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THE HYPOPYGIA OF CERTAIN ANOPHELINES (DIPTERA: CULICIDAE).

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In 1921, I gave a description of the hypopygia of the three German anophelines then known. To the "normal" condition I added another variety from the south of Europe. But later on, when I obtained other specimens of *Anopheles elutus* exhibiting the same features as the said variety, I believed that hypopygium to characterize *A. elutus*, as at that time I was relying on scanty material (1924).

In 1924, La Face, having studied a larger number of hypopygia, pointed out the variability of these parts and demonstrated that I was mistaken in drawing a clear line between the structures of the two "species." In 1930, I supported her statement by giving some drawings of varieties and assymetries of the terminalia, but remarked the prevalence of different varieties in different regions. Later in the same year, Swellengrebel, de Buck and Schoute, attempting to clearly define their variety *atroparvus*, stated that "in wild short-winged males (*var. atroparvus*) round tipped ventral (really dorsal) claspette spines were present in but 0.3% out of 557 cases (in 279 males). In 12%, there was only one ventral spine, in wild long-winged males, 40% had round-tipped ventral claspette spines. In 50%, there existed only one spine on the ventral lobe. In the laboratory broods reared under identical conditions, the incidence of round-tipped spines in the short-winged male was 0.6% (1210 cases in 605 males) against 37% (722 cases in 361 males) in the long-winged. A solitary ventral spine occurred in 18% of the short-winged, and 559 of the long-winged cases."

In 1931, Hackett, Missiroli and the writer showed that by means of the characters of the eggs emphasized by Falleroni, a reliable distinction of at least two races was possible, and the courtesy of the Dutch authors Schüffner and van Thiel enabled us to demonstrate that the short-winged mosquitoes of Medemblik (*atroparvus*) were identical with Falleroni's variety *labran-*

chiaie of northern Italy, and almost pure, and that the long-winged race of Leiden was a mixture of *Falleronis messeae* with some *labranchiae*. Therefore probably neither the wild collected individuals nor the reared mosquitoes of either population will represent an absolutely genetically pure stock.

La Face, raising males from selected eggs, proved in the same year that the one (or two) most dorsal spines are always acutely tipped, in the race with the gray eggs, whereas in the males bred from the dark barred eggs (*messeae*), at least the most "ventral" (really dorsal) spine is mostly blunt. From the striped eggs (*maculipennis* typ.), she raised males with almost identical hypopygia as in *messeae*. For the American *A. maculipennis*, Frost (1932) briefly says: "Claspettes bilobed the dorsal lobe small with two pointed spines, the ventral lobe larger with two or three spines, usually the latter." "Dorsal" and "ventral" have here the same meaning as in this paper. [Compare Christophers 1915 and Edwards 1920.]

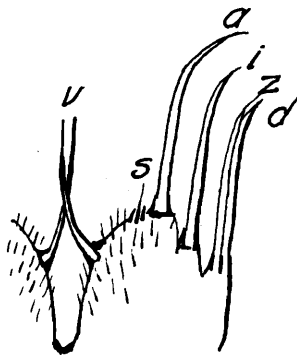


Fig. 1.

By our investigations of 1931 we obtained knowledge of some places where one or the other subspecies occurred purely or almost purely. The mounts of hypopygia of such places are well in accordance with the results of La Face. In the rough sketch (Fig. 1) the spine at the tip of the claspette, the apical spine, is marked "a," the most ventral one "v," the most dorsal one "d." In addition there is always a small sensory hair "s" at the inner side of the apical spine. It is very rarely replaced by a spine.

This poor set is often all that a male of *Anopheles maculipennis* possesses. It is also present in *A. elutus*, *quadrifasciatus*,¹ in *punctipennis*, *atropos*, *walkeri*, *punctimacula*, and others, modified only by the configuration of the spines and by additional appendages. Thus "Fig. B" of Frost shows on the ventral

¹In Booth's Figure of this species "v" is merely a hair. But in a specimen caught by Dampf in northern Mexico it is developed as a spine.

lobe the spine "v," the sensory hair "s," and the spine "a"; on the dorsal lobe, the "d" and an accessory spine. In the description quoted above, she calls the hair "s" a spine, whereas in *punctipennis* it is called a hair. The shape of the spines of the dorsal lobe is not mentioned but the figure shows them to be blunt.

Also in European *maculipennis* additional spines are common. Very often spine "d" is accompanied by another spine, the twin-spine "z." Rarely there is a third one attached to the most dorsal lobe. But sometimes midway between the apical spine and the dorsal ones on a separate lobe there is an intermediate one, "i" (as I figured it for *elutus* (1930) and La Face for the *messeae*). The spines v, a, d are always present and as well the small sensory hair "s." The "z" and "i" are not always easily distinguished, as "i" by its base may be almost attached to the dorsal lobe, and because "z" is not always placed on the same level as "d," but sometimes is inserted posteriorly and more ventrally than "d." Therefore it may be arbitrary if we claim a spine, to be an "i" or a "z," whereas in *A. bifurcatus* the three groups of spines, that of the dorsal, the intermediate and the apical lobe are always easily told and counted.

It should be kept in mind also, that the shape of the claspettes is subject to variation, the bases of the spines often being lobe-like, but not always, and that different position on the slide results in different outlines.

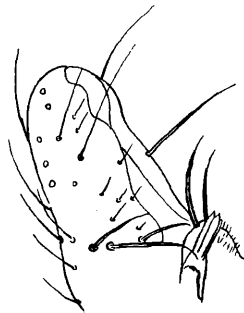


Fig. 2.

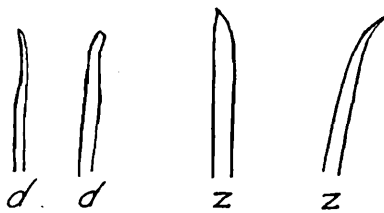


Fig. 3.

As to the shape, "v" and "a" and mostly "i" are slowly tapering sharply pointed spines. The spines "d" may be blunt and rodlike, or acute. But the same spine sometimes looks different in different positions, thus Figure 2 is taken from the same detached dorsal spine rolled beneath the cover slip, and Figure 3 from the same "z" spine. Both are taken from a male of *messeae*. In this subspecies some "d" spines therefore may be placed with the acute spines, which in another position might have been recognized as blunt. The acute spines of *atroparvus* hardly ever give any difficulty.

Rarely "v" is duplicated, the one spine being placed a bit dorsad of the other one, and both exhibiting the peculiar shape of that spine. This variation occurred, among the *atroparvus* material, in two symmetrical hypopygia (4 times) and symmetrically in one *messeae*. Or the sensory hair "s" may be enlarged to form a bristle or a weak spine or a strong spine. It was in *atroparvus*, replaced by bristles on both sides of one hypopygium by spines in both sides of 3 hypopygia and in two single claspettes among the typical *maculipennis*. However, the apical spine "a" may be duplicated, a normal sensory hair being present as well (twice unilaterally among the *atroparvus*).

In one object, the dorsal spine "d" was lacking, only "a," "s," and "v" being present.

Most hypopygia are symmetrical but asymmetries are not at all rare. This remark refers not only to the number but also to the shape of the appendages. Therefore in statistical work we take every claspette as one object, as did Swellengrebel and his co-workers.

In one hypopygium from Ardea (Italy), one side piece exhibited (asymmetrically) the duplication of the interior basal spine. Similar varieties I noted two times in *A. pseudopunctipennis*.² In that of Fig. 4, an accessory spine is developed most laterally. Such observations disprove the reliability of this kind of characters that Kingareff and the present author have used to define certain species of *Anopheles* s. str.

The statistical results are:

<i>A. atroparvus</i>	blunt	tipped	acute
Luurhusen	.....	.....	20
Loppersum	.....	2 x 2	83
Aland	.....	.....	22
Greetsiel	near Emden.....	.....	69
Larrelt	.....	.....	48
Twixlum	.....	.....	8
Tetkum	.....	.....	9
Neuwerk	near Hamburg.....	1	44
Groden	.....	1	8
Totals.....	1	5	311

²About *A. pseudopunctipennis*, Frost says: "No specimen of our species of *pseudopunctipennis* yet examined has had the four delicate serrate leaflets noted by Root (1924) on specimens from Mexico." I got a specimen from Mexico, where these leaflets are not easily detected. Otherwise all our Mexican *A. pseudopunctipennis* exhibit this character clearly and among them is one specimen, where they are as strongly developed as in *A. punctipennis*. I suggested (1932), that this male might belong to a new species, *A. cricillum* described from a single female. One more species of this group is met with in southern Mexico. For the typical *A. pseudopunctipennis*, Matheson also figures the serrate leaflets, and so does Dyar. If they are really absent in the Californian specimens, these might prove to be a new species or subspecies.

In all these localities, *messeeae* is met with only exceptionally.

In 26 cases the dorsal spine was single, double 22 times and triple 3 times among the Emden males. An intermediate spine is registered 21 times.

For the var. *messeeae* the pure population of Kaninchenwerder had at least one blunt rod 39 times, at least one shortly tipped rod 17 times, all spines acute 32 times. But I do not doubt that according to previous remarks, by tearing every hypopygium and rolling the rods we would come to a more homogeneous impression. A "z" was present 35 times, an "i" in 3 samples, among which two belonging to the same hypopygium were associated with two dorsal spines.

At Kappel, I found 16 times, the blunt rod, and only once symmetrically the acute spine. Among Grünberg *messeeae* the "d" was 24 times blunt, 3 times tipped and 2 times a spine. 28 times a "z" was present and 12 times an "i" in this material.

In the almost pure population of *A. maculipennis maculipennis* collected in the Orti di Schito (striped eggs), I found no acute dorsals. Five times the "d" appeared like a very shortly tipped rod, 59 times the "d" was blunt, 11 males of the same race from the Lago di Fucino had blunt rods on all of the 22 halves.

From these 85 objects but 25 had the "d" rod single, 13 times an "i" was present only twice associated with a "z," once three spines were present on the dorsal lobe.

In all places where the light gray eggs occurred, the population is so mixed that this line of research relying on the purity of the population was excluded.

DISCUSSION.

The results confirm those of de Buck, Schoute and Swellengrebel as well as those of La Face concerning the *atroparvus* (*labbranchiae*) and *messeeae*. For the typical *maculipennis* the Dutch author gives no information. La Face says that the hypopygium comes near to that of *messeeae*. Yet I find the blunt rod so regularly in that race, that I would maintain a hypopygium with "d" tapering into a long spine be never a *maculipennis maculipennis*.

I would not wonder if a closer examination, by detaching the spines, would reveal an even higher degree of regularity. But for the moment I have no time for this rather tedious work.

As to the American representatives of this group, the hypopygia of *A. maculipennis* as drawn by Root and Frost agree with the European *atroparvus*,—*labbranchiae*, probably the more thermophilous subspecies of our *A. maculipennis*. We therefore urgently need information on the hypopygia of the northern most *maculipennis* of America.

What I wrote in Lindner's Handbook 1930 still holds good,

viz: The variability of the hypopygium of *A. maculipennis* is too great to allow a clear separation from the most closely related species.

In conclusion, I may draw attention to a genetic question. In *messeae* a spine "i" is more like spine "a," if it is inserted midway between the dorsal and the apical lobe. The closer it stays to the dorsal lobe, the more it resembles a spine "z," and this latter spine comes closest to the shape of the dorsal most one "d," where it is inserted absolutely at the same level as this. That would mean that the shape of a spine is a function of its position on the claspette. If that be true, and if we were able to stimulate or suppress the formation of spines, it nevertheless would only be possible to get a blunt rod in *messeae* at the most dorsal part of the claspette. If there the formation of a spine would be suppressed, we never would get a blunt rod, no matter how many spines we might produce elsewhere. It is a pity that we are not able to do experimental work with these delicate parts, but it might be that similar conditions prevail in other parts of larger insects and might furnish a possibility for experimental work.

Given this idea genetically the variability of the shape of the dorsal spines would be a complex one, being produced by the variable tendency of the organism to form blunt appendages, a tendency which on the edge of the claspette always decreases from dorsal ventrad, and by the variable arrangement of the spines on this posterior edge of the claspette. The reason why a blunt spine is lacking may be that there is little tendency to form a blunt appendage at all, or that the most dorsal spine is placed a bit off the most dorsal part of the claspette.

RESUMÉ.

The author gives a scheme of the appendages of the claspette in the *A. maculipennis* group. He describes some anomalies, he corroborates the statements of de Buck, Schoute & Swellengrebel and La Face, that the most dorsal spine in the subspecies *atroparvus-labbranchiae* is practically always acute, whereas in *messeae* it is prevalingly blunt or short-tipped. He finds in *A. maculipennis maculipennis* the dorsal-most spine practically always blunt. The American *maculipennis* studied by Root and Frost would go with *atroparvus-labbranchiae*.

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CALCARITERMES IN THE UNITED STATES.

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 Department of Agriculture.*

The genus *Kaloterme*s Hagen is divided into a number of subgenera, some of which undoubtedly deserve generic rank. They are all designated as subgenera, however, until more complete biological series of associations of soldiers and winged sexual adults from world collections have been studied.

The subgenera *Calcaritermes* Snyder, *Glyptoterme*s Froggatt, and *Lobiterme*s Holmgren are very closely related in that in the winged adults the median vein runs close to and parallel with the subcostal vein. There are, nevertheless, marked differences in the soldier caste.

Ten species of *Calcariterme*s are known, all from the Neotropical zoo-geographical region, one being from Colima in western Mexico. Species of *Glyptoterme*s have been recorded from the Australian, Oriental, Ethiopian, and Neotropical regions. They are equally well represented in all of these regions except the Ethiopian, where but few species have been recorded. *Lobiterme*s is represented by three species, one from Sarawak and two from South America. No species in any of these subgenera have been recorded from the United States.

Among the insects captured in traps in Florida in connection with a survey of the Mediterranean fruit fly infestation, there

were found three winged adults of a new species of *Calcaritermes*, one insect each from Clay, Levy, and Orange Counties, respectively.

***Kalotermes (Calcaritermes) nearcticus*, n. sp.**

Winged adult.—Head castaneous brown, with scattered long hairs; labrum yellow. Eyes large, separated from lateral margin of head by a distance less than their long diameter. Ocelli fairly large, nearly touching the eyes.

Antennae with 13 segments; second, third, and fourth segments of about the same size.

Pronotum slightly lighter colored than head, with scattered long hairs. Anterior margin of pronotum shallowly concave; posterior margin shallowly and roundedly emarginate, with longitudinal corrugations at base.

Wings iridescently bronze colored, membrane coarsely stippled, margins ciliate. In fore wing median vein running parallel and close to subcosta. In hind wing median branching from subcosta near the base (at 1.5 mm. from base, wing 5.5 mm. in length and 1.60 mm. in width). (Fig. 1.)

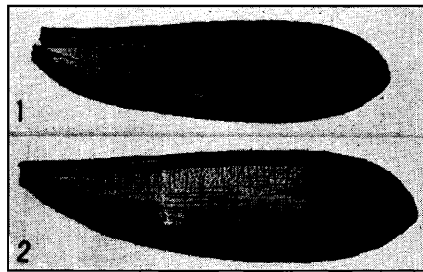


FIGURE 1.—Microphotograph of fore (1) and hind (2) wings of *Kalotermes (Calcaritermes) nearcticus* Snyder. Enlarged 10 times.

Abdominal tergites with a row of long hairs near base.

Legs with femora swollen and with pulvillus between claws.

The dimensions and details of the wing venation distinguish *nearcticus* from the known species.

Measurements.—

Length of entire winged adult.....	7.00 mm.
Length of dealated adult.....	3.50 mm.
Length of head (to tip of labrum).....	1.1 mm.
Diameter of eye (long diameter).....	0.30 mm.
Length of pronotum.....	0.60 mm.
Length of fore wing.....	4.70 mm.
Length of hind tibia.....	0.8 mm.
Width of head (at eyes).....	0.95 mm.
Width of pronotum.....	1.00 mm.
Width of fore wing.....	1.40 mm.

Type locality.—Clay County, Fla.

Described from three winged adults, one from the type