SCHOUTEDENICHIA GIGANTICA AND *S. TIPTONI*, TWO NEW AND EXTRAORDINARY SPECIES FROM MADAGASCAR (ACARINA : TROMBICULIDAE) [1]

BY

P. H. VERCAMMEN-GRANDJEAN and S. G. WATKINS [2]

I. INTRODUCTION.

Through the courtesy of Dr. Robert TRAUB, University of Maryland, we had the opportunity to study a large number of specimens collected in Madagascar by Dr. V. J. TIPTON. One of these collections (#B9828) contains eleven specimens of a *Schoutedenichia* s. str. of gigantic proportions. For instance, its mean Ip is 1400 μ, which is 1.6 × larger than the next largest described species (*S. lumsdeni*) 1400 μ, which is 1.6 × larger than the next largest described species (*S. lumsdeni*) (4). A second smaller species, mean Ip 992 (about 1.2 × that of *lumsdeni*), *S. tiptoni* was found in several different collections. Each series differs from the others in a few morphological details, and we were at first tempted to separate some of them from *tiptoni* ; but we concluded that they are better treated as one species.

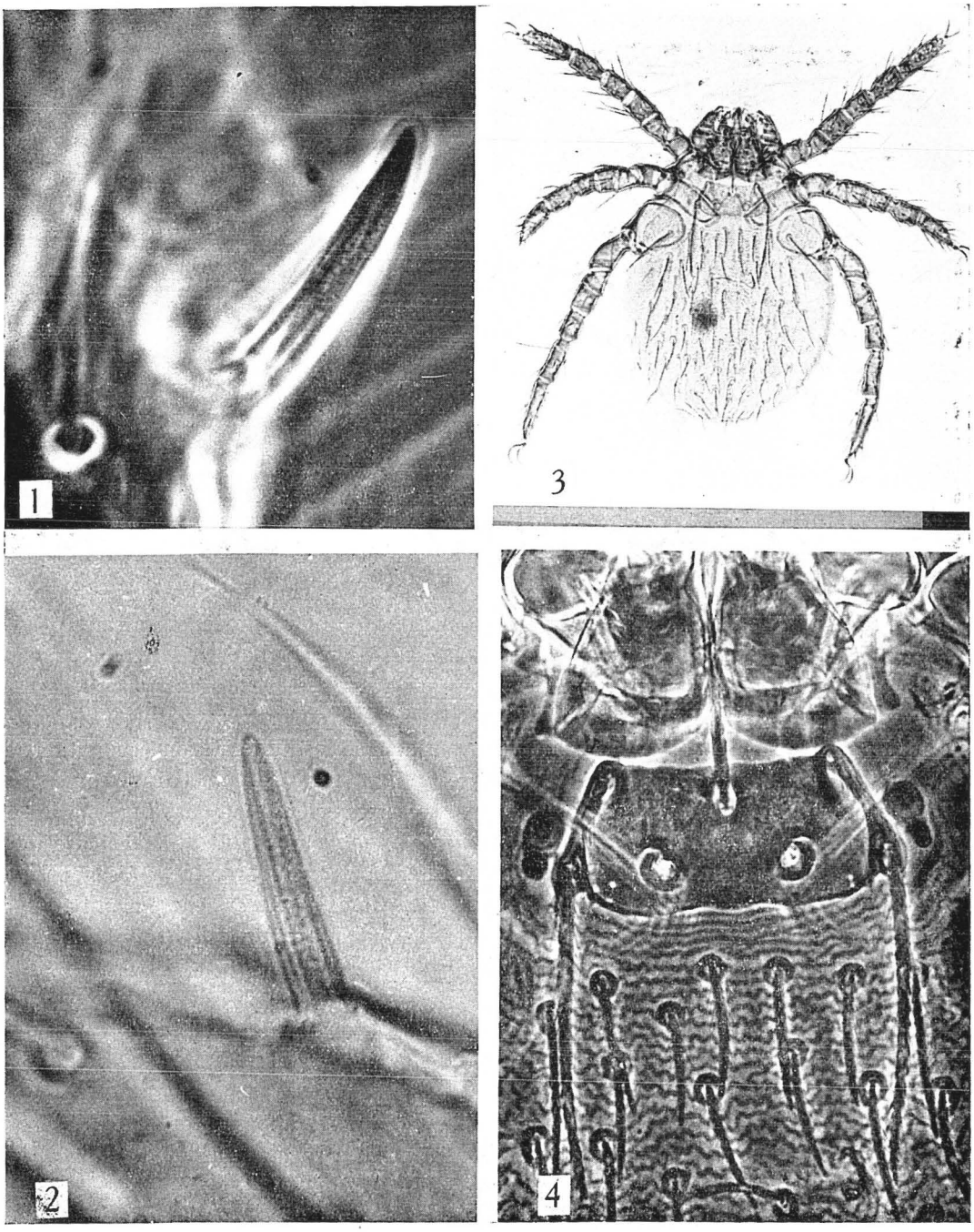
The major differences between *Schoutedenichia gigantica* and *S. tiptoni* are in the general measurements. Two further differences reside in the presence of three or perhaps four barbed setae on coxa 3 of *S. tiptoni*, whereas there is only one coxal seta 3 in *S. gigantica*, and in the chelicerae which are multiply (four) hooked in *S. gigantica* and singly toothed in *S. tiptoni*.

II. CONSIDERATIONS ON SOLENIDION MORPHOLOGY (Pl. 1).

In a previous brief note, the senior author explained the results of his observations on the exceptionally large solenidia of these two Malagasian *Schoutedeni-*

1. This work was supported by Research Grant AI-03793 from the National Institute of Allergy and Infectious Diseases, National Institutes of Health, U. S. Public Health Service.

2. Respectively : Research Parasitologist and Laboratory Technician, The George Williams Hooper Foundation, University of California Medical Center, San Francisco 22, California, U.S.A.



Schoutedenichia (*Schoutedenichia*) *gigantica* n. sp.
1 & 2, solenidion (1, phase contrast ; 2, bright field) ; 3, idiosoma ; 4, scutum.

chia (5). At that time he produced five drawings showing perforation by a great number of small canalicules in the thick walls of the solenidia on leg 2 and the palpal tarsus as well as leg 1. We are now able to show further evidence of this morphology by including photographs numbers 1 and 2 in this work. Number 1 (phase contrast) shows the canalicules as white spots and number 2 (bright field) shows them as dark points surrounded by light aureoles.

As concerns the probable function of the solenidia, considering their true structure, we have advanced the hypothesis of olfaction. The thick solenidion wall should have a structure similar to that of the body ectostracum, but the perforations are much more numerous and dense, even more dense than those of the scutum. The entire structure is covered by a very thin layer of epistracum. The medulla and all canalicules of the solenidion are probably filled by a highly ionized liquid. This liquid is in contact with the environment through the osmotic epistracal membrane. This hypothesis is based on observations only, not on experimental evidence, but is presented in the hope that it may prove useful.

The palpo-tarsal solenidion, because of its oral location, might be considered an apparatus of taste, a function close to olfaction.

III. Observations on post lateral seta extrascutalization.

The problem of extrascutalization of the posterolateral setae, normally inserted on the scutum, is a frustrating one. After encountering a great variety of examples, our conclusions are as follows :

1) A genuine extrascutalization shows a definite fracture between scutum and PL insertion points. During engorgement the two PL's move away from the scutum, sometimes so far that certain authors overlooked them and in the Trombiculinae, for instance, described the scutum as having only three barbed hairs, an inference without standing.

2) In certain cases, we observe bilateral extrascutalization of the PL's, but during engorgement the two PL bases remain near the scutal limits, showing that there is no rupture. In certain specimens of this type, the extrascutalization is unilateral only, showing a definite tendency to retrain scutal integrity.

3) In the case at hand, *Schoutedenichia tiptoni* (pl. III, fig. 7), certain collections contain specimens with a marked tendency toward posterolateral seta extrascutalization, generally unilateral only ; bilateral extrascutalization is fairly rare. We have observed this tendency in other species and will refer to it in later publications.

Without attempting to make conclusive statements, owing to the fact that extrascutalization is widespread in the Trombiculidae, we can observe that certain hosts such as rodents, other mammals, and, especially, bats or certain parasitopes, such as rodent nostrils (in the case of *Traubacarus*) are frequently parasitized by chiggers which show this phenomenon. Extrascutalization has not yet been observed in chiggers which parasitize birds.

IV. **Schoutedenichia (Schoutedenichia) gigantica** n. sp. (pl. II).

A. — Description.

1) Diagnosis : Outstandingly large species, scutum with all the characters of a true *Schoutedenichia* ; palpo-tarsal formula of *f*T = 4 B.S ; galeal seta nude ; genuala formulae : *ga* = 2, *gm* = 1, *gp* = 1 ; no tibiala 3 ; cheliceral blades with four powerful hooks ; epistracum with serpentiform pleats ; dorsal setae resembling fish bones, inserted in peculiar sclerotized cavities which are larger in the pygidial region ; strong coxae partly overlapping in the dorsal zone, the first with two strong spinose processes, the third with one. *f*C*x* = 1.1.1

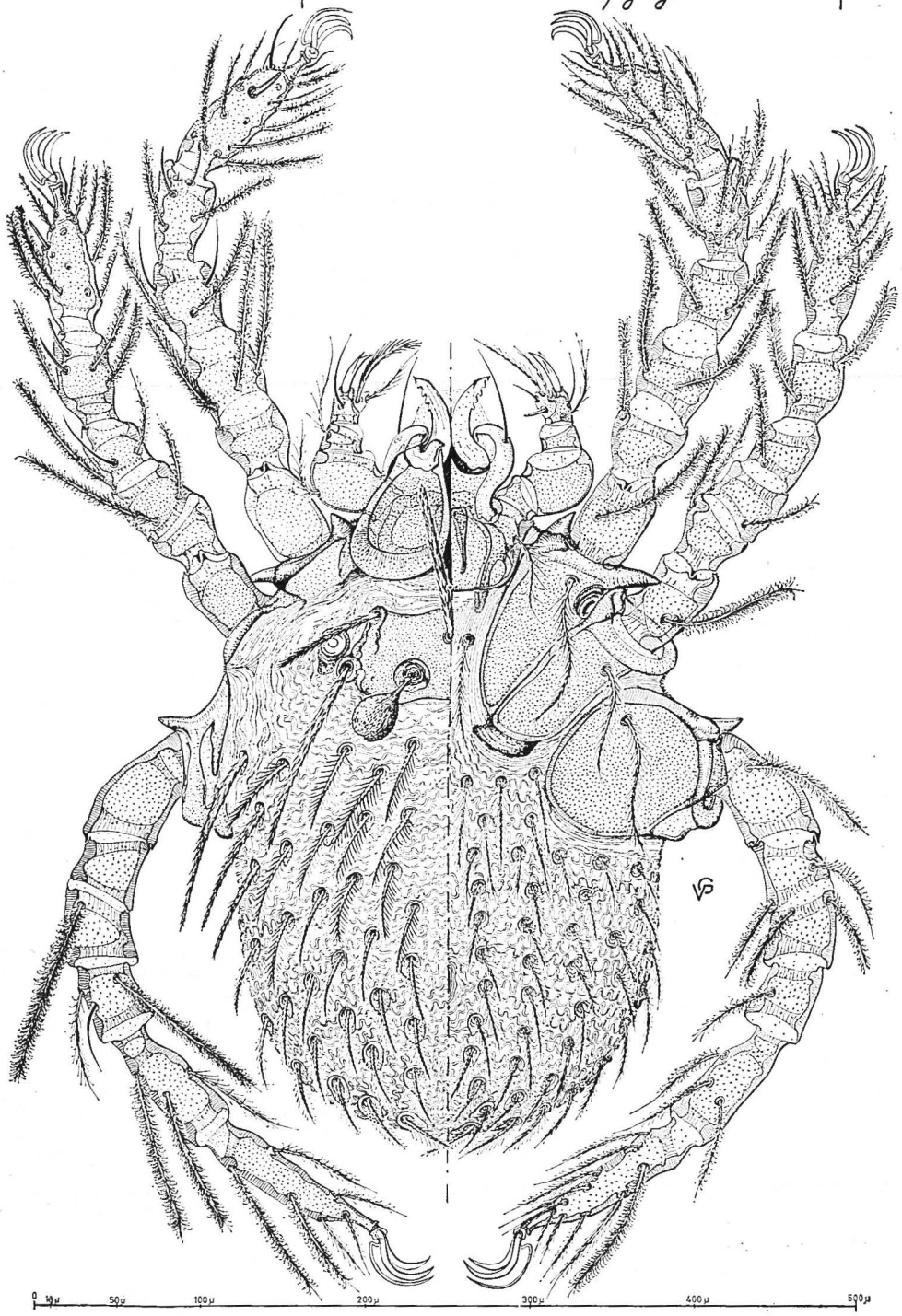
2) Measurements : means and extremes in micra, plus mean measurements of *S. tiptoni* for comparison.

		AW	PW	SB	ASB	PSB	SD	AP	AM	AL	PL	S	H	D	V	pa	pm	pp	Ip
S. gigantica		86	119	44	40	19	59	41	85	78	137	42 28/24 14	112	52/81 39	44/55	478	424	498	1400
extremes	+	4	7	4	2	2	2	3	14	4	7	2 2/0 0	6	3/7 3	3/4	18	16	12	30
	—	4	5	4	2	3	3	1	11	4	6	2 2/0 0	6	5/11 4	4/3	24	12	14	50
S. tiptoni		71	107	39	36	17	53	37	63	65	88	37 26/21 12	51	35/51 27	31/37	339	300	353	992

N. B. Length of tarsus 3 is considerable (mean : T_3 = 117 μ).

3) Scutum (pl. III, fig. 1, pl. II, photograph 4) Widely subtrapezoidal, anterior margin medially convex, posterior margin medially biconcave, all margins heavily sclerotized ; surface with abundant deep, uniformly distributed punctae ; AM long, abundantly and coarsely barbed, its base well behind the AW line ; AL's short, thinner and more abundantly and finely barbed than the other scutal setae ; PL's very long, more coarsely but less abundantly barbed than other scutal setae, their bases with a slight tendency toward extrascutalization ; PL>>AM>>AL ; all scutal setae with prominent, deep-set bases ; sensillae bulbous, abundantly and finely spiculate, SB slightly behind the PL line.

Schoutedenichia (Schoutedenichia) gigantica n.sp.



Eyes with large anterior lenses, the posterior pair degenerate ; anterior lenses slightly behind the AM line.

4) Idiosoma (pl. II). Ectostracum with numerous transverse sepentiform pleats ; setae of the humeral zone with vestiture similar to the PL's, the barbs on the remaining setae sparser, longer and more erect, resembling fish bones ; all body setae inserted in conspicuous sclerotized plates which increase in size toward the pygidium.

$fD = 2H + (6.4).10.10.12.10.6.4.2 = 66$	dorsal setae,
$fV = 10.8.10.10.8.8.8.6.4.2 = 74$	ventral setae,
and NDV = 140.	body setae

Uropore between the 4th and 5th rows of ventral setae.

5) Legs (pl. II). Total length very large, $Ip = 1400\ \mu$; $fsp = 7.7.7$, $fCx = 1.1.1$, and $fSt = 2.6.4$.

All solenidia conspicuously punctate, not striate ; all unspecialized setae very long and provided with numerous fine barbs of equal length.

Leg I : $pa = 478\ \mu$.

Tarsus with 2 bars, 2 claws and empodium, pretarsala, subterminala and parasubterminala ; extremely large solenidion at the distal third, famulus slightly behind it.

Tibia with 3 bars ; 2 solenidia and famulus near the distal bar.

Genu with 3 bars ; 2 long genualae and a microgenuala near the distal bar : $ga = 2$.

Coxa very heavily sclerotized, its distal extremity invading the body dorsum, with a large anterolateral tooth and a still larger posterolateral tooth ; seta long and spinose.

Leg 2 : $pm = 424\ \mu$.

Tarsus with 2 bars, 2 claws and empodium, pretarsala, long solenidion, the famulus distinctly behind it.

Tibia with 3 bars, a solenidion on the distal bar, another slightly behind it.

Genu with 2 bars and a single long genuala : $gm = 1$.

Coxa very heavily sclerotized, its distal extremity invading the body dorsum ; seta resembling that of coxa 1, but shorter.

Leg 3 : $pp = 498\ \mu$.

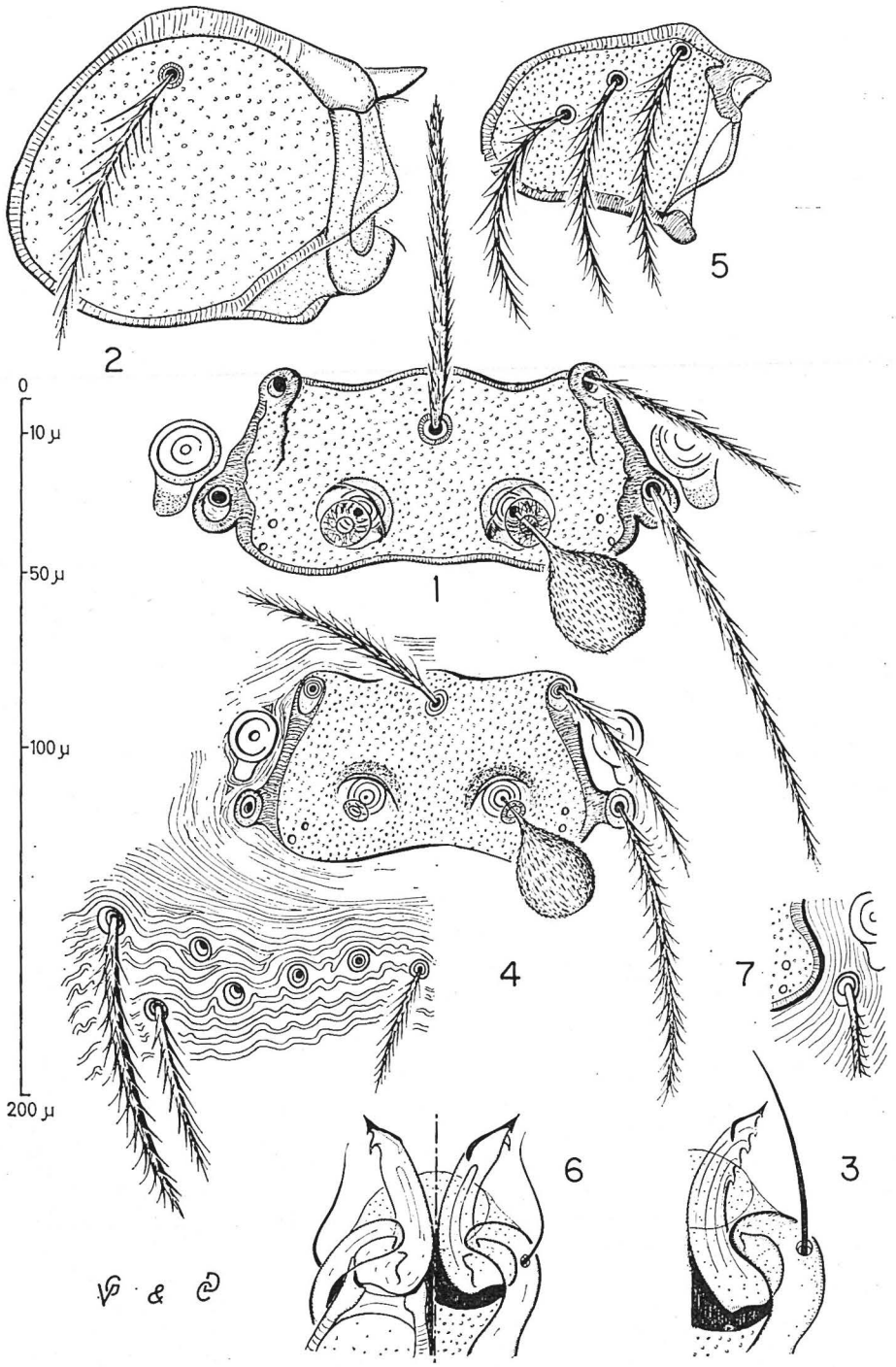
Tarsus with 1 proximal bar, 2 claws and empodium ; distal branched setae shorter, their barbs shorter and more decumbent.

Tibia with 2 bars ; no tibiala : $tp = 0$.

Genu with 2 bars and a genuala : $gp = 1$.

Coxa (fig. 2) nearly as broad as long, very heavily sclerotized, the distal extremity invading the body dorsum, and with a distinct antero-lateral tooth ; seta as on coxa 1.

Schoutedenichia (Schoutedenichia) gigantica - Schoutedenichia (Schoutedenichia) tiptoni .



6) Gnathosoma (pl. II). Chelicerae long and strong, their blades with 4 prominent ventral recurved hooks (pl. III, fig. 3) ; chelobase heavily armored and densely punctate ; galeal seta nude ; coxal seta plumose ; palpo-tibial claw with 1 large axial prong and 2 smaller accessory teeth.
fPp = (B)-(B)-(N).N.B.G_3 — E.(B).(B).S.B.B
and fT = 4B.S.

Dorso-tarsal seta very strong and heavily spinose.

B. — Locality and Date : 68 km., Tamatave Road, Madagascar ; 4 March, 1952 ; V. J. Tipton, collector.

C. — Host : *Rattus rattus alexandrinus*.

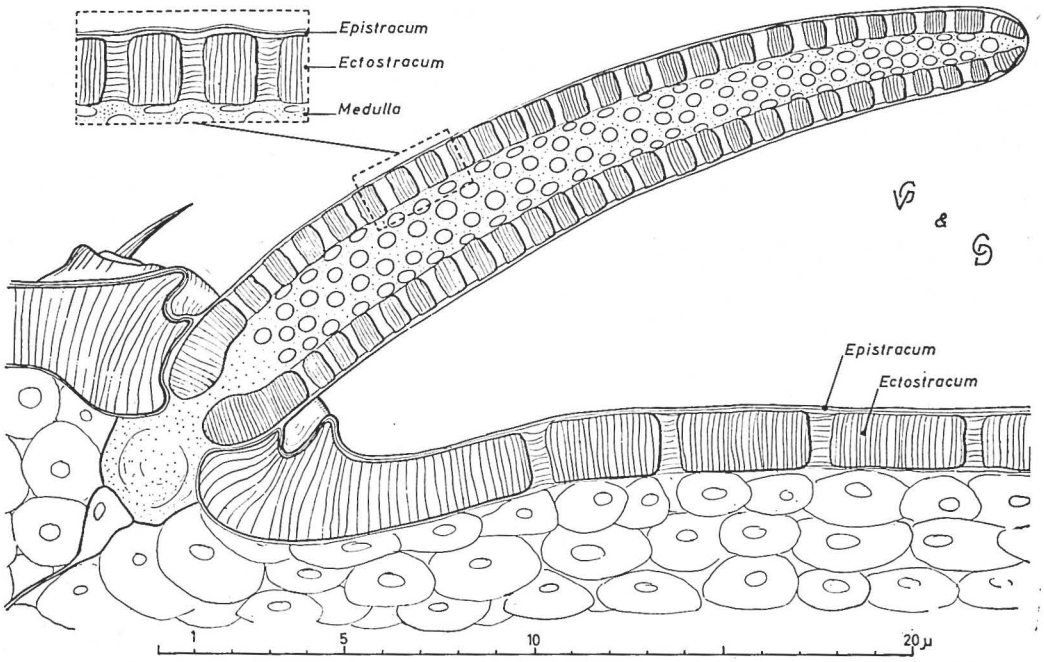
D. — Type Material : Holotype #4352/G/1 in the U. S. National Museum, Washington, D. C. Paratypes numbered 4352/G/2 to /11 in the collections of the Hooper Foundation and Robert Traub.

V. — **Schoutedenichia (Schoutedenichia) tiptoni** n. sp.

A. — Description.

1) Diagnosis : *Schoutedenichia* s. str. whose closest known relative is *S. gigantica*, which it strikingly resembles in scutal configuration, coxae overlapping dorsal-

Solenidion Morphology in *Schoutedenichia (Schoutedenichia) tiptoni* n.sp.



ly, and in the epistracal pleating ; but differing in having all measurements reduced (though still large), cheliceral blades with a single tooth, sclerotization of the body seta bases reduced, coxa 1 with a single tooth, and no tooth on coxa 3 which is multisetose.

2) Measurements : means, in micra, of each collection and of the entire series on the next page.

3) Scutum (pl. III, fig. 4). Subtrapezoidal, anterior margin medially convex, posterior margin broadly concave, lateral margins heavily sclerotized, surface with abundant, deep uniformly distributed punctae ; AM long, abundantly and finely barbed, inserted slightly behind the AL line ; AL's short, thinner than the other scutal setae, more abundantly and finely barbed ; PL's very long, vestiture resembling that of the AM, bases with a distinct tendency toward extrascutalization (fig. 7) ; PL >>AM>>AL ; sensillae bulbous, abundantly and finely spiculate, SB slightly forward of the PL line.

Eyes with large anterior lenses, the posterior pair degenerate ; anterior lenses slightly behind the AM line.

4) Idiosoma. Ectostracum with numerous transverse serpentiform pleats ; setae near the humeral zone thicker than the PL's but with similar vestiture, the barbs on the remaining setae sparser, longer and more erect, resembling fish bones ; all body setae inserted in sclerotized plates which are not so well developed as those of *S. gigantica*.

*f*D = 2(2H) + 10.8.10.10.8.10.12.10.8.6.6.4 = 106 dorsal setae
*f*V = 4.10.10.8.10.10.8.8.8.8.4 = 88 ventral setae
and NDV = 194 body setae

Uropore between the 5th and 6th rows of ventral setae.

5) Legs. Total length large : I*p* = 992 μ ; *fsp* = 7.7.7, *f*C*x* = 1.1.3, occasionally 1.1.4 or asymmetrical, and *f*S*t* = 2.6.4, occasionally 2.4.4. All solenidia conspicuously punctate, not striate ; all unspecialized setae very long and provided with numerous fine barbs of equal length.

Leg 1 : *pa* = 339 μ.

Tarsus with 2 bars, 2 claws and empodium, pretarsala, subterminala and parasubterminala ; large solenidion at the distal third, famulus slightly behind it.

Tibia with 3 bars ; 2 solenidia and famulus near the distal bar.

Genu with 3 bars ; 2 long genualae and a microgenuala near the distal bar : *ga* = 2.

Coxa very heavily sclerotized, its distal extremity invading the body dorsum, with a large postero-lateral tooth ; seta long and spinose.

Leg 2 : *pm* = 300 μ.

Tarsus with 2 bars, 2 claws and empodium, pretarsala ; long solenidion, the famalus distinctly behind it.

Tibia with 3 bars, a solenidion at the distal bar, another slightly behind it.

Collection Number	No. of Specimens	AW	PW	SB	ASB	PSB	SD	AP	AM	AL	PL	S	H	D	V	pa	pm	pp	Ip	T3*
7152/1	1	70	110	38	35	18	53	36	64	52	84	—	48	33/25	20/33	365	310	345	1020	84
9152/1 to /13	13	63	97	34	34	17	51	35	62	62	87	$\frac{36}{10}21$	47	34/26	29/33	311	276	326	913	81
100152/A/1 to /A/7	7	68	103	37	35	18	53	36	63	63	90	$\frac{39}{13}21$	50	34/26	30/34	355	311	360	1026	86
0152/1 to /16	6	75	108	42	36	17	53	38	56	71	82	$\frac{37}{12}21$	51	35/29	32/39	336	311	358	1005	86
28152/A/1 to /A/9 and 28152/B/1	10	81	116	44	38	18	56	41	74	75	93	—	57	39/31	35/40	363	332	387	1082	91
28152/C/1 to /C/3	3	82	116	45	39	17	56	42	71	81	93	$\frac{40}{13}21$	59	41/30	34/43	353	329	386	1086	88
6252/1	1	74	108	39	39	15	54	37	—	68	91	—	52	40/30	33/42	339	310	376	1016	86
4352/T/1 to /T/4	4	78	108	41	36	17	53	36	60	57	79	—	49	33/25	31/36	329	293	338	960	76
8151/1 to /12	12	67	103	39	35	18	53	36	61	63	89	—	49	34/26	31/36	341	299	345	983	85
100152/B/1	1	71	110	41	38	18	56	38	57	52	72	—	42	29/23	30/33	324	282	330	936	71
ENTIRE SERIES	58	71	107	39	36	17	53	37	63	65	88	$\frac{37}{12}21$	51	35/27	31/37	339	300	353	992	84

* T_3 = length of tarsus 3.

Genu with 2 bars and a single long genuala : *gm* = 1.

Coxa very heavily sclerotized, its distal extremity invading the body dorsum ; seta resembling that of coxa 1 but shorter.

Leg 3 : *pp* = 353 μ.

Tarsus with 1 proximal bar, 2 claws and empodium ; distal branched setae with their barbs sparser and more decumbent.

Tibia with 2 bars ; no tibiala ; *tp* = 0

Genu with 2 bars and a genuala : *gp* = 1

Coxa (fig. 5) not so broad as that of *S. gigantica* ; very heavily sclerotized, the distal extremity invading the body dorsum ; no lateral tooth ; 3 setae resembling those of coxa 1 in length and vestiture.

6) Gnathosoma : Chelicerae long and strong, blades with a single prominent ventral recurved hook (pl. III, fig. 6) ; chelobase heavily armored and densely punctate ; coxal seta plumose ; galeal seta nude ; palpo-tibial claw with large axial prong and 2 smaller accessory teeth.

*f*P*p* = (B)-(B)-(N).N.B.G_3 — (E).(B).(B).S.B.B.

and *f*T = 4B.S.

There are slight variations in the palpal setation of the type series ; thus in specimen 7152/1 the formula commences : (B)-(B)-(B).N.B. The palpotarsal formula, of course, is an invariable 4B.S.

B. — Localities and Dates : Holotype #100152/A/6 and 6 paratypes #100152/A/1 to /A/5 and /A/7 from Andrombovato, Madagascar, 10 January 1952 ; Rakota and Tipton collectors.

One paratype #7152/1 from Andrombovato, Madagascar, 7 January 1952 ; V. J. Tipton collector.

Thirteen paratypes #9152/1 to /13 from Andrombovato Madagascar, 9 January 1952 ; V. J. Tipton, collector.

Twelve paratypes #28152/A/1 to /A/9 and 28152/C/1 to /C/3 from Ambatofitorhana, Madagascar, 28 January 1952 ; Beytout and Tipton, collectors.

Four paratypes #4352/T/1 to /T/4 from 68 kilo. Tamatave Road, Madagascar, 4 March 1952 ; V. J. Tipton collector. The type series of *S. gigantica* was part of this collection.

Twelve paratypes #8152/1 to /12 from 40 Kilo. E. of Fianarantsoa, Madagascar, 8 January 1952 ; V. J. Tipton collector.

Other specimens determined as *S. tiptoni* but not designated paratypical are : #6252/1 from Ambohimahasoa, Madagascar, 6 February 1952 ; Beytout and Tipton collectors.

#28152/B/1 from Ambatofitorhana, Madagascar, 28 January 1952, Beytout and Tipton collectors.

#100152/B/1 from Fianarantsoa, MADAGASCAR, 10 January 1952, V. J. Tipton collector.

C. — HOSTS AND PARASITOPES : The type host is *Rattus rattus* " ssp. " Other paratypes were taken on *Rattus rattus alexandrinus*. Nonparatypical specimens were taken on *Tandraka* sp. and *Hemicentetes semispinosus*.

Paratypes numbered 8152 were removed from the ears.

D. — TYPE MATERIAL : Holotype #100152/A/6 in the U. S. National Museum, Washington, D. C. Paratypes in the collections of the Hooper Foundation and Robert Traub.

BIBLIOGRAPHY

(1) AUDY (J. R.), 1956. — " Malayan trombiculid mites. I. *Schoutedenichia vercammeni* n. sp. with a note on the genus. " *Bull. Raffles Mus.*, 28, 81-85.

(2) DOMROW (R.), 1962. — " The genus *Schoutedenichia* in S. E. Asia (ACARINA, TROMBICULIDAE). " *Acarologia*, IV, 357-361.

(3) JADIN (J. B.) and P. H. VERCAMMEN-GRANDJEAN, 1954. — « Cinq nouvelles espèces de Trombiculides (Acarina), Tombidiidae du Ruanda Urundi, et création d'un genre nouveau : *Schoutedenichia*, » *Ann. Mus. Congo Tervuren*, Zool., 1, 194-206.

(4) VERCAMMEN-GRANDJEAN (P. H.), 1958. — « Revision du genre *Schoutedenichia* Jad. et Verc. » *Ann. Mus. roy. Congo Belge, Tervuren* (Zool.), 65, 1-101.

(5) VERCAMMEN-GRANDJEAN (P. H.), 1965. — " On the true nature of the " striate " solendion in chiggers (TROMBICULIDAE : ACARINA). " *Acarologia*, 7, 318-320.

(6) WOMERSLEY (H.), 1952. — " The scrub-typhus and scrub-itch mites (Trombiculidae, Acarina) of the Asiatic-Pacific region. " *Rec. S. Australian Mus.*, 10, 1-673, pls. 1-118.