Descriptions of immature stages of Japanese Chrysomelinae belonging to the generic groups Chrysolina, Gonioctena, Potaninia, Phola and Phaedon (Coleoptera)

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https://doi.org/10.5109/22695

出版情報：九州大学大学院農学研究院紀要. 12 (2), pp.89-103, 1962-10. Kyushu University
バージョン：
権利関係：

Journal of the Faculty of Agriculture, Kyushu University, Vol. 12, No. 2
October 30, 1962

Descriptions of immature stages of Japanese Chrysomelinae belonging to the generic groups *Chrysolina*, *Gonioctena*, *Potaninia*, *Phola* and *Phaedon* (Coleoptera)*

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I. Generic group *Chrysolina*

In the group, the genera *Chrysolina*, *Polygramma* and *Oreina* are included. The group is characterized by the following characters.

Larvae: Generally, body convex. Each of meso- and metathorax and first abdominal segment with a pair of egg bursters. Usually without distinct tubercles on meso- and metathorax and abdomen, but in some species with very minute tubercles. In the latter case tubercles consist of (D-DL-EP) type in prothorax, (DLi) and (DLe) type in meso- and metathorax, and (DLai), (DLae) and (DLp) type in abdomen.

Pupae: Generally sclerotization of surface rather thin and soft. Setae rather close and long. Seventh abdominal segment without any lateral tuberculation. Apex of ninth abdominal segment with a long projection, which extends posteriorly.

Biology: Larvae molt three times. Pupation takes place in the ground.

Genus *Chrysolina* Motschulsky, 1860

Seven species of this genus have been recorded from Japan, but I could only examine two species. Comparing the tubercular form of *C. exanthematica* with the other species of the genus, the species shows a very specialized tubercular form. Bechyně (1950) divided the genus into 45 subgenera but I hesitate to follow his treatment. However, it seems to be true that *Chrysolina* includes too many heterogenous species to compose a single genus and may be separable to certain genera or subgenera. Judging by the tubercular forms I examined and those described by Paterson and Hennig, many kinds of tubercular forms are included in the genus and, it may be said that these larval forms show

* Contribution Ser. 2, No. 145, Entomological Laboratory, Kyushu University. (Studies on immature stages of Japanese Chrysomelinae 2).

the possibility of dividing the genus into some genera or subgenera and the tubercular form of *C. aurichalcea* is not a typical one but rather a specialized one, and suggests some relationships to the generic group Gonioctena.

Chrysolina aurichalcea (Mannerheim, 1825) (Pl. 2, 1)

Last instar larvae.

Ground color pale brownish yellow; head black; tubercles and legs reddish brown.

Generally body very convex, secondary setae very close and homogenously arranged all over the surface. Granular tubercles small and rather sparse; tubercles small, compared with the species belonging to the other genera; claws very slightly grooved at apex; abdomen without pseudopod.

9.0×3.2 mm (in alcoholic specimen).

Head: Cordal suture long, and frontal suture nearly straight. Anterior margin of frons raised. Vertex with about fifty setae and frons with fifteen setae. Postclypeus with three setae and labrum with two setae. Anterior margin of labrum incised.

Prothorax: Dorsal side with a very large tubercle (D-DL-EP), which has sixty or seventy setae, and arranged homogeneously all over the surface. Pleural region with a tubercle (P), which has about five setae. Sternal region with one rather large and many small tubercles. The latter seems to be a secondary tubercle, and the former many be (ES-SS) and with two or three setae and united with the homologous tubercle of another side on the longitudinal line.

Meso- and metathorax: Dorsal side with six tubercles, (Dai), (Dae), (Dpi), (Dpe), (DLi) and (DLe). First five tubercles very small compared with the other species. (Dai), (Dae), (Dpi) and (Dpe) each with a long seta. (DLi) larger than above-mentioned four tubercles, and with two long setae. (DLe) convex, much larger than (DLi) and with fifteen setae, of which two or three setae are longer. Epipleural region with two tubercles, (EPp) and (EPa), which are round, and provided with about ten setae. In mesothorax, spiracle situated on (EPa). Pleural region with a tubercle (P), which has usually three setae. Sternal region with one rather large and many small tubercles. Most of the latter may be secondary tubercles, and one of which may be (SS). The former may be (ES), having one or two setae and united with the homologous tubercle of another side on the longitudinal line.

Abdomen: Dorsal side with seven tubercles, (Dai), (Dae), (Dpi), (Dpe), (DLai), (DLae) and (DLp). These tubercles very small compared with the other species, and each with a long setae. Epipleural region with an oval tubercle (EP). The tubercle with about fifteen setae. Pleural region with a tubercle (P), which is smaller than (EP), and with about ten setae. Sternal region with two rather large tubercles and many small ones. The former may be (ES) and the latter (SS-PS). (ES) with a seta. (SS-PS) with four or five setae.

Chrysolina exanthematica (Wiedemann, 1821) (Pl. 2; Pl. 3, 1-3)

First instar larvae.

Ground color reddish brown; head black; legs blackish brown; tubercles and claws reddish brown.

Generally body very convex, setae scarce and extremely short. Granular tubercles large and extremely close, connected with each other and with a strigose surface but in ventral side slightly sparser than in dorsal side. Claws very slightly grooved at apex.

10.0×5.0 mm (in alcoholic specimen)

Head: Cordal suture rather short and shorter than the length of one fourth of mid-dorsal longitudinal invagination. Anterior margin of frons raised. Vertex with about ten setae and frons with ten setae. Post-clypeus with three setae and labrum with two setae. Anterior margin of labrum incised.

Prothorax: Dorsal side with a very large tubercle (D-DL-EP), which has thirty or forty micro-setae, chiefly arranged on the border of the tubercle. Pleural region with a tubercle (P), which has usually three setae. Sternal region with one rather large tubercle and many small ones. The former may be (ES-SS), and with one or two setae and united with the homologous tubercle of another side on the longidinal line.

Meso- and metathorax: Dorsal side without tubercles, but with about twenty-five micro-setae. Epipleural region without tubercles, but with very minute seven or eight setae. Pleural region without tubercles but with four or five micro-setae. Sternal region with one rather large tubercle and many small tubercles. Most of the latter may be secondary tubercles, of which one may be homologous to (SS). The former may be (ES), which has two or three setae.

Abdomen: Dorsal side without tubercles but with about thirty micro-setae. Epipleural region without tubercles, but with five or six micro-setae. Pleural region without tubercles but with eight setae. Sternal region with many tubercles, which are mostly secondary tubercles.

First instar larvae.

Head: Vertex with about ten setae and frons with five setae.

Prothorax: Dorsal side with a large tubercle (D-DL-EP). The tubercle with fifteen or twenty setae, chiefly arranged on the border of the tubercle. Pleural region without tubercles but with a few micro-setae. Sternal region with two setae. Base of each setae distinctly tuberculate.

Meso- and metathorax: Dorsal side without tubercles. Dorsal region with about seven micro-setae. Dorso-lateral region with a pair of egg-bursters, which may be homologous to (DLi), and are pointed at the tip and has a seta. Dorso-lateral region with four or five micro-setae. Both epipleural and pleural regions without tubercles, and each with a few micro-setae. Sternal region with two setae. Base of each seta distinctly tuberculate.

Abdomen: Dorsal side without tubercles but with about ten micro-setae. On first segment, (DLe) consists of an egg burster and with a seta. Epipleural region without tubercles but with three micro-setae. Pleural region without tubercles but with two or three setae. Sternal region with four setae and the base of each seta distinctly tuberculate.

Pupae.

Elongate, pale reddish yellow. Setae close. Vertex with about ten setae, of which three or four are arranged in a transverse row and one is situated at the interior margin of eye. Pronotum with about thirty setae, homogenously arranged all over the surface. Dorsal surface of mesothorax with about five to seven setae, situated in the central part. Dorsal surface of metathorax with about ten setae, situated in the central part. Dorsal surface of abdomen with about fifteen

setae. Apex of ninth abdominal segment produced posteriorly and the tip strongly pointed.

II. Generic group *Gonioctena*

In the group, the genus *Gonioctena* is included. Judging by the descriptions done by Hennig, the genera *Colaphellus* and *Scleophaedon* may be included in the group. The group is characterized by the following features.

Larvae: Generally body rather flat, tubercles not so small. Setae rather close and strong. Tubercles consist of (DL-DL-EP) type in prothorax, and (DLai), and (DLe) type in meso- and metathorax, and (Dpe) and (DLpi) nearly united together. A pair of egg bursters situated on meso- and metathorax and first abdominal segment.

Pupae: Generally sclerotization of the surface rather thin and soft. Setae rather close and long. Seventh abdominal segment without lateral tuberculation. Apex of ninth abdominal segment with a pair of long projections which are extending posteriorly.

Biology: The larvae molt three times. Pupation takes place in the ground.

Genus *Gonioctena* Chevrolat, 1837

From the Japanese fauna, four species have been recorded, but I could not examine the early stages of two species of this genus. Comparing with the species of *Gonioctena* (*Gonioctena*) spp., it may be said that the subgenus *Brachyphytodecta* has sufficient characters to be separated from *Gonioctena* as an independent genus.

Gonioctena (*Brachyphytodecta*) *rubripennis* Baly, 1862
(Pl. 2, 3–4; Pl. 3, 4–9)

Last instar larvae.

Ground color pale reddish yellow. Head black; tubercles blackish brown; legs yellow, except apex of femora, tibiae and tarsi blackish brown.

Generally, body rather flat, setae long and close. Granular tubercles extremely small and sparse. Claws strongly grooved at apex. Sixth and seventh abdominal segments each with a pair of pseudopods.

8.5×2.0 mm (in alcoholic specimen).

Head: Cordal suture long and frontal suture nearly straight. Frons nearly flat. Vertex with about fifteen setae. Frons with six or seven setae. Post-clypeus with three setae. Labrum with two setae. Anterior margin of labrum incised.

Prothorax: Dorsal side with a large tubercle (D-DL-EP), which has about thirty-five setae, chiefly arranged on the border of the tubercle and nearly glabrous in the central part. Pleural region with a tubercle (P), which has three setae. Sternal region with a tubercle (ES-SS), which has three or four setae, and is united with the homologous tubercle of another side on the longitudinal line. In fully grown larvae, above-mentioned tubercles disappeared.

Meso- and metathorax: Dorsal side with seven tubercles. (Dpe) and (DLpi) nearly united together. (Dai), (Dae) and (DLai) oval, subequal in size, and each with two setae. (Dpe) the smallest, round, and with a seta. (Dpi) larger than (Dpe), and usually with four or five setae. (DLpi) larger than (Dpi), and with five or six setae. (DLe) the largest, convex, and with about twelve setae. Epipleural region with two tubercles, (EPa) and (EPp). (EPa) and (EPp) oval, subequal to each other in size. (EPa) with about five setae. (EPp) with about three setae. On mesothorax spiracle situated separately from (EPa). Pleural region with an oval tubercle (P), which has usually two setae. Sternal region with two tubercles. Each of (ES) and (SS) with two setae. In fully grown larvae, (EPa), (EPp), (P), (ES) and (SS) disappeared.

Abdomen: Dorsal side with six tubercles. (Dai), (Dae) and (DLa) consist of an anterior row, and (Dpi), (Dpe) and (DLp) consist of a posterior row. (Dai) nearly round, the smallest, with two setae. (Dae) oval, nearly equal in size to (DLa), with usually three setae. (DLa) with usually four setae. (Dpi) and (Dpe) oval, subequal in size, and each with four or five setae. (DLp) round, convex, rather large, with five or six setae. Epipleural region with a tubercle (EP). The tubercle with about ten setae. Pleural region with a tubercle (P), which has three or four setae. Sternal region with two tubercles. (ES) with a seta and united with the homologous tubercle of another side on the longitudinal line. (SS-PS) with three or four setae. In fully grown larvae, (EP), (P), (ES) and (SS-PS) disappeared.

First instar larvae.

Head: Vertex with about ten setae. Frons with four setae.

Prothorax: Dorsal side with a large tubercle (D-DL-EP), which has twelve or thirteen setae, arranged on the border of the tubercle. Pleural region with a tubercle (P), which has a seta. Sternal region with a tubercle (ES-SS), which has two setae and is united with the homologous tubercle of another side on the longitudinal line.

Meso- and metathorax: Dorsal side with seven tubercles. (Dpe) and (DLpi) nearly united together. (DLpi) consists of an egg burster. Each of (Dai), (Dae), (Dpi), (Dpe) and (DLpi) with a seta. (DLai) without seta. (DLe) with three long and a short setae. Epipleural region with two tubercles. In mesothorax (EPa) with two setae, and (EPp) with a seta. Spiracle situated separately from (EPa). In metathorax, each of these two tubercles with a seta. Pleural region with a tubercle (P), which has a seta. Sternal region with two tubercles, (ES) and (SS). (SS) with a seta. (ES) with a seta and united with the homologous tubercle of another side on the longitudinal line.

Abdomen: Dorsal side with six tubercles, (Dai), (Dae), (Dpi), (Dpe), (DLa) and (DLp). Each of which with a long seta. (DLp) consists of a pair of egg bursters. Epipleural region with a tubercle (EP), which has three long setae. Pleural regionwith a tubercle (P), which has two rather long setae. Sternal region with two tubercles, (ES) and (SS-PS). (SS-PS) with three setae. (ES) with a seta and united with the homologous tubercle of another side on the longitudinal line.

Pupae.

Elongate, pale reddish yellow. Setae rather close. Vertex with about ten setae. Pronotum with about thirty or forty setae, homogeneously arranged all over the surface. Dorsal surface of meso- and metathorax each with about five setae. Dorsal surface of abdominal segments each with fourteen setae. Apex of

ninth abdominal segment produced posteriorly and divided into a pair of long projections. These projections widely separated from each other and their apies strongly pointed.

Gonioctena (*Gonioctena*) *japonica* Chûjô et Kimoto
(Pl. 2, 5; Pl. 3, 10–12).

The species has been reported by many entomologists as *Gonioctena rufipes* but is clearly distinguished from *rufipes* not only by adult characters but also by larval ones. On the dorsal side the tubercles of *G. rufipes* are distinctly separated from each other, but these of this species are nearly united together. Among the European species of the genus, some of the tubercles are united together in *G. linnaeana*. I think that tubercles of *G. japonica* are regarded as one of the most specialized types.

Last instar larvae.

Ground color pale yellowish brown; head black; tubercles and legs blackish brown; claws reddish brown.

Generally, body rather flat, setae extremely short and very scarce. Granular tubercules very small and sparse. Claws strongly grooved at the apex. Abdomen without pseudopod.

8.5×2.5 mm (in alcoholic specimen).

Head: Cordal suture long, and frontal suture nearly straight but curved at the base. Central part of frons slightly depressed. Vertex with about thirteen setae. Frons with about five setae. Post-clypeus with three setae. Labrum with two setae. Anterior margin of labrum incised.

Prothorax: Dorsal side with a very large tubercle (D-DL-EP), which has about fifteen rather long setae, arranged on the border of the tubercle, and another thirty micro-setae, arranged all over the surface of the tubercle. Pleural region with a tubercle (P), which has about five or six setae. Sternal region with a tubercle (ES-SS), which has one or two long setae and about five micro-setae, and united with the homologous tubercle of another side on the longitudinal line.

Meso- and metathorax: On dorsal side, seven tubercles united together in three tubercles, of which two are anterior and posterior transverse tubercles, and another is a lateral smaller one. (Dai) with one long and one or two micro-setae. (DLai) with two or three micro-setae. (Dpi) with one long and two or three micro-setae. (Dpe) with one rather long seta and a micro-seta. (DLpi) with about twenty setae, of which three or four setae are rather long. Epipleural region with two triangular tubercles, (EPa) and (EPp). (EPa) with about fifteen setae, and (EPp) with about ten rather long setae. On mesothorax spiracle situated on (EPa). Pleural region with a tubercle (P), which has about ten setae. Sternal region with many secondary tubercles. I can not assume which is a primary one.

Abdomen: On dorsal side, seven tubercles nearly united together and show as if two large transverse anterior and posterior tubercles are present. (Dai) with one rather long seta and two or three micro-setae. (Dpe) with one long seta and four or five micro-setae. (DLai) with one long seta and four or five micro-setae. (DLae) with two or three micro-setae. (Dpi) with one long seta and four or five micro-setae. (Dpe) with about five micro-setae. (DLp) with one long seta and

about five micro-setae. Epipleural region with a tubercle (EP), which has about five rather long setae and fifty micro-setae. Pleural region, with a tubercle (P), which has usually two long setae and ten micro-setae. Sternal region with many secondary tubercles. I can not assume which is a primary one.

Pupae.

Elongate, pale yellowish red. Setae rather close. Vertex with about six setae. Pronotum with about thirty setae, which are closely distributed on the border and rather sparsely on the middle. Dorsal surface of meso- and metathorax nearly glabrous. Dorsal surface of each abdominal segments with about sixteen setae. Apex of ninth abdominal segment posteriorly produced and divided into a pair of long projections. These projections strongly pointed at the apex, and very closely contiguous to each other.

6.0×3.5 mm.

III. Generic group *Potaninia*

In the group, the genus *Potaninia* is included. I think that the group is a relative taxon to the generic group *Gonioctena*, but may be separable in having the following characters.

Larvae: On meso- and metathorax of last instar larvae, tubercles consist of three rows, and (Dpe) and (DLpi) distinctly separated from each other. A pair of egg bursters situated on meso- and metathorax and first abdominal segment.

Pupae: Apex of ninth abdominal segment with a pair of long projections, but projections do not extend posteriorly but bent at the base and are not appart so much from body.

Biology: Larvae molt three times. Pupation takes place in the ground.

Also the genus *Entomoscelis* belongs to the group. The genus is a more highly specialized taxon, judging by the description given by Hennig, in having three transverse rows of tubercles in mature larvae.

Genus *Potaninia* Weise, 1889

A single species of the genus has been recorded from Japan.

Potaninia cyrtonoides (Jacoby, 1885) (Pl. 2, 6–7; Pl. 4, 1–5)

Last instar larvae.

Ground color pale yellowish brown; head black; tubercles yellowish brown; legs pitchy brown with apex of tibiae more blackish; claws reddish brown.

Body rather flat, setae long and close; granular tubercles small and sparse; claws strongly grooved at apex; six and seventh abdominal segments with a pair of pseudopods.

8.3×2.5 mm (in alcoholic specimen).

Head: Entirely smooth, cordal suture very short, and frontal suture long and strongly curved. Central part of frons roundly depressed. Vertex with about fifty setae, and frons with about twenty setae. Post-clypeus with three setae and labrum with two setae. Anterior margin of labrum incised.

Prothorax: Dorsal side with a large tubercle (D-DL-EP), which has about eighty rather long setae, homogeneously arranged all over the surface. Pleural region with a tubercle (P), which has about eight setae. Sternal region with two tubercles, (ES) and (SS). (ES) with a seta and (SS) with one or two setae. Each of these two tubercles united with the homologous tubercles of another side on the longitudinal line.

Meso- and metathorax: On dorsal side tubercles consist of three transverse rows. First row consists of two oval tubercles, (ad 3) and (ad 4). Usually (ad 3) larger than (ad 4), and with three rather long setae. (ad 4) with two setae. Second row consists of four tubercles, (Dai), (Dae), (ad 2a) and (DLai). Usually (Dae) the largest, with eighty rather long setae. Usually (Dai) oval, smaller than (Dae) but larger than the other three tubercles, and with five or six setae. Usually (DLai) and (ad 2p) round, subequal in size. (DLai) with three or four setae. (ad 2p) with four or five setae. (ad 2a) the smallest, and with a seta. Third row consists of three tubercles, (Dpi), (Dpe) and (DLpi). Usually (DLpi) the largest, and with eleven to sixteen setae. (Dpe) the smallest, usually with six setae. (Dpi) with about twenty setae. (DLe) large, convex, and with about thirty setae. Epipleural region with two tubercles, (EPa) and (EPa). (EPa) with six to eight setae. (EPp) with six to nine setae or so. On mesothorax, spiracle situated separately from (EPa). Pleural region with a tubercle (P), which has usually seven setae. Sternal region with a rather large tubercle and many secondary tubercles. (ES) large and with one or two setae and united with the homologous tubercle of another side on the longitudinal line.

Abdomen: On dorsal side, tubercles consist of two rows, but many small secondary tubercles appear in last instar larvae, irregularly arranged in a transverse row situated before first row of primary tubercles. First row consists of four oval tubercles, (Dai), (Dae), (DLai) and (DLae). Usually (Dae) and (DLae) subequal in size, and larger than each of (Dai) and (DLai). (Dai) and (DLai) subequal to each other in size. (Dai) with about six setae, (Dae) with about ten setae, and (DLai) with about five setae. (DLae) with about six setae. Second row consists of three oval tubercles, (Dpi), (Dpe) and (DLp). (DLp) the largest, (Dpi) and (Dpe) subequal in size. Each of (Dpi) and (Dpe) with seven or eight setae. (DLp) with about twelve setae. Epipleural region with a tubercle (EP), which has about fifteen setae. Pleural region with a tubercle (P), which has seven or eight setae. Sternal region with two primary tubercles, (ES) and (SS-PS) and a secondary tubercle (as 2). (ES) with about three setae, and united with the homologous tubercle of another side on the longitudinal line. (SS-PS) with about five setae. (as 2) with about six setae.

First instar larvae.

Head: Vertex with about eleven setae. Frons with about five setae.

Prothorax: Dorsal side with a large tubercle (D-DL-EP), which has about fifteen long setae, only arranged on the border of the tubercle. Pleural region with a tubercle (P), which has a seta. Sternal region with two tubercles, (ES) and (SS). Each of (ES) and (SS) with a seta. These two tubercles united with each of the homologous tubercles of another side on the longitudinal line. Sometimes, (ES) and (SS) united together.

Meso- and metathorax: On dorsal side, tubercles consist of two transverse rows. First row consists of three tubercles, (Dai), (Dae) and (DLai). Each of the three tubercles with a seta. Second row consists of three tubercles, (Dpi), (Dpe)

and (DLpi). Each of (Dpi) and (DLpi) with two setae. (Dpe) with a seta. (DLpi) consists of an egg burster. (DLe) rather large, and with five or six setae. Epipleural region with two tubercles, (EPa) and (EPp). (EPa) with three setae, and (EPp) with a seta. Pleural region with a tubercle (P), which has a seta. Sternal region with two tubercles, (ES) and (SS). (ES) united with the homologous tubercle of another side on the longitudinal line, and with a seta. (SS) extremely small, and with a micro-seta.

Abdomen: On dorsal side, tubercles consist of two transverse rows. First row consists of four tubercles, (Dai), (Dae), (DLai) and (DLae). Each of these four tubercles with a seta. Second row consists of three tubercles, (Dpi), (Dpe) and (DLp). Each of (Dpi) and (DLp) with two setae, and (Dpe) with a seta. On first segment, (DLp) consists of an egg burster. Epipleural region with a tubercle (EP), which has four setae. Pleural region with a tubercle (P), which has two setae. Sternal region with two tubercles, (ES) and (SS-PS). (ES) with a seta, and united with the homologous tubercle of another side on the longitudinal line. (SS-PS) with three setae.

Pupae.

Body rather elongate, setae rather sparse but long. Vertex with ten setae, consisting of a rather regular transverse row. Pronotum of prothorax with thirty setae, arranged only on the border of the surface. Dorsal surface of meso- and metathorax with two setae, situated on the central part. Dorsal surface of abdominal segments, each with six setae. Apex of ninth abdominal segment with a pair of long projections and the tip strongly pointed, but these projections not extending posteriorly but bent at the base and intersected to each other.

IV. Generic group *Phola*

Until today studies of the larvae of this tribe established by Weise under the name of Phyllocharini have not been done. This description is the first report on the larva of the group.

Studies on this group was made by the alcoholic specimens of one species and I could not satisfactorily compare it with the other groups, but the general tubercular form and three transverse rows of the tubercles clearly suggest the relationship to the generic group *Gonioctena*. This group may be characterized by its rather scarce club-shaped setae and three transverse rows of tubercles on dorsal and dorso-lateral regions. Pupa and biology are unknown.

Genus *Phola* Weise, 1890

A single species of the genus has been recorded from Japan.

Phola octodecimguttata (Fabricius, 1775) (Pl. 2, 8; Pl. 4, 6-8)

Larvae (instar unknown, perhaps last instar).

Ground color pale yellowish brown; head black; tubercles and legs pale reddish brown; claws reddish brown.

Generally, body rather flat, setae short and club-shaped. Granular tubercles

rather scarce. Claws strongly grooved at the apex. Sixth to eighth abdominal segments each with a pair of pseudopods.

5.5×2.0 mm (in alcoholic specimen).

Head: Vertex smooth, cordal suture long, and frontal suture nearly straight. Frons nearly flat. Vertex with about twenty five setae. Frons with seven or eight setae. Post-clypeus with three setae. Labrum with two setae, and anterior margin of labrum incised.

Prothorax: Dorsal side with a large tubercle (D-DL-EP), which has about thirty or forty club-shaped setae. These setae distribute homogenously all over the surface. Pleural region with a tubercle (P), which has two setae. Sternal region with two tubercles. Each of (ES) and (SS) with a seta.

Meso- and metathorax: On dorsal side, tubercles consist of three rows. First row usually consists of three tubercles, of which interior two tubercles may be homologous to (ad 3) and (ad 4) of *Potaninia cyrtonoides*, and the other one sometimes lacking. Tubercles consisting first row may be secondary tubercles. Each of these tubercles with a seta. In younger examples (instar unknown), tubercles of first row small and irregular. Second row usually consists of eleven tubercles. The most interior two tubercles, perhaps, homologous to (Dai) and (Dae) of *Potaninia cyrtonoides*, and each with a seta. Usually (ad 2) consists of three tubercles. Each of these tubercles with a seta. Sometimes, these tubercles united together. In younger examples, only one tubercle exists on the place. (DLai) consists of three tubercles in most cases, of which two are secondary tubercles, and each furnished with a seta. In younger examples, only one tubercle exsists on the place. Third row consists of five tubercles. Among these tubercles, first and third interior tubercles very small, and each with a seta. These may be secondary tubercles. In younger examples, these two tubercles lacking. The other three tubercles, perhaps, homologous to (Dpi), (Dpe) and (DLpi) of *Potaninia cyrtonoides*. Each of (Dpi) and (Dpe) with one or two setae. (DLpi) with three setae. (DLe) large, rather convex, and with four setae. Epipleural region with two tubercles, (EPa) and (EPp). (EPa) with about five setae, and (EPp) with three setae. On mesothorax, spiracle situated separately from (EPp). Pleural region with a tubercle (P), which has two setae. Sternal region with two tubercles. Each of (ES) and (SS) with a seta.

Abdomen: On dorsal side, tubercles consist of three rows. First row usually consists of four tubercles. Usually each of these tubercles with a seta. In younger examples, these also exist but may be secondary tubercles as in the case of thorax. Second row consists of seven tubercles. The innermost two tubercles, perhaps, homologous to (Dai) and (Dae) of *Potaninia cyrtonaides*, with a seta. Third tubercle sometimes does not exist and seems to be secondary tubercle. (DLai) large and with three setae and sometimes divided into three tubercles. In younger examples, only one tubercle exist on the place. (DLe) usually with two setae. Third rows usually consists of six tubercles. Interior first and third tubercles do not exist in younger examples. (Dpi) usually with two or three setae. (Dpe) with one or two setae. A tubercle in exterior part of (Dpe), which may be a secondary tubercle. (DLp) large, and with usually three setae. Epipleural region with a tubercle (EP), which usually has four setae. Pleural region with a tubercle (P), which has two or three setae. Sternal region with five tubercles. (ES), (SS), (PSi) and (PSe) small and each with a seta, and another tubercle without seta, which is a secondary tubercle.

V. Generic group *Phaedon*

In the group, the genera *Phaedon, Gastrophysa, Phratora* and *Mesoplatys* are included. This group is characteristic in having the following characters.

Larvae: Generally, setae scarce but rather long. Meso- and metathorax and first to seventh abdominal segments each with a pair of eversible glands. Tubercles consist of (D-DL-EPa) and (EPp) type in prothorax, and (DL) type in meso- and metathorax and in abdomen. Claws strongly grooved at apex. A pair of egg bursters situated on meso- and metathorax.

Pupae: Generally sclerotization of the surface rather thin and soft; setae rather sparse but long and strong. Seventh abdominal segment without lateral tuberculation. Ninth abdominal segment without projection at apex.

Biology: Larvae molt twice. Pupation takes place in the ground.

Genus *Phaedon* Latreille, 1829

From the Japanese fauna, two species have been recorded. These are *P. brassicae* and *nigritus*, but I am not sure whether these two species are different or not.

Phaedon brassicae Baly, 1874 (Pl. 2, 9–10; Pl. 4, 9–10)

Last instar larvae.

Ground color reddish yellow. Head black; tubercles and legs blackish brown; claws reddish brown. Generally body rather flat, setae scarce but long and strong; granular tubercules close and large, which are closer on dorsal side but sparser on ventral side; claws not grooved at apex. Abdomen without pseudopods.

5.0×1.8 mm (in alcoholic specimen).

Head: Cordal suture long and frontal suture nearly straight. Vertex with about ten setae. Frons with four setae. Central part of frons roundly depressed. Post-clypeus with three setae and labrum with two setae. Anterior margin of labrum incised.

Prothorax: Dorsal side with a very large tubercle (D-DL-EPa) and a very small one (EPp). The former with about eleven very long and a very short setae, only arranged on the border of the tubercle. The latter with a seta. Pleural region with an oval tubercle (P), which has a long seta. Sternal region with an oval tubercle (ES-SS), which has two setae and is united with the homologous tubercle of another side on the longitudinal line.

Meso- and metathorax: Dorsal side with four tubercles. (D) and (Dpi) transverse, oval, and subequal to each other. (Da) with two long setae, and (Dpi) with a long seta. (Dpe) nearly round, smaller than (Da) and (Dpi), and with three long setae. (DL) round, convex, and with about seven to nine long setae and an orifice of eversible gland on the tip of the tubercle. Epipleural region with two tubercles, (EPa) and (EPp). (EPa) and (EPp) round, nearly equal in size, and with a long seta. On mesothorax, spiracle situated on (EPa). Pleural region with an oval tubercle (P), which has a seta. Sternal region with two tubercles, (ES) and (SS). (SS) round, and with a seta. (ES) with a seta, and united with the homologous tubercle of another side on the longitudinal line. Sometimes a secondary

tubercle appears in the antero-posterior part of (ES), which may be homologous to (as 1).

Abdomen: Dorsal side with two large tubercles, (D) and (DL). (D) large, oval and with three long setae. (DL) large, convex, round, and with two long setae and an orifice of eversible gland on the tip of the tubercle. Epipleural region with a tubercle (EP), which is oval and has two setae. Pleural region with a tubercle (P), which is oval, smaller than (EP), and provided with two setae. Sternal region with three tubercles. (PS-SS) transversely oval, with two setae. (ES) with a seta, and united with the homologous tubercle of another side on the longitudinal line. A secondary tubercle appears in the antero-exterior part of (ES) and with a micro-seta.

First instar larvae.

Head: Vertex with about ten setae, and frons with four setae.

Prothorax: Dorsal side with a large tubercle (D-DL-EPa) and a small one (EPp). The former with ten long setae, arranged on the border of the tubercle. The latter with a seta. Pleural region with a tubercle (P), which has a seta. Sternal region with a tubercle (ES-SS), which has two setae and is united with the homologous tubercle of another side on the longitudinal line.

Meso- and metathorax: Dorsal side with four tubercles. Each of (Da) and (Dpe) with two setae. (Dpi) with a seta. (Dpe) consists of an egg burster. (DL) with two long and a few rather short setae. Epipleural region with two tubercles. On mesothorax, spiracle situated on (EPa). (EPa) with two setae. (EPp) with a seta. Pleural region with a tubercle (P), which has a seta. Sternal region with two tubercles. (ES) with a seta, and united with the homologous tubercle of another side on the longitudinal line. (SS) with a seta.

Abdomen: Dorsal side with two tubercles. (D) with two long and a rather short setae. (DL) with a long and two rather short setae. Epipleural region with a tubercle (EP), which has two setae. Pleural region with a tubercle (P), which has two setae. Sternal region with two tubercles. (ES) with a seta, and united with the homologous tubercle of another side on the longitudinal line. (SS-PS) with three setae, of which one seta is short.

Pupae.

Body elongate, pale yellow. Setae rather sparse but rather strong. Vertex with three setae, arranged in a transverse row. Pronotum with about ten setae, arranged only on the border of the surface. Each of meso- and metathorax with a seta, situated on the central part. Dorsal surface of abdomen with three setae. Ninth abdominal segment without any projection apically.

4.0×2.5 mm.

Genus *Gastrophysa* Chevrolat, 1837

From the Japanese fauna, a single species has been recorded.

Gastrophysa atrocyanea Motschulsky, 1874
(Pl. 2, 11–12; Pl. 4, 11–16)

Last instar larvae.

Ground color pale greyish brown; head black; tubercles and legs blackish brown; claws reddish brown.

Body rather flat, setae sparse but long. Granular tubercles extremely close, but on ventral side sparser than on dorsal side. Claws not grooved at apex. Abdomen without pseudopod.

9.0×2.0 mm (in alcoholic specimen).

Head: Cordal suture long and frontal suture nearly straight. Vertex with ten setae. Frons with four long setae, and roundly depressed on middle. Post-clypeus with three setae and labrum with two setae. Anterior margin of labrum incised.

Prothorax: Dorsal side with a very large tubercle (D-DL-EPa) and a very small one (EPp). The former with about ten very long setae, arranged on the border of the tubercle. The latter with a seta. Pleural region with an oval tubercle (P), which has a seta. Sternal region with a tubercle (ES-SS). The tubercle with two or three setae, and united with the homologous tubercle of another side on the longitudinal line.

Meso- and metathorax: Dorsal side with five tubercles. (Da), (Dpi), (Dpe), (DL) and a secondary tubercle (ad 1) oval. (Dpe) and (Dpi) subequal in size. (Da) and a secondary tubercle (ad 1) subequal in size and smaller than each of (Dpe) and (Dpi). Each of (Da), (ad 1) and (Dpi) with a seta. (Dpe) with a very long and two short setae. (DL) round, convex, and with two long and a short setae and an orifice of eversible gland on the tip of the tubercle. Epipleural region with two tubercles, (EPa) and (EPp). (EPa) and (EPp) round, subequal to each other. (EPa) with two or three setae and (EPp) with a seta. In mesothorax, spiracle situated separately from (EPa). Pleural region with an oval tubercle (P), which has a seta. Sternal region with two tubercles, (ES) and (SS). (ES) and (SS) with a seta, and (ES) united with the homologous tubercle of another side on the longitudinal line. Sometimes a secondary tubercle appears in the antero-posterior part of (ES). This may be homologous to (as 1).

Abdomen: Dorsal side with two large tubercles, (D) and (DL), and a rather small tubercle (ad 1). (D) transversely oval, and with two setae. (DL) round, convex, and with two long setae and an orifice of eversible gland on the tip of the tubercle. Secondary tubercle (ad 1) small, situated on antero-exterior part of (D), and with a seta. Epipleural region with a round tubercle (EP), which has two setae. Pleural region with a round tubercle (P). The tubercle smaller than (EP), and with two setae. Sternal region with three tubercles, (ES), (SS-PS), and a secondary tubercle (as 1). (ES) with a seta, and united with the homologous tubercle of another side on the longitudinal line. (SS-PS) with three setae. Secondary tubercle (as 1) with a seta.

First instar larvae.

Head: Vertex with ten setae, and frons with four setae.

Prothorax: Dorsal side with a very large tubercle (D-DL-EPa) and a very small one (EPp). The former with seven setae, and the latter with a micro-seta. Pleural region with a tubercle (P), which has a seta. Sternal region with a tubercle (ES-SS), which has two setae, and is united with the homologous tubercle of another side on the longitudinal line.

Meso- and metathorax: Dorsal side with four tubercles. Each of (Da), (Dpi) and (Dpe) with a seta. (Dpe) consists of an egg burster. (DL) with two setae. Epipleural region with two tubercles. In mesothorax, (EPa) with five setae and spiracle situated on (EPa). Metathorax (EPa) with two setae. (EPp) with two setae. Pleural region with a tubercle (P), which has a seta. Sternal region with two tubercles. (ES) with a seta, and united with the homologous tubercle of

another side on the longitudinal line. (SS) with a micro-seta.

Abdomen: Dorsal side with two tubercles. (D) with two setae. (DL) with a seta. Epipleural region with a tubercle (EP), which has two setae. Pleural region with a tubercle which has two setae. Sternal region with two tubercles. (ES) with a seta, and united with the homologous tubercle of another side on the longitudinal line. (SS-PS) with two long and a short setae.

Pupae.

Body elongate, pale yellow. Setae sparse but long. Vertex with three setae, arranged in a transverse row. Pronotum with about ten setae, only arranged on the border of the surface. Each of dorsal surface of meso- and metathorax with a seta. Dorsal surface of abdominal segments each with five setae. Ninth abdominal segment without projection apically.

6.5×4.0 mm.

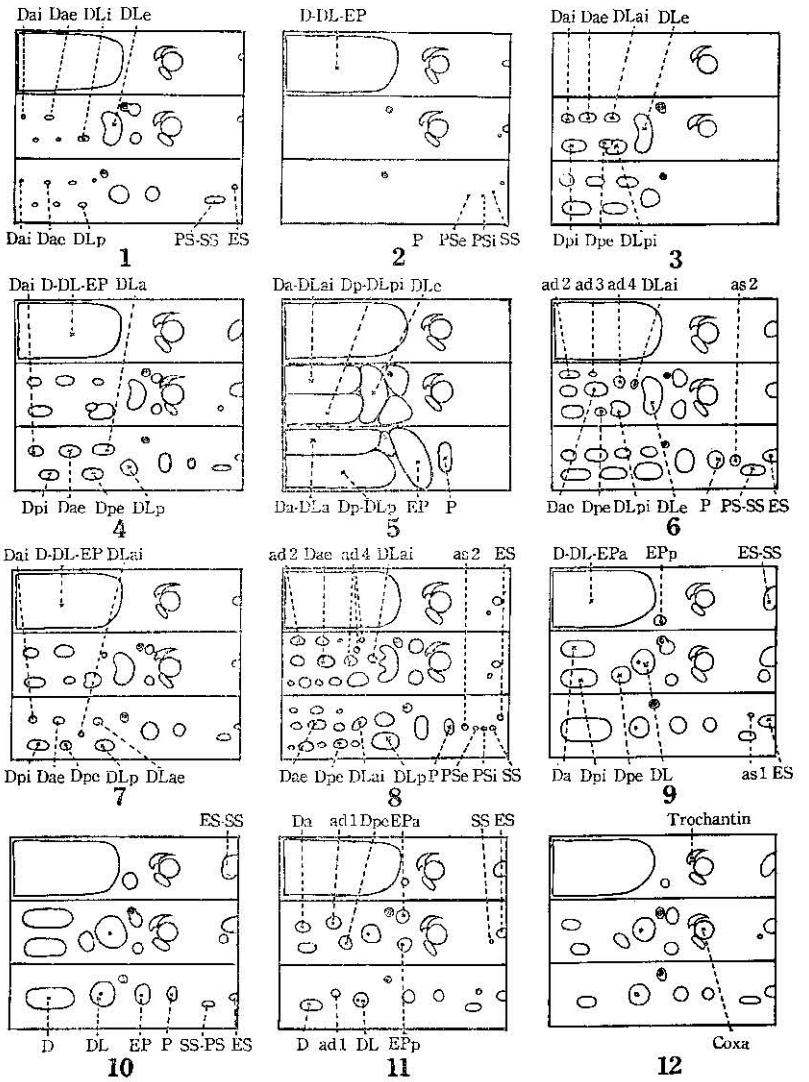
Explanation of Plates

Plate 2

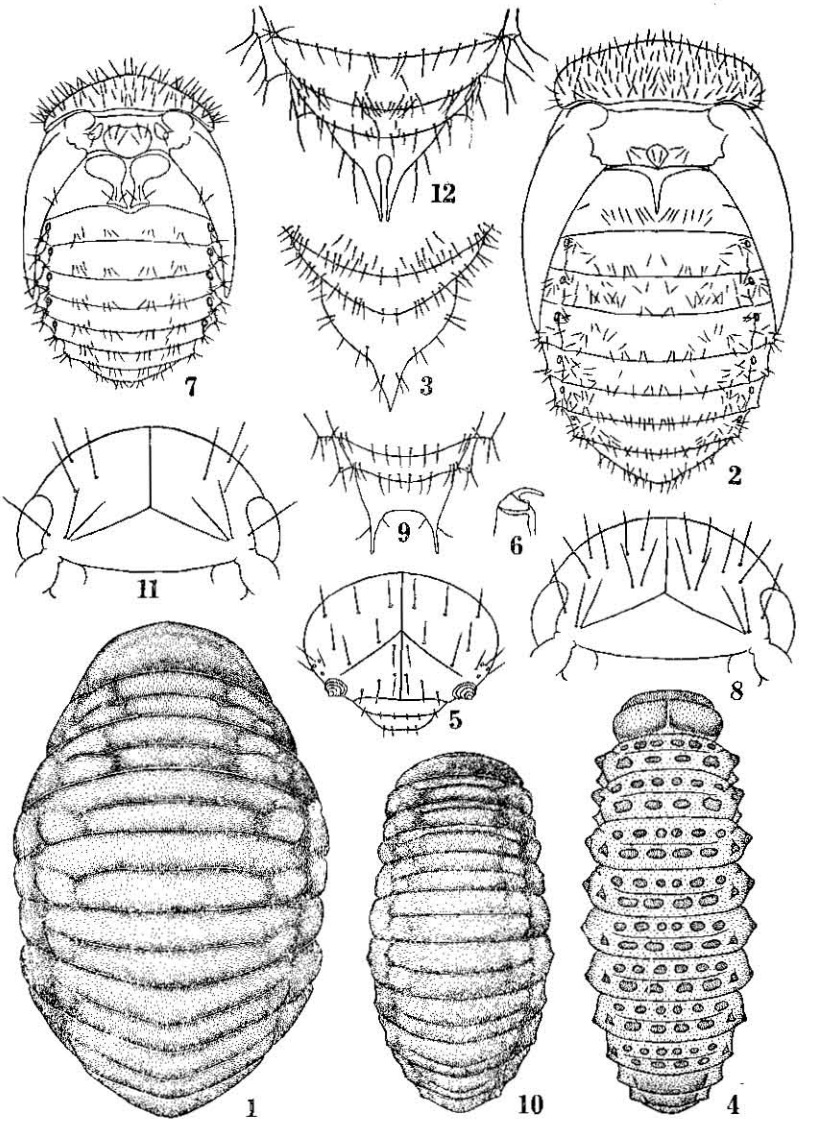
1. *Chrysolina aurichalcea* (Mannerheim). Last instar larva.
2. *Chrysolina exanthematica* (Wiedemann). Last instar larva.
3. *Gonioctena* (*Brachyphytodecta*) *rubripennis* (Baly). Last instar larva.
4. Ibid. First instar larva.
5. *Gonioctena* (*Gonioctena*) *japonica* Chûjô et Kimoto. Last instar larva.
6. *Potaninia cyrtonoides* (Jacoby). Last instar larva.
7. Ibid. First instar larva.
8. *Phola octodecimguttata* (Fabricius). Perphaps, last instar larva.
9. *Phaedon brassicae* Baly. Last instar larva.
10. Ibid. First instar larva.
11. *Gastrophysa atrocyanea* Motschulsky. Last instar larva.
12. Ibid. First instar larva.

Plate 3

1. *Chrysolina exanthematica* (Wiedemann). Last instar larva: Dorsal view.
2. Ibid. Pupa: Dorsal view.
3. Ibid. Pupa: Seventh to ninth abdominal segments, dorsal view.
4. *Gonioctena* (*Brachyphytodecta*) *rubripennis* Baly. Last instar larva: Dorsal view.
5. Ibid. First instar larva: Head.
6. Ibid. Last instar larva: Claw.
7. Ibid. Pupa: Dorsal view.
8. Ibid. Pupa: Head.
9. Ibid. Seventh to ninth abdominal segments.
10. *Gonioctena* (*Gonioctena*) *japonica* Chûjô et Kimoto. Last instar larva: Dorsal view.
11. Ibid. Pupa: Head.
12. Ibid. Pupa: Seventh to ninth abdominal segments.



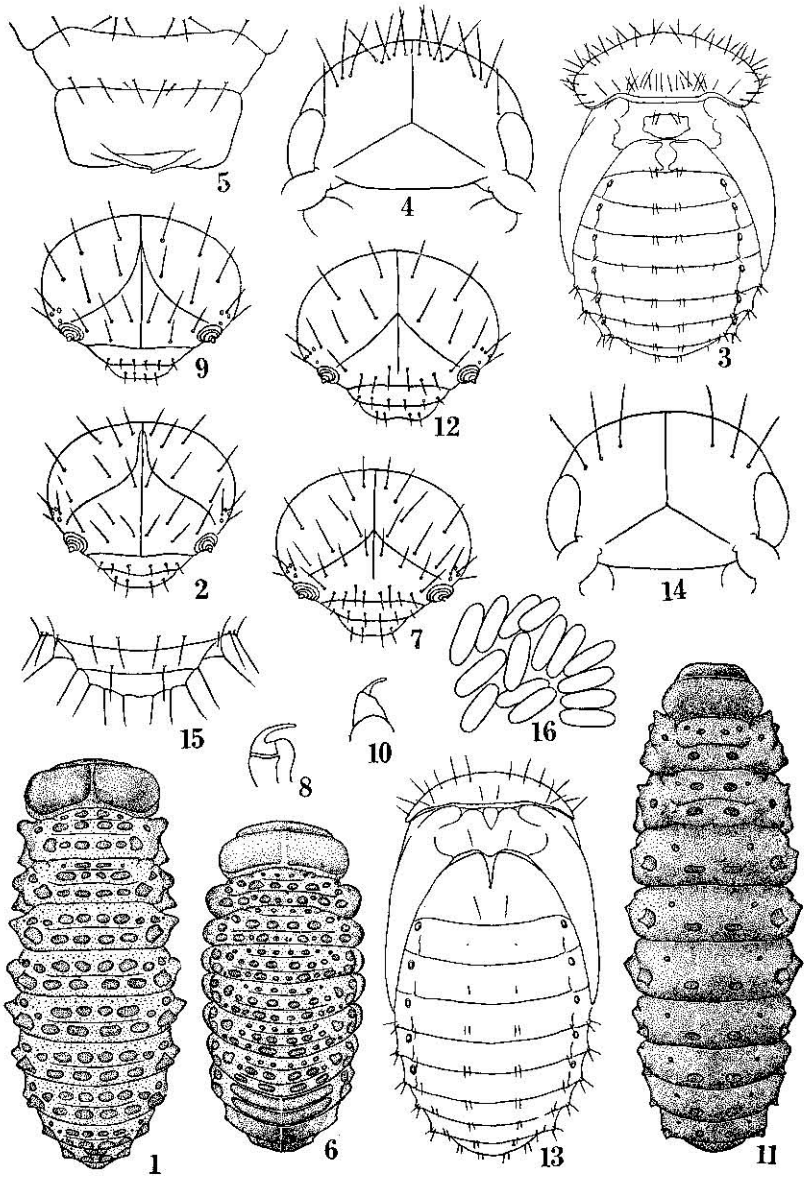
Immature stages of Japanese Chrysomelinae



Immature stages of Japanese Chrysomelinae

Plate 4

1. *Potaninia cyrtonoides* (Jacoby) First instar larva: Dorsal view.
2. Ibid. First instar larva: Head.
3. Ibid. Pupa: Dorsal view.
4. Ibid. Pupa: Head.
5. Ibid. Pupa: Seventh to ninth abdominal segments.
6. *Phola octodecimguttata* (Fabricius). Larva (perhaps last instar): Dorsal view.
7. Ibid. Larva (perhaps last instar): Head.
8. Ibid. Larva: Claw.
9. *Phaedon brassicae* Baly. First instar larva: Head.
10. Ibid. Larva: Claw.
11. *Gastrophysa atrocyanea* Motschulsky. Last instar larva: Dorsal view.
12. Ibid. First instar larva: Head.
13. Ibid. Pupa: Dorsal view.
14. Ibid. Pupa: Head.
15. Ibid. Pupa: Seventh to ninth abdominal segments.
16. Ibid. Eggs.



Immature stages of Japanese Chrysomelinae