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THE GENUS *CHAETOPSYLLA* KOHAUT, 1903 IN NORTH AMERICA, WITH THE DESCRIPTION OF A NEW SPECIES.

(Siphonaptera: Vermipsyllidae)

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The genus *Chaetopsylla* Kohaut, 1903 is holarctic in distribution, with two previously described North American representatives, *Chaetopsylla lotoris* (Stewart, 1926) from the eastern and central United States, and *Chaetopsylla floridensis* (I. Fox, 1939) known only from the type specimens collected in Gainesville, Florida. A new western species is described below, considerably broadening the known range of this genus in North America.

Diagnoses, redescriptions (emphasizing characters differing from the new species) and figures of *C. floridensis* and *C. lotoris* are included.

Chaetopsylla stewarti Johnson, new species

(Figs. 1-4, 7, 11, 17, 23)

Male separable from *Chaetopsylla lotoris* (Stewart) in that the metepimere (fig. 3, *MTM*) possesses a median (first) row of four bristles, not one or two (fig. 15); distinguished from both *C. lotoris* and *C. floridensis* (I. Fox) in that the penis rods form a complete circle (fig. 4, *P.R.*) not merely curved (fig. 5, *P.R.*); sclerotized inner tube (fig. 7, *S.I.T.*) apically bent ventrad, not straight (fig. 6, *S.I.T.* (*floridensis*) or apically inclined dorsad (fig. 8, *S.I.T.* (*lotoris*)). Female separable from *lotoris* in that posterior margin of seventh sternum lacks a sinus (fig. 23, *7S.*); not with deep rounded concavity (figs. 21 and 24). Female differing from *C. floridensis* in lacking bristles below spiracles of abdominal terga four to seven.

Head (fig. 1): A vertical row of three or four small bristles anterior to ocular row which consists of four long bristles. Lacking bristle on genal process just below eye which is present in certain other species of genus. The two postantennal rows (excluding complete apical row of bristles) of three and four (five in female) bristles respectively. Five-segmented labial palpi extending about two-thirds length of procoxa; in male length of ultimate segment about that of third and fourth segments combined; in female ulti-

mate segment somewhat longer than third and fourth combined. *Thorax* (fig. 3): Pronotum (fig. 1, *PRN.*) with one row of bristles; male dorsally with one or two large, and several smaller bristles anterior to row; female with but one large bristle in this area. Prosternosome with ventral margin quite sharply rounded medially; proepimeral flange (fig. 1, *E.F.*) distinct, small, triangular. Metepimere (*MTM*) with anterior row of bristles missing; median row of four bristles (four to six in female); posterior row with four or five (five or six in female). Metasternal furca (*FU.-II*) with short, acute posterior arm. *Legs*: Procoxa (fig. 1) with fifteen or more obviously lateral bristles (in figure, procoxa is turned so that the "mesal" surface is actually the normal lateral surface). All tibiae with six dorsal notches, each with two bristles; laterally metatibia with subdorsal row of 11 bristles in male, 14 in female, plus a few apicoventral bristles. Metafemur with external horizontal row of 18-19 irregularly spaced bristles. *Abdomen*: Male with anterior of the two tergal rows of bristles reduced on terga four to seven, broadly interrupted laterally, dorsally this row with one or two bristles and with one or two bristles directly above spiracle, at times one below spiracle (one of bristles of posterior row may also be below spiracle). Female lacking bristles below spiracles of terga four to seven; anterior rows of but one or two bristles placed directly above spiracle, posterior rows ending well above level of spiracle on terga four to seven. Female intersegmental membranes not as obvious as in *C. floridensis* and lateral tergal margin more nearly vertical (compare figs. 23 (*stewarti*) and 22 (*floridensis*)).

Modified segments, male (fig. 2): Eighth tergum (*8T.*) with two scattered rows of small bristles above and anterior to spiracle, consisting in unique male of nine or ten bristles in all; below and posterior to spiracle with three bristles, the dorsal one small, others rather large. Eighth sternum (*8S.*) with three ventral bristles on a side. Immobile process of clasper (*P.* and fig. 17) somewhat higher than broad; with approximately 10 bristles (other than marginals) scattered over lateral surface from apex to lowest level of insertion of movable finger; below insertion of finger with mesal patch of several light thin bristles. Movable finger (*F.* and fig. 17) almost straight, inserted medially on process, gradually tapering to sharply rounded apex which does not extend beyond margin of process (in normal position); finger five times as long as broad basally; with a few minute bristles on posterior margin. Proximal arm of ninth sternum (*P.A.9*) narrowed apically, joined to manubrium of process; distal arm (*D.A.9*) very short, subtriangular, with a few small apical and subapical bristles. Aedeagal apodeme (fig. 4, *AE.A.*) long and narrow, more than five times as long as broad; apex acute. Crescent sclerite ((fig. 7, *C.S.*) straight and longer than dorsal sclerite of apodemal strut (*D.S.*). Sclerotized inner tube (*S.I.T.*) about five times as long as broad, apically bent ventrad, gradually narrowing from base to apex, armature (*A.I.T.*) diffuse. Median dorsal lobe (*M.D.L.*) with dorsal margin merged with dorsal margin of distolateral lobes, apicoventrally merely a diffuse spiculated semimembranous structure. Distolateral lobes (*D.L.L.*) with apicodorsal angle of about 90°; posteroapical margin unevenly convex; ventroapically sharply rounded. Lateral lobes (*L.L.*) angulate but with angles rounded; extending ventrally almost to lower level of crochets and

pouch wall (*P.W.*). Crochets (*CR.*) arising ventrad to inner tube and about at midportion of tube, not extending to apex of tube, same width throughout; apically rounded (actually, apparently flexed dorsally so that the apex points cephalad); entire margin much more heavily sclerotized than remainder of crochet. Pouch wall (*P.W.*) insensibly joined with base of crochets. Penis rods (fig. 4, *P.R.*) long and forming a complete circle.¹

Modified segments, female (fig. 23): Posterior margin of seventh sternum (*7S.*) lacking sinus, though ventrolaterally the margin is somewhat concave. Eighth tergum (*8T.*) with group of about seven bristles above spiracle; row of large bristles extending from just below spiracle to venter of segment, interrupted lateromedially. Spermatheca (*SP.* and fig. 11) with oval body, tail almost two times as long as body and about half as broad; curved back over body. Bursa copulatrix (*B.C.*) short, sinuate, very lightly sclerotized.

Holotype male, *allotype* female *ex* weasel, SARDINE CAÑON, CACHE COUNTY, UTAH, 28 December 1937, Deming collector. Types deposited in the collections of the United States National Museum.

This species is named for Dr. M. A. Stewart of the University of California, Berkeley, who described the first American representative of the genus.

CHAETOPSYLLA LOTORIS (Stewart)

(Figs. 5, 8, 12-15, 18, 21, 24)

Trichopsylla lotoris Stewart, 1926. *Insecutor Inscitiae Menstruus* XIV(7-9): 122, one fig.

Chaetopsylla lotoris, Wagner, 1936, *Canad. Entom.* 68:195.

Trichopsylla lotoris, I. Fox, 1940, *Fleas Eastern U. S.*: 33, pl. VIII, figs. 35-37; pl. IX, fig. 42.

Chaetopsylla lotoris, Jellison and Good, 1942, *Nat. Inst. Health Bull.* No. 178:41. Ewing and I. Fox, 1943, *Fleas North Amer.*:18, fig. 4e. Fuller, 1943, *Bull. Brooklyn Ent. Soc.* 38:19.

Generally with fewer bristles than the other two North American species. Female separable from *C. stewarti* sp. nov. and *C. floridensis* (I. Fox, 1939) in possessing a large rounded ventral sinus in posterior margin of seventh sternum (figs. 21 and 24); not lacking such a sinus (figs. 23 and 22, *7S.*); further distinct from *C. floridensis* in lacking bristles below the spiracles on terga five to seven (compare figs. 18 (*lotoris*) and 20 (*floridensis*). Male differing from *stewarti* sp. nov. in that the penis rods do not form a complete circle (figs. 5 (*lotoris*) and 4 (*stewarti*), *P.R.*),

¹ The homologies of the median dorsal lobe, distolateral lobes and the crochets are more clearly seen in *Chaetopsylla homoeus* ssp. (from Asia and Europe). In this species the median dorsal lobe (fig. 9, *M.D.L.*) is mesal and more obviously a structure separate from the distolateral lobes (*DL.L.*). The crochets (*CR.*), rather than being flexed upon themselves, are directed caudad in the more typical manner.

the sclerotized inner tube (fig. 8, *S.I.T.*) apically upturned, not bent ventrad (fig. 7, *S.I.T.*); and from *floridensis* in that the median row on the metepimere contains only one or two bristles (fig. 15), not four to six (fig. 16); male and female separable from *floridensis* in that the procoxa lacks lateral bristles, not with 30 or more such bristles.

Head: Preocular row of four short bristles in male, three or four in female; ocular row of four longer, stout bristles. Labial palpi extending about two-thirds length of procoxa in both male and female, apical segment obviously longer than segments two to four combined in male, ultimate segment only somewhat longer than segments three and four combined in female. Postantennal area with first of the two rows containing three or four (usually three) bristles in both sexes; second row of three bristles in all specimens examined. *Thorax*: Metepimere (fig. 15) usually with two rows of bristles; an occasional specimen with a single bristle anterior to the rows; ranges as follows: anterior: 0-1; median: 1-4; posterior: 5-8. The holotype female has 1(0); 2;8(7) bristles on metepimere; cotype male with 0;1;6 bristles. *Legs*: procoxa with all bristles marginal or submarginal. *Abdomen*: Terga 5-7 (usually 4-7) of female lacking bristles below spiracles (fig. 18); anterior of the two rows reduced, consisting of 1-3 bristles on a side placed just above the spiracle. In female, posterior margin of terga not markedly oblique, and intersegmental membranes mostly covered by the terga.

Modified segments, male: Eighth tergum with single row of seven bristles above spiracle. Immovable process of clasper (fig. 14 *P.*) obviously higher than broad, apex sharply rounded in some specimens (including cotype); lateral bristles sparse and confined to area above insertion of movable finger. Movable finger (fig. 14, *F.*) curved, tapering to sharply rounded apex, about four times as long as broad; inserted above middle of immovable process. Aedeagal apodeme (fig. 5, *AE.A.*) three times as long as broad, apically rounded. Crescent sclerite (fig. 8, *C.S.*) straight, somewhat longer than dorsal sclerite of apodemal strut (*D.S.*). Sclerotized inner tube (*S.I.T.*) about six and one-half times as long as broad, straight, gradually narrowing apically and with apex upturned; its armature (*A.I.T.*) vaguely indicated as a large diffuse lateral sclerite overlying most of apical half of tube. Median dorsal lobe (*M.D.L.*) extending well above and beyond distolateral lobes (*DL.L.*); with convex, well-sclerotized dorsal margin; ventral margin pale, rounded apically. Distolateral lobes with heavily sclerotized convex posterior margin, acute ventrally; anterior margin straight, apex of endchamber thus with triangular notch at juncture of *DL.L.* and *M.D.L.* Lateral lobes (*L.L.*) small, ending ventrally at level of dorsal margin of crochets. Crochets (*CR.*) about as broad as long; marginally sclerotized, apically rounded (as in *C. stewarti* sp. nov. they are apparently directed cephalad). Penis rods (fig. 5, *P.R.*) extending past apex of apodeme but uncoiled.

Modified segments, female: Seventh sternum (figs. 21 and 24) with posterior margin deeply excised ventrolaterally. Spermatheca (fig. 12) indistinguishable from *stewarti* sp. nov. In holotype, spermatheca is distorted

and foreshortened (fig. 13). Bursa copulatrix well sclerotized, somewhat curved, not sinuate.

Holotype female, *cotype* male *ex* raccoon, *Procyon lotor*, Olcott, New York, 16 November 1921, deposited in Cornell Museum.

Specimens examined.—Holotype female, cotype male. Three males and three females with same data as holotype. Fifteen females *ex* raccoon, Snicarte, Illinois, December 1933, Hunt and Lane collectors. One female *ex Procyon lotor*, Minnesota, 2 December 1895, Otto Lugger collector. One female *ex* "den of red fox", Urbana, Illinois, December 1939, R. Traub collector. One female *ex Procyon lotor*, Dryden, Maine, 29 March 1952, G. Heinrich collector.

Remarks.—Fox (1940) records this flea from Clayton County, Iowa; Lucerne-in-Maine, Maine; and Pisgah National Forest, North Carolina. All records were from raccoons. Fuller (1943) gives additional records of Findleyville, Pennsylvania *ex Procyon lotor*, and East Greenville, New York *ex* gray fox. Fuller remarks that *Procyon* appears to be the normal host, but that the collections are too sparse to present an adequate sample.

CHAETOPSYLLA FLORIDENSIS (I. Fox)

(Figs 6, 10, 16, 19, 20, 22)

Trichopsylla floridensis I. Fox, 1939, Proc. Ent. Soc. Wash. 41(2):45, fig. 6.

I. Fox, 1940, Fleas Eastern U. S.:32, pl. VIII, figs. 34, 36, 39.

Chaetopsylla floridensis, Ewing and I. Fox, 1943, Fleas North Amer.:17.

Generally with more bristles than the other two North American species. Female separable from *Chaetopsylla stewarti* sp. nov. and *C. lotoris* (Stewart, 1926) by having at least two bristles below spiracles on terga 5-7 (fig. 20), not completely lacking bristles in this area (fig. 18); and with partially double row of bristles on eighth tergum (Fig. 22, 8T.) not with but one row (fig. 23, 8T). Male differing from *C. lotoris* in that median row on metepimere contains 4-6 bristles (fig. 16), not 1-2 (fig. 15); and by the configuration of the distolateral lobes of the aedeagus (compare figs. 6 (*floridensis*) and 8 (*lotoris*), DL.L.); separable from *C. stewarti* sp. nov. in that the penis rods do not form a complete circle and the movable finger (fig. 19, F.) obviously set nearer posterior margin of immovable process of clasper (P.), not median in position on process (fig. 17, F. and P.).

Head: Preocular row of 4-6 short bristles; ocular row of four long, stout bristles. Labial palpi extending approximately to apex of procoxa in female; the apical segment almost as long as segments 2-4 combined; in

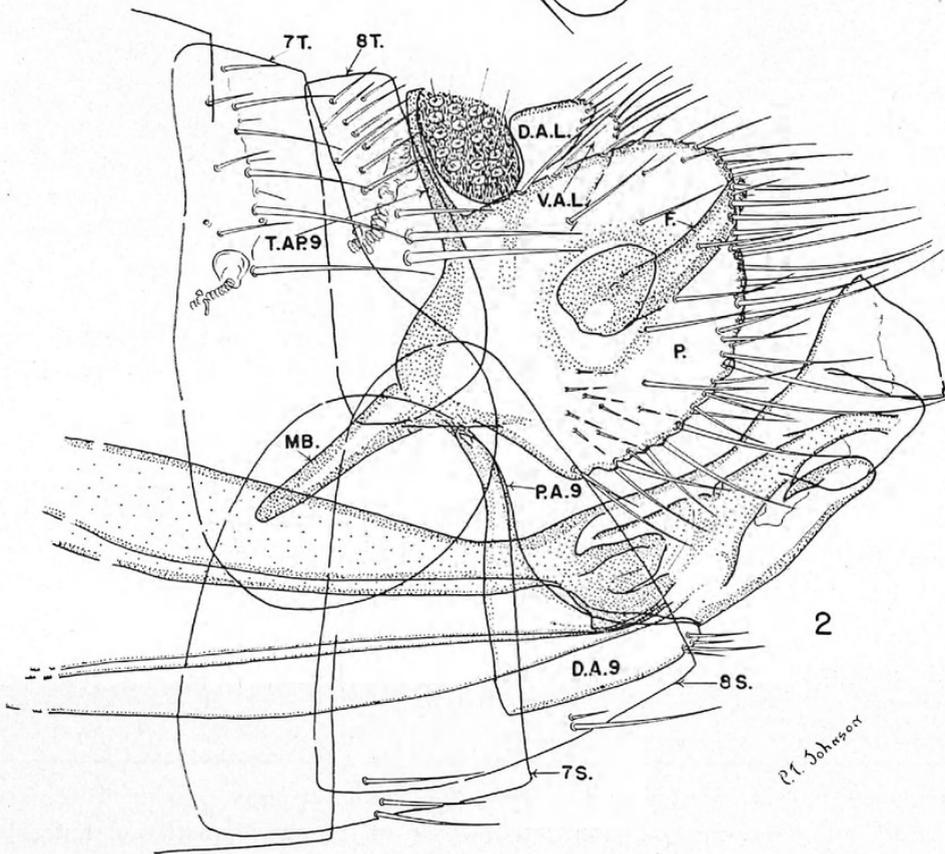
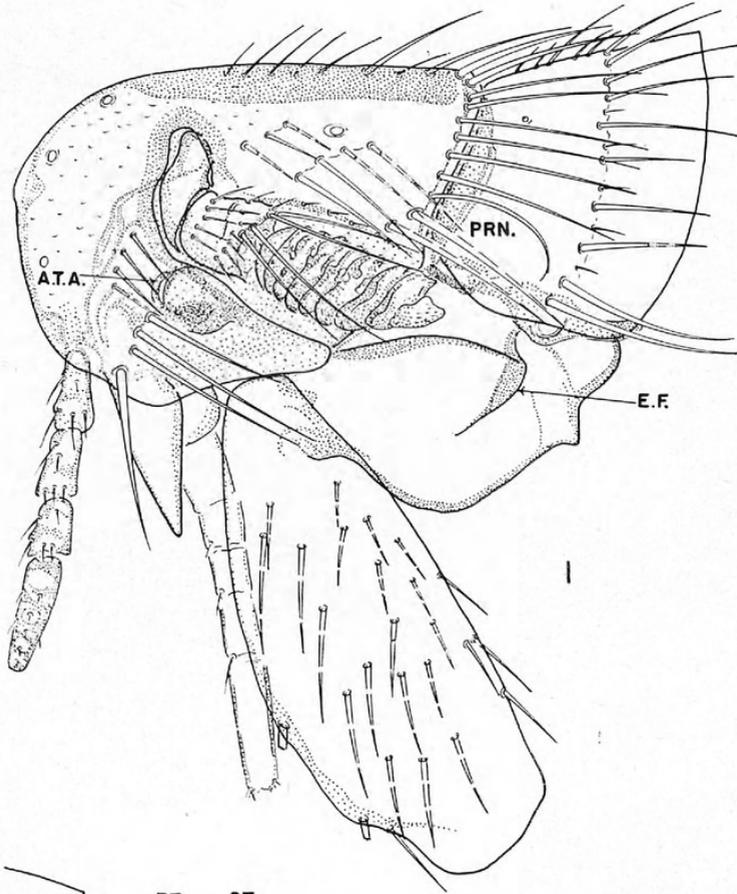
LIST OF ABBREVIATIONS USED IN FIGURES

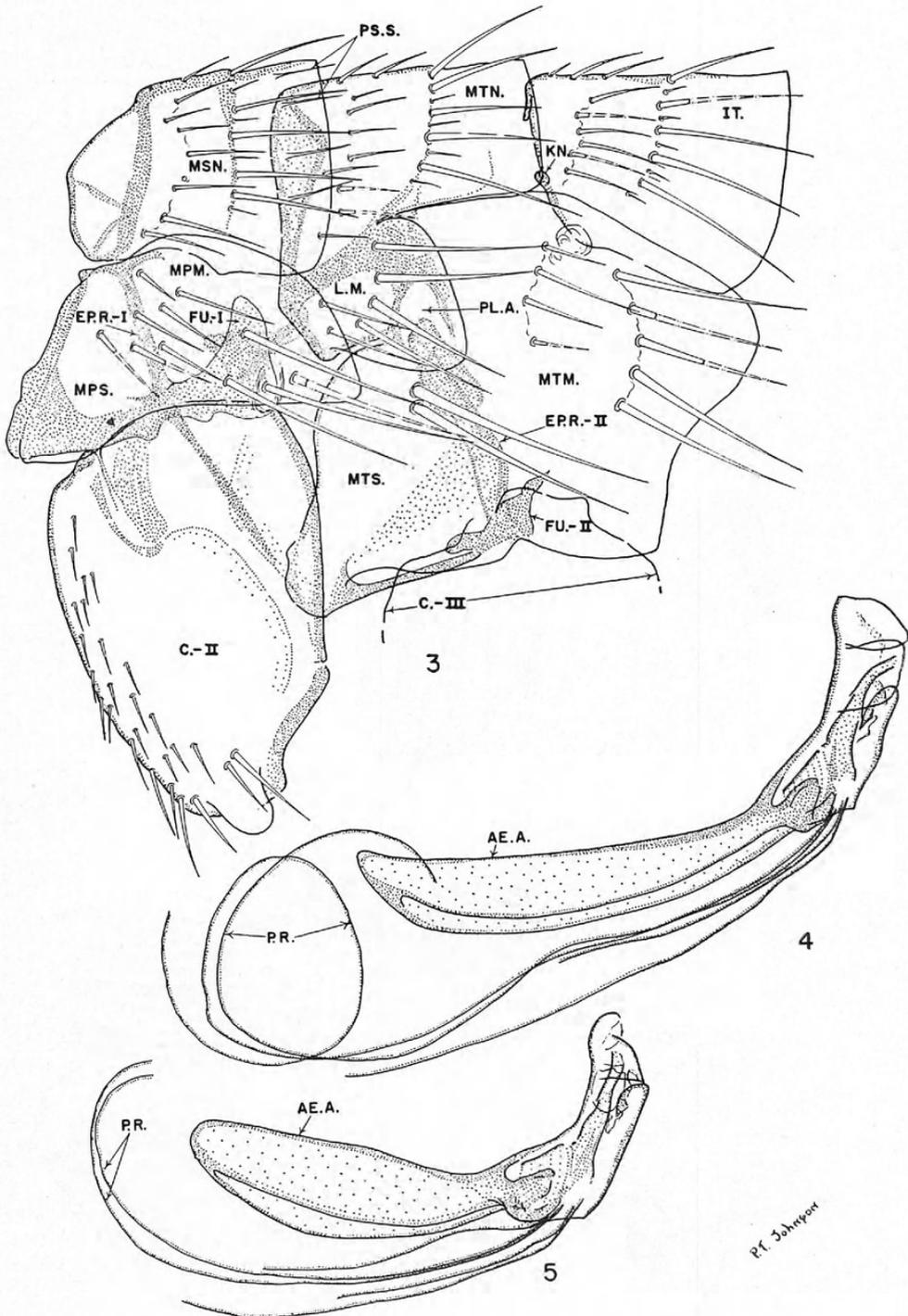
AE.A	aedeagal apodeme	M.D.L.	median dorsal lobe, aedeagus
A.I.T.	armature of sclerotized inner tube, aedeagus	MPM.	mesepimere
A.T.A.	anterior tentorial arm	MPS.	mesepisternum
B.C.	bursa copulatrix	MS.	median sclerite of apodemal strut, aedeagus
C.-II	mesocoxa	MSN.	mesonotum
C.-III	metacoxa	MTM.	metepimere
CR.	crochet	MTN.	metanotum
C.S.	crescent sclerite, aedeagus	MTS.	metepisternum
D.A. 9	distal arm of ninth sternum	P.	immovable process of clasper
D.A.L.	dorsal anal lobe	P.A. 9	proximal arm of ninth sternum
DL.L.	distolateral lobe, aedeagus	PL.A.	pleural arch
D.O.	ductus obturatus	P.R.	penis rods, aedeagus
D.S.	dorsal sclerite of apodemal strut, aedeagus	PRN.	pronotum
E.F.	proepimeral flange	P.W.	pouch wall, aedeagus
EP.R.-I	episternal-epimeral rod, mesothorax	S.I.T.	sclerotized inner tube, aedeagus
EP.R.-II	episternal-epimeral rod, metathorax	SP.	spermatheca
F.	movable finger of clasper	SP.D.	spermathecal duct
FU.-I	mesosternal furca	T.AP. 9	tergal apodeme of segment nine
FU.-II	metasternal furca	V.A.L.	ventral anal lobe
KN.	knob on tergum one (vinculum?)	1T.	first abdominal tergum
L.L.	lateral lobe, aedeagus	7S.	seventh abdominal sternum
L.M.	lateral metanotal area	7T.	seventh abdominal tergum
L.S.	lateral sclerite of apodemal strut, aedeagus	8S.	eighth abdominal sternum
MB.	manubrium of clasper	8T.	eighth abdominal tergum
		9T.	ninth abdominal tergum

male, labial palpi about two-thirds length of procoxa, apical segment about equal in length to segments three and four combined. In both sexes the anterior two postantennal rows consist of 2-4 and 4-5 bristles respectively. *Thorax*: Metepimere (fig. 16) with two or three rows of bristles (if three rows, the first is scattered and merged with the median or second row); the posterior row consisting of 5-6 bristles; the median row of 4-7 bristles except when anterior row is present, in which case there are 8 bristles in the two rows together (in the two cotype females examined). *Legs*: Procoxa with 30 or more lateral bristles, excluding marginal bristles. Metatibia with 11-19 irregularly placed bristles on dorsal half of lateral surface. Metafemur with external horizontal row of 14-15 bristles in female; 11-14 in male. *Abdomen*: Female with tergal and sternal sclerites distinctly separated laterally by

EXPLANATION OF FIGURES

Fig. 1. *Chaetopsylla stewarti* Johnson: head and prothorax, holotype.
Fig. 2. Ibid: modified abdominal segments, holotype.

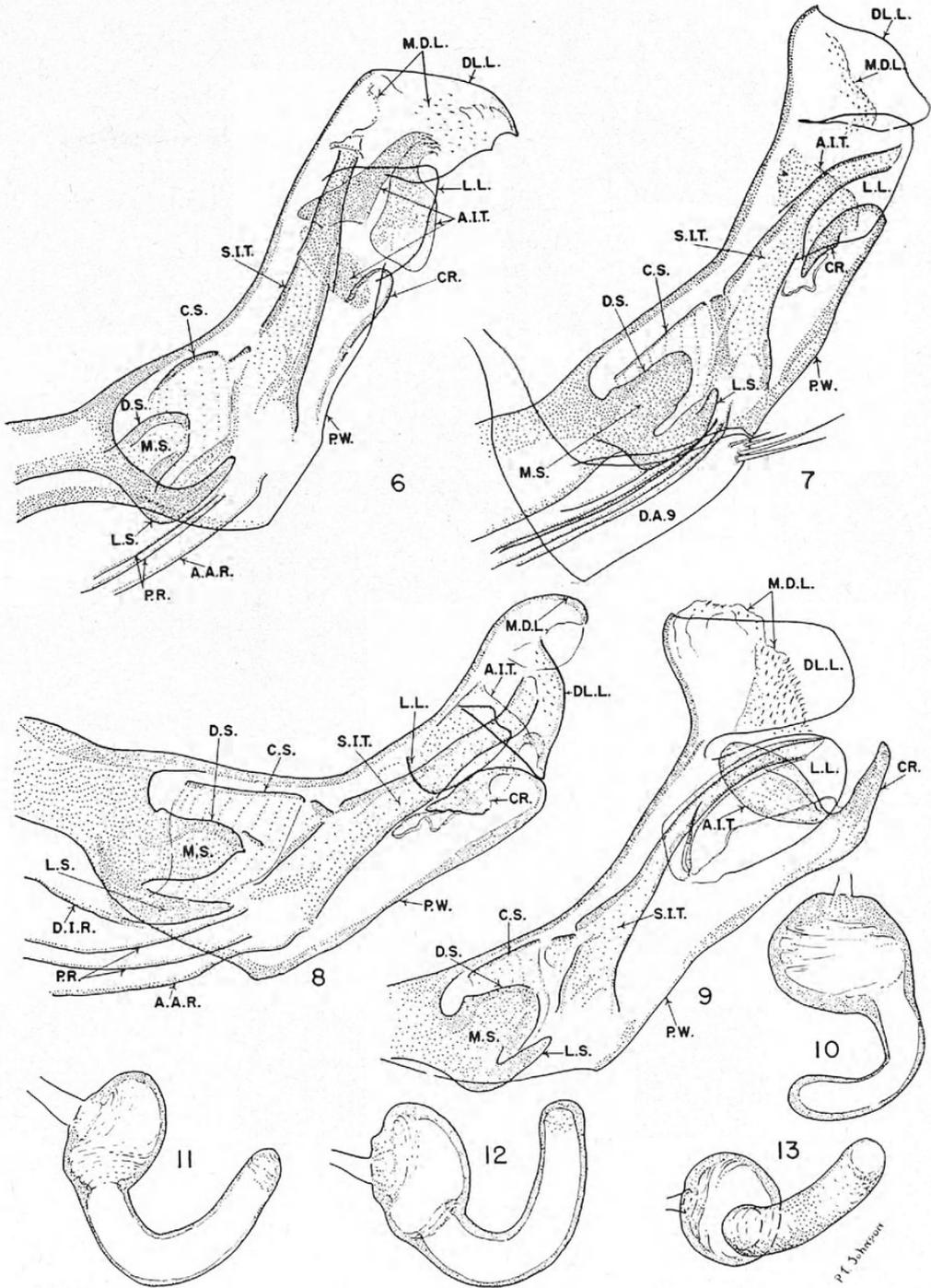




EXPLANATION OF FIGURES

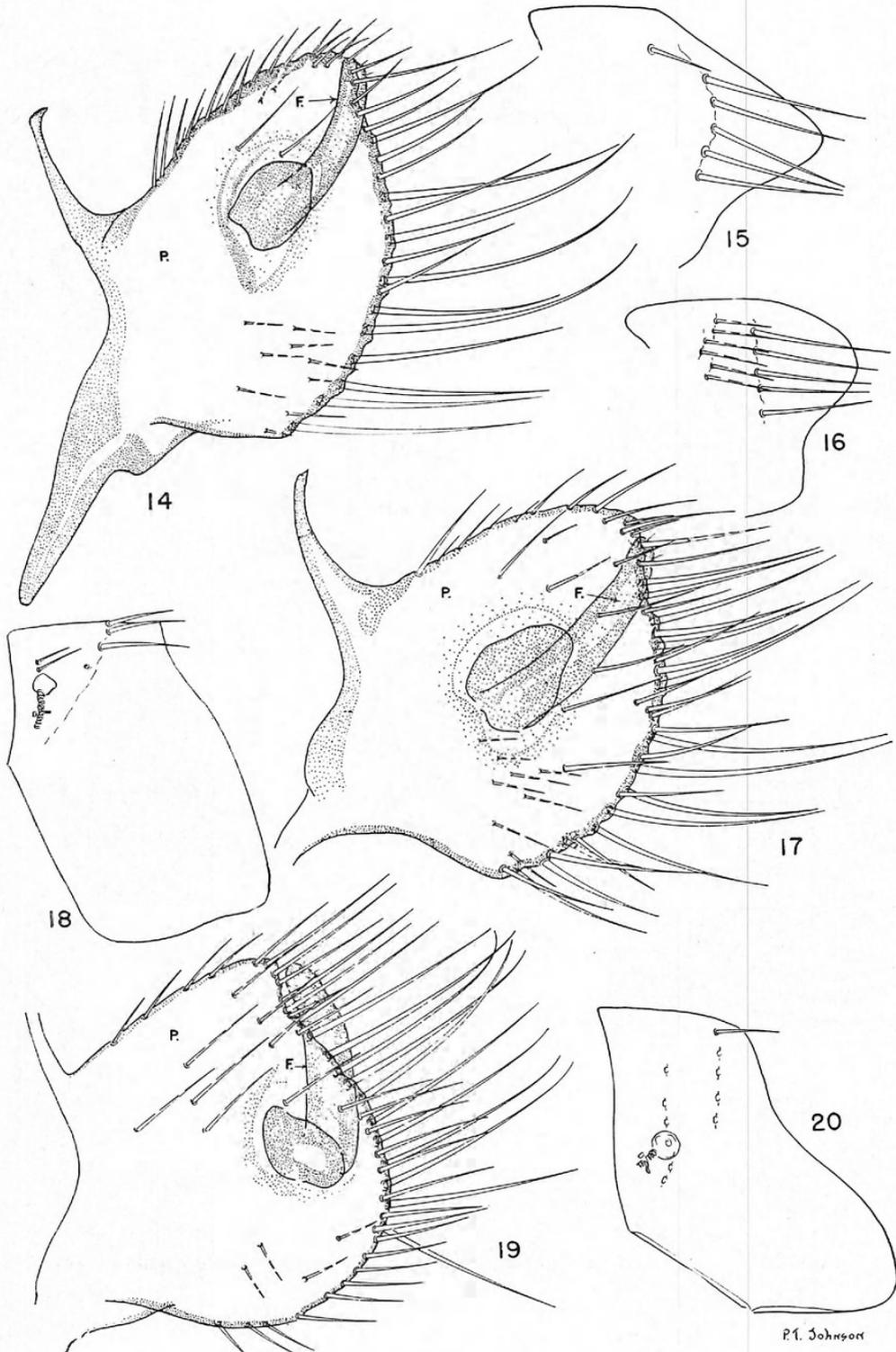
Fig. 3. *Chaetopsylla stewarti* Johnson: meso- and metathorax, holotype.
 Fig. 4. Ibid: aedeagus, holotype. Fig. 5. *Chaetopsylla lotoris* (Stewart):
 aedeagus, cotype.

spiculated intersegmental membranes, the terga strongly produced ventrocaudally (fig. 20). Terga 2-7 in female with at least two bristles of anterior row below spiracle (fig. 20); anterior row on terga 1-3 complete dorsally.



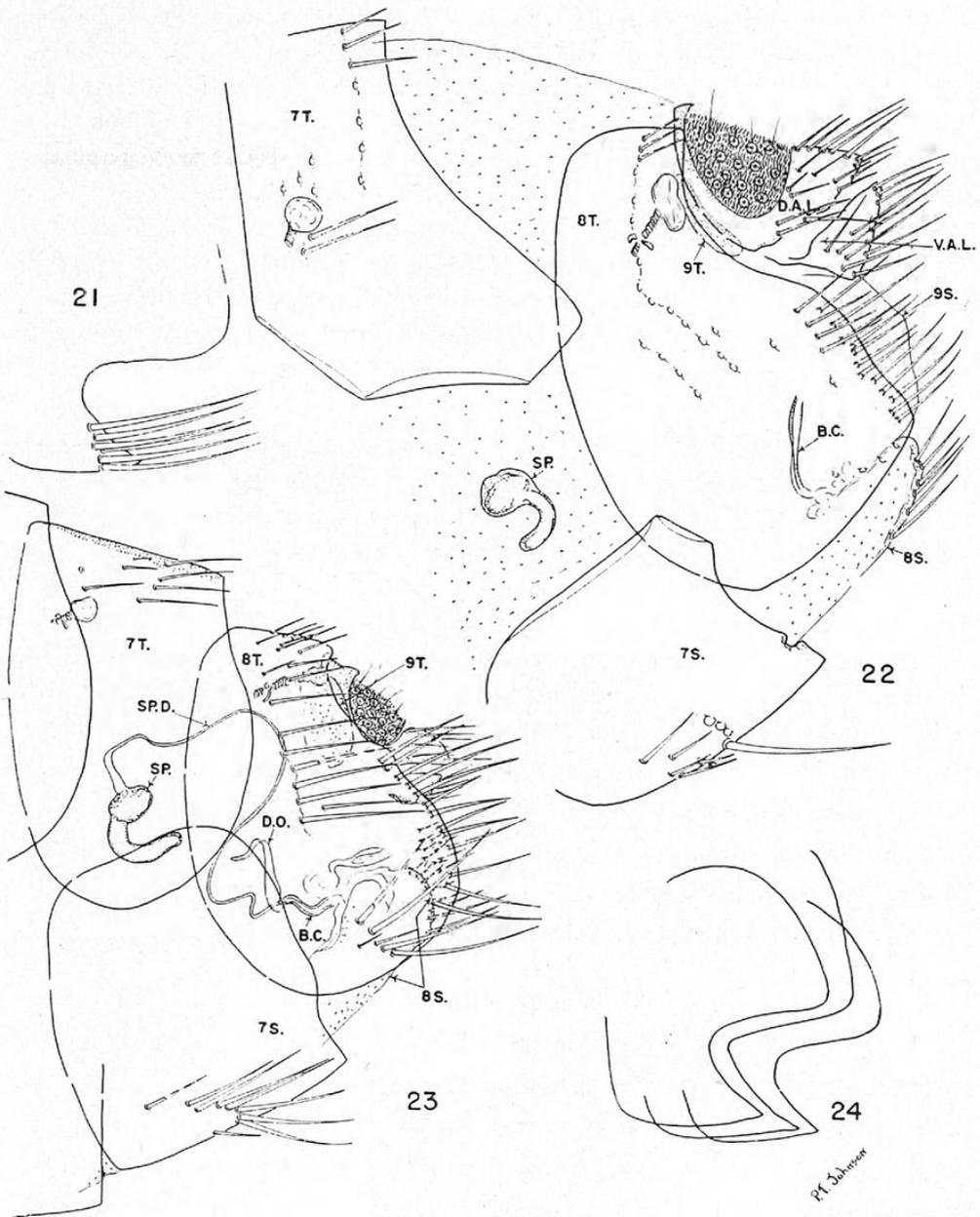
EXPLANATION OF FIGURES

Fig. 6. *Chaetopsylla floridensis* (I. Fox): apex of aedeagus, cotype. Fig. 7. *C. stewarti* Johnson: apex of aedeagus, holotype. Fig. 8. *C. lotoris* (Stewart): apex of aedeagus, cotype. Fig. 9. *C. homoeus* ssp.: apex of aedeagus. Fig. 10. *C. floridensis*: spermatheca, cotype. Fig. 11. *C. stewarti* Johnson: spermatheca, allotype. Fig. 12. *C. lotoris*: spermatheca. Fig. 13. Ibid: spermatheca, holotype.



EXPLANATION OF FIGURES

Fig. 14. *Chaetopsylla lotoris* (Stewart): clasper, cotype. Fig. 15. Ibid: posterior portion of metepimere, cotype. Fig. 16. *C. floridensis* (I. Fox): posterior portion of metepimere, cotype male. Fig. 17. *C. stewarti* Johnson: clasper, holotype. Fig. 18. *C. lotoris*: sixth abdominal tergum, holotype. Fig. 19. *C. floridensis*: clasper, cotype. Fig. 20. Ibid: sixth abdominal tergum, cotype female.



EXPLANATION OF FIGURES

Fig. 21. *Chaetopsylla lotoris* (Stewart): posterior margin of seventh sternum, holotype. Fig. 22. *C. floridensis* (I. Fox): modified abdominal segments, cotype female. Fig. 23. *C. stewarti* Johnson: modified abdominal segments, allotype. Fig. 24. *C. lotoris*: posterior margin of seventh sternum, variations.

Modified segments, male: Immovable process of clasper (fig. 19, *P.*) almost as broad as high; movable finger (*F.*) inserted on process about halfway between most dorsal and most ventral points, and much nearer posterior than anterior margin, measured from insertion on *P.*, finger about three times as long as broad, not strongly curved. Eighth and ninth sterna non-diagnostic. Aedeagal apodeme three times as long as broad anteriorly, apex blunt (as

in *C. lotoris*). Crescent sclerite (fig. 6, *C.S.*) gently convex, about as long as dorsal margin of dorsal sclerite of apodemal strut (*D.S.*). Sclerotized inner tube (*S.I.T.*) about five and one-half times as long as broad; straight, gradually narrowing to apex; its armature (*A.I.T.*) consisting of one ovate diffuse sclerite lying over middle of tube, and two large dark sclerites apically. Distolateral lobes (*DL.L.*) joined insensibly with median dorsal lobe (*M.D.L.*); apicoventrally these lobes acute, somewhat hooked; dorsally almost angled at juncture with *M.D.L.* Median dorsal lobe extending ventrally between distolateral lobes as heavily spiculated, diffuse structure. Lateral lobes (*L.L.*) almost rectangular. Crochets of same general structure as in *C. lotoris* and *C. stewarti* sp. nov. Penis rods extending well beyond apex of apodeme but not coiled.

Modified segments, female (fig. 22): Posterior margin of seventh sternum (*7S.*) concave, though not deeply excised; its exact contour impossible to ascertain since in both specimens it has been somewhat broken or otherwise disturbed. Eighth tergum (*8T.*) with lateral bristles in a double row from level of spiracle to level of lower margin of ventral anal lobe (*V.A.L.*). Eighth sternum (*8S.*) almost entirely semimembranous and spiculated, save for ventral margin where several large bristles are inserted. Spermatheca (*SP.* and fig. 10) with width of tail much less than half that of body, and only one and one-half times as long as body. Bursa copulatrix (*B.C.*) well sclerotized, slightly sinuate.

Cotypes: two males, two females *ex* "garden truck leaf mold", Gainesville, Florida, 30 September 1935. Deposited in United States National Museum.

Specimens examined.—Two male and two female cotypes.

ACKNOWLEDGMENTS

I am grateful to Dr. Henry Dietrich, Curator of Insects of Cornell University, for lending me the type specimens of *Chaetopsylla lotoris* (Stewart, 1926) and to Mr. C. W. Muesebeck, U. S. Dept. of Agriculture, for lending cotype specimens of *Chaetopsylla floridensis* (I. Fox, 1939). Dr. M. A. Stewart and Lt. Col. Robert Traub kindly allowed me access to their specimens of *C. lotoris*. Dr. J. S. Stanford, Utah State College of Agriculture, was instrumental in obtaining for study the specimens of *Chaetopsylla stewarti*.

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