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POPULAR AND PRACTICAL ENTOMOLOGY.

THE CONTENTS OF OUR ENTOMOLOGICAL JOURNALS DURING 1919.

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Entomological journals are mostly what contributing authors make them, and the following, which is a brief summary of the 1919 contents of eight journals devoted entirely to entomology, should, if nothing else, indicate in a general way, the trend of entomological thought and activity. Such a summary, however, will not give an adequate idea of all entomological activities nor of the amount of published material devoted to each branch of entomology, in view of the fact that no consideration has been given to the publications of experiment stations, departments of agriculture, colleges and universities nor to journals devoted only partly to entomology.

The title of this paper clearly indicates its scope, and nothing more nor less should be assumed. In the tables which follow it is not intended that one journal should be compared with another. They have been treated separately only for the sake of convenience, and their contents have been summarized by titles and not by the quantities of printed matter devoted to each subject. These journals range from four to twelve issues per year, are of different sizes, and employ types of various kinds, consequently a true comparison should include all of these factors. All are valuable, all serve a useful purpose, and all should be supported by entomologists.

With the exception of Psyche and the Journal of the New York Entomological Society, the complete 1919 volume of each has been summarized. In the case of the exceptions, the last 1919 numbers of which have not appeared at this writing, the last issue of 1918 was included in order to make a complete volume.

Table I indicates the number of titles on each subject or group of subjects in each magazine. In a few instances, single papers covered more than one subject, and in such cases the titles were placed according to the amount of material on each subject. As for example, if a paper contained 75 per cent. of taxonomic material and 25 per cent. of any other subject, it was placed in the group devoted to classification. However, most of the titles and subject matter fell readily into the classification as given in the tables Table I further shows that papers on classification, including descriptions of new species and papers dealing with the various phases of systematic entomology, outnumber all others. Following this numerical order we have the biological papers, such as those dealing with the life-histories, habits and early stages of insects, and then the economic ones. Only one journal is devoted to economic entomology, and there are hundreds of economic papers published by agricultural

experiment stations, etc., so that the importance of the subject should not be measured by comparing the economic figures in Table I with the figures of other groups.

Papers on distribution, including host lists and those covering general entomology, are evidently of considerable interest to entomologists, judging by the number of titles devoted to each. The same is true for brief notes on all phases of the subject. Anatomical, morphological and physiological subjects are fairly well represented and will undoubtedly be more so in the future. Insect behaviour, ecology and origin are poorly represented, but papers on such subjects often appear in other journals, such as those devoted to animal behaviour and natural history in general.

TABLE I. NUMBER OF TITLES ON EACH SUBJECT.

Subjects	Canadian Entomologist, 12 issues.	Psyche, 6 issues.	Journal N. Y. Ent. Soc., 4 issues.	Entomological News, 10 issues.	Annals Ent. Soc. America, 4 issues.	Bulletin Brook. Ent. Soc., 5 issues.	Proceedings Ent. Soc. Washington, 9 issues.	Journal Economic Entomology, 6 issues.	Totals.
General economic methods, insecticides, etc.								26	26
Economic entomology							1	36	37
General subject	11			9		1	1		22
Classification, descriptions, new species, etc	42	12	17	36	10	16	26		159
Distribution, faunal and host lists	8	5	2	6	2	3	1		27
Anatomy, morphology, physiology	3	3	2		5	1	2		16
Life history, habits, early stages, etc	8	6	3	9	6	2		10	44
Behaviour		2						1	3
Origin				2		2			4
Ecology		1							1
Brief notes, all phases	20	2	13	23	1	6	4	33	102
Proceedings societies	1		3	15	1	4		3	27
Book reviews	11		1	6		5		9	32
Obituaries	2		1	6			3		12
	106	31	42	112	25	40	38	118	512

TABLE II. NUMBER OF MAJOR AND MINOR PAPERS IN ALL JOURNALS.

	Canadian Entomologist.	Psyche.	Journal N. Y. Ent. Soc.	Entomological News.	Annals Ent. Soc. Amer.	Bulletin Brooklyn Ent. Soc.	Proceedings Ent. Soc. Washington	Journal Economic Entomology.
Major papers	72	29	24	62	23	25	31	73
Minor papers, notes, etc	34	2	18	50	2	15	7	45
Totals	106	31	42	112	25	40	38	118

In Table II the titles are further grouped into major ones, which include all of those listed in Table III and minor ones which include everything else,

such as brief notes, book reviews, proceedings of societies, etc. Table III summarizes the major papers and gives the percentages of titles devoted to each subject. This table shows that the percentages of titles devoted to classification in the different journals ranged from 41.4 to 83.9. In nearly all of the journals more than 50 per cent. of the papers were on this subject. The percentages of titles on distribution, etc., varied from 3.2 to 17, those on anatomy etc., from 4 to 22 per cent., and those on life-history, etc., from 8 to 20.7 per cent. The remaining percentages in this table are low, except for the economic and general subjects.

TABLE III. PERCENTAGES OF MAJOR PAPERS DEVOTED TO EACH SUBJECT.

Subjects	Canadian Entomologist.	Psyche.	Jour. N. Y. Ent. Soc.	Entomological News.	Annals. Ent. Soc. Amer.	Bull. Brook. Ent. Soc.	Proc. Ent. Soc. Wash.	Jour. Econ. Ent.
General economic, methods, insecticides, etc.								36
Economic entomology							3.2	49
General subject	15			14.5		4	3.2	
Classification, etc.	59	41.4	71	58	43.3	64	83.9	
Distribution, etc.	11	17	8	10	8.7	12	3.2	
Anatomy, morphology, etc.	4	10.4	8		22	4	6.5	
Life history, habits, etc.	11	20.7	13	14.5	26	8		14
Behaviour		7						1
Origin				3		8		
Ecology		3.5						
	100	100	100	100	100	100	100	100

Fifteen groups or orders of insects were treated in the major papers of all journals as shown in Table IV, with the Coleoptera leading and followed by the Diptera, Lepidoptera, Homoptera, Hymenoptera, Hemiptera and Odonata. The main orders of insects were covered in each journal. No one group was represented to the exclusion of others, however several journals showed a considerable leaning toward some particular order, probably due to the fact that most of the contributing authors to those journals were interested in such a group.

Table V is of interest in showing the locations of authors of major papers. The District of Columbia leads with a total of 63 papers in all of the magazines listed. This is due undoubtedly to the large number of federal entomologists located there. Massachusetts, New York, Illinois, New Jersey, California, Pennsylvania, Canada and Ohio follow the District of Columbia in the order named, in so far as the number of titles is concerned. Several of the journals receive papers from many states, while a few appear to be devoted mainly to contributions from one or two states, at least such was the case during 1919.

It is no secret that most of our entomological publications or journals have seriously felt the increased cost of living during the past several years ,and have had difficulty in making both ends meet This has been made public i

TABLE IV. NUMBER MAJOR TITLES ON VARIOUS GROUPS OF INSECTS.

	Canadian Entomologist.	Psyche.	Journal N. Y. Ent. Soc.	Entomological News.	Annals Ent. Soc. Amer.	Bull. Brook. Ent. Soc.	Proc. Ent. Soc. Wash.	Jour. Econ. Ent.	Totals.
Diptera	15	6	2	13	5	4	5	5	55
Siphonaptera						1			1
Hymenoptera	10	11	1	3	3	2	6	4	40
Lepidoptera	4	3	2	18	5	1	3	9	45
Coleoptera	9	4	11	5	5	5	8	12	59
Orthoptera	2	3	1	1	1	1		2	11
Hemiptera	6		1	2	1	7		1	18
Homoptera	10		4	9	2		6	12	43
Parasitica							1		1
Thysanoptera	1								1
Odonata	2	1		6					9
Trichoptera			1						1
Ephemerida	1								1
Mallophaga								1	1
Isoptera							1		1
Various groups including Acarina	12	1	1	5	1	4	1	27	52
Totals	72	29	24	62	23	25	31	73	

TABLE V. ORIGIN OF MAJOR PAPERS.

	Canad. Ent.	Psyche	Jour. N. Y. Ent. Soc.	Ent. News	Annals Ent. Soc. Amer.	Bul. Brook. Ent. Soc.	Proc. Ent. Soc. Wash.	Jour. Econ. Ent.	Total
Canada	11	1		1	1				14
Idaho								1	1
Va								2	2
Md								1	1
N. H								1	1
Ariz								1	1
Ill	13		1	5	2	4	1	1	27
Col	4			3				1	8
Iowa	2							3	5
D. C	6		1	8	2	5	25	16	63
N. C	2			1					3
Wis	2			1	1			1	5
Mont	1			1		1			3
Ky	1			1				1	3
N. Y	4	4	12	3	2	6		5	36
Mass	7	19	3	6	4	4	3	1	47
Ore	2			1				1	4
Ind	3			2				4	9
Cal	4			5	2			11	22
Ohio	2	1		4	4			3	14
N. D	1								1
Mo	1			2					3
N. J	4	4	2	5	1	3		4	23
T. H	2		1						3
Neb			2	1					3
Conn				1				1	2
Kan				1				4	5
Pa				8	3			4	15
Tex				2				1	3
Mich					1				1
Fla						1	1		2
Minn						1		2	3
Italy			1						1
England			1						1
Japan							1		1
N. Queensland								3	3

various editorials and business proceedings. In view of this it is necessary for entomologists to support their journals in a more substantial manner, and one way of doing this is to subscribe for as many as one can afford. This is a duty which entomologists owe to their science. Moreover, the charges for such subscriptions are extremely low considering present-day prices, and each journal is well worth its price and more.

In one of the publications mentioned in the tables, which is also the official organ of an association of entomologists, the statement is made that "there were a considerable number of both active and associate members who did not subscribe for the publication." It is inconceivable that an active member of an association would refuse to support its journal. In some cases there might be extenuating circumstances, but it is believed that most entomologists can afford the small sums asked for their publications. The fact that a journal is not devoted exclusively to the entomological subject in which one is interested is not a valid excuse for failing to support it. The systematist, the economic worker, the insect ecologist, the insect biologist and the collector all need each other, and each should contribute to the other's support in order to advance the science of entomology.

A NEW SPECIES OF PSEUDACHORUTES (COLLEMBOLA).

BY CHARLES MACNAMARA,
Arnprior, Ontario.

The crystalline limestone that crops out in many places along the shores of Lac des Chats on the Ottawa River is often curiously eroded between the seasonal high and low water-marks into little circular cups with fairly vertical sides and rounded bottoms, ranging in size from about three to about eight inches in diameter by three or four inches deep. The cups occur only on horizontal surfaces, and are usually scattered in small groups rather widely separated; but occasionally a flat rock is so closely pitted with the depressions that it looks something like an enormous dilapidated honeycomb. The cups nearly always contain water, either from rain or from the splashing of the waves; and no doubt they are caused by the solvent action of water on the limestone, but why they should be so symmetrical in shape is not clear.

What concerns us here, however, is that these water-filled rock cups are great traps for some kinds of Collembola. Of course, the brisk, semi-aquatic *Isotoma palustris* Mull, which is at home on fresh-water shores all over the northern hemisphere, can leap nimbly in and out of the cups and play safely over the surface of the water. But any of the plodding Collembolan earth-walkers that blunder into the little hollows find them snares for their feet, and once caught on the water film, few of them ever seem to reach the rocky side and safety again.

So far I have collected nine different species and one variety of Collembola in the rock cups. Four are species common elsewhere in the district, but six of them—and this is what makes the cups such an interesting hunting ground—I have never found anywhere else, and of these at least two are new to science. One of the latter—a Pseudachorutes—is described in the present paper.

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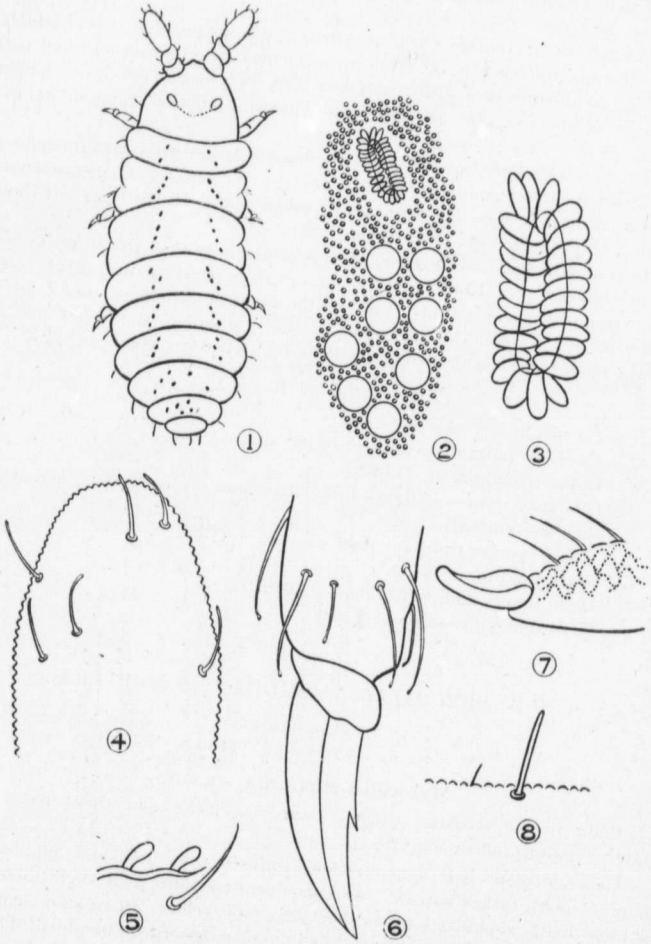
The genus Pseudachorutes, Tullberg, belongs to one of the most generalized of the Collembolan families, the Poduridæ. Including the subject of this paper, it comprises as yet only nine species, five of which are reported from Europe and four from North America. Two or three additional species have been described by different authors, only to melt away into the synonymy that is so rife in Collembolan classification. At present the genus is recorded only from the north temperate zone, but they are rare insects, and future collecting will probably discover them in other parts of the world.

The name "*saxatilis*" given the species here described, is suggested by the insect's habit of frequenting the rocks where it becomes trapped in the water-worn cups. What attraction a moisture-loving Collembolan can find on the sun-baked wind-swept limestone is hard to understand. Like many other members of its order, this Pseudachorutes seems possessed of a *wanderlust* that gets it into trouble. It does not seem possible that it can live on these bare rocks, and a careful search under stones and in crannies near the rock cups failed to discover a single individual. The fifteen or twenty specimens I have collected were all found caught on the water in the cups. The "mother lode" of this supply has not yet been traced, but it is probably among the bushes and trees a few yards back from the shore. In this respect the name is inaccurate, for the next time the insect is taken it will probably be in dead leaves or under rotten bark. But scientific names are no more to be regarded as strictly descriptive than those of persons, and no one expects to find every John Smith hammering iron on an anvil.

Pseudachorutes saxatilis, n. sp.

Plate V. Figs. 1 to 8.

Colour light to dark lavender blue, finely mottled. Body sutures, legs and under parts lighter. Dividing the width of the back into about thirds, are two rows of small light spots which diverge a little caudally on each segment (Fig. 1). *Eye-spots* conspicuously black, particularly so in the lighter-colcured specimens. *Eyes* 8+8, equal (Fig. 2). *Postantennal organ* of about 28 oval leaves arranged in a long ellipse (Fig. 3). The number of elements varies from about 25 to 29. *Antennæ* sub-equal in length with head or slightly shorter. Third and fourth segments confluent dorsally, but suture shows ventrally. Relative lengths of segments vary a good deal in different individuals, but approximate 7 : 8 : 7 : 9. First segment about 1½ times wide as long, second segment about 1¼ times wide as long, third and fourth segments taken together about 2½ times long as wide. Fourth segment furnished with "olfactory" setæ (Fig. 4). Sense-organ of two clavate curving rods situated distal dorsally on third segment (Fig. 5). Antennæ bear many single setæ, sparse on first and second segments, numerous on third and fourth segments. *Buccal cone* relatively short. *Unguis* (Fig. 6) with one large tooth about one-third from base. No tenent hairs, but distal tibio-tarsal hairs are apically bent and minutely knobbed. *Furcula* short and stout. *Dentes* with many coarse dorsal tubercles distally. *Mucrones* (Fig. 7) about one-third as long as dentes, convex in outline, with rounded lamella extending about two-thirds of the length, apical third finger-like, ventral margin curved. Rami of *tenaculum* tridentate, corpus



PSEUDACHORUTES SAXATILIS, n. sp.

without ventral setæ. *Clothing* merely a row of short, blunt simple setæ across middle of each segment with a few minute setæ in addition (Fig. 8) Maximum length 1.5 mm. Found August to October trapped on water in little cups eroded in limestone on shores of Ottawa River at Marshall's Bay, near Arnprior, Ontario.

The most distinctive feature of this species is the long, elliptical, postantennal organ of numerous elements. While these elements are usually referred to as tubercles, in this instance when viewed in plan they look like flat, overlapping plates; in perspective they are seen to be somewhat inflated, outstanding, oval leaves.

The two rows of light spots down the back may also serve for a preliminary identification, and possibly these may prove to be a constant characteristic; but coloration is so unstable with many Collembolans that little weight should be given to their presence or absence.

It is a pleasure to acknowledge the generous help that Dr. J. W. Folsom, of the University of Illinois, has given me in separating this species. His criticisms and suggestions have been of the greatest assistance, and I am indebted to him for pointing out some of the morphological niceties that the average microscopist cannot see until he is told where to look for them.

EXPLANATION OF PLATE V.

Fig. 1. *Pseudachorutes saxatilis* x45.
2. Eyes and postantennal organ of left side. x350.
3. Postantennal organ. x730.
4. Olfactory setæ of right antennæ, dorsal aspect. (Undifferentiated setæ are omitted). x450.
5. Sense organ of third antennal segment. x1500.
6. Right hind foot. x730.
7. Right mucro and part of dens. x660.
8. First abdominal segment. x500.

A NEW *MYZOCALLIS* (APHIDIDÆ: HOMOPTERA).

BY W. M. DAVIDSON,
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Myzocallis alhambra, sp. nov.

Body non-tuberculate; wings clouded; cornicles and tibial bases pale. Alate viviparous female.

General colour pale lemon yellow, suffused with pink and light orange. Shape of body rather narrow. Antennæ slender (third joint slightly enlarged on basal half), about as long as the body, pale yellow, articulations narrowly dusky brown; joint III bears from 2 to 4 circular sensoria on basal half; filament of distal joint longer than base; relative lengths of joints: III 317, IV 233, V 250, VI 133+186; joint IV is sometimes longer than joint V, and vice versa. Head and thorax somewhat dusky on sides; forehead produced obtusely in centre, its longest hairs about one-fourth as long as the head is wide between the antennæ, obscurely capitate; beak pale yellow, tip black, reaching barely to

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second coxæ. Thorax and abdomen without tubercles; wings clouded brown, veins brown, insertions of wing pale yellow, stigma pale yellow, a brown spot at base; legs pale yellow, tarsi grey; sternum dusky grey. Abdomen with many grey setiferous elevated maculations, these of greatest area being on the sides of segment 2 to 4 inclusive; cornicles pale, about as broad at the base as long, narrowingly apically; cauda and anal plate pale, the latter bifid. Venter pale.

The species varies in size considerably. Length from 1.4 to 1.8 mm., width (mesothorax) from .51 to .67 mm., length of cornicles .06 to .075 mm., length of cauda .12 mm.

Host.—*Quercus englemanni* Greeul, *Quercus* sp. On the leaves.
Locality.—Alhambra, Calif.

Dates of collection.—July 7, Sept. 26, November 5, 1919.

Type.—One slide containing four alate specimens deposited in the U. S. Nat. Mus. Collection of Aphididæ.

This species differs from *Myzocallis discolor* Monell in the structure of the third joint of the antennæ, *discolor* having about 8 sensoria placed all along the segment. In Monell's species the apical half of the venter is dusky, in *alhambra* the venter is pale.

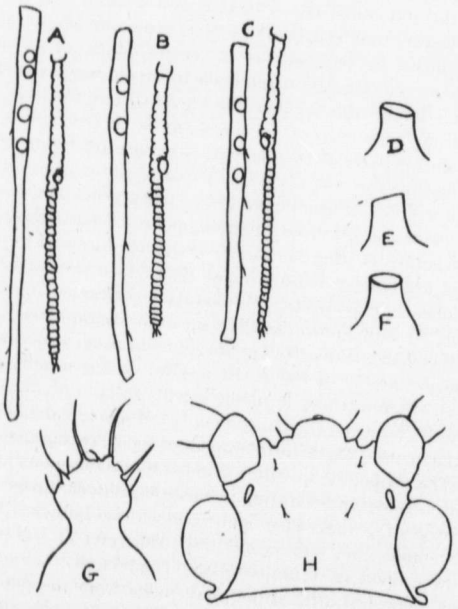

Fig. 18. A, B, C, segments III and VI of three antennæ; D, E, F, three views of cornicle; G, cauda; H, dorsum of head.

REMARKS ON THE BASIC PLAN OF THE TERMINAL ABDOMINAL STRUCTURES OF THE MALES OF WINGED INSECTS.

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The genitalia of male Hymenoptera, Neuroptera, Mecoptera, Diptera, Trichoptera, Lepidoptera, Hemiptera (Homoptera) and Strepsiptera have been compared with those of the lower orders in a paper which appeared in "Psyche," (June, 1920). The added knowledge gained from this study of a wider range of forms, and from an examination of the condition occurring in arthropods related to insects, together with the light thrown upon the nature of the parts in the lower insects in Dr. Walker's recent description of the genitalia of the male of *Grylloblatta campodeiformis* (Can. Ent., LI, 1919, p. 131) have enabled me to come to a better understanding of the fundamental composition of the terminal structures of the Hexapoda, and the following suggestions are here offered in an effort to clear up some of the uncertainties concerning the interpretation of the parts in insects in general and in the higher forms in particular.

Embryologists have maintained that the abdomen of an insect is primarily composed of twelve segments—or eleven segments, with a "telson"—and since the abdomen of the Protura (which are among the most primitive representatives of the Hexapoda) is composed of twelve segments, there is some evidence for considering that twelve is the original number of segments entering into the composition of the abdominal region of insects in general. It is only in exceptional cases, however, that traces of the structures interpreted as the vestiges of a twelfth segment are retained (as in certain odonatan nymphs), and the retention of even eleven complete segments is by no means of common occurrence in the lower pterygotan orders, since the eleventh tergite ("11^{t}" of Fig. 5) is usually lost through atrophy of fusion with the preceding tergites, though certain latero-ventral parts of the eleventh segment are frequently retained to form the so-called paraprocts "e" (Figs. 1 and 5) of lower insects.

The paraprocts "e" (Figs. 1 and 5) are usually much reduced, and unite with the tergites of the tenth or other segments to form the anal papilla or proctiger (a structure bearing the anus) in higher forms (Fig. 6, "h"). The paraprocts, "e", are represented as though distinct, in the diagram of the parts of a sawfly shown in Fig. 3; but this does not correspond to the actual condition occurring in any known sawfly, since the paraprocts in these insects usually form the floor (and sides) of the anus-bearing structure whose tergal region is made up largely of the tenth tergite—which usually unites more or less closely with the ninth tergite in the sawfly group.

The cerci, "f", borne on the paraprocts "e" (Figs. 1, 3 and 5) are homologous with the multiarticulate flagelliform uropods of such Crustacea as the Tanaidacea (Chelifera). The exopodite, or outer branch of the biramous appendage forming the uropod, is sometimes wanting in these flagelliform uropods of the Tanaidacea, thus suggesting that when only one of the branches is retained, the endopodite, or inner one, remains to form the cerci of insects. When both branches of the uropod are retained in the Tanaidacea, they are borne upon a single segment or protopodite (if one may judge from the published figures of these structures, and from the condition exhibited by *Apseudes spinosus*) and on this account I have been led to conclude that Walker, 1919 (Ann. Ent. Soc.

America, XII, 1919, p. 267) is incorrect in adopting the method of designating the basal segment of the cerci as the "basipodite," proposed by the German entomologists. Furthermore, it is quite possible that the paraprocts themselves (or a portion of them) represent the basal region of the uropod (see Fig. 5, "e"), whose endopodite is represented by the cerci. If this be correct, we might also consider the styli-like "paraprocessi",, or articulated processes borne on the paraprocts of certain tridactylids, as the representatives of the exopodite of the uropod whose endopodite forms the cerci of these insects.

The styli of insects apparently represent the exopodites of abdominal limbs, and if the paraprocessi also represent the exopodites of abdominal limbs (uropods) we would naturally expect that those paraprocessi would have the form of styli—as is true of the jointed paraprocessi of the tridactylids. On the other hand, the paraprocessi of certain Plecoptera are not styli-like, and the so-called suprahami (or surhami) of certain Blattida, which are somewhat suggestive of them, are not styli-like, being more like a hook—but the type of structure occurring in the Plecoptera might possibly be regarded as modifications of the original styli-like form. It may be remarked, in passing, that in some larvæ these styli have been interpreted as "cerci"; but this matter will be discussed eslewhwere.

The tenth tergite, "10^{t}", of Figs. 1 and 5, has been referred to as the "epiproct," or supraanal plate, when it is sufficiently well developed to be distinguishable, although the same term has also been applied to the eleventh tergite "11^{t}" in some cases. This is a somewhat lax application of the term epiproct, and Walker, 1919 (l. c.) is much more exact in restricting the designation epiproct or supraanal plate to the eleventh tergite. There is, however, an apparent need for some general designation for the last visible tergite no matter to what segment it belongs, and on this account I have here followed the more lax usage of referring to the apparent terminal tergite as the "epiproct" regardless of the segments involved in its make-up. In the sawflies, the tenth tergite "10^{t}" of Fig. 3 is usually more or less closely united with the ninth tergite, and in most higher insects it is difficult to identity its homologue. The sternum of the tenth segment is usually greatly reduced or atrophied, although it is claimed by some entomologists that the basal portion of the genital forceps "a" of Fig. 2, represents the tenth sternite in sawflies, etc. I think, however, that it is possible to interpret the structure in question in another way, as will be presently discussed. Heymons and others have maintained that lateral structures of the tenth segment form what appear to be the cerci in male Odonata, and there are sometimes present in certain phasmids, accessory lateral clasping organs which might be mistaken for cerci, though in reality they are merely posterior prolongations of the lateral region of the tergite.

Lateral portions of the ninth tergite may become prolonged posteriorly to form the surgonopods ("i" of Fig. 6) or accessory clasping organs of certain Neuroptera, Diptera and related forms, and have, in some cases, been mistaken for the true genital forceps when the latter are reduced and the surgonopods are well developed. The pleural region of the ninth segment labeled "9^{p}" in Fig. 6, has been homologized with the paraprocts "e" (Figs. 1, 3, 5, etc.) in certain higher insects; but the gonopleurite "9^{p}" of Fig. 6, is an entirely different structure, and should be designated by a term indicating this fact. The

sternite of the ninth segment is a structure of considerable interest from the fact that in the higher orders it forms the hypandrium "9^{st}" (Fig. 3) or ventral plate extending below the genital apparatus of the male insect, and its form and development offer features of some value in classification.

Behind the ninth sternite, or hypandrium "9^{st}" (Figs. 4 and 5) of the Ephemerida, there occurs a plate formed by the union of the "coxites" or styligers "a" and "a," which represent the basal segments of the gonopods or styli bearing the labels "b" and "c." The plate "a" and "a" of Fig. 4 is usually interpreted as the tenth sternite by students of the Ephemerida (Morgan, Eaton, et al.); but Handlirsch, 1913, (Handb. der Entomologie) figures the terminal structures of a male ephemerid *Palingenia*, in which the styligers of "coxites" (i. e., the parts labeled "a" in Fig. 4) are separate and distinct, and Walker, 1919 (l. c.) also points out that these "coxites" or styligers may unite to form the plate "a" and "a" behind the ninth sternite in the Ephemerida (Fig. 4). This interpretation is apparently the correct one, and has been adopted in the present discussion.

Between the styli or gonopods labeled "b" and "c" in Figs. 4 and 5 of the Ephemerida, there occurs a pair of penisvalvæ "d," through which the ejaculatory ducts open. In some insects, the common opening of the united ducts is located at or near the base of the penis valves. It is quite possible that the penis valves "d" represent the endopodites (inner branches) of a pair of abdominal limbs whose exopodites (or outer branches) are represented by the styli or gonopods labeled "b" and "c" in Figs. 2, 3, 4, etc. If this be correct, both the penis valves and the gonopods would have to be regarded as belonging to the same segment (the ninth) since they are parts of a pair of limbs borne on one segment. This interpretation has a direct bearing on the view that the inner and the dorsal valvulæ of the ovipositor of the female also represent the endopodites and exopodites of a pair of abdominal limbs, since it is quite possible that the penis valves of the male insect are homologous with the inner valvulæ of the ovipositor of the female; and the gonopods or styli of the male are homologous with the dorsal valvulæ of the ovipositor of the female insect. The penis valves of the male and the inner valvulæ of the ovipositor of the female would represent endopodites, while the styli (or gonopods) of the male and the dorsal valvulæ of the ovipositor of the female would represent exopodites of a pair of abdominal limbs borne on the ninth segment in both cases, according to this view; but Wheeler, 1893, (Jour. Morphol., VIII, p. 1) maintains that the inner valvulæ of the ovipositor, for example, are in reality styli originally borne on the tenth sternite, and are only secondarily located on the ninth sternite as the result of their migration to their final position between the dorsal valvulæ (of the ovipositor) which are located on the ninth sternite. If this be correct, the inner valvulæ of the ovipositor (and their supposed homologues, the penis valves of the male) do not originate on the same segment with the dorsal valvulæ of the ovipositor (or their supposed homologues, the gonopods or styli of the male), and therefore cannot be regarded as the endopodites of a pair of limbs whose exopodites are represented by the dorsal valvulæ (since the two branches of a biramous limb cannot originate on separate segments).

Wheeler, 1893, (l. c.) would interpret the three pairs of valvulæ composing the ovipositor of a female insect, as three pairs of modified styliform appendages

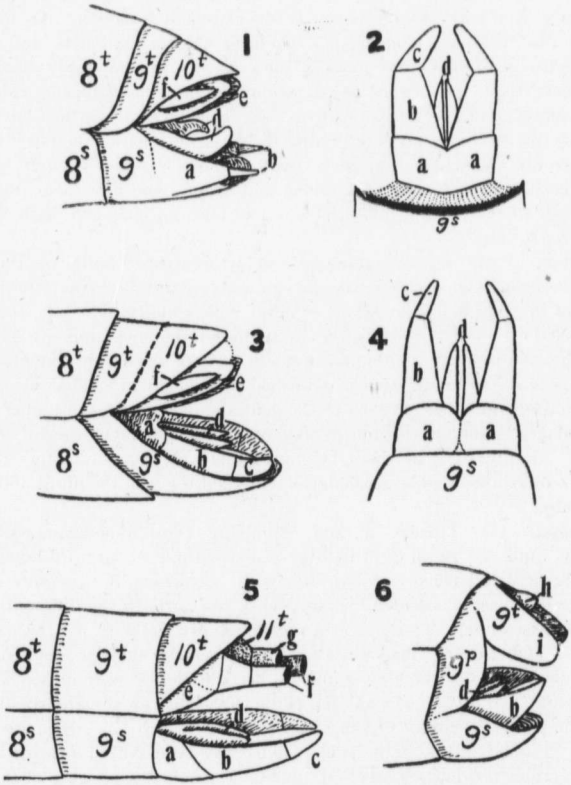
originally borne on the eighth, ninth and tenth sternites respectively, and homologizes them with paired styli borne on the eighth, ninth and tenth sternites of the male. While all three pairs of styli persist in the female (the pair originally borne on the tenth sternite migrating to a position on the ninth, in the female), only the pair borne on the ninth sternite persist in the male, the other pairs gradually disappearing as development proceeds. It must be admitted that Wheeler's choice of *Xiphidium* was an extremely unfortunate one, since the genitalia of the males of these insects are too highly modified to give the best results for such an investigation; and until the ontogenetic development of more favorable forms, such as the Ephemerida, sawflies, etc., have been studied with a view to determining the interpretation of the parts in male insects, we must conclude that the evidence available is not entirely satisfactory, especially since Heymons, Palmen, and others who have also traced the development of the parts in males of lower insects, do not agree with Wheeler in many particulars.

A study of the so-called gonopods, or arthrostyles,* borne on the ninth abdominal segment in trichopterous larvæ, has convinced me that these structures form the claspers or gonopods of adult male caddice-flies (i. e., the structures labeled "c" and "b" in Fig. 2), and since these structures are evidently appendages of the ninth abdominal segment (not of the tenth abdominal segment, as was stated in the article published in Psyche) in caddice-fly larvæ, I would interpret the outer claspers of the genitalia of the males of higher insects as appendages (styli) of the ninth abdominal segment. On the other hand, the penis valves may or may not belong to the same segment, although I am inclined to interpret them as appendages (endopodites ?) of the ninth abdominal segment also.

If the structures labeled "a" and "b" in Fig. 1 are homologous with those labeled "a" and "b" (with "c") in Fig. 5, and if these in turn are homologous with the structures labeled "a" and "b" (with "c") in Fig. 3, it is quite evident that there has been a considerable shifting of the parts in the different insects under consideration. Thus, in the roach shown in Fig. 1, the styligers or "coxites" labeled "a," instead of tending to remain more or less distinct as in the Ephemerida ("a" of Figs. 4 and 5), become more closely united with the ninth sternite "9^{st}" of Fig. 1, while the penis valves "d" are apparently attached behind the posterior border of the ninth sternite—which has either grown out posteriorly beneath them, or the penis valves have been shifted forward basally. If the structures bearing the label "d" in Fig. 1 are the homologues of the penis valves of the other insects figured, they have followed a line of specialization leading toward the asymmetrical development of the parts, and their relation to the styli or gonopods "a" and "b" is somewhat different from that occurring in the higher insects.

Another course of development has apparently been followed in the sawfly shown in Fig. 3, since the ninth sternite "9^{st}" (which does not project far posteriorly in the ephemerid shown in Fig. 5, "9^{st}") has grown outward and back-

*In the larvæ of certain sawflies such as *Neurotoma*, there occur near the base of the sternite of the tenth abdominal segment, a pair of jointed appendages which I interpreted as segmented styli (arthrostyles) from the fact that they are borne on the sternum of the segment. Mr. Middleton, however, informs me that these apparent arthrostyles are transformed into the cerci of the adult male insect, and if this be correct, the structures in question should be designated as cerci rather than as styli (or arthrostyles) in these larvæ.



TERMINAL ABDOMINAL STRUCTURES OF MALE INSECTS.
(P. 183)

ward under the structures labeled "a," "b," "c," and "d" in Fig. 5, thus bringing them into the position of the structures labeled "a," "b," "c," and "d" in Fig. 3. If the plate bearing the labels "a" and "a" in Fig. 2 of a sawfly, represents the plate labeled "a" and "a" in Fig. 4 of an ephemerid, it is quite evident that the styligers or "coxites" whose fusion product is represented by the plate bearing the labels "a" and "a" in Fig. 2, are distinctly separated from the ninth sternite "9^s" which originally bore them (?) thus presenting a condition comparable to

that occurring in the male of *Grylloblatta campodeiformis*, which Walker, 1919 (l. c.) considered to be unique among winged insects.

The relative positions of the parts in the sawfly (Figs. 3 and 2) are essentially the same as in the more primitive representatives of the higher orders of insects, such as the tipulids among the Diptera, *Philopotamus* among the Trichoptera etc., but other structure become secondarily developed in certain of these forms, thereby rendering the arrangement of the parts much more complicated and difficult of interpretation. As was described in a paper on the genitalia of male sawflies (Proc. Ent. Soc. Washington, 1919, Vol. 21, p. 129) there become differentiated from the distal portion of the segment "b" (Fig. 2) of the sawfly's gonopods, a pair of inner claspers which were interpreted as the volsellæ of higher Hymenoptera in the paper referred to above. These volsellæ-like structures probably correspond to the inner claspers of such Lepidoptera as the Geometridæ, etc. One or both of the valves of the penis "d" may form a portion of the aedeagus; and numerous other changes take place through the outgrowth of various "prongs" and other structures, through the modification of the tergites, such as the posterior prolongations of the lateral region of the ninth tergite labeled "i" in Fig. 6, etc., but these features have been more fully described in an article which will soon appear in Psyche, and need not be further discussed here.

Abbreviations.

a. Styligers or "coxites"; basal structures bearing the styli. They may unite to form a single plate or basal ring.
b. Basal segments of the styli or gonopods.
c. Distal segments of the styli or gonopods.
d. Penisvalvæ or valves of the "penis."
e. Paraprocts, or plates on either side of the anus.
f. Cerci.
g. Telofilum, or terminal filament.
h. Proctiger, or anal papilla bearing anus.
i. Surgonopods, or accessory claspers; prolongations of the ninth tergite.

The ninth sternite "9^s" forms the hypandrium, the ninth pleurite "9^p", forms the gonopleurite, and the tenth or eleventh tergite forms the epiproct. The letters t, p and s written to the right and above the numerals are used to indicate the tergite, pleurite and sternite of their respective segments.

Explanation of Plate VI.

Fig. 1. Lateral view of terminal structures of a blattid (based on *Cryptocercus*).
Fif. 2. Ventral view of genital forceps of a sawfly (based on *Sirex*).
Fig. 3. Lateral view of terminal structures of a sawfly.
Fig. 4. Ventral view of genital forceps of a mayfly (based on *Blasturus*).
Fig. 5. Lateral view of terminal structures of a mayfly.
Fig. 9. Lateral view of terminal structures of a Neuropteron (based on *Nymphes* and *Ithone*).

All figures are very diagrammatic.

ON CHILOPODS OF THE FAMILY MECISTOCEPHALIDÆ.

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While some confusion still exists in the application of the generic name Mecistocephalus Newport and consequently of the family name Mecistocephalidæ, under the rules of the International Code the problem is a simple one, and *punctifrons* Newport is clearly the type of the genus. Lamnonyx thus falls as a synonym to Mecistocephalus. In the present paper Mecistocephalus is regarded as thus unalterably fixed, and the family Mecistocephalidæ is treated broadly as including all mecistocephaloid forms

KEY TO GENERA OF THE MECISTOPHALIDÆ.

a. Coxosterna of second maxillæ discrete, not fused at middle line; palpi of second maxillæ clawless ..... (Arrupinæ).
  b. Coxæ of first maxillæ discrete ..... Arrup Chamberlin.
  bb. Coxæ of first maxillæ fused ..... Prolamnonyx Silvestri.
aa. Coxosterna of second maxillæ united at middle line; palpi of second maxillæ with claws ..... (Mecistocephalinæ).
  b. Cephalic plate with a stout spine beneath near each anterolateral corner; clypeal region divided by a distinctly areolate median longitudinal band extending from anterior areolate area; clypeal setæ few.
    c. Coxopleuræ of last pediferous segment very large, extending to or beyond the spiracle of the preceding segment ..... Megethmus Cook.
    cc. Coxopleuræ of last pediferous segment of normal size, not embracing the preceding segment.
      d. Laminæ of mandibles, excepting the first, with teeth confined to distal region proximad of where they are replaced by a close line of cilia.
      Lateral pieces of labrum with margin ciliate throughout ..... Dasyptyx Chamberlin.
      dd. Laminæ of mandibles with teeth throughout, no such ciliate lines.
        e. Labral margins shortly ciliate throughout; teeth of mandibular laminæ, except distally, exceedingly minute ..... Brachyptyx, gen. nov.*
        ee. Labral margins either wholly smooth or setose or ciliate only for a very short distance subjacent to median angles; proximal teeth of mandibular laminæ not at all or only moderately and gradually reduced.
          f. Labral margins wholly smooth; teeth of first lamina of mandibles seven or less ..... Mecistocephalus Newport.
          ff. Labral free margins with a few setæ or a short line of cilia at mesal ends subjacent to median piece; teeth of first mandibular lamina ten or more, the mesal edge of mandible serrate ..... Pauroptyx, gen. nov.

*Genotype, *Mecistocephalus mirandus* Pocock (*Lamnonyx mirandus* Silvestri).

bb. Cephalic plate with no such teeth beneath; clypeal region not divided by a median areolate band, its setæ usually very numerous.

c. Free margins of lateral pieces of labrum ciliate throughout; preclypeal setæ very numerous; channel from salivary pore in coxosternum extending caudad to or near the posterior angles ..... Dicellophilus Cook.

cc. Labral margins wholly smooth; preclypeal and clypeal setæ very few; channel from salivary pore in coxosternum on each side extending laterad to margin well cephalad of posterior angles as in Mecistocephalus, etc ..... Tygarrup Chamberlin.

Below is given a list of the known species of Mecistocephalidæ, with localities for each. In this list the numerals in parentheses with page numbers following each name refer to the literature at the end of the present paper in which the original descriptions were published.

A List of The Mecistocephalidæ.

Mecistocephalus Newport.

M. angusticeps (Ribaut), (24), p. 23. Africa.
M. angustior Chamberlin, (9). Society Is.
M. castaneiceps Haase, (12), p. 102. Pulo Edam Is.
M. cephalotes Meinert, (18), p. 100. Java; India, etc.
M. cephalotes multispinata (Silvestri), (27), p. 61. India.
M. cephalotes subinsularis (Silvestri), (27), p. 61. Ceylon; Sumatra; Mergui; Tonkin.
M. curvidens Haase, (12), p. 104. Philippines (Bohol).
M. cyclops Brölemann, (4), p. 528. Seychelles.
M. diversidens (Silvestri), (27), p. 76. India.
M. diversisternus (Silvestri), (27), p. 81. Japan.
M. erythroceps Chamberlin (9). Fiji Is.
M. guildingii Newport, (21), p. 179. = **M. maxillaris** (Gervais).
M. gulliveri Butler, (3), p. 446. = **M. maxillaris** (Gervais).
M. hamidens Haase, (12), p. 1, 6, legend and fig. = **M. curvidens** Haase.
M. heros Meinert, (19), p. 214. = **M. insularis** (Lucas).
M. heteropus Humbert, (13), p. 19. Ceylon.
M. insularis (Lucas), (17). Annex N. Africa; India; Seychelles, etc.
M. insularis orientalis (Silvestri), (26), p. 59. India; Sumatra; Andamans
M. japonicus Meinert, (20), p. 142. Japan.
M. kurandanus Chamberlin, (9). Australia.
M. leonensis (Cook), (10), p. 79. = **M. maxillaris** (Gervais).
M. lifuensis Pocock, (24), p. 63. Loyalty Is.
M. maxillaris (Gervais), (11), p. 52. Tropicopolitan.
M. meinerti Seliwanoff, (26). Central Asia (Taschkent).
M. mimeticus Chambelrin, (9). Solomon Is.
M. modestus (Silvestri), (27), p. 68. New Guinea.
M. nannocornis, sp. nov. Phillipines.
M. nigriceps Chamberlin, (9). Fiji Is.; Solomon Is.

M. parvus Chamberlin,[1] (8), p. 85. Galapagos Is.

M. punctifrons Newport, (21), p. 179. India.

M. punctifrons glabridorsalis Attems, (1), p. 138. =**M. insularis** (Lucas).

M. rubriceps Wood, (30), p. 42. Japan; Bonin Is.; Philippines; Formosa.

M. simplex Chamberlin, (9). Australia.

M. smithi Pocock, (23), p. 351. China; Formosa.

M. spissus Wood, (30), p. 43. Hawaiian Is.

M. sulcicollis Tömösvary, (28), p. 162. Borneo.

M. tahitiensis Wood, (30), p. 43. Society Is.; Australia; New Guinea; Fiji Is.

M. tenuiculus (L. Koch), (16), p. 794. =**M. rubriceos** Wood.

M. togensis (Cook), (10), p. 39. =**M. insularis** (Lucas).

Megethmus Cook.

M. ferrugineus (Hutton), (14), p. 115. New Zealand.

M. huttoni (Pocock), (22), p. 223. =**M. ferrugineus** (Hutton).

M. microporus (Haase), (12), p. 106. Philippines (Luzon).

M. pluripes, sp. nov. Philippines.

Pauroptyx, gen. nov.

P. himalayanus, sp. nov. India.

P. pallidus (Silvestri), (27), p. 65. India.

P. superior (Silvestri), (27), p. 63. India.

Brachyptyx, gen. nov.

B. mirandus (Pocock), (23), p. 352. Japan; Formosa; etc.

Dasyptyx, gen. nov.

D. gigas (Haase), (12), p. 105. New Guinea.

D. solomonensis Chamberlin, (9). Solomon Is.

D. subgigas (Silvestri), (27), p. 70. New Guinea.

D. uncifer (Silvestri), (27), p. 72. New Guinea.

Dicellophilus Cook.

D. anomalus (Chamberlin), (5), p. 665. Western United States.

D. apfelbecki (Verhoeff), (29), p. 348. =**D. carniolensis** (C. Koch).

D. apfelbecki diversiporus (Verhoeff), (27), p. 348. =**D. carniolensis** (C. Koch).

D. breviceps (Meinert), (19), p. 214. =**D. limatus** (Wood).[2]

D. carniolensis (C. Koch), (15), p. 185. Europe.

D. limatus (Wood), (30), p. 42. Western United States.

Tygarrup Chamberlin.

T. intermedius Chamberlin, (7), p. 212. British Guiana.[3]

1 Dr. Silvestri thinks this the same as *M. maxillaris*, but in this he is in error. As a matter of fact the two species are widely separated. Aside from differences in mouthparts, *parvus* may at once be distinguished from *maxillaris* in having the sternal impressions simple, not at all anteriorly furcate. It is a much smaller species with fuscous head and prehensors.

2 The type of *M. breviceps* Meinert is in the Mus. Comp. Zool. at Cambridge. In the old insect catalogue (No. 310), it is noted as collected on Nantucket in Aug., 1853. This record, however, is probably erroneous. Both the type and the paratype, which is without locality label, agree fully with specimens of *D. limatus* (Wood) from California.

3 Taken at Washington, D. C., in pots of plants at quarantine from British Guiana.

Prolamnonyx Silvestri.

P. holstii (Pocock), (23), p. 352. Japan; China.
P. indecorus (Attems), (2), p. 287. =**P. holstii** (Pocock)
P. santeri Silvestri, (27), p. 87. Formosa.

Arrup Chamberlin.

A. pylorus Chambelin, (6), p. 654. California.

DESCRIPTION OF NEW FORMS.

Mecistocephalus nannocornis, sp. nov.

Dusky brown, the head darker, more blackish.

Head coarsely deeply punctate; exceptionally short in proportion to width, being only 1.4 times longer than wide; frontal suture very distinct as in most species, the suture bowed forward at its middle. Tooth on ventral side of anterior corner much reduced. Antennæ very short, scarcely reaching to end of first tergite.

Tergites uneven, roughened; sulci in middle and posterior regions very strongly impressed.

Prosternum proportionately short and wide, rather finely punctate; anterior margin with two low, rounded teeth. Prehensors with femuroid bearing a single tooth at distal end; second and third joints also armed; claw with tooth low and slight, almost obsolete. Sternites with a deep median longitudinal sulcus not bifurcate at its anterior end.

Last ventral plate strongly narrowed caudad, the caudal margin straight. Coxopleuræ with pores of moderate size, not crowded, about thirty on each side.

Last dorsal plate broad and shield-shaped.

Pairs of legs only forty-five.

Locality.—P. I.; Mt. Makiling. (C. F. Baker).

Type.—M. C. Z., No. 2006.

Like *spissus* Wood, occurring in the Hawaiian Is., in the number of pairs of legs; but readily distinguished by its proportionately much shorter head, etc.

Megethmus pluripes, sp. nov.

This species may be distinguished from *microporus* in the smaller coxopleuræ of the last segment which enroach upon the penult segment only as far as the spiracle, not reaching the anterior end; pores similarly very numerous and fine. Pairs of legs ninety-seven instead of one hundred and one.

General colour fulvous; head and prehensors red or light chestnut.

Head very long and narrow, being just twice as long as the greatest width. Paired sulci close together, parallel, distinct for a short distance in front of caudal margin, then becoming vague Antennæ long; joints all long. Mandible with nine dentate plates of which the first has but three teeth and a median one near twenty of which the more proximal are more widely spaced. Median piece of labrum cuneate; lateral pieces with margin wholly smooth, mesal tooth but vaguely indicated.

Basal plate with a sharply impressed median longitudinal sulcus. Prosternum sparsely punctate; unarmed anteriorly. Femuroid of prehensors each with two stout black teeth on mesal side of which the distal one is much the larger; teeth of second and third joints black, rounded; tooth of claw very low, indistinct.

Sternites each with a deep, Y-shaped impression, the branches widely diverging, at or caudad of the middle, the angle very obtuse, the ends transverse.

Dorsal plates bisulcate from the first caudad.

Length, 75 mm.

Type—M. C. Z. 1,917; paratypes M. C. Z. 1,918. Philippines: Mr. Banahao, C. F. Baker.

Pauroptyx, gen. nov.

In this genus there is a short series of setæ or cilia on or projecting from beneath the free edge of each lateral piece of the labrum at its mesal end. The mesocaudal angle of each lateral piece of the labrum is typically more strongly produced than in Mecistocephalus. The first lamina of the mandible has from ten to sixteen teeth in the known species, the series of teeth being continued proximally by a series of characteristic serrations along the mesal edge of the mandible.

Genotype.—*P. himalayanus*, sp. nov.

The known species are all from India.

Pauroptyx himalayanus, sp. nov.

The median piece of the labrum in this species projects caudad beyond the edge of the main part of each lateral piece; each lateral piece adjacent to the median piece produced caudad into a long acute tooth somewhat like but proportionately much longer than the corresponding processes of *P. superior* and *P. pallidus*. Labrum with setæ showing at mesal end at a near angle formed by mesal process and main part of plate, these in part, at least, merely stiff hairs projecting from beneath (i. e., from dorsal surface) the edge and similar to the other hairs clothing the dorsal surface. Mandibles with nine pectinate lamellæ of which the first is ten-toothed; the inner margin below these teeth conspicuously serrate. A median lamella has about thirty-eight teeth which decrease from the distal end proximad in the usual way. Head 1.9 times, or slightly less, longer than wide. Anal legs more than twice as long as the penult. Last sternite large, more strongly narrowed caudad than in *pallidus* but similarly constricted in front of caudal end; broader in male, the caudal lobe more abruptly set off.

Colour uniform fulvous to light brown, the legs concolorous. Head and prehensorial segment abruptly darker, chestnut to mahogany. Antennæ fulvous.

Length to 60 mm.; width of first plate, 1.8 mm.

Pairs of legs, forty-nine.

Type.—M. C. Z. 899; paratypes, 897, 900, 898. India; Himalayas; Koolloo; near Amballa.

Literature Cited.

1. Attems, C. Dr. Brauer's Myr.-Ausbeute auf den Seychellen. Zool. Jahrb., 1900, 13, p. 39.
2. Attems, C. Myriopoda in Zichy's Dritte Asiatische Forschungsreise, 1901, 2.
3 Butler, A. G. Preliminary Notice of New Species of Arachnida and Myriopoda from Rodriguez. Ann. Mag. Nat. Hist., 1876, (4), 17.
4. Brölemann, H. Myriapodes in Mission Scient. de M. Ch. Alluaud aux îles Séchelles. Mem. Soc. Zool. France, 1895, 8.
5. Chamberlin, R. V New Chilopods. Proc. Acad. Nat. Sci. Phil., 1904.

6. Chamberlin, R. V. The Chilopoda of California, III. Pomona Journal of Ent., 1912, 4.
7. Chamberlin, R. V. The Stanford Expedition to Brazil. The Chilopoda of Brazil. Bull. Mus. Comp. Zool., 1914, 58, No. 3.
8. Chamberlin, R. V. A Diplopod from the Galapagos Is., with Notes on the Chilopoda. Psyche, 1914, 21, No. 3.
9. Chamberlin, R. V. The Myriopoda of the Australian Region. Bull. Mus. Comp. Zool., 1920.
10. Cook, O. F. Geophiloidea from Liberia and Togo. Brandtia VIII, 1896
11. Gervais, P. Études pour servir à la histoire naturelle de Myriapodes. Ann. Sci. Nat., 1837, (2), 7.
12. Haase, E. Die Indisch-Australischen Myriopoden. I. Chilopoden. Abh. u. Ber. d. K. Zool. u. anthrop.-ethnogr. Mus., Dresden, 1886, 1, No. 5.
13. Humbert, A. Essai sur les Myriapodes de Ceylan. Mém. soc. d. Phys. et Hist. Nat. Genève, 1865, 18.
14. Hutton, F. W. Descriptions of new species of New Zealand Myriopoda. Ann. Mag. Nat. Hist., 1877, (4), 20.
15. Hoch, C. L. System der Myriopoden, 1847.
16. Koch, L. Japaneschische Arachniden u. Myriopoden. Verh. z.-b. Ges. Wien, 1878, 27.
17. Lucas, H. Myriapodes, in Maillard's Note sur l'île de la Reunion, ed. 2, 1863.
18. Meinert, F. Myriapoda Mus. Hauniensis, I. Geophili. Naturh. Tidsskr., 1871, (3), 7.
19. Meinert, F. Myriapoda Mus. Cantabrigensis, Mass. I. Chilopoda. Proc. Am. Phil. Soc., 1885, 23.
20. Meinert, F. Myriapoda Mus. Hauniensis, III. Chilopoda. Vidensk. Meddel. fra den Naturh. Foren i Kjbenhavn, 1886.
21. Newport, G. On some new Genera of the Class Myriapoda. Proc. Zool. Soc. London, 1842, 10.
22. Pocock, R. I. Descriptions of some new Geophilidæ in the Collections of the British Museum. Ann. Mag. Nat. Hist., 1891, (6), 8.
23. Pocock, R. I. Report upon the Chilopoda and Diplopoda obtained by P. W. Bassett Smith and J. J. Walker during the cruise in the Chinese Seas of H. M. S. "Penguin," etc. Ann. Mag. Nat. Hist., 1895, (6), 15.
24. Pocock, R. I. Myriapoda, in Willey's Zool. Results, pt. I, 1898.
25. Ribaut, H. Myriapodes I. Chilopoda in Voyage de Ch. Alluaud et R. Jeannel in Afrique Orientale, Résult. Scientifiques, 1914.
26. Seliwanoff. Geophilidæ museja imp. Ak. nauk. Zapiski imp. Akad. nauk. Ft. petersburg, 1881.
27. Silvestri, F. Contributions to a knowledge of the Chilopoda Geophilomorpha of India. Records of the Indian Museum, 1919, 16, pt. 1, No. 5.
28. Tömösvary, Ö. A Myriopaddk osztdlydnak üj alakja Borneo szigéteröl. Termesz füzetek., 1882, 5.
29. Verhoeff, K. Beitr. z. Kenntn, pal. Myriopoden, VI, Ueber Palaar. Geophiliden Archiv Naturges., 1898.
30. Wood, H. On the Chilopoda of North America with a Catalogue of all the Specimens in the Smithsonian Institution. Jour. Acad. Nat. Sci. Phil., 1863, (2), 5.

BOOK NOTICES.

THE CRANE-FLIES OF NEW YORK. Part I. Distribution and Taxonomy of the Adult Flies. By Charles Paul Alexander. Memoir 25, Cornell University Agricultural Experiment Station. Ithaca, N. Y., 1919. Pp. 769-993; with 6 plates and 11 text figures.

It has been heretofore practically impossible for anyone in Eastern North America, except the specialist, to determine for himself specimens of crane-flies taken within that area. The present work has removed this obstacle and, therefore, fills an important gap in entomological literature. It will be widely welcomed by all who ever have occasion to deal with the taxonomy of these flies.

Mr. Alexander's work on this somewhat neglected group is so well known that it is scarcely necessary to comment on the thoroughness with which both the text and the illustrations have been prepared. The work is based on the study of a large number of collections, both public and private, and its geographical scope is much greater than is indicated in the title, all the species from Eastern North America being included.

Besides the portions concerned with classification and distribution, there are useful sections dealing with the immature stages, the haunts and habits of both larvae and adults. The larval habits are very varied, some species being aquatic, some inhabiting mud, others fungi, wood and bark, while a few feed upon leaves like caterpillars. Methods are described for rearing these various types of larvæ.

The external anatomy of the adult flies is treated from the taxonomic point of view, structures affording good taxonomic characters, such as the antennae and wing venation, receiving a relatively large space. In connection with the description of abdominal structures it may be mentioned here, although not in criticism of Mr. Alexander's work, that the term "pleurite" as applied to the structures attached to the caudal margin of the ninth abdominal sternite, is morphologically incorrect, these parts being undoubtedly *coxites*, and having nothing to do with the pleural region of the segment.

The analytical keys appear to be excellent in every respect, so far as can be judged by one who is not a specialist in this group. The details of distribution for each species in New York State are not given in the decriptive part, but in the special section on distribution. An important feature of this section is the discussion of the distribution of the Tipulidae and related familes by life-zones. Following the definitions of the various zones, lists of characteristic plants and crane-flies are given. Between the Canadian and Transition Zones another zone, or sub-zone, the Canadian-Transition, is recognized, a distinction which undoubtedly has its advantages, although it is largely a matter of convenience as to how many zones should be recognized within the territory discussed, where in reality the changes depending on latitude, except where modified by local conditions, are entirely gradual. Some of the plants listed for the Transition Zone are, in the reviewer's opinion, typical of the Upper Austral, such as *Chamaecyparis thycides*, *Juglans nigra* and *Sassafras variifolium*.

"The number of species of Crane-flies that should occur in New York State is probably not less than three hundred and this figure seems similarly appli-

cable to many areas of equal extent and equal diversity of ecological conditions in the North Temperate Zone."

It is almost superfluous to add that this excellent work should be in every entomological library, and that no teacher of systematic entomology can afford to be without it.

E. M. W.

ORTHOPTERA OF NORTHEASTERN NORTH AMERICA with Special Reference to the Faunas of Indiana and Florida. By W. S. Blatchley. The Nature Publishing Co. Indianapolis, 1920. 784 pp. 5 plates and 246 text figures.

The aim of this manual is to furnish a ready means of identifying any species of Orthoptera found in the United States east of the Missippi River and Canada east of the 90th meridian. It is intended for the use of the beginner rather than the specialist, but the subject matter is treated in such detail that it is thoroughly well adapted to the needs of the most advanced student as well.

It is an outgrowth of the author's well-known treatise on the Orthoptera of Indiana, but not only deals with a large number of species not included in the Indiana fauna, but the data on the latter forms is revised and considerably expanded. It also differs in plan from the older work in that it contains an alphabetical list of synonyms at the end of the book, instead of listing these under the head of each species; although the principal synonyms are mentioned in the notes that follow the descriptions.

One of the many excellent features of the book is the full discussion of the haunts, habits and songs of the various species, in which Mr. Blatchley has quoted at considerable length from other authors, selecting those passages which are considered to be of most value to the subject.

The illustrations are for the most part selected either from the author's earlier work or from the works of other specialists, but include also two plates of excellent original figures, by Mr. Fox, of the genitalia of the various species of the genus *Ceuthophilus*. Unfortunately a few of the text figures were inverted by the printer, but the pages on which these occur have already been reprinted with the figures in their correct positions. One of these figures is that of *Arphia sulphurea*, and it was unfortunate that this figure was selected to illustrate this species since, in the reviewer's opinion, it must have been taken from some other species, the tegmina being quite unlike those of an Arphia in their transverse fasciae, which with the shape and pattern of the hind wings, are typical of *Circotettix verruculatus*.

It is the reviewer's unpleasant duty to point out also certain other errors and inaccuracies in this otherwise excellent manual, which have come to his notice.

The Articulata (p. 12) are divided into two great groups, the Vermes and the Arthropods. The term Vermes is here used, of course, for the segmented worms (Annelida) only .It is now obsolete as the name of a taxonomic group, but when in use was understood to include a number of other groups besides the Annelida.

In the description of the mouth-parts on p. 14 it is stated that the labial palpi are attached to the labrum, and no mention is made of the labium.

On page 21 the term *tergite* is used to designate one side of a tergum, whereas it is generally employed to denote the entire dorsal sclerite.

On p. 22 the supra-anal plate (of the locust) is said to be the tergum of the tenth abdominal segment. It is really the eleventh, as is correctly indicated in the figure on the same page.

The family name used for the grouse locusts is Tetrigidæ, since the author objects to the confusion which is likely to arise from the use of both names Acrydiidæ and Acrididæ (the latter being the family to which the ordinary locusts belong). If, as stated on p. 187, the name Acrididæ were derived from the Latin *Acridium*, its proper spelling would be Acridiidæ, and it would indeed be objectionable to use both this term and Acrydiidæ, since *Acridium* is merely an amended spelling of Acrydium. But the name Acrididæ is not derived from Acridium but from Acrida (an Old World genus) and if *Acrydium* is employed for the typical genus of grouse locusts, instead of *Tetrix*, the family name Acrydiidæ and the subfamily name Acrydiinæ must likewise be used, to conform with the established rules of nomenclature.

In the section on p. 745, entitled "Area and Life Zones Covered," the Hudsonian Life Zone as defined as equivalent to the entire Boreal Region of Merriam, and the Boreal Fauna is stated to be the fauna of this zone. According to Merriam the Hudsonian is the middle zone of the three into which the Boreal Region is divided, the others being the Arctic and Canadian; and although, as far as Orthoptera are concerned, there would be little need of these divisions, they are, on the whole, quite as distinct as the zones of the Austral Region.

Mr. Blatchley's definitions of the areas included in the other zones also differ from those generally accepted, but as the limits of the zones are not easily definable, such matters depend to a large extent upon personal preference and judgment. It is unfortunate, however, to select as typical of the Alleghanian fauna *Chorthippus curtipennis*, and *Melanoplus fasciatus*, since these species are distributed throughout the Canadian Zone well into the Hudsonian, if not to the Arctic. Two of the three representatives of the Carolinian Fauna, *Chloealtis conspersa* and *Melanoplus femur-rubrum*, are also in no respect characteristic of this fauna, both ranging through the Transition well into the Canadian Zone.

On the whole Mr. Blatchley has shown very good judgment, in our opinion, in his decisions as to the status of various forms described as species. *Tettix crassus* Morse is, e. g., very properly assigned to the synonymy of *Acrydium ornatum* Say, and *A. hancocki* (Morse) is placed as a variety of this species; while *Oecanthus quadripunctatus* Beutenm. is correctly placed as a variety of *O. nigricornis* F. Walk. He has not, however, accepted the present writer's decision in reducing *Podisma variegata* Scudd. to a race of *P. glacialis* Scudd., although this has been amply proven. In fact *variegata* grades by infinitesimal steps into *canadensis*, and if there is a line to be drawn anywhere it is between *canadensis* and *glacialis*.

It must not be thought that the points criticised affect seriously the usefulness of Mr. Blatchley's book, which we feel sure will prove a most valuable work of reference for all students of this interesting order for many years to come.

E. M. W.

In accordance with the regulations of the Post Office Department respecting the postage rates on monthly magazines, it has been necessary to issue the August and September number separately.

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