

INSECTS OF MICRONESIA

Siphonaptera

By G. H. E. HOPKINS

HONORARY ASSOCIATE, BRITISH MUSEUM (NATURAL HISTORY)

INTRODUCTION

The fleas dealt with in this report are from the Mariana and Caroline Islands, with a single series from the Marshall Islands. Apparently, no fleas have been collected from the Bonin, Volcano, Gilbert, Ocean, Nauru, Marcus, or Wake Islands. I am grateful for the opportunity to examine material from the United States National Museum (US), the Chicago Natural History Museum (CM), and Bernice P. Bishop Museum (BISHOP). I have also seen the single Micronesian flea in the collection of the British Museum (BM). I am much indebted to the trustees of the British Museum for the drawings by Mr. Arthur Smith from which figures 4 and 9 were prepared, and to the Royal Entomological Society of London for permission to reproduce figures 1 to 3 and 5 to 8 from Smit's *Siphonaptera*, published by them in 1957.

The United States Office of Naval Research, the Pacific Science Board (National Research Council), the National Science Foundation, and Bernice P. Bishop Museum have made this survey and publication of the results possible. Field research was aided by a contract between the Office of Naval Research, Department of the Navy, and the National Academy of Sciences, NR 160-175.

All the fleas discussed, with one possible exception, have been introduced by man, and it is probable that this introduction was comparatively recent. The statement by Safford (1905, U. S. Nat. Herb. Contrib. 9: 93) that he saw no fleas in Guam is not, of course, conclusive, but it fits well with the statement of Buxton and Hopkins (1927, London School Hygiene and Tropical Med., Mem. Ser. 1: 55) that fleas were probably absent from the Pacific islands until the arrival of Europeans; the further suggestion of these authors that *Ctenocephalides felis* might have been brought to Samoa and other island groups during the early wanderings of the Polynesians is very improbable in view of the fact that the Samoan representative of this species is the nominate subspecies, which is not indigenous in any area likely to have been the original homeland of the Polynesians. Buxton and Hopkins also quote Gill (1885, Jottings from the Pacific, London, p. 163) for the former absence of "human

fleas" from certain of the Polynesian groups of islands and the term, as used by non-entomological writers, would certainly include *Ctenocephalides felis*, of which at least two subspecies bite man with avidity, though we do not know if this is true of *C. f. orientis*. Gill states that fleas were introduced into Rarotonga and Mangaia in the Cook Islands as late as 1820 and 1823 respectively, and it is probable that fleas were brought to Micronesia at an even later date.

In the systematic part of this report descriptions are confined to just enough to distinguish the flea concerned from others likely to be introduced into Micronesia and only the more important synonyms are given. Fuller descriptions and synonymies are to be found in Hopkins and Rothschild, Catalogue of the Rothschild Collection of Fleas, volume 1 (1953) and volume 2 (1956). Characteristics given for Micronesian species are not necessarily applicable to members of the same genera in other parts of the world.

ZOOGEOGRAPHY

Micronesia, like Polynesia, is extremely poor in fleas, at most six species or subspecies being recorded, of which (with one very doubtful exception) none could be considered indigenous. The doubt about the number of species is due to the case of *Pulex irritans*. Some reports refer to the rarity of the "human flea," and although the phrase almost certainly refers to any flea which bites man, the presence of the species in almost all the surrounding groups of islands (Japan, Philippines, New Guinea, New Hebrides, Tonga, Samoa, Cook, Manihiki, and Tahiti) makes it so unlikely that *P. irritans* has failed to be introduced into Micronesia that it has been thought desirable to include it in this account in spite of the complete absence of definite records or specimens.

Although little collecting seems to have been done on the few non-domestic mammals of Micronesia, it is unlikely that further efforts will extend the list

DISTRIBUTION OF MICRONESIAN SIPHONAPTERA

	MICRONESIAN ISLAND GROUPS						Other Localities	
	N. Mariana	S. Mariana	Caroline					Marshall
			Palau	Truk	Ponape	Kusaie		
1. <i>Ctenocephalides canis</i>		G*					Cosmopolitan	
2. <i>C. felis felis</i>	X	X	X	X			Cosmopolitan	
3. <i>C. f. orientis</i>		X		X	X		Southeast Asia, Philippine Is., New Guinea	
4. <i>Pulex irritans</i>						X	Cosmopolitan	
5. <i>Xenopsylla cheopis</i>		G					Cosmopolitan	
6. <i>Ichnopsyllus indicus</i>		G					Pakistan, Ceylon, China, Japan	

* Indicates Guam only.

of Micronesian fleas much; the most likely group in which additions may be hoped for is the bat fleas.

Of the six fleas dealt with in this report, four (including *Pulex irritans*) are probably of Palaearctic origin and are now almost completely cosmopolitan, although limited to some extent by climatic conditions, especially temperature. The other two are widely distributed in the Oriental Region, in which they probably originated.

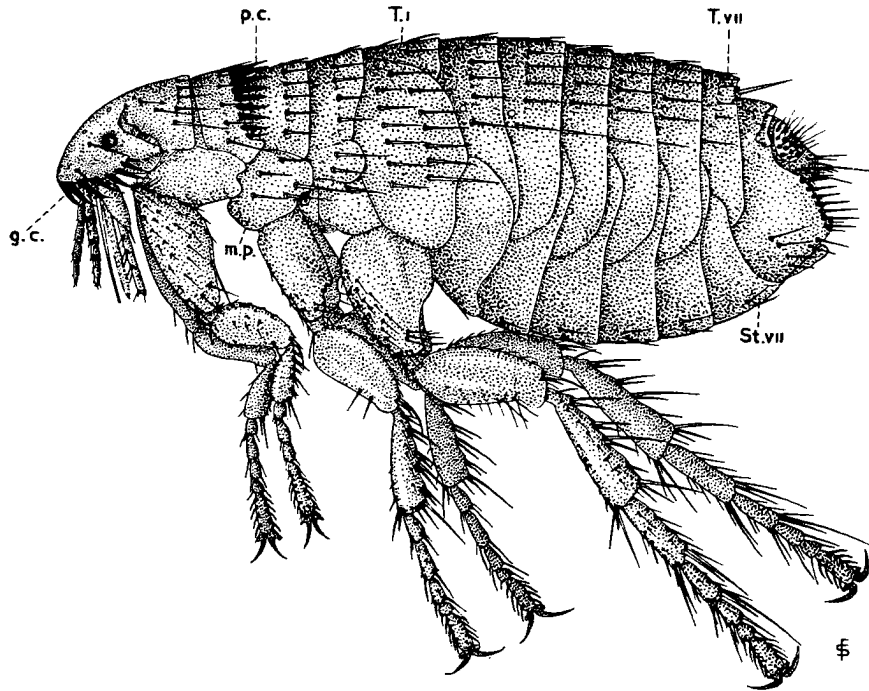


FIGURE 1.—*Ctenocephalides felis felis*, female, to show the general structure of a flea. (After Smit, 1957.) Abbreviations: g.c. = genal comb, m.p. = mesopleuron, p.c. = pronotal comb, St. = sternum, T. = tergum.

SYSTEMATICS

KEY TO MICRONESIAN FAMILIES OF SIPHONAPTERA

1. Genal comb either vestigial or absent (fig. 7) or consisting of at least six pointed spines extending along nearly the whole of ventral margin of anterior portion of head (fig. 1).....**Pulicidae**
- Genal comb present, composed of two flattened spines placed at extreme anterior end of ventral margin of head (fig. 9, a).....**Ischnopsyllidae**

FAMILY PULICIDAE

With or without a genal comb, this comb is composed of at least six pointed spines extending along nearly the whole of the ventral margin of the head. The pronotal comb is present or absent. Abdominal terga I to VII are without spines or spinelets and each has only one row of bristles.

KEY TO GENERA OF MICRONESIAN PULICIDAE

1. Genal comb extensive, of at least six spines (figs. 1; 2, *a*; 3, *a*; 4, *a*).....**Ctenocephalides**
Genal comb vestigial or absent..... 2
2. Mesopleuron (fig. 1) traversed by a very distinct internal rod running almost vertically (fig. 5, *b*).....**Xenopsylla**
Mesopleural rod absent (fig. 5, *a*).....**Pulex**

Genus **Ctenocephalides** Stiles and Collins

Ctenocephalus Kolenati, 1857 (not of Hawle and Corda, 1847), Wiener Ent. Monatschr. 1:65 (type: *C. novemdentatus* Kolenati = *Pulex canis* Curtis).

Ctenocephalides Stiles and Collins, 1930, U. S. Public Health Rept. 45 (23): 1308 (type: *Pulex canis* Curtis).

Genal comb horizontal, consisting (in Micronesian species) of at least six sharp spines which extend along almost the whole of anterior portion of ventral margin of head. Pronotum with comb composed of many spines. Mesopleural rod present.

This is a small genus with indigenous species in the Palaearctic, Oriental, and Ethiopian regions. Two species have become cosmopolitan and a third species or subspecies has a very wide range; all of these are known from Micronesia.

KEY TO MICRONESIAN SPECIES AND SUBSPECIES OF CTENOCEPHALIDES

1. Interval between postmedian and apical long bristles of dorsal margin of hind tibia containing, in normal specimens, two small notches, each with a short, stout bristle (A and B in figure 2, *c*); anterior margin of head (fig. 2, *a, b*) strongly convex, a large part of its lower portion nearly vertical.....**canis**
Interval between postmedian and apical long bristles of dorsal margin of hind tibia (figs. 3, *c*; 4, *c*) containing only one small notch with a stout bristle; anterior margin of head (figs. 3, *a, b*; 4, *a, b*) less convex, a much smaller part of its lower portion nearly vertical..... 2
2. Anterior portion of head (fig. 4, *a, b*) strongly rounded; manubrium of male rather strongly widened apically (fig. 4, *e*); female with a row of minute bristles above antennal fossa (fig. 4, *a*).....**felis orientis**
Anterior portion of head (fig. 3, *a, b*) much less rounded; manubrium of male only feebly widened apically (fig. 3, *e*); female without a row of minute bristles above antennal fossa (fig. 3, *a*).....**felis felis**

1. *Ctenocephalides canis* (Curtis). (Figures 2; 5, *b*.)
Pulex canis Curtis, 1826, British Ent. 3: 114, figs. A-E, 8 (Britain; types lost).
Ctenocephalides canis, Stiles and Collins, 1930, U. S. Public Health Rept. 45 (23): 1308.

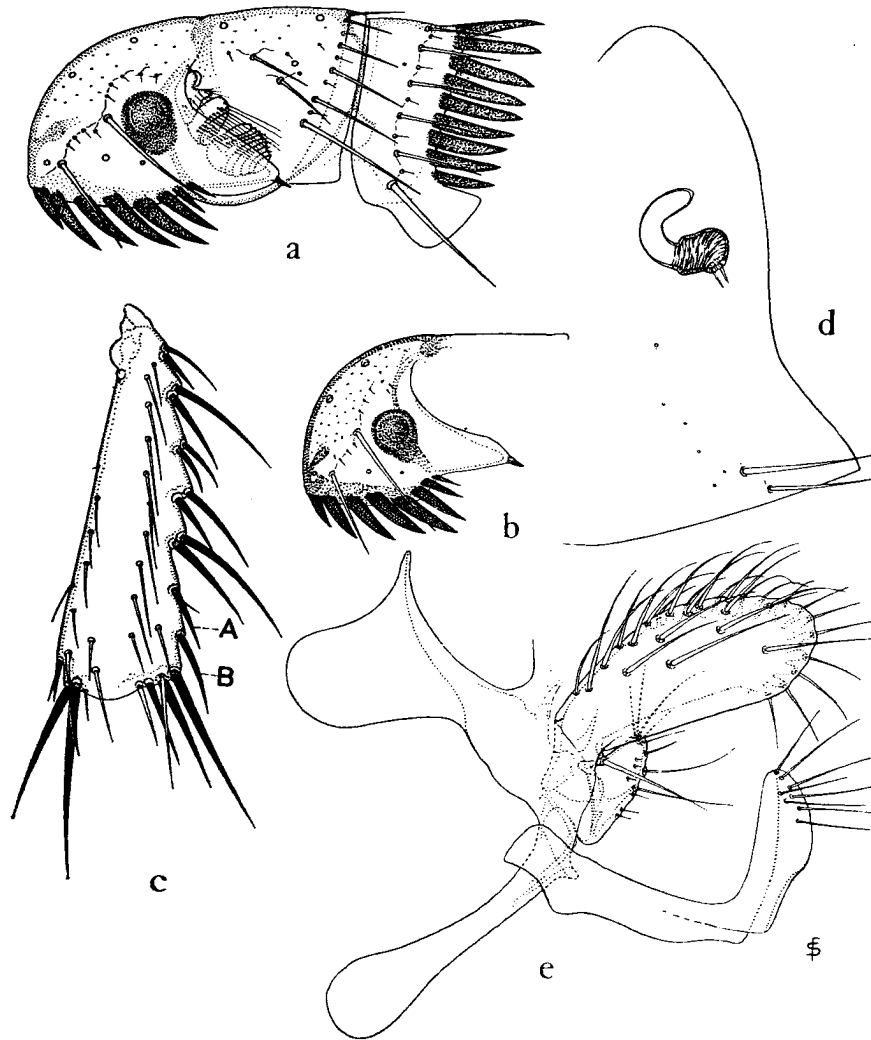


FIGURE 2.—*Ctenocephalides canis*: a, head and pronotum of female; b, anterior part of head of male; c, hind tibia; d, sternum VII and spermatheca of female; e, clasper and sternum IX of male. (After Smit, 1957.)

Anterior margin of head strongly convex in both sexes, a large part of lower portion of margin almost vertical in male and a little less so in female. Anterior spine of genal comb only about one-half length of second spine.

Dorsal margin of hind tibia with seven notches containing stout bristles excluding apical ones, space between postmedian and apical bristles occupied, with rare exceptions, by two shallow notches each containing a stout bristle.

Male: Row of minute bristles immediately above and behind antennal fossa as in all male members of this genus. Terminalia as in figure 2, *e*, apex of manubrium strongly dilated, spatulate.

Female: Normally without minute bristles immediately above and behind antennal fossa, but one to four such bristles very occasionally present. Spermatheca relatively small, apical part of hilla (bent-over apical part of "tail" of spermatheca) longer than the rest of hilla.

DISTRIBUTION: Nearly cosmopolitan; not hitherto recorded from Polynesia, Melanesia, or Micronesia, although *C. felis orientis* has been misdetermined as this.

S. MARIANA IS. GUAM: Three females, from dog, July 1945, Bohart and Gressitt.

HOSTS: The domestic dog, *Canis familiaris*, is the normal host of this species, which also infests wild Canidae. Occurrence on members of other families is probably always accidental.

In spite of the fact that this flea has been carried to almost all parts of the world with domestic dogs, it is unlikely to have established itself on Guam, since it is rare or absent in the hotter parts of the world.

2. *Ctenocephalides felis felis* (Bouché). (Figures 1, 3.)

Pulex felis Bouché, 1835, Acad. Caes. Leop. Nova Acta 17: 505 (probably Germany; syntypes probably lost).

Ctenocephalus felis, Jordan and Rothschild, 1906, Nov. Zool. 13: 175.

Ctenocephalides felis, Stiles and Collins, 1930, U. S. Public Health Rept. 45 (23): 1309.

Ctenocephalus musculi Sugimoto, 1933, Nat. Hist. Soc. Formosa, Trans. 23 (125): 129, pl. 2, figs. 4, 8 (Formosa; syntypes lost?).

Anterior margin of head not strongly convex, very sloping in male and still more so in female. Anterior spine of genal comb much more than one-half length of second spine.

Dorsal margin of hind tibia with only five or six notches containing stout bristles excluding apical ones, space between postmedian and apical bristles occupied by only one shallow notch containing a stout bristle.

Male: Terminalia as in figure 3, *e*, apical portion of manubrium only feebly dilated.

Female: Without minute bristles immediately above and behind antennal fossa. Spermatheca relatively larger than in *C. canis* and bent-over apical part of hilla shorter than remainder.

DISTRIBUTION: Cosmopolitan; records from oceanic groups in the Pacific include New Hebrides, Micronesia, Tonga, Samoa, Tahiti, and the Hawaiian Islands.

N. MARIANA IS. PAGAN: Two females, Apr. 1940, Yasumatsu and Yoshimura.

S. MARIANA IS. SAIPAN: Many, on dogs, July 1944, May 1954, Brown, and Feb. 1945, Hagen; six males, on man, Feb. 1945, Dybas. GUAM: Many, May, June 1936, Swezey, and Aug. 1938, Oakley.

PALAU. BABELTHUAP: Two males, from goat, Apr. 1953, Beardsley, Dec. 1935, Ono. KOROR: Two females, from dog, July 1951, Gressitt.

TRUK. TONOAS (Dublon): Six females, Feb. 1948, Maehler.

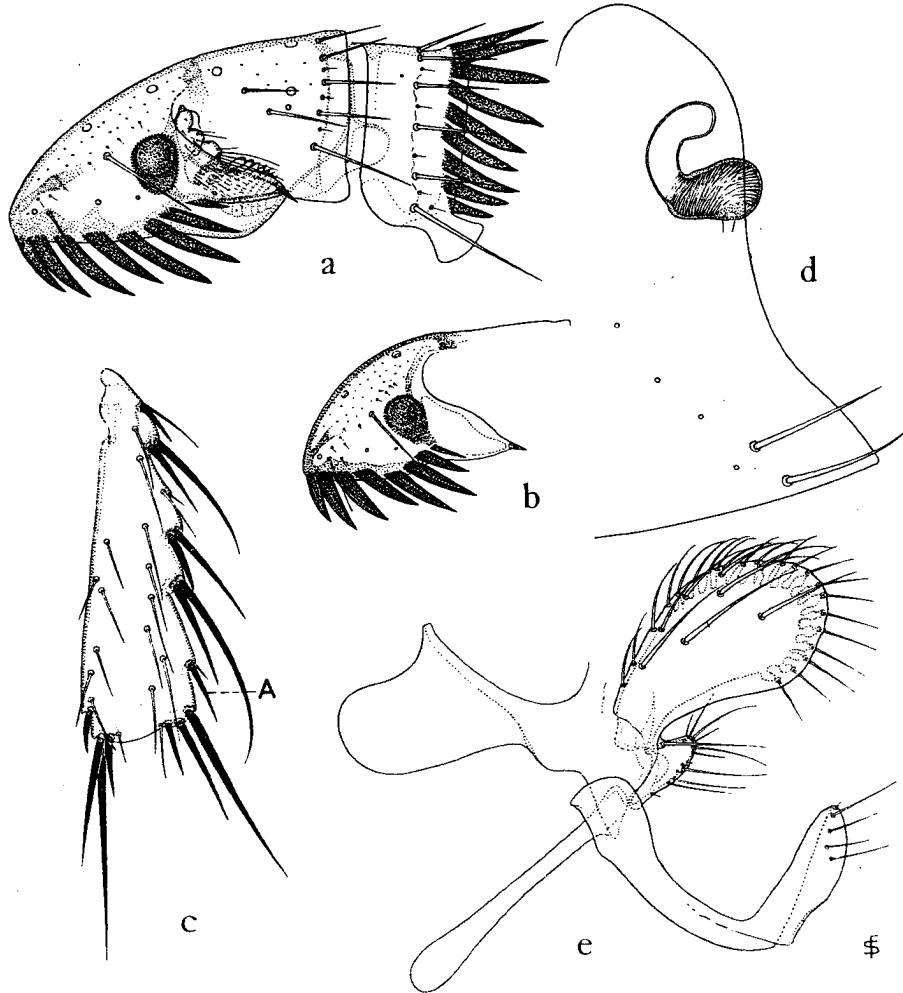


FIGURE 3.—*Ctenocephalides felis felis*: a, head and pronotum of female; b, anterior part of head of male; c, hind tibia; d, sternum VII and spermatheca of female; e, clasper and sternum IX of male. (After Smit, 1957.)

MARSHALL IS. KWAJALEIN: Ebeye (Ebeje) I., three females, June 1944, Wallace; three pairs, from kitten, Jan. 1952, Fosberg No. 686.

HOSTS: The usual host of this flea is the domestic cat, *Felis domesticus*, but it also occurs commonly on other hosts (usually of medium size and not necessarily Carnivora) and readily bites man.

Buxton and Hopkins (1927, London School Hygiene and Tropical Med., Mem. Ser. 1: 56) suggest that *Ctenocephalides felis* might have been brought to Samoa and other island groups in the course of the early migrations of the Polynesians. This is improbable so far as the nominate subspecies is concerned, because in southeast Asia (generally accepted as the original home of the Polynesians) the indigenous subspecies is *C. f. orientis* and *C. f. felis* was almost certainly absent at the time of the migrations, whereas in South America (believed by some to be the source of the Polynesians) no member of the genus *Ctenocephalides* is indigenous. *C. f. felis* was perhaps brought to Micronesia by the Japanese but, in most groups of oceanic islands in the Pacific, it was probably introduced by people of European origin. Alicata's record [1948, Hawaiian Ent. Soc., Proc. 13 (2): 201] of *C. felis* from dogs in Ponape probably refers to *C. f. orientis*.

3. *Ctenocephalides felis orientis* (Jordan). (Figure 4.)

Ctenocephalus felis orientis Jordan, 1925, Nov. Zool. 32: 99 (Ceylon; holotype in British Museum).

Ctenocephalides felis orientis, Stiles and Collins, 1930, U. S. Public Health Rept. 45 (23): 1309.

Anterior margin of head markedly convex, especially in male, but not so much as in *C. canis*, especially in female. Spines of genal comb shorter than in *C. f. felis*, anterior spine obviously more than one-half as long as second spine. Dorsal margin of hind tibia as in *C. f. felis*, with only one shallow notch containing a stout bristle between postmedian and apical groups of bristles.

Male: Terminalia as in figure 4, *e*, apical portion of manubrium strongly dilated as in *C. canis*.

Female: With two to eight minute spiniform bristles immediately above and behind antennal fossa. Spermatheca greatly resembling that of *C. canis*.

DISTRIBUTION: Ceylon, Indian Peninsula, Burma, Indo-China, Malaya, Sumatra, Java, Borneo, Philippine Is. (Celebes), Moluccas, New Guinea, Somaliland, and S. Mariana Is.

S. MARIANA IS. SAIPAN: One pair, on dog, July 1944, Hagen; seven males, female, Feb. 1945, Hagen; female, on man, Feb. 1945, Dybas. GUAM: One pair, from *Canis familiaris*, July 1945, Strong.

TRUK. TONOAS: Three males, two females, Dec. 1935, Ono.

PONAPE. Two males, three females, from dog, goat, and pig, Feb. 1948, Harlbut.

KUSAIE. Five males, eight females, from dog, Apr. 1953, Clarke.

HOSTS: Found principally on the domestic dog and other Canidae but

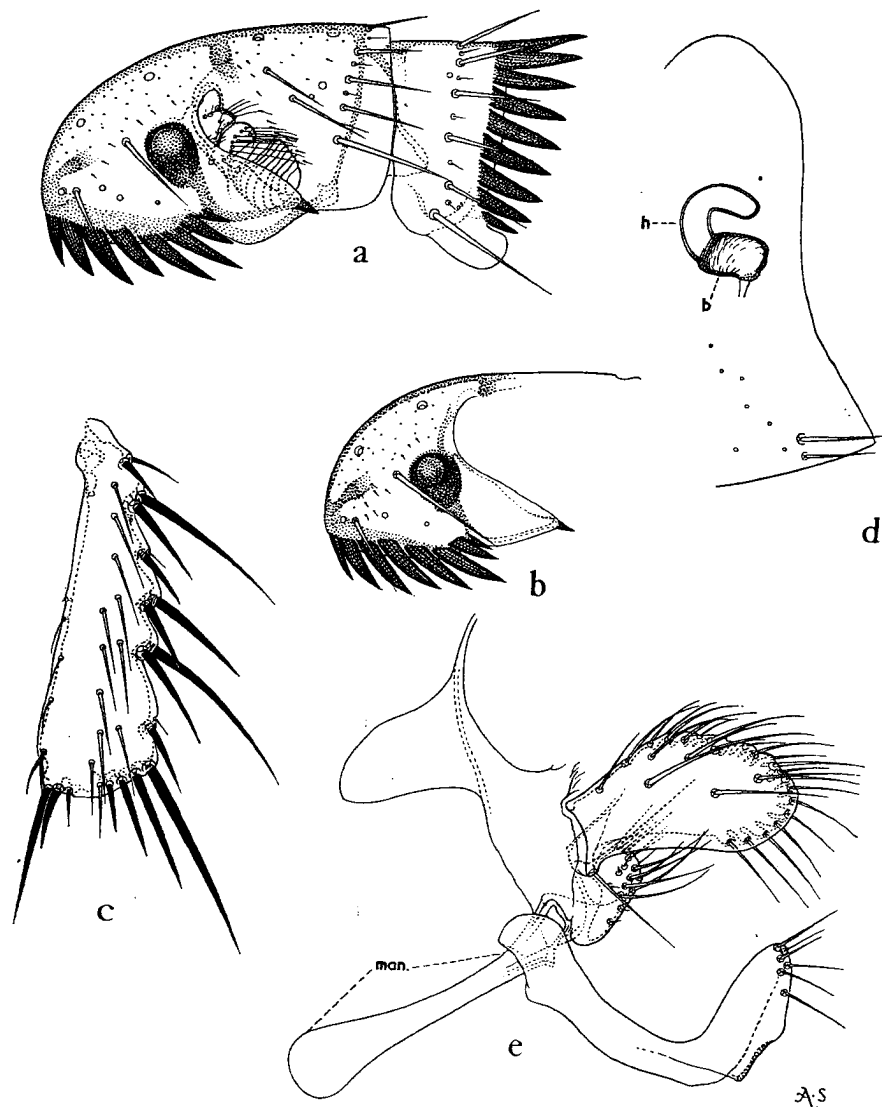


FIGURE 4.—*Ctenocephalides felis orientis*: a, head and pronotum of female (bristles above antennal fossa conspicuous just behind antenna); b, anterior part of head of male; c, hind tibia; d, sternum VII and spermatheca of female; e, clasper and sternum IX of male. Abbreviations: b = bulga of spermatheca, h = hilla of spermatheca, man. = manubrium of clasper.

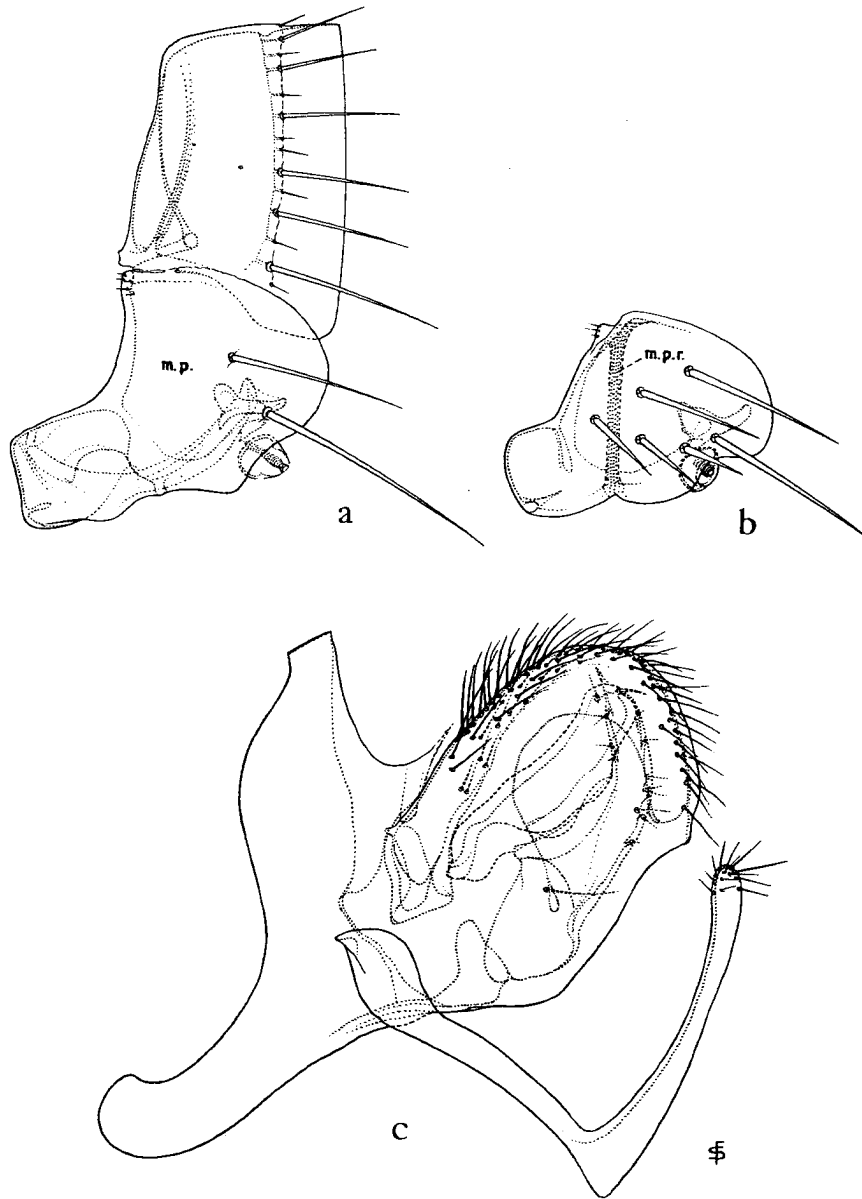


FIGURE 5.—a, mesothorax of *Pulex irritans*, showing absence of vertical rod traversing mesopleuron; b, mesopleuron of *Ctenocephalides canis*, showing presence of mesopleural rod; c, clasper and sternum IX of male *Pulex irritans*. (After Smit, 1957.) Abbreviations: m.p. = mesopleuron, m.p.r. = mesopleural rod.

also on a wide variety of other hosts. H. S. Dybas tells me that a batch of fleas obtained on Saipan and comprising the nominate subspecies and subspecies *orientis* were caught as they jumped up on his trousers and those of his companions while walking along the beach.

C. felis orientis is certainly introduced in Micronesia and probably a recent introduction. Outside Micronesia it is almost confined to the Oriental Region, being found outside this region only in Somaliland (where it is certainly imported and probably not established) and in the chain of islands stretching from Celebes to New Guinea. The present is the first definite Micronesian record; the record of *C. felis* from Ponape [Alicata, 1948, Hawaiian Ent. Soc., Proc. 13 (2): 201] may refer to *orientis*, since the material examined does not include any specimens of the nominate subspecies from Ponape.

There is a possibility that *orientis* would be better regarded as a full species than as a subspecies of *C. felis*, since it is found with the nominate subspecies of the latter in many areas, but no intermediates have been observed.

Genus *Pulex* Linnaeus

Pulex Linnaeus, 1758, Syst. Nat., ed. 10, 1: 614 (type, by designation of Baker, 1904: *P. irritans* Linnaeus).

Genal comb absent or represented only by a single small and inconspicuous spinelet. Pronotal comb absent. Absence of mesopleural rod (fig. 5, *a*) immediately separates this genus from all others known from oceanic islands in the Pacific.

This genus is now known to include at least seven species of which one is cosmopolitan but occurs principally in the Palaearctic Region, while all the rest are Nearctic or Neotropical. The cosmopolitan species, *Pulex irritans*, presents a special difficulty in the matter of distribution because it is likely that a great many records under its vernacular name (the human flea) really refer to other fleas which bite man, such as members of *Ctenocephalides*. The only mention of the flea from Micronesia of which I am aware is under its vernacular name and is probably erroneous, for I have never seen a Micronesian specimen of the species, but the probability that if it is not already present it will shortly be introduced is so great that I think it desirable to give an account of the species. Under the distribution of the species, the localities mentioned include only those from which I have seen specimens.

4. *Pulex irritans* Linnaeus (figs. 5, *a, c*; 6).

Pulex irritans Linnaeus, 1758, Syst. Nat., ed. 10, 1: 614 (Europe and America; neotype in British Museum).

This species is the only member of its genus at all likely to be found in Micronesia and is sufficiently characterized by the generic diagnosis and the illustrations. In view of the absence of definite records, it will not be further described.

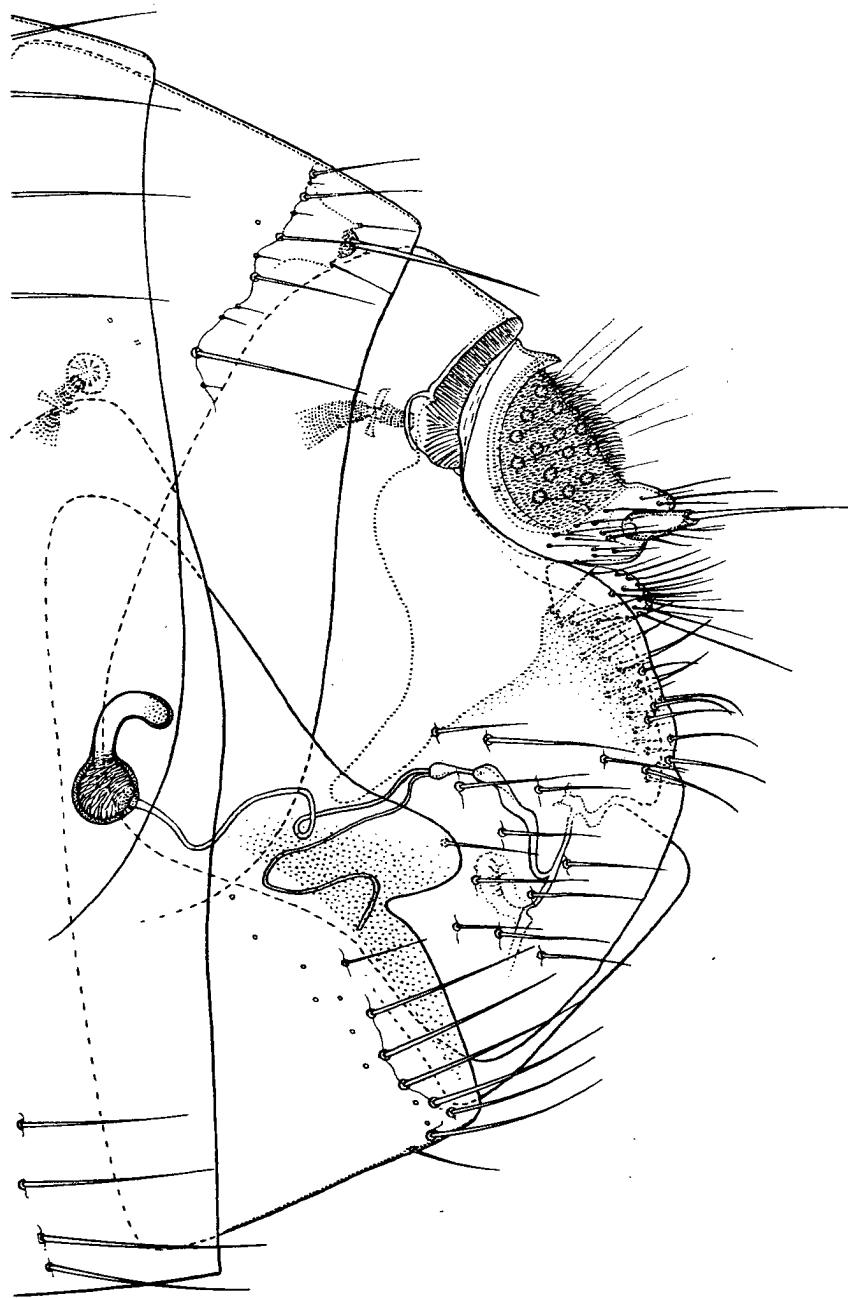


FIGURE 6.—Terminal segments of female *Pulex irritans* (after Smit, 1957).

DISTRIBUTION: Cosmopolitan; confirmed records from groups of islands in the Pacific include Japan, Philippines, New Guinea, New Hebrides, Samoa, Tonga, and Tahiti; no confirmed records from Micronesia.

HOSTS: Although commonly known as the human flea, this species is probably much more attached to the domestic pig; in Europe it occurs in the burrows of large carnivores such as the fox and the badger and is also found on ferrets.

Genus *Xenopsylla* Glinkiewicz

Xenopsylla Glinkiewicz, 1907, Sitzungsab. Akad. Wiss. Wien, Abt. 1, 116: 385 (type: *X. pachyuromydis* Glinkiewicz = *Pulex cheopis* Rothschild).

Loemopsylla Jordan and Rothschild, 1908, Parasitology 1: 15 (type: *Pulex cheopis* Rothschild).

Alaopsylla Jordan, 1933, Nov. Zool. 39: 55 (type: *A. papuensis* Jordan).

Stoutly built fleas, without any vestiges of combs on head, thorax, or abdomen. Anterior margin of head smoothly curved (fig. 7). Mesopleurum traversed by a very distinct internal rod, as in figure 5, *b*. Clasper of male very small; female with bulga of spermatheca and most of hilla (in species likely to occur in the Pacific) extremely dark colored, almost black.

This is a large genus of fleas, occurring mainly in the Ethiopian Region and the warmer parts of the Palaearctic Region. One species has become cosmopolitan and another has spread very widely; both of these occur on house rats and both are capable of maintaining an epidemic of plague. The cosmopolitan species, *Xenopsylla cheopis*, is the most important plague-flea in most tropical areas.

5. *Xenopsylla cheopis* (Rothschild). (Figures 7, 8.)

Pulex cheopis Rothschild, 1903, Ent. Month. Mag. 39: 85 (Sudan; holotype in British Museum).

Pulex philippinensis Schultze and Herzog, IN Herzog, 1904, Bur. Govt. Labs. Philippine Is., Bull. 23: 77, figs. 26, 27 (Philippine Is.; syntypes in British Museum).

Head as in figure 7, dorsal groove on occiput of male moderately deep, extending onto pronotum. Antepygidial bristle in both sexes situated a little before margin of seventh tergite and not placed on a pedestal.

Male: Terminalia as in figure 8, *a*. Largest process of clasper (P^1) somewhat pyriform.

Female: Spermatheca with rather small bulga, basal portion of hilla not much wider than bulga and not projecting below ventral margin of bulga.

DISTRIBUTION: Cosmopolitan in the warmer parts of the world and sometimes establishing colonies in heated buildings in colder countries; records from oceanic groups in the Pacific include Samoa, Hawaiian Islands, Fiji, and south Mariana Islands.

S. MARIANA IS. GUAM: Male, female, from *Rattus rattus*, June 1945, Strong.

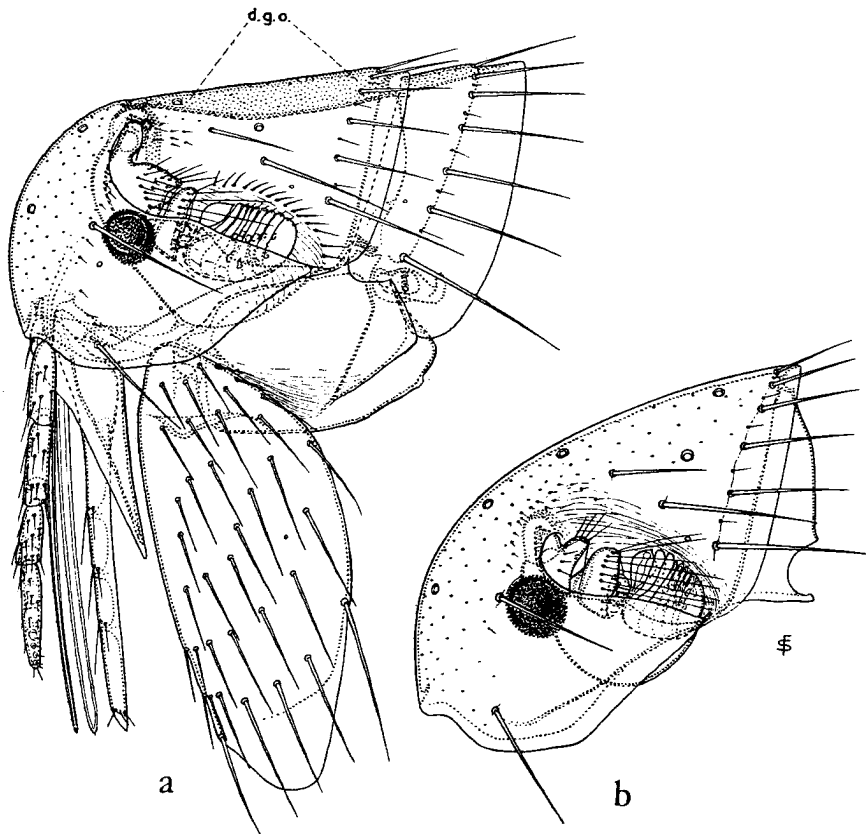


FIGURE 7.—*Xenopsylla cheopis*: a, head and prothorax of male; b, head of female. (After Smit, 1957.) Abbreviation: d.g.o. = dorsal groove of occiput.

HOSTS: *Rattus rattus* and *R. norvegicus* are the principal hosts of *Xenopsylla cheopis*, but it also occurs abundantly on other rats in some areas. The fact that this species is the principal vector of plague in most tropical areas where the disease occurs makes its occasional, and almost accidental, attacks on man of great importance in plague areas.

FAMILY ISCHNOPSYLLIDAE

The genal comb is composed of two flattened spines placed at the anterior end of the ventral margin of the head (fig. 9, a). The head, thorax, and abdomen in the nominate subfamily are all strikingly long in proportion to their height. The pronotal comb is always present and combs are often present on some abdominal segments.

All the members of this family are bat fleas and all of the nominate subfamily (the only one known from Micronesia) occur on Microchiroptera. The single genus which makes up the Thaumapsyllinae occurs on Megachiroptera (fruit bats). Members of the family occur throughout the world wherever bats have been examined for fleas.

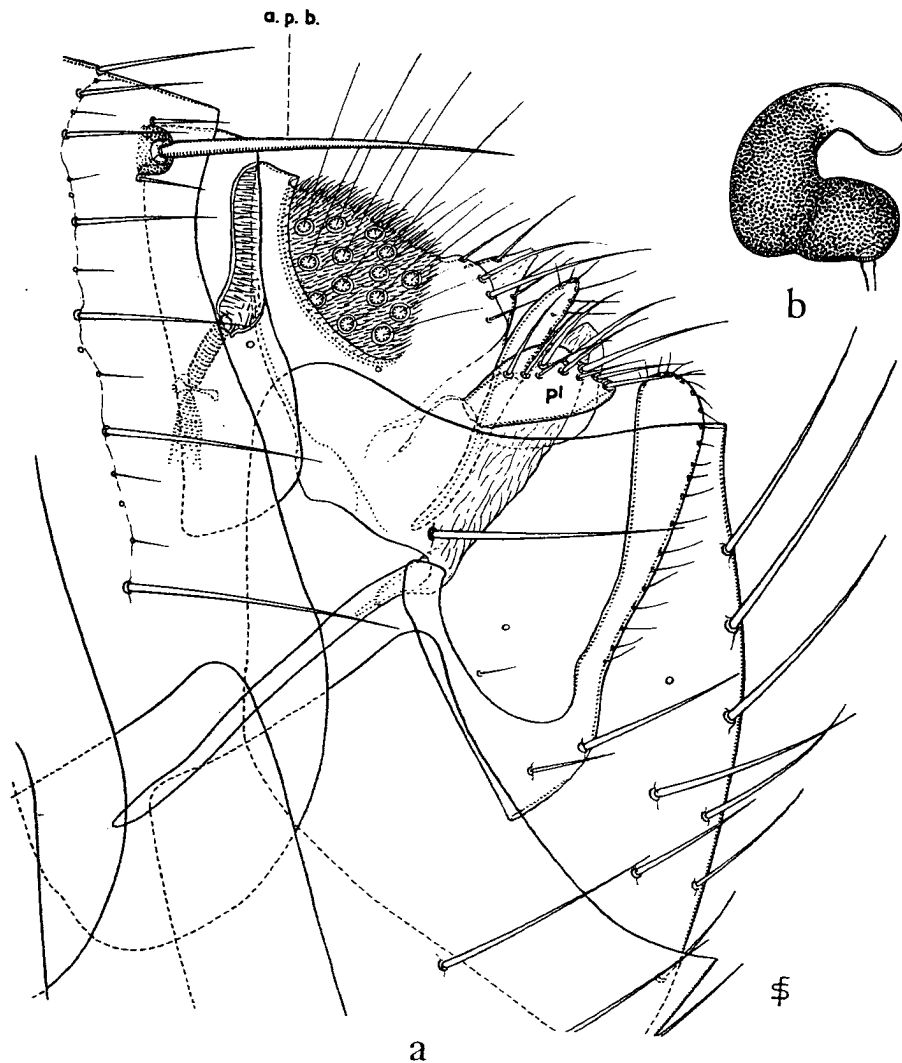


FIGURE 8.—*Xenopsylla cheopis*: a, terminal segments of male; b, spermatheca of female. (After Smit, 1957.) Abbreviations: a.p.b. = antepygidial bristle, P¹ = first process of clasper of male.

Genus *Ischnopsyllus* Westwood

Ischnopsyllus Westwood, 1833, Ent. Mag. 1: 362 (type: *Ceratophyllus elongatus* Curtis).

Frons as in figure 9, a; area anterior to pale band minutely rugulose. At least six combs on thorax and abdomen, those on metanotum and abdominal segments composed of spines which are little smaller than those of pronotal comb.

This is a rather large genus which extends throughout the Palaearctic Region and has one representative in South Africa and another in Pakistan, Ceylon, China, Japan, and Guam.

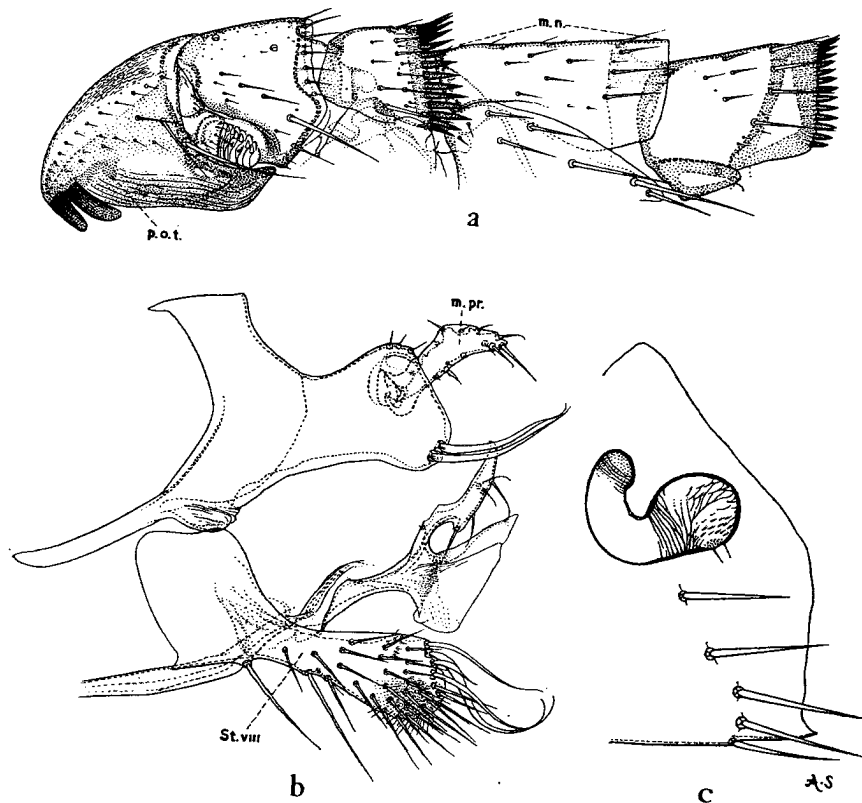


FIGURE 9.—*Ischnopsyllus indicus*: a, head and dorsal portions of thorax of female; b, terminalia of male; c, sternum VII and spermatheca of female. Abbreviations: m.n. = mesonotum, m.pr. = movable process, p.o.t. = preoral tubercle, St. VIII = distal arm of sternum VIII.

6. *Ischnopsyllus indicus* Jordan (fig. 9).

Ischnopsyllus indicus Jordan, 1931, Nov. Zool. 37: 147 (Pakistan; holotype in British Museum).

Ischnopsyllus tateishii Sugimoto, 1933, Zool. Mag., Tokyo, 45: 101 (Formosa; syntypes lost?).

Preoral tubercle long and narrow, bent at about a right angle and narrowest at bend. Eight thoracic and abdominal combs present, placed on pronotum, metanotum, and first six abdominal terga.

Male: Mesonotum without any exceptionally long bristles. Terminalia as in figure 9, *b*; movable process of clasper rather small, with subparallel sides, and nearly straight; apical portion of distal arm of sternum VIII forming an almost symmetrical, club-shaped expansion.

Female: Sternum VII and spermatheca as in figure 9, *c*, the latter large in proportion to the size of flea, bulga oval, obviously longer than wide, and little shorter than hilla.

DISTRIBUTION: Pakistan, Ceylon, southern China, Japan, and Guam.

S. MARIANA IS. GUAM: Female (BM), from *Pipistrellus javanicus abramus*, Owston.

HOSTS: Microchiroptera, principally *Pipistrellus* spp.

The record of this flea from Guam needs confirmation. The specimen was collected from a bat, preserved in alcohol, which was one of a mixed collection from various parts of the former Japanese possessions; there does not appear to be any other record of a pipistrelle from Micronesia. But Owston is known (Hartert, 1898, Nov. Zool. 5: 51) to have sent Japanese collectors to Guam and Saipan, and *Pipistrellus javanicus abramus* is stated to be a wide-ranging migrator. It remains possible, therefore, that the bat got to Guam under its own power and carried the flea with it.