

# PSEPHENIDAE:

## Revision of *Mataeopsephus* WATERHOUSE

### (Coleoptera)

C.-F. LEE, M.A. JÄCH & M. SATÔ

#### Abstract

All known species of *Mataeopsephus* WATERHOUSE, 1876 (Coleoptera: Psephenidae) are treated. *Mataeopsephus esakii* NAKANE, *M. japonicus* (MATSUMURA), *M. maculatus* NOMURA, *M. nitidipennis* WATERHOUSE, and *M. taiwanicus* LEE et al. are redescribed. *Psephenus* (*Sinopsephenus*) *chinensis* NAKANE, 1964 and *Psephenus* (s.str.) *tenuipes* CHAMPION, 1921 are redescribed and transferred to *Mataeopsephus*. Five new species are described: *M. dentatus* sp.n. [China: Jiangxi, Guizhou], *M. minimus* sp.n. [China: Yunnan], *M. sichuanensis* sp.n. [China: Sichuan, Hubei], *M. vietnamensis* sp.n. [Vietnam, China: Guizhou], and *M. quadribranchiae* sp.n. [Taiwan]. *Mataeopsephus coreanicus* DELÈVE, 1967 and *M. japonicus sasajii* SATÔ, 1970 are regarded as junior synonyms of *M. japonicus* (MATSUMURA, 1916). *Sinopsephenus* NAKANE, 1964 is synonymized with *Mataeopsephus*. Lectotypes are designated for *Betelmis japonicus* and *Psephenus tenuipes*. Larvae of *M. chinensis*, *M. esakii*, *M. japonicus*, *M. maculatus*, *M. nitidipennis*, *M. quadribranchiae*, *M. sichuanensis*, *M. taiwanicus*, and *M. vietnamensis* are described.

**Key words:** Coleoptera, Psephenidae, Psepheninae, *Mataeopsephus*, taxonomic revision, new species, new synonymies, Asia.

#### Introduction

The subfamily Psepheninae is comprised of five genera: *Mataeopsephus* WATERHOUSE, *Pheneps* DARLINGTON, *Psephenops* GROUVELLE, *Psephenotarsis* ARCE-PÉREZ & NOVELO-GUTIÉRREZ, and *Psephenus* HALDEMAN. A sixth genus, *Psephenopalpus* ARCE-PÉREZ, is in press.

Most Asian species of Psepheninae hitherto have been attributed to *Mataeopsephus*. However, CHAMPION (1921) described *Psephenus tenuipes* from India, and NAKANE (1964) erected the subgenus *Sinopsephenus* for his *Psephenus chinensis*.

In this paper, we deal with all described Asian Psepheninae, and delimit the genera *Psephenus* and *Mataeopsephus*. Larvae of nine species are described in this paper and a key to the species of *Mataeopsephus* based on males is provided.

#### Material and methods

The larval terminology (Figs. 2, 3) is modified after DAVIS (1986) and LEE et al. (1999a, b). Since the "posterior plates" found in Psepheninae are different significantly from those in Eubrianacinae (see discussion) we coin a new term for the structure in the Psepheninae: pseudoposterior plates.

The lectotype designations in the present work are made in order to support the stability of the nomenclature.

For comparison, the following specimens were examined by the first author:

*Pheneps cursitatus* SPANGLER: four male paratypes (Venezuela, Cerra de la Neblina Basecamp, 140 m, 0°50'N, 66°10'W, on bare emergent rocks in rapid sunlit stream, 11.II.1985, leg. P.J. & P.M. Spangler, R. Faitoute, W. Steiner).

*Psephenus herricki* (DE KAY): two males (USA, Missouri, Taney County, Beaver Creek, 20.VIII.1971, leg. R.W. Baumann).

*Psephenus falli* CASEY: two males and three larvae (USA, California, Sonoma County, 1.5 miles W Shinole Mill, 15.V.1992, leg. W.D. Shepard).

*Psephenops* sp.: two males (Belize, Cayo District, 9.I.1995, leg. W.D. Shepard).

*Psephenotarsis* sp.: two males (Belize, Toledo District, Rio Grande, Big Fall, 10.I.1955, leg. W.D. Shepard).

Some larvae collected in Belize, resembling those of *Psephenus*, are presumed to belong to *Psephenops* and *Psephenotarsis* (with five pairs of gills: Stann, Silk Grass Creek, 8.I.1996, leg. W.D. Shepard; with six pairs of gills: Cany District, Unitedville, 2.VIII.1993, leg. W.D. Shepard).

The Taiwanese and Japanese larvae described below were associated with adults by rearing, whereas the remainder are presumed to be conspecific with adults due to sympatric occurrence.

### Abbreviations used in Figs. 2, 3:

AP1	Abdominal pleurite 1	MtP	Metathoracic pleurite
AP7	Abdominal pleurite 7	PN	Pronotum
AT1	Abdominal tergite 1	PP	Prothoracic pleurite
AT8	Abdominal tergite 8	PpP	Pseudoposterior plate
AT9	Abdominal tergite 9	S1	Sulcus 1
CL	Costal line	S2	Sulcus 2
MS	Medial suture	S3	Sulcus 3
Msn	Mesonotum	S4	Sulcus 4
MsP	Mesothoracic pleurite	TpS	Tergopleural suture
Mtn	Metanotum		

### Acronyms & CWBS localities:

BPBM	Bernice P. Bishop Museum, Honolulu
CAEU	College of Agriculture, Ehime University
CAS	California Academy of Sciences, San Francisco
CASS	Chinese Academy of Sciences, Institute of Applied Ecology, Shenyang
CWBS	China Water Beetle Survey
HUM	The Hokkaido University Museum
NHML	The Natural History Museum, London
NMW	Naturhistorisches Museum Wien
NTU	National Taiwan University, Taiwan
OSUC	Ohio State University, Columbus
TMB	Természettudományi Múzeum, Budapest [= Hungarian Natural History Museum]
USNM	United States National Museum, Smithsonian Institution, Washington, D.C.
WDS	William D. Shepard Collection, Sacramento, California

CWBS loc. 7: **Hong Kong**; Lantau Island; NW Mui Wo Village; shallow pools and streams between Mui Wo and Ngau Kwu Long, ca. 25 - 100 m a.s.l.; 26.VI.1992; leg. M.A. Jäch; [locality number on label: 6]; (see JÄCH & JI 1995: Fig. 9).

CWBS loc. 8: **Hong Kong**; New Territories; Tai Po Kau Forest Nature Reserve near Tai Po New Town; stream, ca. 3 m wide, through secondary forest, ca. 150 - 200 m a.s.l.; 27.VI.1992; leg. M.A. Jäch; [locality number on label: 7]; (see JÄCH & JI 1995: Fig. 7).

CWBS loc. 340: **Sichuan Province**; Mao County; Jiuding Shan; ca. 6 km NE Mao Xian (= Fengyizhen), surroundings of Research Station of Chengdu Institute of Biology; mountain stream in front of the station building, 3 - 5 m wide, crystalline gravel and sand, unshaded, ca. 1750 m a.s.l.; 30.VII.1998; leg. L. Ji, H. Schönmann, K. Schönmann & M. Wang.

CWBS loc. 360: **Yunnan Province**, Xishuangbanna Dai Autonomous Prefecture, Mengla County, Menglun Town, ca. 700 - 800 m a.s.l.; stream (tributary of CWBS loc. 359), ca. 1 - 2 m wide, flowing through dense primary forest, ca. 10 km NW Menglun; 7.XI.1999; leg. M.A. Jäch, H. Schönmann, M. Wang & Y. Wei (see JÄCH & Ji 2003: Fig. 9).

CWBS loc. 445: **Guizhou Province**, Tongren Prefecture, Jiangkou County, ca. 50 km SW Jiangkou, opposite of Shidu Village, 650 - 680 m a.s.l., 27°32'42"N 108°36'18"E - 27°32'25"N 108°36'10"E; small stream (right tributary of River Guanhe), 0.5 - 1 m wide, partly shaded, flowing through secondary forest and agricultural area; 1./4.VII.2001; leg. H. Schillhammer & M. Wang (see JÄCH & Ji 2003: Fig. 13).

### *Mataeopsephus* WATERHOUSE

*Mataeopsephus* WATERHOUSE 1876: 16; NOMURA 1963: 143; LEE et al. 1990: 74. Type species (by monotypy): *Mataeopsephus nitidipennis* WATERHOUSE.

*Mataeopsephenus* (unjustified emendation) ZAITZEV 1908: 4, 1910: 14; BOLLOW 1938: 153; SHIRAKI 1954: 473.

*Metaeopsephenus* (unjustified emendation) MIYAMOTO 1953a: 3, 1953b: 3.

*Betelmis* MATSUMURA 1916: 5; BOLLOW 1938: 164; SATŌ 1970a: 7; BROWN 1981: 143. Type species (by monotypy): *Betelmis japonicus* MATSUMURA.

*Sinopsephenus* NAKANE 1964: 50 (subgenus of *Psephenus*); BROWN 1981: 143 (generic rank); LEE & JÄCH 1995: 350 (list). Type species (by monotypy): *Psephenus* (*Sinopsephenus*) *chinensis* NAKANE. **syn.n.**

**SYNONYMY:** NAKANE (1964) erected a new subgenus, *Sinopsephenus*, based on some particular features, e.g., the extremely long terminal segment of the maxillary palpi, the crenulate posterior rim of the pronotum, and the subserrate antennae. Eventually, *Sinopsephenus* was elevated to generic rank by BROWN (1981). However, these characters are either synapomorphic with other species of *Mataeopsephus* or autapomorphic. Thus, herein we synonymize *Sinopsephenus* with *Mataeopsephus*.

**ADULTS:** Body moderately depressed, subcuneate to oval, 2.6 - 8.5 mm long. Relatively soft-bodied. Dorsal surface brown to black; venter paler. Vestiture: dense pubescence with short semi-recumbent setae intermixed with longer, more erect setae; ventral pubescence often silvery. Integument dull to feebly shining, moderately to finely punctate.

**Male.** Eyes lateral, hemispherical, moderately large and prominent. Antennae 11-segmented, filiform and long, surpassing humeri; widely separated, inserted beneath frontal ridge; segment 1 much longer than segment 2, subequal to or shorter than segment 3, following segments progressively shortened. Fronto-clypeal suture sometimes invisible; but clypeus very well developed and upturned; its anterior rim forming anterior margin of head (Fig. 55). Clypeus lengthened, apically curved. Maxillary palpus 4-segmented, segment 1 very short, segment 2 elongate, segment 3 shorter than segment 2, terminal segment shorter than or subequal to segment 2 in length, usually somewhat compressed and enlarged. Labial palpus 3-segmented, short and slender, terminal segment longest.

Pronotum widest near base, sometimes produced anteriorly; lateral margins straight to arcuate; basal rim smooth or feebly crenulate. Scutellum pentagonal to cordiform, often longer than wide, anterior angles distinct, posterior angles and apex rounded; surface texture and sculpturing usually similar to pronotum. Elytra finely punctate; with longitudinal stripes of grey pubescence; humeri not prominent; clytral apices rounded. Prosternum carinate medially, especially on long slender prosternal process extending between procoxae and fitting into median longitudinal mesoventral groove. Mesoventrite short, narrow between coxae, median longitudinal sulcus or reduced or appearing only near base. Metaventrite wide, slightly inflated on each side; divided

medially by narrow longitudinal groove. Legs: femora swollen, with shallow grooves for reception of tibiae; latter slender, protibiae carinate, subequal to femora in length, with stout ventral teeth of variable size; all tarsi 5-segmented, terminal segment largest and elongate, gradually expanding toward apex, all segments clothed with suberect ventral setae or slender papillae; claws rather long and sharp, often with feeble basal hooks.

Abdomen with seven visible sternites in male, sternite 5 deeply emarginate, sternite 6 more deeply emarginate than sternite 5, entire sternite 7 exposed, apex rounded, with one pair of clusters of long setae near posterior angles.

Aedeagus of modified trilobate type. Fibula usually reduced.

Sexual dimorphism: Female slightly larger, antennae and maxillary palpi shorter, prosternum shorter and wider, abdomen with six visible sternites, tibiae without ventral teeth.

Differential diagnosis: Adults of *Mataopsephus* may be distinguished from other genera of Psepheninae by the following combination of characters: male antenna usually filiform or elongate subserrate (in contrast to moniliform or broadly subserrate antennae of *Psephenus*, *Psephenops*, and *Psephenotarsis*); clypeus lengthened and recurved anteriorly (in contrast to short clypeus of *Psephenus*, *Psephenops*, and *Pheneps*); one pair of clusters of long setae on apices of abdominal sternite 7 in males (not developed in other genera); tarsi not conspicuously modified (in *Pheneps* basal two tarsomeres stouter, in *Psephenops* basal two tarsomeres with ventral pads, and in *Psephenotarsis* basal two tarsomeres with long ventral setae).

LARVAE (see Figs. 2, 9, 19, 34, 48, 54): Flattened; oval to elliptic, widest at metathorax or first abdominal segment, tapering to relatively wide abdominal tergite 9; secondary marginal fringe more or less prominent.

Tergopleural suture present on thoracic terga and abdominal segments 1-7. Costal lines present on all abdominal segments, and meso- and metathoracic pleurites. Pseudoposterior plates only on thoracic tergites. Sulci 1 located halfway between tergopleural sutures and medial suture, directed mesad, present only on meso- and metanota. Sulci 2 originating from bases of tergopleural sutures on pronotum, or from lateral angles of posterior plates and crossing tergopleural sutures on meso- and metanota, directed mesad. Sulci 3 located on meso- and metathoracic pleurites, originating from lateral angles of posterior plates, directed laterad. Sulci 4 originating from bases near tergopleural sutures on abdominal tergite 1, directed laterad, conjoined with tergopleural sutures on basal 0.3, extending into pleurites, directed upward obliquely. Longitudinal cuticular beads prominent on thoracic terga; three longitudinal beads on abdominal pleurites.

Most species with six pairs of gills on posterior margins of abdominal segments 1-6, some species with five pairs of gills (segments 2-6); one species with four pairs of gills (segments 3-6).

Differential diagnosis: Similar to *Psephenus* (Fig. 3), from which they can be distinguished by the presence of triangular plates on meso- and metanota rising from crossing sulci 2 and tergopleural sutures, by the extension of sulci 4 on the first abdominal tergite onto the pleurites, and by the presence of sulci 3 on meso- and metathoracic pleurites.

BIOLOGY: Larvae live in forest streams, where they graze upon diatoms and other algae, which coat rocks and pebbles of riffle areas. Adult behavior is rather diverse: some species (*M. japonicus* and *M. taiwanicus*) are strongly phototactic (MATSUMURA 1916, LEE & JÄCH 1995); *M. chinensis* occasionally is attracted to light traps (DUDGEON 1995). Adults of *M. esakii*, *M. nitidipennis*, and *M. quadribranchiae* were collected from the undersides of wet algae-covered rocks, which were hanging over streams (A. Luen and M.-L. Jeng, pers. comm.).

DISTRIBUTION (Fig. 56): Russian Far East, Korea, Japan, China, Taiwan, Vietnam, India.



***Matacapsephus chinensis* (NAKANE) comb.n.***Psephenus* (*Sinopsephenus*) *chinensis* NAKANE 1964: 50; LEE & JÄCH 1995: 350.*Sinopsephenus chinensis*: DUDGEON 1995a: 465, 1995b: 269.**TYPE LOCALITY:** "Kau-lin Mountain" [not traced], Lianping County, 700 - 900 m a.s.l., Guangdong, southeastern China.**TYPE MATERIAL:** **Holotype** ♂ (CAS): "Kau-lin San, 700-900 m. Lien-ping Distr., Kwantung, S. China, 23.VI.1940, J. L. Gressitt & F. K. To leg. \ 11822". Examined by H.P. Brown.**MATERIAL EXAMINED:**

CHINA: KONG KONG: Tai Po Kau [river], at light, 13.IV.1984, leg. Dudgeon, 1 ♂ (NMW); same locality and collector, 27.IV.1978, 1 ♀ (NTU); Shing Mum, 2.III.1999, leg. A. Luen, 3 larvae (NTU); same locality and collector, 17.X.1997, 2 larvae (NTU); same locality and collector, 20.VIII.1999, 2 larvae (NTU); same locality and collector, 28.I.1999, 1 larva (NTU); FUJIAN: "ChungAn SinFungling Sankang", 10.-11.VI.1943, leg. T.C. Maa, 1 ♂ (BPBM).

**REDESCRIPTION:** Male: length (LP + LE): 6.5 - 7.7 mm; width (WE): 4.0 - 4.8 mm. Blackish brown; maxillary palpi, basal halves of femora, and first antennal segment yellowish brown; antennal segments 2-11 and tarsi brown. Anterior margin of clypeus straight, anterolateral angles rectangular. Frons moderately depressed between eyes. Anterior margin of pronotum feebly convex medially, lateral margins straight and distinct; posterior rim crenulate; disc punctate. Meso- and metatibiae with ventral teeth in distal half; mesotibiae about 1.7 times as long as tarsi (excluding claws); mesotarsal segment 5 about 0.9 times combined lengths of segments 1-4. Antenna (Fig. 8) about 0.7 times as long as body length; segments 3-11 subserrate and flattened; relative lengths of segments 1-11 about 0.6 : 0.1 : 1.0 : 1.0 : 0.9 : 0.8 : 0.7 : 0.6 : 0.6 : 0.5 : 0.7. Maxillary palpus (Fig. 5) 1.4 times interocular width; first three segments very short, terminal segment extremely elongate and hollow. Terminal abdominal sternite without cluster of long setae. LE/WE = 1.3. WP/LP = 1.8 - 2.0. LP/LE = 0.3.

Aedeagus (Fig. 4): Penis about 1.6 times length of parameres, apex rounded, widest at middle, basolateral apophyses long, directed mesad. Parameres 0.7 times as long as basal piece, lateral margin arcuate, dorsal basolateral apophyses short and acute, not surpassing ventral basal margin, basal margin medially emarginate; venter widely connected from middle to base; apical openings large. Basal piece tapering toward base.

Female: 8.5 mm long, 5.0 mm wide. Pronotum reddish brown, darkened centrally; venter yellowish brown. Pubescence very short on pronotum, reduced on elytra. Antenna (Fig. 7) short, about 0.4 times as long as body length. Maxillary palpus (Fig. 6) very short, about 0.3 times width of head; relative lengths of segments 2-4 about 1.6 : 1.0 : 2.8. LE/WE = 1.3. WP/LP = 2.1. LP/LE = 0.3.

**Differential diagnosis:** *Matacapsephus chinensis* is distinguished from the remaining species by the elongate terminal segment of the maxillary palpi and the subserrate flattened antennae.**LARVA** (Fig. 9): Darkened stripes along lined cuticular beads and costal lines on abdominal tergites. One longitudinal dark stripe along lateral margin, isolated by anterior margins of pleurites and costal lines. One transverse dark spot along costal line from basal 1/6 to 3/6. Lined cuticular beads on some apical abdominal pleurites somewhat reduced. Abdominal tergites 1-7 with one pair of black spots halfway between medial suture and tergopleural sutures, usually extending to tergopleural sutures except on tergites 2 and 3. Abdomen with six pairs of gills, and secondary marginal fringe well-developed. Mature larva more strongly darkened.**ECOLOGY:** Life history, secondary production and microdistribution of this species were investigated by DUDGEON (1995a).**DISTRIBUTION** (Fig. 56): China (Hong Kong, Guangdong, Fujian).

*Mataeopsephus dentatus* sp.n.

TYPE LOCALITY: Ciping, Jinggang Mountain, Jiangxi, southeastern China.

TYPE MATERIAL: **Holotype** ♂ (NMW): "CHINA Jiangxi W JINGGANG SHAN Ciping env. 2-14.VI.1994"; **Paratype**: 2 ♂♂ (CASS, NMW): "CHINA: Guizhou, Jiangkou Co., ca. 50 km SW Jiangkou nr. Shidu vill. 27°32.71'N 108°36.30' E trib. of Guanhe riv. 1./4.7.2001, 650 – 850 m leg. Schillhammer & Wang (CWBS 445)".

DESCRIPTION: Male: 6.7 mm long, 3.7 mm wide. Blackish brown; maxillary palpi, three apical antennal segments, basal halves of femora, and tarsi paler. Anterior margin of clypeus straight, anterolateral angles rectangular. Frons moderately depressed between eyes. Anterior margin of pronotum straight, lateral margins arcuate and distinct; posterior rim crenulate; disc punctate. Tibiae with prominent ventral teeth in distal 0.6. Middle legs: tibiae about 1.9 times as long as tarsi (excluding claws); tarsal segment 5 about 0.7 times combined lengths of segments 1-4. Antenna 0.75 times body length, segments 5-10 filiform; relative lengths of segments 1-11 about 0.7 : 0.5 : 1.0 : 0.8 : 0.7 : 0.6 : 0.5 : 0.5 : 0.5 : 0.4 : 0.5. Maxillary palpus 1.4 times interocular width; relative lengths of segments 2-4 about 2.5 : 1.0 : 1.5. Elytra sometimes with stripes of grey pubescence. LE/WE = 1.5. WP/LP = 2.1. LP/LE = 0.3.

Aedeagus (Fig. 10): Penis about 0.8 times length of parameres, tapering apically, apex truncate. Parameres elongate, lateral margins narrowed medially, dorsal basolateral apophyses short and not surpassing ventral basolateral apophyses, basal margin emarginate at middle; venter separate; apical openings large. Basal piece narrow basally.

Differential diagnosis: *Mataeopsephus dentatus* resembles *M. chinensis* due to the crenulate posterior pronotal rim, but differs in its filiform antennae, the long second segment of the maxillary palpus, and the prominent ventral teeth on the tibiae.

DISTRIBUTION (Fig. 56): China (Jiangxi, Guizhou).

*Mataeopsephus esakii* NAKANE

*Mataeopsephenus esakii* NAKANE 1964: 49.

*Mataeopsephus esakii*: LEE et al. 1990: 75; LEE & JÄCH 1995: 350.

TYPE LOCALITY: Wulai, Taipei, northern Taiwan.

TYPE MATERIAL: **Holotype** ♂ (Entomological Laboratory, Kyushu University): "[Formosa] Urai 1. x. 1921 Teiso Esaki \ Holotype Mataeopsephenus esakii Nakane [hand writing on red paper]".

## ADDITIONAL MATERIAL EXAMINED:

T A I W A N: ILAN: Chiduan-Shuling, 13.VII.1999, leg. M.-L. Jeng, 3 ♂♂, 1 ♀ (NTU, USNM); TAIPEI: 27.IX.1980, 1 ♂ (NMW); Wulai, 12.XII.1999, leg. C.-F. Lee, 10 larvae (NTU, NMW).

REDESCRIPTION: Male: 4.6 - 4.7 mm long, 2.4 mm wide. Blackish brown; femora paler; pronotum with one pair of dark red spots. Anterior margin of clypeus straight, anterolateral angles rounded (Fig. 18). Frons moderately depressed between eyes. Anterior margin of pronotum straight, lateral margins arcuate and indistinct, posterior rim smooth; discal punctation fine. All tibiae with very feeble ventral teeth in distal 0.6. Middle legs: tibiae about 2.1 times as long as tarsi (excluding claws); tarsal segment 5 about 0.8 times combined lengths of segments 1-4. Antenna (Fig. 17) about 0.9 times as long as body length, segments 3-11 filiform; relative lengths of segments 1-11 about 1.1 : 0.5 : 1.0 : 0.9 : 0.8 : 0.7 : 0.6 : 0.6 : 0.6 : 0.7. Maxillary palpus (Fig. 15) subequal to interocular width; relative lengths of segments 2-4 about 2.0 : 1.0 : 1.4. Elytra with grey stripes of pubescence. LE/WE = 1.5. WP/LP = 1.8 - 2.0. LP/LE = 0.3.

Aedeagus (Fig. 13): Penis subequal to parameres in length, apex acute, gradually widened toward base. Parameres 0.8 times as long as basal piece, lateral margins parallel, dorsal

basolateral apophyses slender, surpassing ventral basal margin; venter connected from middle to base; apical openings moderate. Basal piece subparallel, emarginate at base.

Female: 5.8 mm long, 3.3 mm wide. Antenna (Fig. 16) about 0.4 times as long as body length. Maxillary palpus (Fig. 14) about 0.6 times width of head; relative lengths of segments 2-4 about 1.8 : 1.0 : 1.8. LE/WE = 1.4. WP/LP = 2.4. LP/LE = 0.2.

Differential diagnosis: *Mataopsephus esakii* is very similar to *M. maculatus* and *M. quadribranchiae*; it can be distinguished from these species immediately by its long antennae.

LARVA (Fig. 19): Brown with random dark brown cuticular beads. All thoracic segments with numerous lined cuticular beads. Three lined beads present on abdominal pleurites except on last six abdominal pleurites. Abdomen with five pairs of gills. Secondary marginal fringe scarce.

DISTRIBUTION (Fig. 56): Northern Taiwan.

### *Mataopsephus japonicus* (MATSUMURA)

*Betelmis japonicus* MATSUMURA 1916: 5; KÔNO 1934: 124; BOLLOW 1938: 165.

*Mataopsephenus japonicus*: MIYAMOTO 1953a: 3 (larva), 1953b (pupa).

*Mataopsephenus japonicus*: GÔSE 1955: 9 (larva); NOMURA & BABA 1961: 28; NOMURA 1963: 143.

*Mataopsephenus granulicollis* HINTON 1935: 169; BOLLOW 1938: 155; SATÔ 1970a (synonymy).

*Mataopsephenus coreanicus* DELÈVE 1967: 414; LEE & JÄCH 1995: 350. **syn.n.**

*Mataopsephus japonicus sasajii* SATÔ 1970b: 28; CAMPBELL & KWON 1981: 13. **syn.n.**

*Mataopsephus coreanicus sasajii*: NAKANE 1991: 10.

TYPE LOCALITY: Gifu, Honshu, Japan.

TYPE MATERIAL:

*japonicus*: **Lectotype**: ♂ (HUM, by present designation): "Sho [abbreviation for Coleoptera; Japanese Kanji character, printed] 89 [printed] \ Betelmis japonicus Mats. [hand writing, black ink] Hirata-doromushi [Japanese name for *M. japonicus*; Japanese Hiragana character, hand writing, black ink] 28 69 [both numbers in Japanese Kanji characters, hand writing, red ink] \ Betelmis japonicus Mats. [hand writing] Type [printed]". **Paralectotypes**: 2 ♂♂, 1 ♀ (HUM): "Japan Matsumura (printed) / underside: Gifu early in December, 1915 Mr. Nawa [Japanese Kanji character; handwriting]".

*granulicollis*: **Holotype** ♂ (NHML). **Paratype** ♂ (NHML). Type material examined by M. Satô.

*coreanicus*: **Holotype** ♂ (TMB): "♂ \ Korea, 1956 Dr. M. Magyar \ Soktan, VII, 31 \ Prépar. genit. N° 17267. 1 \ Holotypus 1967. *Mataopsephus coreanicus* Delève \ Holotype \ J. Delève det., 1967 *Mataopsephus coreanicus* n.sp.". **Paratypes**: 2 ♀♀ (TMB), same data as holotype.

*japonicus sasajii*: **Holotype** ♂ (CAEU, coll. Satô). **Paratypes**: 3 ♀♀ (CAEU, coll. Satô).

### ADDITIONAL MATERIAL EXAMINED:

J A P A N: HONSHU: Toyota City, Aichi Prefecture, 25.VII.1996, leg. M.-L. Jeng, 4 adults (NMW); Kaibara, Hyogo Prefecture, 10.VII.1949, leg. Y. Yamamoto, 2 adults (NMW); Nakagawa [river], Kurobane-machi, Tochigi Prefecture, 29.VI.1994, leg. Ohmomo, 5 adults (NMW); Toyogawa [river], Shinshiro-shi, Aichi Prefecture, 22.VII.1994, leg. H. Yoshitomi, 4 ♂♂, 1 ♀ (NTU); Oppara, Kamo, Gifu Prefecture, VIII.1974, leg. K. Hattai, 1 adult (NMW); Wara-gawa, Gifu Prefecture, 24.VIII.1967, leg. M. Satô, 2 larvae (NTU); Shimane Prefecture, 16.VIII.1974, leg. Y. Notsu, 2 adults (NMW); KYUSHU: Kumamoto Prefecture, 28.IX.1986, leg. E. Matsui, 5 adults (NMW); TSUSHIMA: Mt. Ohboshi, Nagasaki Prefecture, 22.-24.VII.1985, leg. H. Makiyama, 4 ♂♂, 1 ♀ (NTU, NMW); Izuhara, 19.V.1981, leg. M. Satô, 7 larvae (NTU).

K O R E A: Seoul, 10.VII.1952, leg. C. Barmhart, 1 ♂ (OSUC); Andong, 29.V.1952, leg. C. Barmhart, 1 ♂ (OSUC).

C H I N A: LIAONING: Yalu [river], 150-200 miles from mouth, V.1914., 2 ♂♂, 1 ♀ (USNM); HUBEI: 1 km S Gui-Shan Tea Farm, 15 km NE Ma-cheng, Zheng-shui-he, Ma-cheng County, 31.20°N, 115.13°E, leg. J.C. Morse & L. Yang, 1 ♂ (NTU).

R U S S I A: Primorye, Ussuri River, Novochuguyevka, 26.-31.VII.1992, leg. D. Boukal, 13 adults (NMW).

SYNONYMY: Type specimens and additional material of *M. japonicus japonicus*, *M. j. sasajii* and *M. coreanicus* were examined by the authors. No significant differences were found. These three nominal taxa are synonymised formally herein. However, more material must be examined

to decide whether some of the gradual external and aedeagal differences (e.g., the shape of the penile apex) justify subspecific separations between Russian, Korean and Japanese populations.

**REDESCRIPTION:** *Mataeopsephus japonicus* is widespread and variable. Male: 5.7 - 6.2 mm long, 3.0 - 3.6 mm wide. Dark brown; first antennal segment and maxillary palpi paler; femora brown except apices. Anterior margin of clypeus straight, anterolateral angles rounded. Frons slightly depressed between eyes. Anterior margin of pronotum medially convex; lateral margins arcuate and distinct; posterior rim smooth; disc granulate. Ventral teeth on tibiae confined to apices. Protibiae flattened apically. Middle legs: tibiae about 1.5 times as long as tarsi (excluding claws); tarsal segment 5 about subequal to combined lengths of segments 1-4. Antenna (Fig. 24) about 0.6 times as long as body length, segments 3-11 filiform; relative lengths of segments 1-11 about 1.2 : 0.5 : 1.0 : 0.8 : 0.7 : 0.6 : 0.6 : 0.5 : 0.5 : 0.4 : 0.5. Maxillary palpus (Fig. 22) 0.8 times interocular width; relative lengths of segments 2-4 about 1.4 : 1.0 : 1.2. LE/WE = 1.3 - 1.4. WP/LP = 1.6 - 1.7. LP/LE = 0.3 - 0.4.

Aedeagus (Fig. 20): Penis about 1.2 times length of parameres, apex rounded, lateral margins bisinuate; surface of ventral sac with characteristic squamose structure. Parameres 0.3 times as long as basal piece, lateral margin arcuate, without dorsal basolateral apophyses; venter widely connected from middle to base; apical openings small. Basal piece strongly narrowed near base.

Female: 6.0 - 7.7 mm long, 3.8 - 4.4 mm wide. Antenna (Fig. 23) about 0.4 times as long as body length. Maxillary palpus (Fig. 21) about 0.6 times width of head; relative lengths of segments 2-4 about 1.6 : 1.0 : 1.4. LE/WE = 1.3 - 1.4. WP/LP = 1.8. LP/LE = 0.3.

Differential diagnosis: Unlike other members of *Mataeopsephus*, *M. japonicus* does not display a very strong sexual dimorphism, such as varying lengths of antennae and maxillary palpi. In general appearance this species is similar to *M. taiwanicus*, from which it can be distinguished, among other characters, by the shape of the anterior margin of the pronotum.

**LARVA:** Similar to *M. taiwanicus* (see below).

**DISTRIBUTION** (Fig. 56): Russian Far East, Korea, Japan, China (Liaoning, Hubei).

### *Mataeopsephus maculatus* NOMURA

*Mataeopsephus maculatus* NOMURA 1957: 2, 1963: 143.

*Mataeopsephus maculatus*: SATO 1970a: 7.

**TYPE LOCALITY:** Kuroson, Kôchi Prefecture, Shikoku, Japan.

**TYPE MATERIAL:** **Holotype** ♂ (National Science Museum Tokyo). **Paratypes:** 3 exs. (National Science Museum Tokyo).

#### ADDITIONAL MATERIAL EXAMINED:

J A P A N: SHIKOKU: Odamiyama, Ehime Prefecture, 16.VIII.1986, leg. E. Yamamoto, 2 ♂♂ (CAEU, coll. Satô); same locality and collector, 14.V.1994, leg. M. Kawanabe, 1 ♂ (CAEU, coll. Satô); upper course of Fukumi [river], Matsuyama City, 14.VIII.1988, leg. S. Hisamatsu, 4 ♂♂ (NTU, NMW, CAEU); HONSHU: Hatsutani Valley, Toyono, Osaka, 3.VI.2000, leg. C.-F. Lee, 1 larva (NTU).

**REDESCRIPTION:** Male: 4.2 - 5.0 mm long, 2.2 - 2.3 mm wide. Dark brown; with one pair of dark red spots on pronotum; femora yellowish brown. Clypeus elongate and upturned; anterior margin straight; anterolateral angles rectangular; constricted laterally (Fig. 28). Frons moderately depressed between eyes. Anterior margin of pronotum more or less convex; lateral margins arcuate and slightly indistinct; posterior rim smooth; discal punctation fine. Tibiae with ventral teeth in distal half; metatibial teeth not as prominent as those on other tibiae. Middle legs: tibiae about 2.2 times as long as tarsi (excluding claws); tarsal segment 5 about 0.8 times combined lengths of segments 1-4. Antenna (Fig. 27) about 0.7 times as long as body length, segments 3-

11 filiform; relative lengths of segments 1-11 about 1.1 : 0.5 : 1.0 : 0.9 : 0.8 : 0.7 : 0.7 : 0.7 : 0.6 : 0.6 : 0.6. Maxillary palpus (Fig. 26) subequal to interocular width; relative lengths of segments 2-4 about 2.9 : 1.0 : 2.0; terminal segment dilated laterally. LE/WE = 1.4. WP/LP = 1.8 - 1.9. LP/LE = 0.3.

Aedeagus (Fig. 25): Penis subequal to parameres in length, apex rounded, abruptly widened at middle. Parameres 0.9 times as long as basal piece, lateral margin parallel, dorsal basolateral apophyses slender, surpassing ventral basal margin; venter connected in basal 0.3; apical openings moderate. Basal piece subparallel, emarginate at base.

DIFFERENTIAL DIAGNOSIS: *Mataeopsephus maculatus* is similar to *M. esakii*, from which it can be distinguished by its clypeus being emarginate laterally.

LARVA: Very similar to *M. esakii*, having five pairs of abdominal gills; three longitudinal lined cuticular beads on abdominal pleurites 2-7 more prominent than in the latter.

DISTRIBUTION (Fig. 56): Japan (Honshu, Shikoku).

### *Mataeopsephus minimus* sp.n.

TYPE LOCALITY: Stream, ca. 1 - 2 m wide, flowing through dense primary forest, 10 km NW Menglun, Xishuangbanna, southern Yunnan, southern China (CWBS loc. 360).

TYPE MATERIAL: **Holotype** ♂ (CASS): "CHINA: Yunnan, Xishuangbanna ca. 10km NW Menglun 7.11.1999, ca. 700 - 800 m leg. Jäch, et al. (CWBS 360)".

DESCRIPTION: Male: 3.2 mm long, 1.7 mm wide. Dark brown; head blackish brown except two basal antennal segments, clypeus and maxillary palpi; pronotum reddish brown, medially darkened; legs brown. Anterior margin of clypeus straight, anterolateral angles rounded. Frons slightly depressed between eyes. Anterior margin of pronotum feebly convex; lateral margins arcuate and distinct; posterior rim smooth; discal punctation fine. Pro- and mesotibiae with very small ventral teeth on apical 0.3. Antenna about 0.7 times as long as body length, segments 3-11 filiform; relative lengths of segments 1-11 about 1.5 : 0.6 : 1.0 : 1.2 : 1.0 : 1.0 : 0.9 : 0.9 : 0.8 : 0.7 : 0.9. Maxillary palpus 0.6 times interocular width; relative lengths of segments 2-4 about 1.6 : 1.0 : 2.0; terminal segment dilated laterally. LE/WE = 1.4. WP/LP = 1.6. LP/LE = 0.3.

Aedeagus (Fig. 11): Penis about 0.9 times length of parameres, apex rounded, gradually widened toward base. Parameres 0.8 times as long as basal piece, lateral margin parallel, dorsal basolateral apophyses wide, surpassing ventral basal margin, basal margin straight; venter widely connected from middle to base; apical openings moderate. Basal piece subparallel, widely emarginate at base.

Differential diagnosis: *Mataeopsephus minimus* is very similar to *M. nitidipennis*, from which it can be distinguished by the antennal segment 3 and maxillary palpi being shorter, and by the parameres being connected ventrally.

DISTRIBUTION (Fig. 56): Only known from the type locality.

### *Mataeopsephus nitidipennis* WATERHOUSE

*Mataeopsephus nitidipennis* WATERHOUSE 1876: 17; LEE & JÄCH 1995: 350.

*Mataeopsephus nitidipennis*: ZAITZEV 1908, 1910: 4; BOLLOW 1938: 154.

*Mataeopsephus* sp.: DUDGEON 1995a.

TYPE LOCALITY: "China", details unknown.

TYPE MATERIAL: **Holotype** ♀, by monotypy (NHML): "Type \ China \ Bowring. 63.47\* \ 356 7/7/49 \ *Mataeopsephus nitidipennis* (Type) C. Waterh."

#### ADDITIONAL MATERIAL EXAMINED:

C H I N A: HONG KONG: CWBS loc. 7: 1 larva (NMW); CWBS loc. 8: 5 adults (NMW, NTU); Tai Ho, 19.VIII.1999, leg. A. Leun, 8 ♂♂ (NTU); same locality and collector, 4.VIII.1999, 4 larvae (NTU); same locality and collector, 31.XI.1998, 8 larvae (NTU); Wong Lung, 2.I.1999, leg. A. Luen, 2 larvae (NTU); GUIZHOU: Luobai Wu, 810 m a.s.l., Wangcao zhen, ca. 35 km NE Zunyi, Suiyang County, 1.IX.1999, leg. M. Satō, 4 ♂♂ (NMW, CAEU, NTU); Jiangkou, 9.IX.1999, leg. M. Satō, 1 ♂ (NTU); CWBS loc. 445: 1 ♂ (NMW).

DESCRIPTION: Male: 2.6 - 3.3 mm long, 1.5 - 1.9 mm wide. Dark brown; pronotum reddish brown, with irregular dark spots; legs yellowish brown. Anterior margin of clypeus straight, anterolateral angles rounded. Frons slightly depressed between eyes. Anterior margin of pronotum straight; lateral margins arcuate and rather indistinct near base; posterior rim smooth; discal punctation fine. Pro- and mesotibiae with ventral teeth on distal 0.3. Middle legs: tibiae about 1.9 times as long as tarsi (excluding claws); tarsal segment 5 about 0.9 times combined lengths of segments 1-4. Antenna (Fig. 33) about 0.7 times as long as body length, segments 3-11 filiform; relative lengths of segments 1-11 about 1.5 : 0.5 : 1.0 : 1.0 : 0.9 : 0.8 : 0.7 : 0.7 : 0.6 : 0.6 : 0.8. Maxillary palpus (Fig. 31) 0.9 times interocular width; relative lengths of segments 2-4 about 1.3 : 1.0 : 1.3; terminal segment dilated laterally. LE/WE = 1.3 - 1.4. WP/LP = 1.7 - 2.0. LP/LE = 0.3.

Aedeagus (Fig. 29): Penis subequal to parameres in length, apex rounded, gradually widening toward base. Parameres 0.8 times as long as basal piece, lateral margin slightly arcuate, dorsal basolateral apophyses wide, surpassing ventral basal margin; basal margin straight; venter separate; apical openings small. Basal piece subparallel, widely emarginate at base.

Female: 4.0 mm long, 2.3 mm wide. Antenna (Fig. 32) about 0.4 times as long as body length; segments 5-10 moniliform. Maxillary palpus (Fig. 30) about 0.5 times width of head; relative lengths of segments 2-4 about 1.9 : 1.0 : 1.6. LE/WE = 1.4. WP/LP = 2.2. LP/LE = 0.2.

Differential diagnosis: *Mataeopsephus nitidipennis* is similar to *M. minimus* due to its small body size and due to the reddish brown spots on the pronotum. For distinction see diagnosis of *M. minimus*.

LARVA (Fig. 34): Lined cuticular beads present only on thoracic segments. Darkened stripes along lined cuticular beads, sulci 1 and costal lines, not reaching lateral margins. Two black spots on each abdominal pleurite; one at middle and one near lateral margin; inner one much bigger than outer; spots on thoracic pleurites stretching along posterior margin. Costal line on first abdominal tergite reduced. Abdominal tergites 2-7 with one pair of black spots halfway between medial suture and tergopleural sutures, spots on abdominal tergites 4 and 5 stretching out of tergopleural sutures. Secondary marginal fringe reduced; disc with sparse long setae. Abdomen with five pairs of gills.

ECOLOGY: Life history, secondary production and microdistribution of this species was investigated by DUDGEON (1995a: "*Mataeopsephus* sp.").

DISTRIBUTION (Fig. 56): China (Hong Kong, Guizhou).

#### *Mataeopsephus quadribanchiae* sp.n.

TYPE LOCALITY: Headwaters of Yenping stream, Yenping Forest Road, Taitung, southern Taiwan.

TYPE MATERIAL: **Holotype** ♂ (NMW): "TAIWAN - Taitung Cty. Yenping Forest Road 10.7.1992 leg. C. F. Lee". **Paratypes**: 2 ♂♂ (NMW), same data as holotype; 2 ♂♂, 1 ♀ (NTU): "TAIWAN: Taitung Yenping, 26.VI.1992 leg. C.-F. Lee"; 7 ♂♂ (NTU): "Taiwan Hsinchu Co. Jianshi, Mashi 01.VI.2000, 1500m M.L. Jeng leg.".

#### ADDITIONAL MATERIAL EXAMINED:

T A I W A N: TAITUNG: type locality, 1 larva (NMW); HINSINCHU: Jianshi, Mashi, 1.VI.2000, leg. M.-L. Jeng, 1 larva (NMW).

DESCRIPTION: Male: 4.2 - 4.3 mm long, 2.3 - 2.4 mm wide. Dark brown; femora paler; pronotum with one pair of dark red spots. Anterior margin of clypeus straight, anterolateral angles rounded. Frons moderately depressed between eyes. Anterior margin of pronotum straight; lateral margins arcuate and rather indistinct near base; posterior rim smooth; disc finely punctate. Protibiae with ventral teeth near apices. Middle legs: tibiae about 2.0 times as long as tarsi (excluding claws); tarsal segment 5 about 0.9 times combined lengths of segments 1-4. Antenna (Fig. 38) about 0.7 times as long as body length, segments 3-11 filiform; relative lengths of segments 1-11 about 1.1 : 0.5 : 1.0 : 0.9 : 0.7 : 0.6 : 0.6 : 0.6 : 0.6 : 0.5 : 0.6; last four segments flattened. Maxillary palpus (Fig. 37) subequal to interocular width; relative lengths of segments 2-4 about 2.2 : 1.0 : 1.4. Elytra with stripes of grey pubescence. LE/WE = 1.4 - 1.5. WP/LP = 2.0. LP/LE = 0.2 - 0.3.

Aedeagus (Fig. 35): Penis subequal to parameres in length, apex acute, gradually widening toward base. Parameres 0.8 times as long as basal piece, lateral margins parallel, dorsal basolateral apophyses slender, surpassing ventral basal margin; venter connected from basal 0.3 to base; apical openings moderate. Basal piece subparallel, emarginate at base.

Female: 5.0 mm long, 2.9 mm wide. Antenna (Fig. 38) about 0.4 times as long as body length. Maxillary palpus (Fig. 36) about 0.5 times width of head; relative lengths of segments 2-4 about 1.8 : 1.0 : 2.0. LE/WE = 1.4. WP/LP = 2.2. LP/LE = 0.2.

Differential diagnosis: This species is very similar to *Mataeopsephus esakii*, from which it can be distinguished by the shorter, more flattened antennae and by the aedeagus.

LARVA: Very similar to *Mataeopsephus esakii*, from which it is distinguished by having only four pairs of abdominal gills.

DISTRIBUTION (Fig. 56): Taiwan.

### *Mataeopsephus sichuanensis* sp.n.

TYPE LOCALITY: Mountain stream, slowly flowing, with gravel and large boulders, Qingcheng Mountain, 600 m a.s.l., 103.30°E 30.55°N, 65 km W Taiping, Sichuan, China (Fig. 57).

TYPE MATERIAL: **Holotype** ♂ (NMW): "China: Sichuan, Qingcheng Shan, ca. 600m, 103.30E, 30.55N, 65km NW Chengdu, 10 km W Taiping, 4.VI.1997, river valley leg. A. Pütz". **Paratypes**: 1 ♂ (NTU): "CHINA: Sichuan, Qingcheng Shan, Chengdu, 10.IX.1996, leg. M.-L. Jeng"; 1 ♂ (CASS): "CHINA: Sichuan, 30.7.1998 Mao Xian Cty., Jiuding Shan 6 km NE Mao Xian, ca. 1750m Schönmann, Ji, Wang (CWBS 340)"; 1 ♂ (NMW): "CHINA: W-Hubei Daba Shan crk. valley 8 km NW Muyuping 31°29'N 110°22'E 1550-1650m 18.VII.2001 A. Smetana [C115a]".

#### ADDITIONAL MATERIAL EXAMINED:

C H I N A: SICHUAN: Emei Shan, Jieyindian, 2510 m a.s.l., 5.X.1996, leg. M. Satō, 2 larvae (NTU); Qingchen Shan 65 km NW Chengdu, 10 km W Taiping, 4.VI.1997, leg. A. Pütz, 2 larvae (NMW).

DESCRIPTION: Males: 4.6 - 5.6 mm long, 2.5 - 3.4 mm wide. Blackish brown; maxillary palpi paler; legs dark brown, apices of femora darkened. Anterior margin of clypeus straight, anterolateral angles rectangular. Frons moderately depressed between eyes. Anterior margin of pronotum straight, lateral margins arcuate and rather indistinct near base; posterior rim smooth;

disc granulate. Tibiae with feeble ventral teeth in distal half. Middle legs: tibiae about 1.9 times as long as tarsi (excluding claws); tarsal segment 5 about 0.7 times combined lengths of segments 1-4. Antenna (Fig. 42) 0.6 times body length, segments 5-10 subserrate; relative lengths of segments 1-11 about 1.4 : 0.5 : 1.0 : 0.9 : 0.8 : 0.8 : 0.7 : 0.6 : 0.6 : 0.6 : 0.8. Maxillary palpus (Fig. 41) 0.7 times interocular width; relative lengths of segments 2-4 about 1.5 : 1.0 : 1.7. Elytra sometimes with stripes of grey pubescence. LE/WE = 1.3 - 1.4. WP/LP = 1.7 - 2.1. LP/LE = 0.3.

Aedeagus (Fig. 40): Penis about 0.8 times length of parameres, lateral margins parallel, strongly widened near apex. Parameres 0.8 times as long as basal piece, lateral margins parallel, dorsal basolateral apophyses long and wide, basal margin emarginate near lateral margins; venter connected from basal 0.3 to base; apical opening large. Basal piece emarginate basally, lateral margins subparallel.

Differential diagnosis: *Mataeopsephus sichuanensis* is similar to *M. tenuipes*, from which it differs in the tarsi being smaller and in the body color being blackish brown.

LARVA: Similar to *M. esakii*, from which it can be distinguished by having six pairs of abdominal gills and by the lined cuticular beads on abdominal pleurites being reduced.

DISTRIBUTION (Fig. 56): China (Sichuan, Hubei).

### *Mataeopsephus taiwanicus* LEE, YANG & BROWN

*Mataeopsephus taiwanicus* LEE, YANG & BROWN 1990: 74; LEE & JÄCH 1995: 350.

TYPE LOCALITY: Small mountain stream, Habun, Taipei, northern Taipei.

TYPE MATERIAL: **Holotype** ♂ (NTU). **Paratypes**: 1 ♂, 2 ♀♀ (NTU); 1 ♂ (NMW); 1 ♂ (Museum of Natural History, Norman, Oklahoma).

#### ADDITIONAL MATERIAL EXAMINED:

T A I W A N: ILAN: Chiduan-Shuling, 26.VI.1992, leg. C.-F. Lee, 10 ♂♂ (NMW, NTU); same locality and collector, 25.VIII.2000, 2 larvae (NTU, NMW); Fushan, 20.V.1993, leg. C.-L. Li, 4 ♀♀ (NMW); KAOHSIUNG: Shanping, 31.VII.1992 leg. C.-F. Lee, 4 ♂♂, 2 ♀ (NMW, NTU).

J A P A N: RYUKYU ARCHIPELAGO: Iriomote-jima, Nishifunatsuki-gawa, 26.VIII.1994, leg. M. Kimura, 7 ♂♂ (NTU, CAEU); same locality, leg. M. Satô, 5 ♂♂ (CAEU); same locality, 23.III.1995, leg. M. Satô, 1 larva (NTU); Iriomote-jima, Nakama-gawa, 29.VIII.1993, leg. S. Inada, 1 ♂ (CAEU); Iriomote-jima, Aira-gawa, Mt.Komi-dake, 7.IV.1998, leg. T. Toyoguchi, 2 ♂♂ (CAEU).

REDESCRIPTION: Male: 6.2 - 6.8 mm long, 3.3 - 3.6 mm wide. Coloration dark brown; clypeus, three basal antennal segments and maxillary palpi paler; legs brown; elytra paler than pronotum. Anterior margin of clypeus straight, anterolateral angles rounded. Frons slightly depressed between eyes. Anterior margin of pronotum straight, lateral margins arcuate and distinct; posterior rim smooth; disc granulate. Tibiae with very feeble ventral teeth near apices. Middle legs: tibiae about 2.0 times as long as tarsi (excluding claws); tarsal segment 5 about 0.8 times combined lengths of segments 1-4. Antenna (Fig. 47) about 0.7 times as long as body length, segments 3-11 filiform; relative lengths of segments 1-11 about 0.9 : 0.4 : 1.0 : 0.8 : 0.7 : 0.6 : 0.6 : 0.5 : 0.5 : 0.4 : 0.5. Maxillary palpus (Fig. 45) 1.1 times interocular width; relative lengths of segments 2-4 about 1.8 : 1 : 1.1. LE/WE = 1.3 - 1.5. WP/LP = 1.5 - 1.8. LP/LE = 0.3.

Aedeagus (Fig. 43): Penis about 1.2 times length of parameres, apex rounded, abruptly widened at middle. Parameres 0.4 times as long as basal piece, lateral margin arcuate, dorsal basolateral apophyses long and slender, surpassing ventral basal margin; basal margin medially emarginate; venter widely connected from middle to base; apical openings small. Basal piece strongly narrowed near base.



Female: 8.2 mm long, 4.3 mm wide. Antenna (Fig. 46) about 0.4 times as long as body length. Maxillary palpus (Fig. 44) about 0.6 times interocular width; relative lengths of segments 2-4 about 2.4 : 1 : 1.7. LE/WE = 1.5. WP/LP = 1.9. LP/LE = 0.3.

**VARIABILITY:** Populations from Iriomote Island and southern Taiwan differ by darker elytra and legs, and by the punctate pronotum.

**Differential diagnosis:** *Mataeopsephus taiwanicus* is very similar to *M. japonicus*, from which it can be distinguished by the straight anterior margin of the pronotum, and by the antennae and maxillary palpi being longer.

**LARVA** (Fig. 48): Thoracic segments with irregular darkened spots and lined cuticular beads. One pair of derived sulci arising from base of pronotum, directed mesad, sometimes conjoined with sulci 1. Each sulcus 2 usually with branch near apex, directed outward, sometimes connected with sulcus 1. Some cuticular beads on first abdominal tergite instead of costal line. Abdominal pleurites with irregular cuticular beads. Abdominal tergites 1-8 with one pair of small black spots halfway between medial suture and tergopleural sutures. Abdomen with six pairs of gills. Secondary marginal fringe well-developed; disc covered densely with long setae. Mature larva generally dark brown.

**DISTRIBUTION** (Fig. 56): Taiwan, Japan (Iriomote Island).

### *Mataeopsephus tenuipes* (CHAMPION) comb.n.

*Psephenus tenuipes* CHAMPION 1921: 202.

**TYPE LOCALITY:** Almora, Kumaon, Uttar Pradesh, North India.

**TYPE MATERIAL:** **Lectotype** ♂ (NHML, by present designation): "♂ / SYNTYPE (with blue hollow circle) / Type H.T. (with red hollow circle) / C. Almora Dn. Kumaon, U. P. Sept '20 HGC. / Brit. Mus. 1922-71 / E. M. M. det G. C. C. / *Psephenus tenuipes* Champion". **Paralectotype:** 1 ♂ (NHML), same data as lectotype except "Aug '17".

**REDESCRIPTION:** Male: 5.0 mm long, 2.6 mm wide. Brown; head blackish brown except clypeus, maxillary palpi, and two basal antennal segments yellowish brown, antennal segments 3-9 (10-11 lost) brown; femora paler. Anterior margin of clypeus straight, anterolateral angles rounded. Frons slightly depressed between eyes. Anterior margin of pronotum convex medially, lateral margins straight and distinct; posterior rim smooth; disc granulate. Tibiae with very feeble ventral teeth near apices. Middle legs: tibiae about 1.2 times as long as tarsi (excluding claws); tarsal segment 5 about 1.2 times combined lengths of segments 1-4. Antenna (excluding segments 10 and 11) 0.35 times body length, segments 3-9 subserate; relative lengths of segments 1-11 about 0.9 : 0.5 : 1.0 : 0.7 : 0.6 : 0.5 : 0.5 : 0.5 : 0.4. Maxillary palpus 0.6 times interocular width; relative lengths of segments 2-4 about 2.0 : 1.0 : 1.6. LE/WE = 1.4. WP/LP = 1.7. LP/LE = 0.3.

**Aedeagus** (Fig. 12): Penis about 1.1 times length of parameres, apex truncate, gradually widening in apical 0.25, medially narrowed, basally widened. Parameres 0.6 times as long as basal piece, widest at base, dorsal basolateral apophyses very slender, basal margin emarginate medially; venter widely connected; apical openings slender. Basal piece narrowed toward base.

**Differential diagnosis:** *Mataeopsephus tenuipes* is distinguished easily from the remaining species by its elongate fifth tarsal segment and the long third antennal segment.

**DISTRIBUTION** (Fig. 56): North India (Uttar Pradesh).

*Mataeopsephus vietnamensis* sp.n.

TYPE LOCALITY: Tam Dao, northern Vietnam.

TYPE MATERIAL: **Holotype** ♂ (NMW): "N-VIETNAM: Tam Dao 21°28'N 105°38'E 19.5.-13.6., 800-100m leg. Malicky, 1995". **Paratypes**: 1 ♂ (NTU): "N-VIETNAM: Tam Dao (2) 1.-8.6.1996 leg. Dembicky & Patholatko"; 1 ♀ (CAEU): "Tam Dao, off 100km to N.W. from Hanoi, N. VIETNAM, 16-23.V.1991 Takakuwa, M. leg."; 2 ♂♂, 1 ♀ (CASS, NMW): "CHINA: Guizhou, Jiangkou Co. ca. 50 km SW Jiangkou nr. Shidu vill. 27°32.71'N 108°36.30'E trib. of Guanhe riv. 1./4.7.2001, 650 – 850 m leg. Schillhammer & Wang (CWBS 445)".

## ADDITIONAL MATERIAL EXAMINED:

V I E T N A M: Kontum, 10.IX.1998, leg. L.-J. Wang, 11 larvae (NTU).

DESCRIPTION: Male: 5.0 mm long, 2.8 - 2.9 mm wide. Blackish brown; two basal antennal segments and maxillary palpi yellowish brown; frons somewhat paler; pronotum reddish brown except margins, with one longitudinal black band, one pair of oblique black spots at both sides; legs dark brown, femora paler; venter yellowish brown. Anterior margin of clypeus straight, anterolateral angles rounded. Frons moderately depressed between eyes. Anterior margin of pronotum straight, lateral margins arcuate and indistinct; posterior rim smooth; disc smooth, with black pubescence. Tibiae with feeble ventral teeth in distal half. Middle legs: tibiae about 2.2 times as long as tarsi (excluding claws); tarsal segment 5 about 0.8 times combined lengths of segments 1-4. Antenna (Fig. 53) subequal to body length, segments 3-11 filiform; relative lengths of segments 1-11 about 0.9 : 0.4 : 1.0 : 0.9 : 0.8 : 0.7 : 0.7 : 0.6 : 0.6 : 0.5 : 0.6. Maxillary palpus (Fig. 51) 1.2 times interocular width; relative lengths of segments 2-4 about 1.5 : 1.0 : 1.1. LE/WE = 1.3 - 1.4. WP/LP = 2.0. LP/LE = 0.3.

Aedeagus (Fig. 49): Penis about 1.2 times length of parameres, apex rounded, widening abruptly from middle to basal 0.25, narrowed gradually toward base. Parameres 0.6 times as long as basal piece, widened near apex, widest at middle, without dorsal basolateral apophyses, basal margin straight; venter connected from basal 0.25 to base; apical openings moderate. Basal piece emarginate at base, lateral margins subparallel.

Female: 7.5 mm long, 4.2 mm wide. Coloration almost blackish brown, venter dark brown. Antenna (Fig. 52) about 0.4 times as long as body length. Maxillary palpus (Fig. 50) short, about 0.6 times interocular width; relative lengths of segments 2-4 about 1.8 : 1.0 : 1.5. LE/WE = 1.4. WP/LP = 2.0. LP/LE = 0.3.

Differential diagnosis: This new species is characterized by its long antennae and maxillary palpi, and the unique pronotal color pattern.

LARVA (Fig. 54): Thoracic segments with irregularly darkened spots; lined cuticular beads reduced on tergites. Two black spots on each abdominal pleurite; inner one above costal line near tergopleural sutures, outer one smaller and on middle below costal line; spots becoming progressively smaller toward apical segments, obsolete on abdominal pleurite 7. Lined cuticular beads on abdominal pleurites reduced. Abdominal tergites 1-7 with one pair of dark spots, usually stretching out of tergopleural sutures except for segments 2, 3, and 7. Abdomen with six pairs of gills. Secondary marginal fringe very scarce.

DISTRIBUTION (Fig. 56): Vietnam, China (Guizhou).

Key to the species of *Mataeopsephus* based on males

- |   |   |                  |
|---|---|------------------|
| 1 | Posterior rim of pronotum crenulate .....   | 2                |
| - | Posterior rim of pronotum not crenulate .....   | 3                |
| 2 | Terminal segment of maxillary palpi longest; antennal segments 3-11 flattened; ventral teeth on tibiae very feeble..... | <i>chinensis</i> |

- Second segment of maxillary palpi longest; antennal segments 3-11 filiform; ventral teeth on tibiae prominent ..... *dentatus*
- 3 Pronotum black to dark brown..... 4
- Pronotum reddish brown or with reddish brown spots ..... 7
- 4 Parameres relatively short (0.3 - 0.4 times length of basal piece); antennal segments 3-11 filiform..... 5
- Parameres relatively long (0.6 - 0.8 times length of basal piece); antennal segments 5-10 subserrate ..... 6
- 5 Maxillary palpi short, about 0.8 times width of head ..... *japonicus*
- Maxillary palpi long, about 1.1 times width of head ..... *taiwanicus*
- 6 Tarsi long, about 0.8 times length of tibiae; fifth tarsal segment longer than combined length of tarsal segments 1-4 ..... *tenuipes*
- Tarsi short, about 0.5 times length of tibiae; fifth tarsal segment shorter than combined length of tarsal segments 1-4 ..... *sichuanensis*
- 7 Clypeus long, lateral margins constricted ..... *maculatus*
- Clypeus short, lateral margins rounded..... 8
- 8 Body size small, 2.6 - 3.3 mm in length ..... 9
- Body size large, > 4.0 mm in length ..... 10
- 9 Third antennal segment shorter than fourth segment; venter of parameres connected ..... *minimus*
- Third antennal segment subequal to fourth segment; venter of parameres separated..... *nitidipennis*
- 10 Elytra without stripes; maxillary palpi longer than width of head..... *vietnamensis*
- Elytra with stripes of grey pubescence; maxillary palpi subequal to width of head ..... 11
- 11 Antennae long, about 0.9 times body length; antennal segments 6-10 filiform..... *esakii*
- Antennae short, about 0.7 times body length; antennal segments 6-10 flattened .... *quadribranchiae*

### Discussion

LEE et al. (2001) regarded Eubrianacinae as the sister group of Psepheninae because of three synapomorphic larval characters: 1) presence of mesothoracic spiracles, 2) costal lines, and 3) posterior plates. However, the posterior plates are very different morphologically in the two subfamilies; they are plate-like in Eubrianacinae and the median suture extends into these areas; in Psepheninae the plates are like sclerotized intersegmental membranes that lack a median suture. Thus we consider posterior plates to be a homoplasy for both subfamilies. One synapomorphic character is added herein: presence of tergo-pleural sutures, which may be necessary to provide more flexibility for the larval skin covering the pupa (the presence of posterior plates probably has a similar function).

The number of ventral gills often is used to distinguish genera (see SATÔ 1985). However this character may be unreliable since it varies among species of *Mataeoapsephus*. Larger species tend to have more gills because of increased oxygen demand. Comparing all known species, females whose larvae have six pairs of gills are larger than 6.0 mm.

Psepheninae possess a number of larval characters useful for phylogenetic analyses. Although larvae of *Pheneps* are unknown, we suppose that synapomorphic characters within psephenine genera include the following: presence of sulci 1 on pro-, meso-, and metanota, sulci 2 on meso- and metanota, and sulci 4 on first abdominal tergite.

Three autapomorphic larval characters are known for *Mataeoapsephus*: presence of sulci 3 on meso- and metanota, triangular plates due to origin of sulci 2 from the lateral angles of pseudoposterior plates, and the extension of sulci 4 to pleurites.

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Special thanks are due to W. Zelenka for the habitus illustration.

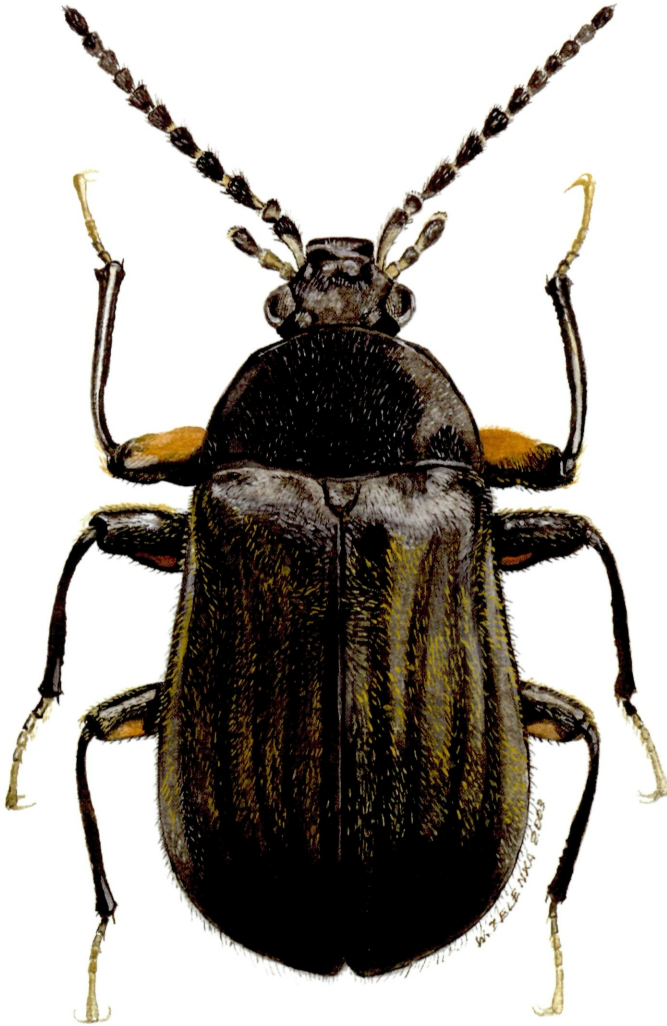


Fig. 1: Habitus of *Mataeopsephus sichuanensis*, paratype (© copyright NMW).

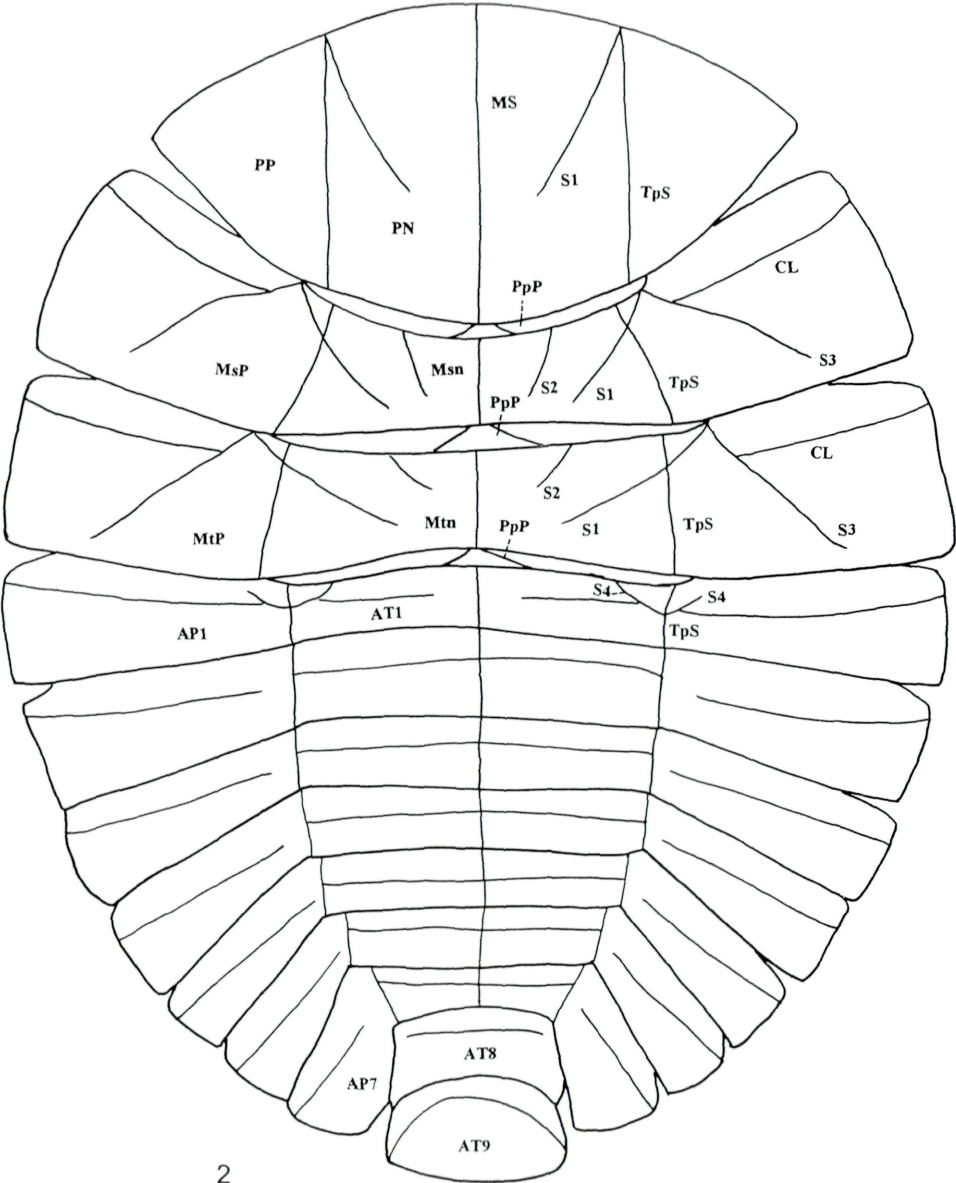


Fig. 2: Larva of *Mataeopsephus*, schematic.

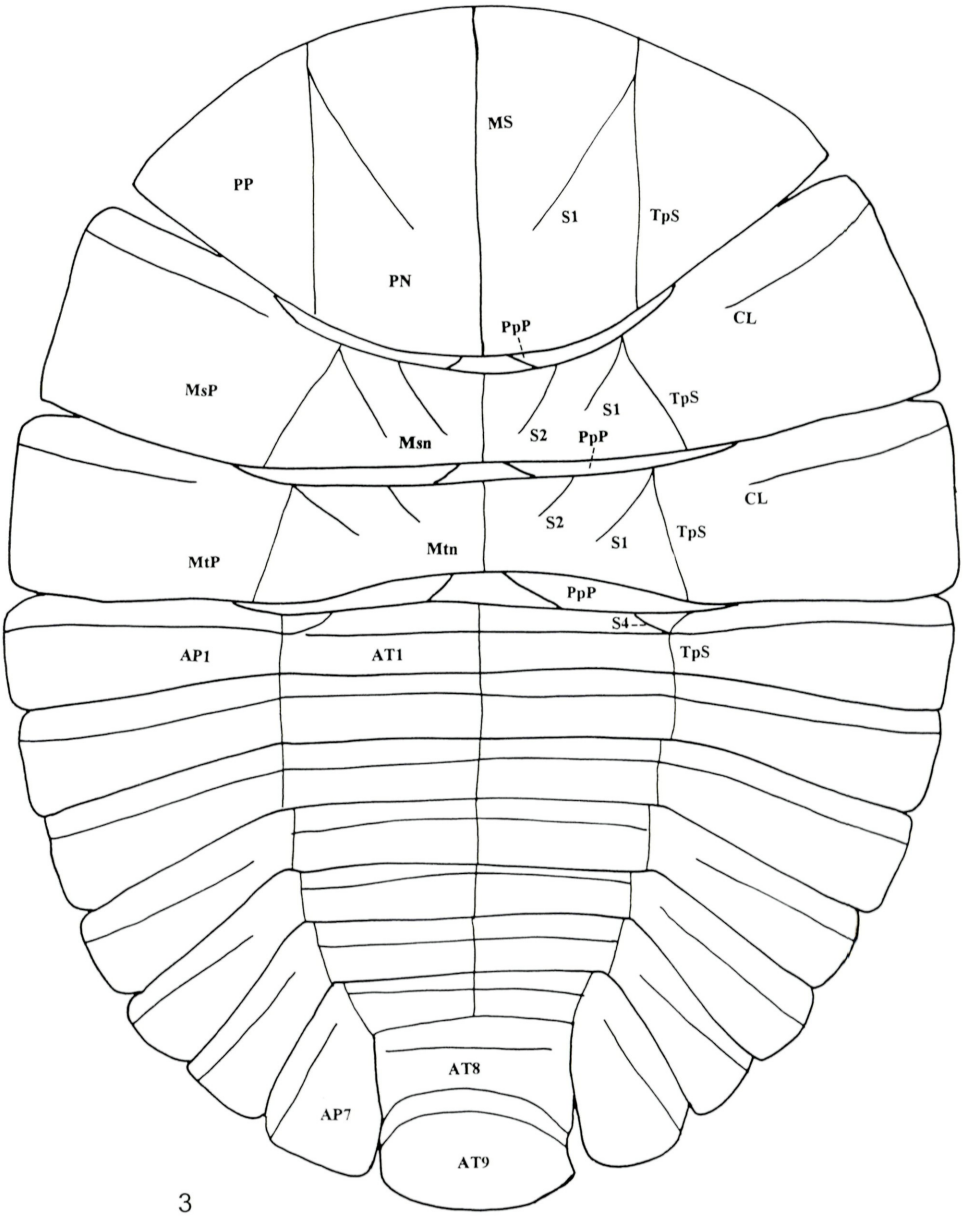
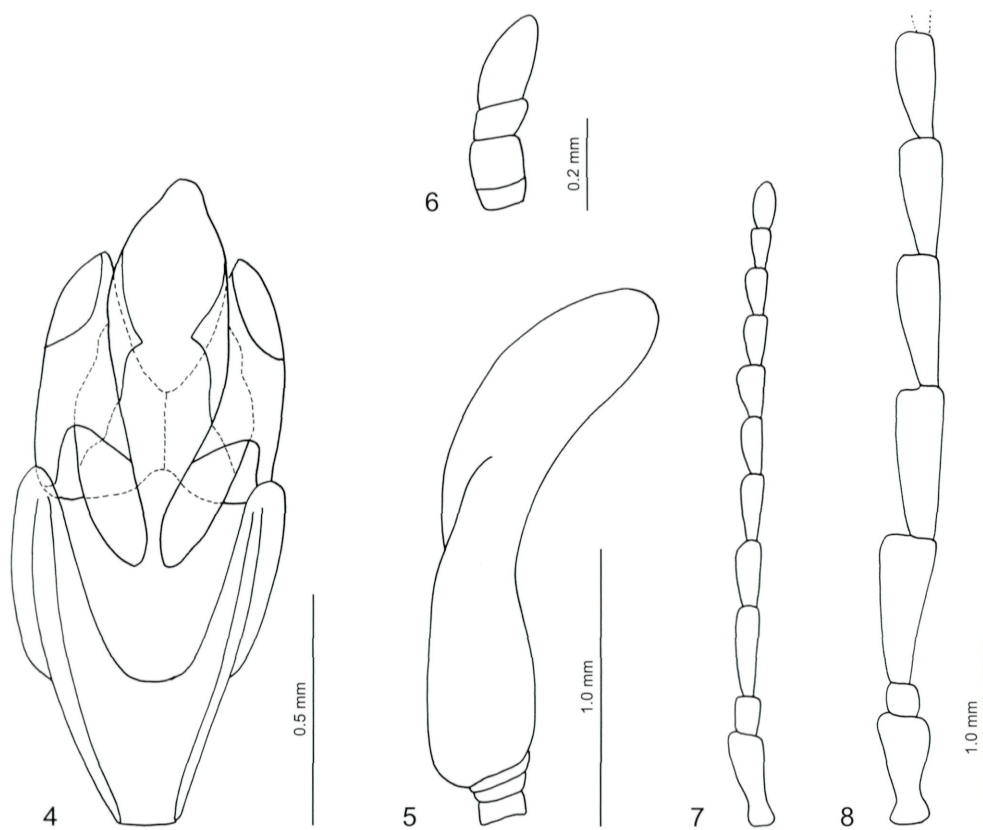
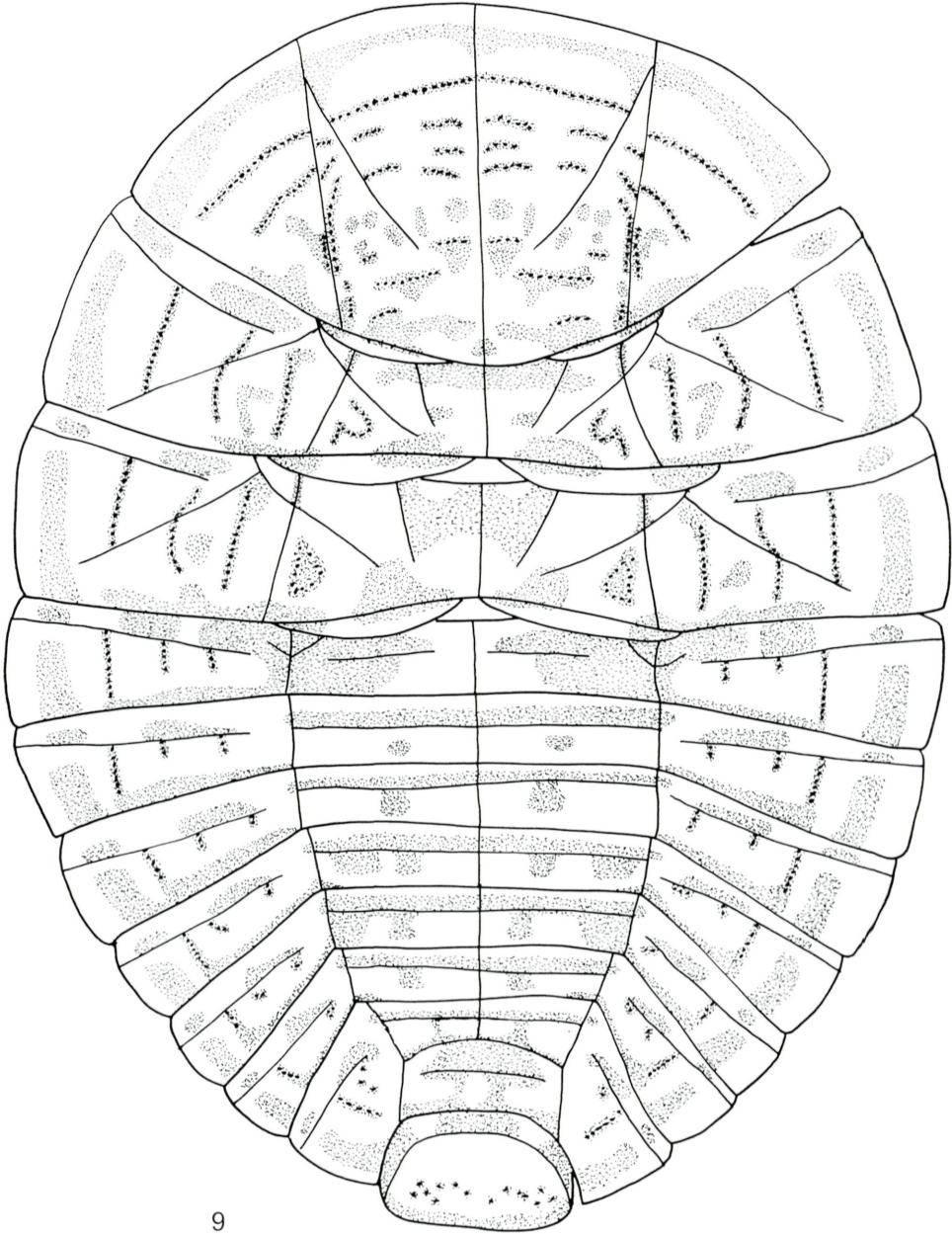


Fig. 3: Larva of *Psephenus*, schematic.



Figs. 4 - 8: *Mataeopsephus chinensis*: 4) aedeagus, ventral view, 5) male maxillary palpus, 6) female maxillary palpus, 7) female antenna, 8) male antennal segments 1 - 7.

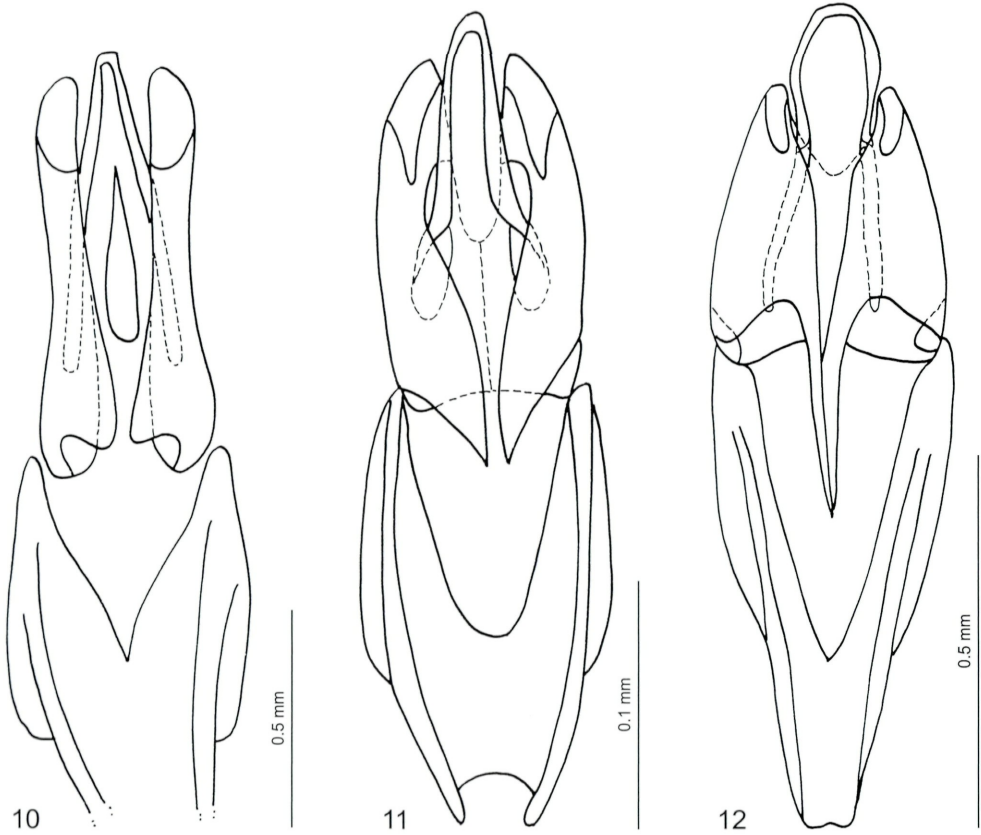




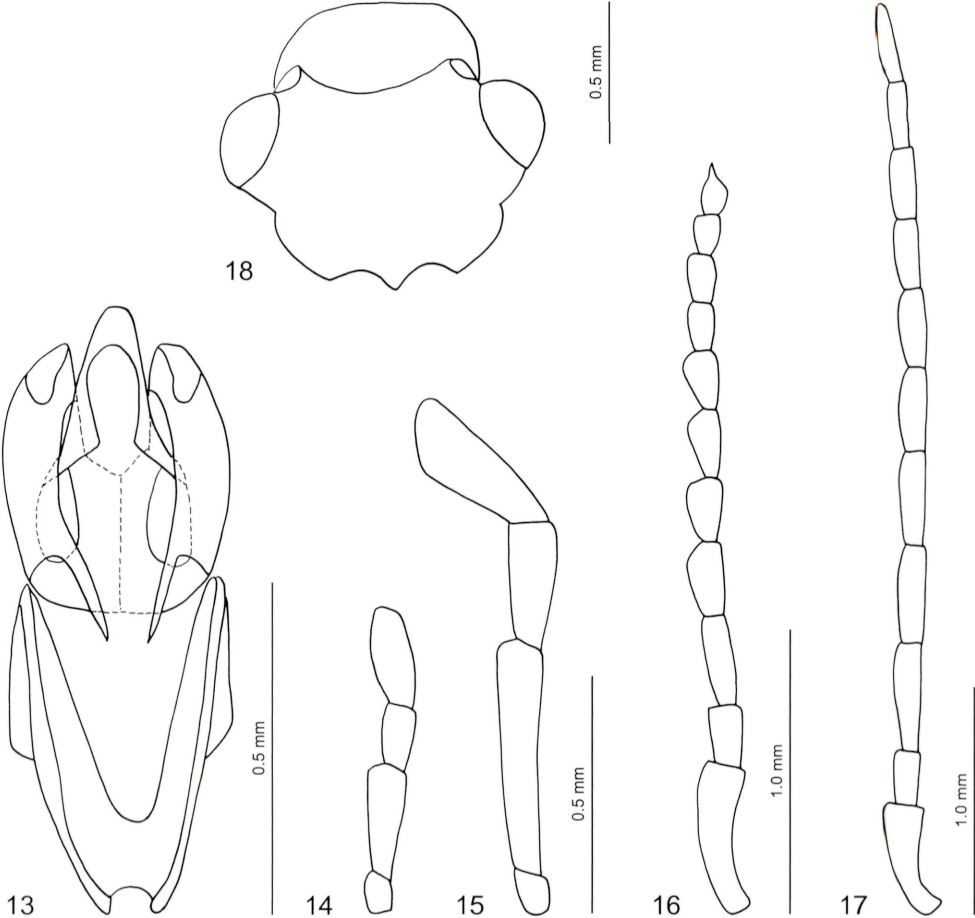
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Fig. 9: *Mataeopsephus chinensis*, larva.

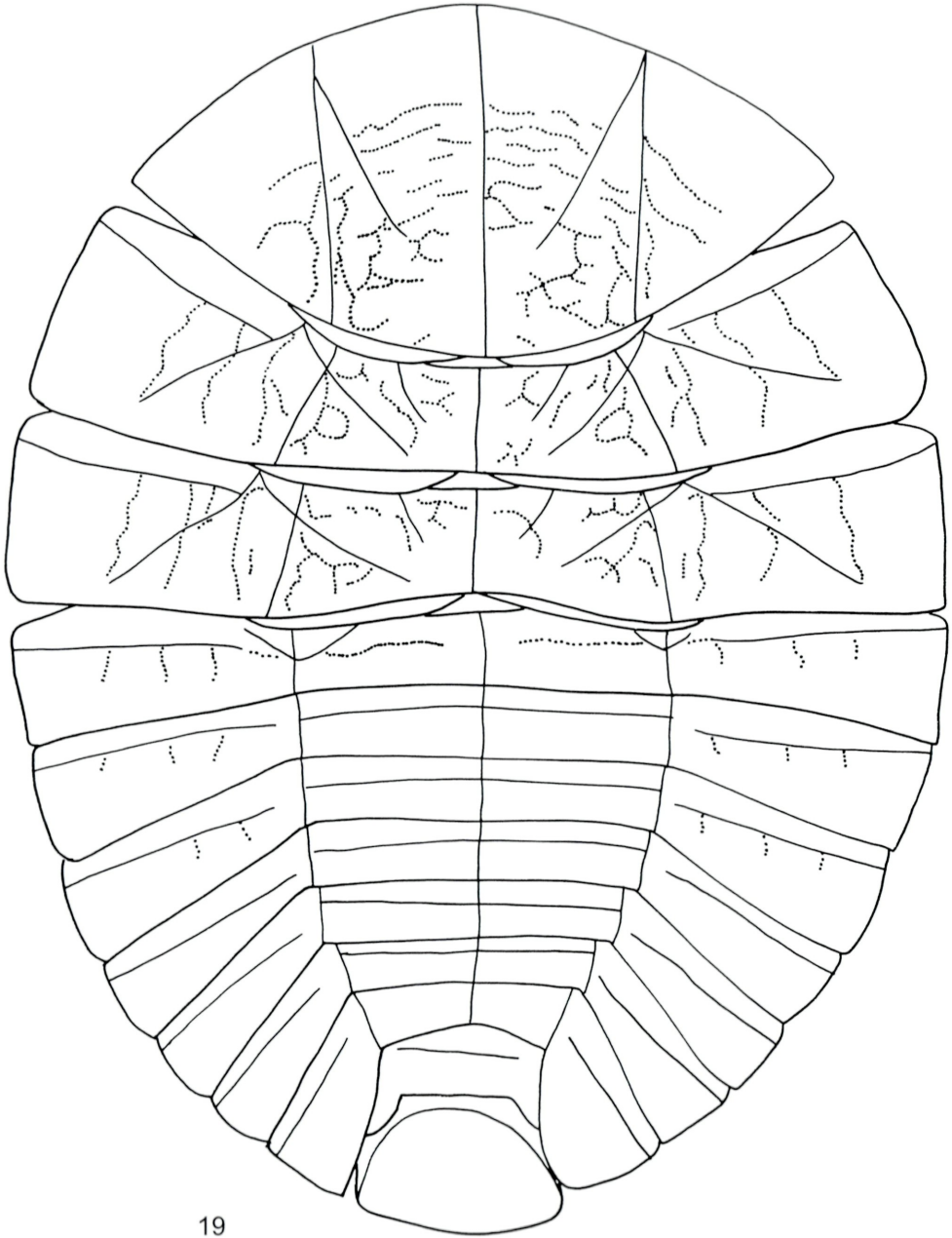




Figs. 10 - 12: Aedeagi of 10) *Mataeopsephus dentatus*, holotype, 11) *M. minimus*, 12) *M. tenuipes*.

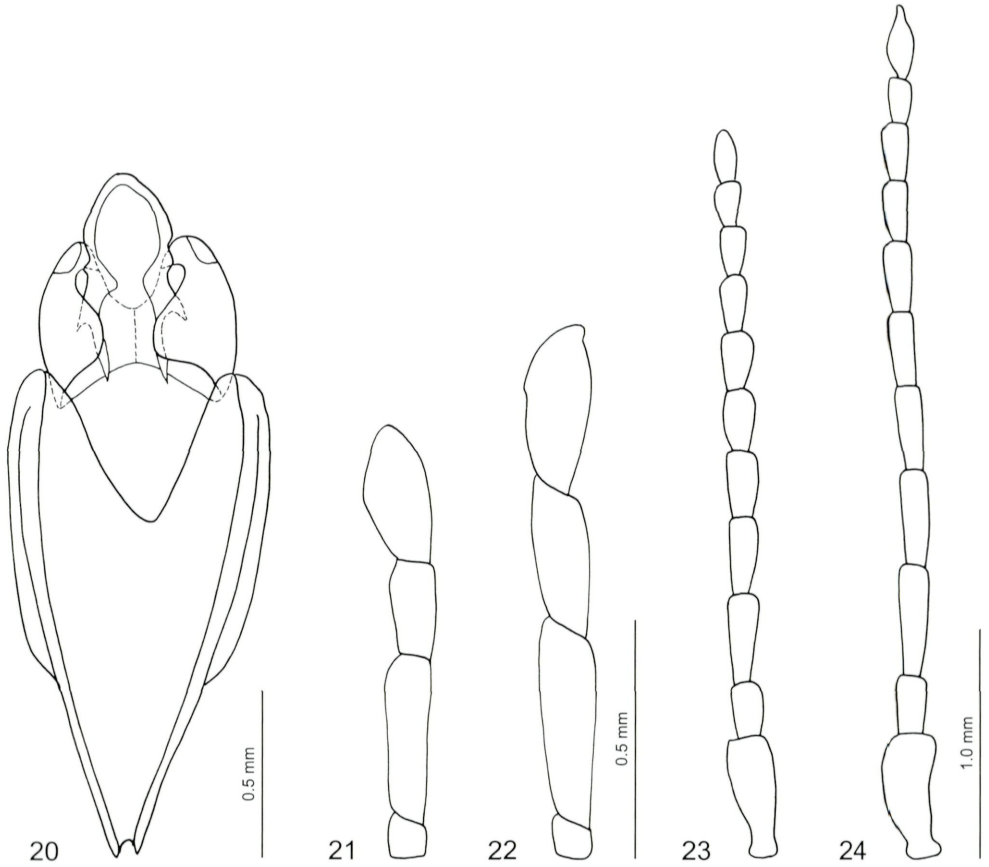


Figs. 13 - 18: *Mataeopsephus esakii*: 13) aedeagus, ventral view, 14) female maxillary palpus, 15) male maxillary palpus, 16) female antenna, 17) male antenna, 18) outlines of head, dorsal view.

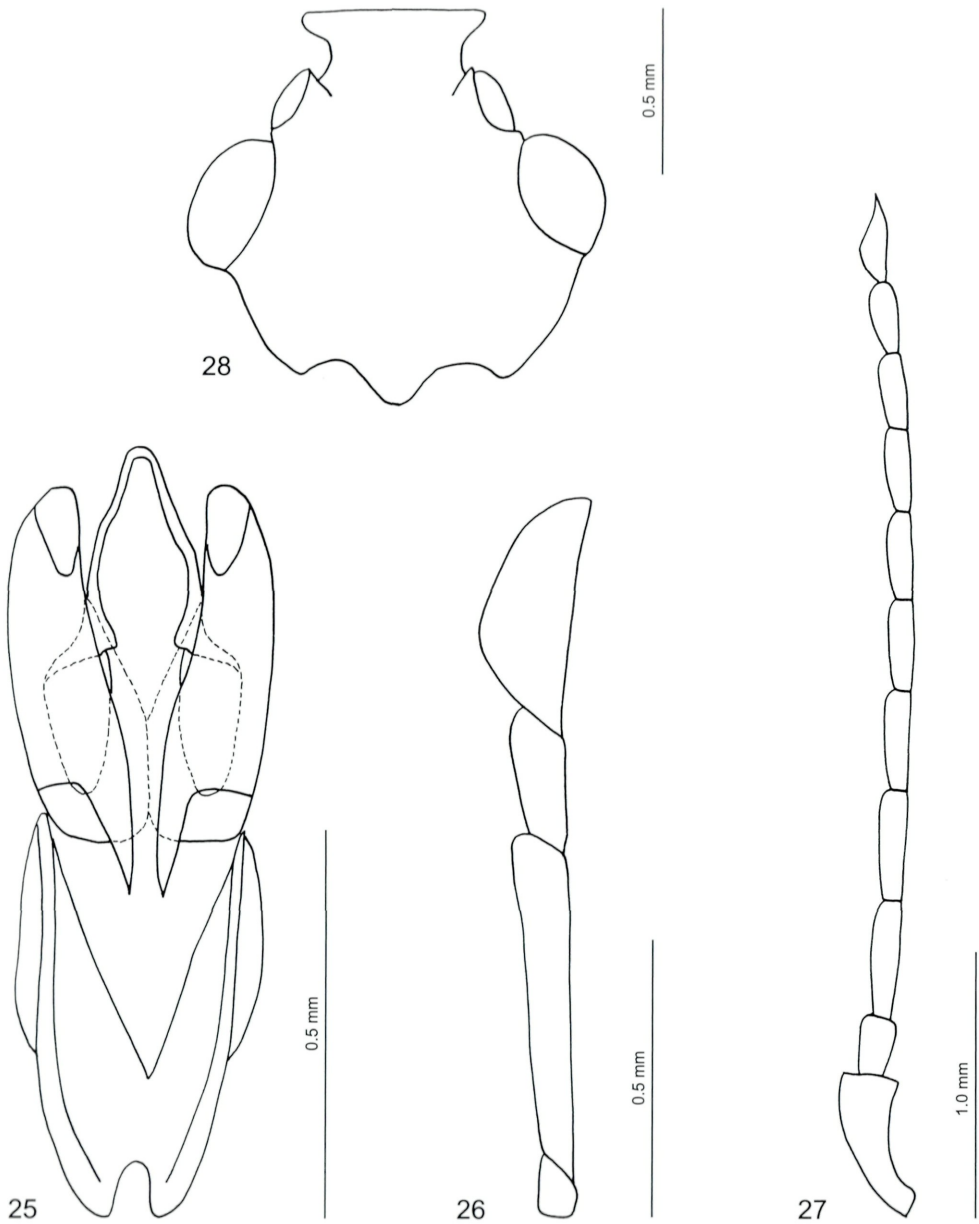


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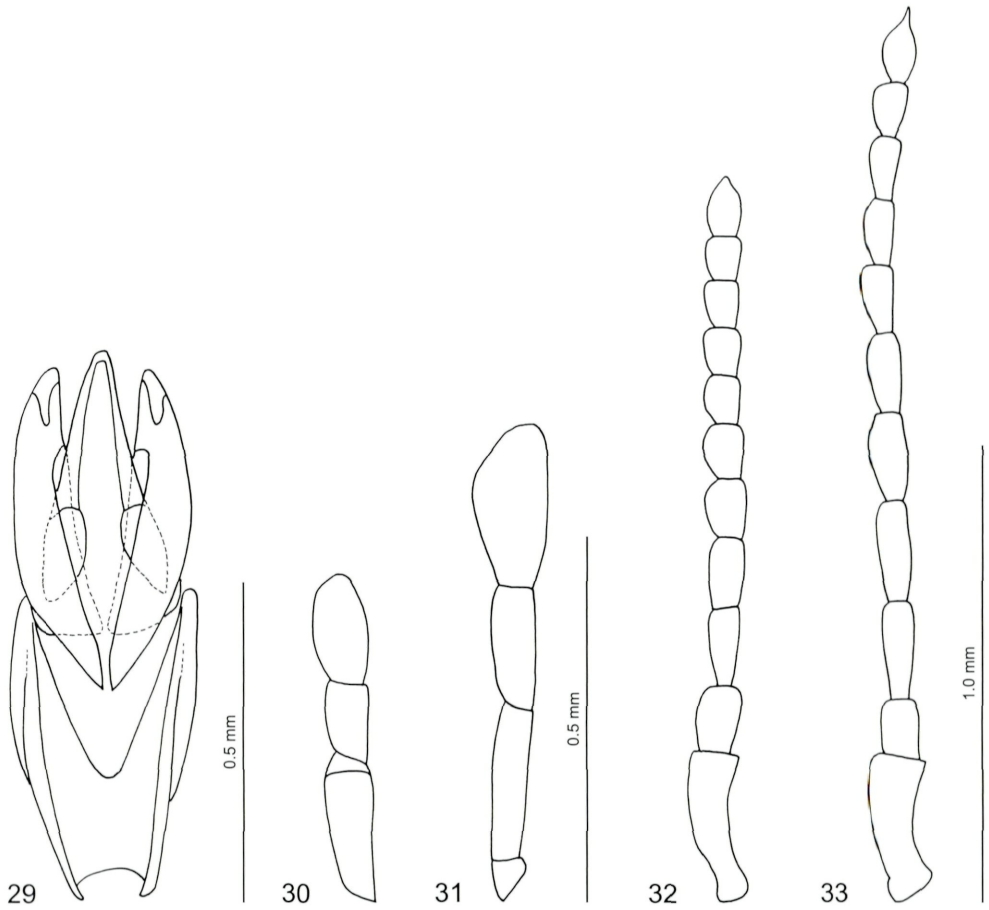
Fig. 19: *Mataeopsephus esakii*, larva.



Figs. 20 - 24: *Mataeopsephus japonicus*: 20) aedeagus, ventral view, 21) female maxillary palpus, 22) male maxillary palpus, 23) female antenna, 24) male antenna.



Figs. 25 - 28: *Mataeopsephus maculatus*: 25) aedeagus, ventral view, 26) male maxillary palpus, 27) male antenna, 28) head, dorsal view.



Figs. 29 - 33: *Mataeopsephus nitidipennis*: 29) aedeagus, ventral view, 30) female maxillary palpus, 31) male maxillary palpus, 32) female antenna, 33) male antenna.

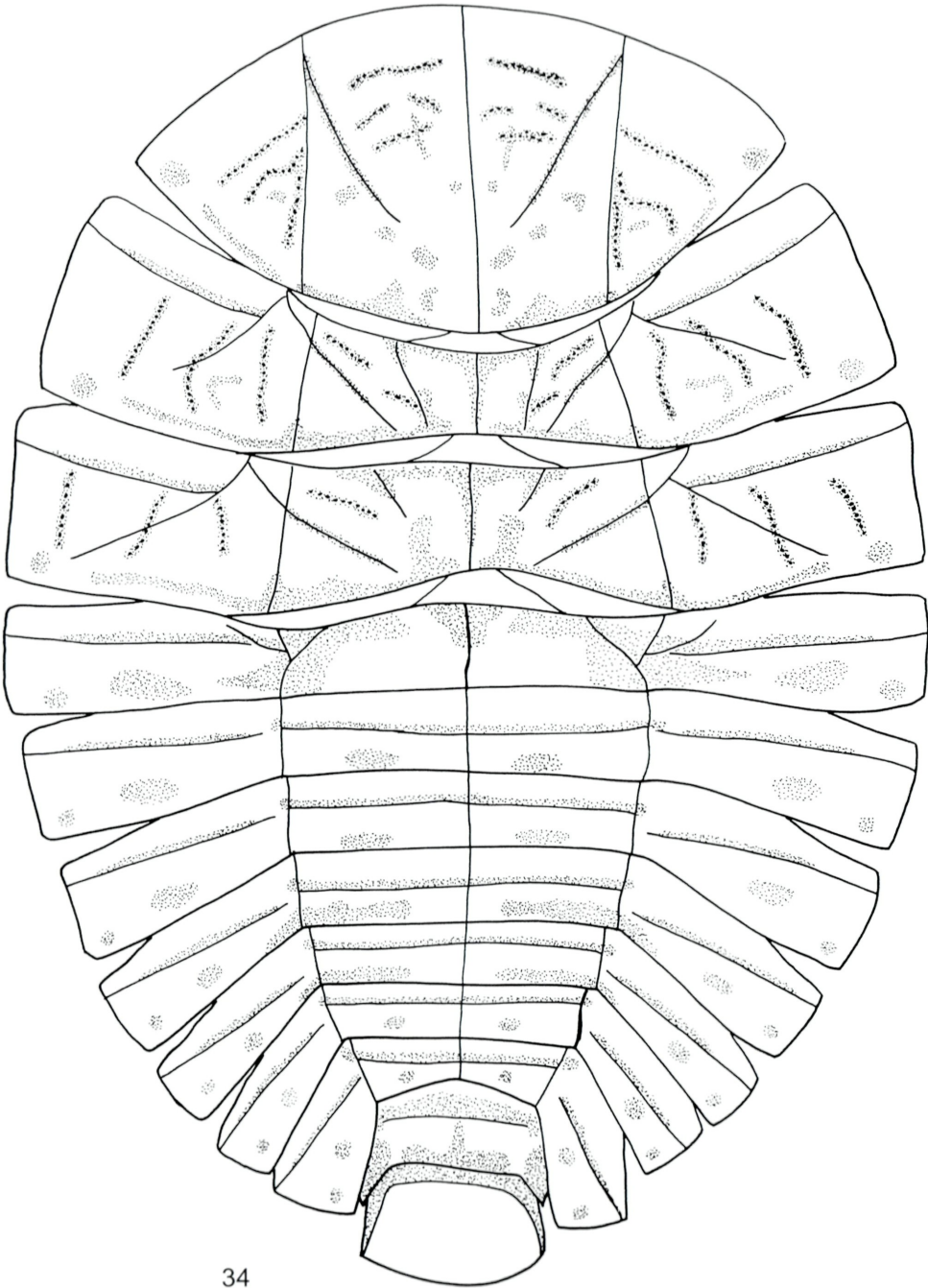
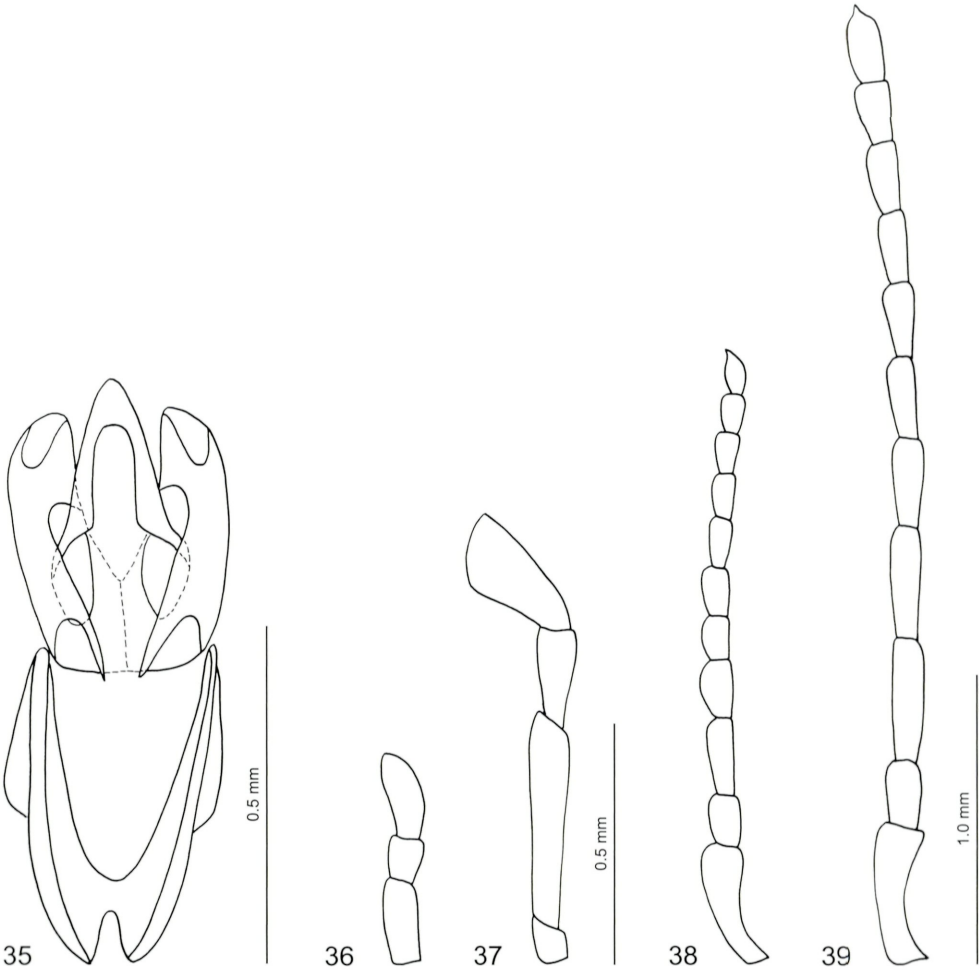
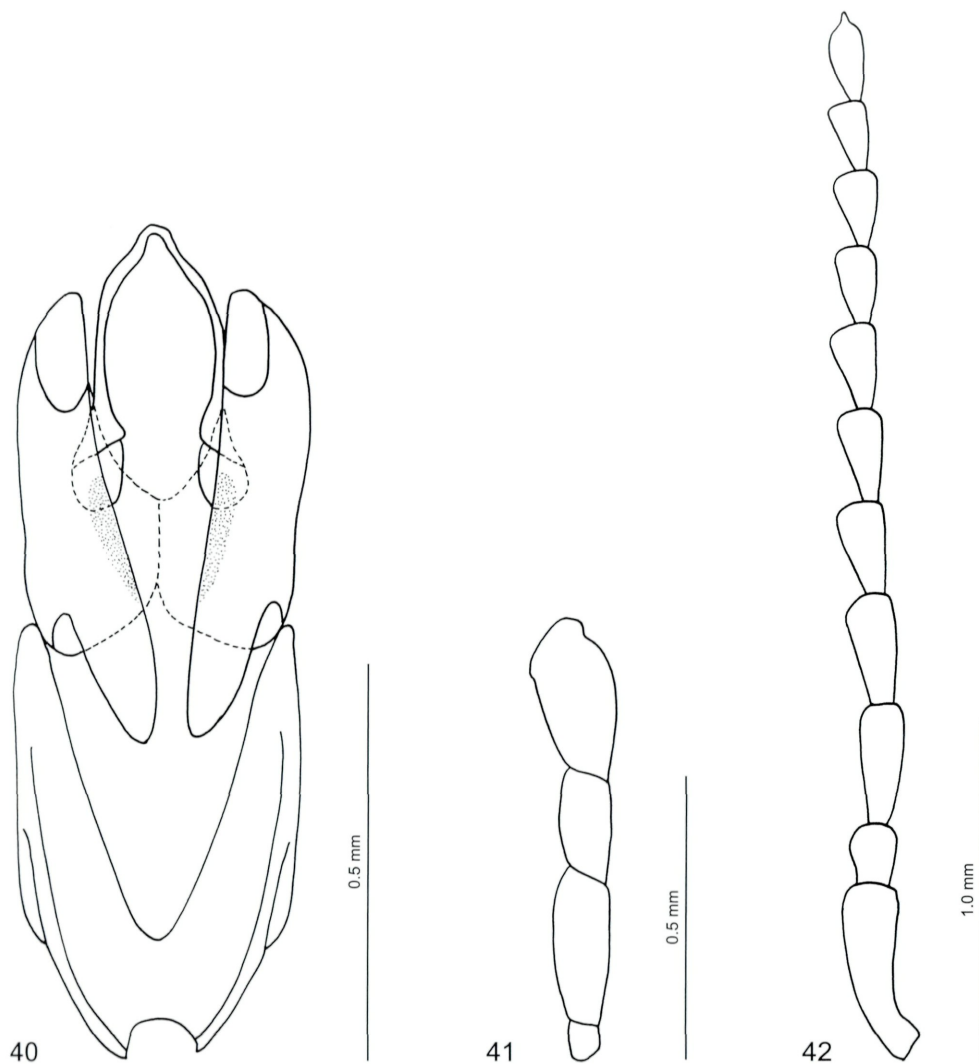


Fig. 34: *Mataeopsephus nitidipennis*, larva.

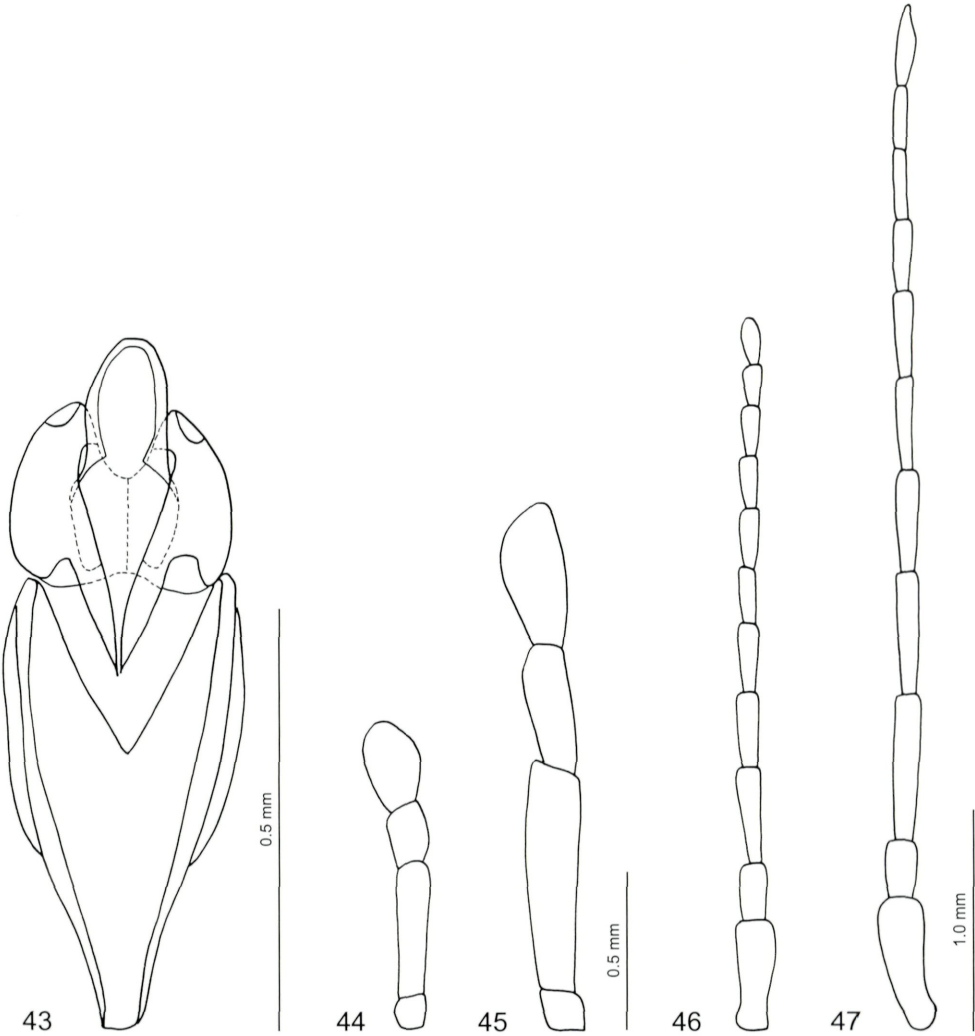


Figs. 35 - 39: *Mataeopsephus quadribbranchiae*: 35) aedeagus, ventral view, 36) female maxillary palpus, 37) male maxillary palpus, 38) female antenna, 39) male antenna.





Figs. 40 - 42: *Mataeopsephus sichuanensis*: 40) aedeagus, ventral view, 41) male maxillary palpus, 42) male antenna.



Figs. 43 - 47: *Mataeopsephus taiwanicus*: 43) aedeagus, ventral view, 44) female maxillary palpus, 45) male maxillary palpus, 46) female antenna, 47) male antenna.

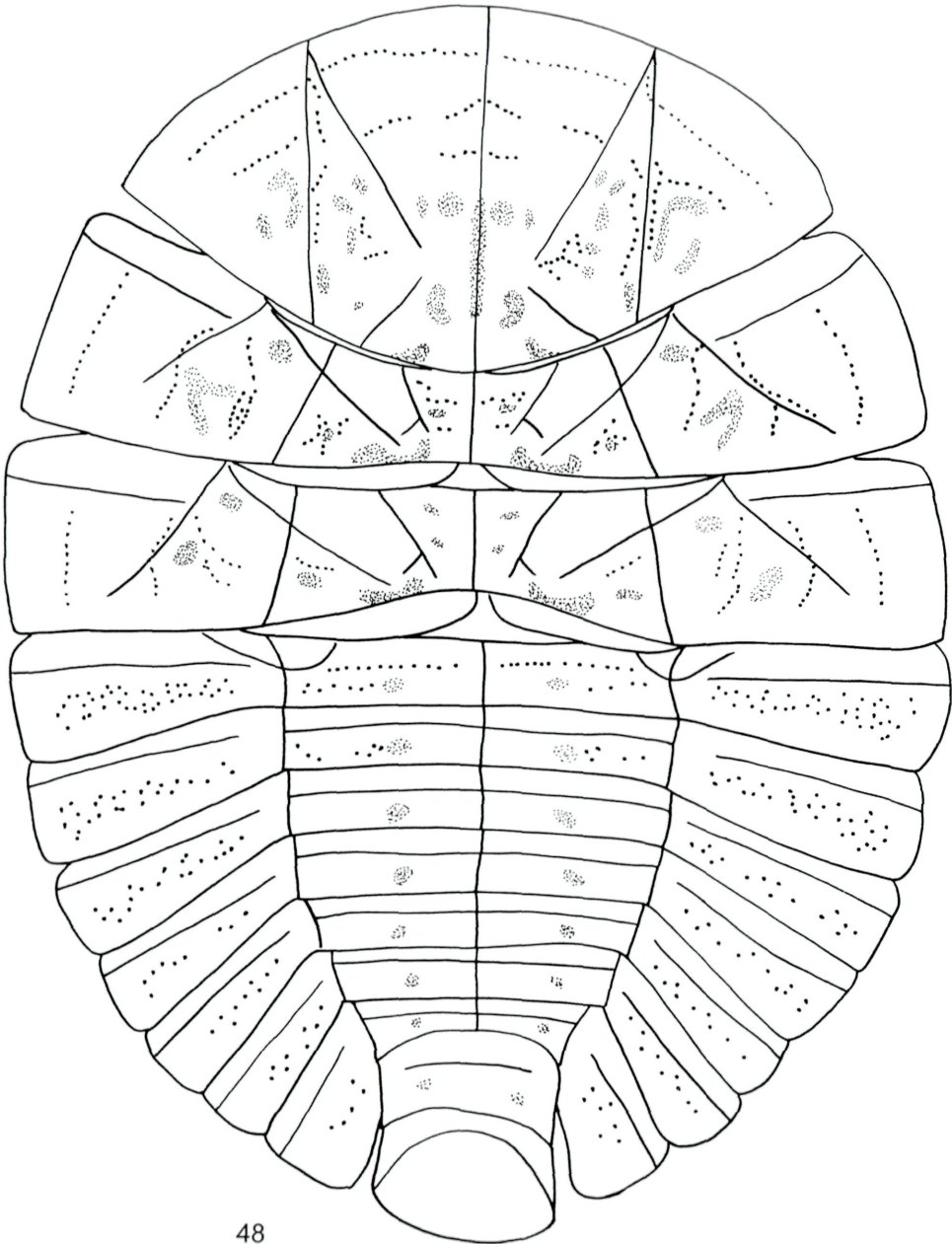
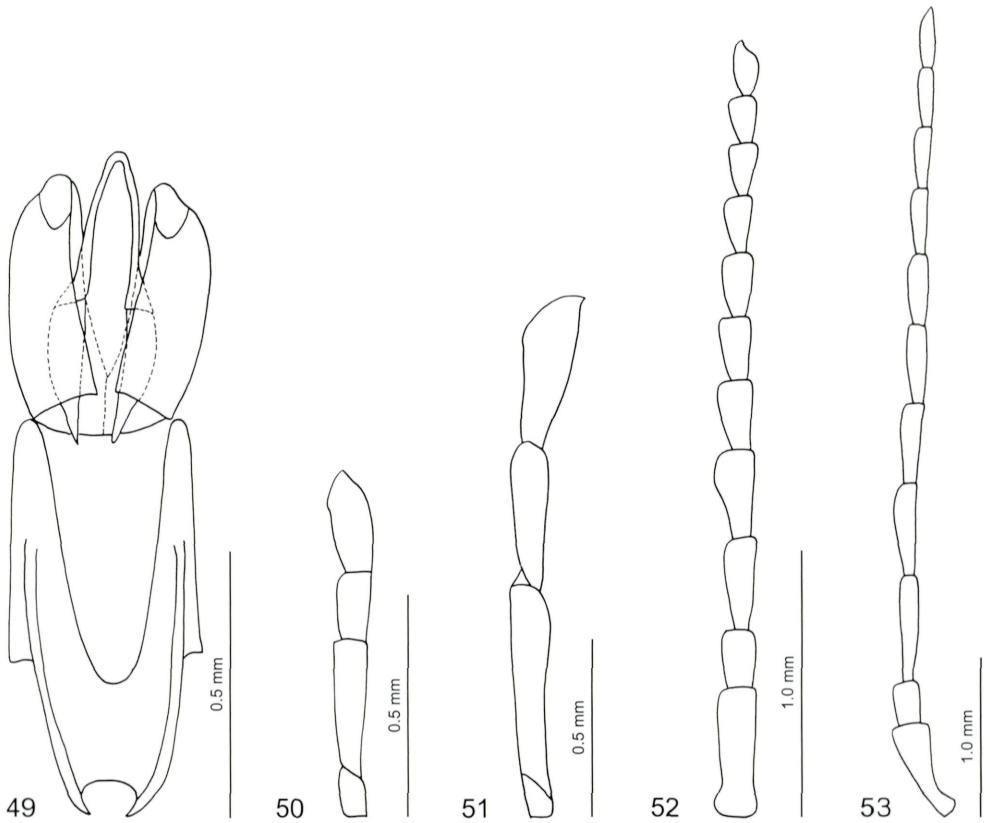


Fig. 48: *Mataeopsephus taiwanicus*, larva.



Figs. 49 - 53: *Mataeopsephus vietnamensis*: 49) aedeagus, ventral view, 50) female maxillary palpus, 51) male maxillary palpus, 52) female antenna, 53) male antenna.

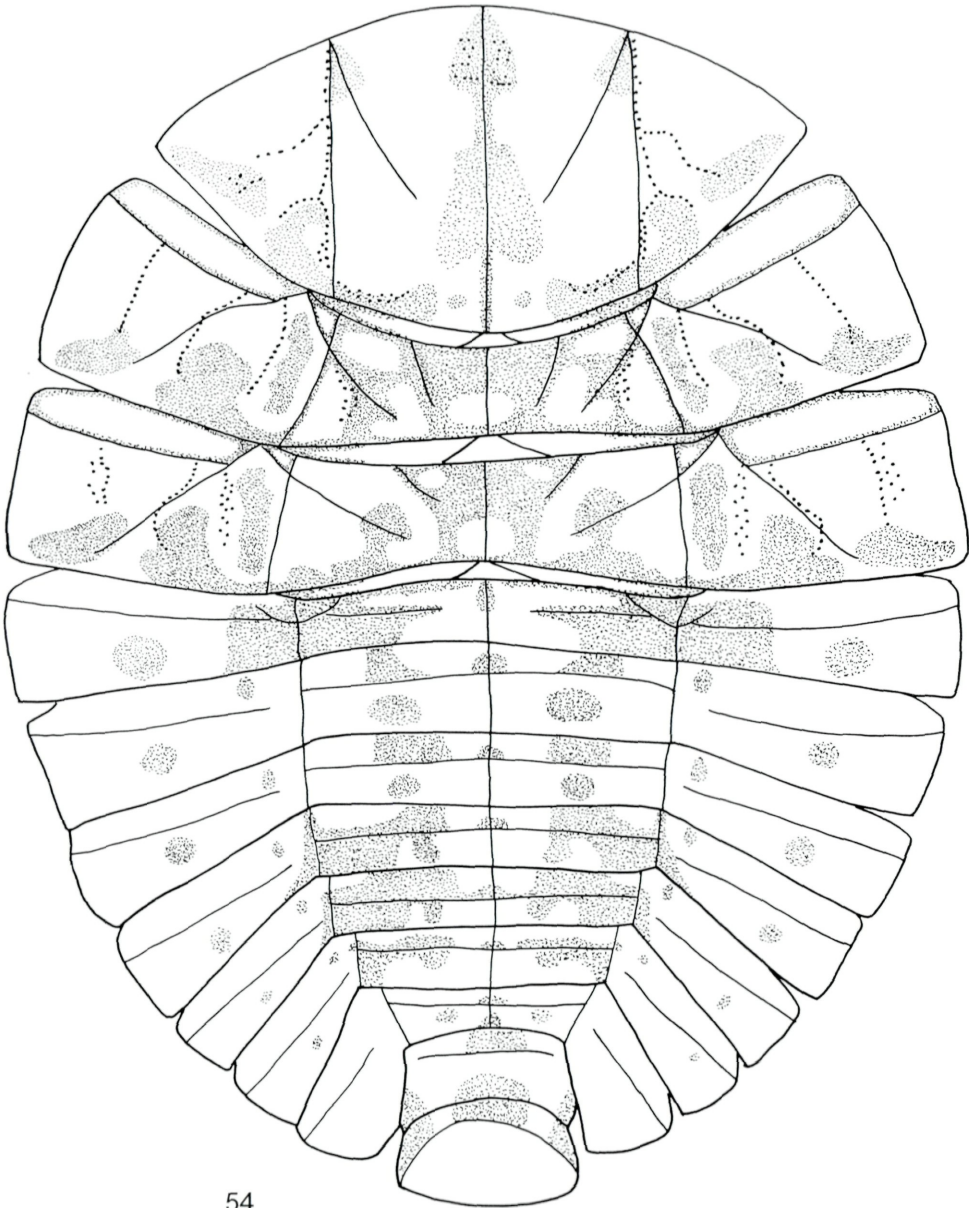


Fig. 54: *Mataeopsephus vietnamensis*, larva.



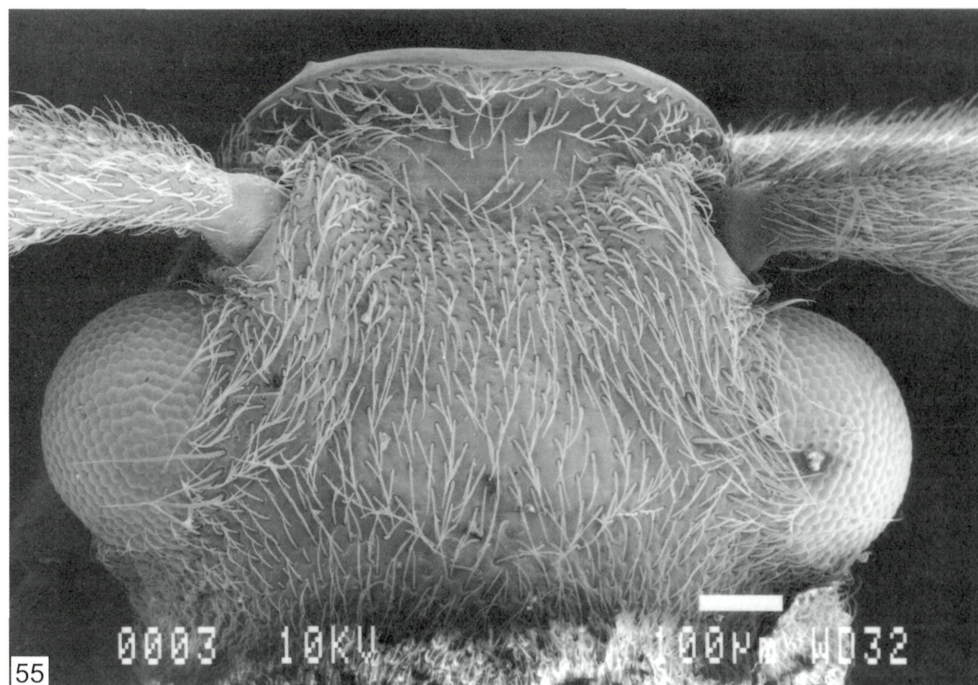


Fig. 55: *Mataeopsephus japonicus*, SEM photograph of head, dorsal view.

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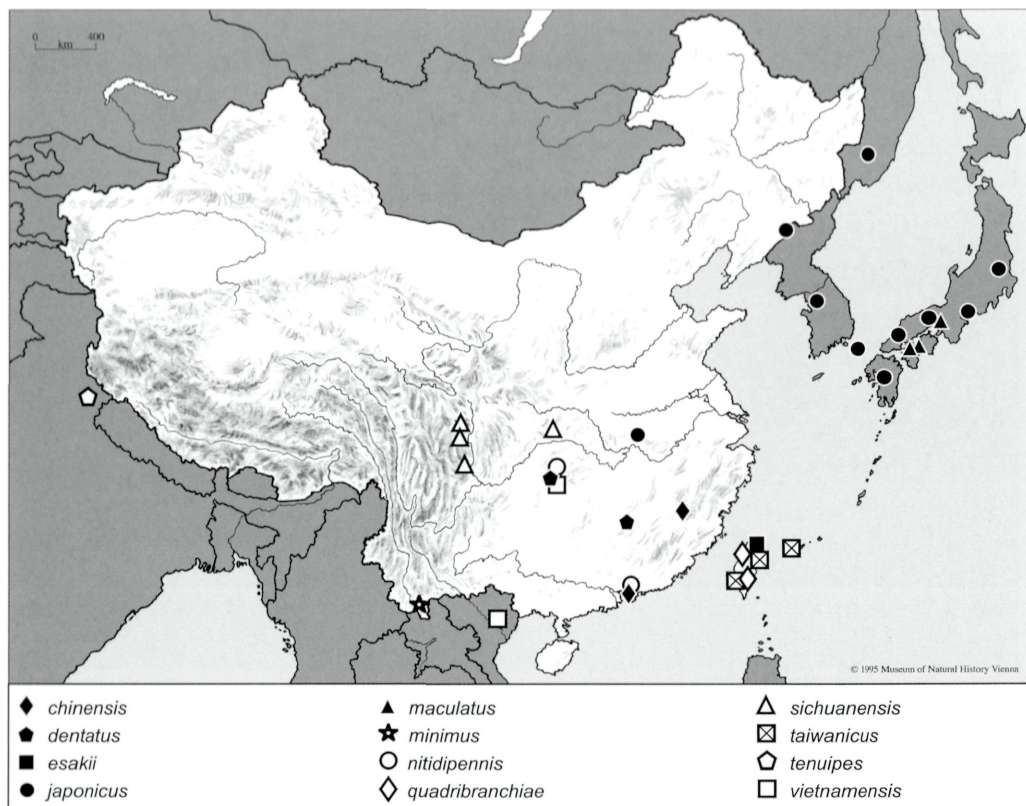


Fig. 56: Geographical distribution of the species of *Mataeopsephus*.

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