

MITES OF THE GENUS NEOPHYLLOBIUS

By E. A. MCGREGOR

Mites of the genus *Neophyllobius* in the past have been included in the family Tetranychidæ. Rather recently doubt has arisen among a few workers, including the present author, as to the correctness of this family placement of *Neophyllobius*. Little, if anything, has been known regarding the feeding habits of these mites.

In recent correspondence, Pence¹ related in detail certain laboratory experiments with *Neophyllobius* mites and *Latania* scale crawlers, condensed as follows: ". . . When a crawler is encountered . . . it is set upon by the mite which quickly inserts its beak into a vulnerable spot . . . some opiate effect is quickly administered. The crawler . . . relaxes and allows its body juices to be extracted without struggle."

Baker,² in recent correspondence, expressed doubt that *Neophyllobius* belongs in the Tetranychidæ. He believes that these mites belong in the Stigmæidæ "in the broad sense." Baker states that observations on several undescribed genera have caused him to undertake a re-examination of the mite complex embracing Raphignathidæ, Stigmæidæ, and Caligonellidæ. The available information seems to justify the transfer of *Neophyllobius* from the family Tetranychidæ to the family Stigmæidæ, which is here done.

GENUS NEOPHYLLOBIUS Berlese

Neophyllobius Berlese, 1886, Acari dan. Piante colt., p. 19.

GENERIC CHARACTERS. (Female.) Body small, compressed dorsoventrally, rotund to ovate, suture between cephalothorax and abdomen rarely visible. Dorsal integument with striæ somewhat tortuous. Dorsal body setæ peglike, lanceolate, or clavate, obscurely to conspicuously setose, often borne on tubercles. Rostrum short, at times hidden. Palpi short, slender, 5-segmented, without the strong, talonlike claw on penultimate segment, but with two or more hairs, one of which may be bladelike. Manibular plate present; stylets needlelike, recurved basally. Legs long, exceeding the body; segments with few hairs, mostly arising from tubercles; patellæ at times with a whiplike hair; patellæ I and II often with a barely visible spine; tibiæ often bearing a very minute, naillike seta subterminally; tarsi much shorter than tibiæ, often swollen at middle, and bearing a minute, spindle-shaped seta; duplex setæ lacking. Onychium bearing two claws, between which is a pulvillus bearing two rows of tenent hairs. Male unknown.

GENOTYPE. NEOPHYLLOBIUS ELEGANS Berlese.

¹Roy J. Pence, University of California, Los Angeles.

²E. W. Baker, Bureau of Entomology and Plant Quarantine, Washington, D. C.

KEY TO SPECIES OF NEOPHYLLOBIUS

1. Patella I bearing a long, whiplike hair, as long or longer than the tibia 2
 Patella I with seta (or setæ) much shorter than tibia I..... 3
2. Dorsum of body bearing 15 pairs of setæ; whiplike hair on patella reaching beyond tip of tarsus—*lamimani*, new species
 Dorsum of body bearing 14 pairs of setæ; whiplike hair on patella reaching only to tip of tibia—*americanus* Banks
3. Dorsum of abdomen with 3 pairs of minute submedian setæ; femora I with setæ mostly longer than intervals to setæ next beyond in line—*virginiensis*, new species
 Abdomen with none of submedian setæ minute; femora I with setæ mostly shorter than intervals to setæ next beyond in line (one exception) 4
4. Dorsal body setæ clavate to obovate—*floridensis*, new species
 Dorsal body setæ not clavate to obovate..... 5
5. Patellæ bearing two easily visible setæ, these shorter than the segment—*agrifoliæ*, new species
 Patellæ bearing a single easily visible seta, these longer than the segment 6
6. Dorsum of body with 17 pairs of setæ, these rodlike, densely bractate—*texanus*, new species
 Dorsum of body with 15 or 16 pairs of setæ, these not rodlike or densely bractate..... 7
7. Femora bearing thickly lanceolate setæ..... 8
 Femora bearing linear-lanceolate setæ..... 9
8. Seta on patella I three times as long as the segment; setæ at caudal margin of body blunt-tipped—*mexicanus*, new species
 Setæ on patella I about twice as long as segment; caudal setæ sharp-tipped—*sierræ*, new species
9. Patella II bearing a hair nearly as long as tibia II; patella IV bearing a hair longer than tibia IV—*burrellis*, new species
 Patella II with hair only two-fifths as long as tibia II; patella IV bearing a hair distinctly shorter than tibia IV—*summersi*, new species.

NEOPHYLLOBIUS AGRIFOLIÆ, new species

Plate 15

FEMALE. Body from above rotund. Dorsum with striæ mostly transverse, but tortuous near margins. Seventeen pairs of strictly dorsal body setæ, including those along caudal margin; setæ thick-lanceolate, shortish, very conspicuously setose, each failing to reach or barely surpassing base of seta next behind, distributed as fol-

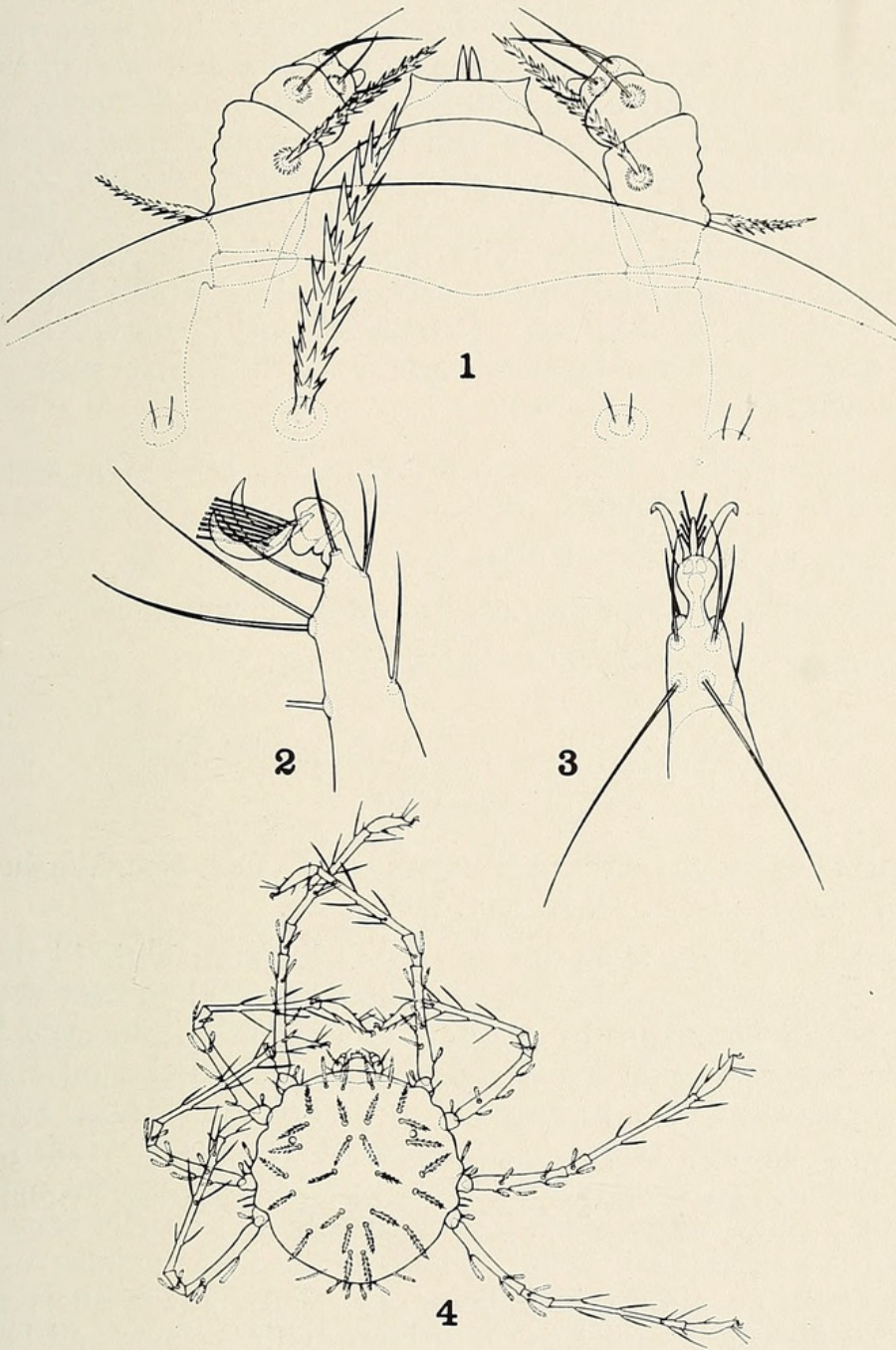


PLATE 15

NEOPHYLLOBIUS AGRIFOLIAE, new species. 1, front of cephalothorax, with frontal setæ, palpi, etc., dorsal view; 2, tip of tarsus, lateral view; 3, tip of tarsus, dorsal view; 4, female mite, dorsal view.

lows: Four submarginally along front of body; seven sublaterally each side between coxæ I and caudal margin; 6 submedian pairs between coxæ II and hind margin; 4 along caudal margin. Rostrum and palpi small. Mandibular plate oval, rounded in front. One perfect and one imperfect eye cornea each side mesad of coxæ II. Second segment of palpus the largest, bearing dorsally a strong, plumose seta and laterally a smaller similar seta; last segment de-

flexed from preceding segment (position of specimens prevented a critical study of the "thumb"). Legs all longer than body, sparsely provided with shortish hairs; setæ on the tibiæ and tarsi linear-lanceolate, those on other segments subclavate and distinctly setose, each shorter than interval to seta next beyond. Tarsi somewhat swollen, much shorter than tibiæ, each bearing distally 2 strong, simple claws, and between them a pulvillus lined on each side with a pectinate series of tenent hairs; tarsi I and II bearing dorsodistally a pair of long, non-duplex hairs, and close behind them a very small, evidently swollen seta. Patella bearing 2 subclavate, setose setæ, shorter than the segment, and a barely visible spine. Male not known.

TYPE MATERIAL. U. S. Nat. Museum No. 1746. One specimen, collected by B. L. Boyden, Sept. 3, 1938.

TYPE LOCALITY. South Pasadena, California.

DISTRIBUTION. Known only from type locality.

HABITAT. Live oak (*Quercus agrifolia*).

NEOPHYLLOBIUS AMERICANUS Banks

Plate 16

NEOPHYLLOBIUS AMERICANUS Banks, 1906, Ent. Soc. Wash. Proc. 7, p. 133; U. S. D. A. Rpt. 108, p. 38.

FEMALE. Body from above, ovate. Dorsum with 14 pairs of linear-lanceolate setæ, each longer than interval to seta next behind; a pair over base of palpi; 5 along and within each lateral margin between coxæ I and IV; 7 submedian pairs on abdomen between usual position of main suture and caudal margin; all dorsal body setæ sparsely setose. Last segment of palpus evidently with one terminal and 3 subterminal setæ; preceding segment evidently without a claw. Legs much longer than body. Patella very short, bearing a whiplike hair about as long as the tibia; patellæ I and II bearing also an almost invisible spine. Tarsi much shorter than tibiæ, swollen near midpoint; onychium with 2 claws and between them a pulvillus pectinate on each side. Tarsus I bearing subterminally a pair of long, non-duplex hairs, and near base of segment a small, swollen sensory seta. Male not known.

TYPE MATERIAL. U. S. Nat. Museum No. 1745, March 15, 1901.

TYPE LOCALITY. Orchard, Alabama.

DISTRIBUTION. Known only from type locality.

HABITAT. Oak.

The foregoing description is based on sketches by E. W. Baker, made from type specimens in the U. S. National Museum. Banks' figure of this mite also was taken into account.

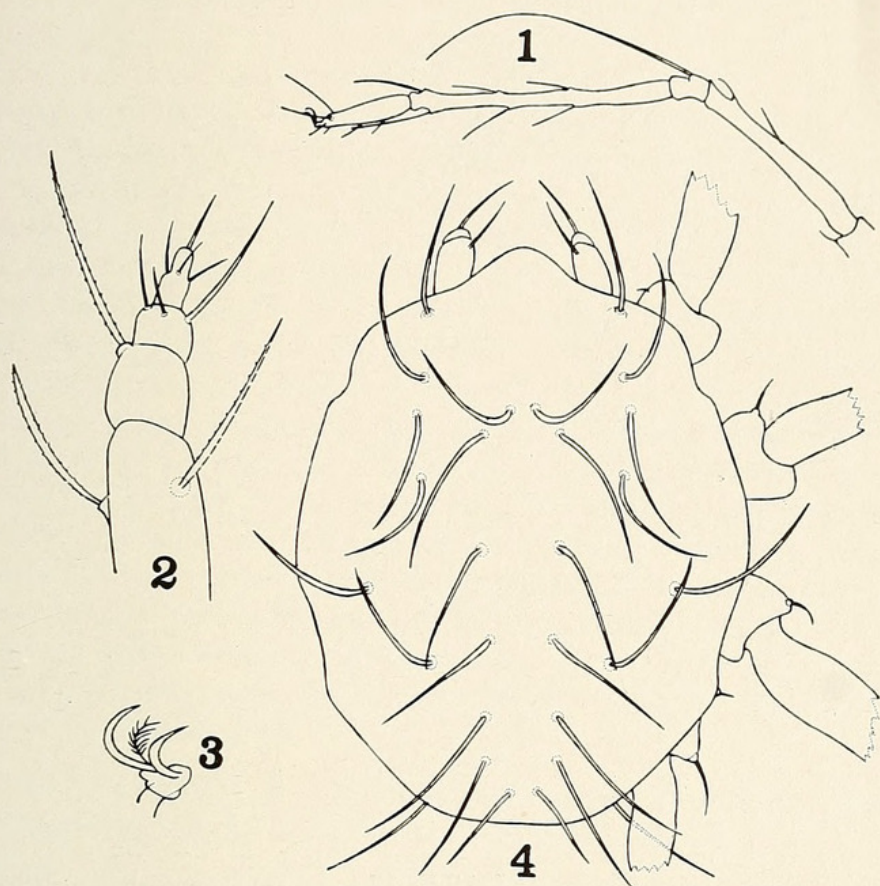


PLATE 16

NEOPHYLLOBIUS AMERICANUS Banks. 1, leg IV; 2, palpus; 3, onychium with claws and pulvillus; 4, dorsum of body showing dorsal setae and base of right legs I-IV (drawn from sketches furnished by Baker from material in the U. S. National Museum).

NEOPHYLLOBIUS BURRELLIS, new species

Plate 17

FEMALE. Body subovate, probably¹ with 16 pairs of linear, minutely bracteolate dorsal body setae, only slightly attenuate terminally, all but the 3rd, 4th, and 5th submedian setae slightly longer than interval to seta next behind, distributed as follows: One frontal seta over each palpus; 6 sublateral setae along each side; a fringe of 6 shorter setae at caudal margin; probably¹ 6 pairs of setae along the dorsal crista. Nearly all body and leg setae arising from tubercles. Rostrum and palpi inconspicuous. Legs all longer than body, sparsely provided with mostly shortish, linear-lanceolate hairs (femora II, III, and IV, bearing linear, bracteolate hairs). Two submarginal eye corneae each side just anteriolaterad of base of

¹In the single specimen, a mass of opaque body material obscures the area where 3 pairs of submedian setae might otherwise be visible.

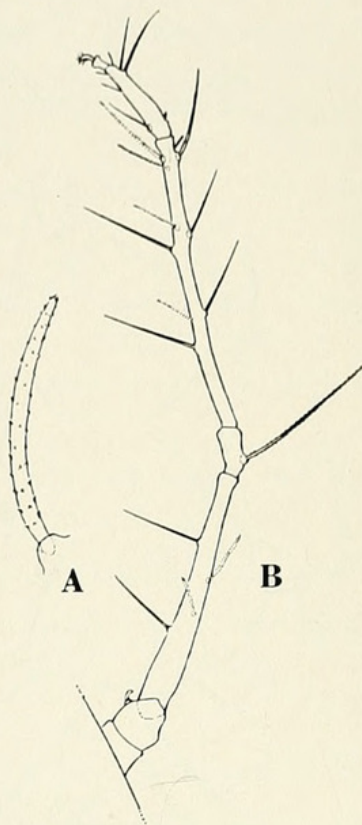


PLATE 17

NEOPHYLLOBIUS BURRELLIS, new species. A, sublateral, abdominal seta; B, right leg I from above.

third submarginal seta. Segment II of palpus the largest, bearing two setae, one of which is densely setose and longer than the segment. Patellae all bearing a linear-lanceolate hair which becomes progressively longer from patella I to IV; this hair on patella I much longer than the segment, and about five-ninths as long as tibia I; that on patella II nearly as long as tibia II; that on patella III equalling the tibia; that on patella IV one-fifth longer than the tibia. Patellae I and II also with a nearly imperceptible spine. All tibiae terminally bearing a short, naillike seta. Tarsi somewhat swollen, much shorter than tibiae, each bearing terminally two strong, simple claws, between them a pulvillus which bears a double row of tenent hairs. Tarsi I and II each bearing sub-basally a minute, sausage-shaped seta.

TYPE MATERIAL. U. S. National Museum No. 1896. A single specimen collected by R. W. Burrell, June 13, 1949.

TYPE LOCALITY. Yakima, Wash.

DISTRIBUTION. Known only from type locality.

HABITAT. Bark of apple tree.

NEOPHYLLOBIUS FLORIDENSIS, new species

Plate 18

FEMALE. Body subovate, with 15 pairs of widely clavate to obovate, petiolate dorsal body setæ, all but the frontals much shorter than interval to seta next behind, distributed as follows: One clavate frontal seta over base of each palpus; 7 ovate-clavate submarginal setæ along each side; a fringe of 4 ovate-clavate setæ at caudal margin; 5 pairs of ovate-lanceolate setæ along the median crista. Nearly all body and leg setæ arising from tubercles. Rostrum and palpi inconspicuous. Legs all longer than body, legs I and IV the longest. Palpus with segment II the largest, bearing two plumose setæ, the longest seta longer than the segment. Legs bearing relatively few linear-lanceolate to spatulate hairs, the latter plumose. Patellæ all bearing an ob lanceolate, densely setose hair, longer than the segment, but much shorter than tibia; patella I and II bearing, in addition, an almost imperceptible spine. All tibiæ terminally with a short, naillike seta. Tarsus I and II sub-basally with a small, clavate seta. A pair of eye corneæ dorsally between bases of coxæ I and II.

TYPE MATERIAL. U. S. National Museum No. 1897. Four specimens collected by D. C. Thurman, Feb. 4, 1948.

TYPE LOCALITY. Dupont Road, Duval County, Fla.

DISTRIBUTION. Known only from type locality.

HABITAT. Spanish moss.

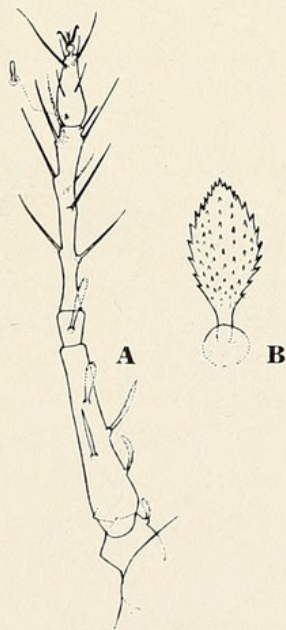


PLATE 18

NEOPHYLLOBIUS FLORIDENSIS, new species. A, right leg I, ventral view; B, a dorsal, submedian seta.

NEOPHYLLOBIUS LAMIMANI, new species

Plate 19

FEMALE. Body from above ovate-orbicular. Dorsum with 15 pairs of setæ, including those on caudal margin; all scythe-blade shaped, sparsely appressed setose, distributed as follows: A pair on frontal margin between palpi, 5 submedian pairs, a pair opposite middle of mandibular plate, one over inner end of coxæ I, one each mesad of coxæ II, III, and IV, 2 each side between coxæ IV and caudal tip, 4 along caudal margin. Rostrum and palpi rather inconspicuous. Mandibles short, styliform, recurved basally. Palpi 5-segmented, segment II the longest; last segment small, thumb-like, subtended from fourth segment which bears a bladelike seta (but no claw); "thumb" terminally with 2 setæ nearly as long as the

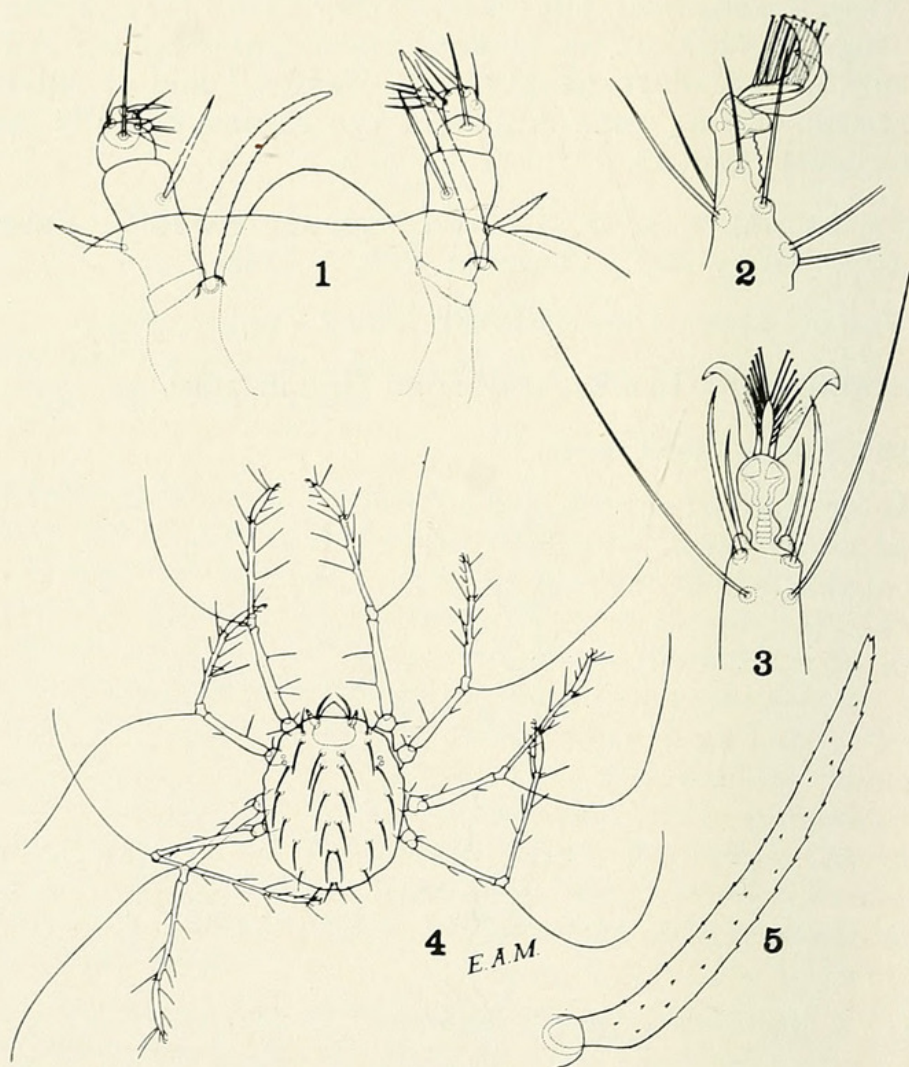


PLATE 19

NEOPHYLLOBIUS LAMIMANI, new species. 1, front of cephalothorax with palpi, frontal setæ, mandibular plate; 2, tip of tarsus, lateral view; 3, same, dorsal view; 4, female mite, dorsal view; 5, dorsal body seta.

segment, and 2 sub-basal setæ. Mandibular plate short, ovate, sharply rotund in front. Legs all much longer than body, legs I and IV the longest; legs bearing relatively few shortish, lanceolate, minutely barbed hairs; patella of each leg with a long, whiplike hair reaching well beyond tip of tarsus; patella I and II also bearing a minute spine; relative lengths of segments of leg I as follows: Coxa, 10; trochanter, 14; femur, 89; patella, 14; tibia, 85; tarsus, 35; tarsi somewhat swollen at middle. Onychium bearing 2 stout, simple, sickle-shaped claws, and between them a pulvillus bearing along each side a pectinate series of tenent hairs about equaling claws. Tarsus I bearing subterminally a pair of longish, non-duplex hairs, also a small, swollen sensory seta near base of segment. Tibiæ subterminally each bearing a minute, naillike seta.

TYPE MATERIAL. Type, California Acad. Sciences, No. 5695; paratype, U. S. Nat. Museum No. 1749.

TYPE LOCALITY. Fresno, Calif., collected by E. W. Baker.

DISTRIBUTION. Dinuba, Davis, Fresno and Planada, Calif.

HABITAT. Lichen on fig tree, grape and salt-grass.

NEOPHYLLOBIUS MEXICANUS, new species

Plate 20

FEMALE. Body ovate. Rostrum and palpi inconspicuous. Fifteen ? pairs of dorsal body setæ, mostly linear-lanceolate, remotely setose or bracteolate, distributed as follows: One frontal seta over each palpus; 7 submarginal setæ along each side; 5 ?¹ submedian pairs of setæ along the dorsal crista; 4 short setæ on caudal margin. The frontal, first and second submarginal setæ, and the first and last submedian setæ longer than interval to base of seta next behind; other body setæ shorter than this interval. Two corneæ each side immediately antero-laterad of third sublateral seta. Second segment of palpus the largest, bearing two lanceolate, densely setose hairs, the inner hair longer than the segment. Legs all longer than body. Hairs on tibiæ and tarsi sparse, shortish, linear-lanceolate; hairs on coxæ and femora short, plumose. Tibiæ subapically each with a short naillike seta. Tarsi all somewhat swollen, much shorter than tibiæ; all bearing terminally two strong, simple claws, and between them a pulvillus lined each side with a series of short tenent hairs; tarsi I and II each sub-basally with a minute, clavate seta. Patellæ all bearing a linear-lanceolate hair; that on patella I about two-thirds as long as tibia I, than on patella II about one-half as long as tibia II, that on patella III nearly as long as tibia III, that on patella IV slightly longer than tibia IV. Patellæ I and II each bearing also an almost imperceptible spine.

¹The area normally bearing the third submedian setæ is opaque in the single specimen; it is assumed that these setæ are present.

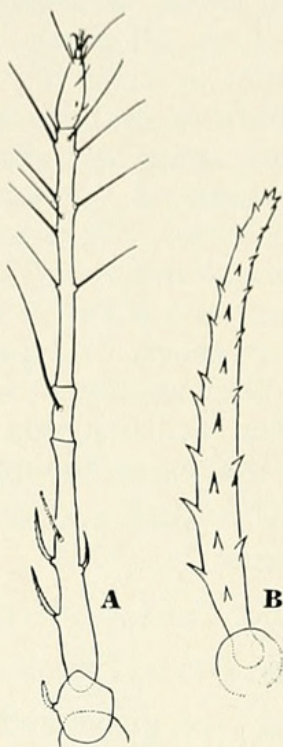


PLATE 20

NEOPHYLLOBIUS MEXICANUS, new species. A, right leg I, dorsal view; B, first submedian, dorsal seta.

TYPE MATERIAL. U. S. National Museum No. 1895. A single specimen, collected Nov. 17, 1948, by A. Williamson.

TYPE LOCALITY. "Mexico" (intercepted at Brownsville, Tex.).

DISTRIBUTION. Known only in the above collection.

HABITAT. Avocado budwood.

NEOPHYLLOBIUS SIERRÆ, new species

Plate 21

FEMALE. Body from above subovate, margin somewhat crenulate, somewhat truncate in front. Fifteen pairs of lanceolate to spindle-shaped dorsal body setae, distributed as follows: A pair near front margin, one over each palpal base; two each side over coxae I; one near margin behind each coxa II; one each over coxae III and IV; two sublaterally between coxae IV and caudal end; four along caudal margin; five submedian pairs; all arising from tubercles, and longer than interval to base of seta next behind. Rostrum and palpi short. Legs all longer than body, legs I and IV longest. Tarsi much shorter than tibiae, somewhat swollen. Mandibular plate notched in front. Second segment of palpus the largest, bearing a strong, bladelike seta and a similar smaller seta; fourth segment without a hook, but bearing a strong, bladelike seta; last segment of palpi

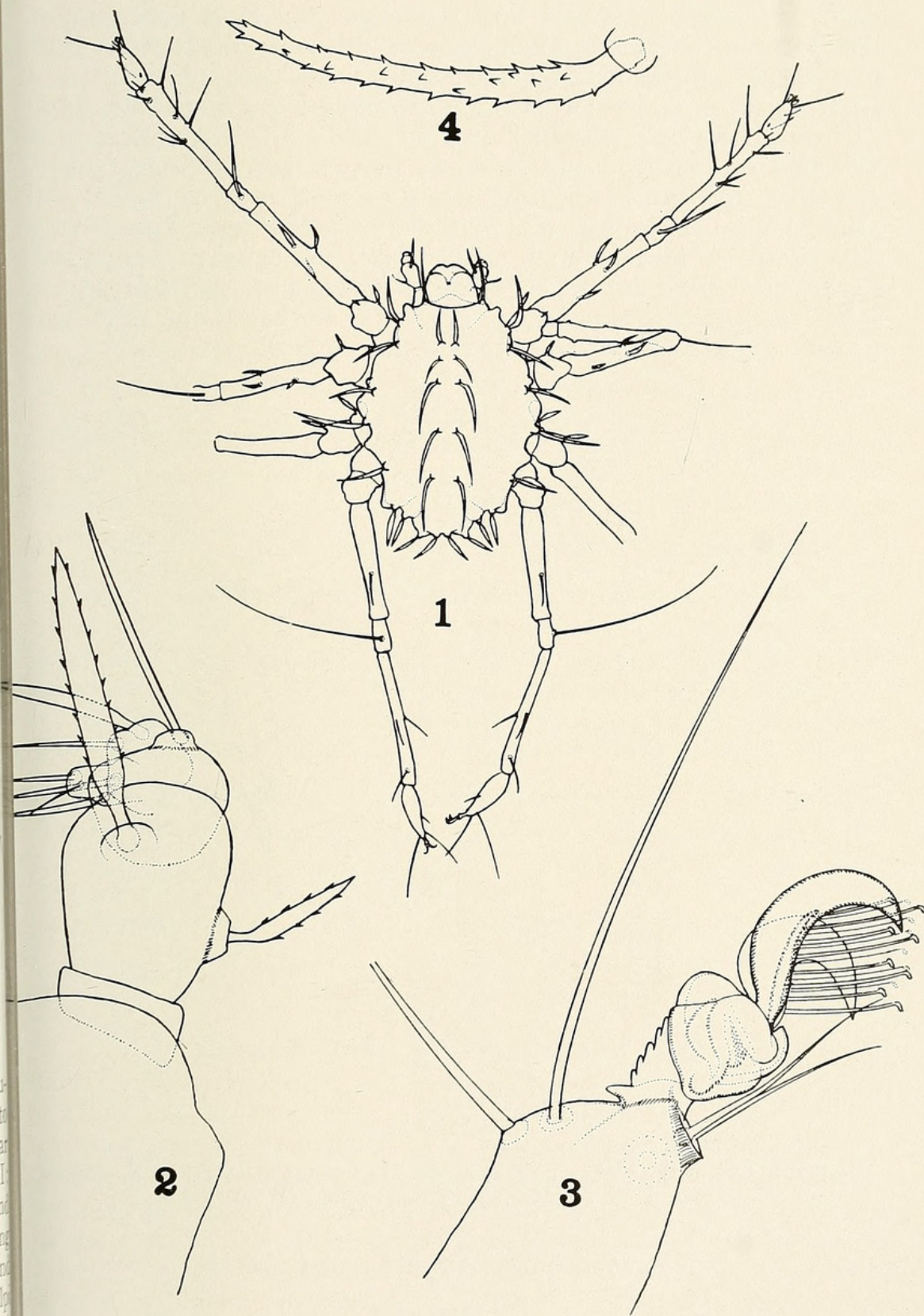


PLATE 21

NEOPHYLLOBIUS SIERRAE, new species. 1, female mite, dorsal view (only base of legs II and III shown); 2, right palpus from above; 3, tip of tarsus, lateral view; 4, a dorsal body seta.

deflexed, evidently bearing three setæ near tip. Legs with setæ of last three segments linear-lanceolate; other segments with setæ mostly short, thickened at middle, each shorter than interval to seta next beyond in line. Only one well-developed seta on patella, those of legs III and IV whiplike, that on patella IV longer than tibia IV; hair on patellæ I and II much shorter than respective tibiæ. Patellæ I and II each bearing also an almost invisible spine. All tibiæ each bearing subterminally a short, naillike seta. Tarsus with onychium bearing two stout, simple claws and between them a pulvillus with a pectinate series of tenent hairs along each side; tarsus I bearing dorsodistally 2 long, non-duplicate hairs, and near base of segment a short, sausage-shaped sensory seta.

Male not known.

TYPE MATERIAL. U. S. Nat. Museum No. 1801. Two specimens collected by E. W. Baker.

TYPE LOCALITY. Camp Nelson, Calif.

DISTRIBUTION. Known only from type locality.

HABITAT. Incense cedar (*Libocedrus decurrens*).

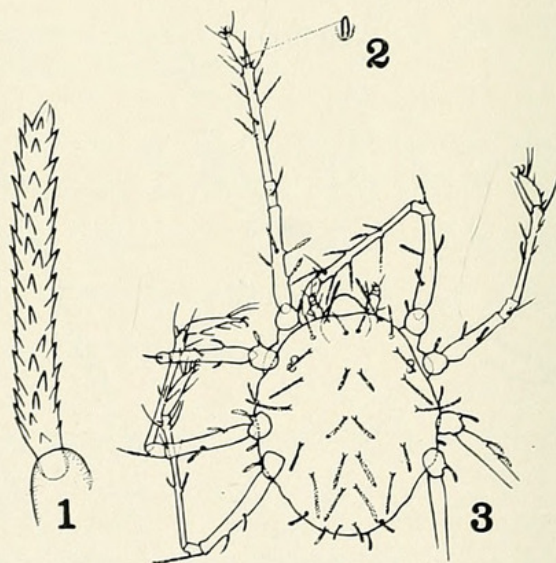


PLATE 22

NEOPHYLLOBIUS TEXANUS, new species. 1, dorsal body seta; 2, sensory seta on tarsus I of female; 3, female mite, dorsal view.

NEOPHYLLOBIUS TEXANUS, new species

Plate 22

FEMALE. Body from above oval; suture between cephalothorax and abdomen not visible; two eye corneæ each side over coxæ II; striations on dorsum mostly tortuous. Rostrum small, ovate. Palpi inconspicuous; second segment with a very setose hair dorsally

slightly longer than the segment, and a similar smaller hair laterally; third segment with a lanceolate hair above; terminal segment with 3 or 4 small setae. Seventeen pairs of rodlike dorsal body setae, as follows: One near front margin over base of each palpus, 2 each side over bases of legs I, one close behind eye, 1 over coxa III, 1 over coxa IV, 1 on lateral margin just before and 1 just behind trochanter III, 1 postmediad of each coxa IV, 4 along the caudal margin, 6 submedian pairs from over the mandibular plate to near the caudal margin; dorsal setae failing to reach, or only slightly surpassing bases of setae next behind; dorsal body setae and most of the leg hairs borne on small tubercles. Legs all longer than body to front of cephalothorax, legs I almost one-half again as long as body. Relative lengths of segments of leg I as follows: Trochanter, 5; femur, 21; patella, 5; tibia, 24; tarsus, 9. All tarsi swollen, each bearing dorso-terminally 2 lanceolate, non-duplex hairs, these fully half as long as the segment; tarsi I and II each bearing near base a minute, sausage-shaped seta (probably a sensory organ). Patellae bearing middorsally a single noticeable, oblong-lanceolate, strongly setose hair, about twice as long as the segment; patellae I and II also bearing each a minute, barely visible spine; tibiae and tarsi with sparse, shortish, setose, lanceolate hairs; trochanters and femora bearing shortish, oblong to spatulate, setose hairs. Tip of tarsi with 2 strong, hooked claws and a median pulvillus, the latter bearing along each side a series of short tenent hairs (the number difficult to observe). The male is unknown.

TYPE MATERIAL. U. S. Nat. Museum No. 1747; one female and one larva collected Sept. 1, 1937, by L. D. Christenson.

TYPE LOCALITY. Tyler, Texas.

DISTRIBUTION. Known only from type locality.

HABITAT. Peach.

NEOPHYLLOBIUS SUMMERSI, new species

Plate 23

FEMALE. Color cherry, with crista white. Body from above ovate. Dorsum with striae irregular; areas embracing base of dorsal setae less distinctly striate, constituting the plates or shields of some authors (see Plate 23). Fifteen pairs of linear-lanceolate, coarsely serrate dorsal body setae, mostly longer than interval to seta next behind, distributed as follows: A frontal seta over base of each palpus; 7 submarginally along each side; 5 pairs of submedian setae; 4 short setae subcaudally. One perfect and one imperfect eye cornea each side sublaterally, just in front of third sublateral seta. Rostrum and palpi short, often hidden. Second segment of palpus the largest, bearing 3 lanceolate, setose setae. Legs

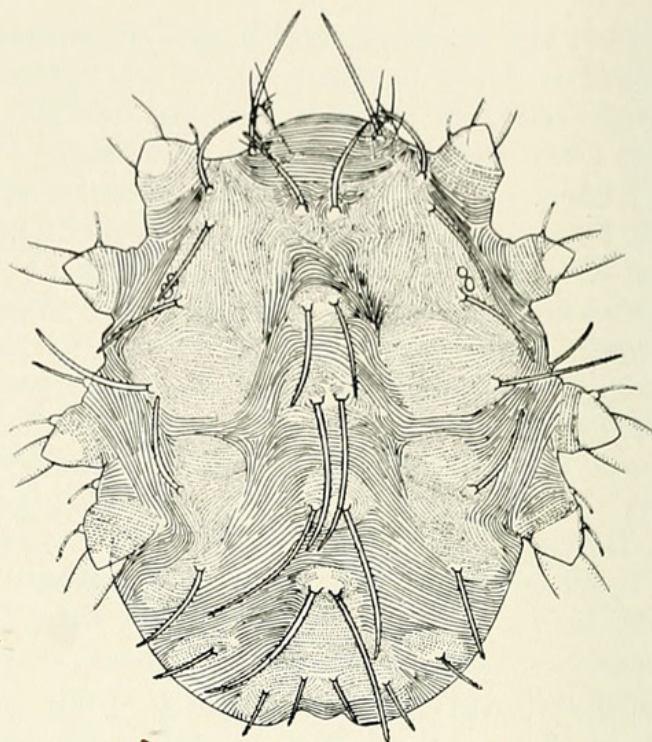


PLATE 23

NEOPHYLLOBIUS SUMMERSI, new species. Dorsal aspect of body, showing dorsal setae, base of legs, and pattern of striations in the dorsal integument.

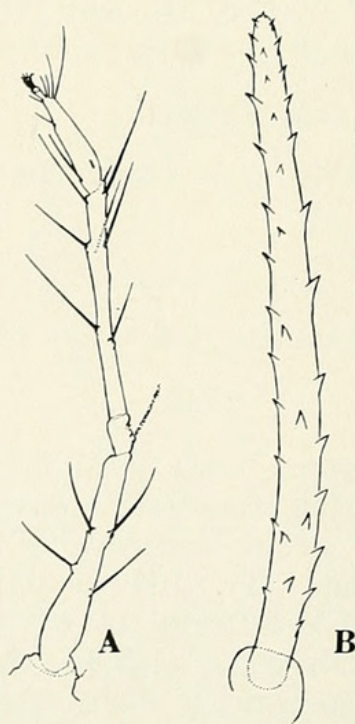


PLATE 24

NEOPHYLLOBIUS SUMMERSI, new species. A, leg I of female; B, submarginal, dorsal body seta.

all longer than body, sparsely provided with shortish, linear-lanceolate hairs. Tarsi swollen, much shorter than tibiae, each bearing terminally two strong, simple claws, and between them a pulvillus lined each side with a pectinate series of tenent hairs. Tarsi I and II each bearing subbasally a minute, finger-shaped seta. All tibiae bearing distally a short, naillike seta. Patellae I and II each bearing a linear, slightly thickened, setose hair, nearly twice as long as the segment, and an almost imperceptible spine; linear hair on patella II only two-fifths as long as tibia II; the linear hair longer on patellae III and IV, but shorter than the tibia of these legs.

TYPE MATERIAL. U. S. National Museum No. 1898. Four specimens collected by E. Cott, January, 1948.

TYPE LOCALITY. One and one-half miles north of Davis, Calif.

DISTRIBUTION. Known only from type locality.

HABITAT. Salt grass.

NEOPHYLLOBIUS VIRGINIENSIS, new species

Plate 25

FEMALE. Body from above rotund-ovate. Dorsum with very fine striations, mostly tortuous. Fourteen pairs of shortish dorsal body setae, including two pairs on caudal margin, mostly rod-shaped, coarsely serrate or bracteate margined, distributed as follows: The longest pair subfrontally over sides of mandibular plate; 7 submarginal setae each side from coxae I back nearly to caudal setae; 4 along hind margin of body; 4 submedian pairs, the first 3 pairs minute, the last pair longer; mostly shorter than intervals to setae next behind. Rostrum and palpi short (deflexed and not readily observable in specimens). Mandibular plate small, rounded in front. Evidently one eye cornea each side, between second and third submarginal setae. Second segment of palpus largest, bearing a strong, setose seta dorsally, and a similar smaller seta laterally; penultimate segment without a claw (last segment could not be seen properly for study). Legs all longer than body, legs I and IV the longest; leg setae mostly stiff, linear-lanceolate, finely setose, those on legs I and II mostly longer than intervals to nearest setae beyond; tarsi much shorter than tibiae, somewhat swollen at middle; duplex setae evidently lacking; patellae very short, bearing a single noticeable seta about as long as segment, patellae I and II bearing also a barely visible spine; tarsi I and II each with a spindle-shaped sensilla dorsally near base. All tibiae subdistally bearing a very short spine. Onychium bearing 2 stout, simple claws, and between them a pulvillus lined on each side with a pectinate series of tenent hairs. Relative lengths of segments of leg I as follows: Coxa ?; trochanter, 7; femur, 33; patella, 5; tibia, 33; tarsus, 14. Male not known.

TYPE MATERIAL. U. S. Nat. Museum No. 1748.

TYPE LOCALITY. Arlington, Virginia.

DISTRIBUTION. Known only from type locality.

HABITAT. Unknown.

The above description is based on one specimen each on two slides bearing sample number E-7483, collected November, 1938, by Floyd Andre.

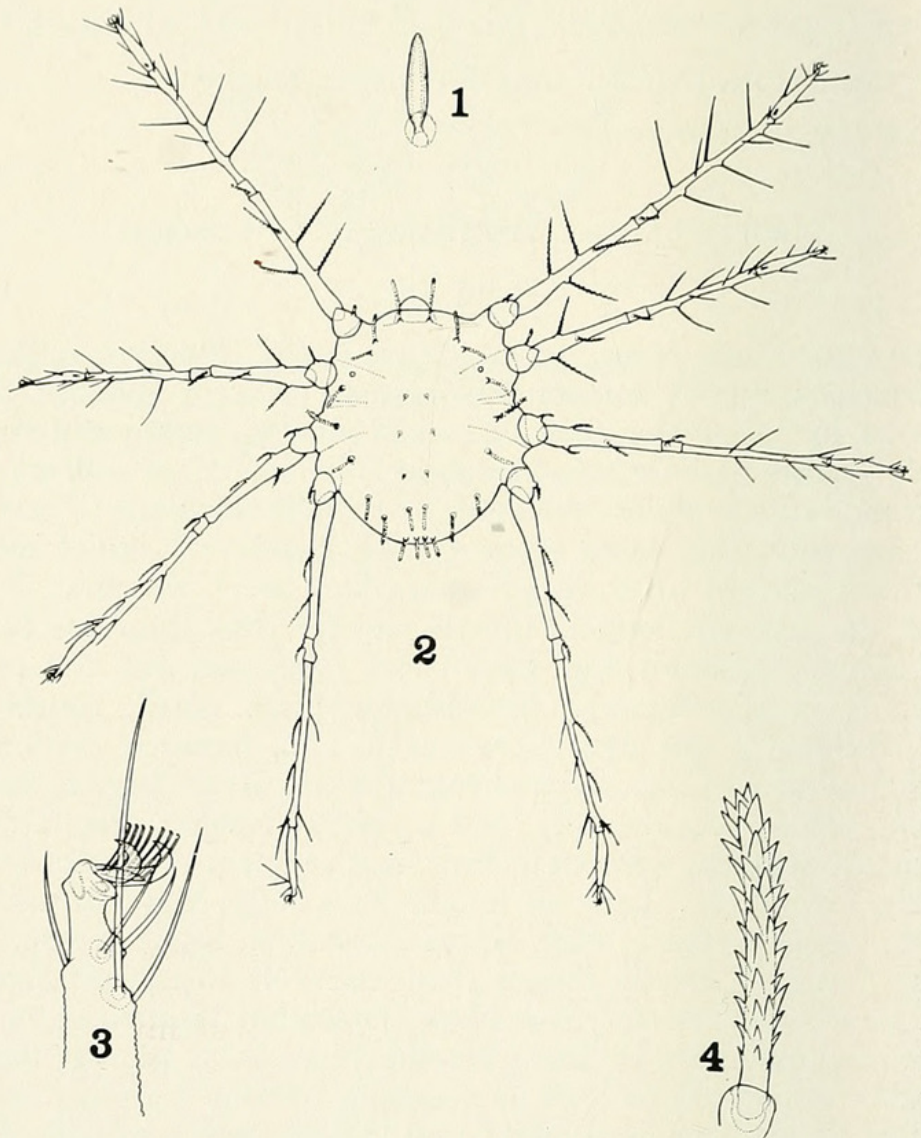


PLATE 25

NEOPHYLLOBIUS VIRGINIENSIS, new species. 1, sensory seta borne on tarsi I and II; 2, female mite, dorsal view; 3, tip of tarsus, lateral view; 4, one of the larger dorsal body setae.



1950. "Mites of the genus *Neophyllobius*." *Bulletin of the Southern California Academy of Sciences* 49, 55–70.

View This Item Online: <https://www.biodiversitylibrary.org/item/106511>

Permalink: <https://www.biodiversitylibrary.org/partpdf/42088>

Holding Institution

New York Botanical Garden, LuEsther T. Mertz Library

Sponsored by

The LuEsther T Mertz Library, the New York Botanical Garden

Copyright & Reuse

Copyright Status: In copyright. Digitized with the permission of the rights holder.

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.