.
- 7 (8). Spinules lacking on pronotum. Found on conifers.
 4. **Semanotus** Muls.
- 8 (7). Spinules present on pronotum; if lacking, these species mainly develop on deciduous species, only some (*P. abietinus* Plav. and Lur.) on conifers.
- 9 (10). Spinules on pronotum mono- or biapical, basally form transverse band or two small tufts. 5. **Oupyrrhidium** Pic
- 10 (9). Spinules on pronotum monoapical, minute, do not form tuft, dispersed in posterior half, or lacking.
- 11 (12). Posterior half of pronotum with stray, sometimes barely visible spinules. 6. **Callidium** F.
- 12 (11). Pronotum in posterior half without spinules.
 7. **Phymatodes** Muls.

1. Genus *Hylotrupes* Serv.

Serville, 1834, *Ann. Soc. Entom. France*, vol. 3, p. 77; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 238-239; Linsley, 1964, *Cerambycidae of North America*, 22, 5, 14-15; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 217.

Adult: Well distinguished from those of other genera by widely separated coxae, long 3rd antennal segment, and structure of claw. Head small, frons transverse. Antennae short, slender; 3rd segment almost 2.0 times longer than 4th, 1.5 times longer than 5th, equal to 1st. Pronotum transversely oval, with smooth shields on disk. Elytra with uniformly rounded humeri, narrow slightly toward apex. Forecoxae widely separated by broad flat prosternal process. Hind femora with clava, but not very thickened. Hind tarsi about 0.50 length of tibiae; 1st segment equal to two successive together. Claws with small denticle at base.

Larva: Characterized by distinct prothoracic basisternum, presence of three ocelli near antennal bases, and other features. Head narrows anteriorly, with rusty, barely visible border on anterior margin. Parietals laterally with stray hairs. Anterior half of pronotum with two transverse yellow spots with one alveolar white notch each on anterior margin. Pronotal scutum convex and coriaceous, with longitudinal furrows. Thoracic legs short. Locomotory ampullae well developed on abdominal segments I to VII, coriaceous, coarsely rugose.

Pupa: Distinguished from other pupae of Callidiini by large number of spinules on abdominal tergites. Disk of anterior half of abdominal tergite VII with spinules forming extensive field (Duffy, 1953).

Genus monotypic, widely distributed in several continents.

Type species: *Cerambyx bajulus* Linnaeus, 1758.

1. *Hylotrupes bajulus* (L.)

Linnaeus, 1758, *Syst. Nat.*, 10th ed., p. 396 (*Cerambyx*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 239-242; Duffy, 1953, *Monograph Immat. British Timb. Beetles*, pp. 207-214; Dürre, 1954, *Entom. Memoirs*, vol. 4, pp. 1-136; Becker, L. 1963, *Z. Angewand. Entom.*, 52, 4, 368-390; Dominik, 1964, *Sylvan*, 108, 1, 47-52; Demelt, 1966, *Tierwelt Deutschlands*, vol. 2, pp. 66-67; Becker, H., 1968, *Z. Angewand. Entom.*, 61, 3, 251-281; Cymorec, 1968, *Z. Angewand. Entom.*, 62, 3, 316-344; Mamaev and Danilevskii, 1975, *Lichinki zhukov-drovosekov*, pp. 193-194.

121 **Adult** (Figure 69): Head slightly convex between antennae, with median longitudinal suture, uneven punctation, adherent gray hairs bent down and forward. Eyes broadly and not very deeply emarginate, space between ocular lobes insignificantly narrower than upper lobe. Antennae short, slender, do not reach middle of elytra; 1st segment slender, not longer than 3rd.

Pronotum transversely oval, rounded laterally, with narrow, smooth, slightly curved border at base, on disk with minute punctation and short hairs, laterally with dense punctation and dense, long, erect, light-colored hairs (therefore pronotum laterally appears densely setaceous), and medially with pair of widely separated smooth shields. Scutellum short, broadly rounded posteriorly. Elytra moderately elongate, convex, with rounded humeri, without impression around humeri, with narrowly rounded inner angle and gently tapering outer angle at apex, with rugose, highly uneven punctation, and tender gray hairs forming individual tufts in form of uneven transverse spots. Pro-, meso-, and metathorax with comparatively dense fine punctation. Abdominal sternites with minute notchlike punctation. Body ventrally with light-colored semiadherent or erect hairs. Body dark brown, with brownish or chestnut hue; elytra with two hairy, faintly spotted transverse bands (*f. typica*). Color of

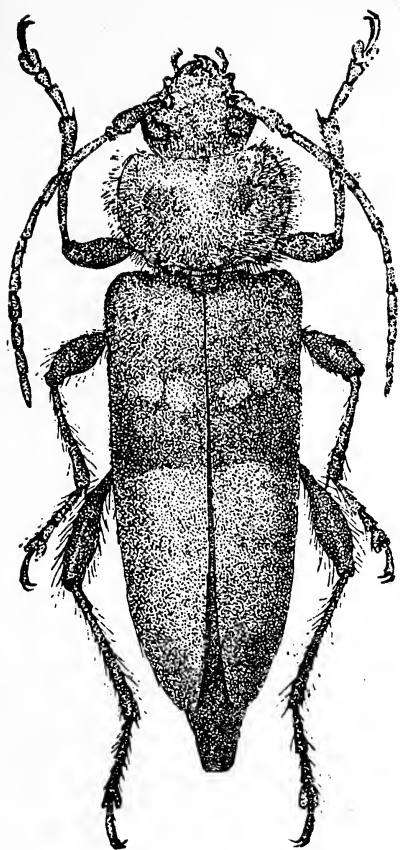


Figure 69. *Hylotrupes bajulus* (L.).

elytra and arrangement of hairs on them variable. Sometimes elytra light brown, legs reddish-rust (ab. *puellus* Villa), or elytra yellow at base, 122 dark brown otherwise (ab. *theresae* Pic), or entirely yellowish-brown with indistinct gray bands, legs black (ab. *scutifer* Veet.). Body length 7.0 to 20.0 mm.

Egg: White, elongate, broadens more at one pole, broadly rounded and pointed at the other. Chorion smooth, matte. Length about 2.0 mm, width 0.5 mm.

Larva (Figure 70): Head narrowly rounded anteriorly, half retracted into prothorax. Epistoma insignificantly convex, with indistinct rusty border on anterior margin, slightly emarginate medially, in posterior half with faint longitudinal suture. Frontal sutures not visible. Hypostoma somewhat convex, white, on anterior margin without border or with very narrow rusty border, broad, broadly rounded laterally, divided medially by flat gula and basally by slightly broadened gula. Parietals in

anterior half with stray hairs, on anterior margin with faint rusty border not covering antennal bases, receding behind latter, with three unevenly pigmented or nonpigmented ocelli forming transverse band. Antennae long, project up to midlength beyond anterior margin of cephalic capsule, with 1st segment not shorter than remainder together. Clypeus slightly trapezoid, with rusty tinge. Labrum transversely oval, broadly rounded on anterior margin, with short light-colored hairs. Mandibles apically broadly rounded, black, basally red; outer side in posterior half with deep median longitudinal groove. Inner masticatory lobes of maxillae broadly rounded apically, with short setae here. Maxillary palps short, only last segment projects forward beyond apex of inner lobes.

Pronotum in anterior half with two transverse tetragonal yellowish-rust spots with one small notch each in anterior margin, laterally with large yellow spot, on disk anterior to scutum and laterally with short rusty hairs forming usually compact field. Pronotal scutum convex, coriaceous, with longitudinal striation, with narrow median longitudinal groove, laterally with long longitudinal grooves, and almost smooth (non-projecting) anterior margin and anterior angles. Prothoracic presternum

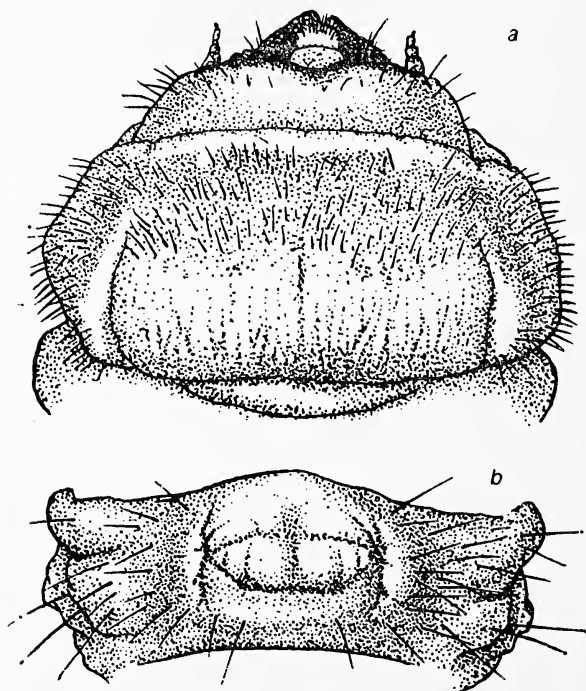


Figure 70. Larva of *Hylotrupes bajulus* (L.).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

with uniform short rusty hairs; eusternum glabrous, bound laterally by deep groove, with coarse furrows. Thoracic legs short, more developed in some specimens, with sharp acicular claw.

Abdomen laterally with very thin light-colored hairs. Dorsal locomotory ampullae rather convex, coriaceous, rugose, divided by common median longitudinal groove, sometimes dentate, sometimes radial and joining anterior and posterior transverse grooves. Ventral locomotory ampullae similar in structure, divided by just one transverse groove merging laterally with lateral longitudinal grooves. Body length of mature larva 25 mm, width of head 4.0 mm.

Pupa: Head square, rounded on occiput. Mesonotum longitudinal, convex, with slightly extended scutellum. Metanotum with median longitudinal groove. Abdominal tergites I to VI with minute setaceous spinules forming transverse oval tuft interrupted medially. Tergite VII triangular, elongate, narrowly rounded apically, with very large spinules directed backward on anterior half of disk. Tergite VIII elongate, with almost parallel sides, narrows slightly posteriorly, with minute paramedial spinules. Hind femora extend beyond anterior margin of tergite IV. Body length 14 to 25 mm, width of abdomen up to 7.0 mm (Duffy, 1953).

123 *Material:* Collected in the European part of the USSR. Adult insect one, larvae four. Collection of the Zoological Museum, Moscow State University used for description.

Distribution: Europe, northern Africa, Asia Minor, eastern China, North America. Indicated for Siberia. We did not find it there, however.

Biology: Life cycle fairly well studied (Dürr, 1954; Duffy, 1953; Becker, 1968; Cymorec, 1968; and others). Under climatic conditions of Europe adult insects seen in June and July. Female oviposits in wood crevices of dead pine, spruce, fir, and other coniferous trees. Often colonizes various structures made of timber, telegraph poles, etc. Female can lay up to 100 eggs or more in her lifetime. Incubation period one to three weeks. At 31.5°C larvae begin to hatch nine days after oviposition.

Larvae live in strong dried wood, make meandering galleries, and plug them with fine white frass. Live for up to three, sometimes seven to eight years. Mature larva makes cell along trunk in top layer of wood and pupates in it. Larval pupation occurs in May. Beetles emerge from pupae two to three weeks later and abandon wood. Life cycle three to four years, rarely longer.

Causes considerable damage in Europe, destroying wooden structures. Evidently very rare in Siberia. We did not find it there. Possibly imported sporadically with transportation of dry timber. Assumed to be imported from Europe into North America.

2. Genus *Rhopalopus* Muls.

Mulsant, 1839, *Hist. Nat. Col. France Longic.*, pp. 39-40; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 242-244; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, pp. 217-218; Linsley, 1964, *Cerambycidae of North America*, 22, 5, 71-72.

Adult: Characterized by comparatively long antennae extending beyond apex of elytra (male) or 11th segment reaching it (female). Pronotum uniformly convex, entirely covered with uniform dense punctation (subgenus *Rhopalopus* s. str.) or with convex smooth shields, uneven punctation (subgenus *Prorrhopalopus* Plav.). Elytra partly flat, almost glabrous, with short, barely perceptible hairs not forming compact cover. Legs comparatively long, femora clavate. First segment of hind tarsi equal to two successive together; first three segments with dense hairy arolium on underside.

Egg: Elongate, rounded at poles, more often pointed at one. Chorion smooth, lustrous, transparent.

Larva: Body moderately thick. Head markedly retracted into prothorax. Parietals in anterior half with stray hairs, laterally near antennal bases with one round convex ocellus. Antennae long, with four segments; apices project beyond anterior margin of cephalic capsule. Epistoma only apically with barely visible longitudinal suture, merges laterally with parietals. Frontal sutures not entirely visible. Anterior half of pronotum with yellowish or yellowish-rust spots, on disk with short hairs, laterally much longer hairs. Pronotal scutum convex, with barely visible longitudinal striation, basally with fine sculpture. Prosternum anterolaterally with long reddish-rust setae forming distinct long tuft [*Rhopalopus clavipes* (F.)] or with usual long light-colored hairs, not forming prominent tuft. Thoracic legs very minute, with barely visible claw.

124 Locomotory ampullae moderately convex, with minute reticulate-squamiform sculpture, matte. Abdominal sternite V in region of locomotory ampullae with pair of round white paramedial ampullae (*R. signaticollis* Sols.), or without them.

Pupa: Differs from pupae of other genera in innumerable large spinules on dorsal side, including pro-, meso-, and metanota, which broaden at base [*R. clavipes* (F.)], or comparatively minute spinules that do not broaden at base. Pronotum laterally rounded or angularly produced.

In USSR fauna this genus comprises 12 species. Five inhabit northern Asia, of which one spread to the central and southern Urals from the west, four into eastern regions. Six are known in Southeast Asia and one in North America. Almost all species of this genus are ecologically associated with broad-leaved woody plants. Hence they are not known in central Siberia. With the disappearance of broad-leaved forests there

in the post-Tertiary period, a discontinuity of geographic range occurred for the genus *Rhopalopus*, which serves as an index of the history of Tertiary fauna that survived the Glacial epoch in remote regions.

Type species: Callidium insubricum Germar, 1824.

KEY TO SPECIES

Adult Insects

- 1 (2). Pronotal disk entirely covered with dense large punctation, without smooth clearances and without shields (subgenus *Rhopalopus* s. str.). Body black. Europe up to the Urals inclusive. 1. **R. clavipes** (F.).
- 2 (1). Pronotal disk with sparse uneven, usually minute punctation, with smooth clearances or with smooth convex shields.
- 3 (6). Pronotal disk with distinctly projecting smooth shields (subgenus *Prorrhopalopus* Plav.).
- 4 (5). Pronotum black, rarely brownish-rusty (ab. *rufithorax* Plav.), at places (between shields and laterally) with dense rugose punctation. East Asia 2. **R. signaticollis** Sols.
- 5 (4). Pronotum red, lustrous, with sparse, very fine punctation. Ussuri-Primor'e region and northeast China. 3. **R. speciosus** Plav.
- 6 (3). Pronotal disk more uniform, without projecting shields (subgenus *Pronocerodes* Plav.).
- 7 (8). Antennal segments apically with distinctly projecting acute spinule. Pronotum smooth, highly lustrous, with stray, very fine punctation. Ussuri-Primor'e region. 4. **R. auranticollis** Plav.
- 8 (7). Antennal segments apically with faint, barely projecting spinule. Pronotum with large, distinctly projecting punctures, giving impression of general background of punctation. Ussuri-Primor'e region and Sakhalin. 5. **R. ruficollis** Mats.

Larvae

- 1 (2). Anterior margin of prosternum laterally with very long reddish-rust setae forming dense tuft. Found mainly on oak. 1. **R. clavipes** (F.).
- 2 (1). Anterior margin of prosternum laterally without long reddish-rust setae, with usual thin light-colored or rusty hairs not forming very dense tuft.

- 3 (4). Abdominal sternite V with pair of sharply projecting, large, white, paramedial ampullae in region of locomotory ampullae. Found on maple. 2. **R. signaticollis** Sols.
- 4 (3). Abdominal sternite V without round white ampullae. Found on oak and maple. 3. **R. speciosus** Plav.

Pupae

- 1 (2). Spinules on dorsal side of body large, broaden markedly at base. 1. **R. clavipes** (F).
- 2 (1). Spinules on dorsal side of body minute, do not broaden at base.
- 3 (4). Pronotum laterally angularly produced. 2. **R. signaticollis** Sols.
- 4 (3). Pronotum laterally rounded. 3. **R. speciosus** Plav.

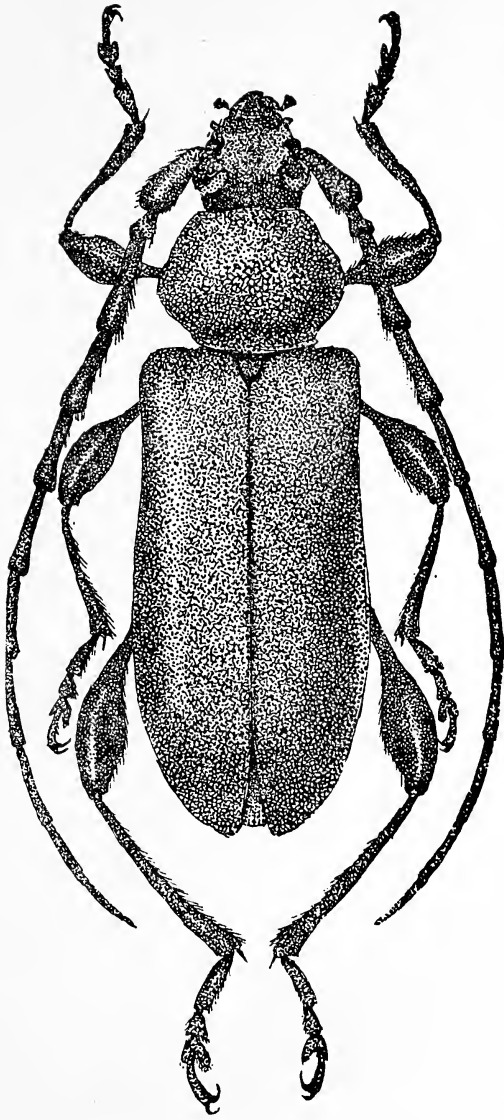
1. **Rhopalopus clavipes** (F.)

Fabricius, 1775, *Syst. Entom.*, p. 188 (*Callidium*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 256-258; Demelt, 1966, *Tierwelt Deutschlands*, vol. 2, pp. 67-68.

Adult (Figure 71): Characterized by densely punctate pronotum devoid of smoothly convex shields and matte black elytra notably compressed posterior to humeri. Head between antennae poorly convex, with faint median longitudinal suture, dense coarse punctation, spaces between punctures smaller than punctures. Eyes fairly convex, finely faceted, widely emarginate, with space between lobes almost equal to 0.50 upper lobe. Antennae extend beyond apex of elytra (male) or just reach it (female). Apices of 3rd to 10th antennal segments project acutely, spine-like on inner side; 5th segment shorter than 3rd, slightly longer than 4th; 1st to 7th segments with black hairs on inner side.

Pronotum narrows gently but significantly anteriorly and more abruptly posteriorly, broadens angularly posterolateral to middle, near anterior margin and at base without transverse groove, only on posterior margin with narrow smooth fringe bent backward, bulges uniformly on disk, without smooth shields, entirely covered with dense large coarse punctation, with spaces between punctures lustrous, considerably narrower than punctures. Scutellum not very broad, narrows slightly toward apex, narrowly or broadly rounded posteriorly, almost not impressed in middle.

Elytra convex, broaden slightly at humeri and posterior to middle, notably compressed laterally beyond humeri, at apex with very narrowly rounded inner angle and gently tapered outer angle, in anterior third with large and elsewhere very minute rugose punctation imparting matte

Figure 71. *Rhopalopus clavipes* (F.).

appearance. Spaces between punctures with fine punctation visible under high magnification. Pro-, meso-, and metathorax with dense deep punctation, abdomen with more minute, less dense, notchlike punctation. Body ventrally with short brownish hairs. Femora with short, more sharply thickened clava. Entire body, antennae, and legs black. Elytra black, lustrous at base, dull in middle and posterior third. Body length 12 to 18 mm.

Egg: White, oval, slightly elongate, narrows markedly toward poles and narrowly rounded there. Chorion smooth, hyaline, transparent. Length 1.8 mm, width 0.9 mm.

Larva (Figure 72): Readily recognized by long setaceous rusty hairs laterally on anterior margin of pronotum, forming dense tuft. Head 126 markedly retracted into prothorax. Epistoma insignificantly convex, with brownish-rust border on anterior margin obliquely, not sharply striate (streaks diverge from posterior margin laterally). Frontal sutures not visible, median longitudinal suture of epistoma smooth, barely perceptible apically. Hypostoma broadens with narrow brownish border, sharp (not rounded) outer anterior angles. Gula slightly rounded anteriorly, does not extend beyond anterior margin of hypostoma, with transverse groove at base. Parietals in anterior third with stray hairs. Near base of antennae from underside convex round hyaline ocellus with black spot recedes backward and deeply concealed in cuticle. Antennae comparatively long; 1st segment slightly shorter or almost not shorter than two successive together. Clypeus semitransparent, widely flattened basally. Labrum broadly rounded anteriorly, narrowly and sharply rounded posteriorly, convex and glabrous on disk, with sparse short setae along margins. Mandibles narrow notably toward apex, rounded apically, on outer side with narrow transverse groove, black, basally with rusty tinge. Inner masticatory lobes of maxillae thick, taper slightly toward apex, whitish, with sparse setae, lustrous on outer side, glabrous, brownish. Maxillary palps distinctly longer than inner lobes.

Pronotum broadly rounded in posterior half, narrows anteriorly, in anterior half with two sharp, tetragonal, transverse, rusty spots, laterally with less distinct small spot, rusty hairs forming two transverse bands on disk, one denser in region of rusty spots and second thinner anterior to scutum. Hairs on disk (especially in region of rusty spots) comparatively short, ringed with sclerotized ringlet, on sides of pronotum long. Pronotal scutum white, bound laterally by straight longitudinal grooves, with very minute longitudinal striation. Prothoracic presternum with not very dense short hairs, on anterior margin laterally with long dark rusty, almost red setae forming two distinct tufts; eusternum glabrous, with 127 faint longitudinal furrows or striation. Meso- and metasterna rugulose, with transverse groove interrupted broadly in middle. Thoracic legs small, with minute claw.

Abdomen thick, narrows moderately from thorax toward posterior end, with rusty hairs laterally. Dorsal locomotory ampullae convex, coriaceous, divided by common median longitudinal groove, transverse groove in front merging laterally with lateral longitudinal grooves. Ventral locomotory ampullae laterally in anterior half with short bracketlike transverse groove curved backward. Abdominal sternites, near ventral loco-

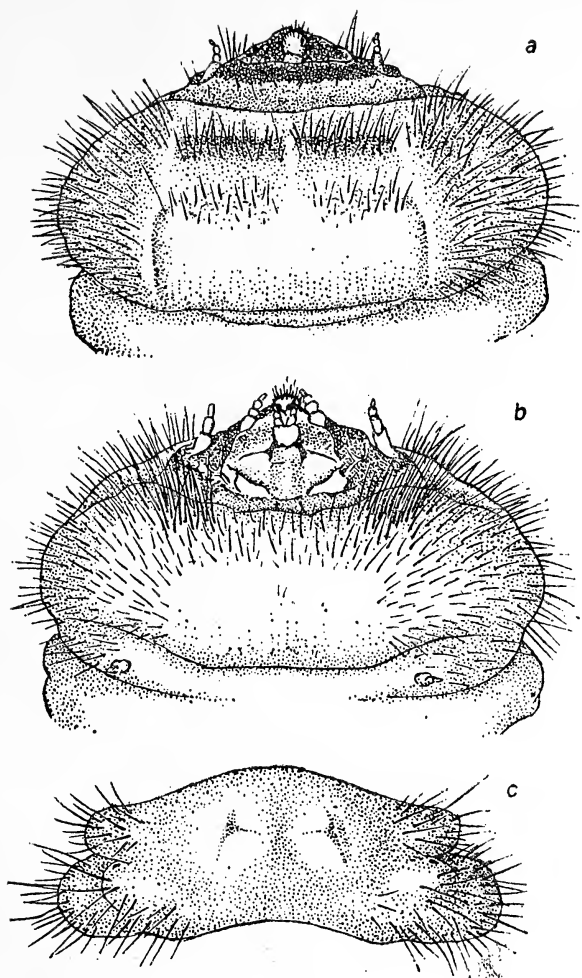
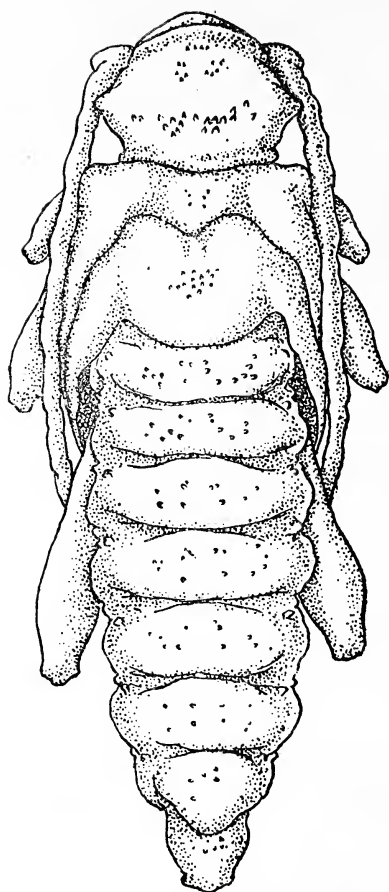


Figure 72. Larva of *Rhopalopus clavipes* (F.).
a—head and pronotum; b—prosternum; c—abdominal
tergite IV with dorsal locomotory ampulla.

tory ampullae, with long rusty-red hairs forming tuft on each side. Body length of mature larva 20 to 25 mm, width of head 2.8 mm. In I-instar larvae abdominal segment VI laterally on posterior margin with short spinule, VII with very long acute brownish spinule, its apex directed backward. These spinules disappear after molt.

Pupa (Figure 73): Characterized by large flat dorsal spinules that
128 broaden basally, rounded or pointed apically. Head short, between antennae insignificantly transversely convex, with median longitudinal suture there, flat on vertex between upper ocular lobes, broadly rounded, glabrous, without setae on occiput. Antennae pressed to sides, bent forward, looplike, in posterior third in male, bent ventrad in female.



127

Figure 73. Pupa of *Rhopalopus clavipes* (F.).

Pronotum transverse, broadens angularly posterior to middle, from there narrows gradually anteriorly and more steeply posteriorly, bulges gently on disk, with barely perceptible minute transverse striation, medially with minute spinules, on hind clivus with large, flat, triangular, sometimes biapical setaceous spinules forming two transversely elongate bands, basally with narrow transverse groove.

Mesonotum transversely impressed in second third, extended convex or elevated scutellum on posterior margin, minute sharp, usually paired spinules medially in posterior half. Metanotum bulges slightly, on posterior margin broadly rounded, on disk posterior to middle with flat spinules bent forward and forming broad tuft.

Abdomen in region of segments III and IV broadens distinctly, narrows markedly posteriorly. Abdominal tergites broad and convex, with faint flat median longitudinal groove; abdomen laterally in anterior half

with minute paired spinules forming transverse row, in posterior third with very large (tergites I to IV) or minute (tergites V to VII) flat spinules forming transverse row or transverse band (three to nine paramedial spinules). Spinules bent sideways, apically more sclerotized, rounded or pointed, basally broaden, light yellow. Tergite VII 1.5 times wider at base than long, convex on disk, with narrowly rounded posterior margin. Tergite VIII with rows of small paired spinules on disk broadly rounded apically. Valvifers of female hemispherical, proximate. Hind femora clavate, pressed to sides of abdomen, with apices more (male) or less (female) extending beyond abdominal tergite V. Body length 16 to 22 mm, width of abdomen 5.0 to 7.0 mm.

Material: Collected in the southern Urals (from Orenburg to Ural'sk). Adult insects 22, larvae 40, pupae—eight males and five females, larval and pupal exuviae from cells with beetles six. Adults and pupae raised in the laboratory from larvae collected in nature.

Distribution: From Atlantic Ocean coast to the Urals inclusive, from Denmark, Sweden, Leningrad, Upper Volga to the Caucasus, Iran, Syria, and the Mediterranean Sea. Sporadic everywhere. Common in broad-leaved forests of the southern Urals.

Biology: Inhabits broad-leaved forests. Ecologically associated with oak and other deciduous species. Beetles fly from end of May through August. Found maximally (southern Urals) in early July. Lead cryptic mode of life, not seen on flowers. Emerge from pupal cells with developed gonads. Ovaries of one female before emerging from pupal cell contained 54 fully developed eggs. During reproduction period beetles found on drying trees. After mating, female oviposits in bark crevices, mainly on branches 3.0 to 5.0 cm in diameter at a height of up to 2.0 m or more above ground.

Larvae hatch three weeks after eggs are laid. In the Urals larvae began hatching in a forest (Krasnokholmsk reserve) on July 25th from eggs laid on July 7 to 11. Atmospheric temperature varied during this period from 13.8 to 32.2°C (average $22.1 \pm 0.5^\circ\text{C}$). Newly hatched larva
129 immediately bores bark and makes a gallery initially in bark along shoot, sometimes with lateral branches from it. II-instar larvae make platform-like galleries under bark imprinted on alburnum. These galleries are usually hollow, not filled with frass, with gentle, at places steep walls. Lateral branches (blind alleys), filled with frass, proceed from platform gallery. Length of platform gallery under bark 7.0 to 11.0 cm, width 1.5 to 3.5 cm. However, configuration and length of gallery depend on diameter of shoot colonized by larvae. Galleries in thin shoots are usually long and narrow, in thick ones broader, platformlike. Quite often, many larvae live side by side. Galleries made by them fuse and form an extensive area fully or partly filled with frass. In one case three larvae made

a gallery 24 cm long in a blackthorn shoot 1.4 cm in diameter, with a total area of 48 cm². In another case one larva made a gallery 38 cm long with a total area of 31.6 cm² under the bark of a blackthorn shoot 3.0 cm in diameter. In an apple tree trunk 10.5 cm in diameter a larva made a gallery 14 cm long with an area of 26 cm².

Mature larvae bore wood and make a longitudinal gallery free of frass which later serves as a pupal cell. Inlet plugged with frass. Width of inlet 0.7 to 1.0 cm. Length of cell (gallery free of frass) 7.5 cm, width 1.2 cm.

Pupation of larvae commences early May, ceasing in June. In the laboratory at $18.3 \pm 0.2^\circ\text{C}$ pupae developed for 15 to 20 days (average 17.6 ± 0.5 days). Young beetles mainly seen in June. Emergence of adults from wood ceases toward end of June. In 1978 emergence had ceased by last 10 days of June in forests of the southern Urals. Life cycle completed in two years (Table 11). Records of 22 insects revealed: weight of larvae before pupation 128 to 530 mg (245.6 ± 20.8), pupae 116 to 422 mg (211.3 ± 18.9), and beetles before emerging from wood 94 to 335 mg (169 ± 15.8). However smaller insects were sometimes seen. For example, one larva weighed 67 mg before pupation, pupa developing from it 58 mg, and beetle before emerging from cell 47 mg.

Table 11. Periods of development of *Rhopalopus clavipes* (F.)

Year of development	April	May	June	July	August	September	October
1st	L	LPA	PAE	AEL	AEL	L	L
2nd	L	L	L	L	L	L	L
3rd	L	LPA	PAE	AEL	AEL	L	L

While inspecting forests in the southern Urals we found 39 insects in larval and adult stages. Of these seven were found on oak, 16 on hawthorn, four on apple, three on bird cherry, three on willow, one on cherry, and five on blackthorn (*Prunus spinosa*). Generally colonizes thin shoots 1.4 to 5.0 cm in diameter, more rarely 13 cm in diameter. Not found on thicker trunks. Recently dried trees are usually colonized. Population density comparatively high. On a cutting 20 cm long and 10.5 cm in diameter seven larvae were found in wood; three mature larvae were recovered from a blackthorn shoot 25 cm long and 1.4 cm in diameter. *Phymatodes testaceus* (L.) and *Xylotrechus antilope* (Schönh.) often colonize oak together with this species, and *Mesosa myops* Dalm. and others colonize apple simultaneously.

130 2. *Rhopalopus signaticollis* Sols.

Solsky, 1872, *Horae Soc. Entom. Ross.*, vol. 9, p. 177; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 246-247; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 218.

Adult (Figure 74): Characterized by dense deep punctation and large convex lustrous shields on pronotum and flat dull elytra. Head short, appears transverse in dorsal view, bulges uniformly transversely between antennae, with narrow median longitudinal suture, broad and moderately impressed between upper ocular lobes, with dense punctation. Eyes finely and distinctly faceted, with broad deep notch, very narrow septum between upper and lower lobes. Antennae longer than body; 8th or 9th segment in male, 10th or 11th segment in female extends beyond apex of elytra; 5th to 9th segments apically produced, spinelike; 10th and 11th segments uniform; 5th segment longer than 4th, shorter than 3rd.

Pronotum transverse, medially notably wider than long, angularly rounded or tubercularly produced laterally, with dark brown erect hairs, narrows less anteriorly, more posteriorly, with narrow flange on posterior margin, and five smooth lustrous convex shields on disk; of these, two lateral in anterior half, two in posterior half, and one medial. Lateral shields sometimes fuse into longitudinal smooth outcurved bands. Gaps between shields and sides of pronotum with dense large punctation. Scutellum broad, its length not more than width, broadly rounded posteriorly, with stray large punctation.

Elytra with parallel sides, flat, broadly rounded posteriorly, with straight humeral tubercles projecting slightly laterally, more lustrous basally, with large rugose punctation, matte farther away from scutellum, with dense, very fine punctation, and short, faint, semiadherent black hairs. Metathorax with dense punctation, abdomen with very sparse notchlike punctures. Legs long. Second half of femora thickened, clavate. Body ventrally with light-colored or brownish hairs. Body black or brownishblack. Elytra with brownish tinge in second half (f. *typica*). Sometimes pronotum brownish-rust (ab. *rufithorax* Plav.). Body length 9.0 to 14.0 mm.

131 *Egg*: White, elongate, narrows more toward one pole and pointed, rounded at the other. Chorion smooth, hyaline, transparent. Length 1.6 mm, width 0.6 mm.

Larva (Figure 75): Unlike larvae of other species, readily recognized by two round white ampullae on abdominal sternite V. Head narrowly rounded anteriorly, markedly retracted into prothorax. Epistoma very short, anteriorly with reddish-brown margin, darkened laterally on clypeus and here with faint, somewhat obliterated, oblique striation; median longitudinal suture slightly translucent only at apex, frontal sutures not visible. Hypostoma broadens anteriorly, rounded on anterior outer

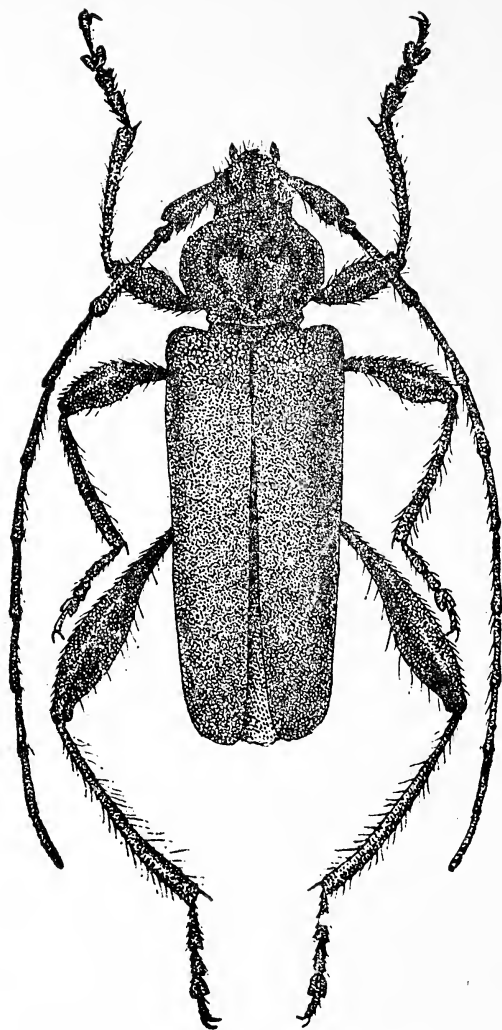
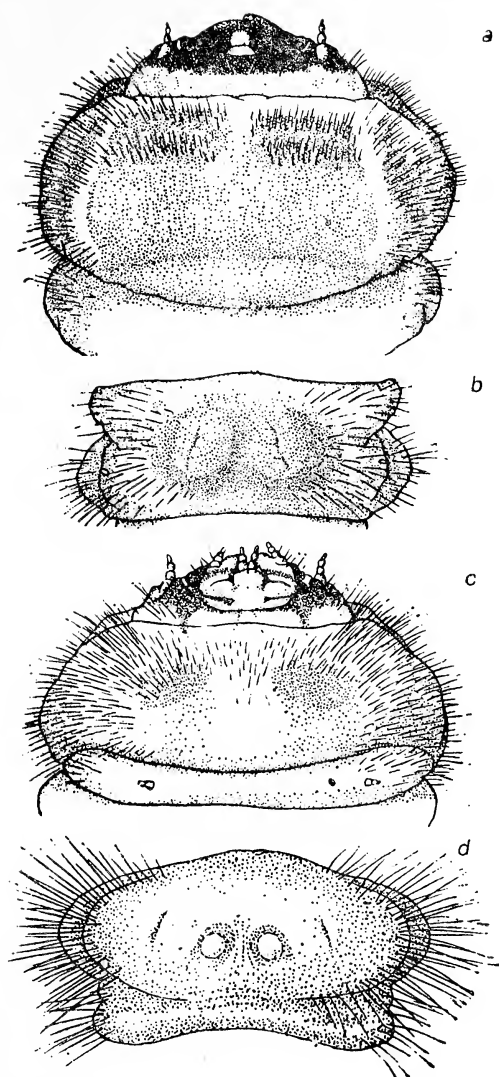


Figure 74. *Rhopalopus signaticollis* Sols.

130

angles, anteriorly with narrow rusty border, with small notch near inner angles. Gula flat, does not project posterior to anterior margin of hypostoma. Parietals in anterior half with sparse short hairs. Ocelli near antennal bases ampullar, hyaline. Antennae long, slender, project forward beyond margin of cephalic capsule. Clypeus very short, broadens markedly at base. Labrum small, convex, narrows anteriorly, narrowly rounded apically, with dense piliform rusty setae along margins. Mandibles thick, massive, uniformly rounded apically, matte on outer side, basally with broad median longitudinal groove, black, reddish-rust at base. Maxillary palps long, distinctly extend forward beyond apex of inner masticatory

132



131

Figure 75. Larva of *Rhopalopus signaticollis* Sols.
 a—head and pronotum; b—abdominal tergite IV
 with dorsal locomotory ampulla; c—prosternum
 d—abdominal sternite V.

lobe of maxillae. Labial mentum laterally with long setae forming tuft on each side.

Pronotum broad, with not very sharp yellow spots in anterior half, two on disk and one longitudinally elongate on each side, and also in anterior half with comparatively uniform rusty hairs forming common field, somewhat thinned in middle (hairs without basal ringlet). Pronotal

scutum white, convex, with dense, barely perceptible longitudinal striation, significantly produced medially on anterior margin and slightly so on anterior angles, bound laterally by deep longitudinal grooves. Prothoracic presternum with dense fine rusty hairs, laterally on anterior margin [unlike larva of *R. clavipes* (F.)] with ordinary hairs not forming long tuft; eusternum glabrous, with fine furrows, and shagreen matte tone. Thoracic legs very minute, with weakly sclerotized claw.

Abdomen laterally, especially ventrally, with dense long light-colored hairs. Dorsal locomotory ampullae moderately convex, shagreen, with very fine reticulate-squamiform sculpture, with broad, common, median longitudinal groove, laterally with short longitudinal grooves, on anterior margin without transverse groove. Ventral locomotory ampullae similar in structure, on sternite I laterally with transverse groove, on II to IV with bracketlike replicate groove, on V and VI with short longitudinal groove, and on VII with short longitudinal groove and transverse groove receding inward from it. In addition to locomotory ampullae, sternite V with pair of round white paramedial ampullae. Body length of mature larvae 18 to 23 mm, width of head 2.9 mm.

Pupa (Figure 76): Characterized by innumerable spinules on dorsal side of body and broad, slightly convex frons. Head short, narrows anteriorly from antennal bases, slightly convex between antennae, barely impressed between upper ocular lobes, uniformly rounded on occiput. Antennae comparatively long, pressed to sides, with apices bent ventrad and forward.

Pronotum transverse, angularly produced laterally, narrows toward base, convex, transversely striate on disk, with innumerable spinules forming distinct or less prominent transverse bands interrupted medially. Spinules short, broaden basally, setaceous. Mesonotum convex, with narrow median longitudinal groove, on posterior margin with elevated scutellum, with minute spinules forming two paramedial tufts, each anteriorly elongate and inclined. Metanotum broad, rounded posteriorly, fairly convex, with median longitudinal groove, with well-developed spinules forming two bands diverging from middle to anterior angles. Hind femora with long, gradually thickening clava.

Abdomen elongate, with almost parallel sides, narrows from segment V posteriorly. Abdominal tergites convex, with common median longitudinal groove, with short pointed spinules forming characteristic uneven transverse band of stray tufts, two (with three spinules per tuft) posterior to middle nearer longitudinal groove, and two (with eight to ten spinules per tuft) transversely elongate slightly posterior. Tergite VII narrowly rounded posteriorly, with spinules on disk forming small common tuft immediately posterior to middle. Tergite VIII moderately elongate, broadly rounded posteriorly, with stray minute spinules. Tip of

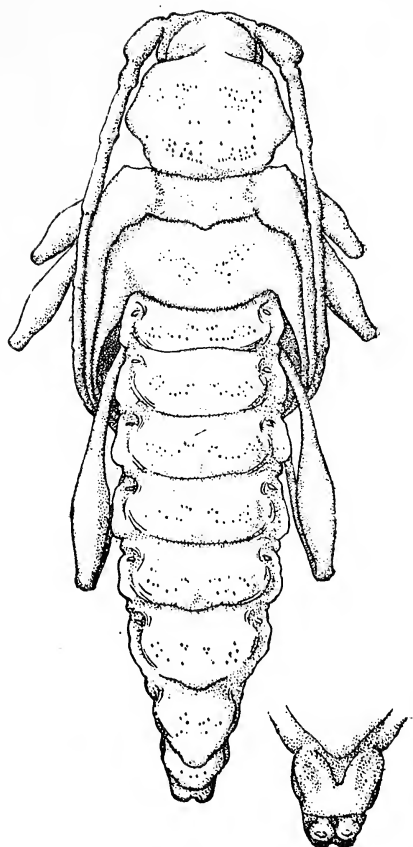


Figure 76. Pupa of *Rhopalopus signaticollis* Sols.

131

133 abdomen (ventral view) distinctly produced. Valvifers of female contiguous, slightly enlarged apically, lustrous at apex, with distinct minute folds. Body length 12 to 16 mm, width of abdomen 4.0 mm.

Material: Collected in Ussuri-Primor'e region (Arsen'ev, Gornotaezhnoe, Komarovka River). Adult insects 35, larvae 20, pupae—two males and three females, larval exuviae with beetles from cells nine.

Distribution: Amur region, Ussuri-Primor'e region, northeast China, Korea, northern Japan.

Biology: Inhabits broad-leaved forests. Beetles seen in June up to end of July. Inhabit dried and drying maple, creeping onto trunk to mate. Female oviposits under bark scales or in wood crevices. Sometimes colonizes viable trees with cavities. Larvae hatched in 18 to 25 days from eggs laid in the laboratory at 13.0 to 19.4°C.

Newly hatched larvae bore bark, make longitudinal meandering galleries imprinted on wood under bark, and plug them densely with fine frass. Before second hibernation mature larva bores wood, makes

longitudinal gallery 2.0 to 4.0 cm long in upper layer to a depth of 0.2 to 2.0 cm, and plugs inlet with fine frass. Size of inlet 0.50 cm \times 0.25 cm to 0.90 cm \times 0.30 cm. Larvae remain in wood for second hibernation. Pupate in spring. Pupae oriented with head toward inlet.

Young beetles nibble oval flight opening (0.35 cm \times 0.15 cm to 0.60 cm \times 0.30 cm) in bark surface and emerge. Weight of larvae before pupation 32.0 to 130.1 mg, pupae 29 to 117 mg, and young beetles before emerging from cell 24 to 95 mg.

Rhopalopus signaticollis Sols. inhabits maple (*Acer mono*, *A. tegmentosum*, and others). While inspecting forests in Ussuri-Primor'e we collected 55 insects in larval, pupal, and adult stages. All of them came from maple. Not found on other species. *Necydalis morio* Kr., *N. ebenina* Bat., and others sometimes colonize together with this species.

3. *Rhopalopus speciosus* Play.

Plavilstshikov [Plavil'shchikov], 1915, *Entom. Vestn.*, vol. 2, p. 108; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 247-248.

Adult (Figure 77): Differs from other species of the genus *Rhopalopus* in sparse fine punctation and red color of pronotum. Head between antennae transversely highly convex, with faint median longitudinal suture, uneven punctation, smooth, not punctate near antennal bases from inner side and on vertex. Eyes black, sharply faceted, broadly emarginate, septum between lobes comparatively broad, barely narrower than upper lobe. Antennae thin markedly toward apex, with 9th (male) or 11th (female) segment extending beyond apex of elytra, long black hairs on underside of 1st to 6th segments, with projecting spinules apically on 3rd to 8th. Fifth antennal segment considerably shorter than 3rd, equal to 4th.

Pronotum transverse, with transverse groove near anterior and posterior margins, angularly or clavately produced laterally, with very fine, smoothened, sometimes uneven punctation on disk, with convex smooth shields, of which two on each side in anterior and posterior half, one anterior to base medially. Sometimes shields greatly smoothened, faint. Scutellum broad, smooth, with stray punctation or without, medially impressed, troughlike.

134 Elytra with parallel sides, convex, with barely projecting humeral tubercles, apically with narrowly rounded inner angles and broadly rounded outer, dense large punctation in anterior third or only at base and here comparatively lustrous, elsewhere with unusually fine punctation imparting matte tone. Metasternum and abdominal sternites with dense fine punctation. Body ventrally with short, not very dense gray hairs. Femora with long distinct clava. Body, antennae, and legs black or blackish-brown, sometimes with chestnut tinge. Pronotum and pro-

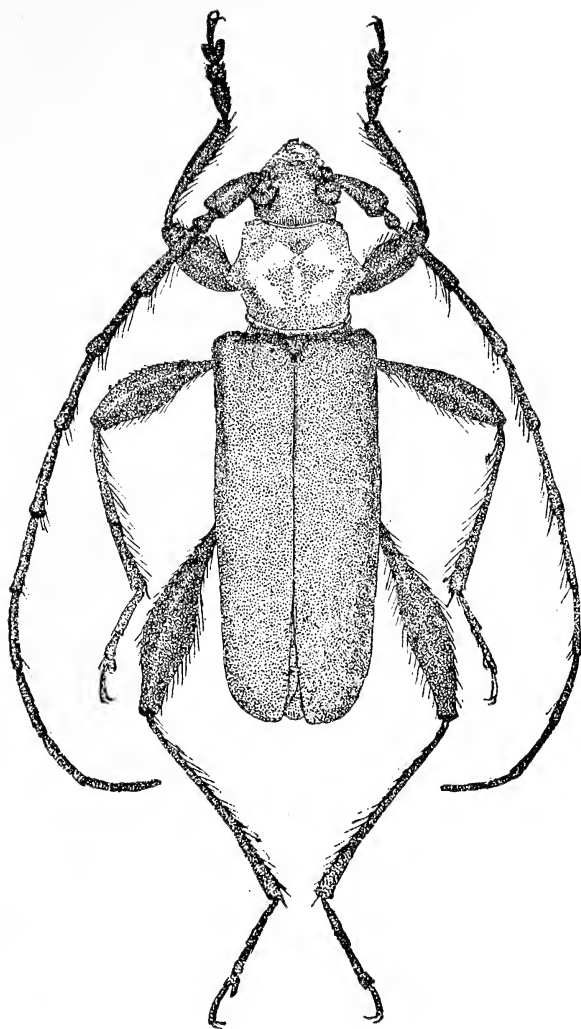


Figure 77. *Rhopalopus speciosus* Plav.

sternum red or reddish-rust. Elytra dark violet or dark blue, in anterior third with metallic sheen, in posterior half matte. Body length 13 to 15 mm.

Egg: White, elongate, rounded at one pole and pointed at the other. Chorion smooth, hyaline, transparent. Length 2.1 mm, width 0.6 mm.

Larva (Figure 78): Similar to larva of *R. signaticollis* Sols., but well distinguished from it in absence of round white ampullae on abdominal sternite V and sparse short hairy cover laterally on abdomen. Head markedly retracted into prothorax, glabrous laterally, with only stray hairs around anterior brownish border. Base of antennae with single

convex, light-colored, hyaline, or brownish ocellus. Antennae long, slender, project forward beyond anterior margin of cephalic capsule. Epistoma insignificantly convex, on anterior margin with broad, reddish-brown, smooth, nonstriate border, anteromedially with faint or almost invisible longitudinal suture, merges laterally with parietals; frontal suture not visible. Hypostoma flat, broadens anteriorly, on anterior margin with narrow brownish-rust border. Anterior margin of gula at level of anterior margin of hypostoma or slightly short of it. Clypeus short, barely projects beyond anterior margin of hypostoma as transverse band. Labrum white, narrows anteriorly, narrowly rounded apically, with short light-colored setae along margin. Mandibles black, reddish-brown basally, with

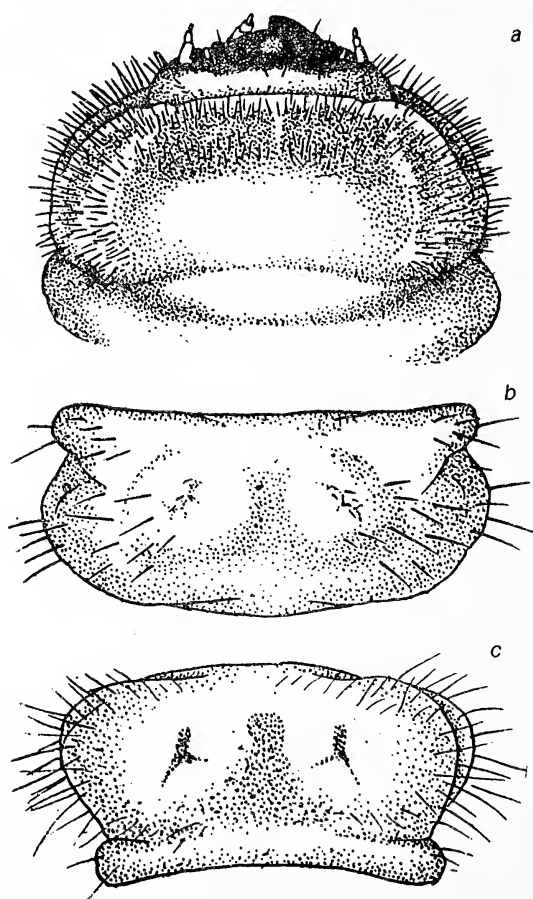


Figure 78. Larva of *Rhopalopus speciosus* Plav.

a—head and pronotum; b—abdominal tergite IV with dorsal locomotory ampulla; c—abdominal sternite V.

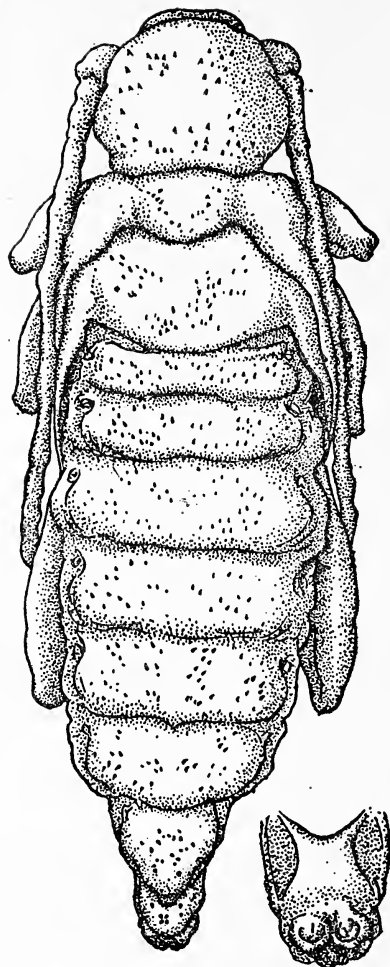
- 135 median longitudinal groove on outer side closer to base resembling deeply impressed stria. Inner masticatory lobes of maxillae thick, insignificantly narrower than long, apically obtuse and with stray setae here. Maxillary palps distinctly longer than inner lobes. Labial mentum posterolaterally with setae forming tuft.

Pronotum in anterior half on disk with two broad indistinct yellow spots, laterally with broad longitudinally elongate yellow spot covering almost entire lateral section, on disk with not very dense, short, light-colored hairs forming two transverse bands, of which one more distinct on anterior margin of yellow spots and second less distinct (diffuse) anterior to scutum. Pronotal scutum basally convex and here with very minute, reticulate-squamiform sculpture, flat anteriorly, sometimes with minute, barely perceptible longitudinal striation, bound laterally by short longitudinal grooves. Prothoracic presternum on disk with short hairs, laterally with very long, thin, light-colored hairs not forming distinct tuft; eusternum glabrous, coriaceous, rugulose. Thoracic legs minute, with sharp claw.

- Abdomen laterally with very sparse short hairs, looks almost glabrous. Dorsal locomotory ampullae matte, convex, with common broad
136 median longitudinal groove, laterally with faint longitudinal grooves, transverse groove lacking. Ventral locomotory ampullae on sternites I to III and VII with transverse grooves, on sternites IV to VI with lateral longitudinal grooves; abdominal sternite V without round white ampullae in middle of locomotory ampullae. Body length of mature larvae 21 to 25 mm, width of head 3.0 mm.

Pupa (Figure 79): In arrangement of spinules on abdominal tergites similar to pupa of *R. signaticollis* Sols. Differs in well-rounded, not angularly produced pronotal flanks. Head moderately bent under, narrows anterior to antennae, between upper ocular lobes flat or slightly impressed, broadly rounded on occiput. Antennae pressed to sides, with apices bent forward, looplike.

Pronotum laterally rounded, narrows almost identically anteriorly and posteriorly, uniformly convex on disk, with faint minute transverse striation, minute setaceous spinules forming two transverse bands, one broader basally and second obscure in anterior half. Stray spinules occur between these two bands. Mesonotum convex, lustrous, with almost straightly truncate posterior margin, and minute spinules forming two paramedial tufts. Metanotum broad, slightly convex, with almost straightly truncate posterior margin, median longitudinal groove, not very large spinules forming extensive tuft extending longitudinally from middle of base to anterior angles. Femora with long clava, pressed to sides of body.



135

Figure 79. Pupa of *Rhopalopus speciosus* Plav.

Abdomen with parallel sides or broadens slightly in region of segment IV, narrowing posteriorly from segment V, and produced at tip. Abdominal tergites moderately convex, medially with narrow, comparatively deep groove, with short spinules forming broad transverse band (20 to 36 spinules per tergite). Abdominal tergite VII narrows conically posteriorly, pointed there, with small spinules in middle of disk forming small (up to six spinules) or large (over 20 spinules) tufts. Tergite VIII insignificantly elongate, with hyaline sheen and stray, barely perceptible spinules. Valvifers of female contiguous, almost hemispherical, do not broaden apically but rounded. Body length 14 to 16 mm, width of abdomen 4.0 mm.

Material: Collected in Ussuri-Primor'e region (Komarovka River). Adult insects three, larvae seven, pupae—two females, larval exuviae from cells with beetles three.

Distribution: Ussuri-Primor'e region and northeast China.

Biology: Inhabits broad-leaved forests. Beetles fly from end of June to August. According to T.P. Samoilov (1936), beetles sighted on flowers of *Sorbaria sorbifolia*. However, they emerge from wood with developed gonads and are capable of reproducing without supplementary feeding. For example, ovaries of one female dissected immediately after emergence from wood contained 38 mature eggs. Female oviposits on trunks of dried oak and maple. Larvae live under bark, make straight or, more often, meandering galleries and plug them densely with fine frass. Mature larva bores wood to a depth of up to 0.4 cm, makes cell along trunk, and remains in it for second hibernation. Inlet to cell plugged with fine frass. Length of pupal cell up to 2.5 cm, width 0.8 cm.

Larvae pupate in spring. Young beetles seen in June. They abandon pupal cell through inlet and nibble oval flight opening (5.0 mm × 3.5 mm to 6.0 mm × 3.5 mm) in bark and exit. Records of six insects showed: weight of larvae before pupation 83.0 to 223.4 mg, pupae 72 to 137 201 mg, and young beetles before emerging from wood 58 to 161 mg. One larva weighed 309.8 mg. While inspecting forests, larvae, pupae, and adults of this species were found on maple.

4. *Rhopalopus aurantiicollis* Plav.

Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 250–251.

Adult: Unlike other species of this genus, recognized by pronotum devoid of punctation and other ornamentation. Head with stray sparse punctation, sparse erect hairs, and distinct longitudinal suture between antennae. Antennae extend insignificantly beyond apex of elytra (male) or just reach it; 1st to 5th segments with dense hairs on lower side, 3rd to 9th segments with projecting apical spinule.

Pronotum slightly wider (female) or not wider (male) in middle than long, rounded or slightly angular laterally, near base with narrow transverse groove or narrow flange (female), smooth fringe medially on anterior margin; disk slightly convex, with small round paramedial impression, smooth, lustrous, with sparse erect hairs. Scutellum slightly elongate, highly impressed, smooth.

Elytra elongate, 3.0 times longer than width at base, posterior to humeri slightly or notably compressed, obliquely rounded apically (with narrowly rounded inner angle and broadly tapered outer), notably flattened, with large flat punctation at base, minute dense punctation elsewhere, lustrous in anterior third, posteriorly matte. Prosternum with punctation and transverse striation. Metasternum with sparse puncta-

tion on disk, very dense but minute punctation laterally. Abdominal sternites with sparse punctation. Body ventrally with sparse thin brownish hairs. Body black, sometimes brownish. Pronotum orangish-red, on posterior margin with black border. Prosternum orange, prosternal process darkened. Elytra dark brown, with faint violet tinge. Body length 12.5 to 13.0 mm.

Distribution: Ussuri-Primor'e region, southern Sakhalin. Described from collection of the Zoological Museum, Moscow State University. Rare. We did not find it in southern Primor'e fauna even after many years of study. Judging from the collection, beetles fly from July through August.

5. *Rhopalopus ruficollis* Mats.

Matsumura, 1911, *J. Coll. Agric. Sapporo*, 4, 1, 138; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 249-250.

Adult: Differs from other species in red pronotum with two impressions and uneven punctation. Head with moderate punctation, sparse erect hairs, longitudinal suture between antennae, and smooth between upper ocular lobes, without punctation. Antennae slender, extend beyond apex of elytra; 5th to 7th segments produced apically, spinelike.

Pronotum transverse, broadens angularly or unevenly laterally, with sparse erect hairs there, broadly fringed on anterior margin and narrowly on posterior, on disk with flat rugose punctation, medially with smooth band with longitudinal impression along each side of band. Scutellum comparatively elongate, longitudinal, smooth, with trough-like longitudinal impression.

138 Elytra elongate, long, 3.0 times longer than width at base, slightly compressed posterior to humeri, obliquely rounded apically, in anterior third coarsely punctate, lustrous, from middle third with minute rugulose punctation, matte. Prosternum with rugulose punctation, metasternum on disk with sparse and laterally very dense punctation. Abdominal sternites with sparse minute punctation. Body ventrally with sparse short brownish hairs. Body black or blackish-brown, pronotum rusty-red, sometimes darkened on posterior margin and in middle. Pronotum in anterior half reddish-rust. Elytra violet or purple. Body length 12 to 14 mm (Plavil'shchikov, 1940).

Distribution: Ussuri-Primor'e region, southern Sakhalin. Rare. Only stray specimens known. We did not find this species in our long-term investigations.

3. Genus *Pronocera* Motsch.

Motschulsky, 1875, *Bull. Soc. Nat. Moscow*, 49, 1, 149; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 261-262; Gressitt, 1951, *Longicorn Beetles*

of China, vol. 2, p. 219; Linsley, 1964, *Cerambycidae of North America*, 22, 5, 12-13.

Adult: Characterized by elongate body, slender antennae, and comparatively broad notch between lower and upper ocular lobes. Pronotum transverse (female) or almost square (male), with uneven punctation on disk. Prosternal process long, slender, completely divides forecoxae. Mesosternal process narrows posteriorly, rounded or almost emarginate apically. Elytra elongate, with parallel sides, with rugulose and minute punctation. Femora with insignificantly, gradually thickening clava.

Larva: Distinguished from larvae of other genera by well-developed ocelli on anterior flat part of parietals behind antennal bases. Head with parallel sides, glabrous mediolaterally, without transverse hairy band, with only stray sparse hairs around brown border on anterior margin. Pronotal scutum white, with longitudinal striation, bound laterally by longitudinal grooves. Thoracic legs short, with sharp claw. Locomotory ampullae developed on abdominal segments I to VII, with very fine sculpture, matte.

Pupa: Characterized by elongate body. Antennae arcuate in second half. Pronotum lustrous, rounded laterally, transversely striate on disk, basally with well-developed spinules forming transverse band. Abdominal tergites with minute spinules forming transverse indistinct row or narrow transverse band interrupted medially.

The genus *Pronocera* Motsch. is very small, with just three species included in it. Of these, *P. angusta* Kriechb. inhabits West Europe, *P. brevicollis* (Geb.) southern regions of northern Asia, and *P. collaris* Kirby the boreal zone of North America. All three species are ecologically associated with coniferous vegetation—*Picea*, *Abies*, and *Pinus*.

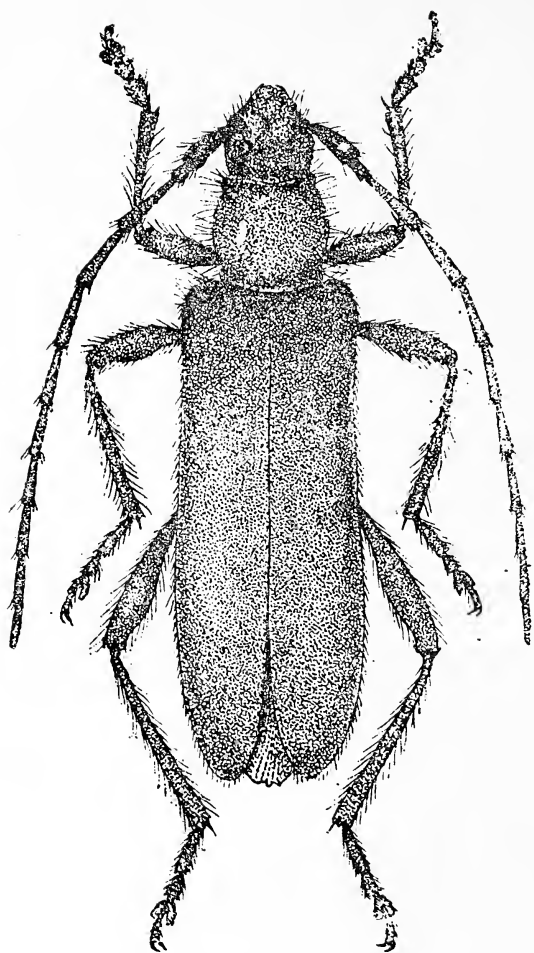
Type species: *Callidium brevicollis* Gebler, 1833.

1. *Pronocera brevicollis* (Geb.)

Gebler, 1833, *Bull. Soc. Nat. Moscow*, vol. 6, p. 302 (*Callidium*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 263-265; Gressitt, 1951, *Longicorn Beetles of China*, vol. 2, p. 219; Cherepanov and Cherepanova, 1973, *Nov. i maloizv. vidy fauny Sibiri*, 6th ed., pp. 68-69.

Adult (Figure 80): Head between antennae highly convex transversely, with median longitudinal suture, dense punctation, and brown hairs.
 139 Eyes broadly emarginate, septum between ocular lobes slightly narrower or almost not narrower than width of upper lobe. Antennae slender, in female extend beyond 0.75 length of elytra, in male beyond elytral apex; 2nd segment short, nodular; 3rd distinctly longer than 5th.

Pronotum wider (female) or almost not wider (male) than long, gently rounded (male) or slightly angularly produced laterally, on disk with sparse and laterally denser punctation, with light brown hairs, medially usually

Figure 80. *Pronocera brevicollis* (Gebler).

with longitudinal smooth band. Scutellum small, flat, narrowly rounded posteriorly.

Elytra elongate, with parallel sides, insignificantly convex, with uniformly rounded humeri (humeral tubercles do not project), individually narrowly rounded apically, posterior to humeri sometimes slightly compressed, with very dense punctation forming transverse wrinkles, with minute light-colored or light brown hairs. Prosternal process pointed apically, reaches posterior margin of forecoxae. Femora with thin clava. First segment of hind tarsi slightly longer than two successive together. Body ventrally light brown, with semiadherent hairs. Entire body black or oily black (f. *typica*), often pronotum red with black border on anterior and posterior margins, prosternum partly red (m. *daurica* Motsch.)

or pronotum black only on disk and red along margins (ab. *divisa* Baeckm.). Body length 9.0 to 13.0 mm.

Egg: White, elongate, rounded at poles. Chorion smooth, without perceptible sculpture. Length about 1.2 mm, width 0.4 mm.

Larva (Figure 81): Head with parallel sides. Epistoma insignificantly convex, on anterior margin with broad, coarsely longitudinal, dark brown striate border (streaks diverge, slope laterally somewhat), in posterior half with just perceptible median longitudinal suture, fuses laterally with parietals, frontal sutures not visible. Hypostoma broadly divided by gula into two triangular sclerites, on anterior margin with narrow rusty border, near inner angles with slight notch. Gula comparatively broad, slightly convex, narrows insignificantly toward apex. Parietals on anterior margin with rusty-red border encircling articulate antennal sockets and ocelli, with short stray hairs behind border. Ocelli convex, hyaline, lateral to base of antennae but somewhat ventral on anterior flat section.

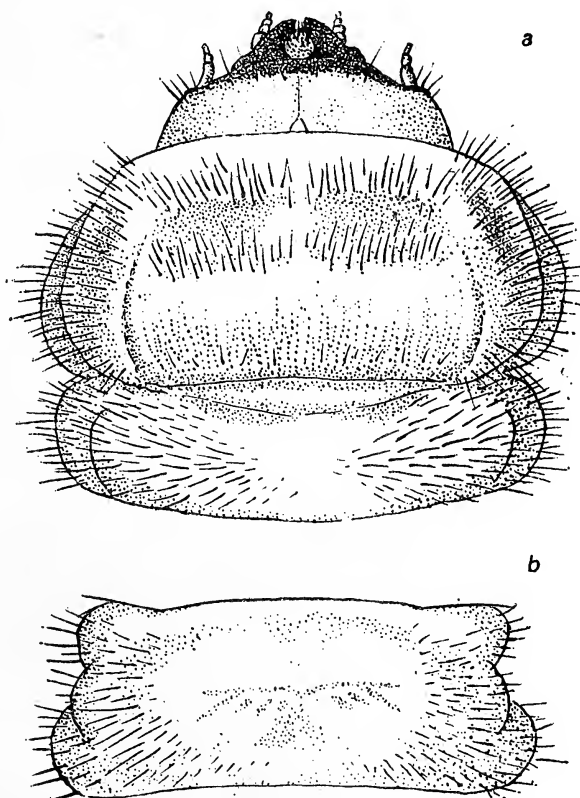


Figure 81. Larva of *Pronocera brevicollis* (Geb1.).
a—head and pronotum; b—abdominal tergite IV
with dorsal locomotory ampulla.

Antennae short, project slightly beyond anterior margin of cephalic capsule, brownish. Clypeus short, trapezoid, barely perceptible. Labrum convex, small, brownish, on anterior margin broadly rounded, with short setae. Mandibles short and black, reddish-rust basally, on outer side with transverse groove, convex, broadly rounded apically. Inner masticatory lobes of maxillae thick, obtuse apically and with short rusty hairs here. Maxillary palps not long, project somewhat beyond apex of inner lobes.

Pronotum 2.0 times wider than long, slopes forward markedly, laterally and on disk with rusty hairs forming two transverse bands, between which two glabrous, yellowish-rust, transversely extended spots occur, laterally with faint longitudinal spot. Pronotal scutum white and moderately convex, with longitudinal striation, basally with stray, barely visible setae forming transverse row, bound laterally by deep longitudinal grooves. Prothoracic presternum laterally with very dense long hairs and on disk sparse short rusty hairs; eusternum with minute furrows, divided anteriorly by gap into two round glabrous plates. Thoracic legs short, with spinelike claw, brownish-rust. Dorsal locomotory ampullae slightly convex, with very fine sculpture, matte, separated by faintly perceptible transverse groove on anterior margin and longitudinal grooves laterally and medially receding from it. Ventral locomotory ampullae with fairly continuous transverse groove or latter interrupted medially, sometimes with lateral longitudinal grooves. Body length of mature larvae 15 to 28 mm, width of head up to 2.0 mm.

Pupa (Figure 82): Body elongate. Head narrows markedly anterior to antennae, convex between antennae, broadly impressed posterior to them between upper ocular lobes, uniformly rounded on occiput. Antennae in second half arcuate, pressed to sides.

Pronotum almost square, somewhat rounded laterally, uniformly convex on disk and with transverse striation there, near base with sharp subulate spinules forming continuous or medially interrupted transverse band. Mesonotum transverse, with faint angularly produced scutellum posteriorly, in posterior half with very minute, slightly sclerotized spinules forming tuft. Metanotum convex, broadly rounded posteriorly, lustrous, posterior to middle with minute spinules forming common tuft. Femora somewhat clavate.

Abdomen elongate, narrows gradually from anterior to posterior end. Abdominal tergites uniformly convex, lustrous, laterally with flat longitudinal impression, medially or immediately posterior to middle with minute acute spinules forming transverse indistinct row or transverse narrow band. Posterior margin of abdominal tergite VII broadly rounded, posterior to middle with four, around posterior margin with two setaceous spinules forming two transverse rows or an indistinct diffuse tuft.

Abdominal tergite VIII lustrous, medially with pair of transverse broadly separated spinules, or without them. Tip of abdomen rounded. Valvifers of female minute, hemispherical, highly contiguous. Body length 10 to 14 mm, width of abdomen 3.5 mm.

Material: Collected in Ob' region, Altai, Salair, Tuva, Ussuri-Pri-
 141 mor'e region, and Sakhalin. Adult insects 49, larvae 63, pupae—one male and four females, larval and pupal exuviae with beetles from cells seven.

Distribution: West from Altai and Central Ob', east to Sakhalin inclusive, northern Mongolia, northeast China, and Korea. Distributed in maximum numbers in southeastern regions of western Siberia and southern parts of eastern Siberia.

Biology: Inhabits spruce, fir, maple, and pine. Found in strip pine forests of Kulunda. Flight of beetles prolonged, commencing mid-June and ending in July. Stray insects even found in first half of September.

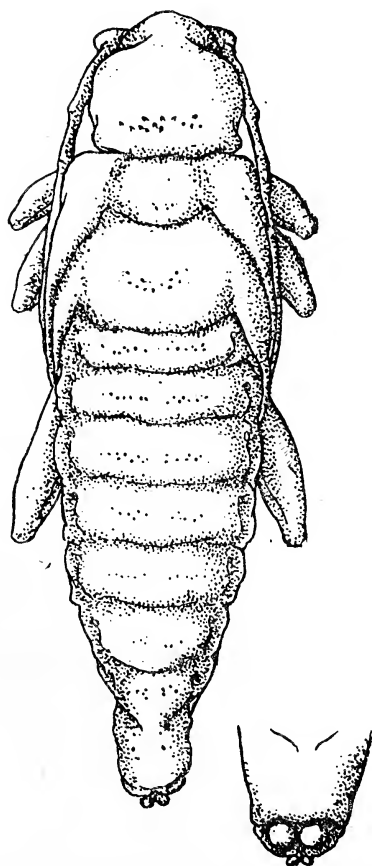


Figure 82. Pupa of *Pronocera brevicollis* (Geb.).

Beetles lead cryptic mode of life, not seen on flowers. During reproduction found on drying trees. After mating, female oviposits in bark crevices. Inhabits branches and tops of mature trees, sometimes undergrowth. Diameter of colonized shoots 1.0 to 12.0 cm. We did not find it on trunks with thick bark. Young larvae seen from July through September.

Larvae live under bark, make longitudinal meandering galleries deeply impressed in alburnum (up to 2.0 mm), and plug them with fine frass. Galleries sometimes narrow, sometimes broader, sometimes like platforms. Before second hibernation larva bores wood, usually at an angle of 45°, leaves transversely elongate-oval opening (3.0 to 5.0 mm wide) on surface, and plugs it with frass. Longitudinal gallery in wood at depth of 0.4 to 3.5 cm. After second hibernation larva makes cell in this gallery and pupates there with its head toward inlet. Length of gallery under bark 18 to 20 cm, width from 0.2 cm initially to 1.5 cm at end.

142 Total area of gallery under bark up to 16 cm². Length of gallery in wood 2.1 to 5.1 cm, width 0.4 to 1.0 cm.

Pupation occurs from May through June. Beetles emerge two weeks after pupation. In the laboratory, at 21°C a beetle emerged from a pupa in 13 days and another beetle in 16 days. Young beetles push frass away from inlet, nibble flight opening (4.0 to 5.0 mm in diameter) on bark surface, and abandon cell through it. Emergence of beetles from wood commences in June and ends in July. Beetles emerge from wood with underdeveloped gonads. Weight of larvae before pupation 30 to 76 mg, pupae 25 to 68 mg, and young beetles before emerging from wood 14 to 52 mg. Weight reduction during metamorphosis is illustrated by these three specimens. Larva before pupation weighed 162 mg (100%), pupa 142 (87.6%), and young beetle formed from pupa before emerging from wood 109.8 mg (67.8%), i.e., in this period the total weight reduction was 32.2%. Generation completed in two years (Table 12).

Pronocera brevicollis (Gebl.) damages mainly spruce, more rarely other species. For example, during forest inspections we found 84 insects in larval, pupal, and adult stages; of these, 67 came from spruce (*Picea obovata*), five from Siberian maple (*Pinus sibiricus*), 11 from pine

Table 12. Periods of development of *Pronocera brevicollis* (Gebl.)

Year of development	April	May	June	July	August	September	October
1st	L	LP	LPA	PAEL	AEL	AEL	L
2nd	L	L	L	L	L	L	L
3rd	L	LP	LPA	PAEL	AEL	AEL	L

P. sylvestris), and one from fir (*Abies sibirica*). *Molorchus minor* (L.) and *Pogonocherus fasciculatus* Deg. sometimes colonize the same shoots together with this species.

4. Genus *Semanotus* Muls.

Mulsant, 1839, *Col. France Long.*, p. 154; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 274-275; Gressitt, 1951, *Longicorn Beetles of China*, vol. 2, p. 221; Linsley, 1964, *Cerambycidae of North America*, 22, 5, 18-19; Mamaev and Danilevskii, 1975, *Lichinki zhukov-drovosekov*, pp. 196-198.

Adult: Characterized by dense punctation on head, comparatively short antennae, extending in female beyond 0.50 length of elytra, in male beyond apex of elytra or even not reaching it. Eyes deeply emarginate. Pronotum rounded laterally, with long erect hairs, on disk with glabrous elevated shields with dense deep punctation between them. Prosternal process long, reaches posterior margin of forecoxae. Elytra with parallel sides, insignificantly convex, with white sinuous or straight transverse bands. Femora clavate. First segment of hind tarsi equal to two successive together.

Larva: Very similar to larvae of the genus *Rhopalopus*. Differs in ocelli not visible near antennal bases. Parietals medially with hairs forming dense transverse band. Pronotum in anterior half with vague yellowish-rust spots, laterally and on disk with light rusty hairs. Pronotal scutum bound laterally by long longitudinal grooves, with minute longitudinal striation. Thoracic legs short, with small, slightly sclerotized claw. Locomotory ampullae developed on abdominal segments I to VII, with very minute reticulate-squamiform or shagreen sculpture, imparting matte tone, separated dorsally on anterior margin by transverse arcuate or bracketlike groove, ventrally with short lateral longitudinal grooves.

Pupa: Characterized by head slightly bent under, insignificantly convex frons between antennae, and broadly rounded occiput. Antennae pressed to sides, in second half ventrally arcuate. Pronotum uniformly convex, rounded laterally, glabrous, without spinules. Abdominal tergites in posterior half with very delicate, barely visible or fully developed (especially on tergites V to VII) spinules.

The genus *Semanotus* Muls. developed in the early phase of coniferous forest formations and occurs in the Holarctic. In USSR fauna four species are known, of which two inhabit northern Asia; Southeast Asia is characterized by five species and North America by four. All species of this genus are ecologically associated with coniferous woody plants.

Type species: *Cerambyx undatus* Linnaeus, 1758.

KEY TO SPECIES

Adult Insects

- 1 (2). Bases of elytra black. Transverse white bands on elytra sinuous. Palearctic 1. **S. undatus** (L.).
- 2 (1). Bases of elytra red or reddish-rust. Transverse white bands on elytra not sinuous, with straight margins. East Asia 2. **S. bifasciatus** Motsch.

Larvae

- 1 (2). Abdominal sternite VII with two sclerotized lobes bent inward. Found on trunks and branches of spruce 1. **S. undatus** (L.).
- 2 (1). Abdominal sternite VII without sclerotized lobes. Found on juniper. 2. **S. bifasciatus** Motsch.

Pupae

- 1 (2). Body narrowly elongate. Abdominal tergites V to VII with weak spinules 1. **S. undatus** (L.).
- 2 (1). Body broad, less elongate. Abdominal tergites V to VII with large distinct spinules 2. **S. bifasciatus** Motsch.

1. **Semanotus undatus** (L.)

Linnaeus, 1758, *Syst. Nat.*, 10th ed., p. 396 (*Cerambyx*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 277-280; Duffy, 1953, *Monograph Immat. Stages of British and Imported Timber Beetles*, p. 214; Demelt, 1966, *Tierwelt Deutschlands*, vol. 2. pp. 69-70; Cherepanov and Cherepanova, 1973, *Nov. i maloizv. vidy fauny Sibiri*, 6th ed., pp. 59-61.

Adult (Figure 83): Readily recognized by long hairs on pronotum and yellow transverse sinuous bands on elytra. Head with very dense punctation, brownish hairs; transversely convex between antennae, with smooth median longitudinal suture, flat between upper ocular lobes. Eyes finely faceted, broadly and deeply (almost up to posterior margin) emarginate. Antennae slender, extend beyond apex (male) or barely beyond 0.50 (female) of elytra. First segment of antennae notably longer than 5th, with very dense and much longer hairs; successive segments with dense, very short, compactly adherent hairs.

Pronotum transverse (female) or not wider than long (male), broadens in anterior half, rounded laterally, narrows less anteriorly, more posteriorly, with dense punctation, long light brown, sometimes dense hairs, with smooth convex shields on disk, two anterolateral to middle,

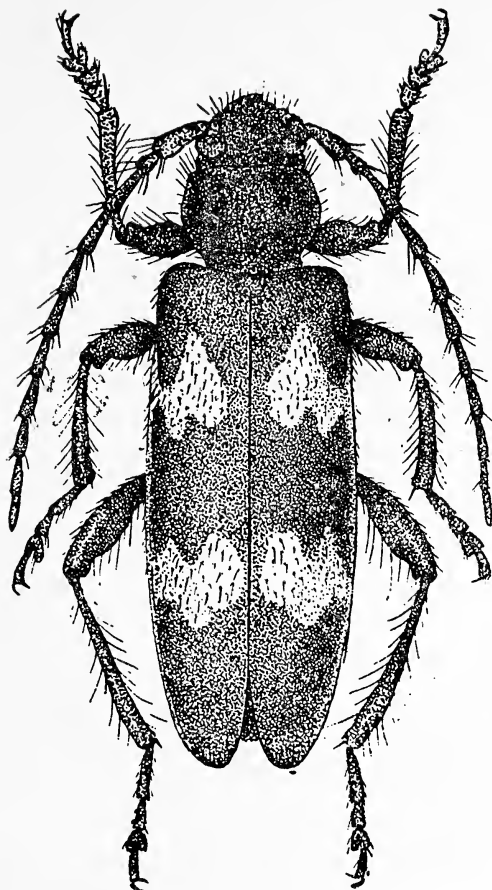


Figure 83. *Semanotus undatus* (L.).

two posterolateral, and one between them medially. Sometimes lateral shields fuse to form two smooth longitudinal bands. Scutellum small, broadly rounded posteriorly, with adherent hairs.

Elytra with parallel sides, convex, individually rounded apically, somewhat compressed on suture posterior to scutellum and posterior to middle, with coarse punctation, semiadherent brown hairs. Femora thicken gradually almost from base to apex, with long clava. First segment of hind tarsi longer than two successive together. Body ventrally with adherent and erect, sometimes dense hairs. Body black, femora dark brown, tibiae and tarsi more rusty, antennae dark brown or reddish-rust. Elytra dark brown or black, with two transverse, broad, sinuous, light yellow bands, one in anterior half, the other posterior to middle, more often shortened on suture (f. *typica*), sometimes extended from lateral margin to suture (ab. *transversefasciatus* Plav.), more rarely reduced to stray

spots (ab. *biinterruptus* Plav., ab. *semireductus* Plav., and ab. *quadri-lunatus* Hell.). Body length 8.0 to 15.0 mm.

Egg: White, elongate, almost identically rounded at poles. Chorion smooth, lustrous, transparent. Length 1.6 to 1.8 mm, width 0.5 to 0.6 mm.

Larva (Figure 84): Readily recognized by sclerotized lobes on abdominal sternite VII. Head narrowly rounded anteriorly. Epistoma notably convex, with broad, longitudinally striate, dark brown border on anterior margin, distinctly projecting longitudinal brown suture in posterior half, and fuses laterally with parietals. Frontal sutures not visible. Hypostoma short, slightly convex, almost flat, laterally with straight parallel sutures, on anterior margin with very narrow brownish border. Parietals with short setaceous hairs forming medial transverse band extending from hypostoma to frontal plate (epistoma), on anterior margin with broad brownish-rust border encircling antennal sockets. Antennae short, 145 project insignificantly beyond anterior margin of cephalic capsule. Clypeus trapezoid, light brown. Labrum slightly elongate, narrowly rounded apically, barely narrows toward base, in anterior half with short setae. Mandibles thick, broadly rounded apically, dark red basally, with transverse groove on outer side at junction of red and black parts. Inner masticatory lobes of maxillae thick, taper apically and with short setae there. Maxillary palps somewhat longer than inner lobes.

Pronotum 2.0 times wider than long, transverse yellow band in anterior half on disk separated medially by white clearance into two even transverse tetragonal spots, laterally and in zone of yellow spots with dense rusty hairs, before scutum with sparse, much shorter hairs. Pronotal scutum white, slightly convex, with faint longitudinal striation bound laterally by long straight longitudinal grooves. Prothoracic presternum laterally with denser hairs, on disk with moderately dense rusty 146 hairs; eusternum glabrous, rugulose, anteromedially divided by hairy clearance into two plates. Legs small but well developed, brownish-yellow or brown and lustrous; claw short.

Abdomen laterally with short rusty hairs. Dorsal locomotory ampullae slightly convex, with common median longitudinal groove, transverse groove in front, recurved lateral groove, with fine sculpture imparting matte silvery tone. Ventral locomotory ampullae laterally with longitudinal grooves, medially with transverse groove joining them. Abdominal sternite VII with two lobular sclerotized processes lateral to locomotory ampulla; lobes bend down and inward. Body length of mature larva 15 to 20 mm, width of head 2.1 mm.

Pupa (Figure 85): Characterized by absence of spinules on pronotum, presence of weak spinules on abdominal tergites. Head short and glabrous, without setae and spinules, transversely convex between antennae,

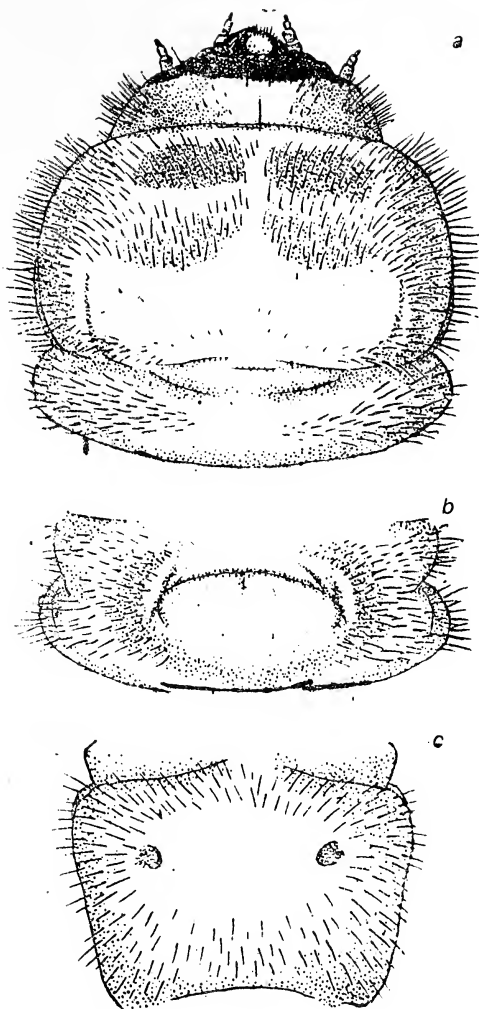
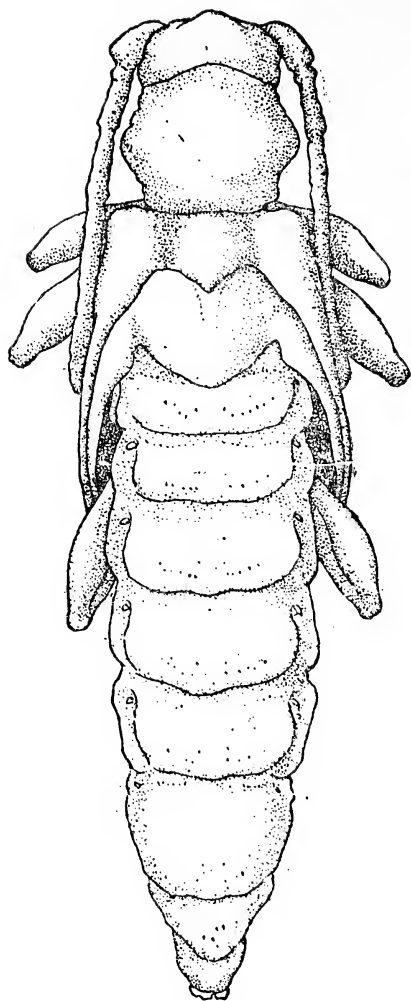


Figure 84. Larva of *Semanotus undatus* (L.).

a—head and pronotum; b—abdominal tergite IV with dorsal locomotory ampulla; c—abdominal sternite VII.

flat or flatly impressed between upper lobes of eyes, rounded and lustrous on occiput. Antennae pressed to sides, arcuate in second half.

Pronotum laterally slightly rounded, with almost parallel sides, broadly rounded on posterior margin, uniformly convex on disk, transversely very finely and densely striate, glabrous, without setae or spinules. Mesonotum convex, with angularly or conically produced scutellum posteriorly, in posterior half with short setae visible under high magnification, without spinules. Metanotum broad, uniformly convex, without median longitudinal groove, lustrous, with or without weak setae.

Figure 85. Pupa of *Semanotus undatus* (L.).

Abdomen elongate, broadens slightly in region of segment IV, narrows gradually posteriorly. Abdominal tergites uniformly convex, without median longitudinal groove, in posterior half with weak spinules forming transverse row. Tergite VII more elongate, narrowly rounded posteriorly, in posterior third with fine spinules forming common tuft. In female tip of abdomen more produced, valvifers large, hemispherical, highly contiguous. Body length 10 to 15 mm, width of abdomen 3.5 mm.

Material: Collected in western and eastern Siberia, in Ussuri-Primor'e region. Adult insects 192 (including 119 raised in the laboratory from larvae collected in nature), larvae 190, pupae—nine males and five females, larval exuviae with beetles from cells 14.

Distribution: Palearctic, from Atlantic to Pacific Ocean, northern boundary of range of coniferous forests to central Europe, northern Mongolia, northern China, and Korea. Found in large numbers in forests of foothills and hills of southern Siberia.

Biology: *Semanotus undatus* (L.) lives in coniferous forests and is ecologically associated with spruce. Beetles fly from May through July. Found on withering and physiologically weakened trees; not seen on flowers. Female lays eggs singly in bark crevices. Weight of egg just laid 0.25 mg. Female can lay about 50 eggs in her lifetime. Beetles mate the very day of emergence from wood and female begins to oviposit two days later. Colonizes trunks of wind-fallen and standing drying trees.

Incubation period of eggs extends up to two weeks. In the laboratory at 14.6 to 19.6°C (average 17.5°C) larvae hatched in one experiment 11 days after oviposition, and in two other experiments in 12 to 13 days. Larvae rupture the chorion, bore bark, make longitudinal galleries, and plug inlet with fine frass. Galleries under bark meandering, width 0.3 to 0.7 mm, deeply impressed in wood, with steep, sharp, or gentle walls, sometimes fuse to form common area. One such platformlike gallery, made by a single larva, was 6.5 cm long, 2.5 to 3.8 cm wide, with four small branches 0.7 to 1.1 cm wide. In one of these branches the larva had bored wood. Total area of gallery under bark 25 cm².

Mature larvae bore wood to a depth of up to 2.5 cm, make longitudinal hollow gallery, and do not fill it with frass. Length of longitudinal gallery in wood 3.0 to 10.0 cm, width 0.6 cm. Inlet into wood plugged with frass, elongate along trunk, its width 0.4 to 0.6 cm. At end of hollow gallery (blind alley) larva makes cell, seals it off from gallery with plug of fine frass, then pupates with head toward plug. Length of cell 1.4 to 2.3 cm, width 0.35 to 0.60 cm. Length of plug between cell and hollow gallery up to 1.4 cm. Pupal cells in wood at depth of 0.2 to 4.0 cm or more.

According to our observations in Salair, larvae begin to pupate in midsummer, mainly in first and second 10 days of July. Pupal development at an average daily temperature of 19.7°C takes 20 to 28 days, average 24.3 ± 0.8 days. Beetles emerge from pupae at end of July and in August, but remain in cells for hibernation. In spring, with the onset of warm weather, beetles rupture plug sealing cell, push back frass, penetrate bark through hollow gallery and larval inlet, nibble oval flight opening (0.3 to 0.4 cm wide) in surface, and exit. Emergence of hibernating beetles from wood commences in May and ends in June. Some mature larvae remain in cell for second hibernation and pupate in May or early June. Young beetles developing from these pupae emerge from wood within a week and begin to reproduce almost immediately. Beetles not seen on flowers and do not require supplementary feeding; they

emerge from wood with developed gonads. For example, ovaries of one female dissected just after emergence from wood contained 45 eggs, of which 38 were mature. Another female on emerging from wood laid 25 eggs in a garden, and another 14 eggs were found in her ovaries on dissection.

Weight of mature larvae at time of entry into wood increases up to 178.0 to 295.5 mg but decreases considerably in prepupal stage. During metamorphosis insects lose an average of up to 31.5% weight. For example, 12 insects under observation in the laboratory weighed 842 mg (100%) in the larval stage before pupation, pupae developed from them 749.9 (89%), and young beetles 578.3 mg (68.5%). Records of 37 insects established: weight of larvae before pupation 23.0 to 107.5 mg (68.9 ± 3.4), pupae 21.5 to 103.0 mg (62.3 ± 3.2), and young beetles 148 before emerging from cells 17.5 to 90.0 mg (49.1 ± 2.6). One newly emerged beetle (female) recovered from a cell weighed 116 mg.

Under laboratory conditions at room temperature life cycle from time of oviposition to emergence of adult was completed in about 13 months (refrigerated June–August). In nature life cycle completed in two years (Table 13).

147

Table 13. Periods of development of *Semanotus undatus* (L.)

Year of development	May	June	July	August	September	October
1st	A	AE	AEL	EL	EL	L
2nd	L	L	L	LPA	PA	A
3rd	A	AE	AEL	EL	EL	L

Semanotus undatus (L.) inhabits drying and physiologically weakened spruce (*Picea obovata*). We did not find it on any other species. While inspecting forests, 257 insects were collected from trees in larval, pupal, and adult stages. From the larvae collected in nature, 119 beetles were raised, all of them on spruce trunks. Population density was comparatively high. For example, from a spruce trunk 20 cm in diameter at chest height and 10.8 m high, 178 mature larvae were recovered from wood. Over 16 larvae were recovered from each meter length of the trunk. Trunk riddled with an extensive network of larval galleries.

Pogonocherus fasciculatus Deg., *Molorchus minor* (L.), and *Saperda interrupta* Gebel. are often recovered with this species from branches, and *Clytus arietoides* Reitt., *Monochamus saltuarius* Gebel., and others simultaneously from the same trunks.

2. *Semanotus bifasciatus* Motsch.

Motschulsky, 1875, *Bull. Soc. Nat. Moscow*, 49, 1, 149; = *sinensis*, Gahan, 1888, *Ann. Mag. Nat. Hist.*, 6, 2, 61; = *ab. fasciatus*, Plavilstshikov [Plavil'shchikov], 1934, *Best. Tabel. Entom. Coleopt.*, vol. 112, p. 186; = *ssp. sincauster*, Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 222; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 276-277; Kojima and Okabe, 1960, *Food Plants of Japan. Cerambycidae*, pp. 123-124; Ivliev and Kononov, 1972, *Trudy Biologo-Pochv. In-Ta DVNTs AN SSSR*, 7, 110, 100.

Adult (Figure 86): Well distinguished from *S. undatus* (L.) by markedly hairy pronotum and elytra with nonsinuuous transverse white bands. Head with dense deep punctation, spaces between punctures smaller than punctures, with erect brownish hairs, with or without narrow median longitudinal suture. Eyes minute but sharply faced, broadly emarginate, with narrow septum between ocular lobes, and one or two rows of facets. Antennae shorter than body; apices reach hind clivus of elytra (male) or slightly beyond 0.50 elytral length (female); 1st segment with

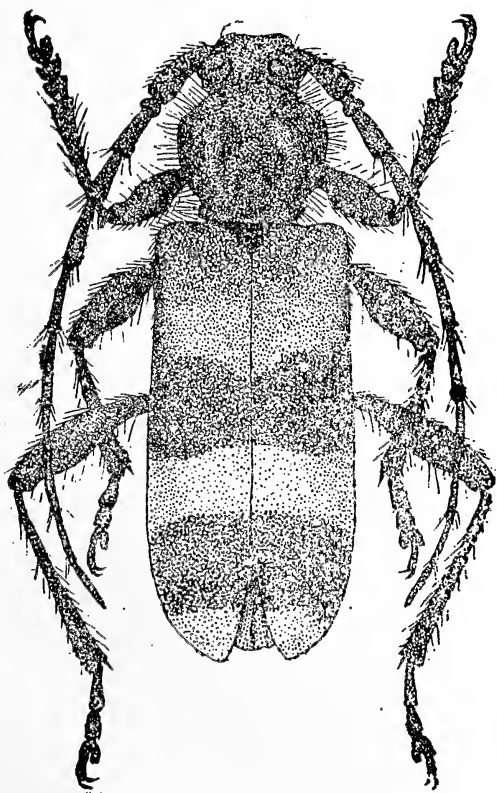


Figure 86. *Semanotus bifasciatus* Motsch.

dense long semiadherent hairs, remaining segments with very short adherent hairs; 5th to 10th segments angularly produced apically.

Pronotum equal in width and length, broadens roundly in anterior half, gently toward posterior margin, narrows abruptly anteriorly, convex on disk, with dense large deep punctation, laterally with dense long erect hairs, with five smooth convex shields, two anterolateral, two posterolateral, and one usually longitudinally elongate posteromedial. Anterolateral shields usually circular, posterolateral ones longitudinally elongate; sometimes latter well developed and join anterolateral ones or, contrarily, reduced, even absent in some specimens. Scutellum flat, broadly rounded anteriorly, with sparse minute hairs.

Elytra comparatively broad, with parallel sides, convex, individually rounded apically, basally in front of anterior white band and also in region of white bands with large flat punctation, elsewhere with fine dense punctation, with short semiadherent hairs (on black background black, on white background light colored), around suture with long erect
 149 white hairs forming longitudinal distinct row. Femora clavate; hind femora with long insignificantly thickened clava. First segment of hind tarsi equal to two successive ones. Body ventrally with long semi-adherent light brown hairs, looks densely hairy. Body black, antennae dark brown, apically dark rust. Legs black or dark brown, tarsi with rusty tinge. Elytra in anterior third reddish-rust, anterior to middle with narrow white band, anterior to posterior third with broad transverse white band slightly curved anteriorly, white apically; black or blackish-brown between white transverse bands and also behind posterior bands. Impression created of elytra with red base, white apex, two white narrow and two black much broader transverse bands (f. *typica*). Other forms (ab. *fasciatus* Plav., ab. *latifasciatus* Matsuch.) with minor differences. Only ssp. *sincauster* Gress. differs from nominal form in very smooth, not coarse punctation in region of medial black band on elytra. Latter in anterior half or only posteriorly appears rugose. Length 8.0 to 14.0 mm.

Egg: White, elongate, broadly rounded at one pole, narrows markedly toward the other and pointed. Chorion smooth, lustrous, transparent. Length 2.1 mm, width 0.4 mm.

Larva (Figure 87): Similar to larva of *S. undatus* (L.). Differs in markedly oblique, almost transverse striation on anterior margin of epistoma and absence of sclerotized lobes on abdominal sternite VII. Half of head retracted into prothorax; general outline of head broadly rounded anteriorly. Epistoma insignificantly convex, whitish, with broad
 150 dark brown border on anterior margin and almost transverse striation, in posterior half with distinct median suture. Frontal sutures not visible. Hypostoma laterally with straight sutures, in anterior half with transverse striation, on anterior margin with narrow clavate border. Gula

basally insignificantly broadened, narrows moderately, anteriorly, notably elongate. Parietals more yellowish, on anterior margin with broad brownish-rust border encircling articulate antennal sockets, around base of antennae without perceptible ocelli, medially with dense rusty hairs forming transverse band dorsally up to epistoma. Antennae comparatively long, project beyond anterior margin of cephalic capsule. Clypeus short, very broad, projects as narrow band from behind anterior margin of epistoma. Labrum transversely oval, with broadly rounded anterior margin, in anterior half with short setae, whitish, basally brownish. Mandibles apically broadly rounded, black, on outer side with lac sheen, reddish basally. Inner masticatory lobes of maxillae thicken slightly toward apex, white and broadly rounded apically, with short light-colored setae there. Maxillary palps basally thick, narrow conically apically, slightly longer than inner masticatory lobes.

Pronotum almost 2.5 times wider than long, in anterior half with two transverse, tetragonal, rusty-yellow spots, laterally and on disk with light rusty hairs forming transverse band in zone of rusty spots. Anterior to scutum hairs comparatively short and sparse. Pronotal scutum white,

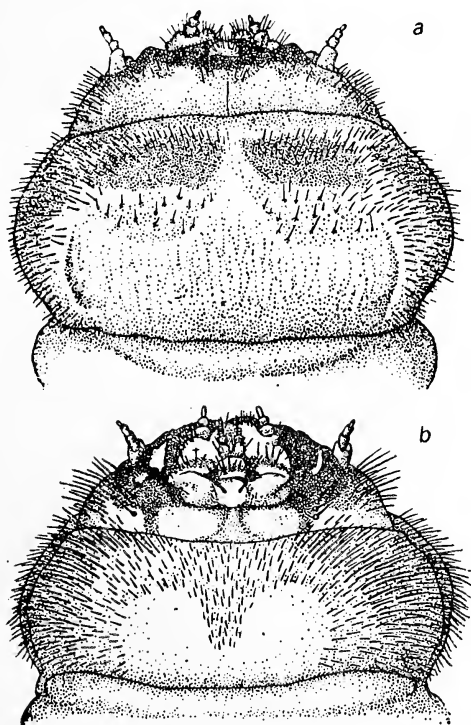


Figure 87. Larva of *Semanotus bifasciatus* Motsch.
a—head and pronotum; b—prothorax.

moderately convex, bound laterally by longitudinal grooves that are insignificantly outcurved, slightly produced forward on anterior margin medially and laterally, with minute, barely perceptible longitudinal striation. Prothoracic presternum laterally with long hairs and on disk with shortened rusty hairs; eusternum in form of two glabrous, circular, rugulose plates separated in front by comparatively broad hairy clearance. Thoracic legs minute, with acicular, slightly sclerotized claw.

Abdomen laterally with short, not very dense light-colored hairs. Dorsal locomotory ampullae insignificantly convex, with faint common median longitudinal groove, on anterior margin with transverse groove that is laterally arcuate or posteriorly bracketlike, with minute shagreen or reticulate-squamiform sculpture, matte silver. Ventral locomotory ampullae laterally with short longitudinal grooves, on sternite VII with deep transverse groove, laterally without sclerotized lobes. Body length of mature larvae 16 to 20 mm, width of head 2.8 mm.

Pupa: Differs from pupa of *S. undatus* (L.) in very broad body. Head short, slightly bent under, glabrous, without spinules, barely convex between antennae, flat between upper ocular lobes, uniformly rounded on occiput. Antennae pressed to sides, ventrally arcuate in second half.

Pronotum broadens in anterior half, narrows gradually posteriorly, insignificantly convex on disk, lustrous, without spinules. Mesonotum almost equal in length and width, with slightly produced scutellum posteriorly. Metanotum uniformly convex, without median longitudinal groove.

Abdomen flat, broadens in middle, gradually narrows posteriorly. Abdominal tergites on posterior margin with minute spinules forming transverse row or transverse band. Tergite VII with large spinules forming extensive tuft in posterior half. Body length up to 16 mm, width of abdomen up to 4.0 mm.

151 *Material:* Collected in Ussuri-Primor'e region (Suvorovka River near Zmeinaya hill). Adult insects 15 (raised from larvae collected in nature), larvae 10 (of which five raised from eggs laid by beetles in the laboratory), pupa one (injured), larval and pupal exuviae from cells with beetles six.

Distribution: Ussuri-Primor'e region, northeast China, Korea, and Japan.

Biology: Inhabits coniferous forests and ecologically associated with juniper. Beetles fly from June through August. Found on trunks of wind-fallen and standing withering trees, mate there, and oviposit in bark crevices. One female can lay 48 eggs in her lifetime. In the laboratory beetles begin to reproduce soon after emerging from wood. Larvae hatch from eggs 11 to 16 days (average 14 days) after oviposition. Nineteen eggs were kept under observation. Atmospheric temperature during this period 11.0 to 20.6°C (average 17.4°C).

Larvae live under bark, make meandering galleries that broaden gradually or sharply, terminate in platform deeply imprinted in alburnum, and plug them with fine frass. Width of gallery imprinted in sapwood initially 0.2 cm, then 0.9 cm, and at end of platform up to 1.6 cm. Length of gallery up to 11 cm or more. Mature larvae bore wood, leaving an oval inlet on surface that is transversely elongate or oblique to axis of trunk. Width of inlet 0.6 cm. Larva makes cell along trunk in wood to a depth of 2.0 cm or more and pupates in it with head toward inlet plugged with frass. Sometimes cell disposed in wood not along trunk but radially. Length of cell up to 2.1 cm and width 0.9 cm. Length of plug of fine frass sealing cell from inlet opening 0.9 cm. Pupae seen at end of summer; beetles emerge by autumn and hibernate in pupal cells.

Young beetles emerge from wood in June, break plug around inlet, push back frass, reach bark, nibble oval flight opening, and emerge from wood. Dimensions of opening 3.0 mm × 5.5 mm. Weight of beetles just emerging from wood 53.4 to 81.7 mg, average 63.6 mg (five insects weighed). Generation completed in two years.

Semanotus bifasciatus Motsch. inhabits trunks and thick branches of juniper (*Juniperus rigida*). For example, on a cutting 64 cm long and 5.0 to 7.5 cm in diameter, 11 adults and one larva were found in wood. On the same cutting, under bark, 15 insects (larvae, pupae, and adults) of *Atimia nadezhdae* Tsher. were also recovered simultaneously.

In Japan, Korea, and China this species colonizes *Juniperus*, *Chamaecyparissus*, *Thuja*, and *Thujopsis*.

5. Genus *Oupyrrhidium* Pic

Pic, 1900, *Catal. Longic.*, p. 50; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 285–286 (*Oupyrrhidium*); Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 226.

Adult: Differs from those of other genera of this tribe in long 3rd antennal segment, fairly long prosternal process, and sharply dilated, comparatively short clava of hind femora. Head with dense punctation and adherent hairs. Eyes deeply emarginate. Antennae long, slender; 3rd segment longer than 5th. Pronotum laterally rounded, with very dense minute punctation, short adherent hairs. Elytra elongate, with parallel sides, individually broadly rounded at apex, matte, with longitudinal 152 ribs. Prosternal process pointed apically, with apex almost reaching posterior margin of forecoxae. Femora sharply clavate, markedly convex apically. First segment of hind tarsi considerably longer than two successive together.

Larva: Legs poorly developed, very short. Epistoma longitudinally weakly striate only medially on anterior margin, laterally smooth.

Parietals glabrous in middle, with stray hairs around brownish-rust border on anterior margin. Locomotory ampullae developed on abdominal segments I to VII, with minute furrows imparting characteristic sculpture, with silvery sheen.

Pupa: In arrangement of spinules very similar to pupae of *Pronocera* Motsch. Well distinguished, however, in sharply clavate femora. Head short. Second half of antennae bent ventrad, looplike. Pronotum longitudinally oval, usually with biapical spinules mediobasally. Meso- and metanota on posterior margin or behind middle with minute spinules forming one small tuft each. Abdominal tergites in posterior half with minute mono- or biapical spinules forming transverse row, transverse band, or one small paramedial tuft each. Abdominal tergite VII transverse (male) or elongate (female), with single tuft of minute spinules in posterior half.

Opyrrhidium Pic is a monotypic genus characteristic for eastern regions of Asia, and probably evolved in broad-leaved forests at commencement of Quaternary period.

Type species: Callidium cinnabarinum Blessig, 1872.

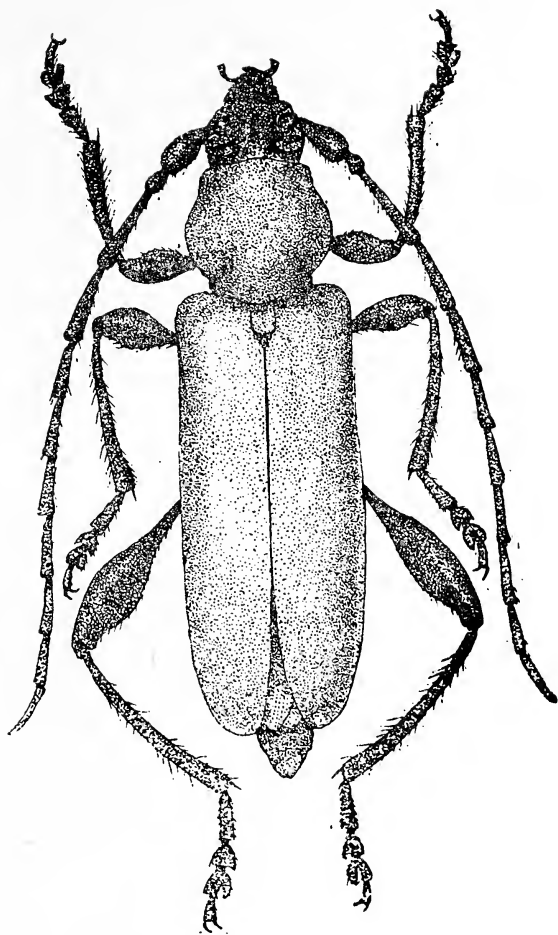
1. *Opyrrhidium cinnabarinum* (Bless.)

Blessig, 1872, *Horae. Soc. Entom. Ross.*, vol. 9, p. 179 (*Callidium*); Pavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 286-287 (*Opyrrhidium*); Gressitt, 1951, *Longicorn Beetles of China*, vol. 2, p. 226.

Adult (Figure 88): Characterized by flat body and vermilion elytra. Body elongate, flat, head transversely convex between antennae, with narrow median longitudinal suture extending onto vertex, with minute extremely dense punctation, dense adherent reddish hairs on vertex, elsewhere sparse gray hairs. Eyes emarginate almost up to posterior margin. Antennae longer than body; 9th (male) or 10th (female) segment extends beyond elytral apex; 1st segment thick (female) or slightly elongate (male), not longer than 3rd segment, with large punctation.

Pronotum somewhat longer than wide, unevenly rounded laterally, narrows more posteriorly, less anteriorly, with very dense minute punctation, dense adherent red hairs directed forward throughout disk from posterior to anterior margin, dark brown hairs laterally in anterior half forming one large black spot on each side. Scutellum longitudinal, flat, broadly rounded at apex, with minute punctation, and short dense adherent reddish hairs.

Elytra elongate, flat, with parallel sides, individually broadly rounded at apex, slightly impressed around humeri, with longitudinal ribs (two or three ribs each), very dense minute punctation imparting matte tone, and minute semiadherent, barely visible, reddish hairs. Legs long; femora clavate, highly convex in second half; hind tibiae somewhat curved.



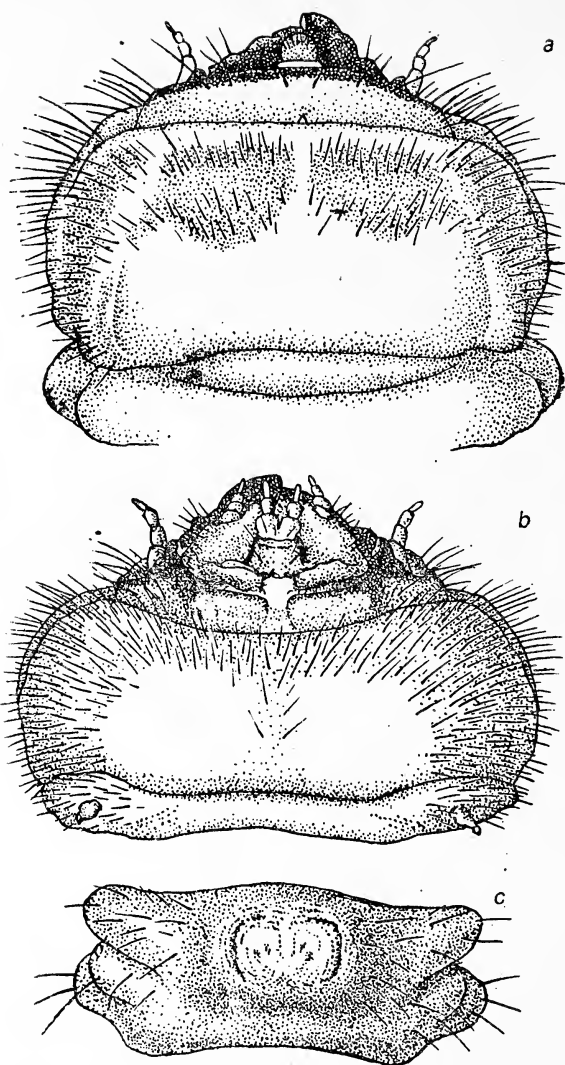
154

Figure 88. *Oupyrrhidium cinnabarinum* (Bless.).

First segment of hind tarsi 1.5 times longer than two successive together. Abdominal sternite V transverse, posteriorly truncate (male) or elongate, 153 narrowly rounded posteriorly (female). Body, antennae, and legs black; tarsi rusty; pronotum red on disk, black laterally; scutellum and elytra vermilion (f. *typica*); pronotum sometimes entirely black (ab. *nigricollis* Plav.). Body length 7.0 to 17.0 mm.

Egg: White, elongate, somewhat thickened in one half, rounded at poles. Chorion smooth, without perceptible sculpture. Length 1.4 to 1.8 mm, width 0.5 mm.

Larva (Figure 89): Head narrows somewhat anteriorly, with almost parallel sides. Epistoma slightly convex, divided medially by distinct longitudinal suture, laterally without distinct frontal sutures, on anterior margin with narrow dark brown border, in middle with longitudinal



155

Figure 89. Larva of *Oupyrhridium cinnabarinum* (Bless.).
a—head and pronotum; b—prosternum; c—abdominal
tergite IV.

striation, smooth around anterior angles, with setaceous hairs behind border forming transverse row. Hypostoma short, on anterior margin with smooth narrow brownish border, in anterior half with faint transverse furrows or without them. Parietals on anterior margin with narrow rusty-brown border, behind which stray hairs in anterior half do not form distinct tuft. Antennae slender, with apices barely projecting beyond anterior margin of cephalic capsule. One unevenly pigmented ocellus

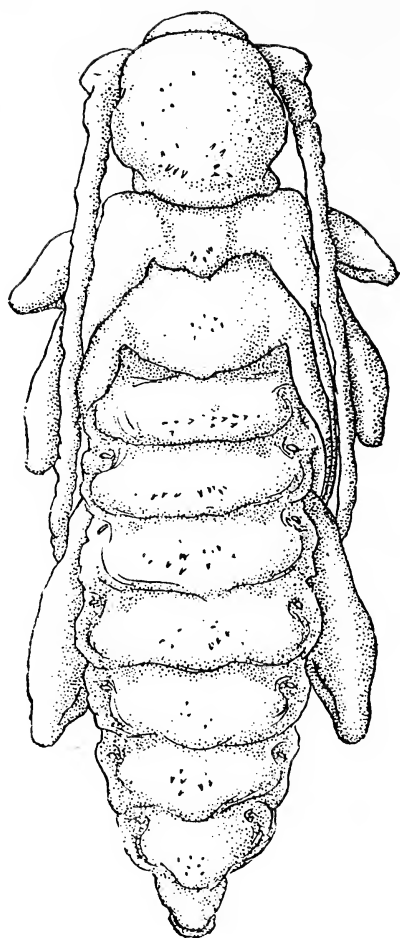
near each base of antennae ventrally. Clypeus short, projects from behind epistoma as narrow band. Labrum small, whitish, rounded or narrowly rounded anteriorly, with short setae. Mandibles on outer side with transverse groove, black, basally reddish-rust. Inner masticatory lobes of maxillae thick, lustrous, narrowly rounded apically, distinctly shorter than maxillary palps.

Pronotum in anterior half with pair of large yellow or yellowish-rust spots, short fine rusty hairs laterally and on disk forming two transverse bands, one denser along anterior margin of yellow spots, the other less dense anterior to scutum. Pronotal scutum with two emarginations on anterior margin, medial one prominent, with anterior angles insignificantly produced forward, white, with minute longitudinal striation, fine sculpture at base imparting matte silver tone, and laterally with deep longitudinal grooves. Prothoracic presternum with short erect hairs on disk, laterally with long rusty hairs bent down and sideways; euster-num glabrous, rugulose, anteriorly with faint very short hairy septum. Thoracic legs very short, with minute thin claw.

Abdomen laterally with sparse short light-colored hairs. Dorsal locomotory ampullae moderately convex, with minute furrows imparting characteristic sculpture, with silvery hue, common median longitudinal groove, lateral longitudinal grooves, and faint short transverse grooves on anterior margin receding inward from lateral longitudinal grooves. Ventral locomotory ampullae similar in structure, laterally with short grooves flexed angularly in form of small dent near posterior end. Ampullae on abdominal sternite VII divided medially by continuous transverse groove. Body length of mature larva up to 20 to 23 mm, width of head 2.8 mm.

Pupa (Figure 90): In arrangement of spinules on pronotum very similar to pupa of *Pronocera brevicollis* (Gehl.). Differs in markedly clavate (apically dilated) hind femora. Head rounded, between antennae transversely convex, flat on vertex, uniformly rounded on occiput, lustrous. Antennae long, pressed to sides, bent forward, looplike, in second half ventrad.

Pronotum not wider or even narrower than long, broadly rounded 154 laterally, uniformly convex on disk, transversely striate medially in posterior half, basally with biapical spinules forming small tuft. Mesonotum longitudinally elongate, convex, lustrous, with barely extended scutellum posteriorly bearing small tuft of small spinules. Metanotum transverse, rounded broadly on posterior margin, in posterior half medially with minute spinules forming tuft. In some specimens stray spinules replace tuft. Hind femora long, sharply clavate, almost reach posterior margin of tergite VI.



155

Figure 90. Pupa of *Oupyrrhidium cinnabarinum* (Bless.).

Abdomen widens in region of tergites III and IV, narrows slightly anteriorly and markedly posteriorly, more produced at tip in female. Abdominal tergites uniformly convex, laterally with longitudinal, streak-like, slightly convex furrows, in posterior half with mono- or biapical spinules forming one paramedial tuft each (two to five spinules per tuft). On abdominal tergites I and II these spinules form transverse row or transverse band. Tergite VII in male transverse, broadly rounded posteriorly minute spinules around posterior margin form sparse tuft, in female elongate, longitudinal, narrowly rounded posteriorly, posterior to middle with minute dispersed spinules. Valvifers of female oval, transversely slightly elongate, contiguous. Body length 9.0 to 18.0 mm, width of abdomen 3.5 to 4.0 mm.

Material: Collected in Ussuri-Primor'e region (Komarovka, Manzovka, and Volkhovka Rivers). Adult insects 32, larvae 11, pupae—three males and one female, larval and pupal exuviae with beetles from cells three.

Distribution: Southeastern northern Asia, from Khabarov to coast of Sea of Japan, from Sikhote-Alin' to Lake Khanka and Khasan, north-east China, and Korea. Often found in southern areas of Ussuri-Primor'e region.

Biology: Inhabits broad-leaved, mainly oak-elm forests. Prefers clearances, fringes of large forests, and sparse damaged cuttings. Beetles fly from mid-June to end of July. Found only on recently dried and
155 drying shoots of elm and oak, often on seedlings, mate there and oviposit. Female lays eggs under bark strips singly or spaced in batches. Colonizes thin shoots 2.0 to 3.0 cm in diameter. One female can lay up to 48 eggs. Larvae hatch from eggs in two weeks. Larvae hatched from eggs laid in the laboratory in 14 to 16 days. Larvae began hatching on the 19th of July from eggs laid in nature on July 6th.

Newly hatched larva ruptures egg chorion, emerges, and bores bark. Larvae make meandering galleries under bark, deeply impressed in alburnum, and plug them with fine frass. Larval galleries sometimes widen and narrow alternately, and sometimes resemble platforms with rather sharp edges. Length of gallery under bark up to 13 cm, width 0.4 to 1.2 cm. Mature larvae bore wood to a depth of 0.6 to 1.0 cm and nibble pupal cell there along shoot. Width of inlet 5.0 to 6.0 mm. Length of pupal cell 1.8 to 3.4 mm and width 0.5 to 0.6 mm.

156 Larvae pupate after second hibernation. Pupation commences in May, ceases in June. Pupae lie in cells with head toward inlet. Young beetles emerge from pupae in two to three weeks. Weight of larvae before pupation 29.6 to 139.0 mg, pupae 26.5 to 118.8 mg, and young beetles before emerging from cell 21.5 to 98.0 mg. Young beetles nibble oval flight opening (3.0 mm × 2.0 mm to 5.0 mm × 3.5 mm) in bark surface and emerge. Emergence of young adults from wood commences mid-June and ceases early July. Adults begin to reproduce soon after emergence from cells. Usually not seen on flowers. Generation completed in two years (Table 14).

Table 14. Periods of development of *Oupyrrhidium cinnabarinum* (Bless.)

Year of development	April	May	June	July	August	September
1st	L	LP	LPAE	PAEL	EL	L
2nd	L	L	L	L	L	L
3rd	L	LP	LPAE	PAEL	EL	L

Oupyrrhidium cinnabarinum (Bless.) damages thin shoots mainly of elm, more rarely oak, of viable as well as withering trees. Thus of the 49 insects (larvae, pupae, and adults) found by us on shoots, 46 were from elm and three from oak. Population density is illustrated in these examples. On an elm shoot 43 cm long and 2.3 cm in diameter three adults and one pupa were found. On another shoot 40 cm long and 2.0 cm in diameter four larvae were found. Similar population density found on other shoots. *Exocentrus marginatus* Tsher., more rarely *Pterolophisa ussuriensis* Plav., colonize shoots of elm concomitant with this species.

6. Genus *Callidium* (L.)

Fabricius, 1775, *Syst. Entom.*, p. 187; Mulsant, 1839, *Hist. Nat. Col. France Longic.*, p. 42; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 287-291; Gressitt, 1951, *Longicorn Beetles of China*, vol. 2, pp. 223-224; Linsely, 1964, *Cerambycidae of North America*, 22, 528-30; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 72; Cherepanov and Cherepanova, 1973, *Nov. i maloizv. vidy fauny Sibiri*, 6th ed., pp. 53-54.

Adult: Characterized by moderately elongate, comparatively flat body. Head short, frons between antennae, last segment of maxillary palps large, markedly broadened apically. Pronotum transverse, rounded laterally, narrows insignificantly anteriorly, more posteriorly, on disk usually with large and laterally minute punctation. Elytra with parallel sides, with dense minute punctation, without furrows [*C. violaceum* (L.) and others] or broadened from base posteriorly, with large transverse furrows, flatter or flattened posteriorly (*C. aeneum* Deg.). Prosternal process short, does not reach middle of forecoxae, or long, extending far beyond middle of forecoxae. Femora clavate. Hind femora of female do not reach apex of elytra, of male extend almost beyond it.

Egg: White, moderately (*C. aeneum* Deg.) or markedly [*C. chlorizans* (Sols.)] elongate.

Larva: Body moderately elongate. Head small, more or less retracted into prothorax. Epistoma on anterior margin with brownish-rust border on which striation transverse [*C. violaceum* (L.)] or longitudinal and 157 oblique (*C. aeneum* Deg., *C. coriaceum* Payk.), or absent [*C. chlorizans* (Sols.)]. Hypostoma with spinules on anterior margin (*C. aeneum* Deg.) or without them [*C. violaceum* (L.) and others]. Pronotal disk with uniformly rusty hairs forming two transverse fields. In some species basally with sclerotized ringlet (*C. coriaceum* Payk., *C. aeneum* Deg.), in others without ringlet [*C. violaceum* (L.), *C. chlorizans* (Sols.)]. Pronotal scutum with fine dense longitudinal striation, basally with minute shagreen sculpture forming transverse matte silver border. Thoracic legs short, with sharp acicular claw.

Pupa: Characterized by slightly convex frons between antennae. Head lustrous, without setae or spinules, broadly rounded on occiput. Antennae pressed to sides, with apices ventrad (female) or arcuate, directed forward (male). Pronotum transverse, rounded laterally, slightly convex or somewhat flattened on disk. Upper side of body with spinules [*C. violaceum* (L.)] or without them (*C. aeneum* Deg.). Tip of abdomen in male narrowly rounded, in female more extended, without spinules.

This genus is distributed in the Holarctic. No less than 12 species are found in the Palearctic and 17 species in North America; of these, one [*C. violaceum* (L.)] is widespread in Eurasia as well as in North America. Four species are known in northern Asia. All of them are ecologically associated with conifers and mainly colonize drying and withered trees.

Type species: *Cerambyx violaceum* Linnaeus, 1758.

KEY TO SPECIES

Adult Insects

- 1 (4). Prosternal process short, does not reach middle of forecoxae (subgenus *Callidium* s. str.).
- 2 (3). Elytra with parallel sides, uniform on disk, not rugose, without longitudinal carinae, with violet tinge. Eurasia and North America. 1. ***C. violaceum*** (L.).
- 3 (2). Elytra broaden notably from base posteriorly, in posterior half as though flattened, on disk posterior to base coarsely, transversely rugose, with distinct longitudinal carinae, with greenish-bronze hue. Eurasia. 2. ***C. aeneum*** Deg.
- 4 (1). Prosternal process long, elongate, extends far beyond middle of forecoxae (subgenus *Palaeocallidium* Plav.).
- 5 (6). Elytra rusty-brown, with bronze or bluish-bronze iridescence. Eurasia. 3. ***C. coriaceum*** Payk.
- 6 (5). Elytra dark green, with bronze or purplish-bronze metallic iridescence. Northern Asia from Altai to Pacific Ocean coast. 4. ***C. chlorizans*** (Sols.).

Larvae

- 1 (4). Dorsal locomotory ampullae with single transverse groove.
- 2 (3). Hypostoma on anterior margin, lateral to gula, without spinules. 1. ***C. violaceum*** (L.).
- 3 (2). Hypostoma on anterior margin, lateral to gula, with pair of large spinules. 2. ***C. aeneum*** Deg.

- 4 (1). Dorsal locomotory ampullae with two transverse grooves, of which anterior one continuous, posterior one widely interrupted medially.
- 5 (6). Epistoma on anterior margin with dense thin striation. Hairs on pronotal disk basally with sclerotized ringlets. 3. **C. coriaceum** Payk.
- 158 6 (5). Epistoma on anterior margin without striation. Hairs on pronotal disk without basal sclerotized ringlets. . . . 4. **C. chlorizans** (Sols.).

Pupae

- 1 (2). Pro-, meso-, and metanota, and abdominal tergites with spinules. 1. **C. violaceum** (L.).
- 2 (1). Pro-, meso-, and metanota invariably without spinules, abdominal tergites with faint spinules or without them.
- 3 (4). Head broadly concave on vertex. Abdominal tergites without spinules. 2. **C. aeneum** Deg.
- 4 (3). Head not concave on vertex, forming there common plane with frons between antennae. Abdominal tergites with distinct or faint spinules. 4. **C. chlorizans** (Sols.).

1. *Callidium violaceum* (L.).

Linnaeus, 1758, *Syst. Nat.*, 10th ed., p. 395 (*Cerambyx*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 297-298; Duffy, 1953, *Monograph Beetles*, pp. 214-216; Linsley, 1964, *Cerambycidae of North America*, 22, 5, 30-32, Starzyk, 1968, *Przegląd Zoologiczny*, 12, 4, 401-404; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 72; Cherepanov and Cherepanova, 1973, *Nov. i maloizv. vidy fauny Sibiri*, 6th ed. pp. 56-59.

Adult (Figure 91): Characterized by double punctuation on pronotum in male and more uniform large punctuation in female, and violet elytra. Head with large punctuation, markedly retracted into prothorax, transversely convex between antennae, with narrow median longitudinal suture. Eyes finely faceted, straightly truncate posteriorly, deeply emarginate anteriorly on inner side. Antennae barely extend beyond 0.50 (female) or 0.66 length of elytra (male), lustrous in anterior half and matte in posterior half.

Pronotum laterally rounded anterior to middle, sometimes broadens angularly, narrows markedly posteriorly, on disk in posterior half with large punctuation, laterally and in anterior half with dense minute punctuation (male) or dense large punctuation throughout entire surface (female), with sparse erect rusty hairs. Scutellum short, rounded posteriorly, medially impressed, troughlike. Elytra with parallel sides, insignificantly convex, uniform, without longitudinal carinae, apically with narrowly rounded

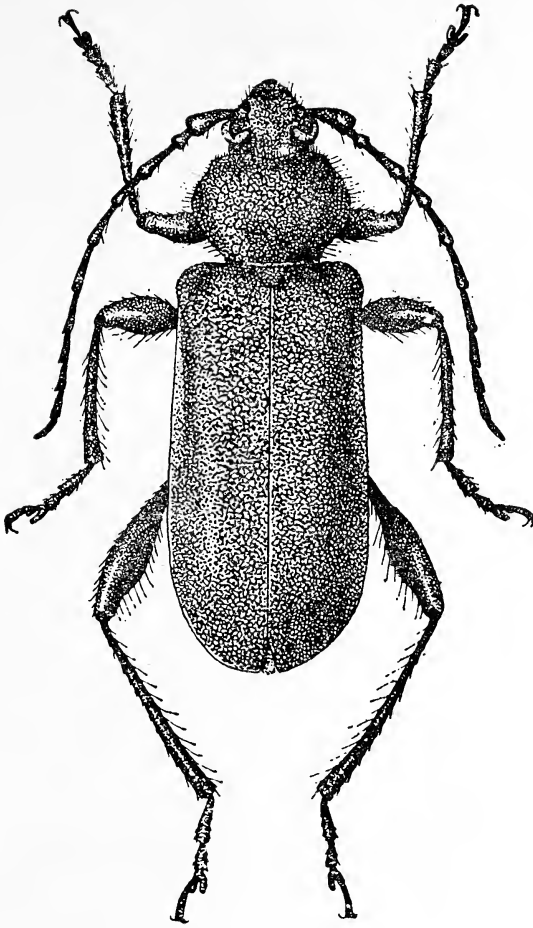


Figure 91. *Callidium violaceum* (L.).

159 inner angle and hollow tapered outer angle, with dense coarse punctation, and semiadherent short thin hairs. Femora with long flattened clava. Hind femora extend almost beyond apex of elytra (male) or do not reach it (female). Body ventrally with long light-colored semiadherent hairs. Head, pronotum, prosternum, and elytra violet or bluish-violet with metallic iridescence, meso- and metanota and abdomen brownish-rust or chestnut with rusty tinge. Antennae and legs dark brown (f. *typica*), rarely elytra green (ab. *virescens* Stierl.) or violet with purple iridescence, and legs rusty-red (ab. *salessei* Pic). Body length 9.0 to 15.0 mm.

Egg: White, elongate, rounded at poles. Chorion smooth, without perceptible cellular sculpture. Length 1.8 mm, width 0.6 mm.

Larva (Figure 92): Head short, retracted into prothorax up to apex of median suture. Epistoma slightly convex, almost flat, uniform on anterior

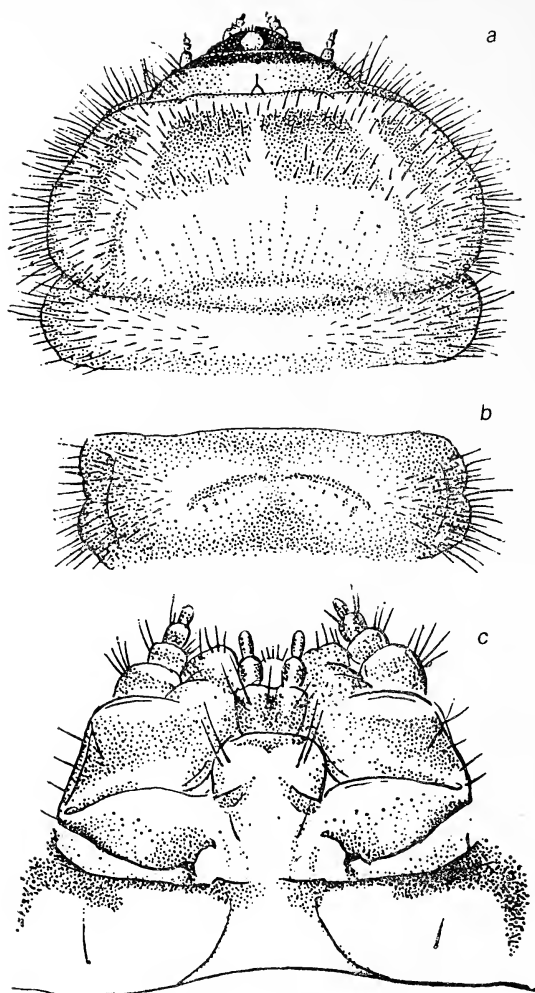


Figure 92. Larva of *Callidium violaceum* (L.).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—ventral view of head (maxillae, labium, hypostoma, and gula)

margin, with rusty-red border, laterally on clypeus with dark brown spot, with transverse thin curved streaks visible under high magnification, fuses laterally with parietals, frontal sutures not visible, median longitudinal suture visible only at apex. Hypostoma lustrous, transversely finely striate together with gula in anterior half, without spinules on anterior margin. Parietals in anterior half with short thin hairs. One convex gray ocellus near base of each antenna. Antennae project forward insignificantly; 1st segment thick, not shorter than remainder together.

Clypeus white, trapezoid, lustrous. Labrum small, white, narrows toward apex, narrowly rounded there, broadens angularly in posterior half, convex on disk, with short light-colored setae along margins. Mandibles massive, broadly rounded apically, dark red basally, convex and smooth on outer side. Inner masticatory lobes of maxillae apically with short light-colored setae, somewhat shorter than maxillary palps.

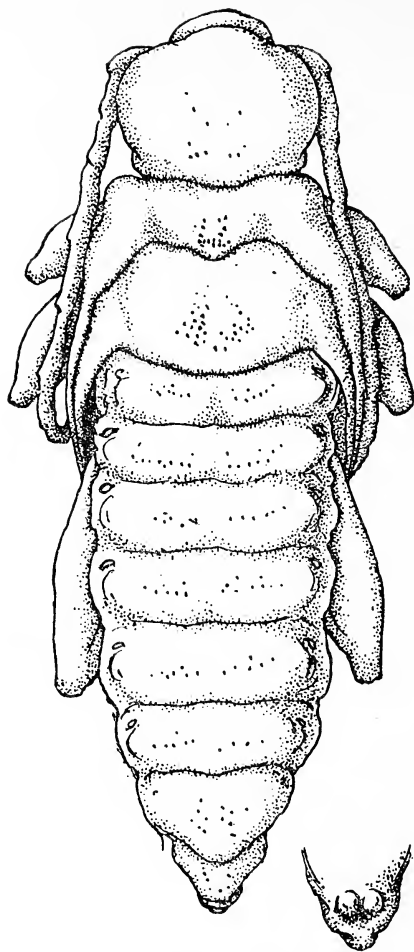
Pronotum transversely oval, slightly narrower anteriorly, with one longitudinally elongate spot laterally, two transverse tetragonal yellow spots on disk in anterior half, before scutum, and also in anterior half in region of yellow spots and laterally with rusty hairs forming two transverse fields, between which longitudinal hairy clearance retained medially; clearance separates two glabrous plates posterior to yellow spots. Pronotal scutum insignificantly convex, white, with barely perceptible longitudinal striation, bound laterally by short longitudinal grooves, glabrous, only basally with eight to ten short setae forming transverse row. Prothoracic presternum with short hairs on disk, laterally with dense long rusty hairs; eusternum in form of pair of round glabrous lustrous lateral plates, divided anteriorly by hairy field, sometimes yellowish. Base (supporting part or sternellum) of pro-, meso-, and metasterna glabrous in middle, with rusty hairs laterally. Thoracic legs small, rusty-brown; claw sharp.

Abdomen laterally with thin light-colored hairs. Abdominal tergites in anterior half with lateral constriction. Dorsal locomotory ampullae moderately elongate, divided by common median longitudinal groove, anteriorly with transverse groove curved forward, joining laterally with lateral longitudinal grooves. Ventral locomotory ampullae divided by common longitudinal groove, laterally near anterior angles with short bracketlike, sometimes triradial grooves. Body length of mature larvae 18 to 21 mm, width of head 2.1 mm.

Pupa (Figure 93): Body comparatively elongate (male) or widens in region of abdomen (female). Head between antennae transversely convex, widely impressed between upper ocular lobes, glabrous, without setae. Antennae pressed to sides, in second half bent ventrad, arcuate.

Pronotum laterally rounded, flat on disk or slightly convex, narrows uniformly anteriorly and posteriorly, near base with sparse, dispersed, broad short spinules which, in female, sometimes form compact row or sometimes medially interrupted transversely. Mesonotum convex, with insignificantly produced elevated scutellum with tuft of short widened spinules in posterior part. Metanotum transverse, slightly convex, on disk posterior to middle with short spinules forming extensive tuft separated partly or fully in front by longitudinal groove.

Abdomen elongate, almost with parallel sides (male) or broadens (female), narrows markedly anteriorly and especially posteriorly. Abdominal tergites more (male) or less (female) convex, with common median



159

Figure 93. Pupa of *Callidium violaceum* (L.), female.

longitudinal groove, in posterior half laterally with minute spinules forming transverse band (eight to ten paramedial spinules in male and 12 to 20 in female). Tergite VII narrows posteriorly, in second half with minute spinules forming dispersed tuft. Tergite VIII in female elongate, with almost parallel sides, triangular in male, not elongate, narrowly rounded posteriorly. Valvifers of female hemispherical, contiguous, comparatively large. Body length 18 mm, width of abdomen 5.0 mm.

Material: Collected in western and eastern Siberia. Adult insects 187, larvae 125, pupae six.

Distribution: Zone of growth of coniferous forests. Europe from the Atlantic to the Urals, from Sweden and Finland to the Mediterranean; Asia from the Urals to the Pacific Ocean, from forest tundra to northern Mongolia, northern China, Korea, and Japan; North America.

Biology: Inhabits deciduous, pine, cedar, and mixed forests with viable conifers. Large numbers occur in forests in plains and foothills, found in hills to a height of 1,000 m above sea level. Beetles fly from May to July. Maximum numbers seen in second half of June. During systematic inspections of forests, mainly in the southern regions of Siberia, 142 beetles were collected in one season; of these, 2.1% were found in May, 89.4% in June, and 8.5% in July. Beetles usually not seen on flowers during reproduction, but on stumps, trunks of irretrievably withered, just dried, and felled coniferous trees. Inhabit trunks of varying thickness and branches up to 3.0 cm or more in diameter. Female lays eggs in bark crevices singly or in batches of five each. According to observations made in Tuva, incubation period of eggs in nature at $18.9 \pm 0.7^{\circ}\text{C}$ varies from 17 to 19 days. Hatching of larvae commences end of June and ceases in August.

Larvae live under bark, make meandering (sometimes platformlike) longitudinal or transverse, quite often intersecting broad galleries, impressed in alburnum, and plug them with fine frass. Mature larva bores wood to a depth of up to 1.0 cm, makes short longitudinal gallery with cell at end, plugs inlet with frass, turns head toward inlet, and pupates. Length of gallery under bark up to 15 cm, width 1.0 to 2.5 cm. Width of inlet into wood 0.4 cm. Length of longitudinal gallery in wood 3.0 to 7.0 cm, length of pupal cell 1.6 to 2.0 cm and width 0.5 cm.

Pupation of larvae commences early May, ceases in first half of June. Young beetles nibble oval openings (3.0 mm \times 5.0 mm to 4.0 mm \times 8.0 mm) in bark surface and abandon cell through them. Emergence of beetles from wood commences in last 10 days of May and ceases in early July. Beetles begin to reproduce soon after emerging from wood. Records of nine insects revealed: weight of larvae before pupation 101.0 to 214.1 mg, pupae 85.0 to 194.1 mg, and young beetles before emerging from cells 68 to 154 mg. Weight of some larvae under bark before penetrating wood 233 mg.

More often colonizes larch, rarely other conifers. For example, of 152 insects (larvae, pupae, and adults) collected by us in nature, 116 came from larch, 26 Siberian maple, nine pine, and one spruce. Not found on fir. Technically described as a pest. Evidently does not attack growing viable trees, not even weakened ones.

2. *Callidium aeneum* Deg.

Degeer, 1775, *Mem. Ins.*, vol. 5, p. 89; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 299–301; Gressitt, 1951, *Longicorn Beetles of China*, vol. 2, p. 226; Demelt, 1966, *Tierwelt Deutschlands*, vol. 2, p. 70; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 72.

162 **Adult** (Figure 94): Differs from other species in broad transverse coarse wrinkles on elytra. Head posterior to eyes with almost parallel sides,

with dense fused punctation, longitudinal suture medially between antennae. Eyes very finely faceted, broadly marginate. Antennae slender, apices extend beyond middle or reach hind clivus of elytra.

Pronotum transverse, rounded laterally, narrows less anteriorly and notably posteriorly, slightly convex on disk, with minute fused rugulose punctation, laterally with two longitudinal grooved dents (male) or with very distinct, separated punctures, with shagreen spaces between them, laterally with slight, bandlike dents or without them (female). Scutellum smooth, comparatively short, broadly rounded apically (male) or more elongate, narrows notably toward apex, narrowly rounded posteriorly (male) [*sic*]. Elytra flat, broaden from base to apex, individually rounded apically, with faint longitudinal carinae, fine punctation at base, elsewhere with transversely folded coarse furrows. Femora broaden almost from base to apex, quite flattened. Body dark brown, ventrally more rusty. Legs dark rust or chestnut. Antennae rusty or dark brown. Elytra with green, greenish-bronze, or bronze metallic iridescence. Body length 10 to 14 mm.

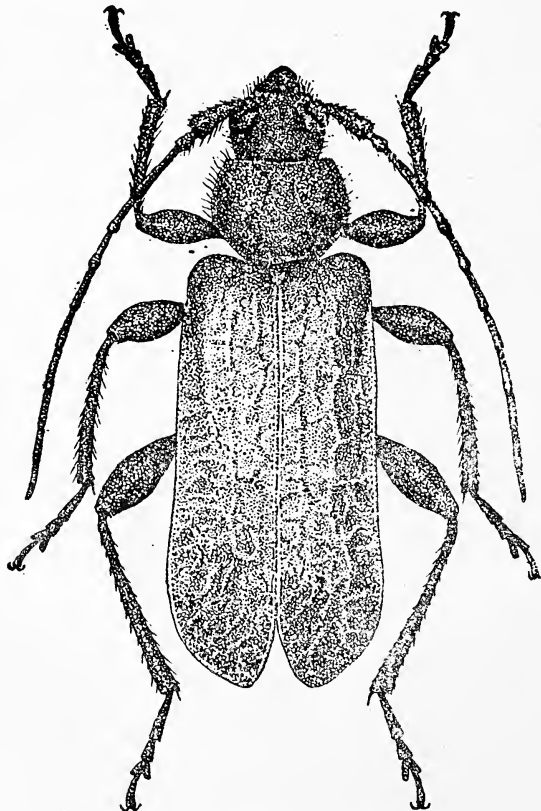


Figure 94. *Callidium aeneum* Deg.

Egg: White, matte, moderately elongate, broad at one pole, notably more narrowly rounded at the other. Chorion with fine sculpture visible under high magnification. Length 1.6 to 1.8 mm, width 0.6 mm.

Larva (Figure 95): Well distinguished from all species of this genus by spinules on anterior margin of hypostomal sclerites. Head almost with parallel sides, transverse. Epistoma flat, laterally without perceptible frontal sutures, medially in posterior half with distinctly visible brown longitudinal suture, on anterior margin with broad brownish-rust border, obliquely (directed laterally) striate; fine streaks extend from middle of posterior margin of border forward toward base of mandibles [these streaks in *Callidium violaceum* (L.) transverse but, contrarily, on clypeus narrowly bent backward]. Hypostoma slightly convex, lustrous, laterally with straight sutures, on anterior margin with rusty-brown border, two large dark brown spinules on each sclerite, of which outer one somewhat larger than inner and slightly posterior relative to it. Gula narrows
163 somewhat anteriorly in anterior half, flat, does not project beyond

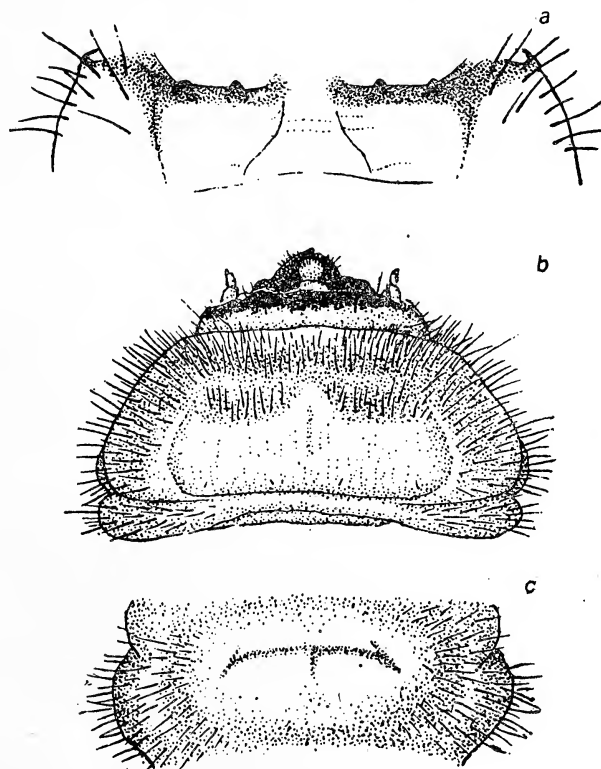


Figure 95. Larva of *Callidium aeneum* Deg.

a—hypostoma; b—head and pronotum; c—abdominal tergite with dorsal locomotory ampulla.

hypostoma. Parietals in anterior half with hairs forming extensive tuft. Antennae rusty, project insignificantly from antennal sockets. One unevenly pigmented ocellus located laterally near base of each antenna. Clypeus short, widely flattened at base, hyaline. Labrum white, basally with slight brownish tone, narrowly rounded apically, with short light-colored setae. Mandibles thick, short, smooth on outer side, medially in posterior half with longitudinal, not very deep groove.

Pronotal disk with dense, comparatively long rusty hairs anterior to scutum and laterally, two transverse, comparatively narrow, yellowish-rust spots in anterior half, with one longitudinally elongate yellowish-rust spot laterally. Hairs on anterior margin of yellow spots basally with sclerotized ringlet and form compact transverse band here. Pronotal scutum insignificantly convex, with two emarginations on anterior margin, medially extends markedly forward, bound laterally by longitudinal groove, matte at base. Prothoracic presternum on disk with dense short, laterally dense very long rusty hairs. Thoracic legs short but fully developed, with small poorly sclerotized claw, and diffuse yellowish coloration.

Abdomen moderately elongate, narrows insignificantly from thorax posteriorly, with sparse rusty hairs laterally. Dorsal locomotory ampullae white, matte, divided by common median longitudinal groove, in front by transverse groove joining longitudinal lateral grooves. Ventral
164 locomotory ampullae laterally with raylike dent. Abdominal sternite VI with pair of hyaline ampullar-spherical processes on locomotory ampulla. Body length of mature larvae 18 to 20 mm, width of head 2.2 to 2.8 mm.

Pupa (Figure 96): Differs from pupa of *Callidium violaceum* (L.) in absence of spinules on dorsal side of body. Head short, moderately bent under, transversely slightly convex between antennae, broadly curved on vertex. Antennae pressed to sides, arcuate, bent ventrad posterior to mid-femora.

Pronotum transverse, rounded laterally, narrows anteriorly and posteriorly, slightly convex on disk, almost flattened, without spinules. Mesonotum short, medially longitudinally convex, impressed pitlike in region of posterior angles around elytra, with extended elevated scutellum posteriorly, without spinules, lustrous. Metanotum transverse, slightly convex, medially with longitudinal groove, broadly rounded posteriorly, glabrous, without spinules. Femora clavate; apices of hind femora extend beyond abdominal tergite IV.

Abdomen elongate, with almost parallel sides (male). Abdominal tergites uniformly convex, with slight median longitudinal groove, glabrous, without spinules. Body length 10 mm, width of abdomen 3.5 mm (male).

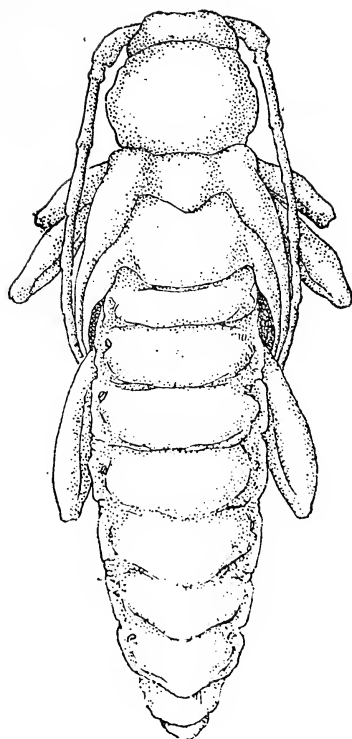


Figure 96. Pupa of *Callidium aeneum* Deg.

Material: Collected in Trans-Baikal, Yakutia (Zhigansk region), Tuva, Altai, and Ob' region. Adult insects 43, larvae 177, pupa one (male).

Distribution: Europe, from boundaries of coniferous forests in the north to the Mediterranean Sea, Asia from Salekhard, Zhigansk in the north to Altai, Sayan, and Amur in the south. Common in Trans-Baikal (Shilka River basin).

Biology: Mainly occurs in fir forests, more rarely in other forests. Found in hills up to 2,000 m above sea level. Beetles sighted in first half of June up to end of July. Lead cryptic mode of life. Not seen on flowers. Fly to drying trees, mate there, and female later oviposits in bark crevices. Mainly colonizes branches from lower to upper level, including crowns. Quite often colonizes freshly felled and wind-fallen trees. Fertility of female comparatively high. Ovaries of one female just emerging from cell contained 48 mature eggs.

Larvae live under bark and make meandering, usually longitudinal, more rarely transverse galleries, impressed in alburnum. Mature larva bores wood and makes cell there along trunk. Length of gallery in wood

4.0 cm, length of pupal cell 1.5 to 1.6 cm and width up to 0.5 cm. Cell sealed from inlet with plug of frass. Larva pupates with head toward inlet.

Pupation commences mid-May and ends in June. Emergence of young beetles from pupal cells completed in June. Beetles emerge with developed gonads and do not need supplementary feeding. Reproduction commences soon after emergence from wood. Weight of larvae before pupation (data of 11 specimens) 53 to 120 mg, pupae 45 to 105 mg, beetles after emerging from cells 37 to 84 mg. Generation completed in two years.

Mainly damages fir. For example, while collecting these insects in nature, 140 were found on fir shoots, 20 on spruce, 20 larch, five pine, and two maple; total, 187 insects. Population density sometimes comparatively high. On one fir shoot 2.5 cm thick and 18 cm long four insects were recovered from wood, including two larvae and one beetle. On the same shoot three larvae of *Pogonocherus fasciculatus* Deg. were found. Not found on deciduous species.

165 3. ***Callidium coriaceum* Payk.**

Paykull, 1800, *Fauna Suecica*, vol. 3, p. 91; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 291-294; Gressitt, 1951, *Longicorn Beetles of China*, vol. 2, pp. 224-225; Cherepanov and Cherepanova, 1973, *Nov. i maloizv. vidy fauny Sibiri*, 6th ed., p. 56.

Adult (Figure 97): Head comparatively small, with uneven rugose punctation, broad longitudinal suture between antennae, quite often here less punctate, more lustrous. Eyes finely faceted, broadly but not very deeply emarginate, with broad septum between lobes barely narrower than upper lobes. Antennae slender, apices extend considerably beyond 0.50 (female) or 0.66 length of elytra (male); 3rd segment longer than 4th, equal to 5th.

Pronotum broadens in posterior half, narrows less anteriorly, more posteriorly, slightly convex on disk or even flat and here medially with large, sometimes uneven punctation throughout length, laterally with dense minute punctation, quite often with lustrous smooth band anterior to scutellum. Scutellum minute, broadly rounded apically, smooth or with sparse punctation, flat or longitudinally somewhat impressed. Pro-, meso-, and metasterna with dense minute punctation, prosternal process long, cuneiform and pointed apically. Elytra with parallel sides, slightly convex, with insignificantly projecting rounded humeri, individually rounded and with densely rugose punctation apically, in anterior half with large and posterior half less large punctation, with semiadherent minute light-colored hairs. Body ventrally with dense semiadherent light-colored hairs. Hind femora extend beyond apex of elytra (male) or considerably short

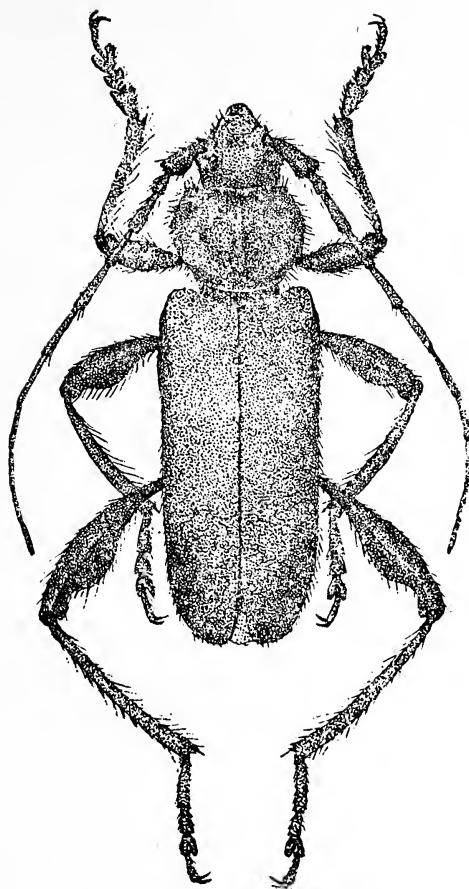


Figure 97. *Callidium coriaceum* Payk.

of reaching it (female). First segment of hind tarsi longer than two successive together.

Body black, blackish-brown; abdomen generally with rusty or chestnut hue, legs dark brown; elytra rusty-brown, with bronze or bluish-bronze iridescence, lighter in color toward apex; antennae dark brown or dark rust (f. *typica*). Sometimes elytra greenish, legs light rust (ab. *aeneipenne* Muls.). Body length 8.0 to 14.0 mm.

Egg: White, elongate, broadly and obtusely rounded at one pole, pointed at the other. Chorion with minute noncellular sculpture. Length 1.9 mm, width 0.6 mm.

Larva (Figure 98): Characterized by fine longitudinal striation of pronotal scutum, structure of locomotory ampullae characteristic of the subgenus *Palaeocallidium* Plav., and other features. Head markedly retracted into prothorax. Epistoma with slight median longitudinal suture,

fuses laterally with parietals (frontal sutures not visible), on anterior margin with dense, thin, longitudinally directed striation and also rusty-brown border. Hypostoma smooth on anterior margin, without spinules, with narrow rusty-brown border. Hypostomal suture straight, very distinct. Gula narrows markedly anteriorly, with narrow anterior margin, two transverse narrow grooves at base. Hairs on anterior half of parietals sparse, form dispersed tuft. Antennae slender; 1st segment insignificantly thicker than 2nd. Ocelli (one on each side) hyaline, somewhat dorsoventrally elongate. Clypeus very short, white, looks like transverse band. Labrum almost triangular, narrows anteriorly from base, not pointed apically, with short setae along margins, white, brownish at base. Mandibles on outer side of base with faint longitudinal groove.

Pronotum on disk and laterally with dense rusty hairs forming two transverse bands, one in anterior half, the other anterior to scutum. Hairy band with glabrous clearance between them. Hairs basally with fairly distinct sclerotized ringlet. Yellowish-rust spots in anterior third of pronotum distinct, on disk broad, tetragonal, transversely elongate, laterally more oval, longitudinally elongate. Pronotal scutum insignificantly convex, only slightly produced anteromedially on anterior margin, tapers straightly from there to sides, with dense thin longitudinal striation, at base shagreen, matte, with very minute nonstriate sculpture.

Prothoracic presternum glabrous as in other species of this genus, on disk with short hairs and laterally with long dense hairs; eusternum

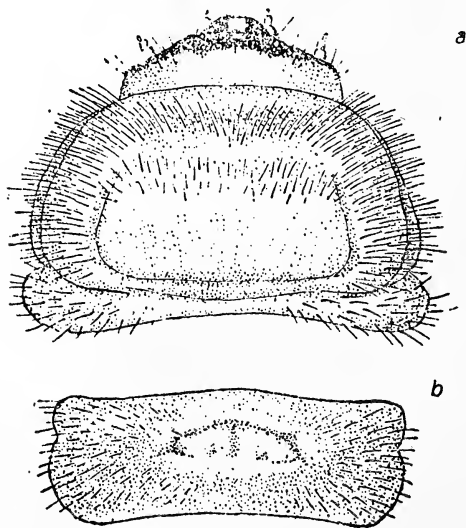


Figure 98. Larva of *Callidium coriaceum* Payk.
a—head and pronotum; b—abdominal tergite
with dorsal locomotory ampulla.

basally in form of glabrous plates divided anteriorly by hairy clearance. Thoracic legs small, with thin claw, dark brown on anterior and posterior sides and more sclerotized there.

Abdomen narrows posteriorly from thorax, in region of segments III to VI with parallel sides, segment VII usually somewhat broadened, laterally with thin rusty, sometimes rather dense hairs. Dorsal locomotory ampullae matte, divided by two transverse grooves joined laterally with lateral longitudinal grooves, anterior groove invariably continuous, apically outcurved, posterior groove often medially interrupted and replicate. Ventral locomotory ampullae moderately convex, divided by single transverse groove, broadly interrupted medially, and laterally joins short lateral longitudinal groove. Sometimes these grooves are shortened, resemble depressions with three rays, or curve backward, bracketlike. Length of mature larvae 20 to 22 mm, width of head 2.8 to 3.0 mm.

Pupa: Not known.

Material: Collected in the eastern Urals, Ob' region, Altai, Tuva, north of Yakutia (Zhigansk and Aldan), Primor'e, and Ussuri-Primor'e 167 region. Adult insects 28, larvae 40.

Distribution: Viable zone of coniferous forests. Europe from Sweden, Finland, and Karelia almost up to the Mediterranean Sea (mainly in hills there), northern Asia from the Urals to the Pacific Ocean coast, including Siberia, northern Mongolia, northern China, and Korea. Sporadic everywhere, comparatively few in numbers.

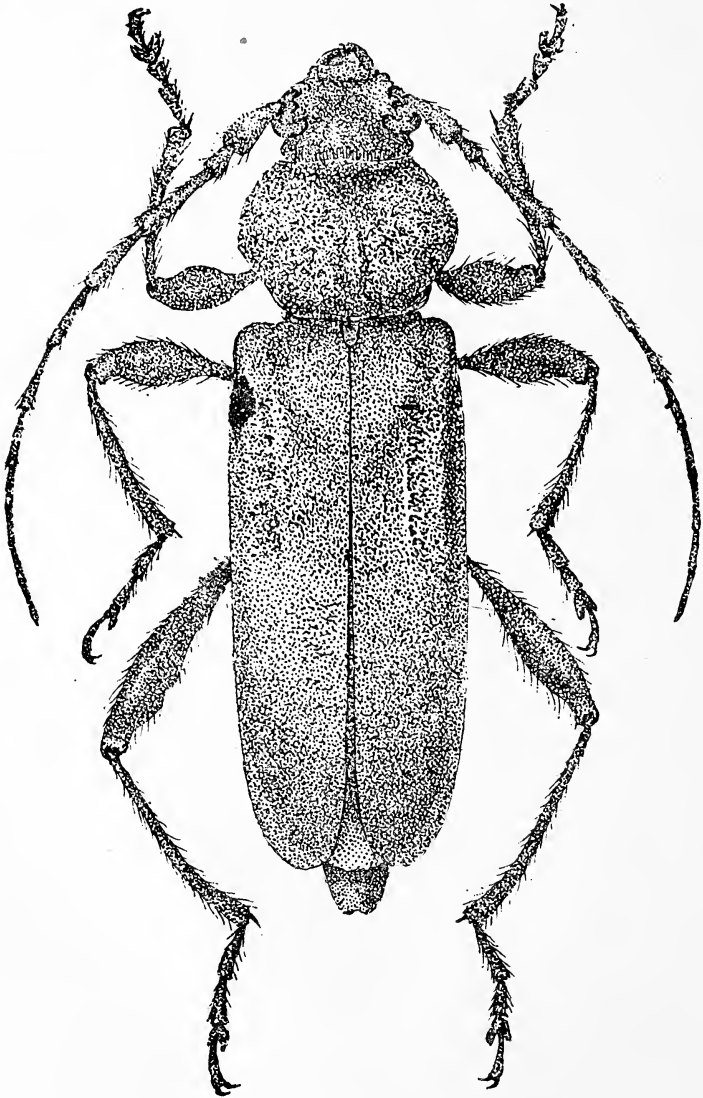
Biology: Ecologically associated with coniferous forests. Inhabits plains as well as hilly regions. We found it around Lake Telets at a height of 2,000 m above sea level. Beetles fly in June and July. At this time found on trunks of drying and freshly felled trees where mating takes place. Female oviposits in bark crevices.

Newly hatched larvae bore bark, live under it, and make longitudinal meandering, at places platformlike galleries. They penetrate wood before pupation and make cell in upper layer along trunk. We detected one gallery and cell. Gallery extended top downward. Length of gallery under bark 23 cm, width 0.6 to 1.6 cm. Length of cell 2.5 cm, width 0.9 cm. Beetle (female) lay in cell with head toward inlet. Ovaries of this female contained 48 fully mature eggs. Generation completed in not less than two years. Colonizes spruce, larch, and Siberian maple, in that order. While inspecting forests we found 45 insects (larvae and adults) in wood; of these, 23 were recovered from Siberian spruce, 12 from larch, nine from Siberian maple, and one from fir.

4. *Callidium chlorizans* (Sols.)

Solsky, 1870, *Horae Soc. Entom. Ross.*, vol. 7, p. 384 (*Semanotus*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 294-295; Gressitt, 1951, *Longicorn Beetles of China*, vol. 2, p. 224.

Adult (Figure 99): Similar to *Callidium coriaceum* Payk. Differs in greenish-bronze upper part of body, which is very long. Head with dense large punctation, spaces between punctures narrow, smaller than punctures, and broad longitudinal groove between antennae. Eyes distinctly and finely faceted, with broad shallow notch; septum between lobes slightly narrower than upper lobe. Antennae apically reach only 0.50 (female) or slightly more than 0.66 length of elytra (male), with minute gray adherent hairs, basally with much longer hairs, apically shorter ones.



Pronotum broadens anterior to middle, broadly rounded laterally in anterior half, narrows basally (but gently) and less apically (steeply), straightly truncate on anterior margin or more often broadly and insignificantly emarginate and notably curved medially here, fairly convex, with deep large punctation, fine light-colored erect hairs; spaces between punctures on disk sometimes fuse to form one smooth (usually median) or two or three facets that are usually longitudinally elongate. Scutellum minute, smooth, broadly rounded posteriorly, glabrous, without hairs. Elytra long, elongate, with distinctly parallel sides, individually rounded apically, basally on disk more convex with rounded or slightly projecting humeri, longitudinally impressed in second third along suture, with large dense punctation forming transverse wrinkles on disk, and light-colored semiadherent hairs. Prosternum with dense, almost fused punctation. Prosternal process long, elongate, pointed or more rarely rounded apically. Metasternum with dense notchlike punctation, abdomen with sparser punctation.

- 168 Body ventrally with dense light-colored adherent and erect hairs. Abdominal sternites laterally with deep circular, comparatively large pits. Sternite V in female more elongate, rounded apically or sometimes narrowly emarginate, transverse in male and gently rounded apically. Hind femora extend slightly beyond apex of elytra or fall considerably short of it. Top of head, pronotum, and elytra dark green with bronze or purplish-bronze metallic iridescence. Legs dark brown, with reddish-rust or chestnut tone. Body ventrally rusty-brown, chestnut. Antennae dark brown or almost black, sometimes lighter in color, rusty. Body length 9.0 to 17.0 mm.

Egg: White, markedly elongate, slender, narrows gradually more toward one pole and pointed, narrowly rounded at the other. Chorion transparent, smooth, hyaline, without perceptible sculpture. Length 2.1 mm, width 0.5 mm.

- Larva* (Figure 100): Well distinguished from larvae of proximate species *Callidium coriaceum* Payk. by absence of striation on anterior margin of epistoma and sclerotized ringlets at base of hairs on pronotum. Head 169 small, narrows somewhat anteriorly. Epistoma on anterior margin with broad, sharp, dark brown, smooth border altogether devoid of striation, in posterior half with dark brown median longitudinal suture, fuses laterally with parietals. Frontal sutures lacking. Hypostoma narrows somewhat anteriorly, on anterior margin with narrow dark rust border, deep notch near inner angles of sclerites bearing articulate spinule of maxillae. Gula gradually or angularly narrows steeply anteriorly, slightly convex, basally without perceptible transverse grooves. Parietals in anterior half with thin, sometimes fairly dense hairs. Antennae slender, comparatively long; 1st segment white, subsequent ones yellowish-brown. One convex

hyaline ocellus near base of each antenna. Clypeus short, projects somewhat from behind epistoma, white, trapezoid, comparatively broad. Labrum minute, broadly rounded apically, with sparse short setae, whitish, basally brownish. Mandibles massive, thick, smooth and convex on outer side in anterior half, flattened in posterior half, medially without perceptible longitudinal groove, broadly rounded apically. Maxillary palps short, not longer than inner masticatory lobes. Latter broadly rounded apically, with short light-colored setae.

Pronotum laterally rounded, narrows notably more anteriorly, slopes toward head, with two transverse tetragonal yellowish (sometimes faint) spots in anterior half, longitudinally elongate spot laterally, thin light
 170 rust hairs on disk forming two compact transverse bands. Hairs basally without sclerotized ringlets. Laterally, light rust hairs form extensive field. Pronotal scutum insignificantly convex, with usually two emarginations on anterior margin, medially more elongate, anterior angles less elongate, with dense thin longitudinal striation, basally matte and with minute shagreen sculpture, with short setae forming transverse row separating striate section of scutum from nonstriate, matte, bound laterally by short

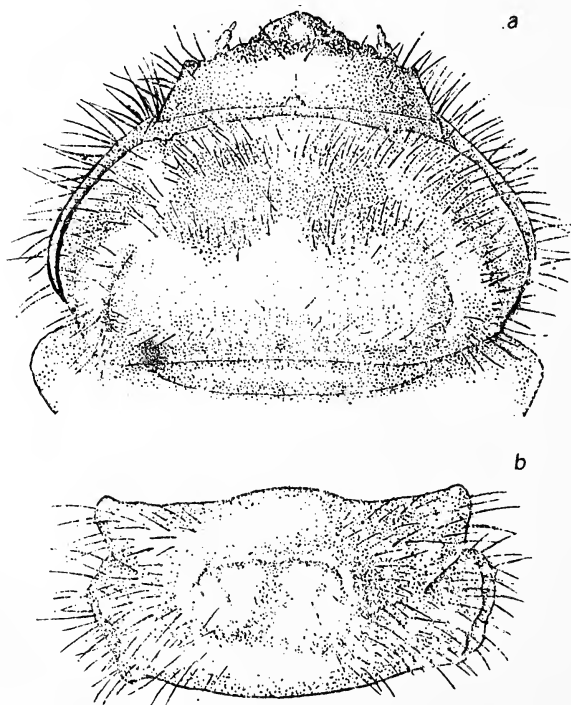


Figure 100. Larva of *Callidium chlorizans* (Sols.).
 a—head and pronotum; b—abdominal tergite with
 dorsal locomotory ampulla.

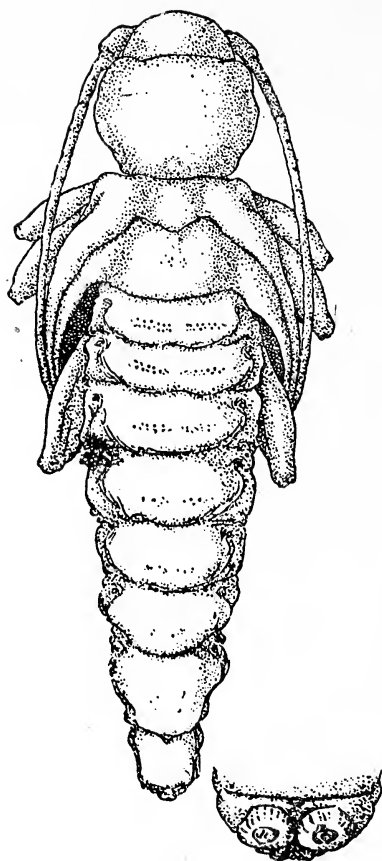
longitudinal grooves. Alar lobes glabrous on inner side. Prothoracic presternum generally with short hairs on disk, laterally with very long and very dense rusty hairs; glabrous plates of eusternum divided medially by compact hairy band, with coarse punctation or minute furrows. Thoracic legs dark brown on outer side, light rust on inner side, with sharp acicular claw.

Abdomen laterally with dense long rusty hairs. Dorsal locomotory ampullae fairly convex, matte, with common median longitudinal groove, with two transverse grooves, of which anterior one continuous, posterior one broadly interrupted medially; transverse grooves merge laterally with short longitudinal grooves. Sometimes transverse grooves merge among themselves at an acute angle. Ventral locomotory ampullae also matte, divided by common broad median longitudinal groove; short transverse groove on disk broadly interrupted medially and laterally merges with short longitudinal grooves. Body length of mature larvae 20 to 22 mm, width of head 2.2 to 2.5 mm.

Pupa (Figure 101): Characterized by poorly developed spinules on abdominal tergites, convex vertex in same plane as frontal gap between antennae. Head short, narrows anteriorly from antennae. Frons between antennae broad, almost flat, in same plane as vertex. Occiput broadly rounded, with sparse large punctation forming clusters. Antennae comparatively short, pressed to sides, with apices bent ventrad posterior to midfemora (female) or ventrad and forward (male).

Pronotum laterally rounded, narrows less toward apex, more so toward base, slightly convex on disk, lustrous, smooth, without spinules, medial width not more or only slightly more than length. Mesonotum lustrous, longitudinally convex, slightly slopes laterally, with produced scutellum on posterior margin, and devoid of spinules. Metanotum insignificantly convex, with faint median longitudinal groove, broadly rounded posteriorly, without spinules. Femora clavate, thicken gradually toward apex.

Abdomen elongate (male) or broadens somewhat in region of segment IV (female), sometimes narrows gradually from base to apex. Abdominal tergites uniformly convex, with common median longitudinal groove, in posterior half with minute sharp spinules forming transverse, usually indistinct row. Spinules more distinct in female, barely or not at all perceptible in male. Tergite VII narrowly (male) or broadly rounded at apex, convex and smooth on disk, without spinules. Tergite VIII in female elongate, with parallel sides, in male short, narrows toward apex. Valvifers of female (ventral view) large, hemispherical, matte at apex, with fine sculpture. Body length 10 to 15 mm, width of abdomen 3.0 to 4.0 mm.



169

Figure 101. Pupa of *Callidium chlorizans* (Sols.).

Material: Collected in Altai, Tuva, Baikal region, and Ussuri-Primor'e region. Adult insects 25, larvae 58, pupae 10 (seven males and three females).

- 171 **Distribution:** Northern Asia, including Altai, Tuva, eastern Siberia, northern Mongolia, northern China, Korea, northern Japan. Sporadic. We sighted large numbers in northern offshoots of Tannu-Ol range in Tuva.

Biology: Inhabits coniferous forests and is ecologically associated with larch. Beetles fly in first half of June up to end of July, and sighted at this time on trunks of trees. Mainly colonizes lower section of larch trunks in zone of thick bark.

Larvae live in bark and make meandering galleries in bark layer without affecting bast. On removing bark, thin layer of beast covering gallery filled with fine frass visible on inner side. Width of gallery 0.6 to 1.0 cm. Gallery ends in bark with pupal cell. Beetle nibbles short exit to surface

from cell, leaving fine layer of bark outside. Cell along trunk axis or oblique. Length of pupal cell 1.5 to 2.0 cm, width 0.6 to 0.9 cm.

Pupation of larvae commences end of May and ends in June. Duration of pupal stage about three weeks. Beetles develop from pupae in June, but emerge from cells in June and first half of July. In Tuva beetles and II-instar larvae were seen simultaneously on trees on July 10, indicating that the same tree is colonized repeatedly. Beetles emerge from cells with developed gonads. Ovaries of two females recovered from cells contained 16 and 30 mature eggs respectively.

Weight of insects varies considerably. Weight of larvae 37.0 to 114.2 mg, pupae 34 to 100 mg, and beetles in cells 22.5 to 96.0 mg. The following example demonstrates weight variation during metamorphosis. Three specimens in the larval stage before pupation weighed 263.7 mg (100%), pupal stage 230.2 mg (87.2%), and adults 185 mg (70.1%). Generation completed in two years (Table 15).

Table 15. Periods of development of *Callidium chlorizans* (Sols.)

Year of development	April	May	June	July	August	September
1st	L	LP	LP AE	PAE	EL	L
2nd	L	L	L	L	L	L
3rd	L	LP	LP AE	PAE	EL	L

Note: Periods of development of other species of this genus, described above, are almost identical.

Found only on larch. In Tuva in 1976 often found on drying trees priorly damaged by the Siberian silkworm. *Tetropium gracilicorne* Reitt. and *Clytus arietoides* Reitt. colonize together with this species.

7. Genus *Phymatodes* Muls.

Mulsant, 1839, *Col. France Longic.*, p. 47; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 303-307; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, pp. 226-227; Linsley, 1964, *Cerambycidae of North America*, 22, 5, 44-45; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, pp. 72-73; Mamaev and Danilevskii, 1975, *Lichinki zhukov-drovosekov*, pp. 201-202.

Adult: Characterized by comparatively small body (especially in the subgenus *Phymatodellus* Reitt.). Pronotum laterally rounded, with smooth shields on disk [*P. testaceus* (L.), *P. abietinus* Plav. and Lur.] 172 or without them (*P. zemlinae* Plav. and Anufr., *P. mediofasciatus* Pic).

Apex of femora thickened, clavate, markedly dilated [*P. maaki* (Kr.)] or thickens gradually (*P. abietinus* Plav. and Lur.), Elytra slightly convex or notably flattened. First segment of hind tarsi 1.5 times longer than successive two together (*Phymatodes* s. str.) or not longer (*Phymatodellus* Reitt.).

Larva: Differs from larvae of other genera in pronotum with yellowish-rust transverse band interrupted three times by white band into four equal tetragonal spots covered with dense hairs. Head markedly retracted into prothorax; one ocellus near base of each antenna. Epistoma fuses with parietals, frontal sutures not visible, median longitudinal suture projects more distinctly only in posterior half. Pronotum usually narrowly rounded anteriorly, on disk in region of proscutellum and laterally with dense hairs. Pronotal scutum uniformly convex, rugulose or bulges more basally and here with minute reticulate-squamiform sculpture, matte, notably flattened anteriorly and lustrous, longitudinally striate. Thoracic legs poorly developed, wartlike, sometimes almost imperceptible, especially in young larvae. I-instar larvae (*P. ermolenkoi* Tsher.) laterally on abdominal segments VI and VII with one acute, slightly sclerotized spinule on each side, which disappears after molt.

Pupa: Body moderately elongate. Head short, with widely separated antennae, wide frons between them. Antennae pressed to sides, posterior or midfemora bent ventrad, with apices directed forward. Femora clavate. Abdominal tergites II to VII with pair of widely separated spinules (*P. ussuricus* Plav., *P. vandykei* Gress.) or without them (*P. abietinus* Plav. and Lur.) or with four to twelve spinules [*P. mediofasciatus* Pic, *P. maaki* (Kr.)] forming transverse rows. Tip of abdomen rounded, without spinules.

No less than 16 species of this genus are known in the USSR; of these, nine are found in northern Asia including one [*P. alni* (L.)] ranging west to the Urals inclusive, one (*P. abietinus* Plav. and Lur.) covering southern regions of western Siberia, five east in Ussuri-Primor'e region, and one [*P. testaceus* (L.)] in Europe, southern Urals, Japan, and North America. Not known on the continent between the Urals and Japan. In Southeast Asia 10, Japan five, and North America 24 species of this genus are known.

All species of the genus *Phymatodes* Muls. inhabiting northern Asia are ecologically associated with forests. Among them, *P. maaki* (Kr.), *P. mediofasciatus* Pic, *P. ussuricus* Plav., and *P. vandykei* Gress. develop on grapevine, *P. testaceus* (L.) and *P. alni* (L.) develop on oak and other deciduous species. *Phymatodes abietinus* Plav. and Lur. develops on Siberian fir and *P. ermolenkoi* Tsher. on oak.

Type species: *Cerambyx testaceus* Linnaeus, 1758.

KEY TO SPECIES

Adult Insects

- 1 (10). Elytra without transverse white bands.
- 2 (3). First segment of hind tarsi 1.5 times longer than two successive together (subgenus *Phymatodes* s. str.). Europe up to southern Urals inclusive. 1. **P. testaceus** (L.).
- 3 (2). First segment of hind tarsi not longer, or only slightly longer than two successive together (subgenus *Phymatodellus* Reitt.).
- 173 4 (5). Body red or reddish-rust; elytra bluish. Ussuri-Primor'e region. 2. **P. zemlinae** Plav. and Anufr.
- 5 (4). Body black or blackish-brown; elytra without bluish iridescence.
- 6 (9). Elytra comparatively short, not more than 3.0 times longer than pronotum. Femora sharply thickened toward apex, clava markedly dilated.
- 7 (8). Humeral tubercles of elytra do not project, gently rounded, inner side with faintly visible impression. Ussuri-Primor'e region. 3. **P. ussuriicus** Plav.
- 8 (7). Humeral tubercles of elytra distinctly project forward, inner side with very distinct longitudinal impression. Kunashir and Japan. 4. **P. vandykei** Gress.
- 9 (6). Elytra very elongate, long, not less than 4.0 times longer than pronotum. Femora thicken gradually toward apex, clava not markedly dilated. Western Siberia 5. **P. abietinus** Plav. and Lur.
- 10 (1). Elytra with transverse white bands.
- 11 (12). Elytra with single white band, on suture without erect hairs posterior to scutellum (subgenus *Paraphymatodes* Plav.) Ussuri-Primor'e region. 6. **P. mediofasciatus** Pic.
- 12 (11). Elytra with two white bands, on suture with tuft of upright black hairs (subgenus *Poecilium* Fairm.).
- 13 (16). Pronotum with dense, long, erect brownish hairs forming especially dense brush laterally. Hairs not shorter than 3rd antennal segment. Ussuri-Primor'e region.
- 14 (15). First to 6th antennal segments with stray hairs, 2nd segment almost not longer than wide. 7. **P. maaki** (Kr.).
- 15 (14). First to 6th antennal segments with dense setaceous hairs, 2nd segment almost 2.0 times longer than wide. 9. **P. ermolenkoi** Tsher.
- 16 (13). Pronotum with short erect hairs, not forming dense brush. Hairs shorter than 3rd antennal segment. Europe to the Urals inclusive. 8. **P. alni** (L.).

Larvae

- 1 (2). Pronotum anterior to scutum with sparse thick setaceous hairs. Pronotal scutum lustrous, with deep longitudinal striation. Found on trunks of oak and other deciduous species. 1. **P. testaceus** (L.).
- 2 (1). Pronotum anterior to scutum with dense hairs; if with sparse hairs, then hairs thin and nonsetaceous. Pronotal scutum with dense thin, fairly distinct longitudinal striation or without it.
- 3 (10). Pronotal scutum more convex at base, with fine reticulate-squamiform sculpture imparting matte tone, lustrous anteriorly, longitudinally striate.
- 4 (5). Transverse yellowish-rust band in anterior third of pronotum continuous, without white clearances, only with three small flanges. Found on grapevine. 2. **P. zemlinae** Plav. and Anufr.
- 5 (4). Transverse yellowish-rust band in anterior third of pronotum with three longitudinal interruptions separating it into four transverse spots.
- 6 (9). Pronotal scutum in anterior half with sparse longitudinal streaks; distance between streaks several times more than their width.
- 7 (8). Dorsal locomotory ampullae with coarse longitudinal striation. Inner masticatory lobes of maxillae narrowly rounded at apex. Pronotal scutum at base with narrow, convex, matte transverse band covering not more than 0.25 of scutum. Found on grapevine. 3. **P. ussuriicus** Plav.
- 8 (7). Dorsal locomotory ampullae without perceptible longitudinal striation. Inner masticatory lobes of maxillae broadly rounded at apex, as though obtuse. Pronotal scutum at base with much wider matte transverse band covering not less than 0.33 of scutum. Found on grapevine. 4. **P. vandykei** Gress.
- 9 (6). Pronotal scutum in anterior half with very dense longitudinal streaks; distance between streaks not more than their width. Found on fir. 5. **P. abietinus** Plav. and Lur.
- 10 (3). Pronotal scutum uniformly convex, lustrous, at base with faint reticulate-squamiform sculpture or without it, rugulose, with longitudinal streaks.
- 11 (12). Hairs on yellowish-rust spots of pronotum simple, basally without sclerotized ringlets. Found on grapevine. 6. **P. mediofasciatus** Pic.
- 12 (11). Hairs on yellowish-rust spots of pronotum basally with distinct sclerotized or barely projecting ringlet.

- 13 (14). Hairs on yellowish-rust spots of pronotum basally with highly sclerotized ringlet. Found on grapevine. 7. **P. maaki** (Kr.).
- 14 (13). Hairs on yellowish-rust spots of pronotum basally with slightly sclerotized ringlet. Found on other species.
- 15 (16). Yellowish-rust spots in anterior third of pronotum on disk transverse, slightly elongate, almost square, slightly longer in cross section than lengthwise. Found on oak. 8. **P. alni** (L.).
- 16 (15). Yellowish-rust spots in anterior third of pronotum on disk transverse, highly elongate; in cross section (relative to body axis) almost 2.0 times length. Found on oak. 9. **P. ermolenkoi** Tsher.

Pupae

- 1 (2) Abdominal tergites II to VI with six to nine paramedial spinules in posterior third forming transverse distinct or indistinct row. Found mainly on oak. 1. **P. testaceus** (L.).
- 2 (1). Abdominal tergites II to VI with one to four well-developed or faint paramedial spinules in posterior third forming one or two indistinct transverse rows. If with large number of spinules, found on grapevine.
- 3 (12). Clava of hind legs thickens gradually from base to apex. Spinules on abdominal tergites minute, poorly developed.
- 4 (11). Spinules on abdominal tergites II to VI form single transverse row.
- 5 (6). Abdominal tergites II to VI with four to six paramedial spinules forming indistinct transverse row. 2. **P. zemlinae** Plav. and Anufr.
- 6 (5). Abdominal tergites II to VI with or without one or two paramedial spinules.
- 7 (10). Pronotum laterally in anterior third without flange. Abdominal tergites II to VI with perceptible spinules.
- 8 (9). Spinules (two) on abdominal tergite VII erect or bent down and backward. 3. **P. ussuricus** Plav.
- 175 9 (8). Spinules (two) on abdominal tergite VII large, bent down and forward. , 4. **P. vandykei** Gress.
- 10 (7). Pronotum laterally in anterior third with fairly distinct flange. Abdominal tergites II to VI without visible spinules 5. **P. abietinus** Plav. and Lur.
- 11 (4). Spinules on abdominal tergites II to VI form two transverse rows. 6. **P. mediofasciatus** Pic.

- 12 (3). Clava of hind legs in second half sharply thicken, dilated. Spinules on abdominal tergites well developed; if poorly developed [*P. alni* (L.)], insects develop mainly on oak.
- 13 (16). Spinules on abdominal tergites (two to four on each side of longitudinal groove) large, acute, directed backward.
- 14 (15). Abdominal tergites II to VI with three or four spinules on each side of longitudinal groove. Found on grapevine. 7. *P. maaki* (Kr.).
- 15 (14). Abdominal tergites II to VI with two or three spinules on each side of longitudinal groove. Found on oak. 9. *P. ermolenkoi* Tsher.
- 16 (13). Spinules on abdominal tergites minute, barely developed. Found mainly on oak. 8. *P. alni* (L.).

1. *Phymatodes testaceus* (L.)

Linnaeus, 1758, *Syst. Nat.*, 10th ed., p. 396 (*Cerambyx*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 307-312; Duffy, 1953, *Monograph Beetles* pp. 217-219; Romadina, 1954, *Trudy Zool. In-ta*, vol. 16, p. 219; Nakamura, 1958, *Miscell. Report of Hiwa Museum for Nat. History*, vol. 2, pp. 14-15; Nakamura, 1960, *ibid.*, vol. 3, pp. 1-2; Linsley, 1964, *Cerambycidae of North America*, 22, 5, 63-64; Demelt, 1966, *Tierwelt Deutschlands*, 52, 2, 71-72.

Adult (Figure 102): Differs from other species of this genus in markedly elongate, with parallel sides, yellow or metallic blue elytra. Head between antennae transversely convex, with median longitudinal suture, smoothened punctation, transversely impressed between upper ocular lobes. Eyes sharply faceted, deeply emarginate. Antennae with short adherent hairs; 10th segment extends beyond apex of elytra (male) or considerably short of it (female).

Pronotum laterally rounded or angularly slightly produced, narrows less anteriorly, notably posteriorly, on posterior margin with narrow transverse groove, convex on disk, with moderate punctation, short dark brown or light-colored hairs, with three smooth lustrous shields, of which two anterolateral to middle and one median in posterior half. Scutellum flat, broadly rounded posteriorly, with minute punctation, and adherent light-colored hairs. Elytra markedly elongate, with parallel sides, bulge slightly on disk, apically individually or almost jointly rounded broadly, with minute uniform, sometimes smoothened punctation, rugulose sculpture in clearances between punctures, with short semiadherent light-colored hairs. Prosternum with large deep (male) or minute faint (female) punctation. First segment of hind tarsi longer than two successive together.

Body yellowish-rust, with reddish tinge (especially on pronotum), metathorax black, abdomen for most part (male) or only at base (female)

black or dark brown, elytra light colored, rusty or rusty-brown, legs and antennae reddish-rust (f. *typica*); quite often elytra light rust, dark brown or blue at apex or most of posterior half (ab. *praeustus* F.), more often elytra entirely blue (ab. *variabilis* L.). Color highly variable. Large number of aberrant forms known (Plavil'shchikov, 1940). Body length 7.0 to 16.0 mm.

Egg: White, moderately elongate, narrows more toward one pole, broadly rounded or notably obtuse at one end, narrowly rounded at the

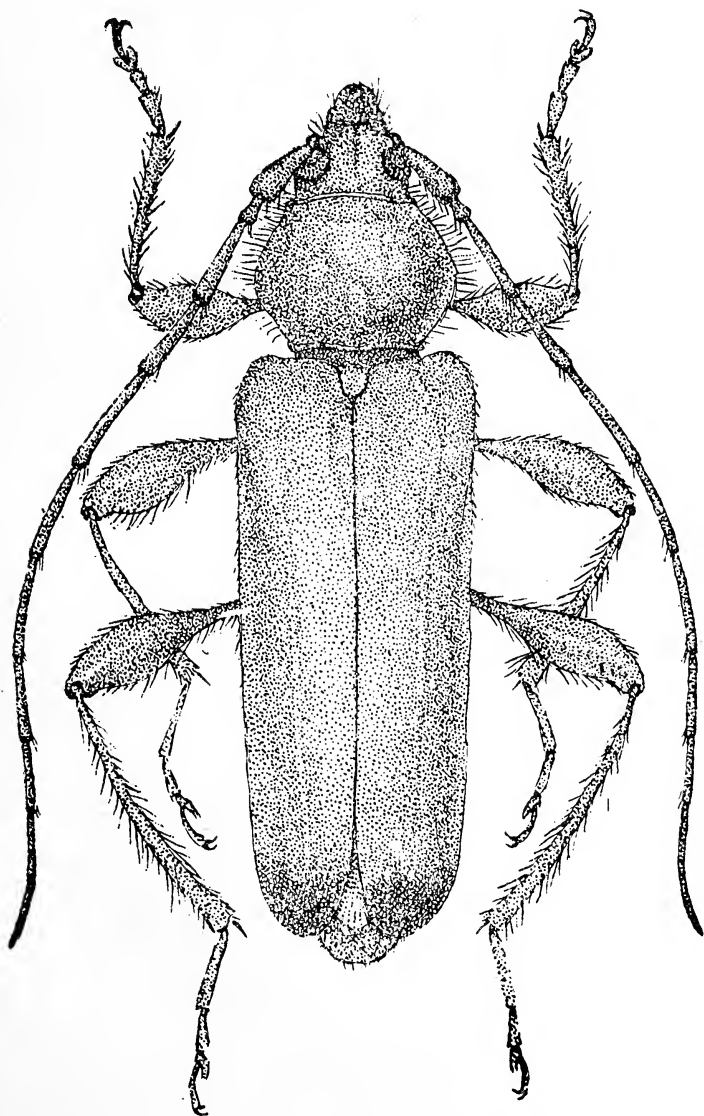


Figure 102. *Phymatodes testaceus* (L.).

other. Chorion smooth, hyaline. Length 1.2 mm, width 0.5 mm.

Larva (Figure 103): Head short, markedly retracted into prothorax, Epistoma faintly convex, broadly emarginate on anterior margin, with smooth narrow dark brown border, behind which stray short setae form transverse row, with faint or almost imperceptible longitudinal suture in posterior half. Frontal sutures not visible. Epistoma laterally fuses with parietals. Hypostoma slightly convex, smooth, with narrow brownish border on anterior margin; hypostomal sclerites with extended sharp inner angles, narrow markedly on posterior inner margin. Gula basally very broad, narrows anteriorly, without brownish border on anterior margin. Parietals on anterior margin ventral and dorsal to antennae with
177 broad rusty-brown border, posterior to antennae with extensive, transversely oval, elongate, pigmented ocellus, with not very long hairs forming transverse band. Antennae slender, apices project forward beyond anterior margin of cephalic capsule; 2nd and 3rd antennal segments brownish, whitish ringlet at apex. Clypeus lustrous, semitransparent or whitish, narrows toward apex, broadens markedly at base, flattened, strip-like. Labrum semitransparent, broadens in posterior half, narrows anteriorly, rounded apically, with short sparse setae in anterior half. Labial submentum transverse, slightly convex; mentum slightly longitudinal, narrows slightly apically, with long setae laterally. Inner masticatory lobes of maxillae comparatively thick, rounded apically and with short sparse

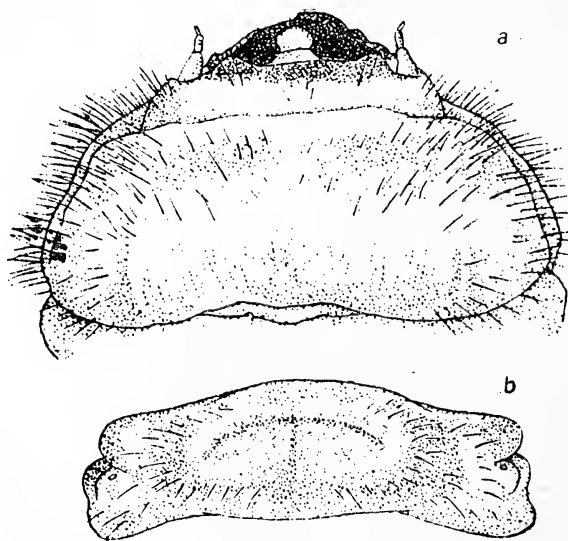


Figure 103. Larva of *Phymatodes testaceus* (L.),
a—head and pronotum; b—abdominal tergite IV
with dorsal locomotory ampulla.

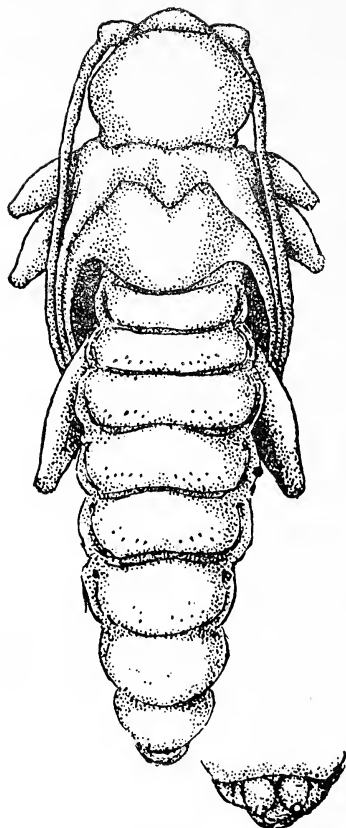
setae there. Maxillary palps thin, barely longer than inner lobes. Mandibles black, with contrasting red border basally, and median longitudinal groove on outer side of base.

Pronotum slopes distinctly toward head, with yellowish or rusty spots in anterior third forming transverse band (two of these spots on disk transverse, two on sides longitudinally elongate), in anterior half in front of scutum and laterally with rusty, not very long hairs, without distinct ringlet at base. Pronotal scutum convex, white, with narrow median longitudinal groove, bound laterally by short longitudinal folds, with two emarginations on anterior margin, medially produced anteriorly, with coarse longitudinal striation, matte silver basally and here with minute reticulate-squamiform sculpture. Prothoracic presternum uniformly convex, with dense rusty hairs; eusternum not bound by groove, merges with presternum, glabrous at base, lustrous, coriaceous, with rounded hairy clearance only on anterior margin medially. Thoracic legs not visible in I-instar larvae, fully developed in II-instar and mature larvae.

- 178 Abdomen comparatively thick, narrows insignificantly posteriorly, with sparse short hairs laterally. Dorsal locomotory ampullae convex, transversely elongate, with barely visible common median longitudinal groove, without grooves laterally and on disk, only sometimes with prominent longitudinal, barely visible narrow dents, or with transverse, barely visible narrow groove (on tergites I, II, and VII), with minute reticulate-squamiform sculpture that imparts matte silver tone. Ventral locomotory ampullae bulge, transversely elongate, cover much of sternites, with minute squamiform sculpture. Pattern on dorsal ampullae given by Duffy (1953) and Mamaev and Danilevskii (1975) evidently not correct; either described from a damaged larva of *Xylotrechus antilope* (Schönh.) or some other species. Body length of mature larva 10 to 18 mm, width of head 2.1 mm.

Pupa (Figure 104): Differs from other species of this genus in very large body and innumerable minute spinules on abdominal tergites. Head narrower than prothorax, on occiput convex, smooth, on vertex between upper ocular lobes widely impressed, transversely striate. Frons between antennae insignificantly convex, with median longitudinal suture, between lower ocular lobes with coarse transverse furrows. Antennae comparatively long, slender, markedly bent ventrad in second half.

Pronotum transverse, angularly produced mediolaterally, narrows identically anteriorly and posteriorly; disk slightly convex, with thin transverse striation, glabrous, without setae and spinules, with small medial tubercle near anterior margin. Mesonotum glabrous, in anterior half slightly convex, on posterior margin with angularly produced scutellum, transversely impressed slightly in middle. Metanotum glabrous, without setae, broad, with median broad longitudinal cavity, transverse



177

Figure 104. Pupa of *Phymatodes testaceus* (L.), female.

striation on disk, broadly rounded on posterior margin.

Abdomen elongate, with almost parallel sides, narrows slightly anteriorly and markedly posteriorly from segment VI. Abdominal tergites convex, laterally with thin longitudinal outcurved furrows, in posterior third with minute spinules forming transverse row on tergite I; tergites II to VI with transverse band interrupted medially (six to nine paramedial spinules in band). Tergite VII narrows posteriorly, broadly rounded on posterior margin, bulges slightly on disk, with very minute, specklike spinules forming transverse row near posterior margin directed backward. Valvifers of female comparatively large, hemispherical, notably narrow toward base on inner side. Hind femora gently clavate and apices barely reach posterior margin of tergite IV. Body length 9.0 mm, width of abdomen 2.8 mm.

Material: Collected in broad-leaved forests of the southern Urals. Adult insects 14, larvae six, pupa—one female, exuviae with beetles and pupae from cells three. One pupa and three adults raised from larvae hatched from eggs laid in the laboratory.

Distribution: Extends from Atlantic Ocean coast to the southern Urals inclusive, north from Sweden and Norway, south to northern Africa and Syria; also occurs in Japan and North America. Difficult to consider this species imported from Europe. It probably covered the entire Holarctic, then disappeared from Siberian territory but was preserved within the present range.

Biology: Inhabits various forests; confined more to oak-broad-leaved forests. Beetles fly from May through June, sometimes up to mid-July. 179 Flight occurs in second half of day, with insects active in warm weather before sundown. Often confined to drying oak and mates there. Female lays eggs singly (some distance apart) in bark crevices of trunk. Fertility comparatively high. For example, ovaries of one female dissected before oviposition contained 42 eggs, of another female 124. Embryonic development takes more than two weeks. Larvae began hatching on July 9 to 10 from eggs laid by beetles in a forest under a gently sloping tree on June 22 to 24. Total duration of egg development 15 to 17 days. Atmospheric temperature during this period 15 to 27°C ($22.1 \pm 0.5^\circ\text{C}$).

Larvae live in and under bark, make meandering longitudinal galleries, leaving no impression on alburnum, and plug them with fine frass of bark particles. Galleries made by larvae sometimes narrow, sometimes broader, sometimes resemble platforms. Mature larva makes cell on thick-barked tree under bark or even in upper layer of wood parallel or oblique to trunk axis. Length of gallery made by larva 13.5 cm, width 9.0 to 15.0 mm. Length of pupal cell 14 to 21 mm, width 5.0 to 8.0 mm. Exit from cell to surface up to 6.0 mm long. Thin bark layer remains between exit and surface. Larvae pupate early spring. Pupa lies in cell with head upward, develops for 15 to 17 days. In the laboratory at 18.3 to 21.2°C one beetle emerged on the 15th, another on the 17th day after appearance of pupa. Young beetles nibble oval flight opening (1.5 mm \times 3.0 mm to 3.0 mm \times 5.0 mm) on bark surface and emerge from cell through it. Emergence of beetles commences in May and ceases by mid-June. Life cycle from egg to mature adult completed in one to two years. It is significant that development of eggs of the same batch under laboratory conditions at the same temperature (16 to 25°C) was completed in nine months by some and over 10 months by others. Weight of larvae before pupation (records of six insects) 44 to 84 mg, pupae 28.5 mg, adults 22 and 69 mg.

Mainly colonizes oak. According to Plavil'shchikov (1940), Duffy (1953), and Demelt (1966), it also attacks chestnut, elm, beech, alder, willow, and other deciduous species. We found it in the southern Urals in the basal section of trunks and on thick branches 18 to 30 cm in diameter on drying and just desiccated oak trees.

2. **Phymatodes zemlinae** Plav. and Anufr.

Plavilstshikov [Plavil'shchikov] and Anufriev, 1964, *Zool Zhurn.*, 43, 10, 1565–1569; Cherepanov and Cherepanova, 1974, *Usachi vinograda amurskogo*, pp. 34–36.

Adult (Figure 105): Characterized by absence of smooth shields on pronotum, red body color, and bluish metallic iridescence of elytra. Head with dense deep punctation, between antennae with broad longitudinal suture. Eyes markedly convex, coarsely faceted, with broad deep notch. Antennae markedly shorter than body, apices barely reach posterior margin of middle third of elytra (male) or extend slightly beyond middle (female), with adherent rusty hairs; 1st to 8th segments with long erect hairs, 5th segment shorter than 3rd, equal to 4th.

Pronotum convex, uniformly rounded laterally, near base with narrow transverse groove, with uniform dense deep punctation, short rusty non-adherent hairs, without smooth shields. Scutellum broad, insignificantly

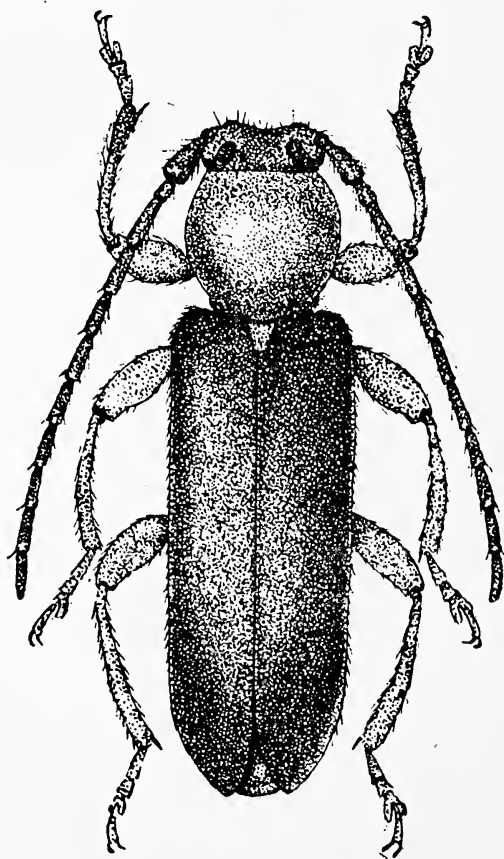


Figure 105. *Phymatodes zemlinae* Plav. and Anufr.

180 longer than width at base, narrowly or broadly rounded posteriorly, with dense deep punctation. Elytra with parallel sides, rather convex, rounded jointly at apex, on inner side around humeri with short longitudinal groove, with dense punctation forming rather distinct transverse wrinkles, and short adherent hairs. Hind femora with elongate clava. First segment of hind tarsi slightly longer than 2nd and 3rd segments together. Head, pronotum, underside of body, and scutellum rusty-red, eyes dark brown, antennae chestnut, elytra bluish with metallic iridescence, femora yellowish-red, tibiae and tarsi brownish. Body length 5.0 to 8.0 mm.

Larva: Body moderately elongate. More than half of head retracted into prothorax. Epistoma with flat or medially faintly notched anterior margin, with lustrous brownish border there, behind which setae form transverse band; divided by median longitudinal suture, bound laterally by faint frontal sutures. Hypostoma with triangular sclerites widely separated by gula, slightly convex, with three striae diverging from posterior angle. Clypeus trapezoid. Labrum small, rounded, in anterior half with short setae. Mandibles massive, broadly rounded apically, hollow inside, smooth outside, posterior to middle with transverse narrow groove, black, reddish-rust at base.

Pronotum transverse, rounded laterally, narrows more anteriorly, on anterior margin with rusty transverse continuous band extending
181 laterally, and anterior to scutum and laterally with rusty hairs. Pronotal scutum convex, longitudinally rugose, with two emarginations on anterior margin, bound laterally by longitudinal folds, divided by median longitudinal groove. Thoracic legs short, minute, wartlike.

Abdomen laterally with thin light-colored hairs. Locomotory ampullae developed on abdominal segments I to VII, divided by median longitudinal groove, laterally with radial folds, faint on sternite VII. Body length of mature larvae up to 10 mm, width of head 1.1 mm.

Pupa (Figure 106): Body moderately elongate, somewhat flattened. Head broad, bulges between antennae, with median longitudinal suture, without setae, uniformly rounded on occiput. Antennae pressed to sides, bent ventrad posterior to midfemora, with apices directed forward.

Pronotum insignificantly convex on disk, rounded laterally, narrows anteriorly and posteriorly, with setae on disk, without spinules. Mesonotum short, transverse. Metanotum longitudinal, with median longitudinal groove, and very gently rounded on posterior margin. Apices of hind femora extend slightly beyond abdominal tergite IV.

Abdomen in region of segments IV and V broadens insignificantly, narrows gradually posteriorly, with median longitudinal groove on dorsal side. Abdominal tergites II to VI with minute sharp spinules in posterior half forming indistinct transverse row (eight to twelve spinules in row). Tergite VII apically broadly rounded, in posterior half close to posterior

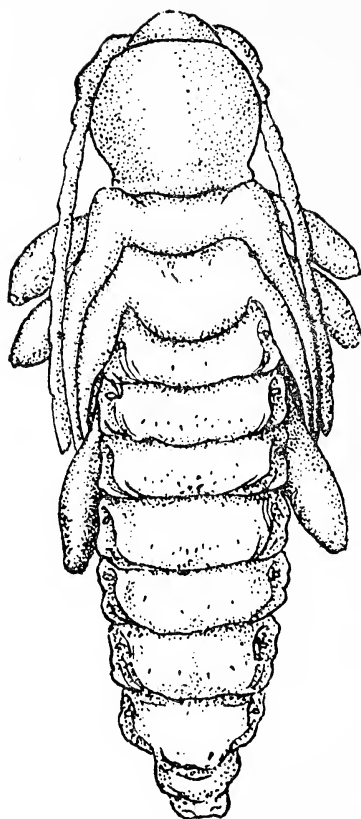


Figure 106. Pupa of *Phymatodes zemlinae*
Plav. and Anufr.

180

margin with spinules forming transverse row, of which two bent down toward center. Sometimes spinules wanting. Body length 5.0 to 8.0 mm, width of abdomen 1.8 to 2.1 mm.

Material: Collected in Ussuri-Primor'e region. Adult insects (raised in laboratory) three, pupae—two males and one female, larvae 12, larval exuviae with beetles from cells three.

Distribution: Ussuri-Primor'e region.

Biology: Colonizes broad-leaved forest biotopes. Ecologically associated with grapevine. Beetles fly in May and June, lead cryptic mode of life. Not seen on flowers. After mating, female oviposits under intact bark strip. Colonizes thin moist viable shoots of Amur grapevine (*Vitis amurensis*) 3.0 to 7.0 mm in diameter.

Newly hatched larvae bore wood, make galleries along pith, and plug them with fine frass. Upper layer of wood adhering to bark not damaged. Length of gallery 8.0 to 15.0 cm, width up to 3.0 mm. Mature

larva hibernates. The following spring makes cell and pupates in it. Length of cell 21 mm, width 3.0 mm.

Pupae found in May. Young beetles emerge from them in second half of May and early June. Beetles nibble oval openings on shoot surface and abandon cell. Size of openings 1.5 mm \times 2.5 mm. Generation completed in one to two years.

Brachyclytus singularis Kr. colonizes thicker portions of the same shoots, with diameter of 5.0 mm or more.

3. *Phymatodes ussuricus* Plav.

Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 318; Cherepanov and Cherepanova, 1974, *Usachi vinograda amurskogo*, pp. 26-30.

182 *Adult* (Figure 107): Characterized by small body, hind femora markedly dilated at apex, and other features. Head minute, retracted up to eyes into prothorax, lustrous, with minute deep punctation, sparse long hairs, near base of antennae elevated tubercularly, with median longitudinal suture. Eyes distinctly faceted, markedly emarginate, upper lobes of eyes half size of lower ones, septum between them narrow, with two rows of facets. Antennae slightly thickened apically, last segment extends beyond 0.50 (female) or almost beyond 0.66 (male) length of elytra, with minute adherent hairs; 1st to 5th segments with long hairs.

Pronotum narrows less anteriorly, more posteriorly, rounded laterally, markedly produced near base and poorly near apex, flat on disk, with minute deep punctation, light-colored erect hairs. Scutellum longer than width at base, broadly rounded posteriorly, with uneven punctation. Elytra with parallel sides, 3.0 times longer than general width, with projecting humeral tubercle, longitudinally impressed inward from it, flat on disk, with narrowly rounded inner apical angle and gently tapered outer, in anterior half with distinct deep punctation, in posterior half with fine smoothened punctation, with rusty semiadherent short hairs. Legs with long setae. Second half of femora markedly dilated, smooth, with fine smoothened punctation. Hind tarsi 0.50 length of tibiae, 1st segment equal to two successive together.

Abdomen convex ventrally, with sparse minute punctation, and long semiadherent hairs. Body dark brown chestnut, elytra in anterior half reddish-rust, gradually darken toward apex, quite often entirely dark brown or chestnut. Body length 4.0 to 5.0 mm.

Egg: White, semitransparent, narrows more toward one pole. Chorion smooth, hyaline. Length 1.0 mm, width 0.4 mm.

Larva (Figure 108): Body small, elongate. Head narrowly rounded anteriorly, markedly retracted into prothorax. Epistoma insignificantly emarginate on anterior margin, with dark brown lustrous border; in posterior half divided by entirely distinct median longitudinal suture;

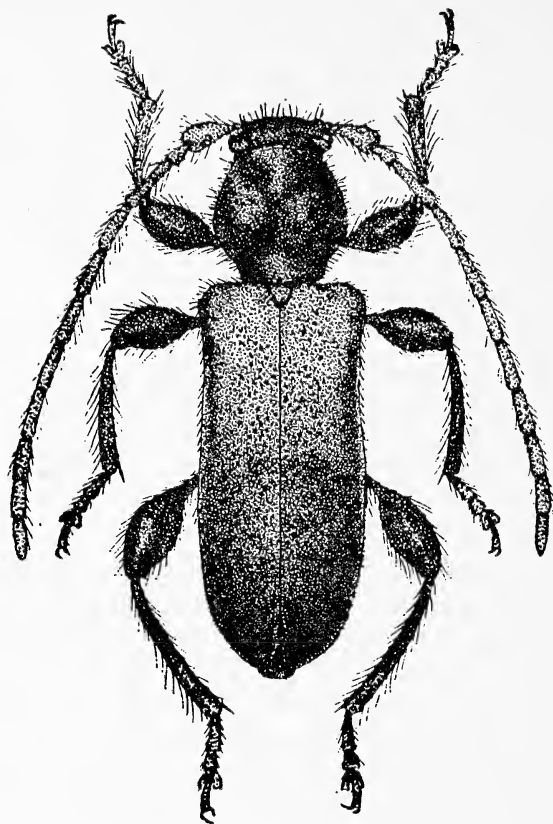


Figure 107. *Phymatodes ussuricus* Plav.

poorly demarcated laterally; frontal sutures not visible. Hypostoma divided into two convex minute lustrous triangles, with tapered or rounded outer anterior angle and sharply produced inner angle, on anterior margin with rusty diffuse border. Parietals in anterior half with stray hairs. Clypeus minute, trapezoid, rusty-brown. Labrum narrowly rounded apically, with sparse setae. Mandibles black, rusty at base, rounded at apex, with cultrate edge; dorsoventral width not less than length. Inner lobes of maxillae convex, thin, narrowly rounded apically. Maxillary palps thin, do not project anteriorly or project slightly beyond apex of inner masticatory lobes.

Prothorax narrowly rounded anteriorly, at base not narrower or somewhat wider than mesothorax. Pronotum transverse, convex on disk, slopes slightly toward head, with four yellowish-rust spots on anterior margin forming transverse band interrupted three times, in anterior half before scutum and laterally with long rusty hairs. Pronotal scutum white, glabrous, without hairs, bound laterally by barely perceptible short longitudinal

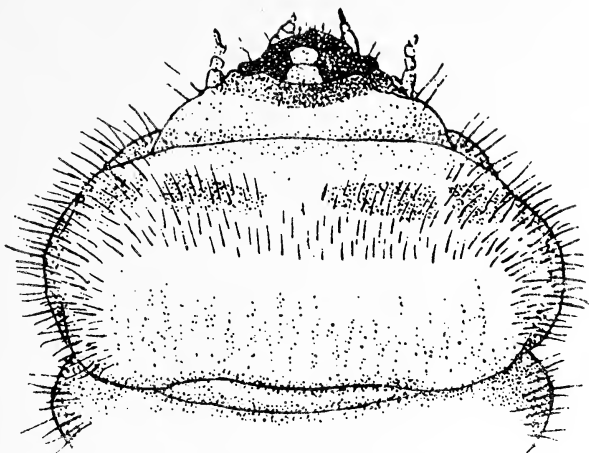


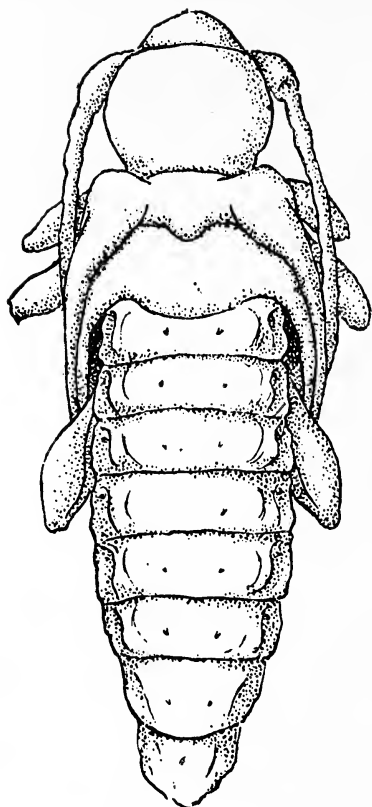
Figure 108. Larva of *Phymatodes ussuricus* Plav., head and pronotum.

grooves, more convex at base, with minute reticulate-squamiform sculpture, matte, lustrous for most part in front, with long longitudinal striation, with spaces between striae several times wider than striae. Alar lobes with rusty hairs. Prosternum in anterior half and laterally with long rusty hairs, on disk posterior to middle with pair of widely separated, lustrous, glabrous, sometimes faint spots. Thoracic legs lacking, or barely perceptible in mature larvae (under high magnification) as wart-like processes; claw brownish.

Abdomen narrows slightly posteriorly, laterally with sparse short light-colored hairs. Locomotory ampullae better developed on abdominal segments I to VI and less so on segment VII, matte, with minute reticulate-squamiform sculpture, medially divided by common longitudinal groove, laterally with coarse longitudinal rugose streaks. Body length of mature larva 5.0 to 8.0 mm.

Pupa (Figure 109): Characterized by widely separated, minute paired spinules on abdominal tergites. Body comparatively flat. Head short, transversely convex between antennae, with median longitudinal suture, without setae, hemispherically rounded on occiput. Antennae pressed to sides, bent ventrad posterior to midfemora.

184 Pronotum uniformly convex, transverse, rounded laterally, narrows gradually posteriorly, more steeply anteriorly, glabrous, without setae. Mesonotum convex, with broadly rounded scutellum posteriorly. Metanotum lustrous, not shorter than wide, with median longitudinal groove, glabrous, without spinules. Hind femora distinctly clavate, markedly thickened in second half, with apices extending almost beyond abdominal tergite IV, closely pressed to sides.



183

Figure 109. Pupa of *Phymatodes ussuricus* Plav.

Abdomen moderately elongate, widens somewhat in region of segment IV, narrows significantly posteriorly. Abdominal tergites uniformly convex, with median longitudinal groove, with one barely visible paramedial spinule, flat laterally, not produced. Tergite VII in posterior half with pair of widely separated, more distinct, much larger spinules. Tergite VIII elongate, rounded posteriorly. Valvifers of female hemispherical, somewhat separated. Body length 5.0 mm, width of adomen 1.1 mm.

Material: Collected in Ussuri-Primor'e region (Komarovka, Suvorovka, Artemovka Rivers, environs of Vladivostok, and so forth). Adult insects 13, larvae 41, pupa—one female, larval exuviae with beetles from cells four.

Distribution: Ussuri-Primor'e region. We found it in the region of Komarovka and Suvorovka Rivers, along Kaban' spring near Ussuriisk, and in "Kedrovaya Pad'" sanctuary.

Biology: Found in broad-leaved forests on Amur grapevine (*Vitis amurensis*). Beetles fly from last few days of June up to mid-August. En masse flight in middle 10 days of July. Beetles lead cryptic mode of life,

not seen on flowers. Found on grapevine creepers, mate there. Female usually lays eggs singly under intact bark strips. Colonizes only thin shoots 4.0 to 8.0 mm in diameter. Larvae hatch from eggs 18 to 20 days after oviposition. For example, larvae began hatching from eggs laid July 3 through 6 from the 24th of that month. In another instance larvae began hatching from eggs laid on a creeper on July 7 to 9 from July 29th and immediately commenced boring wood.

Larvae live in wood, make galleries along shoots initially in upper layer directly under bark, later along pith, and plug them with fine frass. They then hibernate in wood. In spring of the following year they continue to make galleries and in June make a cell along the shoot in upper layer of wood or in pith. Thin layer of wood left between cell and bark. Length of cell 6.0 to 8.0 mm, width 1.8 to 2.0 mm. Larva passes through preparatory phase in cell before pupation. It evacuates intestinal contents and loses considerable weight. For example, in the laboratory four larvae lost 23.6 to 28.8% of their weight during this period.

Pupation of larvae is generally completed in June. Pupae found up to early July. Young beetles emerge from pupae in second half of June and early July. They nibble an oval opening (1.5 mm \times 2.0 mm to 2.0 mm \times 2.5 mm) on shoot surface and emerge from pupal cell through it. Complete life cycle from egg to adult requires one year.

Population density on grapevine creeper comparatively high. Thus in a creeper section 52 cm long and 5.0 to 7.0 mm in diameter eight insects were found; in another section 90 cm long and 4.5 to 7.0 mm in diameter 32 insects (seven adults, 23 larvae, and two pupae); in a third section 1.0 m long and 4.5 to 5.0 mm in diameter 10 insects, i.e., over 20 insects of this species were found on the average for every meter of creeper. *Teratoclytus plavilstshikovi* Zaitz. sometimes colonizes together with this species but usually lives on much thicker sections of the creeper.

4. *Phymatodes vandykei* Gress.

Gressit, 1960, *Kontyu*, 9, 4, 172-173; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 73.

Adult (Figure 110): Very similar to *Phymatodes ussuriicus* Plav. and almost indistinguishable from it. Only very minor differences in structure of eyes and other features evident. Head retracted into prothorax up to antennae, flat between them, without distinct tubercular elevation, with narrow streaklike median longitudinal suture, with sparse minute punctation, sparse light-colored hairs. Eyes broadly emarginate, upper lobes 0.25 size of lower one, covered for most part by pronotum, septum between ocular lobes narrow, with one row of facets. Antennae thicken toward apex, extend beyond middle of elytra; 11th segment elongate, con-

cally (female) or more acutely produced (male) at apex, with sparse hairs at base, and denser adherent hairs toward apex, with long erect hairs on first five segments.

Pronotum convex, markedly narrower at base than at apex, rounded laterally, with broad shallow constriction in anterior third, more distinctly sloped constriction near posterior margin, convex (not flat) on disk; with uniform, fairly dense punctation and rusty hairs. Scutellum flat, narrows posteriorly, narrowly or broadly rounded apically. Elytra with parallel sides, posterior to scutellum along suture somewhat impressed, with moderate punctation (in anterior half much larger, in posterior comparatively small but entirely distinct), with short semiadherent hairs.

Body dark brown with rusty tinge, pronotum much darker. Elytra in anterior half rusty-brown or chestnut, much darker in posterior half. Body length 4.5 to 5.0 mm.

Egg: White, elongate, broadly rounded at one pole, narrows gradually toward the other, appears pointed. Chorion smooth, hyaline, semitransparent. Length 0.8 mm, width 0.35 mm.

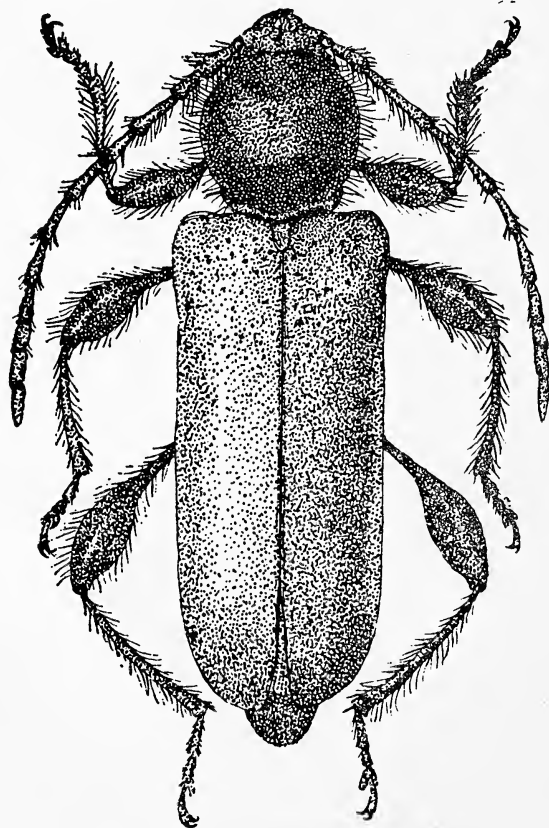


Figure 110. *Phymatodes vandykei* Gress.

Larva (Figure 111): Similar to larva of *Phymatodes ussuricus* Plav. Differs in absence of longitudinal groove on dorsal locomotory ampullae, and very thick inner maxillary lobes broadly rounded apically. Head short, half of it retracted into prothorax. Epistoma smooth, uniform on anterior margin, with lustrous brownish-rust border contrasting sharply, indistinctly bound laterally (frontal sutures not visible), with faint median longitudinal suture. Hypostomal sclerites smooth, lustrous, somewhat produced forward on inner angles, rounded on outer anterior angles. Gula flat, markedly widens basally and slightly apically, laterally in anterior half appears emarginate. Parietals in anterior half with stray long setaceous hairs. Antennae long, with long thick 1st segment. Clypeus elongate, trapezoid, semitransparent. Labrum oval, gently rounded on anterior margin, with sparse short setae, and together with clypeus covers only half of mandibular joint. Mandibles thick, broadly rounded and black apically, reddish-rust at base. Inner lobes of maxillae thick, broadly rounded apically, with sparse light-colored setae. Maxillary palps conical, comparatively short, not longer than inner lobes.

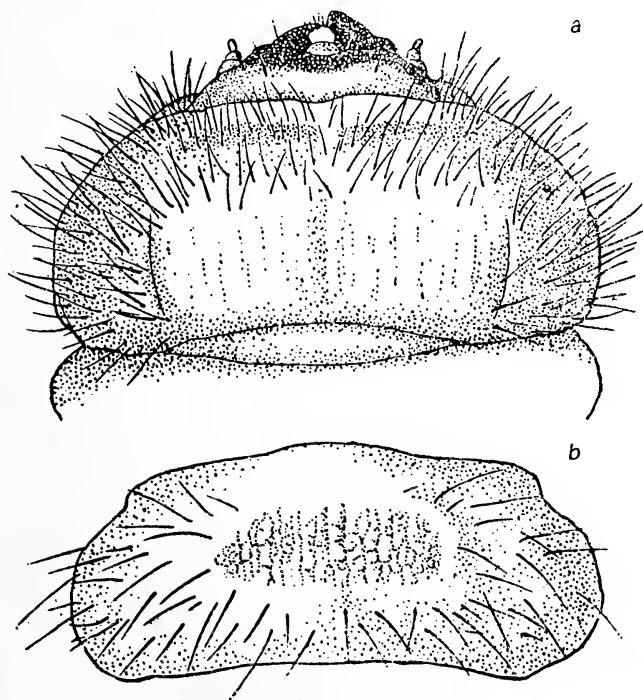


Figure 111. Larva of *Phymatodes vandykei* Gress.

a—head and pronotum; b—abdominal tergite IV with dorsal locomotory ampulla.

186 Pronotum laterally rounded, narrows more anteriorly, on disk with short and laterally much denser longer hairs, in anterior half with transverse yellowish band divided by three white longitudinal interruptions into four spots; of these, middle ones more distinct than lateral. Pronotal scutum short, convex, white, lustrous, on anterior margin slightly produced medially, with barely visible thin longitudinal striation, bound laterally by well-developed longitudinal grooves, basally more convex, matte (this section covering not less than 0.33 of scutum). Prothoracic presternum laterally with dense long, on disk sparse short light-colored hairs; eusternum in form of pair of widely separated, lustrous, glabrous round spots. Thoracic legs lacking; only in mature larvae present as slight warts. Base (supporting part or sternellum) of pro-, meso-, and metasterna glabrous, matte.

Abdomen elongate, narrows from thorax to middle, in second half with parallel sides, quite often obtuse at posterior end. Abdominal segments laterally with sparse light-colored hairs, with insignificant flange in anterior half or without it. Locomotory ampullae on abdominal segments I to VII slightly convex, transversely elongate, with minute reticulate-squamiform sculpture, matte, less developed on sternite VII. Body length of mature larva 7.0 to 8.0 mm, width of head 1.0 mm.

Pupa (Figure 112): Differs from pupa of *Phymatodes ussuricus* Plav. in more developed spinules on abdominal tergite VII. Body elongate. Head short, narrows slightly in front of antennae. Frons broad, flat, around antennal bases on inner side transversely slightly convex, with median longitudinal suture. Vertex posterior to antennae slightly impressed. Occiput hemispherically rounded, glabrous, lustrous. Antennae short, pressed to sides, with apices insignificantly bent ventrad.

Pronotum not longer than width in middle, almost transverse, rounded laterally, convex on disk, with median longitudinal, transversely striate band in anterior half. Mesonotum slightly convex, broadly rounded posteriorly, not produced in region of scutellum. Metanotum broad, distinctly transverse, insignificantly convex, with slight median groove. Femora in second half highly thickened, dilated, clavate. Hind femora just reach posterior margin of abdominal tergite IV.

187 Abdomen elongate, with almost parallel sides in anterior half, broadens very slightly in region of segments IV and V, narrows gradually posteriorly. Abdominal tergites highly convex, even, with one barely visible paramedial spinule each directed backward. On some (especially anterior) tergites, these spinules are altogether imperceptible. Tergite VII broad, transverse, broadly rounded posteriorly, in posterior half with pair of transversely separated, much larger, entirely visible spinules directed forward. Tip of abdomen rounded, glabrous, without setae or spinules. Body length 5.1 mm, width of abdomen 1.1 mm.

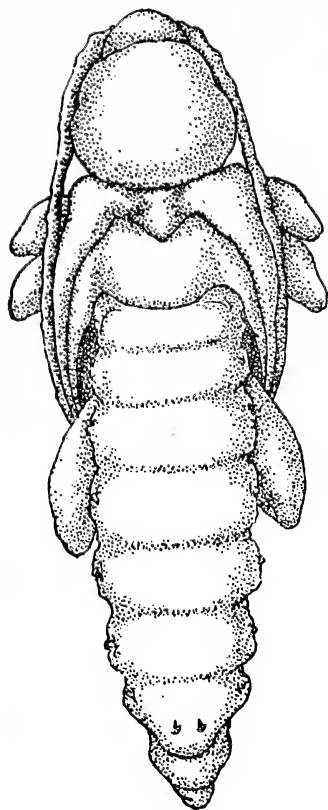


Figure 112. Pupa of *Phymatodes vandykei* Gress.

Material: Collected on Kunashir Island. Adult insects five, larvae six, pupa—one male, exuviae with beetles from cells four.

Distribution: Islands of Japan and southern Kuril' (Kunashir Island), within viable zone of grapevine (*Vitis*).

Biology: Inhabits broad-leaved and mixed forests. Beetles fly from second half of July. They do not require supplementary feeding and mate immediately on emergence from pupal cells. Female oviposits under intact bark strips of grapevine shoots. Colonizes mainly thin shoots up to 1.0 cm in diameter. Eggs generally laid singly.

In hatching larvae rupture chorion, emerge, and bore shoot. Their longitudinal galleries under bark are deeply impressed in wood and densely plugged with fine frass of bark and wood. In June mature larva makes cell under bark in upper layer of tree along shoot and pupates in it. Length of galleries 9.0 to 14.5 cm, width around cell up to 3.5
188 mm. Length of pupal cell 6.0 to 7.0 mm, width 2.5 to 3.0 mm. Sometimes larva bores wood before pupation, makes cell in pith of shoot,

turns head toward inlet, and then pupates. Pupation commences end of June. Pupae found up to mid-July.

Emergence of young beetles from cells was observed in last 10 days of July near Alekhino village on Kunashir Island. Beetles nibble oval opening (1.0 mm \times 1.2 mm) on shoot surface and emerge. By this time their gonads are fully developed. Ovaries of a female just emerging from cell contained 22 mature eggs. Weight of beetles immediately after emergence from shoots 3.0 to 4.5 mg (male) to 6.0 mg (female).

A given shoot is colonized repeatedly. Three beetles were found in cells on a shoot 19 cm long and 0.7 cm in diameter. *Phymatodes maaki* (Kr.) inhabits grapevine shoots together with this species.

5. *Phymatodes abietinus* Plav. and Lur.

Plavilstshikov [Plavil'shchikov] and Lurie, 1960, *Byull. Mosk. O-va Ispyt. Prirody, Otd. Biol.*, 65, 4, 124-125.

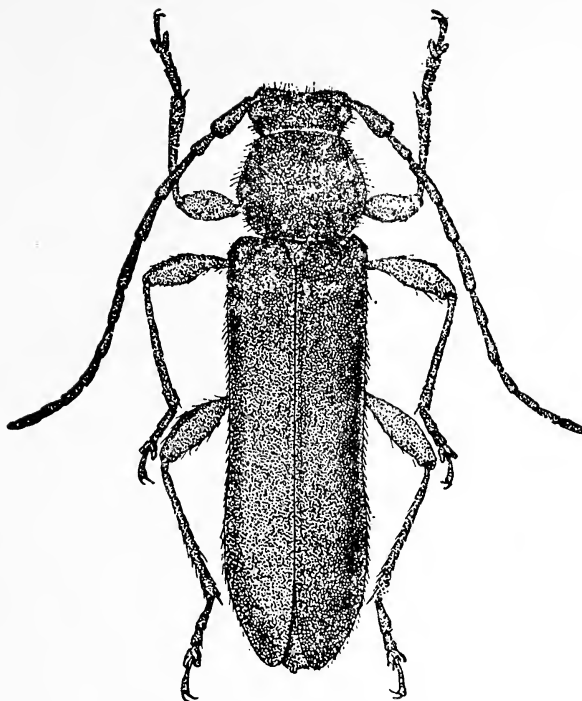
Adult (Figure 113): Characterized by short slender antennae, poorly developed smooth shields on pronotum, and markedly elongate elytra with parallel sides. Body minute, comparatively narrow. Head insignificantly retracted into prothorax, with uneven punctation, short smooth median suture between antennae, and sparse erect hairs. Eyes indistinctly faceted, on inner side slightly and angularly emarginate. Antennae slender, comparatively short, with apices extending beyond 0.66 (male) or 0.50 (female) length of elytra. Third antennal segment only 2.0 times longer than 2nd, notably longer than 5th; latter equal to 4th.

Pronotum not longer than width in middle, rounded laterally, with distinct groove near base and poorly developed transverse groove near apex, moderately convex on disk, with uneven punctation, sparse light brown hairs not forming compact cover, on disk with smooth distinct or barely visible shields, two anterolateral to middle and one, rarely well developed, on hind clivus. Scutellum longitudinal, rounded posteriorly, with adherent hairs.

Elytra with parallel sides, markedly elongate, 3.0 times longer than wide at humeri, with faint impression around humeri at base, individually rounded apically, with dense punctation forming transverse wrinkles, and short light-colored semiadherent hairs. Femoral clava comparatively long, moderately thickened. Hind tibiae straight in male and female. First segment of hind tarsi shorter than two successive together. Body ventrally with sparse hairs and lustrous sheen.

Entire body, antennae, and elytra dark brown, legs much lighter colored, rusty, sometimes antennae rusty. Body length 4.5 to 6.0 mm.

Egg: White, oval, obtusely rounded at poles. Chorion smooth, lustrous, hyaline. Length 0.8 mm, width 0.3 mm.

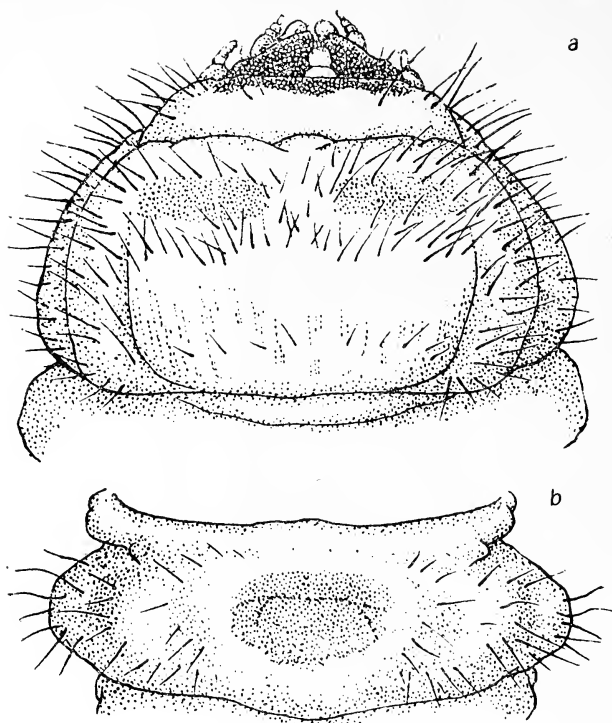


188

Figure 113. *Phymatodes abietinus* Plav. and Lur.

Larva (Figure 114): Characterized by uniform distribution of hairs laterally and on disk of pronotum, faint yellowish spots on pronotum, and very dense longitudinal striation on pronotal scutum. Head short, markedly retracted into prothorax, narrowly rounded anteriorly. Epistoma on anterior margin with broad lustrous brownish border. Median longitudinal suture and frontal sutures not visible. Hypostoma narrows anteriorly, laterally with straight sutures and pointed inner angles of sclerites widely separated by gula. Parietals in anterior half with stray long piliform setae. Antennae with three segments, comparatively thick at base. Clypeus small, basally flattened and white. Labrum oval, convex, hyaline, in anterior half with sparse short setae. Mandibles black, basally
 190 thick, broadly rounded apically, with angularly produced upper margin, smooth outwardly, inner side broadly emarginate as though hollow. Inner lobes of maxillae broadly rounded apically, lustrous, with sparse short setae. Maxillary palps thick, long, with four segments.

Pronotum 2.0 times wider than long, somewhat narrowly rounded anteriorly, with faint wide yellowish spots in anterior third (almost not visible in some specimens), on disk with sparse short, and laterally much longer fine hairs. Pronotal scutum insignificantly convex, white, with fine dense longitudinal striation (distance between streaks less than their



189

Figure 114. Larva of *Phymatodes abietinus* Plav. and Lur.

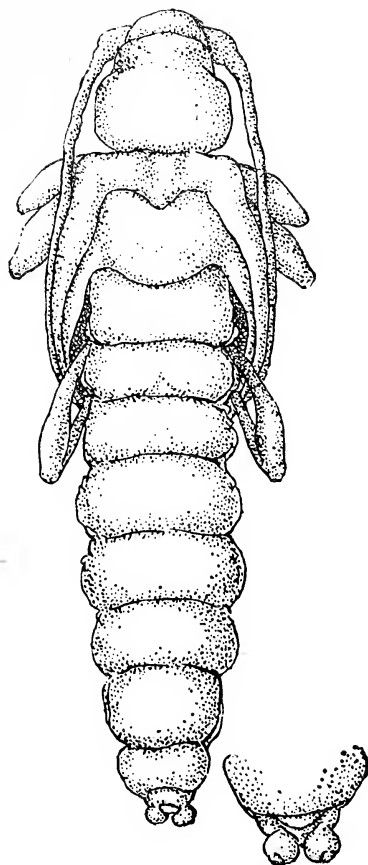
a—head and pronotum; b—abdominal tergite IV with dorsal locomotory ampulla.

width), bound laterally by short longitudinal grooves, at base with minute reticulate-squamiform sculpture. Alar lobes outwardly lustrous lateral to grooves, with sparse hairs. Thoracic legs poorly developed, barely perceptible, wartlike.

Abdomen moderately elongate, narrows somewhat posteriorly. Abdominal segments I and VII laterally in anterior third with narrow deep flange, behind which long fine hairs occur. Locomotory ampullae developed on abdominal segments I to VII, with fine reticulate-squamiform sculpture, matte, without longitudinal streaks. Body length of mature larvae 6.5 to 7.0 mm, width of head 1.1 mm.

Pupa (Figure 115): Differs from other species of this genus in absence of spinules on dorsal side of body. Head narrows anteriorly from eyes, notably impressed between antennae, on occiput spherically rounded, hyaline, glabrous, without setae. Antennae slender, bent ventrad, loop-like in second half.

Pronotum slightly elongate, in posterior third broadens angularly, narrows gently anteriorly, flat on disk (female) or notably convex (male),

Figure 115. Pupa of *Phymatodes abietinus* Plav. and Lur.

hyaline, with lustrous sheen. Mesonotum convex, with broadly rounded (female) or slightly produced (male) scutellum posteriorly. Metanotum transverse gently rounded on angles, slightly convex, with median longitudinal groove in anterior half. Hind femora in second half moderately thickened, with spines extending beyond base of abdominal tergite IV.

Abdomen elongate, narrows insignificantly anteriorly, not obtuse at posterior end, rather somewhat pointed. Abdominal tergites convex, rounded laterally, without setae or spinules. Valvifers of female large, adjacent, broadly and uniformly rounded apically. Body length 5.5 to 6.0 mm, width of abdomen 1.3 mm.

Material: Collected in Salair fir forests. Adult insects eight, larvae 12, pupae six, larval exuviae with beetles from cells six.

Distribution: Southern regions of western Siberia. Found in forests of Novosibirsk and Kemerov regions.

Biology: Inhabits fir forests of different densities. Beetles fly from first half of July. Female oviposits on thin drying fir shoots (*Abies sibirica*) 0.5 to 1.7 cm in diameter in lower tier of crown. Larvae hatch two weeks later from eggs. Under laboratory conditions, at 20°C, larvae began emerging from eggs 12 to 15 days after oviposition. Larvae begin to hatch from early August.

In hatching larvae rupture chorion, bore bark, make gallery under bark along shoot in upper layer of wood, and plug it with fine frass. Length of gallery under bark up to 12 cm and width 2.0 mm. Before second hibernation larvae bore wood, leaving an inlet 2.5 cm in width on surface. The following spring mature larva makes pupal cell along shoot and pupates in it. Length of pupal cell 7.0 to 11.0 mm, width 2.5 to 3.0 mm.

- 191 Pupation commences end of May, early June, and ceases in last 10 days of June. Young beetles appear mainly in second half of June. Found in wood up to middle 10 days of July. Young beetles nibble oval flight opening (1.0 mm × 1.5 mm to 1.4 mm × 2.5 mm) on shoot surface and abandon cell. Emergence of beetles from wood completed in first half of July. Young beetles do not require additional feeding, mate immediately after emergence from wood, and female later oviposits. Female notably larger than male. For example, in a series of weighings males (eight) in larval stage before pupation weighed 3.4 to 7.4 mg, in pupal stage. 2.9 to 6.5 mg, and adults 1.8 to 4.2 mg; females (nine) correspondingly weighed: 5.8 to 11.8, 5.3 to 10.1, and 4.3 to 8.2 mg.

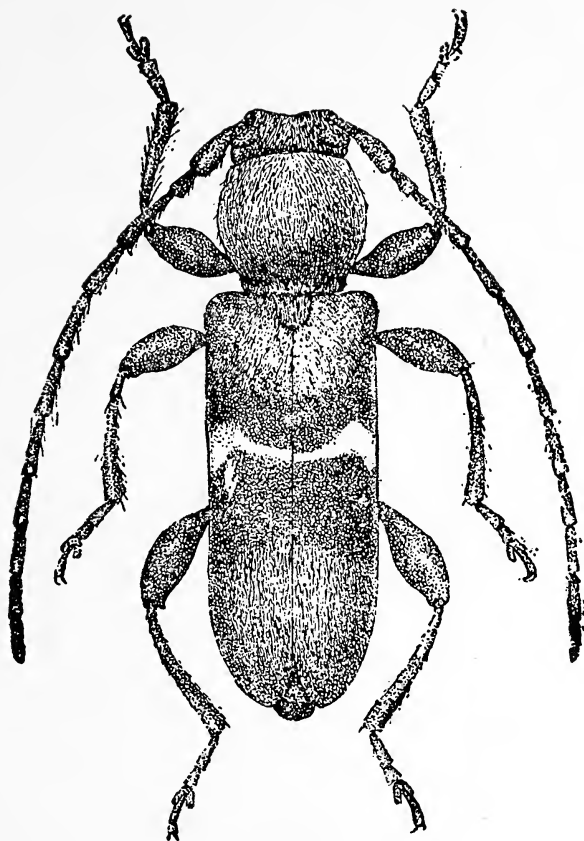
Population density sometimes comparatively high. On a shoot 21.5 cm long and 1.7 cm in diameter, 11 specimens were found including seven pupae and four larvae.

6. *Phymatodes mediofasciatus* Pic

Pic, 1933, *Mel. Exot.*, vol. 62, p. 29; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 324–325; Cherepanov and Cherepanova, 1974, *Usachi vino-grada amurskogo*, pp. 30–33.

Adult (Figure 116): Readily recognized by a single white transverse band on black elytra. Head markedly retracted into prothorax, with faint anteromedian longitudinal suture, slightly impressed between upper ocular lobes, with dense minute punctation, and light-colored adherent hairs. Eyes finely and distinctly faceted, with individual facets in septum between lobes forming narrow band. Antennae barely reach, more often do not reach elytral apex (male) or 11th segment extends beyond 0.75 length of elytra (female). Third antennal segment equal to 5th, insignificantly longer than 4th.

Pronotum convex, roundly enlarged in anterior half, narrows more toward base, near posterior margin with narrow transverse groove, with

Figure 116. *Phymatodes mediofasciatus* Pic.

deep uniform punctation, distance between punctures smaller than punctures, with thin compactly adherent gray hairs combed forward and from sides toward middle, laterally with long erect setaceous hairs. Scutellum broad, broadly, more rarely narrowly rounded posteriorly, with dense punctation, and adherent hairs. Elytra moderately elongate with parallel sides, at base from inner side of humeral tubercle uniformly convex, individually or almost jointly rounded at apex, basally with large, elsewhere with very small dense punctation, medially with brownish hairs, on transverse band with white short hairs, at base and on hind clivus with very long whitish hairs forming two compact light-colored fields—one at base, the other at apex. Hind tibiae straight (female) or notably curved (male). First segment of hind tarsi distinctly longer than two successive together.

Entire body, antennae, and legs black only tarsi sometimes rusty-brown. Elytra black, medially with curved white transverse band. Body length 4.0 to 7.0 mm.

Egg: Initially transparent, hyaline, later turns whitish and elongates. Chorion smooth. Length 1.2 mm, width 0.4 mm.

Larva (Figure 117): Differs from larvae of the subgenus *Phymatodellus* in large body, entirely visible thoracic legs, elongate longitudinal spots laterally on pronotum, and structure of dorsal locomotory ampullae. Head narrowly rounded anteriorly, more than half of it retracted into prothorax. Epistoma laterally almost not demarcated, fuses with parietals, medially divided by longitudinal suture, well distinguished 192 in posterior half, with broad rusty-white border on anterior margin. Frontal sutures not visible. Hypostomal sclerites barely convex, smooth, with sharply manifest dark rusty border on anterior margin, sharply produced inner and straight outer anterior angles. Parietals in anterior third rusty-brown, with setaceous hairs forming indistinct transverse row. Antennae comparatively long; 1st antennal segment very thick, elongate, almost conical. Clypeus small, trapezoid, semitransparent. Labrum small, elongate, narrowly rounded apically, with short setae. Mandibles massive, broadly rounded apically, with cultrate margin, on outside basally with transverse groove. Inner lobes of maxillae thin, elongate, narrowly rounded apically.

Pronotum transverse, roundly enlarged in posterior half, narrows anteriorly, slopes moderately toward head in anterior half, with four yellow

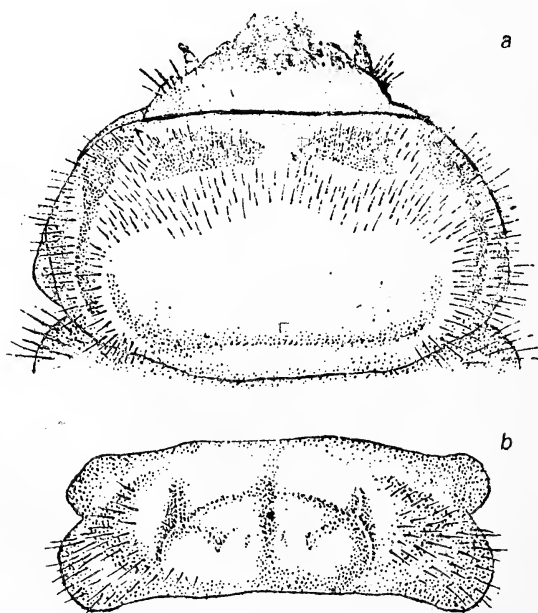


Figure 117. Larva of *Phymatodes mediofasciatus* Pic.
a—head and pronotum; b—abdominal tergite with
dorsal locomotory ampulla.

spots on anterior margin; of these spots, middle ones transversely elongate, tetragonal, lateral ones longitudinal, extend almost up to base, narrowly cuneiform posteriorly, with hairs only on anterior margin, elsewhere glabrous, lustrous (in species of *Phymatodellus* lateral spots with long uniform hairs do not extend toward base). Pronotal scutum white, lustrous, uniformly convex, without matte transverse band at base, with two emarginations on anterior margin, anteromedially elongate, bound laterally by short longitudinal grooves. Proscutellar zone with short hairs; pronotum laterally with dense long rusty hairs. Transverse yellow spots in anterior half with long hairs, without sclerotized ringlets at base. Prothoracic presternum on disk with shortened, laterally with long rusty hairs; eusternum glabrous. Thoracic legs minute, poorly developed but entirely perceptible.

Abdomen narrows slightly posteriorly, with dense light-colored hairs laterally. Abdominal segments in anterior third laterally with deep constriction. Dorsal locomotory ampullae markedly convex, developed on abdominal tergites I to VII, coriaceous, without squamiform sculpture, with minute furrows, divided by common median longitudinal groove, laterally with longitudinal short groove, on anterior margin with transverse groove, mediolaterally with faint oblique groove that extends posteromedially. Ventral locomotory ampullae less convex, weakly developed on sternite VII. Length of mature larvae 11 to 12 mm, width of head 1.3 mm.

Pupa (Figure 118): Body moderately elongate, not flat. Head narrows steeply from antennae anteriorly, transversely convex between antennae, uniformly rounded on occiput. Antennae in male comparatively long, bent ventrad round midfemora, with apices turned forward; in female notably shorter, extend beyond hind femora, with apices bent ventrad.

Pronotum rounded, bulges uniformly on disk, not longer than width in middle, smooth, lustrous. Mesonotum medially convex, longitudinally impressed laterally, not produced on posterior margin, angularly rounded. Metanotum with broad median longitudinal groove, laterally with distinct oblique dents, broadly rounded on posterior margin, almost semi-circular.

Abdomen moderately elongate, broadens notably in region of segments III and IV, narrows gradually posteriorly. Abdominal tergites convex, with common, narrow, median longitudinal groove, with stray fairly prominent spinules that medially and in posterior half form two transverse rows. Tergite VII broadly rounded posteriorly, in posterior half with minute spinules directed dorsally and forming diffuse tuft. Tip of abdomen rounded. Valvifers of female conically produced laterally, adjacent. Body length 8.5 mm, width of abdomen 2.3 mm.

Material: Collected in Ussuri-Primor'e region. Adult insects 25,

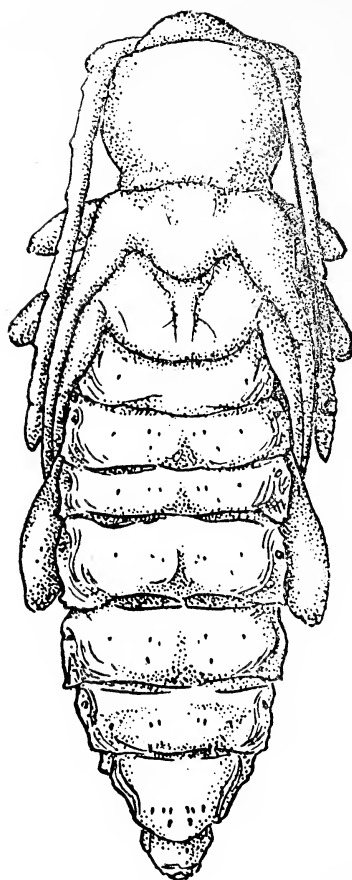


Figure 118. Pupa of *Phymatodes mediofasciatus* Pic.

larvae 16, pupae—two males and females, larval exuviae with beetles from cells 10.

- 194 *Distribution:* Ussuri-Primor'e region, northeast China. We found it around Komarovka and Suvorovka Rivers, near Vladivostok and Ochinnikovo village.

Biology: Inhabits broad-leaved forests of various densities, but sporadically distributed in them. Vitally associated with grapevine (*Vitis amurensis*). Beetles fly from end of May to July inclusive; they require no supplementary feeding. After emerging they mate, and later female oviposits. One female can lay up to 24 eggs in her lifetime. Eggs are spaced singly under intact (tightly adhering) bark strip. Thin shoots of grapevine 4.0 to 8.0 mm in diameter are usually colonized. At $21.6 \pm 0.6^{\circ}\text{C}$, larvae hatch from eggs in eight to 14 days, average 11.5 days, after oviposition. Hatching of larvae commences in second half of June and ends in August.

Newly hatched larvae bore wood and during this process chorion of eggs falling under bark is filled with frass. Larvae make longitudinal galleries in wood, usually along pith, and plug them with fine frass. Sometimes they damage almost the entire plant; only bark filled with frass remains. Mature larva after hibernation, in spring with the onset of warm weather, makes cell 10 to 15 mm long and 4.5 to 5.0 mm wide in wood, quite often in pith of shoot. Thin layer of wood usually remains between cell and bark.

Pupation of larvae observed in May and first half of June. Young beetles appear in second half of May and in June. One week after emergence they nibble an oval opening (2.7 mm \times 3.5 mm) on surface of grapevine shoots and abandon pupal cell through it. Weight of mature larvae before pupation 16.9 to 35.3 mg, pupae up to 18.5 mg or slightly more, and beetles before emerging from wood 7.5 to 29.0 mg. Generation completed in one year.

7. *Phymatodes maaki* (Kr.)

Kraatz, 1889, *Deutsch. Entom. Z.*, vol. 22, p. 105 (*Callidium*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 329–331; Nakamura, 1958, *Miscell. Report of Hiwa Museum Nat. History*, vol. 2, pp. 15–16; Cherepanov and Cherepanova, 1974, *Usachi vinograda amurskogo*, pp. 22–26.

Adult (Figure 119): Differs from other species of this genus in very thick clava of hind femora, characteristic color of elytra, and comparatively large body. Head retracted into prothorax almost up to eyes, faintly convex between antennae, flat between upper ocular lobes, with dense deep punctation, and erect hairs. Eyes distinctly faceted, broadly emarginate, with narrow septum between lobes. Antennal apices reach beyond posterior band (male) or anterior band (female) of elytra. Third antennal segment longer than 4th, equal to 5th or somewhat longer.

Pronotum laterally rounded, uniformly convex on disk, basally with narrow flange, width in middle not less than pronotal length, with uniform deep punctation, long erect brownish hairs, sometimes thin median longitudinal carinae. Scutellum triangular, narrowly rounded posteriorly, with barely visible smoothened punctation.

Elytra slightly elongate, with parallel sides, individually rounded apically, insignificantly convex on disk, in anterior half (before anterior band) with large deep punctation and black erect hairs forming very dense tuft on posterior margin of scutellum, in posterior half with minute smoothened, poorly distinguishable punctation and tender brownish (on bands white) compactly adherent hairs. Clava of hind femora markedly thickened, hind tibiae notably curved. First segment of hind tarsi not longer than two successive together. Head and prothorax black. Meso- and metathorax, abdomen, and scutellum red or reddish-rust, anterior

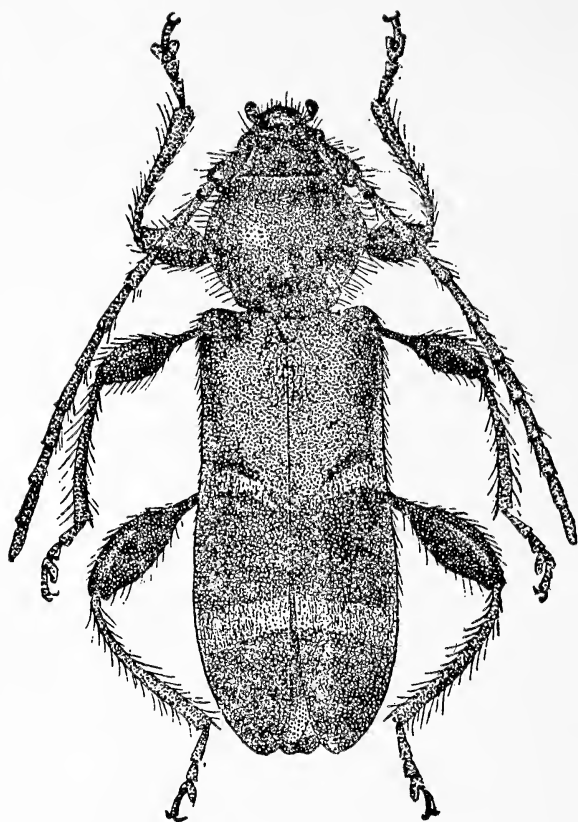


Figure 119. *Phymatodes maaki* (Kr.).

196

half of elytra red, posterior half black, with two white transverse bands, one (anterior) narrow and anterior to middle, the other (posterior) broad and anterior to hind clivus. Antennae rusty-brown, darken more toward apex. Base of femora, tibiae, and tarsi rusty, femoral clava black (f. *typica*). Quite often anterior white band anteriorly bound by black band (ab. *anticemarginatus* Plav.), sometimes abdomen black (ab. *obscuriventris* Plav.). Body length 6.0 to 10.0 mm.

Egg: White, semitransparent, narrows more toward one pole, rounded at ends. Chorion smooth, hyaline, without perceptible sculpture. Length 1.1 to 1.2 mm, width 0.5 to 0.6 mm.

Larva (Figure 120): Characterized by comparatively large body and sclerotized ringlets at base of hairs along anterior margin of yellowish-rust spots on pronotum. Head narrowly rounded anteriorly, markedly retracted into prothorax. Epistoma in general color merges laterally with parietals, its boundaries not perceptible (frontal sutures not distinct), divided by median longitudinal suture, more distinct in posterior half;

anterior margin with brownish border, distinct median emargination, and lateral to notch with translucent black, almost square spot. Hypostoma slightly convex, with narrow brownish border on anterior margin, laterally with straight sutures, divided into two triangular sclerites on which inner angles broadly rounded and anterior outer ones straight or even somewhat pointed. Gula laterally notched, rusty-brown in anterior half, lighter colored posteriorly. Parietals in anterior half with stray coarse hairs. Antennae long, project far beyond base of mandibles. Clypeus minute, lustrous, semitransparent, almost rectangular. Labrum rounded, convex, not narrower or slightly narrower than clypeus, in second half with minute setae, narrows markedly toward base. Mandibles massive, black, basally project somewhat and with rusty tinge, broadly rounded apically. Inner masticatory lobes of maxillae narrowly rounded apically, shorter than maxillary palps.

Pronotum transverse, narrowly rounded anteriorly, broadens in posterior half, with four sharp light red-rust spots in anterior third forming transverse band interrupted three times by white clearance, laterally and on disk anterior to scutum with dense light rusty hairs. Rusty spots with long hairs and dark red sclerotized ringlet at base of hairs. Pronotal scutum white, glabrous, uniformly convex, without longitudinal striation, with fine, barely visible furrows, bound laterally by short longitudinal grooves. Prothoracic presternum laterally and on disk with dense rusty hairs; eusternum in form of two round glabrous plates divided anteriorly by hairy clearance. Base of pro-, meso-, and metasterna (basisternum s. sternellum) glabrous, matte, laterally with sparse hairs. Thoracic legs poorly developed, wartlike. Better developed in mature larvae before pupation, not seen in young larvae.

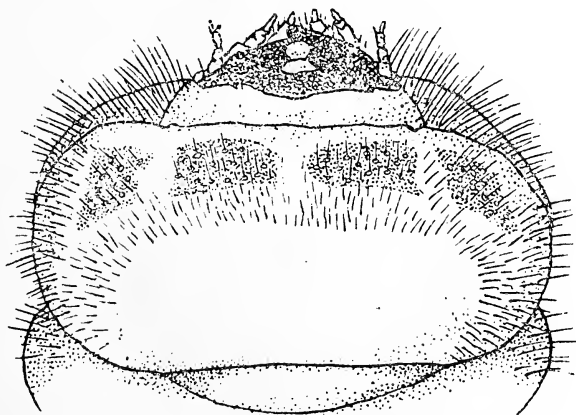
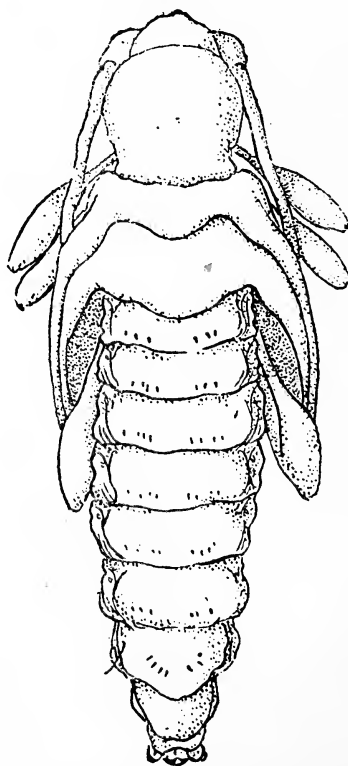


Figure 120. Larva of *Phymatodes maaki* (Kr.),
head and pronotum.

Abdomen narrows slightly posteriorly, laterally with thin, light-colored, not very dense hairs. Dorsal locomotory ampullae convex, rugulose, without squamiform sculpture, without perceptible longitudinal streaks, divided by common median longitudinal groove, laterally with short longitudinal folds, on anterior segments oblique deep folds. Ventral locomotory ampullae similar in structure. Body length of mature larva 10 to 15 mm, width of head 1.4 mm.

Pupa (Figure 121): Differs from pupae of other genera in well-developed spinules on abdominal tergites and produced scutellum on posterior margin of mesonotum. Head short, somewhat bent under, flat in region of frons, between antennae with slight transverse elevation smoothened somewhat in female, on vertex and occiput rounded hemispherically. Antennae pressed to sides, bent ventrad around midfemora, with apices directed forward.

Pronotum convex, not longer than width in middle, rounded laterally, narrows identically anteriorly and posteriorly (female), sometimes gradually anteriorly and more steeply posteriorly (male), smooth on



disk, glabrous, without spinules or setae. Mesonotum lustrous, convex, on posterior margin with produced and somewhat elevated scutellum. Metanotum transverse, broadly rounded posteriorly, with median longitudinal groove. Femora clavate; clava of hind femora in male markedly dilated, thickens gradually in female.

Abdomen elongate, narrows slightly toward base, gradually but more so toward tip. Abdominal tergites uniformly convex, with common median longitudinal groove, on posterior margin with short spinules forming transverse row, and three or four paramedial spinules each. Tergite VII broadly rounded posteriorly, in posterior half with spinules forming one or two tufts or transverse row. Tip of abdomen rounded, glabrous. Body length 8.5 to 13.0 mm, width of abdomen 2.0 to 2.8 mm.

Material: Collected in Ussuri-Primor'e region (Komarovka River, environs of Partizansk, Vladivostok, Nakhodka, and Ovchinnikovo village) and Kunashir Islands (Alekhino, Sernovodsk). Adult insects 60, larvae 109, pupae—five males and 11 females, exuviae of larvae with beetles from cells 28. Large series of larvae raised from eggs laid by beetles in the laboratory.

Distribution: Ussuri-Primor'e region, Sakhalin, Kunashir Island, north-east China, Korea, and Japan within viable zone of grapevine (*Vitis*).

Biology: Inhabits broad-leaved forests. Ecologically associated with 197 grapevine (*Vitis*). Found more often in thinned forests. Beetles fly end of May, early June, with maximum numbers occurring from middle 10 days of June through first 10 days of July. Lead a cryptic mode of life; not seen on flowers. During flight period seen more often on drying grapevine trunks where they mate. Female lays eggs singly there under intact bark strips. One female can lay up to 24 eggs. Colonizes shoots of medium thickness, 1.2 to 5.0 cm in diameter. Colonizing commences from apex and extends to base. Thick shoots rarely colonized.

Hatching of larvae from eggs commences two to three weeks after oviposition. For example, from eggs laid by beetles on June 10 to 18 first larvae appeared on July 3, and from eggs laid after June 28 larvae hatched July 16 and 17. Period of larval hatching in nature extends from last 10 days of June to end of July. Newly hatched larvae bore grapevine shoot, make longitudinal gallery under bark, deeply impressed in wood, and plug it densely with fine frass. Length of gallery under bark up to 15 cm, width 3.0 to 4.0 mm. Mature larva penetrates deeper into wood, advances there along shoot, makes cell, later nibbles falcate exit from it toward surface, leaving layer of wood usually not more than 1.0 mm, more rarely up to 5.0 mm, and pupates in it. Length of cell 12 to 15 mm, width 4.0 to 5.0 mm.

Pupation of larvae observed in May. Beetles emerge from pupae three weeks later. Young beetles nibble oval-elongate openings

(1.5 mm × 2.0 mm to 2.0 mm × 3.0 mm) on bark surface along shoot, and abandon pupal cell through them. Emergence of beetles from wood completed mid-June. For example, on Kovarovka River in 1971 almost 90% of the population had emerged from wood by June 8. Beetles emerge with developed gonads and hence are capable of reproduction without supplementary feeding. Weight of mature larvae before pupation 28.6 to 79.8 mg, pupae 16.0 to 55.6 mg, and young beetles in wood before emerging from cells 9.6 to 42.5 mg.

Teratoclytus plavilstshikovi Zaitz. and *Brachyclytus singularis* Kr. quite often inhabit the same shoots together with this species. For example, we collected from one Amur grapevine shoot 40 cm long and 4.0 to 5.0 cm in diameter, *Phymatodes maaki* (Kr.) (21), *T. plavilstshikovi* Zaitz. (1), and *B. singularis* Kr. (2). This species also develops on grapevine (*Vitis cognetiae*) in Japan (Nakamura, 1958).

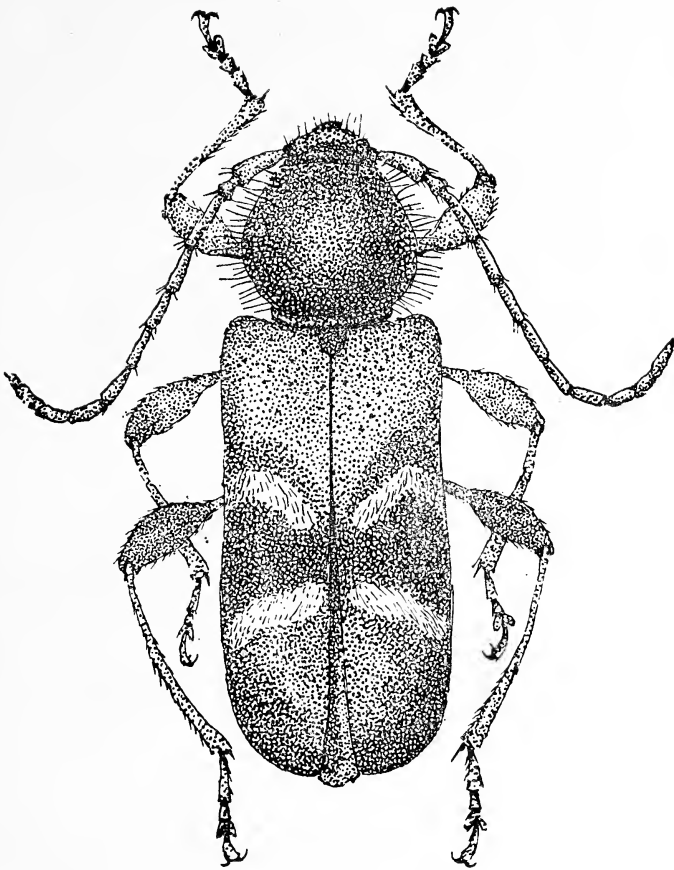
198 8. *Phymatodes alni* (L.)

Linnaeus, 1767, *Fauna Suecica*, p. 639 (*Leptura*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 325-326; Duffy, 1953, *Monograph Immat. Stages of British Import. Timb. Beetles*, pp. 219-220 (*Poecilium*); Demelt, 1966, *Tierwelt Deutschlands*, 52, 2, 73-74.

Adult (Figure 122): Similar to *Phymatodes maaki* (Kr.). Differs in broad anterior transverse band on elytra, small size, and other features. Body short, comparatively broad. Head retracted into prothorax almost up to antennae, with minute punctation and minute, barely visible hairs, somewhat convex around base of antennae, with median longitudinal suture. Eyes distinctly faceted, broadly and deeply emarginate. Antennae somewhat thickened toward apex, reach hind clivus of elytra (male) or extend beyond 0.50 length of elytra (female); 3rd antennal segment equal to 5th, notably longer than 4th; 11th segment thick, narrows steeply to pointed apex.

Pronotum laterally rounded, quite convex on disk, with narrow flange at base, dense minute punctation, without smooth shields, with short clavate erect hairs. Scutellum longitudinal, with almost parallel sides, gently rounded posteriorly. Elytra 2.7 times longer than total width at humeri, posterior to humeri somewhat compressed laterally, with projecting humeral tubercles and inward to them slight impression, individually rounded at apex, with rather sparse punctation, more distinct at base, with short, clavate, faint erect hairs, on disk posterior to scutellum sometimes with long black hairs forming tuft. Hind femora thicken gradually, clavate at apex; hind tibiae straight, not curved.

Body black, antennae reddish-rust, legs brownish-rust, elytra basally light rust, elsewhere blackish-brown, with two white transverse bands, one anterior to middle directed anterolaterally from suture, second

Figure 122. *Phymatodes alni* (L.).

anterior to hind clivus curves posterolaterally from suture (f. *typica*). Sometimes elytra reddish-rust at base and apex, black between white bands (ab. *apicale* Pic) or entirely black, only with two white bands (ab. *infuscatus* Chevr.). Body length 3.5 to 7.0 mm.

Egg: White, hyaline, somewhat matte, rounded at poles, broadens anteriorly, narrows posteriorly. Chorion with minute faint sculpture. Length 0.8 mm, width 0.4 mm.

Larva (Figure 123): Very similar to larva of *P. ermolenkoi* Tsher. Differs in denser hairy cover on pronotal disk, absence of hairy septum on prothoracic eusternum, and other minor features. Head narrowly rounded anteriorly, markedly retracted into prothorax. Epistoma convex, with broad dark brown border on anterior margin, broadly emarginate there, around anterior angles with narrow secondary notch, longitudinal (median) suture and frontal sutures not visible. Hypostoma flat

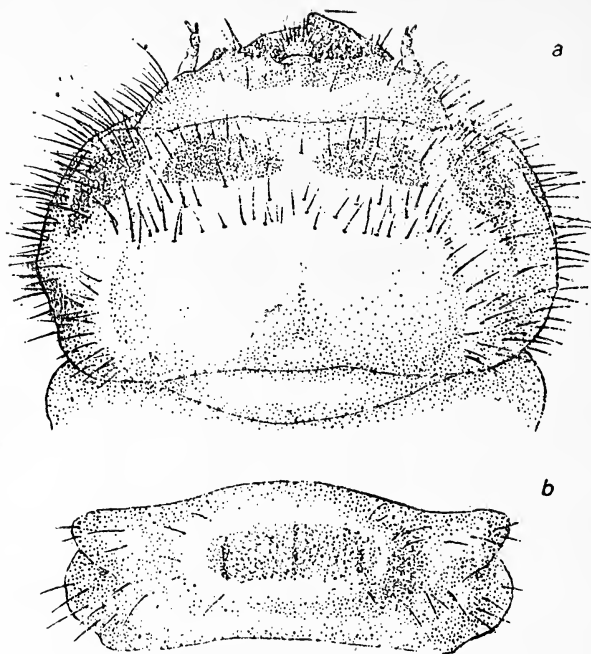


Figure 123. Larva of *Phymatodes alni* (L.).

a—head and pronotum; b—abdominal tergite IV
with dorsal locomotory ampulla.

or slightly convex, on anterior margin with narrow rusty-brown border; hypostomal sclerites with sharply produced anterior inner angles and steeply rounded posterior inner margin. Gula between sclerites of hypostoma whitish, without rusty border on anterior margin, 2.0 times longer than width at apex. Parietals medially with stray or several setaceous hairs, on anterior margin lateral to antennal sockets with broad rusty-brown border. Antennae long, apices extend beyond anterior margin of cephalic capsule. Posterior to antennae transversely elongate, unevenly pigmented, sometimes barely visible ocellus present. Clypeus short, flattened, almost striplike, semitransparent, hyaline. Labrum semitransparent, minute, oval, with sparse short light-colored setae. Mandibles with transverse groove on outer side around base, gently rounded apically and there with sharp cultrate edge, black, reddish-brown basally. Labial submentum somewhat longitudinal, slightly convex in middle. Inner lobes of maxillae whitish, lustrous, rounded apically, with stray short setae. Maxillary palps narrow markedly apically, brownish, notably longer than inner lobes of maxillae.

Pronotum slopes toward head, rounded on anterior margin, broadly rounded in posterior third, in anterior half closer to anterior margin

with four sharp, broad, rusty, tetragonal spots forming transverse band, separated medially and laterally by longitudinal whitish clearances; anterior to scutum and in zone of rusty spots with dense, comparatively long, light rust hairs basally with small, slightly projecting, sclerotized reddish-brown ringlets (in *P. ermolenkoi* Tsher. these hairs are sparse and basal ringlet almost imperceptible). Pronotal scutum white and convex, on anterior margin angularly produced medially, slopes toward anterior angles, with minute but sharp longitudinal striation, laterally with short shallow longitudinal grooves, medially with long narrow longitudinal groove. Prothoracic presternum convex, with moderately dense but not very long hairs; eusternum glabrous at base, lustrous, not demarcated by groove from presternum, anterior margin medially without hairy clearance or barely perceptible one. Thoracic legs lacking or seen as faint wartlike projections.

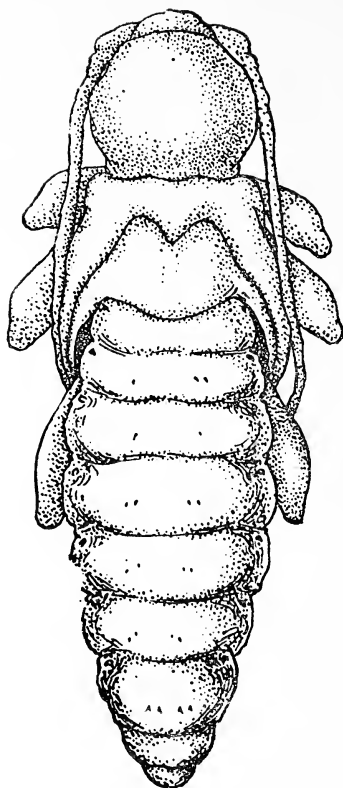
Abdomen laterally with fairly dense light-colored hairs. Dorsal locomotory ampullae insignificantly convex, transversely oval, with minute silvery squamiform sculpture, laterally with faint longitudinal grooved dents or without them. Ventral locomotory ampullae similar in structure. Abdominal tergite IX very small, short, considerably shorter and narrower than tergite VIII, apically with sparse long setaceous hairs. Body length up to 8.0 mm, width of head 1.1 mm.

Pupa (Figure 124): Well distinguished from that of *P. ermolenkoi* Tsher. by very minute, barely perceptible spinules on abdominal tergites. Body small, moderately elongate. Head short, on occiput hemispherically rounded, lustrous, between antennae broad, slightly convex. Antennae slender, pressed to sides, apices bent ventrad somewhat.

Pronotum broadens posterior to middle, rounded laterally, narrows gradually anteriorly, steeply toward base, slightly convex on disk, almost flattened. Mesonotum slightly convex, on posterior margin with triangularly produced scutellum. Metanotum broad, insignificantly convex, broadly rounded on posterior margin, without setae or spinules.

Abdomen broadens in region of segments III and IV, narrows very slightly anteriorly but markedly posteriorly. Abdominal tergites convex, with faint median longitudinal groove, with one or two specklike, barely perceptible paramedial spinules or without them. Abdominal tergite VII triangular, rounded posteriorly, bulges on disk, with four minute spinules in posterior third forming transverse row. Apices of hind femora barely extend beyond abdominal tergite IV. Body length 5.2 mm, width of abdomen 1.5 mm.

201 *Material*: Collected in broad-leaved forests in the southern Urals. Adult insect one, larvae three, pupa—one male, larval exuviae from cells two. Collection of adult insects in Zoological Museum of Moscow State University also studied.



199

Figure 124. Pupa of *Phymatodes alni* (L.).

Distribution: Almost all of Europe, east up to the Urals, north up to Scandinavia, and south up to the Mediterranean Sea.

Biology: Inhabits deciduous forests and ecologically associated mainly with oak. Beetles fly from May through June. Female oviposits on thin drying shoots of viable as well as withering trees. Diameter of colonized shoots 1.5 to 7.5 cm.

Newly hatched larva bores shoot, makes longitudinal straight or meandering gallery under bark, impressed deeply in wood, and plugs it densely with fine frass. Sometimes larva makes longitudinal gallery under bark initially in one direction, then in another; gap between galleries narrow, resembles septum. Mature larva bores deeper into wood and makes cell there along shoot or sloping toward shoot surface. Sometimes cell slitlike. Length of cell 9.0 to 11.0 mm, width up to 3.0 mm. Larva pupates in cell with head toward inlet.

Pupation observed in early spring. Pupa develops for about two weeks, possibly more. In the laboratory, at 17.2 to 20.0°C (average $19.1 \pm 0.3^\circ\text{C}$) pupa developed in 12 days. Beetle developed from it

made an oval opening (1.5 mm \times 2.5 mm) after one week on shoot surface and emerged from wood through it. Weight of larvae before pupation (eight insects) 8.0 to 16.0 mg, pupae 5.0 to 11.0 mg, and beetles 4.5 mg or more. According to our observations, this species colonizes oak. According to data available in literature (Plavil'shchikov, 1940; Demelt, 1966), also attacks elm, chestnut, ash, alder, maple, and dog rose. However, found more often on oak. *Phymatodes ermolenkoi* Tsher. found together with this species in oak forests in Ussuri-Primor'e region.

9. *Phymatodes ermolenkoi* Tsher.

Cherepanov, 1980, *Nov. i maloizv. vidy fauny Sibiri*, pp. 88-89.

Adult (Figure 125): Similar to *P. maaki* (Kr.) in tuft of long black setaceous hairs posterior to scutellum and shape of white transverse bands on elytra. Differs in black antennae, elytra lustrous lac black on hind clivus, and other features. Head short, between antennae with faint longitudinal groove, with dense deep punctation, and dark brown erect hairs. Eyes sharply and finely faceted, markedly emarginate, with more convex lower lobes. Antennal apices extend beyond middle of elytra, commencing from 5th segment more (male) or less (female) serrate, with dentate produced outer angle, notably thickened toward apex, with minute faint adherent hairs, and long (denser on 1st to 6th segments) setae. First antennal segment elongate, apically thickened, slightly longer than 3rd; 5th segment longer than 4th, equal to 3rd; 11th segment slightly longer than 10th, apically pointed or narrowly rounded.

Pronotum slightly transverse, laterally rounded, with narrow flange at base, posterior margin curved, dense large deep punctation, and erect setaceous dark brown hairs; hind clivus sometimes with narrow smooth longitudinal band. Scutellum flat, narrowly or broadly rounded posteriorly, with uneven punctation. Elytra with parallel sides, moderately convex, with straight humeri, insignificantly projecting rounded humeral tubercle, tapered outer angle at apex, and narrowly rounded inner angle; in anterior third with large coarse punctation, middle third with minute faint punctation, posterior third on hind clivus with barely perceptible, smoothened punctation, with lac sheen; disk with two transverse white bands (anterior one shortened, anterior to middle of elytra, and curves forward; posterior one broader, not shortened or slightly so, anterior to hind clivus), in anterior half with very long hairs, posterior half with short hairs, on suture posterior to scutellum with dense long black hairs forming distinct tuft. Body ventrally with long light brown hairs. Abdominal sternites convex and lustrous, with sparse minute punctation. Legs with dense erect setaceous hairs. Femora sharply clavate, with short, markedly dilated, lustrous, finely and sparsely punc-

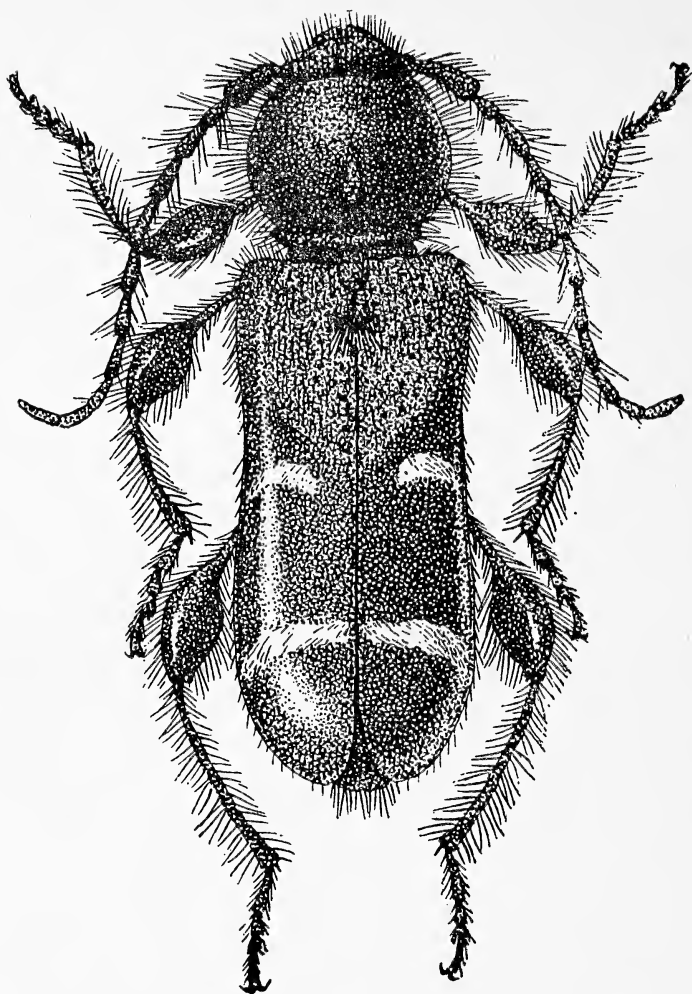


Figure 125. *Phymatodes ermolenkoi* Tsher.

tate clava, with very long, coarsely punctate shaft. Hind tibiae notably shorter than femora, with dense coarse punctation. First segment of hind tarsi longer than two successive together. Body and antennae black. Legs black, shaft of femora red. Elytra black, in anterior third red, dark red or dark brownish-red, more rarely entirely black. Body length 5.0 to 7.0 mm.

Differs from proximate species *P. quadrimaculatus* Gress., distributed 203 in Japan, in very short clava of hind legs (clava shorter than shaft), markedly smoothened punctation on hind clivus of elytra, and much larger body size.

Egg: White, silvery, tapers gently toward one pole, steeply toward

the other, acute or narrowly rounded at ends. Chorion transparent, lustrous. Length 1.0 mm, width 0.5 mm.

Larva (Figure 126): In shape of rust-colored spots on pronotum resembles larva of *P. maaki* (Kr.). Differs in absence of sharply sclerotized ringlet at base of hairs covering rusty spots in anterior third of pronotum. Head narrowly rounded anteriorly, markedly retracted into prothorax. Epistoma slightly convex, lustrous, on anterior margin with broad dark brown border, behind which stray setaceous hairs form transverse row, anterior angles produced somewhat forward, with faint light-colored median longitudinal groove, and laterally fused with parietals. Frontal sutures not visible. Hypostoma slightly convex, on anterior margin with indistinct, sometimes narrow rusty-brown border. Gula

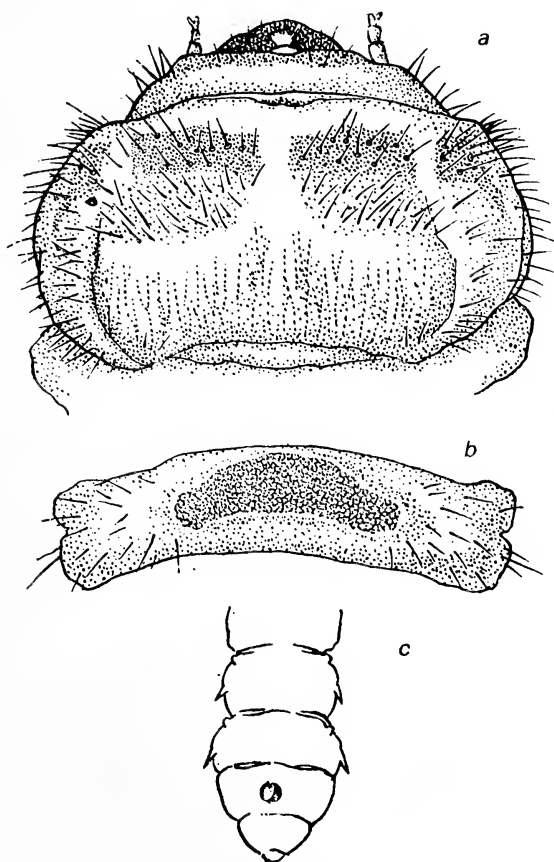


Figure 126. Larva of *Phymatodes ermolenkoi* Tsher.
a—head and pronotum; b—abdominal tergite with
dorsal locomotory ampulla; c—abdominal segments
VI to IX of I-instar larva.

between sclerites of hypostoma longer than apical width, broadens basally, whitish, without brownish border on anterior margin. Parietals on anterior margin dorsal and ventral to antennae with broad rusty-brown border that does not cover antennal sockets from behind; posteriorly sockets with one transversely oval, unevenly pigmented, spotlike ocellus
 204 each; medially parietals with stray long hairs. Antennae long; 1st segment almost as long as two successive segments together. Clypeus lustrous, semitransparent, broadly flattened basally. Labrum oval, whitish, convex, with long light-colored setae. Mandibles black, dark red basally, broadly rounded apically. Labial mentum somewhat transverse, convex, with long setae laterally. Inner lobes of maxillae digitate, with sparse short setae apically. Maxillary palps comparatively thin, shorter than inner lobes.

Pronotum transverse, narrows anteriorly, broadly rounded on anterior margin, in anterior third with four sharply manifested rusty or rusty-yellow transverse spots forming transverse band interrupted medially and laterally by longitudinal white clearances, anterior to scutum with rather dense hairs, in zone of rusty spots with sparse minute light-colored hairs encircled basally by faint ringlet or without it. Pronotal scutum silvery shagreen, with narrow median longitudinal groove and deep straight lateral longitudinal grooves. Prothoracic presternum with dense hairs, laterally sometimes long, on disk short; eusternum not demarcated, merges with general surface of presternum, basally with pair of lustrous glabrous plates separated anteriorly by broad hairy clearance. Thoracic legs lacking, or not perceptible.

Abdomen thick, laterally with short, not very dense, light-colored hairs. Dorsal locomotory ampullae slightly convex, transversely oval, with silvery squamiform sculpture covering much of tergites. Ventral locomotory ampullae broad, transversely elongate, with minute silvery reticulate sculpture. In I-instar larvae segments VI and VII laterally with one large sharp spinule each directed posterolaterally. After molt these spinules disappear. Body length of mature larva up to 6.0 mm, width of head 1.0 mm.

Pupa (Figure 127): Characterized by small body, well-developed spinules on abdominal tergites, glabrous convex pronotum, and other features. Head short, transversely convex between antennae, with narrow faint median longitudinal suture, glabrous, without setae, on occiput hemispherically rounded, lustrous. Antennae pressed to sides, with apices turned dorsad (female) or slightly bent ventrad (male).

Pronotum roundly (female) or angularly (male) broadens medially, and here notably wider than long, flattened on disk, medially with fine transverse striation, narrows markedly anteriorly and posteriorly, with rounded angles. Mesonotum medially with transverse striation, laterally

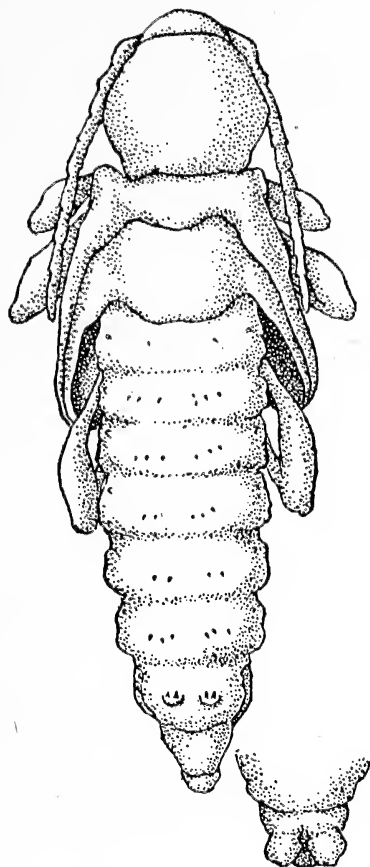


Figure 127. Pupa of *Phymatodes ermolenkoi* Tsher., female.

matte silver, posteriorly with produced, sometimes slightly elevated scutellum. Metanotum broad, sometimes rounded, with median longitudinal, barely visible, troughlike, transversely finely striate groove. Pro-, meso-, and metanota glabrous, without setae.

Abdomen narrows insignificantly anteriorly and markedly posteriorly. Abdominal tergites convex, with common median longitudinal groove, on posterior third of tergites with one (on I) or more often three (on II to VI), more rarely two or four paramedial spinules forming transverse row. Spinules in female much larger, in male slender. Abdominal tergite VII narrows posteriorly and there narrowly or broadly rounded, on posterior margin with four, more rarely one or two or five comparatively large spinules that bend forward and form distinct transverse or curved uneven row, with two small spinules each anterior to this row forming additional transverse row. Tergite VIII moderately
 205 elongate, trapezoid, narrows somewhat posteriorly and glabrous here,

rarely with one or two faint spinules. Valvifers of female hemispherical, proximate, with apices slightly produced laterally. Apices of femora markedly clavate, hind femora closely pressed to sides, with apices extending beyond abdominal tergites IV and V. Body length 5.5 to 9.0 mm, width of abdomen up to 3.0 mm.

Material: Collected in Ussuri-Primor'e region, near village Khasan. Adult insects (raised in laboratory) 21, larvae 30, pupae—five males and five females, series of larvae raised from eggs laid by beetles in the laboratory.

Distribution: Southeastern zone of Ussuri-Primor'e region.

Biology: Inhabits broad-leaved forests and ecologically associated with oak. Beetles fly in first half of summer. Colonizes thin shoots of undergrowth and physiologically weakened trees. Female lays eggs singly in bark crevices. One female can lay up to 20 eggs in her lifetime. Ovaries of one female dissected seven days after emergence contained 16 eggs. In the laboratory beetles lived for 31 to 38 days. Egg development from moment of laying to hatching of larvae at 17.7°C extended for 18 to 24 days, average 19 days (12 eggs under observation).

Newly hatched larvae bore bark, make longitudinal galleries, impressed in wood and inside bark, and plug them with fine frass of wood and bark particles. Galleries usually slitlike, radially elongate crosswise; larvae lie in them with one side toward bark, the other toward pith. Mature larva makes slitlike pupal cell along shoot in which it hibernates. Length of larval gallery under bark 9.0 cm or more. Length of pupal cell 8.0 to 11.0 mm, width 3.5 to 4.0 mm. Cell impressed in wood and inside bark.

Pupation of larvae commences early spring. In the laboratory, at room temperature, pupae developed for 22 to 25 days. Newly formed beetles nibble ellipsoid flight opening (2.5 mm × 1.5 mm to 3.0 mm × 1.8 mm) on bark surface and emerge through it from pupal cell. Records of 33 insects showed: weight of larvae before pupation 8.0 to 27.0 mg, pupae 7.5 to 23.5 mg, adults 7.0 to 23.0 mg. Some larvae before preparation for pupation weighed about 37 mg. Females considerably larger than males.

Colonizes oak shoots 1.8 to 3.0 cm in diameter. Population density quite high. For example, on shoots with a total length of 89 cm and diameter 1.8 to 2.4 cm, 29 insects were found: nine larvae, 12 pupae, and eight adults.

SUPPLEMENT

- 206 A description of the morphology and biology of some species is given below supplementing information in *Usachi Severnoi Azii* (Prioninae—Aseminae) [Cerambycidae of Northern Asia (Prioninae—Aseminae)] released in 1979.

III. Subfamily Lepturinae

6. TRIBE STENOCORINI

2. Genus *Rhamnusium* Latr.

1. *Rhamnusium gracilicorne* Théry

Théry, 1894, *Bull. Soc. Entom.*, p. 265; Cherepanov, 1979, *Usachi Severnoi Azii*, pp. 85–87.

Adult (Figure 128): Two males raised from larvae collected in nature belong to var. *rufotestaceum* Pic. Head, pronotum, and abdomen red; eyes black, antennae red, matte only at apex from 5th segment; meso- and metasterna and scutellum black; elytra red. Identical to nominal form in rest of features.

Larva: See *Usachi Severnoi Azii* (Cerambycidae of Northern Asia) (Cherepanov, 1979).

Pupa (Figure 129): Differs from pupae of all other genera of the tribe Stenocorini in absence of spinules and long setae on abdominal tergites. Rusty or light-colored setae faintly visible only under high magnification against background of chitinous cover. Body of pupa moderately elongate. Head short and bent under, around clypeus and at base of antennae with very minute setae, frons between antennae transversely insignificantly convex, vertex between upper lobes of eyes slightly impressed, occiput broadly rounded, antennae short, their base recessed toward mandibles, pressed to sides of body, with apices bent ventrad.

Pronotum narrows anteriorly, rounded on posterior angles, on anterior and posterior margin slopes uniformly and there without transverse groove and without flange, convex on disk, with stray thin rusty setae seen only under high magnification. Mesonotum convex, on posterior margin with thickly produced scutellum, laterally with very fine short rusty setae forming elongate tuft on each side of scutellum. Metanotum

transverse, convex, in posterior half with minute rusty setae forming two paramedial tufts (one tuft on each side).

207 Abdomen elongate, narrows slightly posteriorly. Abdominal tergites I to VI convex, with median transverse groove, behind which very minute setae, barely visible under high magnification, form broad transverse band. Tergite VII broadly rounded posteriorly, not longer than width at base, convex on disk, with minute rusty hairs, more numerous in posterior half. Tergite VIII transverse, 2.0 times wider than long, broadly rounded posteriorly, convex, with minute, on posterior margin much longer rusty setae. Tip of abdomen rounded, obtuse (ventral view), laterally with broad, horseshoe-shaped, lustrous carina bearing stray light-colored, very minute setae. Valvifers of female small, proximate, apically

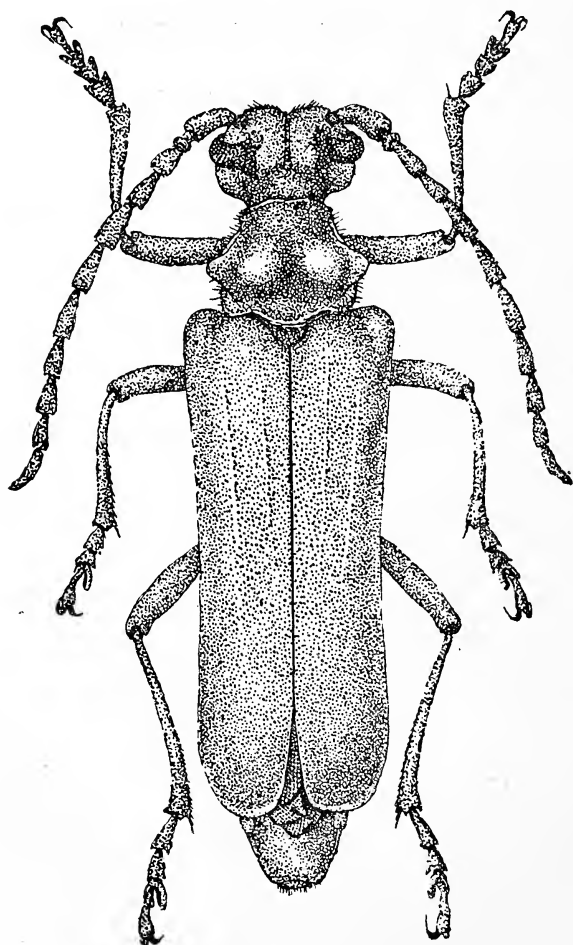


Figure 128. *Rhamnusium gracilicorne* Théry.

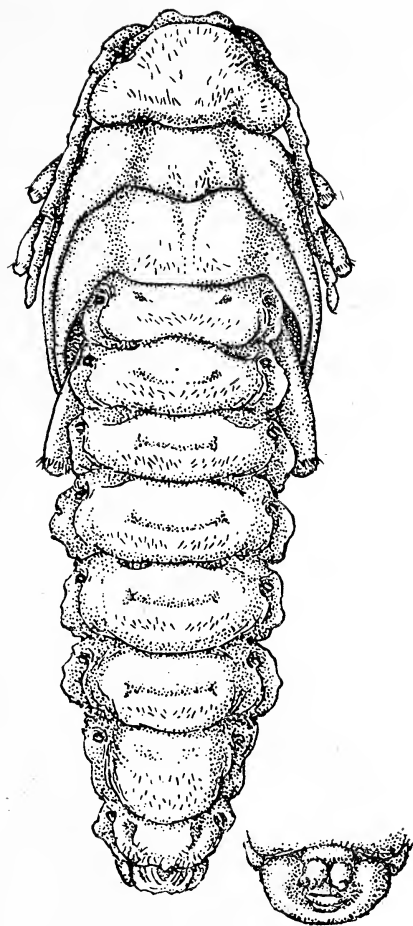


Figure 129. Pupa of *Rhamnusium gracilicorne* Théry.

with laterally extended tubercle, with minute furrows, rust colored. Body length 15 to 22 mm, width of abdomen 5.0 mm.

Material: Collected in the southern Urals (Chesnokovka). Adult insects—two males (raised from larvae in the laboratory), pupae—six females.

Biology: Found in broad-leaved forests in the southern Urals. Larvae found in wood at base of thick dead branches on thick-trunked viable elm trees (*Ulmus*). Mature larva makes cell along shoot, nibbles exit to shoot surface, plugs it with fibrous frass, and pupates with head toward exit. Length of cell 25 to 35 mm, width 9.0 to 15.0 mm. In the laboratory, at 11.0 to 20.2°C (average $16.4 \pm 0.5^\circ\text{C}$) pupae developed in 23 to 208 days. Young beetles push back frass, nibble flight opening (8.0 mm \times 6.0

mm to 10.0 mm \times 6.0 mm) on shoot surface and emerge from cell. Weight of two pupae (male) 190.5 and 198.0 mg; weight of two beetles after emerging from cell 120 to 138 mg.

4. Genus *Stenocorus* F.

2. *Stenocorus meridianus* (L.)

Linnaeus, 1758, *Syst. Nat.*, 10th ed., 398 (*Leptura*); Cherepanov, 1979, *Usachi Severnoi Azii*, pp. 95-97.

Pupa (Figure 130): Differs from proximate species *Stenocorus amurensis* Kr. in long setae on head around base of antennae laterally and posterior to upper ocular lobes. Body stocky, slightly concave. Head markedly bent under, impressed on vertex between upper ocular lobes, transversely convex between antennae, with median longitudinal suture, in region of frons and vertex often with transverse striation (with uni-

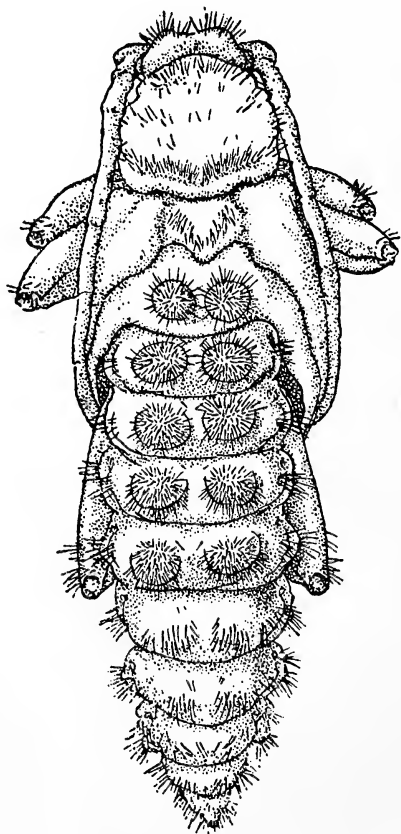


Figure 130. Pupa of *Stenocorus meridianus* (L.).

form transverse furrows), with long rusty setae forming one tuft each around base of antennae on inner side and in postorbital zone, posterior to upper ocular lobes (in *Stenocorus amurensis* Kr. tufts of setae absent on head, at most stray short setae, not forming tufts, present). Antennae pressed to sides, arcuate in second half, bent ventrad, with apices usually adjoining 1st segment of midtarsi.

Pronotum convex on disk, transversely rugose, with narrow median longitudinal groove, narrows markedly anteriorly, with broad sharp flange anteriorly, with two steep emarginations on posterior margin and elevated there in form of carina, on anterior elevated margin with not very dense long setae, basally with dense rusty setae forming compact band replicated angularly in middle, elsewhere on surface with stray scattered setae. Mesonotum small, insignificantly convex, on posterior margin with produced scutellum, laterally with dense rusty setae forming two distinct tufts. Metanotum glabrous in anterior half, transversely finely striate, with pair of tubercular, densely setaceous processes in posterior half. Femora markedly bent dorsad, apically with setae forming collar or spread out.

Abdomen narrows from anterior to posterior end. Abdominal tergites I to IV with sharp tubercular paramedial elevations covered with dense rusty setae. Tergite V with two faint elevations covered with setae; tergite VI without tubercular elevation, in posterior half with rusty setae forming small paramedial tuft. Abdominal tergite VII convex, narrows slightly posteriorly, broadly rounded at posterior margin, in posterior half with sparse setae. Tergite VIII almost semicircular, in posterior half with long rusty setae forming two dense lateral tufts. Posterior margin of tergite IX elongate, with short, slightly bifurcate, coriaceous urogomphus, in posterior half with long rusty hairs. Tip of abdomen (ventral view) obtuse, bound laterally by carina covered with sparse long rusty hairs. Valvifers of female almost triangular, angularly produced inward, with lateral conical tubercle apically. Body length 18 to 25 mm, width of abdomen up to 6.0 mm.

Material: From broad-leaved forests of the southern Urals. Raised from larvae collected in nature (additionally); adult insects six, pupae—two males and one female.

Biology: Larvae live under root bark of elm, oak, and other deciduous woody species, make galleries impressed in wood. Mature larva nibbles opening on root surface and emerges through it into soil. Usually makes pupal cell alongside root, polishing inner walls by rotary movement, and pupates. Length of cell 21 to 25 mm, width 12 to 15 mm. Pupation of larvae May–June. Pupae develop for up to three weeks. At low temperatures pupal development is retarded. For example, in the laboratory larvae pupated by August 18, pupae formed in cells placed in refrigera-

tor at 1.0°C, then kept at 12.0 to 13.8°C (average $13.1 \pm 0.8^\circ\text{C}$). Beetles emerged from these pupae on December 22 to 27, i.e., 126 to 131 days after pupation of larvae, or 17 to 22 days after refrigeration at optimum temperature (four pupae under observation). Weight records of five specimens (male) showed: larvae before pupation 300 to 424 mg (average 381.2), pupae 235 to 314 mg (average 291.6), and beetles before emerging from soil 187 to 244 mg (average 223.4), i.e., during metamorphosis weight loss was 44.1%. In another instance (one female specimen) larval weight before pupation 719 mg (100%), pupa developed from it 536 mg (74.5%), and beetle emerging from latter 435 mg (60%). Beetles remain in cell for one week, emerge on soil surface with developed gonads, and commence reproduction.

IV. Subfamily Aseminae

10. Tribe ASEMINE

2. Genus *Arhopalus* Serv.

3. *Arhopalus tristis* (F.)

Fabricius, 1787, *Mant. Ins.*, vol. 1, p. 154 (*Callidium*); Cherepanov, 1979, *Usachi Severnoi Azii*, pp. 425-427.

Larva (Figure 131): Characterized as follows. Parietals along frontal suture with white glabrous plate, more often without it. Thoracic legs glabrous on outer side or with stray setae, inner side at apex of femora with long setae forming transverse row or collar [thoracic legs in *Arhopalus rusticus* (L.) with dense setae on both inner and outer side of femora forming broad band encircling femur in distal half]. Posterior margin of abdominal tergite IX with pair of widely separated spinules set on thick extended base. Distance between these spinules 2.0 times diameter of their base [in *Arhopalus rusticus* (L.) spinules at apex of abdominal tergite IX more proximate; distance between them not more than diameter of their base].

I-instar larvae characterized by more protruding pleural tubercles. Posterior margin of abdominal tergite IX with pair of faint tubercular formations devoid of sclerotized spinules. Latter seen in II-instar.

Pupa (Figures 132 and 133): Differs from pupa of proximate species *Arhopalus rusticus* (L.) in arrangement of spinules on abdominal tergites and other features. Head slightly narrower than pronotum, faintly convex between antennae, with fine but faint transverse striation, rounded on occiput, posterior to upper ocular lobes with short setae that form narrow transverse band there, on inner side of which and around clypeus

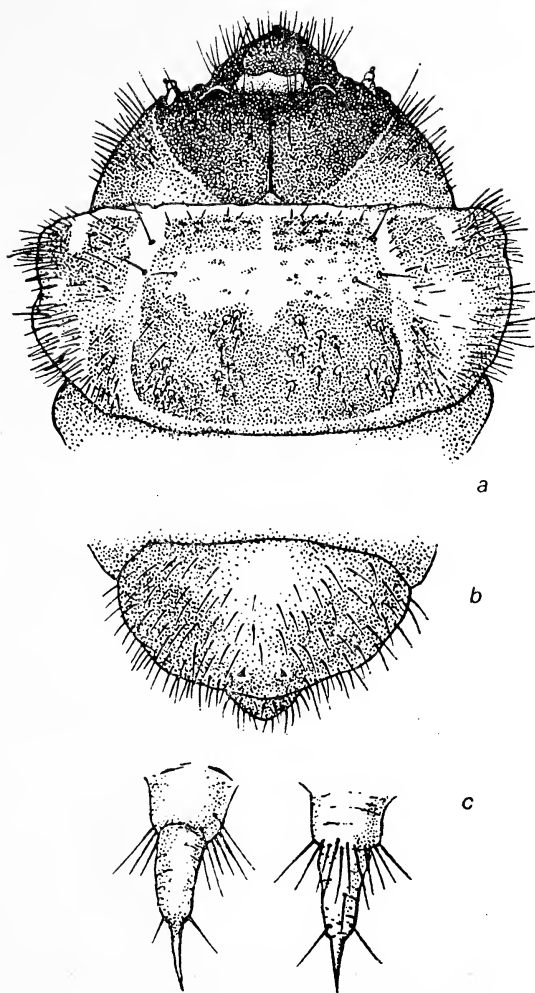
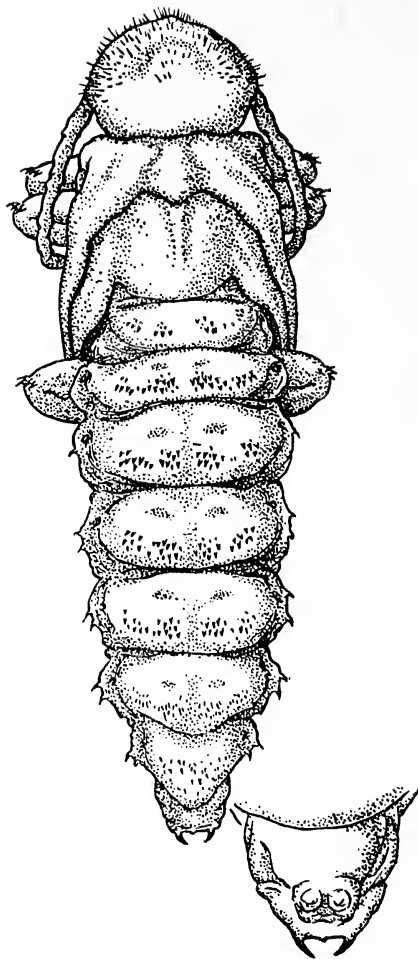


Figure 131. Larva of *Arhopalus tristis* (F.).

a—head and pronotum; b—abdominal tergite IX;
c—outer and inner side of leg.

with stray, barely perceptible setae. Antennae short, pressed to sides, with apices bent ventrad; outer side of 1st segment with one to three minute spinules, remaining segments without spinules [antennae in *Arhopalus rusticus* (L.) with innumerable large spinules on outer side of 1st segment, remaining segments with minute spinules].

Pronotum slightly transverse, rounded laterally, slightly convex on disk, with sharp acicular spinules laterally and in anterior third set on thin protruding coriaceous base, medially with minute setae forming longitudinal band. Mesonotum transversely impressed, with produced scutellum on posterior margin, transverse furrows, laterally with numerous



210

Figure 132. Pupa of *Arhopalus tristis* (F.), female.

minute or sparse stray setae. Metanotum broadly rounded posteriorly, with faint median longitudinal groove, with transverse furrows or streaks; minute setae laterally in anterior half form one fairly distinct tuft each.

Abdomen elongate, broadens insignificantly in region of segments II to IV, narrows gradually posteriorly. Abdominal tergites in posterior third convex and there with twin (large and minute) spinules forming transverse band narrowly interrupted in middle, laterally in anterior half with distinct dent, in anterior third with sparse, fine, barely perceptible setae [abdominal tergites in *Arhopalus rusticus* (L.) with dense spinules in entire posterior half, forming broad continuous, almost uninterrupted band]. Posterior margin of tergite VII rounded, not longer than width at base, convex on disk, glabrous in anterior half, with sparse, rather small

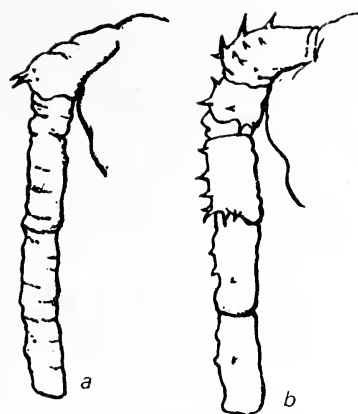


Figure 133. Antennae in pupae of (a) *Arhopalus tristis* (F.) and (b) *A. rusticus* (L.).

spinules in posterior half. Tergite VIII transverse, convex, with stray setae barely visible under high magnification. Tip of abdomen with pair of thin urogomphi ending in sharp sclerotized spinule curved inward. Abdominal sternites laterally with tubercular process covered with minute spinules. Anterior third of sternites with minute sparse setae visible under high magnification. Valvifers of female small, hemispherical, apically with slightly projecting tubercle, separated by rather small gap. Body length 18 to 24 mm, width of abdomen 5.0 to 5.5 mm.

Material: Collected in pine forest near Klyuchi (Kulunda) village. Larvae 16, pupae—two males and three females (two females raised from eggs laid by beetles in the laboratory), larval exuviae from cells with pupae three.

Biology: Larvae live in upper layer of wood, make longitudinal galleries, and plug them densely with fine frass. Larva makes cell at end of gallery and pupates in it. Pupation in June. One week after emergence beetles nibble oval flight opening (6.0 mm × 4.0 mm) on bark surface and abandon cell. Length of cell 3.0 to 5.5 cm, width 10 to 12 mm. Generation completed in two years. Hibernation in larval stage. Under laboratory conditions simulating natural environment, beetles emerged in 1979 from eggs laid in 1977. However, development was delayed up to three years in dry wood.

Weight indices of specimens differ little from those of *Arhopalus rusticus* (L.). One larva before pupation weighed 303 mg (100%) and pupa developed from it 279 mg (92%); corresponding values in another specimen (female): 468 mg (100%) and 363.5 mg (77.7%). Specimens developing in dry wood small. *Arhopalus tristis* (F.) inhabits pine (*Pinus sylvestris*). We did not find it on any other species. Lives in root zone of thick-trunked trees.

INDEX OF LATIN NAMES OF CERAMBYCID BEETLES*¹

- abietinus, Phymatodes 13, 118, 119,
120, 171, 172, 173, 174, 175, **188**,
189
Acanthoderes 36
Acmaeops 65
acutivittis, Rhaphuna 11, 116
adpersus, Xylotrechus 13
aeneipenne ab., Callidium 166
aeneum, Callidium 156, 157, 158,
161, 162, 163
Aglaophis 11
alni, Phymatodes 12, 13, 172, 173,
174, 175, **198**, 199
alpina, Rosalia 112
alpinus, *Cerambyx* 112
altaicus, Xylotrechus 10, 11, 12, 13,
14
Amarysius 3, 10
amurensis, Stenocorus 208
angusta, Pronocera 138
antilope, Xylotrechus 12, 129, 178
anticeinterruptus, ab. Polyzonus 108
anticemarginatus ab. Phymatodes
195
apicalis ab., Phymatodes 199
apicalis ab., Molorchus 55
arcuatus, Plagionotus 12, 13
argentatus, *Cerambyx* 97
Arhopalus 209, 210, 211, 212
arietis, Clytus 3, 11
arietoides, Clytus 3, 11, 13, 148, 171
arnoldi, Xylotrechus 10
Aromia 9, 11, 13, 87, 88, **89**, 90, 91,
92, 93
arvicola, Xylotrechus 12
Aseminae 3, 200, 209

Asemini 209
Asemum 211
Asias 11
Atimia 151
auranticollis, Rhopalopus 124, **137**

bajulus, *Cerambyx* 120
bajulus, Hylotrupes **120**, 121
batesi, Rosalia 112
bifasciatus, Rhopaloscelis 38, 42
bifasciatus, Semanotus 143, **148**, 149,
151
biinterruptus ab., Polyzonus 108
biinterruptus ab., Semanotus 144
binotatum ab., Stenogrinum 27
bivittatum, *Callichroma* 93
Brachyclytus 197
Brachyta 3
brevicollis, *Callidium* 138
brevicollis, Pronocera 13, 118, **138**,
140, 141, 142, 153
brevicorne, Obrium 32, **36**, 38, 39,
40, 42
brevipennis, Nathrius 3, **47**, 48, 49,
50
brunneipennis ab., Molorchus 66

Caenoptera 51
Callichroma 93
Callichromini 7, 8, 9, 10, 11, 12, 15,
16, 18, **87**, 107, 111, 112
Callidiini 7, 8, 10, 11, 12, 15, 16, 17,
18, 111, **116**, 120, 213
Callidiopini 7, 8, 12, 14, 25
Callidium 28, 82, 116, 117, 118, 119,
120, 124, 125, 138, 152, **156**, 157,

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¹All taxa higher than genus are printed in bold face and synonyms in italics. Page numbers in bold face denote description of taxa.

- 158, 159, 161, 162, 163, 164, 165,
167, 168, 169, 171, 194, 209
Callimellum 51
campestris, *Trichoferus* 19, 20, 22
cantharinum, *Cerambyx* 32
cantharinum, *Obrium* 31, 32, 34, 35,
36, 37
capricornis, *Xylotrechus* 3
castanipennis ab., *Molorchus* 66
Cerambycidae 3, 72, 97, 101, 102
Cerambycinae 7, 8, 11, 12, 13, 29
Cerambycini 7, 12, 14, 15, 22
Cerambyx 19, 22, 32, 89, 97, 107,
112, 120, 143, 157, 158, 172, 175
Chelidonium 10, 11, 13, 87, 88, 89,
97, 98, 99, 101, 106
chinensis, *Xylotrechus* 3
Chloridolum 11, 13, 87, 88, 89, 93,
94, 95, 97
chlorizans, *Callidium* 156, 157, 158,
167, 168, 169, 171
Chlorophorus 3, 10, 11, 12, 13, 16,
87
christophi, *Plagionotus* 12, 13
cinereus, *Cerambyx* 19
cinnabarinum, *Callidium* 152
cinnabarinum, *Oupyrthidium* 152,
154, 155, 156
clavipes, *Acanthoderes* 36
clavipes, *Rhopalopus* 9, 13, 118, 123,
124, 125, 126, 127, 129, 132
Clytini 7, 8, 9, 10, 11, 12, 15, 17, 18
Clytus 3, 10, 11, 16, 148, 171
coelestis, *Rosalia* 11, 112, 113, 116
collaris, *Acmaeops* 65
collaris, *Pronocera* 138
colobothaeoides, *Aglaophis* 11
conjunctum ab., *Stenygrinum* 27
coriaceum, *Callidium* 157, 165, 167
cuneipennis, *Xylotrechus* 12, 13

daurica m., *Pronocera* 139
decempunctata, *Rosalia* 112
Deilus 11, 82, 83, 86, 87
detritus, *Plagionotus* 12, 13
Dilus 82
Dilusini 7, 8, 9, 12, 15, 16, 17, 81,
213
Disteniinae 3
divaricata, *Sydonia* 46
divisa ab., *Pronocera* 139

Epania 51
ebenina, *Necydalis* 133
Epiclytus 16
ermolenkoi, *Phymatodes* 9, 12, 13,
172, 173, 174, 175, 199, 200, 201,
202, 203
Evodinus 3
Exocentrus 78, 156

fasciatus, *Cerambyx* 107
fasciatus, *Polyzonus* 8, 10, 106, 107,
111
fasciatus ab., *Semanotus* 148, 149
fasciculatus, *Pogonocherus*, 58, 142,
148, 164
fenestratus, *Stenhomalus* 43
figuratus, *Chlorophorus* 3
floralis, *Plagionotus* 8, 10
fugax, *Callidium* 82
fugax, *Deilus* 11, 82, 83, 86, 87
funebri, *Rosalia* 112

gilvipes, *Tetrops* 65
gracile, *Obrium* 10, 31, 32, 36, 38,
39, 40, 41, 42
Gracilia 14, 15, 27, 28, 29, 30
gracilipes, *Chlorophorus* 11
gracilicorne, *Rhamnusium* 206, 207
gracilicorne, *Tetropium* 171
Graciliini 7, 12, 14, 15, 17, 27, 81,
213
grallator, *Amarysius* 3

heptapotamicus, *Molorchus* 52, 53,
54, 66, 69, 70, 71
herbsti, *Chlorophorus* 12
Hesperophanes 19
Hesperophanini 7, 9, 12, 14, 15, 17,
18, 213
Hylotrupes 117, 118, 119, 120, 121
hypocrita, *Clytus* 3

incarinatus ab., *Molorchus* 55
incognitus, *Molorchus* 52, 53, 54, 75,
76, 77
infuscatus ab., *Phymatodes* 199
insubricum, *Callidium* 124
interrupta, *Saperda* 58, 148

japonicus, *Mallambyx* 22
junebris, *Rosalia* 112

- kaehleri, *Purpuricenus* 13
 kiesenvetteri, *Molorchus* 52, 53, 54, 64, 65, 66, 68
 kobotokensis, *Molorchus* 11, 52, 53, 54, 58, 72, 73
 kunashiricus ssp., *Molorchus* 72

 lameeri, *Rosalia* 112
 latefasciatus ab., *Polyzonus* 108
 lateritia, *Rosalia* 112
 latifasciatus ab., *Semanotus* 149
 Leontium 9, 10, 11, 87, 88, 89, 101, 102, 103, 105, 106
Leptidea 46, 47
Leptideella 47
Leptura 198, 208
Lepturinae 3, 7, 11, 206
 Linomius 51, 52

 maaki, *Phymatodes* 118, 172, 173, 174, 175, 188, 194, 196, 197, 198, 201, 203
 Mallambyx 7, 14, 22, 23, 24
 marginatus, *Exocentrus* 156
 Mausaridaeus 111
 mediofasciatus, *Phymatodes* 118, 172, 173, 174, 175, 191, 192, 193
 meridianus, *Stenocorus* 208
 Mesosa 129
 minor, *Molorchus* 11, 52, 53, 54, 55, 57, 142, 148
 minor, *Necydalis* 52
 minuta, *Callidium* 28
 minuta, *Gracilia* 3, 14, 28, 29, 30
 mixtus, *Xylotrechus* 3
Molorchini 7, 8, 10, 12, 13, 14, 16, 17, 46, 51, 81
Molorchinus 51
 Molorchus 3, 10, 11, 51, 53, 54, 55, 57, 58, 59, 61, 62, 63, 64, 65, 66, 68, 69, 70, 71, 72, 73, 75, 76, 77, 78, 142, 148
 Monochamus 148
 morio, *Necydalis* 116, 133
 moschata, *Aromia* 9, 11, 13, 89, 90, 91, 92, 93
 moschatus, *Cerambyx* 89
 myops, *Mesosa* 129

 Nadezhdiana 9, 51, 78, 79
 nadezhdae, *Atimia* 151
 Nathriini 7, 8, 9, 12, 14, 16, 17, 46
 Nathrius 3, 46, 47, 48, 49, 50
Neocerambyx 22
 Necydalis 52, 53, 116, 133
 nigricollis ab., *Oupyrrhidium* 153
 nigrifulus, *Clytus* 3

Obriini 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 30, 48, 81
 Obrium 10, 30, 31, 32, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43
 Obscuriventris ab., *Phymatodes* 195
 orientalis ssp., *Aromia* 90, 92
 Oupyrrhidium 117, 118, 119, 120, 151, 152, 154, 155, 156

 Palaeocallidium 157, 166
 pantherinus, *Xylotrechus* 13
 Paraphymatodes 173
 pavlovskii, *Xylotrechus* 3
 perforata, *Saperda* 36
 petasifer, *Purpuricenus* 3, 13
 Phymatodellus 171, 172, 191, 192
 Phymatodes 9, 12, 13, 16, 117, 118, 119, 120, 129, 171, 172, 173, 174, 175, 176, 177, 179, 180, 181, 182, 183, 185, 186, 187, 188, 189, 191, 192, 193, 194, 196, 197, 198, 199, 200, 201, 202, 203
 Plagionotus 8, 10, 12, 13
 plavilstshikovi, *Teratoclytus* 13, 185, 197
 Placaederus 22
 Polyzonus 8, 10, 87, 88, 89, 106, 107, 111
 Pogonocherus 58, 142, 148, 164
 Poecilium 173, 198
 porteri, *Nathrius* 47
 posticeinterruptus ab., *Polyzonus* 108
 praeusta, *Tetrops* 65
 praeustus ab., *Phymatodes* 175
Prioninae 206
 Pronocera 13, 116, 117, 118, 119, 120, 138, 139, 140, 141, 142, 152, 153
 Pronocerodes 124
 Prorrhopalopus 123, 124
Psebiini 14, 16, 46, 81
 Pseudocallidium 111
 Pterolophia 156

- puellus ab., *Hylotrupes* 121
 pulcher, *Plagionotus* 12, 13
 Purpuricenus 3, 10, 13
 pygmaeum, *Callidium* 28
- quadrilunatus ab., *Semanotus* 144
 quadrimaculatus, *Phymatodes* 203
 quadrinotatus, *Stenygrinum* 3, 25, 26
- raddei, *Mallambyx* 14, 22, 23, 24
 raddei, *Neocerambyx* 22
 Rhamnusium 206, 207
 Rhaphuma 7, 11, 116
 Rhopalopus 8, 9, 10, 13, 16, 117, 118, 119, 123, 124, 125, 126, 127, 129, 130, 131, 132, 133, 134, 135, 136, 137, 142
 Rhopaloscelis 38, 42
 Rosalia 11, 111, 112, 113, 116
 Rosaliini 7, 8, 9, 12, 15, 16, 18, 111
 rufescens ab., *Molorchus* 55
 ruficollis, *Rhopalopus* 124, 137
 rufilius, *Xylotrechus* 3
 rufithorax ab., *Rhopalopus* 124, 130
 rufotestaceum var., *Rhamnusium* 206
 rusticus, *Arhopalus* 209, 210, 211
 rusticus, *Xylotrechus* 10, 13
- salessei ab., *Callidium* 159
 saltuarius, *Monochamus* 148
 Saperda 28, 36, 58, 148
 sartor, *Chlorophorus* 3
 scalaris, *Saperda* 36
 scutifer ab., *Hylotrupes* 122
Semanotus 11, 13, 14, 117, 118, 119, 120, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 167
 semireductus ab., *Semanotus* 144
 sexmaculatus, *Chlorophorus* 12, 13
 sibiricus, *Cerambyx* 107
 sieversi, *Chloridolum* 11, 13, 88, 94, 95, 97
 signaticollis, *Rhopalopus* 124, 125, 130, 131, 133, 134, 136
 sinensis, *Semanotus* 148
 singularis, *Brachyclytus* 13, 197
 sincauster ssp., *Semanotus* 148, 149
 speciosus, *Rhopalopus* 124, 125, 133, 134, 135
- Stenaspini* 7, 8, 10, 11, 12, 15, 17, 18
Stenhomalus 10, 30, 31, 32, 42, 43, 44, 45, 46
Stenocorini 206
Stenocorus 208
Stenopterus 51
Stenygrinum 3, 25, 26
 stierlini, *Exocentrus* 78
 striatum, *Asemum* 211
 Sydonia 46
- Teratoclytus* 8, 13, 185, 197
 testaceus, *Cerambyx* 172
 testaceus, *Phymatodes* 118, 129, 171, 172, 173, 174, 175, 176, 177
Tetropium 171
Tetrops 65
 theresae ab., *Hylotrupes* 121
Tomentaromia 89
 transversefasciatus ab., *Semanotus* 144
Trichoferus 18, 19, 20, 22
 tristis, *Arhopalus* 209, 210, 211, 212
 tsherepanovae, *Purpuricenus* 13
 tuvensis, *Asias* 11
- ubsanurensis, *Chlorophorus* 3
 umbellatarum, *Molorchus* 3, 52, 53, 54, 58, 59, 61, 62, 63
 undatus, *Cerambyx* 143
 undatus, *Semanotus* 11, 13, 14, 118, 143, 144, 145, 146, 147, 148, 149, 150
Upyrrhidium 151, 152
 ussuricus, *Phymatodes* 13, 118, 172, 173, 174, 181, 185, 186
 ussuriensis, *Molorchus* 52, 53, 54, 58, 59, 61, 62, 64
 ussuriensis, *Pterolophia* 156
- vandykei, *Phymatodes* 172, 173, 174, 175, 185
 variabilis ab., *Phymatodes* 175
 varius, *Chlorophorus* 12, 87
 villioni, *Xylotrechus* 3
 villosa, *Nadezhdiana* 78, 79
 violaceum, *Callidium* 156, 157, 158, 159, 162, 164
 violaceum, *Cerambyx* 15
 virescens ab., *Callidium* 159

viride, Leontium 9, 11, 87, **102**, 103,
105, 106

vulcanus, Stenhomalus 10, **43**, 44,
45, 46

Xyloclytus 3

Xylotrechus 7, 9, 10, 11, 12, 13, 14,
16, 129, 178

zaitzevi, Chelidonium 11, 13, **97**, 98,
99, 101, 106

zemlinae, Phymatodes 172, 173, 174,
179, 180