

**Contributions to the knowledge of the
life-habits, development and syste-
matics of the Coleoptera.**

IV.

**On the larva of *Batrisodes venustus* Reichenb.,
with remarks on the life-habits of other
so-called myrmecophile Coleoptera.**

By

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With Plate I.

Since Fr. Meinert in 1881 described the larva of *Scydmaenus* the want of knowledge of the Pselaphid larva has been severely felt, the more so as this family contains so many genera and species.

Certainly two descriptions on larvae have been published later (Xambeu (1889) and Ganglbauer (1895)), referring according to the authors to *Chennium bituberculatum* Latr. But beyond the fact of the said larvae being found in the nests of those ants where also *Chennium* Imagines were found and in society with the latter, there is absolutely nothing to justify the referring of these larvae to the *Pselaphidae*. Ganglbauer's larva must, especially according to the shape of the clypeus, the mandibles, the other mouth parts and the cerci, absolutely be referred to some of the many genera of the Staphylinid family, to which, as far as it appears, the larva described by Xambeu also must be referred.

At the outset it was to be presumed, that the larva belonging to a family so remarkable as the *Pselaphidae* — the species of which are some of the most interesting

within the Coleoptera — might be very characteristic and distinctly different from the Staphylinid larvae. The larva, which I have found and judged to be *Batrisodes venustus*, is likewise the above named not reared, and when nevertheless I am giving the following description under this name, it is firstly due to the fact, that it differs essentially from all Staphylinid larvae. After a preliminary microscopic examination of the larva, I was sure that it not only represented a new generic type, but also a quite new family type, the correct reference of which would not cause unsurmountable difficulties, as the number of Coleopterous families found in Denmark, the larvae of which are unknown, is only 2, viz *Pselaphidae* (incl. *Clavigeridae*) and *Sphaeriidae*.

The *Sphaeriidae* may be left out of consideration on account of the Imagines being too small, when compared with my larva.

Thus the *Pselaphidae* is the only family to which it may be referred. As to the larvae previously described as Pselaphids I must remark, that the larva described by Chapman as belonging to *Claviger longicornis* is not at all a *Claviger*, but a Staphylinid belonging to the tribe *Paederini* and nearly related with the genera *Medon* and *Stilicus*, thus representing the larva of *Sunius*, *Scopaeus* or another undescribed Paederin genus (cfr. Peyerimhoff 1914), and the larva described by Wasmann (1918) as most probably that of the central african *Rhadamopsis Bickmanni* Reichensp. is also according to my view a Staphylinid*). v. Heyden (1904) has shortly described the larva of *Claviger testaceus*, this description refers most probably to the real *Claviger* larva, as it in essential respects agrees with the larva found by me.

*) Professor Wasmann was so kind to send me the *Rhadamopsis* larva for examination, for which favour I beg him receive my best thanks.

When I however have judged my larva not to be a *Claviger*, but another Pselaphid it is due to the fact that I found my specimen — only one specimen was found — in a forest (Boserup Skov) near Roskilde the 10th May 1908 in a red rotten oak stump together with more than 20 Imagines of *Batrisodes venustus* Reichenb., and according to the above I feel justified in referring it to this species.

Imagines of *Batrisodes venustus* I had already observed in the same place the preceding year (the 12th May 1907), but only a couple of specimens; I found the species again on 16th May 1910 in an oak („Kongeegen“) in a forest (Nordskoven) near Jægerspris, also only two specimens, and this time under the same conditions as when first I found them. The Imagines — as well as the larva — were in each case found in such places in the rotten oak which could be cleft in flat pieces, and which were moist and sappy and pervaded by the mycelium of some Polyporaceae. I observed in this rotten oakwood several galleries, probably made by the larvae of gnats, but I never found such larvae, nor mites*) there, the only living being besides *Batrisodes* being *Caenoscelis ferrugineus* — one Imago in each of the stumps examined by me in Boserup.

I therefore consider the *Batrisodes* as hardly being carnivorous, and suppose that in some way or other it feeds on the sap in the rotten oak or — by some species — perhaps on the fungous mycelium.

I only found the *Batrisodes* in such parts of the rotten wood which were sheltered from the rain; the other parts exposed to the rain or reduced to dust did not harbour any life whatever.

*) According to Wasmann (1892) *Batrisodes adnexus* feeds on mites in ants' nests, and Wasmann considers this fact the main cause that *B. adnexus* and *oculatus* are treated in a friendly manner by *Lasius brunneus*.

I consider it impossible that the species has any connection with ants (Wasmann, Ganglbauer and others are thus in an error in naming *Lasius brunneus* and *Ponera contracta* as hosts for this species) and furthermore I was not able to find any *Lasius* or other ant species in any of the abovenamed localities.

In this connection I shall mention another species of *Pselaphidae*, viz. *Trichonyx sulcicollis* Reichenb. As already known, it is said to be myrmecophile and live together with *Lasius brunneus* and *Ponera contracta*. I have sometimes been able to observe this species, which I am sure is neither a guest of ants; I feel convinced that it lives in the sappy or partly rotten portions of the wood of old trees and stumps. Under such circumstances, at any rate, I found on the 14th July 1907 five imagines in a hollow poplar stump at Bognæs. The stump was not occupied by ants, and *Trichonyx sulcicollis* only lived in the inner sappy, almost rotten parts of the wood; nor was it possible here to find any insect or larva or mite that might serve as food. It was evidently only the sap that the *Trichonyx* had searched for.

Another specimen of *T. sulcicollis* was found in a mole's nest in the forest Ermelunden on the 12th May 1912; it is to be supposed that it had hibernated in the nest. Ants were not to be found here or in the nearest environs.

As *Trichonyx*, after all, in this country, is not found with *Lasius brunneus* or with any other ant species, and as it was found almost each time under bark and moss, I suppose that this species as well as *Batrisodes venustus* are quite independant of ants and breeds in old trees and stumps.

Several of the coleoptera which in literature are recorded to be myrmecophiles and, as a matter of fact, are constantly found in nests of *Lasius*, I have observed several times, and my opinion is that they are not myrmecophiles. The fact, that they are found together with

Lasius, is easily explained: the conditions which have allured the ants have also allured the beetles, and both have found in the old trees and stumps the food which they especially are in search for.

Thus I have often observed the following four species: *Ediquus microps* Grav., *Xylodromus depressus* Gyll., *Leptinus testaceus* Müll. and *Nemadus colonoides* Kr. in various localities, especially during several years in an old, decayed, hollow beech in the park at Lethraborg. In this beech *Lasius fuliginosus* had founded a large colony, and when I sifted the leaves at the foot of the tree, I found among the great crowd of ants not only the common myrmecophiles as *Myrmedonia*, *Oxypoda* a. o., but also other species of beetles, — such as *Xylodromus depressus*, *Ediquus microps* and *Leptinus testaceus*; in the same way I found *Nemadus colonoides* in the deposit in the hollow of the tree. In literature it is stated that *Ediquus microps* is a guest of *Lasius fuliginosus*, and *Nemadus colonoides* of *L. fuliginosus* and *L. brunneus*, but neither these two nor the two other above named species of beetles are to be considered as guests of ants; they only live in the old wood because the circumstances there are favorable for their development (cfr. Heselhaus 1914 and 1915).

Ediquus microps occurs in hollow beeches, oaks and elms with sappy dust. Especially in such elms in „Dyrehaven“ I have observed the species in great numbers, but there I never found it in society with *Lasius fuliginosus* or any other *Lasius* species, but exclusively in the sappy dust.

Xylodromus depressus, *Leptinus testaceus* and *Nemadus colonoides* are on the other hand typical inhabitants of nests; the two first named in mouse's nests, — and they were also found in such a nest in the beech at Lethraborg, — *Nemadus colonoides* in a bird's nest in the cavity in the tree.*)

In no case the beetles were annoyed by the ants, as far as I could observe, but they seemed to be on friendly terms with them.

It is a fact that the above named species frequently occur in the colonies of *Lasius* in old trees, but as to their life-habits they may be classified in the following way:

Species living in old trees, „nidicoles“: *Xylo-dromus depressus* and *Leptinus testaceus*, in mouse's nests; the species of *Microglossa* and *Nemadus colonoides*, in bird's nests.

Species living in sappy or rotten wood in old trees and likely feeding on the sap, or eating living organisms in the sap: *Batrisodes venustus*, *Trichonyx sulci-collis*, *Ediquus microps*.

The larva of *Batrisodes venustus* Reichenb.

The following description of the larva of *Batrisodes* is based upon the above named single specimen which was found more than ten years ago; searching later on for it has been in vain. Before proceeding to the description I should like to take some reservation as to the interpretation of the description of some parts viz: mentum, ocelli, spiracles, insertion of cerci and the first joint of the antennae, — the interpretation of which, at the present condition of the larva, is very difficult; a further treatment of the larva with chemical reagents would however scarcely give any other result than perfectly destroying it. Therefore I have confined the examination to what is mentioned in the following description:

*) When the species of *Microglossa* are found with *Lasius fuliginosus*, the circumstances are really the same as to *Nemadus*: They live in bird's nests, and it will always turn out to be the case, that the tree in question has both ant's nests and bird's nests.

General description: Body short and broad, nearly fusiform, a little more than three and a half times longer than broad, prothorax and 2'—3' abdominal segment narrower. Head as broad as meso- and metathorax. Prothorax about one fourth narrower than these. Abdominal segments short and broad, 1' segment nearly as broad as metathorax, 2'—3' segment a little narrower, the 4' somewhat broader than the 1', then equally decreasing in width posteriorly. The three thoracal segments with light yellow, distinctly formed dorsal plates and as well as the cranium rather strongly chitinized. Bristles long, especially on the abdominal segments. Legs long and slender, with scanty, long, strong bristles. Anal segment broad, cup-shaped, dilated towards the tip. Longitude 1,5 mm.

Head, caput, bent a little downwards, one third broader than long, without collar contraction. Sides of epicranium strongly curved, shortly before the occipital margin a little contracted. The whole cranium with a few long forwards directed bristles. Ocelli very indistinct, apparently only represented by a single not prominent ocellus behind each of the antennae. Frontale about one third broader than long, provided with some long bristles. The frontal sutures take their rise in front close before the antennae; in the first three fourths they are straight and are meeting each other at the epicranial suture in a little concave bow. The epicranial suture scarcely visible. Through the whole frontale goes a broad longitudinal furrow which is posteriorly tapering. The fore margin of epistoma on each side of the longitudinal furrow with a knotformed protuberance each of which with two long bristles. It is prolonged to a rectangular prominent nasale, provided with 2 short, obtuse teeth bearing a long bristle close to the antennae and a short one near the teeth. Antennae short and thick, three-jointed, provided with very curious sensories. 1' joint a

little longer than broad, mostly immersed in the cranium by means of a very large and soft membrane, apparently permitting the larva to push forward the antennae in the same way as the *Drilus*-larva. 2' joint narrowest at the base. The inner side equally becoming broader anteriorly, the outer side on the last thirdpart much enlarged and bearing a large, two-lobed appendix. Between the two lobes a narrow oblong opening out of which the tip of a large triangular organ protrudes to which 2 nerves are leading. On the outer side the 2' joint has a long bristle near the base, in the middle a shorter one, and on the inner side above a short and thick bristle. 3' joint small, one third shorter and only half as broad as 2' joint, inserted excentrically on this (nearest the inner side of 2' joint) and at the tip provided with 4 sensitive hairs: 1 extremely long, nearly one time and a half as long as all the antennal joints together, on the inner side, and on the knotformed enlarged anterior corner on the outer side 3 bristles close together. Mandibles curved, unsymmetrical. When closed, the two mandibles are crossing each other so much that their backs almost are forming a straight line. Right mandible provided with 6 teeth on its cutting edge from a little beyond middle and out to the tip; the 2' tooth is large and strong with a sharp apex. On the flat underside of the mandible there are 3 smaller blunt teeth in a flat bow on the midmost third part. Penicillum absent. On the inmost third part of the back of the mandible there are 2 strong, short bristles. Left mandible on its cutting edge in the utmost halfpart with 4 rather strong teeth and on the back with 2 bristles as on the right mandible. On the maxillae the *cardo* is somewhat broader than the basal joint of stipes, and provided with a single bristle. Stipes longer than broad, broader anteriorly than posteriorly. It bears anteriorly a cuneate lacinia about as long as the stipes, terminating with an obtuse tip and on

the inner edge provided with 3 short, thick spines; at the tip of lacinia there are also 3 somewhat longer spines and a little slender, and on the underside near the base one single spine. Stipes palpiger maxillarum a little broader than long, broadest in the middle, nearly globular at the base, with a long bristle and a two-jointed palpus maxillaris, the first joint of which is conical, at the base a little more than half as broad as stipes palpiger; the inner and outer margin are each provided with a bristle; 2' joint long, subulate, a little more than twice as long as the 1'. It has been very difficult on the specimen in question to elude the accurate shape of mentum, submentum and stipes palparum labialium, and my drawing is therefore to be used with criticism. Ligula absent. The labial palpus rather slender, two-jointed; 1' joint a little longer than broad; 2' joint very thin, subulate, nearly twice as long as the 1'.

Prothorax narrower than head and metathorax, narrowest anteriorly and with straight, posteriorly slightly diverging sides. The anterior margin strongly rounded, the posterior margin slightly rounded. Meso- and metathorax much broader than long, nearly thrice as broad as long. The dorsal plates of the thoracal segments are almost perfectly covering the segments and are each provided with 12 bristles. On prothorax they are arranged in the following way: in the middle there are 3 transversal rows, the two anterior of which with 2, the 3' with 4 short bristles, and near the sidemargins 2 long bristles at each side. Mesothorax as well as metathorax has each 2 transversal rows, each of which with 4 short bristles, and at the anterior corners each 2 long bristles. The abdominal segments extremely short, until six times as broad as long, from 3' segment slightly decreasing in width posteriorly. The dorsal plates thinly chitinized, perfectly covering the abdominal segments; they are all provided with long bristles which are shortest on the 1'

segment and then slightly increasing in length until the 9' segment. The number of bristles varies from 6 until 12 on each segment. The ventral segments are also provided with long bristles. The 9' segment bears 2 long subulate cerci. The anal segment broad and strong, towards the tip cup-shaped dilated. I have not been able to observe a pygopodium, but it is hardly absent.

Legs thin and long, five-jointed as in the Staphylinid larvae; they are differing from the legs of the latter in their structure and as to their muscles. In spite of their slenderness they may not be interpreted as cursorial legs, but as grasping or climbing legs, adapted to hook on to the rotten oakwood, and the well developed anal segment is supporting them. Coxae strong and broad and with the usual four direct coxal muscles (cm, cm1, cm2, cm3) strongly developed. Trochanter rather large, triangular; direct muscles absent. Femur a little longer than coxa, somewhat contracted near trochanter, then the width slightly increasing towards the tip. The two usual direct muscles are present, viz. the upper extensor (d1) and the lower flexor (d2), both attached to the upper wall of femur close to trochanter, moreover there is a „bridge muscle“ passing through trochanter, where it is attached to the lower wall of this joint, and femur, where it joins the flexor muscle. The next joint, which preliminarily we name tibia, is long and narrow, a little longer than trochanter and femur together, broadest at the base, then the width slightly decreasing as far as a little beyond the middle, where it is suddenly contracted, the two last fifth parts of tibia thus terminating with a proportionally thin part similar to a tarsus. The inner three fifth parts of tibia are strongly chitinized and have 6 long bristles of which the three outside ones are placed circularly around the abrupt contraction of tibia, in the same way as may be seen at the borders between two joints. The thin distal part of tibia is at the tip very thin and termi-

nates with a little and sharp, right-angled claw bent inwards. The tip of the tibia on the outside and the claw close to the tip at the innerside are each provided with a very thin and extremely short bristle. A claw's tendon and muscles for insertion are perfectly absent in all the joints of the legs.

In Verhoeff's: „Ueber Tracheaten-Beine“ the author on page 149–153 also mentions the coleopterous larvae and writes as follows in his introduction to this chapter:

„Bekanntlich haben die Untersuchungen Schiödte's und anderer Forscher dazu geführt, die Coleopteren-Larven in zwei grosse Gruppen einzutheilen, nach der Beschaffenheit der Beine, nämlich in Adephagen, deren Larven-beine 5-gliedrig sind und aus Coxa, Praefemur, Femur, Tibia und Tarsus bestehen (abgesehen von den Krallen), und den übrigen (Heterophagen), welche nur Coxa, Praefemur, Femur und Tibia besitzen, dazu eine sogenannte Kralle, – also 4-gliedrige Beine. Es erhebt sich nun die Frage: „Wo ist bei den Heterophagen der Tarsus geblieben?““.

An elucidation of this question would be important for the interpretation of the morphology of the *Batrisodes*-larva. There are two possibilities: 1) tibia and tarsus have fused and the „claw“ is a real claw, and 2) tibia is normal, tarsus and claw have fused. The first point of view is maintained by Börner, the second by Verhoeff. The case quoted by Börner for supporting his opinion does not seem to be irresistible against criticism as far as concerns the coleopterous larvae (*Tenebrio*). What Börner names „tibiotarsus“ in the heterophagous larvae, Verhoeff says does not exist; According to Verhoeff only a „tarsungulum“ has been demonstrated. Quoting several instances Verhoeff makes account for his interpretation, and his drawings are proofing his assertion. Thus his fig. 12 displays the basal part of the utmost joint (the claw) with its many bristles being the real tarsus, and the

claw itself is rather distinctly separated. In his fig. 16—17 (the *Hylecoetus dermestoides*-larva) a distinct contraction is visible outside the bristle-bearing basal part, so that the claw-joint appears distinctly having disposition to two joints.

I have observed quite the same in the Aleocharin-larvae, and I have especially examined *Boletochara lunulata* the utmost leg-joint of which distinctly conveys the impression to be two joints which have fused, the inner basal part having one pair of strong spines — one at the outer margin and one at the inner margin — between the supposed tarsus and ungulum.

This feature will surely be found in all the genera of the Aleocharin group and also in the most part of the Staphylinid genera with a very few exceptions.

The legs of the *Batrisodes* larva are surely not to be interpreted in the same way as in the other heterophagous larvae named above. From the foregoing description and my figures there is no doubt, that the *Batrisodes* larva has a real „tibiotalarsus“, i. e. tibia and tarsus fused together, and we can state, that a „tibiotalarsus“ only is found within the Pselaphids (*Batrisodes*, *Claviger* teste Heyden).

I don't think it possible, mainly based upon a single genus, to point out the larval family characters of *Pselaphidae*, a family containing ca. 300 genera, but I suppose that the greater part of the characters set forth below are of more than generic importance:

Caput broader than long, without distinct collar contraction.

Antennae broad and strong, three-jointed. The joints about as broad as long. 1' joint may be pushed forward by means of a large soft membrane. 2' joint with a strong, lobed appendix. 3' joint with long, sensitive hairs.

Mandibulae strong, unsymmetrical, with several teeth of unequal length.

Stipes strong and broad, with a two-jointed and slender palpus maxillaris on stipes palpiger maxillarum, and a thick lacinia provided with short strong spines.

Galea absent.

Palpi labiales two-jointed, slender.

Ligula absent.

Pedes long, slender, five-jointed; tibiotarsus (tibia + tarsus which at any rate in *Batrissodes* have fused) long and slender, terminating with a little claw bent downwards. The tendon of the claw and all the muscles for insertion absent.

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Explanation of Plate.

Fig. 1—8: *Batrisodes venustus* Reichenb.

- Fig. 1. Fullgrown larva, from above. 54/1.
 " 2. Head, from below. 140/1.
 " 3. Right mandible, from below. 305/1.
 " 4. Left mandible, from below. 305/1.
 " 5. Left antenna, from above. 610/1.
 " 6. Head and thorax, lateral view. The leg somewhat shortened. 140/1.
 " 7. Left hind leg. 140/1.
 " 8. 8'—9' abdominal segments and the anal segment, lateral view. 140/1.

<i>An</i>	Antenna.	<i>kp</i>	1' joint of maxillar palpus.
<i>a1</i>	1' antennal joint.	<i>kp1</i>	2' " " " "
<i>aP</i>	Supposed basal part of 1' antennal joint.	<i>L</i>	Lacinia.
<i>a2</i>	2' antennal joint.	<i>lp</i>	1' joint of labial palpus.
<i>a3</i>	3' " " "	<i>lp1</i>	2' " " " " "
<i>aI</i>	Soft membrane of 1' antennal joint.	<i>M</i>	Mandible.
<i>aII</i>	Appendix of 2' antennal joint.	<i>m</i>	Spines at the back of mandible.
<i>aIII</i>	Sensitive hairs of 3' antennal joint.	<i>m1</i>	Teeth on the underside of right mandible.
<i>ap</i>	Lobes of appendix.	<i>m2</i>	Flexor muscle of mandible.
<i>ap1</i>	Opening between the lobes of appendix.	<i>m3</i>	Extensor " " "
<i>ap2</i>	Triangular organ of append.	<i>Mn</i>	Mentum.
<i>ap3</i>	Two nervous fibres of "	<i>N</i>	Teeth of nasale.
<i>Anal</i>	Anal segment.	<i>O</i>	Ocelli.
<i>b</i>	"Bridge-muscle" of femur.	<i>spl</i>	Stipes palporum labialium.
<i>d1</i>	Extensor muscle " "	<i>spm</i>	Stipes palpiger maxillarum; basal joint of maxillar palpus.
<i>d2</i>	Flexor muscle " "	<i>stm</i>	Stipes maxillaris.
<i>C</i>	Cerci	<i>Tita</i>	Fused tibia and tarsus, = tibiotarsus.
<i>c</i>	Cardo	<i>Tr</i>	Trochanter.
<i>Cx</i>	Coxa	<i>U</i>	Ungulum.
<i>F</i>	Femur.	<i>I—X</i>	1'—9' abdominal segment.
<i>cm</i>			
<i>cm1</i>	} The four muscles of coxa.		
<i>cm2</i>			
<i>cm3</i>			

