

Larva of *Tetrigus fleutiauxi** Van Zwaluwenburg

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The following description was prepared from material collected under the bark of a fallen tree on the island of Ongea-ndriti, in the Lau Archipelago of the Fiji Islands, at a point below the 300-foot elevation line on July 28, 1924. The larvae were collected by E. H. Bryan, Jr., of the Bernice P. Bishop Museum, and submitted for description by R. H. Van Zwaluwenburg, of Honolulu, Hawaii.

GENERAL DESCRIPTION

Length 19 mm., breadth 4 mm.

Body (figs. 5, 7, and 9) robust, dorso-ventrally depressed, subparallel, with all segments, except the ninth abdominal, of about the same width and wider than long. Feebly sclerotized and creamy white, except head, prothorax, mesothorax, legs, and ninth abdominal segment, which are moderately sclerotized and light brown.

Head (figs. 1 and 2) subquadrangular, laterally convex, slightly broader than long. Dorsal surface with a large, flat, depressed region limited on each side by a deep groove (*ds*, fig. 1) with elevated outer margin extending in an outward curve from the base of the antenna to near the collum (*col*, fig. 1). Frons and dorsal face of epicranium with numerous minute setae in rather large and deep cups; frons also with 4 pairs of long setae (*af*, *lf*₁, *lf*₂, and *pf*, fig. 1); epicranium with 3 additional pairs of long dorsal setae (*aed*, *led*, *ped*, fig. 1), a long series of setae of medium length along each of the deep dorsal epicranial grooves (*dss*, fig. 1), and setae of medium length distributed evenly over the surface. Ventral surface of cranium with a single longitudinal groove (*vs*, fig. 9a) on each side extending from near ventral end of pleurostoma obliquely inward toward paragenal area (*pge*, fig. 9a), the exterior limitation of which it forms. Two long setae (*lev*₁ and

*This species was described in *Stylops*, vol. 2, pt. 8, pp. 176-177, 2 figs., August 15, 1933.

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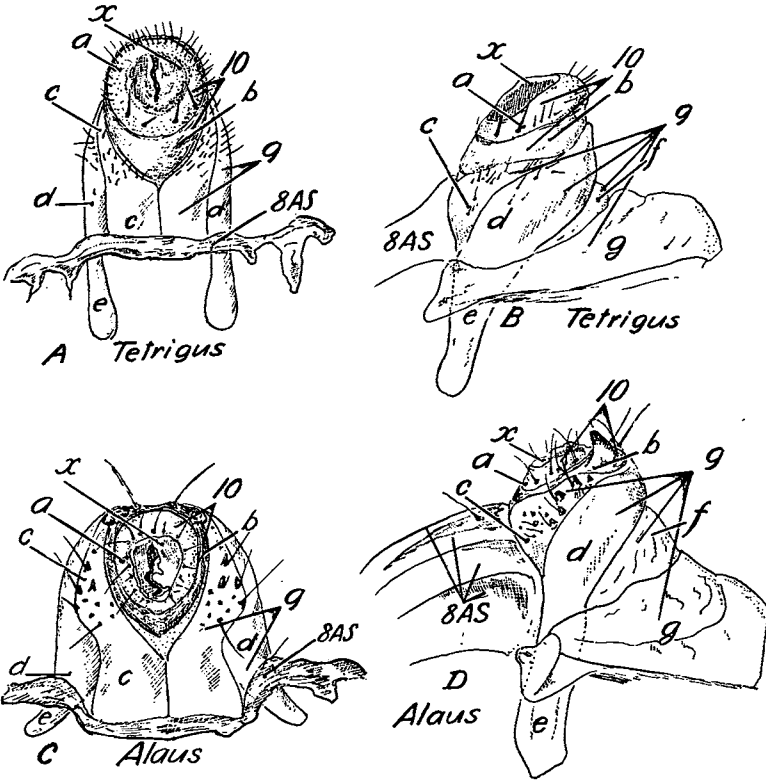
*lev*₂, fig. 2) on each side, a series of long and moderately long setae along the ventral groove (*vss*, fig. 2), and a few shorter setae placed antero-laterally and medio-laterally (fig. 2).

Terga of prothorax and mesothorax glabrous; terga of metathorax and first two abdominal segments asperate with very short, densely set setae arranged in a median patch covering about anterior half of terga; terga of third to eighth abdominal segments lacking this median patch (fig. 7); tergum of metathorax (*mtt*, fig. 8) with lateral patches of asperities flanking median patch; terga of first 3 abdominal segments (*1abd*, *2abd*, *3abd*, fig. 8) also with lateral patches but with the asperities decreasing posteriorly in size and numbers; terga of fourth and following abdominal segments to ninth with patches only feebly indicated or absent (fig. 7).

Ninth abdominal segment (figs. 5, 7, and 9) about two thirds as wide as preceding segments and, exclusive of the urogomphi, about as long as wide, subcordate, and terminating in a pair of short, biramous, upwardly directed urogomphi. Urogomphi distinctly separated by a subtriangular interspace with extreme width about equal to width of a single urogomphus. Dorsal surface of tergum rather densely beset with pointed asperities which increase in size posteriorly, each bearing a single seta at its base or several setae radiating from the base (figs. 7 and 7*a*). Pair of paramedian, straight, and parallel grooves extending from anterior margin of tergum to middle. Under surface of tergum without asperities but with many long, fine setae (figs. 5 and 9). Each ninth pleural area (*9p*, figs. 5 and 9; *d* and *e*, text figs. A and B) irregularly lanceolate, with proximal part (*e*) invaginated into connecting membrane between eighth and ninth segments; distal part nearing setae. Ninth sternite (*9st*, figs. 5 and 9; *c*, text figs. A and B) flat, with a sagittal suture; anterior margin straight, posterior margin deeply emarginate for reception of tenth abdominal segment; densely setose at emargination.

Tenth abdominal segment (10, figs. 5 and 9; *a* and *b*, text figs. A and B) tubular, short and stout, divided into a ring-shaped, slightly sclerotized proximal part (*b*) and a smaller, disklike, membranous distal part (*a*). Disklike part with a median longi-

tudinal anal slit. Margin of disk provided anteriorly with 4 strong setae and posteriorly with a semicircular series of fine, densely setae.



Ninth and Tenth Abdominal Segments of *Tetrigus* and *Alaus*

A, *Tetrigus*, ventral view; *B*, *Tetrigus*, lateral view;

C, *Alaus*, ventral view; *D*, *Alaus*, lateral view.

- a*, distal part of tenth abdominal segment;
- b*, proximal part of tenth abdominal segment;
- c*, ninth abdominal sternum;
- d*, distal part of ninth abdominal pleurum;
- e*, invaginated proximal part of ninth abdominal pleurum;
- f*, membrane between ninth abdominal pleurum and epipleurum;
- g*, ninth abdominal epipleurum;
- x*, region with anus;
- 8AS*, part of eighth abdominal segment.

DETAILED DESCRIPTION

Head (figs. 1 and 2) medium-sized; wider than long across the middle, considering the length from the insertion of the mandibles to the base of the head, subquadrangular with arcuate sides and a short collum (*col*, fig. 1); flattened above and below. Frontoclypeal region well limited by distinct frontal sutures; anterior part transverse, elongate-oval, laterally extending to bases of antennae; posterior part longitudinal, spatulate, extending back toward but not quite reaching occipital foramen. Gular suture long and well defined.

Nasale (*n*, fig. 1a) with 3 subequal, blunt lobes. Subnasale (*sn*, fig. 1a) also trilobed, but lateral subnasal lobes fused with lateral nasal lobes exteriorly; thus forming together a 4-leaf rosette.¹

Paranasal lobes (= frontal angles auct.) (*pn*, fig. 1) strongly produced beyond nasale, sulcate anteriorly. Anterior dorsal margin of sulcus with a row of long setae; anterior ventral margin densely pilose.

Talus (*tal*, fig. 1), with the condyle for the mandible, produced and strong.

Ocellus not well defined in preserved material at hand.

Antenna 3-jointed, about two thirds length of mandible. Basal joint (1, fig. 1) clavate; second joint (2, fig. 1) cylindrical, half as wide as basal joint and three fourths as long; apical joint (3, fig. 1) lost in specimen at hand. Sensory appendix (*sj*, fig. 1) inconspicuous, conical, and with a strong seta at base. Basal and second joints beset with several long, strong setae.

Mandible (fig. 6) falciform, with width at base about three fourths of length; terminal part incurved but strongly deflected upward. Inner face of terminal part excavated, with sharp edges and a median longitudinal carina. Retinaculum absent. Basal part (*b*) protuberant on side toward buccal cavity, rounded and carrying small granules. Fossa for antenna profound (fig. 7). Penicillus lacking. Two fine setae on outer face.

¹In elaterid and cantharoid larvae distinct subnasal features are present below nasale, consisting of the median subnasal denticles (or lobes) and a pair of wing-shaped, large, but often rather indistinctly defined, subnasal flaps on each side of the denticles. The entire subnasal region is here interpreted as representing the epipharyngeal region of coleopterous larvae which, as for instance in *Prionocyphon* or *Ptilodactyla*, possess a distinct labrum and clypeus. See Böving, A.G., and Craighead, F.C., "An illustrated synopsis of the principal larval forms of the order Coleoptera," 1931, plate 78, A, compared with plates 65, A, and 67, A. (Reprinted from Ent. Amer. 11 (n.s.): 1-351, illus.)

Ventral mouth parts as long as sides of head, excluding palpi and other appendices. These mouth parts move as a unit forward and backward usually in a horizontal plane with cardines acting as hinges (*c*, fig. 3).

Cardines (*c*, figs. 2 and 3) small, sagittally adjacent, obliterating submentum. Each cardo subtriangular, posteriorly attenuate and ending with a small, dark condyle which fits into a fossa of a small, triangular sclerome (*scl*, figs. 2 and 3) in the floor of the head immediately anterior to the bottom of the deep sinus of the basin-shaped hypostoma (*hy*, figs. 2, 3, and 9).

Stipites large, approximating at base (fig. 9). Proxistipes and dististipes distinctly separated. Proxistipes dark, hard, with sides subparallel, somewhat curved on outer margin but straight within, carrying numerous long setae distally on outside. Dististipes (*dis*, figs. 2 and 9) proximally dark, distally whitish, subtriangular, ventrally glabrous, dorsally densely setose toward buccal cavity; setae branched.

Lacinia (*lac*, fig. 2) elongate, rather indistinct, densely setose; setae branched.

Galea (*ga*, fig. 2) 2-jointed. Basal joint ring-shaped, slightly wider than long. Distal joint thimble-shaped, slightly more than twice as long as basal joint but not so wide, terminally beset with one strong spine, which is about as long as the joint itself and with a few shorter and finer setae.

Maxillary palpus 4-jointed. Basal joint (1, fig. 2) ring-shaped; second joint (2, fig. 2) cylindrical, three times as long as basal joint; third joint (3, fig. 2) ring-shaped, similar to basal joint but only about half as wide and somewhat shorter; distal joint (4, fig. 2) cylindrical, about three times as long as third joint but not so wide. All joints except distal joint beset with long, fine setae.

Submentum lacking.

²Mentum (fig. 9) dark and hard, elongate-triangular, tapering posteriorly; one pair of long setae present at anterior corners and one pair of long setae asymmetrically seated near posterior end of plate.

²The following recent terminology for the three main parts of the labium has merit and may possibly be applied in future descriptions: (1) "prementum" (=stipites labii, labiostipites, labium proper, or mentum); (2) "intermentum" (mentum of most authors, the present authors included); and (3) "submentum." When intermentum and submentum are fused, the term suggested for this joined part is "postmentum."

Prementum (fig. 9) dark and hard, subtrapezoidal, with anterior margin about as long as one of converging lateral margins, separated from mentum (intermentum) by light membranous skin.

Labial palpus (fig. 2) 2-jointed. Basal joint cylindrical, about as long and one third as wide as prementum; apical joint thimble-shaped, half as long and half as wide as basal joint. Inner side of basal joint dorsally beset with numerous long, fine, stiff setae. Apical joint without setae, sculptured with longitudinal lines and terminally provided with minute tactile papillae.

Ligula (fig. 2) vestigial, with a pair of long bristles inserted between bases of palpi.

Prehypopharynx (*hx*, fig. 2), or fore part of hypopharynx above prementum, membranous, with minute, posteriorly pointing asperities and a pair of short, strong setae. Posthypopharynx (*po hx*, fig. 2), or hind part of hypopharynx above mentum, posteriorly limited by hypopharyngeal sclerome, membranous, medially furnished with a dense tuft of silky hairs (*tu*, fig. 2). Hypopharyngeal sclerome (*hc*, fig. 2) dark and strong; laterally connected both with anterior ends of hypostoma (*hy*, fig. 2) by a pair of strong, rod-shaped braces (*hb*, fig. 2) and with frons near antennal ring by another pair of rod-shaped but somewhat weaker braces (*hr*, fig. 2). Mandible movable in V-shaped interspace between two sets of hypopharyngeal rods, and connected with these by a folded membrane. Anterior margin of an infolding of hypopharynx (*f*, fig. 2) in front of hypopharyngeal sclerome furnished with a transverse series of silky hairs. Maxillulae (*mxl*, fig. 2) situated on each side of median hair tuft of posthypopharynx, lobe-shaped, and completely covered with long, fine, branched hairs.

Prothorax (figs. 5, 7, and 9) covered dorsally with a subrectangular shield, which is somewhat wider than long, glabrous, with slightly sinuate transverse wrinkles and provided with a sagittal suture throughout its entire length. Anterior and posterior margins of shield membranous and longitudinally striate. Fine setae sparsely distributed in a row along anterior and posterior margins and on sides of shield. Epipleural areas (*eppl*, fig. 9a) subtriangular and membranous. Episternal plates (*eps*, fig. 9a) large, reaching the sides of the presternal plate (*pst*, fig. 9a) anteriorly; epi-

meron (*em*, fig. 9a) without distinct scleromes. Presternal area sclerotized, triangular, and large; eusternum (*est*, fig. 9a), in front of suture between furcal pits, membranous and small; sternellum (*stl*, fig. 9a) and post-sternellum (*post*, fig. 9a) small and membranous.

Mesothorax and metathorax each about half as long and nearly as wide as prothorax. Mesothorax dorsally covered with a glabrous shield, with only posterior margin membranous and longitudinally striate; sagittal suture posteriorly indistinct; row of sparse, fine setae along anterior, posterior, and lateral margins of shield. Metathorax slightly sclerotized dorsally, sagittal suture almost absent, and surface asperate with numerous short, strong, pointed setulae arranged densely in a median and two lateral patches (*mtt*, fig. 8). Mesothoracic and metathoracic epipleural and sternal areas of usual type; each triangular epipleural area carrying a small circular pore leading into a sac (fig. 5a).

Legs (fig. 4) of moderate size, strong, and the pairs approximate. Coxa (*cx*, fig. 4) sessile, oval with a shallow depression for receiving trochanter, proximally with a small, dark articulating cup, and distally with a large, obtuse projection; depression for trochanter flanked with long setae in a single row distally continued in a group of short, strong, thick, almost egg-shaped setae; a few typical setae scattered over entire surface. Trochanter (*tr*, fig. 4) cylindrical, more than half as long as coxa, longer on inner side than on outer side, beset with short, strong, almost egg-shaped setae in a dense patch on outer surface and in a more sparsely set patch on inner surface, ventrally with a series of long setae between patches. Femur (*fe*, fig. 4) obliquely attached to trochanter; not quite so long and wide as this joint; with a patch of short setae and a few long hairs, similar in form to those found on coxa and trochanter, both on inner and outer faces, each of these patches only half as large as on the more proximal joints. Tibio-tarsus (*ti-ta*, fig. 4) subcylindrical, tapering somewhat distally, about half as long and half as thick as femur, with 2 or 3 egg-shaped setae and a few long hairs. Ungula (*u*, fig. 4) hard and rather dark; straighter and blunter than usual in elaterid larvae; movably inserted in a small, membranous part bearing a ventral seta.

First to eighth abdominal segments about as wide as thoracic segments, tapering slightly in width posteriorly from seventh segment; thinly sclerotized, without tergal shields, and without the transverse and longitudinal impressions³ present in so many other elaterid larvae. Each segment directly in front of spiracles provided with a light-colored, rather fleshy, bilobed protuberance (*fpr*, fig. 8), each lobe of which carries terminally from 3 to 5 stiff, dark, pointed setae; setae from half as long as spiracles to longer. Terga bearing a sparse row of thin setae along the posterior margins.

First abdominal segment (*1abd*, fig. 8) with anterior two thirds of tergum densely beset with very short, strong, pointed setulae, arranged in a pattern as on metathorax.

Second and third abdominal terga (*2abd* and *3abd*, fig. 8) carrying similar but smaller patches of setulae. Fourth to eighth abdominal segments with only 2 or 3 setulae on each side near the spiracles.

Abdominal epipleural and pleural (hypopleural) areas (*eppl* and *hp*, fig. 9*a*) well defined and separated by a distinct ventro-lateral suture (*vl*, fig. 9*a*). Both areas with 2 or 3 setae at each end, and pleural area with an additional median seta. Epipleural lobe posteriorly with a distinct ring-shaped pore opening into a sac (fig. 5*a*). Sternal areas feebly sclerotized and carrying few setae.

Ninth abdominal segment dorsally (fig. 7) with a pair of paramedian and parallel furrows limiting a median rectangular region twice as long as wide. Anterior half of this region with about 25 short setae, posterior half with about 7 irregularly placed, small, dark asperities; each asperity with 1, rarely 2, moderately long setae at base. Dorsal surface laterad of furrows covered with fine, short setae and a few asperities with a seta at base; dorsal surface posterior to the rectangular region with 2 paramedian pairs of rather large asperities with star-shaped bases and 5 setae regularly arranged around the base of each; dorsal surface posterior to the regions laterad of the furrows with 2 asperities with star-shaped bases and about 5 setae at the base of each, and also with a few smaller asperities with 1 or 2 setae at the base. Ventral surface of

³ Usually, but erroneously, termed "muscular impressions." No muscles are attached to these areas.

ninth tergite (*9tg*, fig. 9) with fine, moderately long, or long setae. Each pleuron (*9p*, fig. 9), with strong retractor muscles attached to the invaginated proximal part (*e*, text figs. A and B), the distal and exposed part (*d*, text figs. A and B) with numerous fine setae at the end. Sternum (*9st*, figs. 5 and 9; *e*, text figs. A and B) proximally glabrous, distally with many fine setae.

Urogomphi (fig. 7*a*) separate; each dorsally with 2 long setae (*l* and *m*, fig. 7*a*) on outer prong and 1 long seta (*t*, fig. 7*a*) at base of inner prong close to outer prong; ventrally with 1 long seta (*v*, fig. 7*a*) at base of inner prong; with some additional minor setae both dorsally and ventrally.

Tenth abdominal segment (10, figs. 5 and 9) with ring-shaped proximal part glabrous and without hooks (*b*, text figs. A to D).

Spiracles (fig. 8) bifore,⁴ each situated in a membranous field which is limited by an indistinct, low, ring-shaped wall (*r*, fig. 8); the respiratory air tubes long, slender, slightly sinuate, almost parallel, adjacent and directed backward; the spiracular orifice itself closed by a callus (*cal*, fig. 8) situated anteriorly in a circular, membranous disk, the tectum (*tec*, fig. 8), in front of the respiratory tubes.

Phylogenetic Position

The systematic position of the genus *Tetrigus* seems perfectly clear according to its larval form. It approaches closely the larva of the genus *Hemirhipus*,⁵ of the subtribe Hemirhipina, of the tribe Pyrophorini. The two genera have a very characteristic general habitus and many anatomical features in common, but represent two well-defined generic forms.

It has been a matter of discussion between systematists working exclusively with the adults whether the genus *Alaus* should be placed in the Hemirhipina or in the Chalcolepidina. Thus, *Alaus* is included in the Hemirhipina by Candeze⁶ and the South American species are separated out under the generic name *Calais*. The

⁴ The term "bifore" (altered by different authors to "biforous" or "biforate") is derived from the Latin adjective "biforis," meaning "with two entrances." The term was originally introduced by J. C. Schiodte, "De Metamorphosi Eleutheratorum Observationes. Pars II," Naturhist. Tidsskr. (3) 3:150, 1864 (spiracula biforia).

⁵ The larva of *Hemirhipus* is mentioned by the senior author in "Phylogeny of the Elateridae based on larval characters," Ann. Ent. Soc. Amer. 10:252, 1917, and is figured by him in "An illustrated synopsis of the principal larval forms of the order Coleoptera," by A. G. Böving and F. C. Craighead, 1931, plate 84, A-G (see footnote 1).

⁶ Candeze, M. E. Monographie des Elaterides, v. 1, p. 201, 1857.

North American species of *Alaus* are not congeneric with those of South America, Asia, and Africa; the latter may possibly be in the subtribe Hemirhipina. The North American species belong to the Chalcolepidina.

In common with the other larvae of the tribe Pyrophorini, the larvae of the subtribe Hemirhipina have a smooth head without numerous long scales, a body without a furlike covering, a pointed mandible without retinaculum or other teeth, and a triangular, posteriorly pointed mentum with converging sides.

Besides these common characters the larvae of the Hemirhipina possess the following special subtribal characters: The nasale and subnasale form together a rosette-like mass with 4 leaves; the first to eighth abdominal segments are very thinly sclerotized with no dorsal shields, but with short, strong asperities arranged in definite pattern, at least on the first 3 segments; and the spiracles have long, closely contiguous respiratory tubes.

In comparison, the larvae of the Chalcolepidina have a nasale with 3 denticles in the same plane and an anteriorly convex, finely serrate, and ridge-shaped subnasale, which is considerably longer transversally than the nasale and does not unite with it laterally; the first to eighth abdominal segments are somewhat sclerotized on the exposed parts but bear no definite shields, are glabrous, shining, and provided with only a few silky hairs; and the spiracles have the respiratory tubes widely diverging anteriorly.

The following key may serve for the determination of the larvae of the two genera *Tetrigus* and *Hemirhipus*:

Frontal sutures obliterated; dorsal patches of small asperities present on the terga of the first to eighth abdominal segments; bilobed, fleshy processes lacking in front of the spiracles; urogomphi fused into a thick, biramous process; scansorial hooks present on the ring-shaped sclerome of the tenth abdominal segment.....*Hemirhipus*

[*H. fascicularis* (Fab.)]

Frontal sutures distinct; dorsal patches of small asperities present on the terga of the first to third abdominal segments; bilobed, fleshy processes present in front of the spiracles, each lobe carrying 4 to 5 long, stiff, and spinelike setae; urogomphi short, paired, each urogomphus terminally biramous; scansorial hooks absent on the ring-shaped sclerome of the tenth abdominal segment.....*Tetrigus*

(*T. fleutiauxi* Van Zwaluw.)

ABBREVIATIONS USED FOR THE FIGURES OF PLATE I

- abd*, abdominal segment
aed, dorsal antero-epicranial seta
af, antero-frontal seta
b, basal part of mandible
c, cardo
cal, callus closing opening of spiracular mouthpiece
col, collum
cx, coxa
cxl, coxal lobe
dis, dististipes
ds, dorsal sulcus
dss, dorso-sulcal setae
em, epimeron
epf, epipleuron
eps, episternum
est, eusternum
f, membrane in front of hypopharyngeal sclerome
fe, femur
fpr, fleshy furcate process in front of abdominal spiracles
ga, galea
hb, hypopharyngeal bracon, or rod-shaped brace between hypopharyngeal sclerome and hypostoma
hc, hypopharyngeal sclerome
hp, pleuron (= hypopleuron)
hr, rod between hypopharyngeal sclerome and frons near antenna
hx, prehypopharynx
hy, hypostoma
l, exterior seta of outer prong of urogomphus
lac, lacinia
led, dorsal latero-epicranial seta
lev₁, ventral anterior latero-epicranial seta
lev₂, ventral posterior latero-epicranial seta
lf₁, interior latero-frontal seta
lf₂, exterior latero-frontal seta
m, interior seta of outer prong of urogomphus
mst, mesothorax
mti, metathorax
mxl, maxillulae
n, nasale
p, pleura of ninth abdominal segment
ped, dorsal postero-epicranial seta
pf, postero-frontal seta
pge, paragenal area
pn, paranasal lobe
pohx, posthypopharynx
post, post-sternellum
pst, presternum

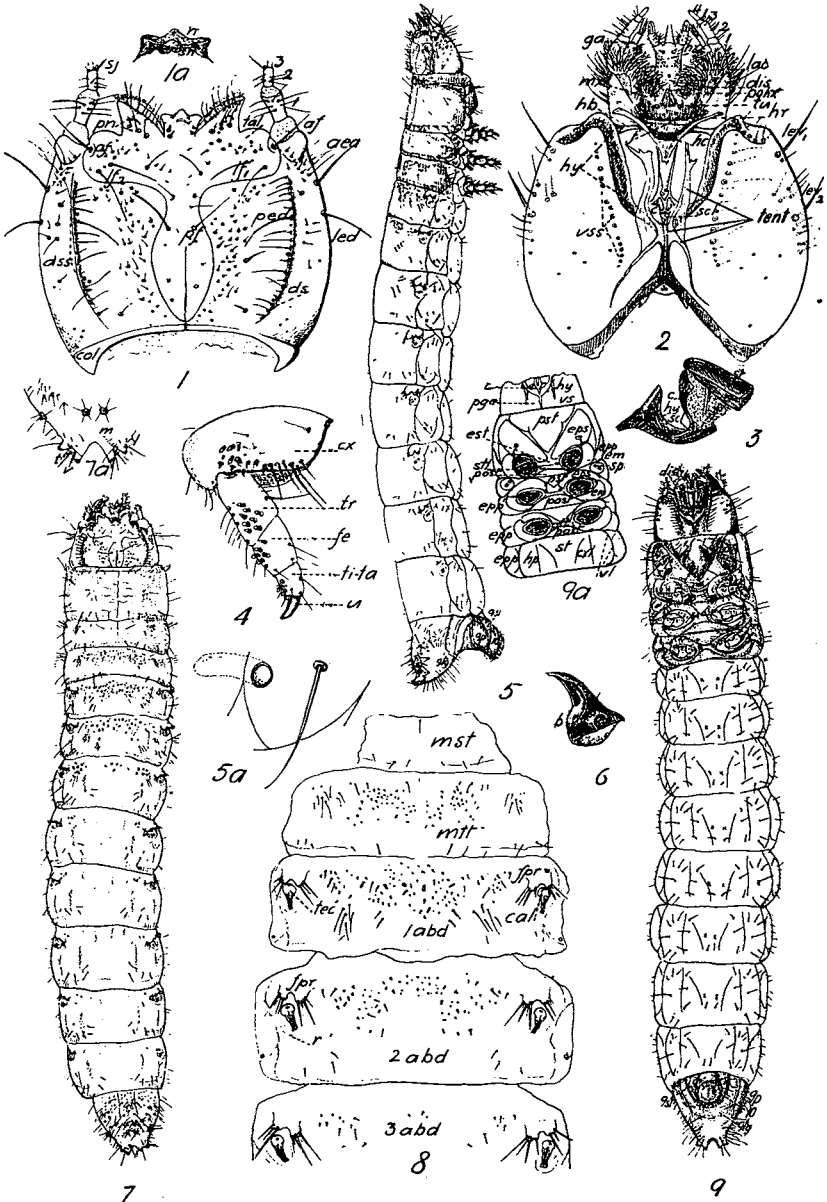
r, ring-shaped wall around membranous field in which spiracle is seated
scl, sclerome carrying cardines
sj, sensory appendix (= supplementary joint)
sn, subnasale
sp, spiracle
st, sternum
stl, sternellum
t, dorsal seta of inner prong of urogomphus
tal, talus
tec, tectus, or membranous disk with spiracular opening
tent, tentorium with bridge, anterior and posterior arms
tg, tergum of ninth abdominal segment
ti-ta, tibio-tarsus
tr, trochanter
tu, hair tuft on posthypopharynx
u, ungula (= dactylopodite of Snodgrass)
v, ventral seta of inner prong of urogomphus
vl, ventro-lateral suture
vs, ventral sulcus of cranium
vss, ventro-sulcal setae

EXPLANATION OF PLATE I

(Drawn by A. G. Böving)

Tetrigus fleutiauxi Van Zwaluwenburg

- Fig. 1.—Head, dorsal view
 Fig. 1a.—Nasale and subnasale, ventral view
 Fig. 2.—Head, inner view of ventral side of cranium
 Fig. 3.—Diagram demonstrating horizontal movements of ventral mouth parts with cardines acting as hinges (see p....)
 Fig. 4.—Left prothoracic leg, exterior view
 Fig. 5.—Larva, lateral view
 Fig. 5a.—Epipleural sac
 Fig. 6.—Right mandible, dorsal view
 Fig. 7.—Larva, dorsal view
 Fig. 7a.—Tip of urogomphi, dorsal view
 Fig. 8.—Metathorax and first three abdominal segments, dorsal view
 Fig. 9.—Larva, ventral view
 Fig. 9a.—Anterior part of fig. 9, with areas marked



Tetrigus fleutiauxi van Zwaluwenburg

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