THREE NEW BIRD-FLEAS FROM KASHMIR.

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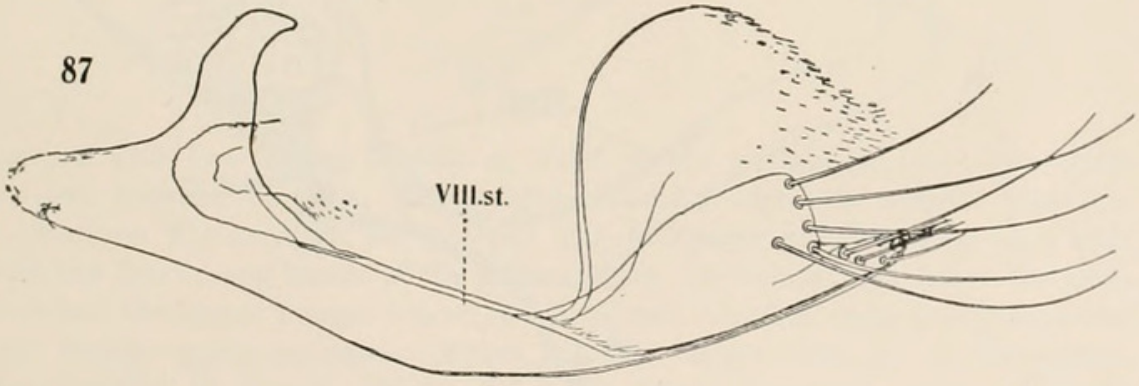
(With 6 text-figures.)

THE species here described were collected by Mr. H. Whistler at Dras, Ladakh, Kashmir, 10,500 ft., in May 1928, on *Chelidonaria urbica* (presumably in its nest) and sent to me by Mr. G. B. Thompson, of the staff of the British Museum (Natural History), to both of whom I tender thanks. There are altogether 18 specimens, mounted by Mr. Thompson, which represent four species. One of the species is the common martin-flea (*Ceratophyllus hirundinis* Curtis 1826), the one ♂ and the series of ♀♀ agreeing well with European examples. Two others also belong to *Ceratophyllus* Curtis 1826, presenting the general characteristics of the Ceratophylli living in martins' nests, while the third species is nearly related to the European *Ceratophyllus waterstoni* Jord. 1925, which is not a true *Ceratophyllus* and is placed here into a separate genus. This new species and *C. waterstoni* are of a different phyletic origin than *C. hirundinis* and congeners, being bird-fleas derived from *Citellophilus* Wagner 1934, with which they show a striking affinity, or, in other words, being originally mammal-fleas which have taken to birds' nests and acquired characteristics of bird-fleas.

1. **Ceratophyllus orites** sp. nov. (text-figs. 87, 88, 89).

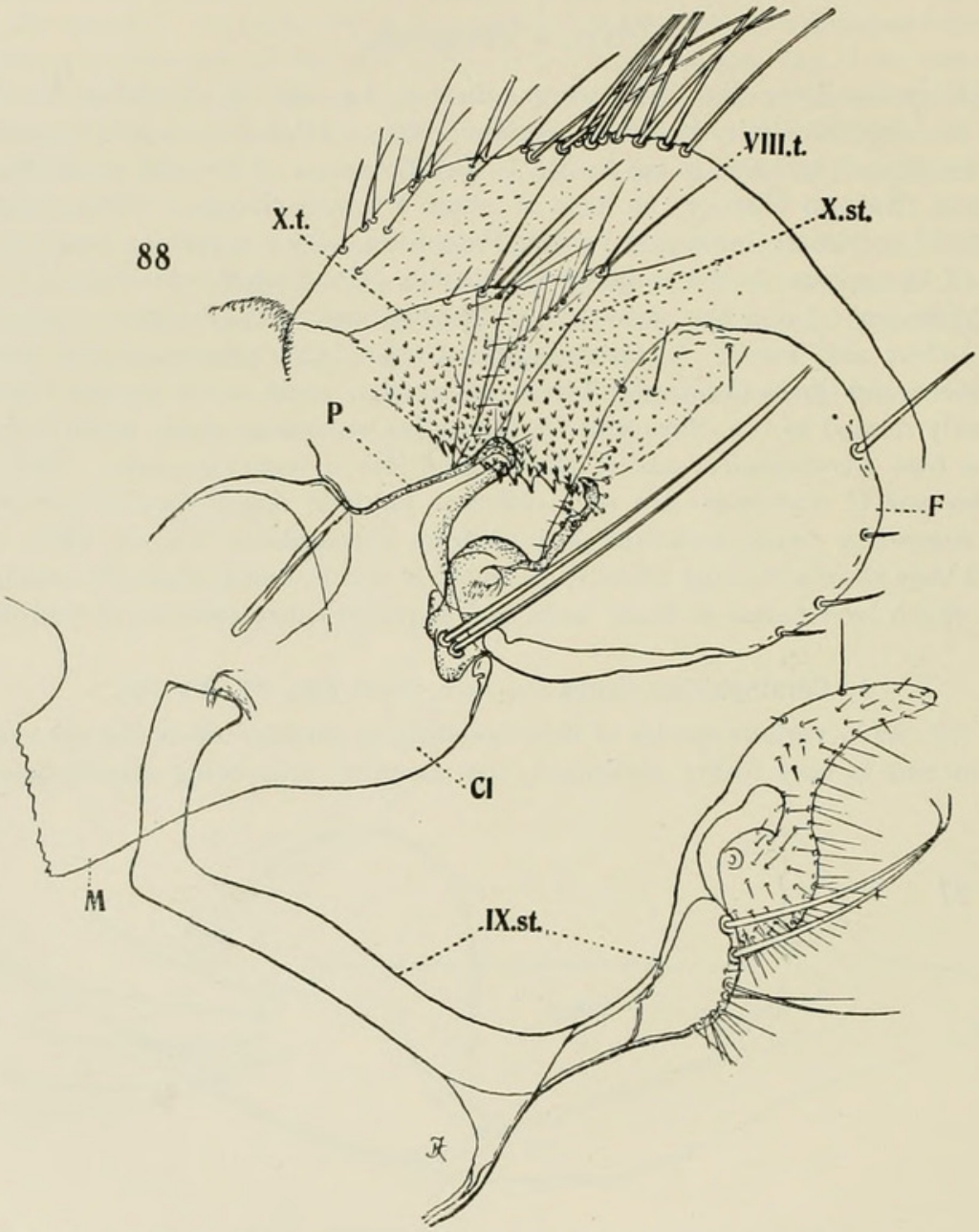
♂♀. As in various species of fleas breeding in martins' nests the apex of the metanotum is very feebly chitinized, the marginal area being membranaceous



from the row of long bristles, and the apical spines of the metanotum and abdominal terga pale and narrow. Chaetotaxy nearly as in *C. hirundinis*. Pronotal comb with more than 30 spines (32–34). One long antepygidial bristle, above and below it a very minute one in ♂, in ♀ the upper about the size of the anterior small bristles of VII. t. and the lower one absent.

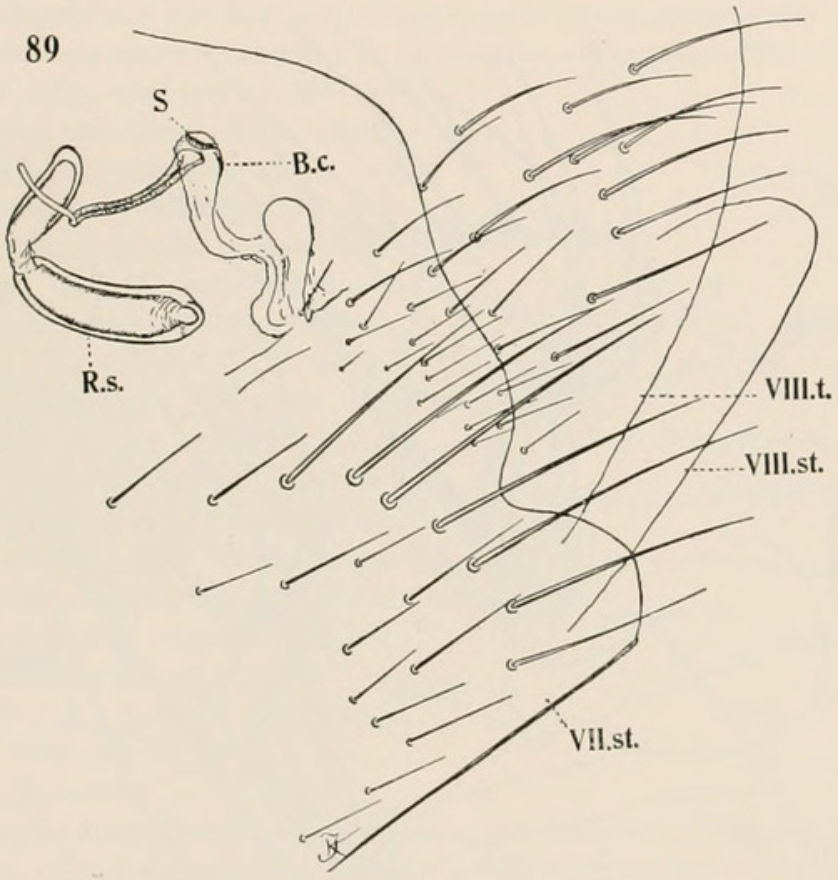
Genitalia.——♂. Tergum VIII strongly rounded, at dorsal margin about a dozen thin bristles, some of them on inside, upon these follows a densely packed row of long ones, 8 to 10 altogether (text-fig. 88) ; there are no bristles on the lower area of VIII. t. The spiculose area of inner surface large, almost elliptical, fading away dorso-apically, sharply defined ventrally, the most ventral spicules

large, dentiform, directed downward. Apex of sternum VIII (text-fig. 87, VIII. st.) with ventral apical horizontal projection which bears 5 shortish strong bristles a little longer than the sternite is broad in middle, proximally to the horizontal projection the segment is widened dorsally, this area apically truncate and bears 5 or 6 long bristles, 4 of them in a vertical row and 1 or 2 in front of



the row, another long bristle on the apical process ; a large apical flap, sharply defined on frontal side and here rounded, the posterior outline not well marked in the two specimens, this portion of the drawing therefrom possibly incorrect. Clasper (text-fig. 88, Cl) short, the bay above process P small ; two long acetabular bristles placed about halfway between lower and upper margins of acetabulum ; process P narrow, slightly rounded-dilated at apex. Finger F rounded-pyriform, more strongly rounded ventrally and apically than dorsally, strongly chitinized basally, very pale distally, at dorso-apical angle apparently membranaceous, base rounded and projecting dorsally ; very few bristles : one strong one below

middle of apical margin, as stout as acetabular bristles, but not so long as anterior margin of process P ; in outer half of ventral margin 3 short stout bristles, the upper the shortest, middle one the longest, being less than half the length of the bristle of apical margin ; along the basi-dorsal incrassation and above it some small bristles as usual, and towards dorso-apical angle a very short, somewhat stumpy, marginal bristle, on a level with it a thin hair and another hair near apical margin. Sternum IX similar to that of *C. hirundinis*, but anterior



portion with two strong bristles as stout as the acetabular ones, but much shorter, anterior to them thin marginal bristles and two longish ones.—— ♀. Sternum VII (text-fig. 89, VII. st.) with a distinct rounded sinus on a level with the fourth long bristle of the posterior row, the ventral lobe below the sinus rounded, the apical margin above the sinus first rounded, then gently incurved and finally again rounded. Stylet a little longer than in *C. hirundinis*. Spermatheca (R.s.) also longer, its tail without appendix. Apex of bursa copulatrix (B.c.) with a sclerification (S) opposite the base of the duct of the spermatheca, this sclerification not present in *C. hirundinis*.

Length : ♂ 2·7, ♀ 2·9 mm. ; hindfemur : ♂ 0·43–0·48, ♀ 0·45–0·51 mm.

Two pairs.

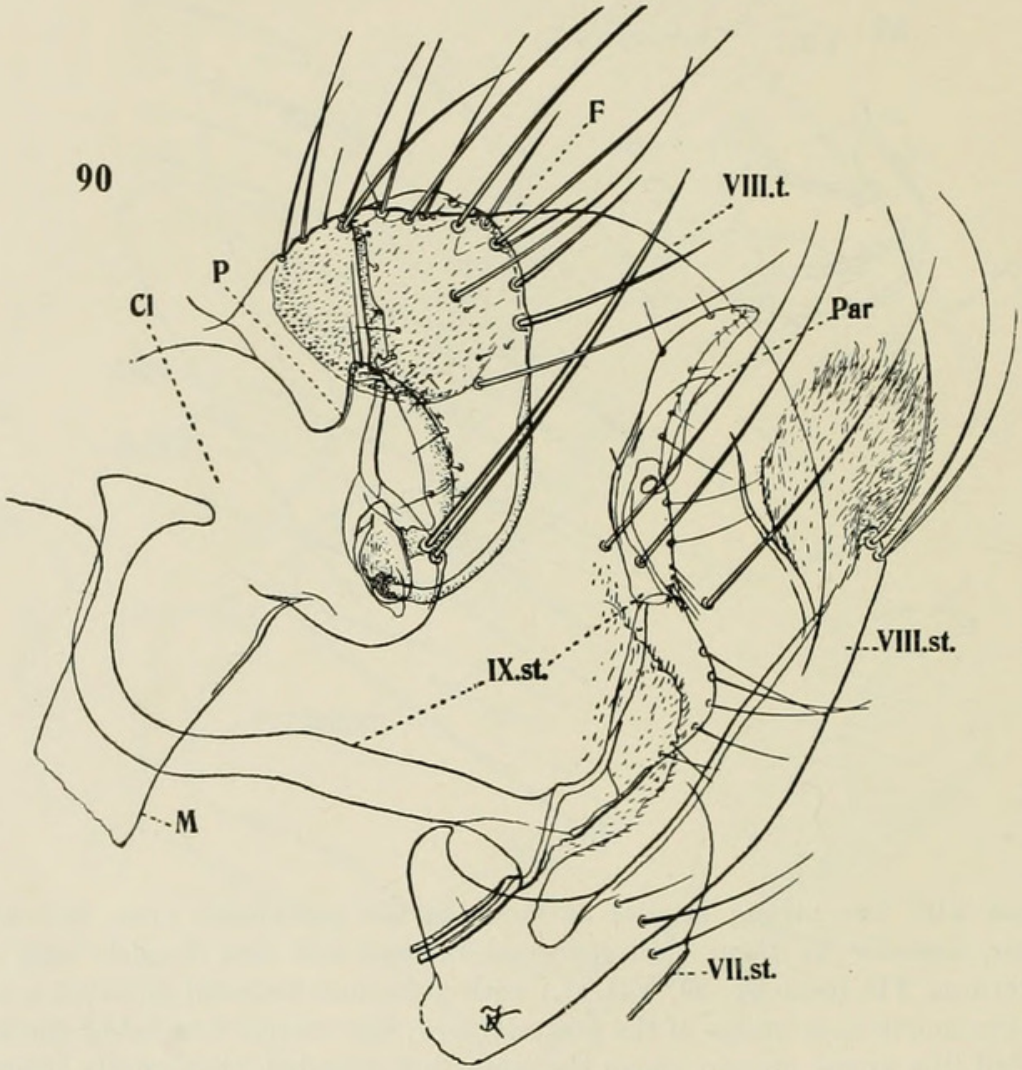
2. **Ceratophyllus caliotes** sp. nov. (text-figs. 90, 91).

♂♀. Likewise a true martin-flea in the apical area of the metanotum being membranous and its spines resembling a bristle in shape. Differs from both *C. hirundinis* and *C. orites* sp. nov. in the smaller number of spines in the pronotal comb and in the longer bristles of the hindtarsus, besides the modified

segments. Nearest to *C. rusticus* Wagn. 1903, tergum VIII different in both sexes.

Smaller than the preceding species. Comb with 27 or 28 spines. Longest apical bristle of hindtarsal segments I and II projecting well beyond apex of segment following. Lower minute antepygidial bristle absent, upper one very thin, longer in ♀ than in ♂.

Genitalia.——♂. Tergum VIII (text-fig. 90, VIII. t.) strongly rounded, with a dozen bristles in dorsal area and 3 in lower area, the spiculose area of inner



surface round, about as broad as long, the spicules near ventral margin of area much smaller than in *C. orites* and pointing upwards. Sternum VIII with 6 or 7 long slender bristles at apex (on the two sides together); filamentous flap large, rotundate on the two sides, the rim supporting the flap on anterior side free in upper half. Clasper (Cl) short, dorsal bay at anterior side of process P small; two long acetabular bristles on a level with middle of acetabulum, the clasper ventrally strongly convex between manubrium and acetabular bristles. Process P short, its sides almost parallel, apex obliquely rounded, projecting upwards on anterior side, posterior angle almost effaced. Finger F almost gradually widening from base to middle, angle of anterior margin in middle, the margin incurved from this angle to base and straight to anterior apical angle, apical and posterior margins rounded together, width of F at middle like length

of straight portion of anterior margin ; in upper half of posterior margin 4 strong bristles, almost evenly spaced, the lower two somewhat stronger than the acetabulars, but much shorter, the third thin and shorter, the fourth also thinner, but nearly as long as second ; near anterior apical angle a very thin dorso-marginal bristle ; along anterior margin a number of small bristles ; F resembles to some extent that of *C. lunatus* J. & R. 1920, but that species is otherwise very different. Posterior apical nose of vertical arm of sternum IX long ; ventral arm narrow, at ventral margin of proximal half 6 or 7 slender bristles ; apical half narrower than in *C. hirundinis*, the lobe projecting frontad being particularly narrow, the thin bristles less numerous than in *C. hirundinis*. Paramere (Par) shorter.——♀. In the only specimen of this sex (text-fig. 91) sternum VII covers tergum VIII, projecting beyond it ; its apical margin is evenly rounded up to two-thirds, then slightly incurved, the upper angle round and the dorsal margin again somewhat incurved ; bristles on VII. st. and VIII. t. less numerous than in *C. orites* and *C. hirundinis* ; upper angle of dilated portion of VIII. t. completely rounded. Stylet as short as in *C. hirundinis*. Spermatheca (R.s.) as in *C. hirundinis*; but oral end subtruncate ; tail with appendix. Bursa copulatrix (B.c.) without sclerification at apex.

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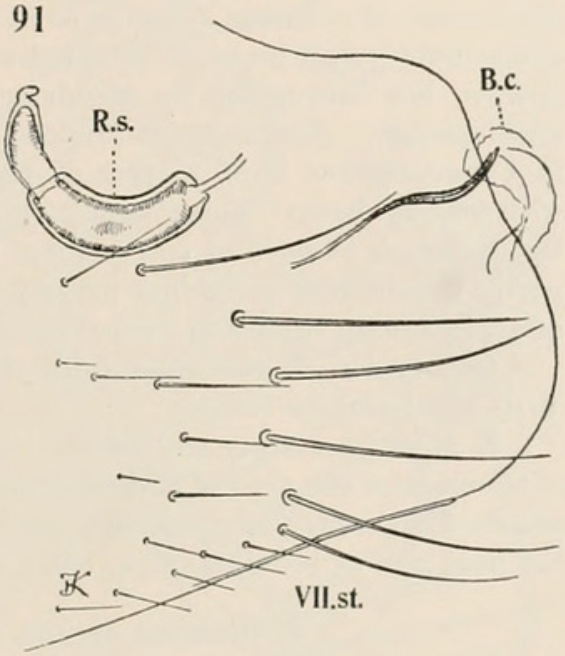


Length : ♂ 1·9, ♀ 2·1 mm. ; hind femur : ♂ 0·35, ♀ 0·39 mm.

Two ♂♂, one ♀.

Among the true Bird-Ceratophylli—i.e. the species in which the body of the spermatheca is long, sausage-like, and the basal portion of the duct of the spermatheca darkened—I find in our collection only three species besides *C. caliotes* in which the apex of the bursa copulatrix has no sclerification in the posterior wall : *C. hirundinis* Curtis 1826, *C. rusticus* Wagn. 1903 and *C. rossittensis* Dampf. 1912. The sclerification is present in *C. numidus* J. & R. 1915, a martin-flea from North Africa.

Orneacus gen. nov.

♂♀. Agrees with *Ceratophyllus* Curtis 1826, s. restr., in the eye being large, the bristles of segment II of antennae long, some projecting in ♂♀ beyond apex of club, the pronotal comb containing a large number of spines (more than 30 in both species of *Orneacus*) and in the ventral apical pair of bristles of segment V of fore- and midtarsus being long in both sexes, resembling fourth lateral bristle, not being incrassate in ♂. In spite of these similarities with *Ceratophyllus*, *Orneacus* is an offshoot from a different group of Ceratophylline fleas, being akin to *Citellophilus* Wagner 1934, a genus of mammal-fleas. Inner surface of mid- and hindcoxae with a row of slender bristles from near apex to near base, as in *Oropsylla*, *Citellophilus* and other genera, but the number of bristles reduced. Apical marginal area of metanotum very much shorter than that of mesonotum, but not entirely membranous as in the Martin-Ceratophylli ; apical

spines short, somewhat smaller than those on abdominal terga I to IV, being much shorter and broader than in *Ceratophyllus hirundinis* and allies. One long antepygidial bristle, in ♂ accompanied by two minute ones, of which the lower one is sometimes missing, in ♀ these small bristles longer and thicker than the penultimate bristles of tergum VII.

Genitalia.——♂. Tergum VII without spiculose dorsal area or this area vestigial only. Apical lobe of ventral arm of sternum IX broad, subtruncate, the forward projection so long that the bristles of its apex and those of the strongly convex portion of the anterior half of IX. st. are close together ; apex of vertical area feebly or not at all curved backwards. Tendons of IX. st. and of phallosome short, curved upwards, but not making half a convolution. Phallosome of a similar structure as in *Citellophilus* ; apical, protruding, portion of ejaculatory duct broad, more or less transversely ribbed (the duct itself perhaps narrow, but surrounded by glandular tissue ; a similar structure obtains in *Citellophilus*). Anal sternum (divided into a right and a left lobe) longer than in *Ceratophyllus*. F of clasper of the *Citellophilus* type.——♀. Spermatheca with oblong body. Bursa copulatrix short, broad, upright, apex and wide basal portion of duct of spermatheca enveloped by glandular tissue, which is partly lamellate or somewhat densely folded ; no sclerification. Short bristles of anal sternum stout and curved (as in *Citellophilus dolabris* Roths. 1911).

Genotype : *O. waterstoni* Jord. 1925 (= *Ceratophyllus rothschildi* Waterst. 1910, nec Rainbow 1905).

It is an interesting and for our understanding of evolution significant case of the creation of a type of bird-flea from a branch of mammal-fleas, the attributes acquired, evidently in connection with the adoption of the martin as host and the hard nest as breeding-place, being external.

3. **Orneacus oreinus** sp. nov. (text-fig. 92).

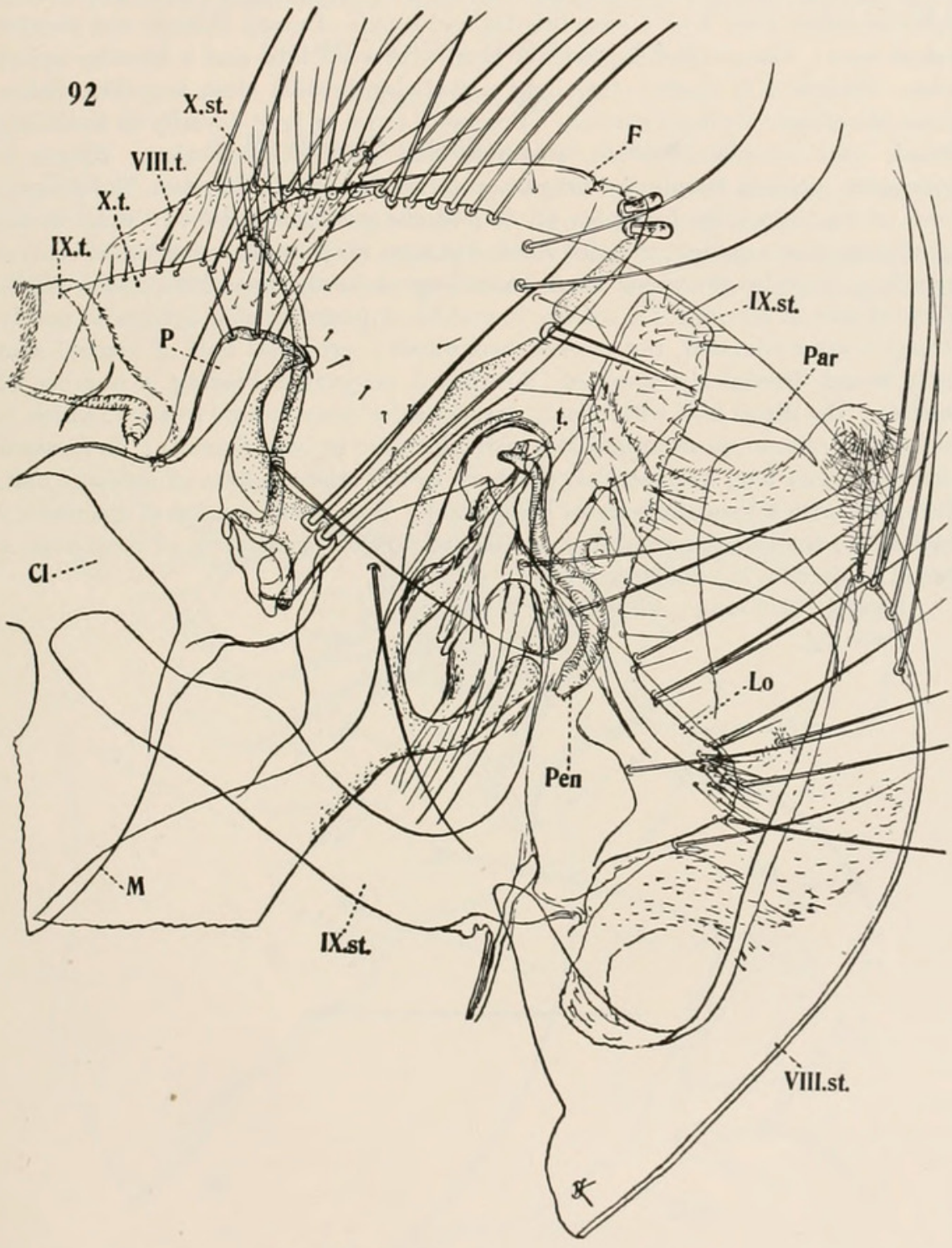
♂. Similar to the ♂ of *O. waterstoni*, distinguished by the long dorsal bristles of the thorax and anterior abdominal segments and by the tail-end.

Frontal tubercle sharp, sunk, but distinctly projecting. In front of row of three eye-bristles one single small bristle, placed towards antennal groove. On occiput three bristles above antennal groove, first short or long, second and third long, the last being the ventral bristle of the posterior row, at some distance behind and above median bristle a small one ; dorsal groove of occiput shallow. Proboscis reaching to apex of forecoxa. At least six of the bristles of antennal segment II reach well beyond club.

Spines of pronotal comb longer than notum ; dorsal bristles longer than lateral ones, but shorter than most ventral one ; on mesonotum dorsal bristles likewise prolonged and in front of row two or three long additional bristles, on metanotum one such additional long bristle ; metanotum one spine each side (in *O. waterstoni* two or three), this spine smaller than in *O. waterstoni*, as are also those of abdomen.

Dorsal bristles of posterior row of abdominal terga I to III more or less prolonged, at least longer than in *O. waterstoni* ; number of apical spines on two sides together : I 4, II 5 or 6, III 4, IV 3 or 4 ; two rows of bristles on I to VII, an incomplete third row and a few additional dorsal bristles. Bristles on sterna on two sides together : III 5 or 7, IV 5 or 6, V 7 or 8, VI 5 or 7, VII 2 or 4, total in type 25, in paratype 31.

On hindtibia 8 dorsal notches, bristles of third and sixth notches small. None of the hindtarsal bristles reach beyond apex of segment following. First pair of plantar bristles of segment V of fore- and midtarsi bent inward ; on sole



of V minute hairs from apex to second pair of plantar bristles. Proportions of hindtarsal segments : 41, 28, 16, 10, 20.

Genitalia.——Tergum VIII (text-fig. 92, VIII. t.) broadly rounded, with a dorso-marginal row of long bristles, some of them close together, one or two lateral ones (drawn as they are on the slides, forced downward), and on lower area from 8 to 12 long bristles, partly arranged in a vertical row ; close to dorsal

margin indications of spicules on inner surface. Sternum VIII elongate-boat-shaped, convex ventrally, dorsally nearly straight, with a slight upward bend in central area ; anterior upward-projection measured from ventral surface of VIII. st. more than twice as long as VIII. st. is broad in centre ; apex of VIII. st. subacuminate, with 3 or 4 long bristles and a pair of much thinner and shorter apical ones ; filamentous flap with a narrow upward lobe and a broader apical lobe. Clasper (Cl) short ; two long acetabular bristles close together, below them the clasper strongly convex. Process P twice as long dorsally as medianly broad, apex rounded-truncate, posterior nose pointed, projecting. Finger F triangular, ventral margin the longest, anterior margin the shortest, the proportions of the three sides being 55, 41, 30 ; at the posterior angle two short broad spiniforms close together, rounded-dilated at apex ; above three-fourths of ventral margin a large bristle which is about as long as its distance from upper angle. Vertical arm of sternum IX convex in middle of posterior side, otherwise nearly straight, apex rounded, not curved backwards ; proximal half of ventral arm with broad, irregularly rounded, downward projection bearing a number of bristles ; the distal half with nearly parallel sides from middle to apex, which is rounded-truncate (more irregular in paratype than in type figured) ; its forward extension (Lo) long and slender, reaching to the trichose area of anterior half. Paramere with a long and narrow hook (Par). Free apical section of ejaculatory duct (Pen) somewhat resembling an elephant's trunk ; at apex of penis-tube a dorsal projection (t.) which is strongly chitinized.

Length : 2·6 mm. ; hindfemur : 0·48 mm.

Two ♂♂.