

BEITRÄGE ZUR KENNTNISS DER INSEKTENFAUNA
VON KAMERUN.

(CONTRIBUTIONS TO THE KNOWLEDGE OF THE INSECT-FAUNA OF CAMERUN).

3.

ON THE STRUCTURE AND HABITS
OF
HEMIMERUS TALPOIDES WALK.

BY

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(Pl. 2—3.)

I. Introductory Remarks.

This very curious Insect has attained great renown by the monograph of SAUSSURE quoted later on. The statement of this author that it possesses »labia 2 superposita, utrumque palpis 2», consequently 4 pairs of mouth-organs formed of modified legs, differs so strongly from the commonly adopted view of the mouth-organs of Insects that every one, having an interest in the morphology of Arthropods and more especially in the morphology of Insects, must be very anxious to examine this animal. In British Museum (Natural History) the type-specimens of WALKER are found, all exsiccated, and the mouth-organs of 2 of the specimens are dissected and pasted on paper. During a visit in London in the year 1891 I obtained by the courtesy of two of the Entomological assistants, Mr. Ch. O. WATERHOUSE and Mr. W. F. KIRBY, the permission to study these dissected organs and arrived at a result very exactly agreeing with the following representation, based on the investigation of specimens preserved in spirit.

In »Entomologisk Tidskrift», Årgång 12, 1891, p. 161—74 we find travelling sketches from Kamerun by Cand. Y. SJÖSTEDT, and a short postscript to these by Prof. CHR. AURIVILLIUS, in which he mentions that some specimens of *Hemimerus talpoides* were found among the animals sent home. Having read this publication I immediately applied myself to Prof. AURIVILLIUS, who with the greatest courtesy left to me 1 female and lent me 1 female, 1 young and later moreover 1 male, all excellently preserved in spirit. My best thanks are due to him for having entrusted me with this precious, rare and very interesting material. Subsequently Mr. SJÖSTEDT has sent me a letter containing the very important informations on the occurrence and habits of the animal, communicated in this paper.

Now I will proceed to describe the animal, subsequently make mention of its propagation, its occurrence and biology, then criticise the literature in question, and finally set forth some remarks on its systematic position.

Literature cited in the following.

- H. DE SAUSSURE: Specilegia Entomologica Genavensia, I. Genre *Hemimerus*. 1879. 4:to.
 F. MEINERT: Om Ordenen *Diploglossata* (Videnskabelige Meddel. fra d. naturh. Forening i Kjöbenhavn f. Aarene 1879—80, p. 343—46).
 H. J. HANSEN: Zur Morphologie der Gliedmassen und Mundtheile bei Crustaceen und Insecten (Zoologischer Anzeiger, 1893, N:o 420—21). — This paper has been translated in: Ann. and Mag. Natur. Hist. 6th Ser. Vol. XII, December 1893, p. 417—34.

II. Description.

a. **The body** (Pl. 2, fig. 1 and 2) is oblong-ovate, $3-3\frac{1}{2}$ times longer than broad, with the greatest breadth over the second thoracic segment, considerably depressed, both the upper and the lower side rather faintly arched.

b. **The head** is directed forward, has somewhat more than half the breadth of the 2nd thoracic segment, is more than twice

as broad as long, with the low posterior side faintly excavated, and broadly rounded in front. Eyes are completely wanting. On the upper side (Pl. 2, fig. 3) is seen anteriorly in the middle of the front a portion of the almost vertical, broad labrum (c), at its lateral angles the superior lateral portion of the mandibles (d), behind these their articular membrane (f), and a little more backwards on the lateral margin the articular membrane (b) of the antenna.

The antennæ (Pl. 2, fig. 1, Pl. 3, fig. 1) are rather short, about as long as the greatest breadth of the head, situated on its lateral margin half-way between its posterior angle and the labrum. They are inserted in that manner, that in front of their basis is found a rather large articular membrane, forming on the upper side of the head a smaller, on the lower side a greater triangle (Pl. 2, fig. 4, b); behind this insertion the lower side of the head is somewhat excavated along the prominent lateral margin (Pl. 2, fig. 4), so that the peduncle of the antenna can be laid back in this excavation and the flagellum be hidden beneath the lateral portion of the prothorax. Each antenna consists of a stouter, 2-jointed peduncle and a more slender, 9-jointed flagellum, which is but half as long again as the peduncle. The basal joint of the peduncle is more than twice as long as and somewhat stouter than the 2nd joint; the transverse section is triangular with the corners somewhat rounded. In the flagellum the 3 proximal joints are a little more slender and much shorter than the others, which are of almost the same length; the last joint is somewhat acuminate. While the joints of the peduncle show but a lesser number of spread setules, the joints of the flagellum are trimmed with numerous setules, and besides on the anterior side near the apex of each is found a flat area set with numerous, short, tenon-like sense-setæ, projecting from round holes of rather different size (Pl. 2, fig. 5, s).

The labrum (Pl. 2, fig. 2 and 4, c; fig. 6) occupies, as said before, a great portion of the anterior margin of the head, so that it is seen both from above and from below. It is somewhat arched, almost rectangular, with rounded lateral inferior corners, and almost $2\frac{1}{2}$ times larger than long. The inferior free margin is in some distance from the median line provided to an

extent with a row of very fine, almost cylindrical hairs, which almost all were worn in the delineated specimen (Pl. 2, fig. 6.)

The mandibles (Pl. 2, fig. 7 and 8) are almost triangular and strongly compressed. On the upper side of the head at the lateral margin close behind the labrum we see a little portion (with a rather faintly developed condylus) of the mandible (Pl. 2, fig. 3, d) and behind it the articular membrane (f) which, moreover, extends far inwards on the inferior side of the head (Pl. 2, fig. 4, f). Besides on this inferior side is seen a greater portion of the mandible (fig. 4, d) and its inferior well developed condylus (fig. 4, e); the rest of the mandible is overlapped by the labrum and other mouth-parts. Fig. 7 exhibits the inferior condylus (a) and the basis of the *musculus adductor* (c) and *musculus abductor* (b). Each mandible is inwards compressed to such a degree that the inner margin forms a sharp edge, the anterior half of which on the mandible (fig. 7) is sinuated and incised to form 5 teeth, the 3 distal of which are lying close together and to a certain extent above each other, while the right mandible (fig. 8) possess but 3 teeth, all at the apex. On the inner margin of each mandible somewhat in front of the posterior angle is found 6—7 short setæ in a short row (fig. 7, d).

The maxillæ are large and for the most part visible without preparation (Pl. 2, fig. 4, g, and h) with exception of the inner lobe. When taken out and cleaned each maxilla is seen (Pl. 2, fig. 11) to consist of a large *cardo* (s), an oblong, powerful *stipes* with 2 lobes about equal in dimensions, and a 5-jointed *palpus*, which is shorter than the portion of the stipes lying behind its insertion. The morphological structure of the maxilla is easily understood when compared with the maxilla of *Machilis*, according to the interpretation of the mouth-organs in Crustaceans and Insects given by me in »Zool. Anzeiger». The 1st joint is the *cardo*. The 2nd joint (2) forms the broad basal portion of the stipes which tapers distally, where it is continued as the inner lobe (1²), this consequently being the lateral prolongation of the 2nd joint. The exterior side of the maxilla is formed by an oblong, triangular plate (fig. 11, a), posteriorly *not quite reaching the cardo* and in front bearing the palpus; aslope inside and in front of the distal half of this plate is found another oblong, triangular

plate (b), to which the not-jointed outer lobe (1^b) is articulated. Compared with the maxilla of *Machilis* the last-named plate turns out to belong to the long plate at the exterior margin (cut off from this by a secondary articulation), so that the two plates together constitute the 3rd joint of the maxilla, and the outer lobe is the prolongation of this joint (being cut off by another secondary articulation — quite as the lobe from the 3rd joint of the maxillipeds of a *Gammarus*). *That this interpretation is correct is seen partly from the mentioned comparison with Machilis, partly from the circumstance that the palpus is articulated with the plate marked a, for if the plate marked b was not a piece secondary cut off but the real 4th joint of the maxilla the palpus must take its origin from this and not from the first-mentioned plate.*

The inner lobe of the maxilla is towards the apex strongly excavated along the inner side (Pl. 2, fig. 12), the apex is obliquely cut off and by incisions divided in small lobes; behind these a number of long, stout, almost cylindrical, partly somewhat curved spines are found. The outer lobe is almost round, for the most part firmly chitinised, a portion at the apex, especially on the exterior side, is soft-skinned and clothed (as it were scaled) with extremely short hairs. The palpus (fig. 11, p) is 5-jointed: the basal joint (4) is short and stout, the 2nd very short, the three others longer and cylindrical, the apex of the 5th showing the same structure as the apex of the labial palpus (Pl. 2, fig. 14), viz., an exceedingly small, cylindrical joint, the terminal face of which is set with a number of very small sense-pits, and round about this little joint the terminal face of the 5th joint is provided with a number of larger and smaller annular pits, each with a spine-like, rather long sense-hair.

The labium (Pl. 2, fig. 13), formed by the coalescence of 2 limbs, consists of 3 joints (formed by fusion along the median line), a lobe on each side from the 3rd joint and a 3-jointed palpus. The basal joint, *submentum* (1), and the 2nd joint, *mentum* (2), constitute together a large plate, somewhat broader than long, of which the mentum occupies the greater portion, the submentum being only a narrow plate, which seen from below (Pl. 2, fig. 4, k) is posteriorly bent somewhat downwards. The

3rd joint consists very plainly of two in the median line coalesced halves, each of which is continued as an articulated, free, obliquely triangular lobe (1^b), being but a little longer and broader than its joint, set with rather long setæ along a portion of the outer margin, while its distal part is soft skinned and ornated as the tip of the maxilla. The palpus is about half as long as the maxillary palpus, 3-jointed, the joints increasing in length from the base, and the last one with the terminal face showing the same structure (Pl. 2, fig. 14) as the above described last joint of the maxillary palpus.

Submentum is posteriorly articulated with a rather large, transverse plate (Pl. 2, fig. 4, o) lying between it and the prosternum (p), and this plate I consider to be the well developed sternum of the segment, which bears the labium and of which the tergite is not developed, while chitinous plates, probably representing the epimera, are present behind at the posterior lateral angles of the sternum. From below we see on each side a smaller, transverse plate, divided by a transverse line into two halves (fig. 4, q), and from the anterior margin arises a plate (not seen in the figure), broad behind and forward narrowed, stretching forward at the side of »the neck» and anteriorly connected with the skeleton of the head. Such a strong development of a sternum for the labium is, as far as I know, otherwise only found in the *Forficulina*, while in several other *Orthoptera*, f. inst. the *Mantodea*, we find the lateral plates very highly developed. The inner surface of the submentum and of the greatest part of the mentum is as usual coalesced with the inferior side of the head, the median sternal part of which as in other *Orthoptera* and in *Thysanura* prolongs itself forward in the mouth-cavity as a free process, which is called the hypopharynx.

The hypopharynx is (Pl. 2, fig. 9, h) oblong triangular, anteriorly somewhat rounded, the inferior side is well chitinised and glabrous with the exception of the soft-skinned anterior tip, the upper side (fig. 10, h) is soft-skinned and clothed with exceedingly fine hairs as the apical part of the outer maxillary lobe. When the labium is removed from the head it is seen that it has been coalesced with the inferior side of the head not quite to the beginning of the hypopharynx, and at the hind corner of the hypo-

pharynx originates on each side an oblong, triangular process, lying partly outside of, partly (seen from below) somewhat beneath the basal part of the hypopharynx). This process (m) is a little longer but considerably narrower than the hypopharynx, soft-skinned, with exception of the outer portion of the side turned downwards. These two processes are generally described as *paraglossa*, but this name is extremely unfortunate, because they have nothing to do neither with the hypopharynx nor with the labium; as I have stated in »Zool. Anzeiger» (see later on) they must be considered as the reduced *maxillulæ*, homologous with the 1st pair of maxillæ in *Crustacea* (which I have called *maxillulæ*) and that these organs are found much higher developed like real maxillulæ in *Machilis* and especially in *Campodea* and *Fapyx*.

The upper side of the hypopharynx is posteriorly the continuation of the inferior wall of the pharynx, and at the beginning of the latter is found just behind the hypopharynx on each side a 3-branched chitinous plate (Pl. 2, fig. 10), the one branch of which (n) is directed behind, being long and broad and at the middle ornated with a small group of very small sense-pits (s), most likely organs of taste; the second branch is directed outwards, the third (o) is slender, curved, directed inwards and a little forward and in the median line coalesced with the corresponding branch from the opposite side; in front of this thuswise formed arch is seen another slender transverse arch (p), the ends of which come in contact with the anterior margin of the first-mentioned arch a short way from its beginning.

c. **Thorax.** Both on the prothorax and on the mesothorax the terga are strongly expanded at the sides, forming free, rather broad, somewhat deflexed plates, further the posteriorly strongly emarginated pronotum overlaps a considerable part of the mesonotum, and this, posteriorly somewhat lesser emarginate, overlaps a portion of the metanotum. The metanotum is considerably shorter and somewhat narrower than the mesonotum, while the pronotum is almost as long as the two other nota together and but very little narrower than the mesonotum. When the thorax is seen from below (Pl. 3, fig. 1) the free lateral tergal plates of the pro- and mesothorax (a and b) are very conspicuous; the sterna are strongly developed in all 3 segments, forming large median

plates. The prosternum (d) is the longest and most narrow, one third longer than broad, and overlaps posteriorly a little part of the mesosternum (e), which is somewhat shorter and broader, a little longer than broad, posteriorly overlapping the anterior margin of the metasternum; the metasternum (f) is somewhat shorter and considerably broader than the former, anteriorly having the sides largely expanded and the anterior margin deeply emarginate, posteriorly it overlaps the anterior median portion of the 2nd abdominal sternite (s²), the sternite of the 1st abdominal segment being evanished. To give a good description of the obliquely ascending lateral parts of the thorax with the coxæ is very difficult. The short coxæ are articulated at the outer margin of the sterna a short way behind the beginning of the posterior half of the latter; the portion, visible from below, of the coxæ of the 1st pair of legs (o) is very short, while it is somewhat longer on the two other pairs. At the hindmost pair of coxæ an almost semilunar »*trochantin*» (n) can be pointed out with certainty; at the second pair of coxæ the trochantin (m) is a narrow plate, directed obliquely forwards and outwards. If we will try to indicate one of the plates in prothorax as being the trochantin, it must be a very long plate (l), directed forward and anteriorly pointed, the interior half of which (with the posterior, long angle connected with the coxæ) is overlapped by the protruding lateral margin of the prosternum. The trochantins thus being drawn in between the thoracic plates is a very different structure from that found in *Machilis*, where the trochantins are free and very distinctly constitute the 1st joint of the legs (see my note in »Zool. Anz.»). In the prothorax is found in the lateral wall one large, oblong plate, which consequently must be the *epimeron* (Pl. 2, fig. 1, g). In the mesothorax are found 2 well developed plates (fig. 1, h), which I think are most correctly interpreted as the bipartited epimeron, and in front a smaller plate (i), most likely interpreted as *episternum*. In the metathorax only one single, arched plate, the epimeron (k), is found, the lateral wall being to a great extent occupied by the anteriorly strongly expanded metasternum.

d. **The legs.** These are rather short, comparatively rather stout and vigorous, and increase strongly in length from the first

to the third, but otherwise essentially similar in structure (Pl. 2, fig. 1 and Pl. 3, fig. 2—6). The coxæ are mentioned above. The trochanter is stout, cut off from the femur by a rather oblique articulation; both on the upper and the lower side is found a group with 4—9 small sense pits (fig. 2, 4 and 6, s); on the lower side of the two posterior pair of legs 4 or 6 of them are arranged in a row, the others lying a little apart; on the upper side and on the first pair the arrangement is somewhat more irregular. The femur is stout with the one side considerably arched. The tibia has a very peculiar shape, it increases strongly in thickness from the base towards the middle, and on the 1st pair a little before, on the 3rd pair a little outside the middle begins a peculiar plane, owned to the circumstance that the tibia on the outer side is cut off very obliquely, so that its distal end becomes slender; the margins along this long, a little excavated and more membranous plane is trimmed all around with long setæ. Spurs are wanting. The tarsi contain 3 joints, the 2 first of which (Pl. 3, fig. 3 and 5) are strongly expanded, almost circular, the 3rd is slender, somewhat clavated, articulated at the middle of the upper side of the foregoing joint and ending with 2 uniform claws; empodium is wanting. In the tarsi of the 1st pair (fig. 3) the basal joint seems to be somewhat broader than in the 2 other pairs, but besides the 2 broad joints in all the tarsi are membranous on the interior side and along the lateral margins on the upper side in such a way that they become soft cushions, which are able to be much extended in living specimens, while they collapse very much in specimens preserved in spirit and especially in exsiccated specimens. The inferior side of these 2 joints is closely studded with the usual fine and short fixing hairs (such hairs are found in the same way f. inst. on the 3 basal joints in the tarsi of *Cerambycidae*); the 3rd joint is studded with similar hairs on a small area near the apex (fig. 2). — About the endowment of the legs with setæ and hairs the figures give a sufficient idea.

e. **Abdomen.** In proportion to the thorax this seems to be somewhat longer and a little more slender in the male (Pl. 2, fig. 2) than in the female with young (fig. 1). In both sexes it is somewhat longer than head and thorax together; the tergite of the 1st segment is short bending downwards laterally and a

little inwards on the ventral side (Pl. 3, fig. 1, t¹) outside the articulation of the posterior coxæ, while the sternite is completely wanting. The segments externally distinctly observed are, with exception of the 1st and the 2nd last ones, all of the same structure and similar in both sexes; each consists of a tergite occupying the back and the sides and projecting inwards on the ventral side (Pl. 3, fig. 9, t⁸, t⁹) as a triangle, the inner portion of which overlaps the lateral margin of the well developed sternite, the result being that epimeral plates are wanting and that the pleuræ only are present as an articular membrane.

In the female we count in all 9 tergites, the last of which is small, and near the basis of the last but one tergite issue the cerci; on the ventral side only 6 sternites are found. In the male is found 11 very distinct tergites (Pl. 2, fig. 2), the last but one with the cerci, and 8 sternites. Consequently very essential differences exist in the structure of the abdomen in the two sexes: now it is to be examined if they in reality are so great as it seems externally. Examining a distended skin of a female cleaned in caustic potash 2 very short tergites otherwise drawn forward and concealed under the 7th tergite (Pl. 3, fig. 8, t⁷), are easily found between this and the following broad tergite, which consequently becomes the 10th (t¹⁰) and is connected with the cerci. Thus we have 11 tergites in both sexes, the 8th and 9th being very short and totally concealed in the female, while in the male they are quite similar to the preceding.

As mentioned above the female possesses only 6 distinct sternites belonging to the 2nd—7th segment; the 5 anterior sternites are the usual transverse plates, but the 6th is prolonged backwards as a great semicircular lobe (Pl. 3, fig. 7, s⁷), reaching almost the hind margin of the abdomen; at the beginning of this lobe is seen on each side a rather long split (a) going forward through the sternite. On the above mentioned, cleaned skin is seen with transmitted light under this sternite 2 narrow, curiously formed plates, interrupted in the middle and obviously being the sternites (s⁸, s⁹) of the 8th and 9th segments, transformed in this manner on account of the female genital aperture. At the outer margin of these two small sternites is seen in fig. 7 the ventral portion of the two corresponding tergites (t⁸, t⁹) and behind them

the ventral portion of the greater 10th tergite (t^{10}). At the inner margin of this last tergite is seen a small, triangular plate, undoubtedly the very small 10th sternite (s^{10}), the posterior edge of which forms the anterior wall in the cotyle of the cerci; the rest of the ventral side of the 10th segment is membranous. The 11th segment, the »telson», is, seen from above, anteriorly truncated and posteriorly rounded, seen from below (Pl. 3, fig. 7, 11) the lateral portion is anteriorly somewhat prolonged into the membrane of the 10th segment; it is all over firmly chitinised, the sternite and the tergite not being separated by any membrane.

Unfortunately I am not able to give so full a description of the structure of the male, having only one single specimen, which shall be spared. As mentioned before we find 8 well developed sternites, belonging to the 2nd—9th segment; in the female the sternite of the 7th segment was produced backwards as a rounded lobe, but in the male the sternite of the 9th segment is, quite from the lateral margins, produced backwards as a somewhat shorter, triangular lobe (Pl. 3, fig. 9), the median hind corner of which is further produced into a smaller, somewhat oblique, spine-like process, which seen from the side (Pl. 3, fig. 10) is curved considerably outwards. Behind the lobe are seen the exterior male organs, viz., 2 large chitinous hooks (fig. 9, a) and the penis (b). The two hooks are lying on each side of the median line, but both are curved towards the left (seen from below as in fig. 9 towards the right) side; the right hook is curved only a little, the left very considerably, and this is half as long again as the other. The penis (b) is large, rather soft-skinned, a little laterally compressed, posteriorly somewhat expanded, with the right lateral corner produced into a shorter, cylindrical prolongation, the terminal end of which is obliquely cut off and shows a peculiar structure; near the median line on the inferior side at the hind margin of the penis is found a small, conical process. — The 10th tergite of the male is somewhat depressed longitudinally in the median line (Pl. 2, fig. 2); the 11th tergite is somewhat different in shape from that of the female, viz., somewhat larger and longer and posteriorly cut off. About the structure of the 10th sternite and the 11th segment I am not able to give any further information; the figure 9 (Pl. 3) shows what

is seen without dissection, but I do not dare to give any interpretation.

As mentioned before the 10th segment is provided with *cerci*. These are essentially uniform in both sexes, but perhaps a little longer in the female; in the figured female each is 4,9^{mm} long, in the male but 4,5^{mm}. From a point near the basis they decrease evenly in thickness towards the acute tip, and they are inarticulate, somewhat depressed and upon and near the lateral margins provided with numerous, shorter, stiff setæ.

f. **The clothing of the body** etc. In the male the posterior portion of the lateral margin and the exterior portion of the posterior margin of the 3 thoracal tergites are furnished with a row of middle-long setæ, being shorter anteriorly on the lateral margin and towards the middle line on the posterior margin; the hind margin of the 9 anterior abdominal tergites and 7 anterior sternites are towards the lateral corners furnished with similar setæ. On the superior hind margin of the head is also found some similar setæ towards the lateral corner. Further the upper side of the body with exception of the head and the 11th abdominal segment is rather closely set with exceedingly short, depressed hairs («le corps est . . . revêtu d'un duvet de poils courts et couchés, plus ou moins clairsemés» [SAUSSURE, op. cit. p. 12]) which rather easily are rubbed off. The head of my specimen is destitute of such hairs, but if it also will be the case in fresh specimens I do not venture to say.

In the two examined females the setæ along the lateral and hind margins of the thoracal and abdominal segments are about half as long as in the male, and almost all the minute hairs on the surface have disappeared, but the tergites are everywhere finely punctuated, these punctuations being marks of former hairs. Fig. 1 (Pl. 2) shows the female as I found it almost without hairs. The male measures 11,9^{mm}, the female 11,5^{mm} without the cerci.

g. **Colour.** In the female the whole body, the antennæ and the cerci are of a uniform, tawny colour, the legs perhaps a little lighter, more yellowish; the male is a little more reddish brown, with the process from the sternite of the 9th segment and the genital hooks dark brown.

h. **The spiracles.** None of these, with exception of the

first pair, can be discovered with certainty without special preparation. In order to examine their number and position I opened longitudinally the back of a female with a pair of scissors, put it into a strong, cold dissolution of caustic potash during 24 hours and then into glycerine. The more general features of the tracheal system are now rather easily studied with transmitted light under a dissecting microscope. We find the typical number, viz., 10 pairs. The 1st pair (Pl. 3, fig. 1, 1) lies in the soft skin between the epimera of pro- and mesothorax close outside the basis of the anterior coxæ, and these spiracles are larger than all the others. The 2nd pair (2) is found behind the epimeron of the mesothorax close before the circumflexed anterior end of the metanotum and is smaller than the foregoing pair and somewhat larger than the following pairs. The 3rd pair (3), almost belonging to the metathorax, is situated in the membranous skin outside its epimera and close before the anterior margin of the circumflexed 1st abdominal tergite. The 4th pair (4) is situated in the membrane outside the sternite of the 2nd segment close to its anterior margin and is hidden by the marginal portion of the tergite of the same segment. The following pairs are (as the 4th) found in the above mentioned membranous pleuræ close outside the sternites of the concerned segments and a little behind their anterior margin, but are overlapped in a double way: firstly the pleuron with the spiracle being overlapped, as mentioned before, by the tergite of the same segment, secondly the sternite of the foregoing segment with its posterior portion overlaps the anterior part of the sternite and ventral portion of the tergite of the concerned segment; thus f. inst. the 3rd abdominal spiracle (the 5th, when all are counted) is found as shown in fig. 1 (Pl. 3) near the posterior margin of the 2nd sternite (the place is indicated 5). The last spiracle in the female belongs to the first one of the (2) shortened and overlapped segments and it is found quite on the same place as the other. — The spiracles are oblong and do not seem to present peculiarities; their structure and mechanism for closing I have, however, not examined more closely. From each tracheal chamber inside the spiracle goes a longitudinal tracheal stem to the chamber of the foregoing spiracle; the other stems I have not examined.

III. Propagation.

Having treated one of the females with caustic potash and then cleaned it in glycerine, something still remained in its interior, incommoding the study of the skeleton and the tracheal system. Having taken it out and examining it I became astonished by finding the skin of a gigantic young and skins of several smaller young ones of very different size. These skins being very distended and therefore not giving any trustworthy idea of the shape and real longitude of the young I did clip a longitudinal aperture in the back of the other female and found 6 young ones. The greatest one was situated rather posteriorly in the abdomen, the other in front of it and the smallest one far forward under the metanotum. They were all of different size, the largest one (Pl. 3, fig. 11) gigantic, in his convoluted condition having the length of 2,8 mm from the anterior to posterior margin, consequently much longer when being stretched out in full length and then, I think, attaining almost $\frac{1}{3}$ of the length of the mother (11,5 mm) the smallest one was in the convoluted state 1,2 mm long. Perhaps it had been possible to find still 1 or 2 very small young or ova, if I had undertaken a regular dissection, but the rare animal should be treated with lenience. The largest of the young ones (Pl. 3, fig. 11) is convoluted in such a way, that the cerci (c) are lying along the upper side of the head; all the segments of the body are easily seen (telson excepted) and the setæ on the thorax, the abdominal tergites and sternites, the cerci and the legs are well developed. The antennæ (a) have but 8 joints and are still inclosed in the skin from an earlier larval stage, much surpassing its tip. On the ventral side of the thorax is seen a folded mass of membranous skin (d). In the larva coming nearest as to size to the former the body is covered by a thin membrane without setæ, but under this is seen the above described setæ more feebly developed. In the earlier stages such setæ are wanting. The most remarkable feature is, however, that in the 4 greatest specimens issues from the membrane between the head and the protergum an unpaired organ (b), slender at the basis but rapidly rather stout, the exterior side and the lateral margins of which are lacerated in a different way in the different larvæ; to the best

of my understanding this organ must be in connection with the interior wall of female genital organs and thus serve the nutrition of the young ones, which are growing to the astonishing size within the mother. By the taking out of the two smallest young the head was broken off, which seems to me to indicate that also these specimens had been fixed by an organ from the neck.

From this description it is evident that *Hemimerus* only gives birth to one young at a time and probably several days will pass away before the next young is developed to such a degree that it is ready to become born. Unfortunately I am not able to add anything more about this very interesting development.

This curious propagation places the *Hemimerus* totally isolated from all known Insects, as far as I know, for the propagation of the *Pupiparous Diptera* differs very much from this, and the other viviparous Insects always bear several or many young at a time, whereas *Hemimerus* simultaneously gives birth only to one young, differing from the adult specimens almost only in the number of joints of the antennæ and in the wanting sexual development of the last abdominal segments.

As mentioned above Mr. SJÖSTEDT has also captured one young; this is white, the total length (the cerci excepted) is 4.5^{mm}, the abdomen is comparatively somewhat shorter than in the adults (the segments being — from influence of the spirit? — more contracted into each other), but besides it differs only in the structure of the antennæ and of the last abdominal segments. The antennæ are composed of 8 joints, the 3rd being considerably longer than the following ones, and evidently this later on becomes divided into 4 joints, the 3 first of which are short (Pl. 3, fig. 1), the 4th about as long as the following. The abdominal tergites as in the male and 8 well developed sternites, but the 8th sternite is considerably lesser produced backwards than in the adults of both sexes, and the posterior margin is equally arched. I believe that this young is turning to be a male, not thinking it possible that the 8th and 9th segment later on should be reduced as in the adult female, but I dare not deny the possibility.

When verbally giving Inspector Dr. F. MEINERT a communication about this propagation, he called my attention to state-

ments on a viviparous Cockroach and lent me the concerning treatises, viz., C. V. REEV: A viviparous Cockroach (Insect Life, Vol. III, p. 443—44) and the same author's: Further Note on *Panchlora* (Insect Life, Vol. IV, p. 119—20). In the first paper is stated that the author already had published a note on *Panchlora viridis* in »Proceed. Entom. Soc. Washington», Vol. II, p. 129. It is evident from these notes that *Panchlora viridis* certainly at least as a rule gives birth to living young, but the whole is confined to that the young are slipping out of »the eggs, which as usually are to form an egg-cluster» a short time before the birth, that f. inst. a specimen »while being examined . . . had given birth to about thirty living young, besides some individuals still in their »pupa-cases» [egg sacs] and a cluster of about twelve pupæ [eggs] arranged side by side» (Vol IV, p. 119). Then this fact is of little importance, only showing that while many other Cockroaches are giving birth to an egg-cluster, the eggs of which have the young undeveloped, the egg-capsule remains a long time within the female of *Panchlora viridis*, so that the young ones become developed to such a degree that they hatch a very short time before the birth. Among specimens of just this species, captured by Dr. MEINERT ($\frac{1}{2}$ 1892) in the island of St. Jan (West-India) I have found a female with an egg-capsule somewhat protruding from the vagina. Further Dr. MEINERT has shown me a specimen of the common South-American species: *Blabera gigantea* L., captured in a drawer within a house in Caracas ($\frac{18}{10}$ 1891), in the drawer were also found several newborn young running about, and on the well preserved adult specimen is seen a pair of young protruding from the vagina. The newborn young attain a length of 8,8 mm, while the female is 43,5 mm.

A comparison between these facts, observed in the fam. *Blattina*, with that stated about *Hemimerus*, shows sufficiently that the development of these forms is essentially different, presenting but a point of resemblance of secondary nature in the birth of living young.

IV. Occurrence and Biology.

SAUSSURE writes op. cit. p. 20: »Habitat: Littus orientale Africae, Sierra Leone», and p. 12: »Nous ne savons rien du genre

de vie des Hemimerus. Nous ne serions pas éloigné de leur supposer des moeurs parasitiques. C'est là ce que semblent indiquer leurs formes aplaties, l'atrophie des yeux, la brièveté des antennes, la forme des pattes qui sont bien aptes à remplir l'office de crampons. Il ne serait pas impossible que ces insectes vécussent sur des quadrupèdes, comme les *Platypstylus* avec lesquels ils offrent une certaine analogie de faciès.» These suppositions have turned out to be right. Mr. YNGVE SJÖSTEDT, who has collected a rich material of different classes of Arthropods for the »Riksmuseum» in Stockholm and besides has captured Rodents to Prof. T. TULLBERG in Upsala, has written to me a letter at great length, the most part of which I shall translate here. In order to capture Rodents, traps of different kind were set »in the forests on such places where these animals through their holes are proving themselves to be found, and in such a trap, a fox-trap, set in April inside the portion of the primitive forest near to the mangrove forest on Kitta, a great rat was captured, according to the determination of Prof. T. TULLBERG being *Cricetomys gambianus* WATERH. Occupied with detaching this Rodent from the trap I observed a considerable multitude of small, tawny animals, very lively springing upon the rat and penetrating between the hairs or curring upon the trap in advance of my hands, from which they turned down upon the ground, where I succeeded in catching some specimens and put them into a tube with spirit; a pair and among them a young [described above] was taken upon the rat. If I had been suspecting what a curious and rare Insect I had before my eyes I had, undoubtedly, obtained many more specimens by continued searching. Informed by Prof. AURIVILLIUS that it was just the mentioned *Hemimerus talpoides*, and requested to search after it carefully in the future in order to obtain more specimens, I examined very carefully all the rats taken during the latter time, among which, however, no *Cricetomys*, but without result. Immediately before my homeward route I visited Rio del Rey's factory, conducted by Mr. G. LINNELL, who had promised to preserve all the Rodents he possibly could obtain, and at my arrival he told me that he had succeeded in getting a great rat, ardently searched for by the natives for the sake of its flesh — just the *Cricetomys gambianus* — captured

within the mangrove forest and preserved in rum. Asking him, if he, when the rat was captured, not had seen any yellowish Insects springing about it, he answered that such were very numerous, but probably lost during the bringing home of the animal, some of them, however, perhaps remained and were then to be found in the rum containing the rat, a supposition which proved to be right, because I found on the bottom of the jar 7—8 specimens.»

This letter gives very interesting informations about the occurrence and habits of the *Hemimerus*; concerning the Rodents collected by Mr. SJÖSTEDT in Kamerun and indicated in the letter I may perhaps refer the reader to TYCHO TULLBERG: Ueber einige Muriden aus Kamerun (Nova Acta Reg. Soc. Sc. Ups. Ser. III, 1893).

What the *Hemimerus* feeds upon seems to me, however, to be rather puzzling. On account of the structure of the mouth we are able to say with considerable certainty, that it does not nourish itself by biting apertures in the skin of the host and sucking blood; it is more probable that it is feeding as most part of the *Mallophaga*, but its mouth-parts are, however, very different from those found within this large group. Perhaps the *Hemimerus* feeds upon other small parasites on the *Cricetomys*, and, according to the shape of the mouth-organs, this supposition does not seem quite improbable. The proventriculus does not possess the rows of chitin-tacks, found f. inst. in the *Blattina* and *Grylloidea*.

V. Literature on the subject.

SAUSSURE writés (op. cit. p. 5): »En 1871, FRANCIS WALKER a indiqué plutôt que décrit, sous le nom de *Hemimerus*, un genre d'insectes aptères, qu'il classa dans l'ordre des Orthoptères, famille des Gryllides, tribu des Gryllotalpiens (Catalogue of the species of Dermaptera, Saltatoria, etc. of the British Museum, t. V, 1871, Supplém. page 2).» This statement must be sufficient as to the description of WALKER, as I have not seen the quoted work. — The treatise of SAUSSURE, the capital work on this animal, contains c. 22 pages in 4to and 1 plate, and is based on the exa-

mination of one single, exsiccated male, given him by the British Museum. The description is, in the whole, better than the figures (comp. f. inst. fig. 4, showing the antennæ as possessing a short, not existing basal joint, and numerous joints in the flagellum, while the description (p. 7) is correct). To enter into all details of his description and figures, pointing out what is right, what is erroneous and what it not mentioned, seems to me to be useless, because I have given a representation which, I presume, may be able to compensate for SAUSSURE'S treatise in all points, as it is based upon much better material. I shall only point out that he has produced a description, which is very good in many particulars, but contains some very remarkable errors; it is, however, to be remembered that he has examined but one single, exsiccated specimen. Next it will be necessary to discuss the most essential errors and differences from my own representation.

P. 7 he says: »Les yeux manquent, et semblent être remplacés par une sorte de dépression ou par une petite pièce étroite (o) qui est comme incrustée sur le bord antérieur de la tête, en dedans de l'origine des antennes.» Examining his fig. 3 (with the letter o) and comparing this with my fig. 3 (Pl. 2) it is easily discovered that his »pièce étroite (o)» is either the articular membrane of the mandible or the upper exterior part of the mandible, visible on the upper side of the head (see above). It becomes more difficult to understand his representation of »labium inférieur», both the description and the figure (fig. 6) showing the 3rd joints (of the labium) with their lobes as not cut off from the 2nd joint and very small, though they, indeed, are rather large (comp. Pl. 2, fig. 13) and very well defined, and he describes and delineates the labial palpi as being 4-jointed, though they are composed of but 3 joints. Quite inconceivable to me is his representation of »labium supérieur, ou interne (endolabium)» (p. 26) as a rather large, anteriorly broader plate, split from the anterior margin a rather long way in the median line and with 3-jointed lateral palpi! I must believe that a very bad preparation has been the basis for this representation, for it seems to me to be quite impossible that individual anomalies can exist to such a degree. On the maxillæ he has overlooked the large cardo, on the other hand he has added in the description and the figures a chitinous

piece (d. in fig. 8 and fig. 9), which perhaps belongs to the inner skeleton of the head (Pl. 2, fig. 10, n in this paper), and most decidedly has nothing to do with the maxilla.

Somebody will perhaps assert it being impossible, that an Entomologist so well reputed as H. DE SAUSSURE has been able to commit such great and curious errors in the representation of the mouth-organs of an Insect of such a considerable size, that he consequently has examined a totally different animal, and that my above remarks then are quite unwarrantable. Hereupon I will answer that the animals from Kamerun examined by me most decidedly must be referred at least to the same genus as SAUSSURE'S animal (about the chance of another species see later on), and here are my reasons. 1) The specimen described by SAUSSURE was given him by the British Museum and taken out of a little series of mounted, dried specimens; in London I have myself (in 1891, see above) examined the dissected mouth-parts of a pair of the specimens and concerning the »labium supérieur» and the shape of hypopharynx and maxillulæ I arrived to results very exactly agreeing with the foregoing description. 2) SAUSSURE'S description and figures of the shape of the body, the number of joints in the antennæ, the shape of the mandibles and of the inner and outer lobe of the maxillæ, the size and form of the labial sternum, and of pro-, meso- and metasternum, the characteristic shape and structure of the tibiæ and of the abdominal cerci, the existence of 2 exterior sexual hooks in the male etc. show evidently, that his animal belongs to the same genus as those examined by me, for otherwise such accordance in so many essential structural features was hardly possible. If WALKER'S and SAUSSURE'S species are identical with mine is, on the other hand, another and much more difficult question; SAUSSURE'S description and especially his figures are in several particulars not sufficiently correct to settle this question with complete certainty. The geographical occurrence: Sierra Leone and Kamerun, does not yield any point of support, because the host, *Cricetomys gambianus*, has not been determined with absolute certainty by T. TULLBERG (see p. 44) in his work quoted p. 82, the possibility not being excluded, that the Rodent is *Cric. dissimilis* de ROCHEBR., and besides *Cric. gambianus* has been found in Senegambia, north

of Sierra Leone, and most probably also in the last-named country, where the typical specimens of *Hem. talpoides* have been captured. But only two of the differences between SAUSSURE's and my representation are essential enough to merit a further discussion. SAUSSURE writes (p. 11) about the sternite of the 9th segment: »lequel est grand, transversal, ayant son bord postérieur large et taillé à l'angle obtus», and the appertinent figure (fig. 18) shows about the same, while, as stated before, the sternite in the male examined by me is »produced backwards as a somewhat shorter, triangular lobe (Pl. 3, fig. 9), the median hind corner of which is further produced into a smaller, somewhat oblique, spine-like process, which seen from the side (Pl. 3, fig. 10), is curved considerably outwards» (p. 75), but it seems to me to be possible, that SAUSSURE has overlooked these peculiarities, otherwise this difference may be a specific character. Further SAUSSURE delineates the penis and the 2 genital hooks as being rather different from what is found by me, the right hook being considerably stouter and more straight, the left one not curved to such a degree as seen in my figure (fig. 9). But his figures are, as mentioned before and with especial reference to what is stated about the numerous joints in the antennæ, too untrustworthy for laying stress on such details. *In my opinion it is most probable that my species is the Hemimerus described by WALKER and SAUSSURE*, but according to the differences pointed out it is impossible to state it with absolute certainty; it being, unfortunately, impossible to borrow animals from the British Museum, I must leave to the Entomologists of this Museum to settle this question.

A large portion of SAUSSURE'S treatise is taken up by »Discussion des affinités des Hemimerus» (p. 12—14) and »Comparaison avec les divers Ordres d'insectes» (p. 15—18), of which the remarks and results, based upon the existence »d'un second labium» now are entirely worthless. His »Comparaison avec les Thysanoures» based upon MEINERT'S well-known paper about *Japyx* and *Campodea*, is much better, but not complete, his »Comparaison avec les Orthoptères» is of little value. His establishing of a new order, *Diploglossata*, is, in consequence of me representation, very unfortunate. Quite inconceivable to me is his concluding remark (p. 24), in which the author, according to new

investigations on its affinities, undertaken »depuis que cette notice a été mise sous presse», pronounces: »Nous avons été conduit à envisager cet être comme constituant un type à part qu'on aura probablement à séparer de la classe des insectes.»

MEINERT (in the note indicated above p. 66) has not seen any specimen of the *Hemimerus*; therefore is taking it for granted that SAUSSURE'S description and figures of the mouth-organs are correct, but finds that his conclusion: a new order of Insects or a new sub-class of Arthropods, is not justified. He advances the opinion that in the Orthoptera the labium is the 4th pair of mouth-limbs, while the 3rd pair is not developed in the earlier known Insects, but the mouth-part, from which it should originate, is believed to be the »3die (egentlig förste) Metamer, som skulde svare til de övriga Insecters Underläbe . . . Orthopterernes saakalde Tunge (lingua), som i Almindelighed betragtes som en Deel af eller hele Hypopharynx» (p. 344), and which just in *Hemimerus* should be furnished with the »limbs (palpi)» figured by SAUSSURE. That I do not agree with MEINERT as to the greatest part of these theories will be seen from the following. He concludes the note with these words: »Efter sin Form og Habitus er *Hemimerus* nu nærmest en Orthopter, men efter sin Mundbygning en Thysanur; efter min Opfattelse staaer den som en Melleform mellem disse to nærbeslægtede Ordener, men til at danne en egen Orden, synes den mig dog for lidet udmærket.»

In the aboved quoted preliminary note in »Zoolog. Anzeiger» I have produced an interpretation, new in most of the main-points, of the mouth-organs of the Insects, and I have used this in the above description. Here I shall quote but the following main-points. The labium of Insects is homologous with the maxillipeds f. inst. in *Isopoda* and *Amphipoda*, the maxillæ of Insects with the 2nd pair of maxillæ in *Crustacea*, the hypopharynx in Insects (developed as a free organ in *Thysanura*, *Orthoptera* and *Diptera*) is homologous with the »paragnatha» of *Crustacea*, while the maxillulæ (1st pair of maxillæ) in *Crustacea* are rather well developed in most of the *Thysanura* (but very differently interpreted by the different authors) and are also found as lateral lobes at the basis of the hypopharynx in several *Orthoptera*. Further I have studied the more special composition of the maxillulæ,

maxillæ and maxillipeds in Malacostracous Crustaceans and Insects. Here I perhaps may add a note which is the consequence of different paragraphs of the treatise, but is not pronounced expressly: that the mandible, »corpus mandibulæ», (the joints of the palpus not included) in the *Phyllopoda* and other *Entomostraca* is homotypous with the basal joint in the limbs of *Phyllopoda*, the mandible in the *Malacostraca* is homologous with the mandible in *Phyllopoda* and hymotypous with the basal joint in the maxillulæ and maxillæ (the »lacinia mobilis» on the mandible being a secondary lobe of the same nature as the lobes from the joints of the maxillæ), and the mandible in the *Insecta* is homologous with the mandible of the *Crustacea* (hymotypous with the cardo in the maxillæ of Insects but not with the trochantin of the legs), consequently consisting of but one joint and no basal joint or joints of it being included in the lateral parts of the head, as set forth by different authors.

VI. The systematic position of Hemimerus.

The *Hemimerus* must be referred either to *Orthoptera* or to *Thysanura*; other Insects-orders being quite out of the question. As stated by SAUSSURE it stands far from the *Thysanura* concerning the structure of the tarsi and in the absence of the sternite of the 1st abdominal segment; I can add that the structure of the abdomen in the female (two of the segments being reduced and concealed), the short coxæ and especially the structure of the mouth removes it very far from the *Thysanura* and leads it to the *Orthoptera*. In the *Thysanura* the mandibles exhibit a shape and an articulation, agreeing even up to details with that which is found f. inst. in the *Cumacea*: the articulation with the head is stretching very long forward on the inner side of the mandible, and a great part of the muscles issues from the inner wall of the cavity of the mandible and fixes itself with the other end upon a horizontal chitinous plate between the mandibles etc., while in *Hemimerus* as in the different families of *Orthoptera* we find the mandibles articulated with their broad basal end, which is cut almost transversely off, and being moved about an axis going from a more strongly developed inferior and a rather feeble

superior condylus through a stout *musc. adductor* and a rather slender *musc. abductor*, but no muscles are going from the interior of the mandibles to any median plate.¹

Hemimerus most decidedly belongs to the *Orthoptera*, and, as far I can see, it does not possess any character removing it from this order. It is more difficult to point out the family, near to which it ought to be placed, nobody having tried to give a thorough representation, based upon an extensive morphological study of the skeleton etc., of the main genera in the very numerous families put together in this group, a study I intend to undertake on a subsequent occasion. I do not think that it would be correct to lay any stress on that in *Hemimerus* the eyes and wings are wanting; but its very anomalous propagation seems to me to be of greater systematical importance. It is easily seen that it has no connection with the *Ephemeridæ*, *Libellulina*, *Perlariæ*, *Termitina*, *Physopoda* and *Psocina*; in the structure of the thorax etc. it is also far removed from the *Mantodea*, *Phasmodea*, *Gryllodea*, *Locustina* and *Acridiodea*. The remaining groups are but *Blattina*, *Embidæ*, *Forficulina* and *Mallophaga*. From the *Mallophaga* it is profoundly divergent in the structure of the whole skeleton; the *Blattina*, which are very similar in general aspect, disagree in the structure of the antennæ, in the structure of the neck (and the accompanying direction of the head), but, above all, in the totally different structure of the thorax, in the long, triangular, protruding coxæ, 5 joints in the tarsi etc. Comparing specimens of *Embidæ* with *Hemimerus* several very essential differences are easily found; comparing, on the contrary, the animal with the *Forficulina* we are surprised at finding very great accordance in almost all structural features. Taking one of the wingless species, as *Forf. acanthopygia* GÉNÉ or *Labidura advena* MEIN. (and executing only a superficial dissection of this form)

¹ In »Zoolog. Anzeiger» I have briefly indicated these differences in the structure of the mandibles between *Thysanura* and *Orthoptera*; here I perhaps may add that the *larvæ* of the *Ephemeridæ* as to the articulation and muscles of the mandibles in the essential points are agreeing with those of the *Thysanura* (*Campodea*, *Japyx*, *Collembola*, *Machilis*, *Lepisma*), while all other *Orthoptera* and their *larvæ* possess the above indicated structure. The *Ephemeridæ* and especially their *larvæ* also exhibit several other primitive features, f. inst. in the structure of the legs of the *larvæ*.

we find that it agrees very much with the *Hemimerus* in the following particulars: The shape of the hypopharynx with the maxillulæ, the structure of the maxillæ and particularly of the labium, with the same number of joints in the maxillular and labial palpi, the direction of the head and the existence of a well developed »labial sternum», the shape of the 3 thoracal sterna (exceedingly striking is the accordance in the shape of the coxæ and their articulation with the body), the want of spurs on the tibiæ, the number of joints in the tarsi, the absence of a sternite in the 1st abdominal segment, the bending downwards and inwards on the under side of the abdominal tergites, concealing the lateral margin of the sternites, in the female the sternite of the 7th segment being enlarged and the 8th and 9th segment reduced and concealed, in the male the sternite of the 9th segment being enlarged and the 8th and 9th segment very well developed.

The more essential differences between *Forficula* and *Hemimerus* are: the long cerci in the latter form, undoubtedly being homologous with the forceps, the smaller number of joints in the antennæ in the *Hemimerus*, some difference in the shape of the head, mandibles and maxillæ, in the shape of the thoracal segments, the two basal joints in the tarsi being expanded in *Hemimerus* etc. The anomalous propagation of *Hemimerus* is the most considerable difference.

Thus we obtain the following result: *Hemimerus* belongs to the Orthoptera, constituting a separate family very closely allied to the fam. *Forficulina*. I will leave to an Entomologist, disposing of a much richer collection of the genera of *Forficulina* than we possess in our Museum, to work out diagnoses for the two families, thinking that my description and figures may be furnishing him for this task with sufficient materials as to the *Hemimerus*.

Copenhagen, medio December 1893.

Explanation of the Plates.

Pl. (Taf.) II.

- Fig. 1. Oviparous female of *Hem. talpoides* WALK. (vix $\frac{9}{2}$); the few remaining minute hairs on the body omitted.
- Fig. 2. Adult male (a little more than $\frac{9}{2}$); legs and antennæ omitted, but the minute hairs delineated even where rubbed off (see the text).
- Fig. 3. The head (of the female) seen from above ($\frac{19}{2}$); a. basal joint of the antenna, b. articular membrane of this joint, c. labrum, d. superior edge of the mandible, f. articular membrane of the mandible.
- Fig. 4. The head (of the female) with the most anterior portion of the thorax, seen from below ($\frac{17}{1}$); a. basal joint of the antenna, b. articular membrane of this joint, c. labrum, d. mandible, e. inferior condylus of the mandible, f. articular membrane of the mandible, g. »the stipes» of the maxilla, h. exterior lobe of the maxilla, i. maxillary palpus, k. 1st joint of the labium (submentum), l. 2nd joint of the labium (mentum), m. lobe from the 3rd joint of labium, n. labial palpus, o. chitinised plate between submentum and prosternum (the »labial sternum»), p. prosternum, q. chitinous plates going from the »labial sternum» upwards on the side of the neck. Almost all hairs on the maxillæ and labium are omitted.
- Fig. 5. The 2 outmost joints of antennæ (of the female), seen in front ($\frac{23}{1}$); s. sense-pits of different size.
- Fig. 6. The labrum, seen in front ($\frac{30}{1}$). On the free margin the hairs are delineated only on the right side, and these seems to me to be uncomplete, the ends being broken off.

It may be remarked that fig. 6, fig. 7, fig. 8, fig. 9, fig. 11 and fig. 13 all are delineated with *the same enlargement* ($\frac{30}{1}$), with the intention of showing the relative size of all mouth-parts (of the same female).

- Fig. 7. The left mandible, seen from below; a. condylus, b. origin of *musculus abductor*, c. origin of *musc. adductor*, d. a row of short setæ.
- Fig. 8. The right mandible, seen from above.
- Fig. 9. Hypopharynx (h.) and maxillulæ (m.), seen from below.
- Fig. 10. Hypopharynx (h.) and maxillulæ (m.), seen from above ($\frac{5}{1}^5$), together with a portion of the inferior wall of the pharynx; n. chitinous plate in this wall, with a small group of sense-pits (s); o. chitinous branch from the last-named plate, running inwards and at the median line coalesced with a similar one from the other side, p. transverse, somewhat arched chitinous band. — In this as in the other figures on the two plates I have indicated the membranous skin with a clear greyish uniform tone, while the chitinised parts are white; the shadowed portions of hard chitin are shaded more strongly and sharply than the membranous parts, as it is seen especially on fig. 4.
- Fig. 11. The left maxilla, cleaned with caustic potash and seen from below; 1. the 1st joint (cardo); 2. the 2nd joint, 1². the lobe of the 2nd joint; 3. the 3rd joint, consisting of two parts (a. and b.) and together with the 2nd joint forming »the stipes», 1³. the lobe of 3rd joint (»the galea»); 4. the 4th joint of the limb, being the basal joint of the palpus (p.).
- Fig. 12. The apical portion of the interior lobe of the maxilla, seen from the inner side (c. $\frac{7}{1}^0$).
- Fig. 13. The labium, seen from below ($\frac{3}{1}^0$); 1. the basal joint (submentum), 2. the 2nd joint (mentum); 3. the 3rd joint, 1³. the lobe from the 3rd joint. On the 1st joint only the insertions of an irregular series of setæ are indicated.
- Fig. 14. The apical part of the labial palpus with the very small supplementary joint (a) and the sense-pits with their short setæ (s) ($\frac{1}{1}^5$).

Pl. (Taf.) III.

- Fig. 1. The anterior half of the body of the female, seen from below ($\frac{1}{2}^5$); the legs, with their coxæ, removed on the

right side of the animal (the left side of the figure) and the tibiæ etc. on the other side; a. the inferior side of the expanded pronotum, b. the mesonotum, c. the metanotum, d. the prosternum, e. the mesosternum, f. the metasternum, g. the epimeron of the prothorax, h. the bipartited epimeron of the mesothorax, i. the episternum of the mesothorax, k. the epimeron of the metathorax, l. the »trochantin» of the 1st pair of legs, m. the trochantin of the 2nd pair of legs, n. the trochantin of the 3rd pair of legs, o. the coxa of 1st pair of legs, p. the coxa of the 2nd pair of legs, q. membrane on the outer side of the metathorax, r. the »labial sternum», s² sternite of the 2nd abdominal segment, t¹. the tergite of the 1st abdominal segment, t². the tergite of the 2nd abdominal segment, 1—6 the places of the 1st to the 6th spiracle.

Fig. 2. The 1st leg on the right side of the female, seen from below ($\frac{2}{2}$); s. sense-organs.

Fig. 3. The tarsus of the 1st right leg, seen from above ($\frac{2}{1}$).

Fig. 4. The 2nd leg on the right side of the female, seen from below ($\frac{2}{2}$); s. sense-organs.

Fig. 5. The tarsus of the 2nd right leg, seen from above ($\frac{2}{1}$).

Fig. 6. The 3rd leg on the right side of the female, seen from below ($\frac{2}{2}$); s. sense-organs.

Fig. 7. The hind part of the abdomen of the female, seen from below ($\frac{1}{2}$); the hairs are omitted, and on the left side of the figure are indicated by dotted lines the sternites and the lateral, ventral parts of the tergites, being concealed in the normal condition; s⁶.—s¹⁰. sternites of 6th to the 10th segment, only s⁶ and s⁷ being externally visible, t⁶—t¹⁰ lateral, ventral portion of the tergites of the 6th to the 10th segment, only t⁶ and t⁷ being externally visible, 11. the »telson», concealed with exception of its narrow posterior portion, a. incision into the sternite s⁷.

Fig. 8. The hind part of the abdomen of the female, treated with caustic potash and very distended, seen from above; between t⁷ and t¹⁰, the tergites of the 7th and 10th segment, are seen the tergites of the 8th and 9th segment,

totally concealed in the normal condition of the animal (comp. Pl. 2, fig. 1). 11. the telson.

- Fig. 9. The hind part of the abdomen of the male, seen from below ($\frac{9}{7}$); a. genital hooks, b. the penis, c. the cerci, s^8 . and s^9 . the sternites of the 8th and 9th segment, t^8 .— t^{10} . the tergites of the 8th to 10th segment.
- Fig. 10. The posterior end of the sternite of the 9th segment, seen from the side.
- Fig. 11. The greatest young taken out of one of the females, being in its natural position (c. $\frac{1}{1}$); a the antenna, b. the organ from the neck, c. the cerci, d. a folded mass of membranous skin.

Förteckning öfver fjärilar, tagna på Hunneberg sommaren 1893. Studeranden vid Venersborgs allm. läroverk, C. O. NORÉN, som erhöi Entomol. Föreningens vandringstipendium för ofvannämnda år, har lämnat nedanstående redogörelse för de fynd han lyckats göra på Hunneberg under sina exkursioner för undersökning af fjärilfaunan därstädes.

Aporia Cratægi L. Allmän öfverallt.

Pieris Brassicæ L. Likaledes.

» *Napi* L. Likaledes.

Leucophasia Sinapis L. Östra sidan af berget, juni.

Colias Hyale L. Samma lokal och tid.

Thecla Rubi L. Allmän öfverallt.

Polyommatus Virgaureæ L. Östra sidan af berget.

» *Phleas* L. Allmän öfverallt.

Lycæna Orion PALL. Östra sidan af berget, juni.

» *Argus* L. Allmän öfverallt.

» *Optilete* KNOCH. Västra sidan af berget.

» *Icarus* ROTT. Allmän.

Limenitis Populi L. Västra sidan af berget, juli.

Vanessa Urticæ L. Allmän.

» *Antiopa* L. Tämligen allmän.