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## ERIOPHYID STUDIES X

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**E**RIOPHYID Studies IX appeared in the Bulletin of the State Department of Agriculture, Vol. 29, No. 2, p. 112, April, May, June, 1940, issued June 21, 1940. Eriophyid Studies VIII was issued March 21, 1940. The present installment presents the descriptions and figures of four new genera and sixteen new species. This brings the total to 135 new species proposed in these studies.

The second *Phyllocoptes* described in this paper is of particular interest as it has on two occasions caused serious damage to tomatoes in California. A mite, *Calacarus adornatus* K., is listed as a Camelia pest of some importance. Two new species, herein described, are from Azalea, and two new species are from eastern *Vaccinium*.

The major portion of the species recorded here were collected by the writer while on a survey for blueberry budmite, *Eriophyes vaccinii* K., on the east coast of the United States. An account of this survey will be published later. Most of the descriptions in this article were made possible by the excellent microscopical equipment loaned by Dr. C. F. W. Muesebeck of the Bureau of Entomology and Plant Quarantine, U. S. D. A.

### *Phyllocoptes manzanitae* Keifer, new species

#### Plate 140

Female 160-180  $\mu$  long, 50-55  $\mu$  wide, 55-60  $\mu$  thick, spindleform, reddish-amber color, slightly waxy. Rostrum 40  $\mu$  long, large, curved down. Shield 44  $\mu$  long, 50  $\mu$  wide, median line present to rear, admedians complete, one submedian line on each side running obliquely inward, some granules; sides spinulate; dorsal tubercles 26.5  $\mu$  apart, dorsal setae 41  $\mu$  long, projecting backward. Forelegs 32  $\mu$  long, tibia 8  $\mu$  long, fore-tibial seta long, tarsus 8  $\mu$  long, claw 11.5  $\mu$  long, slender, tapering, feather-claw 5-rayed. Hindlegs 27  $\mu$  long, tibia 5  $\mu$  long, tarsus 7  $\mu$  long, claw 11.5  $\mu$  long. Sternal line short, coxae set with fine spinules, setae I wider than setae II. Abdomen entirely spinuliferous, the dorsal spinules longer; tergites and sternites not strongly differentiated; about 50-55 tergites; sternites about 70-75. Lateral seta 21  $\mu$  long, on about sternite 11; first ventral 65  $\mu$  long, on about sternite 25; second ventral 17.5  $\mu$  long, on about sternite 43; third ventral 17.5  $\mu$  long, on about sternite 7 from rear; accessory seta present, moderate size. Female genitalia shallow basin-shaped, 30  $\mu$  wide, 16  $\mu$  long, coverflap with about 12 furrows, seta 23  $\mu$  long.

Male 150  $\mu$  long, 50  $\mu$  thick.

**Type locality:** Magalia, Butte County, California. **Collected** July 2, 1940, by the writer. **Host:** *Arctostaphylos* sp., Manzanita. **Relation to host:** The mites are leaf vagrants on both surfaces, leaving white exuvia streaks. No damage is done to this species of manzanita, which is not particularly viscid. **Type slide:** so designated as above. **Paratype slides,** four in number, as above. This mite is characterized by the pointed shield lobe and the abdominal spinules.

### *Phyllocoptes destructor* Keifer, new species

#### Plate 141

Female 150-180  $\mu$  long, 55  $\mu$  wide, 45-50  $\mu$  thick, light yellow amber, spindleform. Rostrum 24  $\mu$  long, projecting down. Shield 40  $\mu$  long, 47  $\mu$  wide, subtriangular, central design obscure, disc limited by a line from each tubercle meeting over frontal

lobe, sides "cellular", frontal lobe short and blunt; dorsal tubercles  $37\ \mu$  apart, on rear margin; dorsal setae  $13\ \mu$  long, projecting caudo-laterally. Forelegs  $35\ \mu$  long, tibia  $8\ \mu$  long, tarsus  $7.5\ \mu$  long, claw  $8\ \mu$  long, small knob, featherclaw 4 rayed. Hindlegs  $31.5\ \mu$  long, tibia  $6\ \mu$  long, tarsus  $7.5\ \mu$  long, claw  $8.5\ \mu$  long. Sternal line prominent, setae I slightly ahead of sternal line and a little farther apart than setae II. Abdomen with smooth tergites, back somewhat flattened, a slight sub-lateral ridge on each side; sternites heavily microtuberculate the tubercles pointed; posterior sternites with elongate tubercles; 27 tergites; 60-65 sternites. Lateral seta  $30\ \mu$  long, on about sternite 7; first ventral  $60\ \mu$  long, on about sternite 21; second ventral  $16\ \mu$  long, on about sternite 36; third ventral  $24\ \mu$  long, on about sternite 5 from rear; accessory seta absent. Female genitalia shallow bowl-shaped,  $25\ \mu$  wide,  $14\ \mu$  long, coverflap with 8 to 10 longitudinal furrows, seta  $14\ \mu$  long.

Male  $140-150\ \mu$  long,  $45\ \mu$  wide,  $40-45\ \mu$  thick.

**Type locality:** Modesto, California. **Collected** June 27, 1940, by Dr. S. F. Bailey and the writer. **Additional locality:** Broderick, Yolo County, California, August 7, 1940, collected by R. B. Auer. **Host:** *Lycopersicum esculentum* Mill. Tomato. **Relation to host:** The mites feed on the leaves, stems and fruit, causing severe browning and curling of the leaves, and russetting of the fruit. **Type slide**, so designated, with the Modesto data. **Paratype slides**, five in number, from Modesto. A mite *Phyllocoptes lycopersici* Masee, Bul. Ent. Res. Vol. 28, p. 403, 1937, has already been described from Australian tomato that causes about the same damage as that by *destructor*. Examination of the description of *lycopersici* reveals many similarities, suggesting a close relationship. But there are nevertheless these differences:

<i>lycopersici</i>	<i>destructor</i>
Female $200\ \mu$ long	Female $150-180\ \mu$ long
Center of shield smooth	Center of shield with discernible lines
Featherclaw 3-rayed	Featherclaw 4-rayed
Female genital coverflap smooth	Female genital coverflap furrowed

In Modesto the mites attacked tomatoes in a greenhouse, completely destroying the leaves and russetting the fruit. Treatment with sulfur dust (Bailey) produced almost complete eradication, the plants developing normally thereafter. In the Broderick district of Yolo County the mites attacked field tomatoes, producing noticeable damage and indicating the potentialities of this species as a pest.

### *Phyllocoptes atlantazaleae* Keifer, new species

#### Plate 142

Female  $160-170\ \mu$  long,  $55\ \mu$  thick, color light amber, spindleform. Rostrum  $29\ \mu$  long, projecting down. Shield  $47\ \mu$  long,  $50\ \mu$  wide, anterior lobe with 2 spinules which are variable, sometimes absent; design obscure, median and admedian lines present; dorsal tubercles  $32\ \mu$  apart, on rear margin, dorsal setae  $18\ \mu$  long, projecting backward. Forelegs  $37.5\ \mu$  long, tibia  $9.5\ \mu$  long, tarsus  $7\ \mu$  long, claw  $6.5\ \mu$  long, tapering, knobbed, featherclaw 4 rayed. Hindlegs  $33.5\ \mu$  long, tibia  $7\ \mu$  long, tarsus  $6.5\ \mu$  long, claw  $7\ \mu$  long. Sternal line moderately long, unforked, setae I distinctly farther apart than setae II. Abdomen with tergites bearing small microtubercles, the sternites strongly microtuberculate; about 36 tergites; about 60-65 sternites. Lateral seta  $17.5\ \mu$  long, on about sternite 7; first ventral  $40\ \mu$  long, on about sternite 21; second ventral  $18.5\ \mu$  long, on about sternite 40; third ventral  $27.5\ \mu$  long, on about sternite 4 from rear; accessory seta present. Female genitalia  $23.5\ \mu$  wide,  $16\ \mu$  long, coverflap with 10 to 12 radial furrows, seta  $12\ \mu$  long.

Male  $160\ \mu$  long,  $50\ \mu$  thick.

**Type locality:** Atkinson, Pender County, North Carolina. **Collected** May 4 and 6, 1940, by the writer. **Host:** *Azalea atlantica* Ashe, Dwarf Azalea. **Relation to host:** A sparse population of the mites was found around the terminal buds. **Type slide**, so designated, with the above data, collected May 4, 1940. **Paratype slides**, two in number, one the 4th and the other May 6th. This mite belongs to the group of *Phyllocoptes* having a pair of spinules on the anterior shield lobe.

The shield pattern, length of dorsal setae, and tergal tubercles characterize the species.

### *Phyllocoptes rhododendronis* Keifer, new species

#### Plate 143

Female 185-200  $\mu$  long, 55  $\mu$  thick, spindleform, light amber. Rostrum 47  $\mu$  long, projecting down. Shield 59  $\mu$  long, 53  $\mu$  wide, design obscure, anterior lobe bearing two spines; dorsal tubercles 40  $\mu$  apart, on rear margin; dorsal setae 90  $\mu$  long, projecting backward. Forelegs 44  $\mu$  long, tibia 11.5  $\mu$  long, tarsus 10.5  $\mu$  long, claw 11  $\mu$  long, tapering, knobbed, featherclaw 4 rayed. Hindlegs 39  $\mu$  long, tibia 8.5  $\mu$  long, tarsus 9  $\mu$  long, claw 11.5  $\mu$  long. Sternal line unforked; setae I farther separated than setae II. Abdomen with tergites smooth, sternites completely microtuberculate; tergites about 22; sternites about 70. Lateral seta 20  $\mu$  long, on about sternite 9; first ventral 55  $\mu$  long, on about sternite 27; second ventral 16.5  $\mu$  long, on about sternite 47; third ventral 23  $\mu$  long, on about sternite 5 from rear; accessory seta present. Female genitalia 29  $\mu$  wide, 17.5  $\mu$  long, coverflap with 12-14 radial furrows, seta 16  $\mu$  long.

Male not studied.

**Type locality:** Three miles east of Paradise, Butte County, California. **Collected** July 2, 1940, by the writer. **Host:** *Rhododendron occidentale* Cy-Ar. **Relation to host:** The mites are undersurface leaf vagrants, causing no appreciable damage, though so far not observed in numbers. The immature individuals waxy, leaving white lines of cast skins. **Type slide**, so designated, with the above data. **Paratype**, three in number as above. This mite also belongs to the same group as *atlantazaleae*. The long dorsal setae, and the smooth tergites are two important features of this species.

### *Phyllocoptes liquidambaris* Keifer, new species

#### Plate 144

Female 175-200  $\mu$  long, 50-55  $\mu$  wide, 50  $\mu$  thick, brownish color, spindleform. Rostrum 40  $\mu$  long, projecting down, antapical setae 10  $\mu$  long. Shield 52  $\mu$  long, 55  $\mu$  wide, design an obscure network, prominent lateral lobes, a pair of spines on frontal lobe; dorsal tubercles 45  $\mu$  apart, on rear margin; dorsal setae 160  $\mu$  long, projecting up and somewhat laterally. Forelegs 42  $\mu$  long, tibia 11  $\mu$  long, tarsus 8.5  $\mu$  long, claw 7  $\mu$  long, with a large knob, featherclaw 4 rayed. Hindlegs 36  $\mu$  long, tibia 9.5  $\mu$  long, tarsus 7  $\mu$  long, claw 7  $\mu$  long. Sternal line thin, fairly long, forked posteriorly; setae I slightly farther apart than setae II. Abdomen with non-tuberculate tergites and a subdorsal furrow, sternal microtubercles small; tergites about 29; sternites about 70. Lateral seta 28  $\mu$  long, on about sternite 7; first ventral 46  $\mu$  long, on about sternite 23; second ventral 26  $\mu$  long, on about sternite 47; third ventral 26  $\mu$  long, on about sternite 4 from rear; accessory seta present, small. Female genitalia 30  $\mu$  wide, 20  $\mu$  long, coverflap with 8 to 10 ridges, seta 13.5  $\mu$  long.

Male not studied.

**Type locality:** Meggett, Charleston district, South Carolina. **Collected:** May 11, 1940, by writer. **Other localities:** Castle Hayne, Wilmington district, N. C., May 6 and 8, 1940; Clayton, N. C., June 1, 1940; Brunswick, Ga., May 14, 1940; Lyman, Gulfport district, Miss., June 10, 1940. **Host:** *Liquidambar styraciflua* L. Sweet Gum. **Relation to host:** The mites are primarily upper surface vagrants, causing no apparent damage. **Type slide**, so designated, with the above data. **Paratype slides**, five in number, one with the above data, four others, two from Castle Hayne and two from Brunswick, Ga., as above. This mite is characterized by the pair of small spines on the shield lobe, by the long dorsal setae, and the dull brown color. It is more abundant, at least in the spring and early summer, on the South Carolina and Georgia coast, than in North Carolina.

**Phyllocoptes vandinei** Keifer, new species

## Plate 145

Female 140-160  $\mu$  long, 50-55  $\mu$  wide, 40  $\mu$  thick, light amber, flattened, long wedge-shaped. Rostrum 23.5  $\mu$  long, projecting down, antapical seta long. Shield 48  $\mu$  long, 52  $\mu$  wide, design obscure, the admedian lines indicated; dorsal tubercles 21  $\mu$  apart, ahead of rear margin; dorsal setae 5  $\mu$  long, projecting up and centrad. Forelegs 26.5  $\mu$  long, tibia 6  $\mu$  long, tarsus 6  $\mu$  long, claw 5.5  $\mu$  long, knobbed, featherclaw 4 rayed. Hindlegs 23  $\mu$  long, tibia 4  $\mu$  long, tarsus 5  $\mu$  long, claw 6  $\mu$  long. Sternal line short. Abdomen with tergites broad and smooth, sternites microtuberculate; about 22 tergites; about 50-55 sternites. Lateral seta 9  $\mu$  long, on about sternite 7; first ventral 24  $\mu$  long, on about sternite 19; second ventral 11.5  $\mu$  long, on about sternite 34; third ventral 22  $\mu$  long, on about sternite 5 from rear; accessory seta present. Female genitalia 17.5  $\mu$  wide, 12.5  $\mu$  long, coverflap with about six furrows; seta 13  $\mu$  long.

Male 120  $\mu$  long, 45  $\mu$  wide, 35  $\mu$  thick.

**Type locality:** Ten miles southwest of Brunswick, Georgia. **Collected** May 14, 1940, by the writer. **Host:** *Vaccinium amoenum* Ait., Blueberry. **Relation to host:** The mite is a sparse upper surface leaf vagrant. **Type slide**, so designated, as above. **Paratype slides**, two in number, as above. This mite is very similar in general flatness and habit to species in either the genus *Oxypleurites* or in *Tegonotus*. However, as it lacks the precise distinguishing features of these genera it must be thrown into *Phyllocoptes* where it is still unharmonious because of its flatness. It was collected in the course of the survey of blueberry budmite and I take pleasure in naming it for D. L. Van Dine, in charge of the Division of Fruit Insects, Bureau of Entomology and Plant Quarantine, U. S. D. A., who arranged the survey.

**Calacarus** Keifer, new genus

Rostrum quite large, downcurved and recurved, antapical seta long. Legs with all setae, except the patellar seta of second legs, which is missing. Cephalothoracic shield lacking dorsal tubercles and setae; the pattern of curved wax-bearing lines or narrow ridges. The abdomen with a central and one or two lateral wax-bearing ridges; the tergites not much less numerous than the sternites. Female genital coverflap with fine obscure scoring.

Genotype: *Calacarus pulviferus* n. sp.

This genus differs from *Epitrimerus* by the large beak, the lack of dorsal setae, the curved shield lines, and the fine scoring of the coverflap. It differs from *Callyntrotus* by the large beak, wax-bearing ridges rather than wax-bearing lines of spiniferous microtubercles, in the absence of dorsal setae, and the fine female genital coverflap scoring. Besides the genotype, *adornatus* Keifer, belongs here. Together these two species form a compact association that seems to be a connection, in part, between *Epitrimerus* and *Callyntrotus*, although the new genus is amply distinct from both in the rostrum, shield and coverflap characters.

**Calacarus pulviferus** Keifer, new species

## Plate 146

Female 150-170  $\mu$  long, 60  $\mu$  wide, 60  $\mu$  thick, dark purple color, robust spinulate. The shield lines and abdominal ridges secrete bands of glass-like wax; often dust covered. Rostrum 52  $\mu$  long, large, downcurved and recurved, antapical seta long. Shield 70  $\mu$  long, 60  $\mu$  wide, the central part an oval disc with 2 'V' marks, curved lines forming anterior cells; lateral lines very sinuate; dorsal tubercles and setae missing. Forelegs 41  $\mu$  long, tibia 10  $\mu$  long, tarsus 8.5  $\mu$  long, claw 8  $\mu$  long, large knob, featherclaw 4 rayed. Hindlegs 35.5  $\mu$  long, patellar seta absent; tibia 8.5  $\mu$  long, tarsus 8  $\mu$  long, claw 8  $\mu$  long. Anterior coxae touching. Abdomen with a wide central, and a lateral wax-bearing ridge, the tergites not tuberculate; sternites a little more numerous and microtuberculate; about 45 tergites; about 55 sternites. Lateral seta 24  $\mu$  long, on about sternite 4; first ventral 50  $\mu$  long, on about sternite 18; second ventral 26  $\mu$  long, on about sternite 36; third ventral 21  $\mu$  long, on about

sternite 5 from rear; accessory seta absent. Female genitalia 31  $\mu$  wide, 16.5  $\mu$  long, coverflap with obscure fine lines, seta 20  $\mu$  long.

Male apparently usually lacking wax, purplish, 130-140  $\mu$  long, 50  $\mu$  wide, 50  $\mu$  thick.

**Type locality:** Ravine along highway below and southwest of Grass Valley, California. **Collected** July 26, 1940, by the writer. **Host:** *Quercus kelloggii* Newb. Kellogg's Black Oak. **Relation to host:** The mites are upper surface leaf vagrants. **Type slide**, so designated, with the above data. **Paratype slides**, five in number, as above. This species differs from *adornatus* (K.) in the pattern and length of the shield, in the rays of the featherclaw, and in having but one lateral wax-bearing ridge.

### *Calacarus adornatus* (Keifer)

Bul. Cal. Dept. Agr. Vol. 29, p. 32, March 21, 1940

The species was described from both leaf surfaces of *Viburnum opulus* L. This season the mite has been found at Chico, June 4, 1940, and at Sacramento, July 7, 1940, to be very numerous on the leaves of *Camellia japonica* L. A certain amount of leaf browning has resulted, as well as a heavy speckling of the leaves with the short white exuvia streaks.

### *Acaricalus* Keifer, new genus

Rostrum of moderate size, projecting down. Legs with all setae present; bifurcate featherclaws. Cephalothoracic shield with acute anterior lobe; dorsal tubercles prominent, ahead of rear margin; dorsal setae short, projecting upward. Abdomen with no extra setae; a transverse ridge behind shield, followed by a wide longitudinal dorsal trough; a narrow central longitudinal ridge, from the anterior transverse ridge, ends well before end of trough. Tergites of abdomen narrow, not microtuberculate; sternites microtuberculate. Female genital coverflap with longitudinal scoring.

Genotype: *Acaricalus secundus* n. sp. }

*Acaricalus* is close to *Calepitrimerus* as the abdominal structure shows; however, the anterior transverse abdominal ridge and the divided featherclaws easily separate it.

### *Acaricalus secundus* Keifer, new species

#### Plate 147

Female 120-145  $\mu$  long, 50  $\mu$  wide, 45  $\mu$  thick, color yellowish amber, wedge-shaped. Rostrum 30  $\mu$  long, projecting down, antapical seta moderate in size. Shield 50  $\mu$  long, 50  $\mu$  wide, with a central keel, precipitous behind; laterally with disk-like lobes; dorsal tubercles 22  $\mu$  apart, well ahead of rear margin; dorsal setae 9.5  $\mu$  long, projecting up. Forelegs 30  $\mu$  long, tibia 6.5  $\mu$  long, tarsus 6  $\mu$  long, claw 5.5  $\mu$  long, knobbed, featherclaw divided, 4 rayed on a side. Hindlegs 27  $\mu$  long, tibia 6  $\mu$  long, tarsus 5.5  $\mu$  long, claw 5.5  $\mu$  long. Anterior coxae slightly separated. Abdomen with tergites non-tuberculate, sternites microtuberculate, somewhat of a crossridge just behind shield, central ridge extending back to about tergite 51; between 65 and 70 tergites and sternites. Lateral seta 6.5  $\mu$  long, on about sternite 6; first ventral 35  $\mu$  long, on about sternite 22; second ventral 14  $\mu$  long, on about sternite 40; third ventral 16  $\mu$  long, on about sternite 5 from rear; accessory seta absent. Female genitalia 24  $\mu$  wide, 13  $\mu$  long, coverflap with about 10 furrows; seta 8.5  $\mu$  long.

Male 110-120  $\mu$  long, 45  $\mu$  wide, 40  $\mu$  thick.

**Type locality:** In a ravine along highway southwest of Grass Valley, California. **Collected** July 26, 1940, by the writer. **Host:** *Quercus kelloggii* Newb., Kellogg's Black Oak. **Relation to host:** The mites are vagrants, chiefly on the upper leaf surface. **Type slide**, so designated, as above. **Paratype slides**, four in number, as above. **Additional locality:** San Mateo Memorial Park, La Honda district,

California, August 12, 1940. **Host:** *Quercus agrifolia* Nee. The new species differs from the previously described *hederae* K., which was put in *Calepitrimerus*, by the strongly keeled shield, the abdominal sculpturing, and the four-rayed featherclaws. *A. secundus* is associated on *Quercus kelloggii* with *Calcarus pulviferus*. A third species of *Acari-calus* is known from eastern alder, *Alnus rugosa*, two specimens having been taken from leaves collected in southern Virginia by the writer.

### *Calepitrimerus darrowi* Keifer, new species

#### Plate 148

Female 140-150  $\mu$  long, 50  $\mu$  wide, 45  $\mu$  thick, light amber yellow, wedge-shaped. Rostrum 23.5  $\mu$  long, projecting down, antapical seta moderate. Shield 50  $\mu$  long, 48  $\mu$  wide, design obscure; anterior lobe with three or four minute spines; dorsal tubercles 19  $\mu$  apart, well ahead of rear margin; dorsal setae 5.5  $\mu$  long, projecting up and forward. Forelegs 29  $\mu$  long, tibia 6  $\mu$  long, tarsus 6  $\mu$  long, claw 6  $\mu$  long, knobbed, featherclaw 6-rayed. Hindlegs 26.5  $\mu$  long, tibia 4.5  $\mu$  long, tarsus 6  $\mu$  long, claw 6  $\mu$  long. Sternal line moderately long, setae I ahead of anterior end of this line. Abdomen with central ridge microtuberculate and extending caudad 22 to 24 tergites; sternites microtuberculate; about 36 tergites; between 55 and 60 sternites. Lateral seta 9  $\mu$  long, on about sternite 6; first ventral 31  $\mu$  long, on about sternite 18; second ventral 26  $\mu$  long, on about sternite 36; third ventral 20.5  $\mu$  long, on about sternite 5 from rear; accessory seta present. Female genitalia 18.5  $\mu$  wide, 12.5  $\mu$  long, coverflap with 6 to 8 furrows; seta 24  $\mu$  long.

Male not seen.

**Type locality:** Beltsville, Maryland. **Collected** June 5, 1940, by the writer. **Host:** *Vaccinium* sp. affinity *atrococcum* (Gray). **Relation to host:** The mites are vagrants on both sides of the leaf. **Type slide,** so designated, as above. **Paratype slides,** three in number, as above. This species falls in the group with dorsal tubercles ahead of the rear shield margin. It is characterized by the obscure shield pattern, and the 6-rayed featherclaw. I take pleasure in naming this species for Dr. G. M. Darrow, Senior Pomologist, Bureau of Plant Industry, U. S. D. A., who has contributed much data on the blueberry bud-mite and who showed me the plant on which this mite was found in the Bureau of Plant Industry screenhouse.

### *Oxypleurites simus* Keifer, new species

#### Plate 149

Female 150-160  $\mu$  long, 65-70  $\mu$  wide, 40  $\mu$  thick, yellow, flattened, wedge-shaped. Rostrum 23  $\mu$  long, projecting down, antapical seta rather long. Shield 47  $\mu$  long, 58  $\mu$  wide, anterior lobe short, blunt, design obscure, sides somewhat granulate; dorsal tubercles 14  $\mu$  apart, well ahead of rear margin; dorsal setae 6.5  $\mu$  long, projecting up. Forelegs 30  $\mu$  long, tibia 4.5  $\mu$  long, tarsus 6  $\mu$  long, claw 5.5  $\mu$  long, elongate knob, featherclaw 4-rayed. Hindlegs 23  $\mu$  long, patellar seta missing, tibia 3.5  $\mu$  long, tarsus 5  $\mu$  long, claw 6  $\mu$  long. Sternal line long, not forked posteriorly. Abdomen with broad tergites, most of which alternately project as large spine-like appendages; tergites above last four sternites confluent, the caudal section of abdomen with only three distinct tergites; sternites microtuberculate; about 14 tergites; about 45 sternites. Lateral seta 17.5  $\mu$  long, on about sternite 2; first ventral 33  $\mu$  long, on about sternite 15; second ventral 14  $\mu$  long, on about sternite 28; third ventral 16  $\mu$  long, on about sternite 5 from rear; accessory seta present, small. Female genitalia 21.5  $\mu$  wide, 14.5  $\mu$  long, coverflap with two ranks of furrows, seta 11.5  $\mu$  long.

Male 140  $\mu$  long, 45-50  $\mu$  wide, 35  $\mu$  thick.

**Type locality:** Castle Hayne, Wilmington, North Carolina. **Collected** May 8, and June 1, 1940, by the writer. **Additional locality:** Valhalla, Edenton, N. C., collected May 18, 1940, by the writer. **Host:** *Alnus rugosa* (Du Roi), Alder. **Relation to host:** The mites are sparse, flat, undersurface vagrants on the leaves. **Type slide:** of specimens from Castle Hayne, June 1, 1940. **Paratype slides,** five in number,

one from Castle Hayne May 8, two from Valhalla, May 18, and two from Castle Hayne, June 1, 1940. Mites of this genus heretofore described from *Alnus* are: *heptacanthus* Nal., from European *Alnus glutinosa*; *marinalni* K. from California *Alnus rubra*; *platynaspis* Nal., from European *Alnus incana*; *trouessarti* Nal., from European *Alnus glutinosa*. All of these species have the dorsal tubercles ahead of the rear shield margin and are likely allied. The new species is separated by the large lateral points, and the 14 tergites, followed by the confluent tergites. It is the nearest to the genotype, *heptacanthus*, of any species yet studied by the writer.

### *Caroloptes* Keifer, new genus

Rostrum small, projecting down. Legs with all usual setae. Shield subtriangular, the anterior lobe short, with a mantle projecting down a short distance over the rostrum; dorsal tubercles a little ahead of rear margin, the setae projecting up and forward. Abdomen rather long, somewhat narrow, the back broadly flat; tergites non-tuberculate; sternites microtuberculate; last four or five abdominal rings distinct from anterior rings and projecting obliquely down. Female genital coverflap with a concentric half circle.

Genotype: *Caroloptes fagivagrans*, n. sp.

### *Caroloptes fagivagrans* Keifer, new species

#### Plate 150

Female 140-160  $\mu$  long, 50  $\mu$  wide, 35-40  $\mu$  thick, yellow, flattened, somewhat elongate. Rostrum 23  $\mu$  long, projecting down. Shield 38  $\mu$  long, 38  $\mu$  wide, the design obscure making the shield almost smooth; dorsal tubercles 23.5  $\mu$  apart, a little ahead of rear margin; dorsal setae 15  $\mu$  long, projecting up and forward. Forelegs 33  $\mu$  long, tibia 7  $\mu$  long, tarsus 8  $\mu$  long, claw 8  $\mu$  long, somewhat knobbed, featherclaw 4-rayed. Hindlegs 26  $\mu$  long, tibia 5.5  $\mu$  long, tarsus 7  $\mu$  long, claw 9  $\mu$  long. Sternal line strong. Abdomen with the characters of the genus; about 31 tergites; between 55 and 60 sternites. Lateral seta 15  $\mu$  long, on about sternite 7; first ventral 27  $\mu$  long, on about sternite 21; second ventral 19.5  $\mu$  long, on about sternite 34; third ventral 20.5  $\mu$  long, on about sternite 5 from rear; accessory seta present. Female genitalia, 21  $\mu$  wide, 13.5  $\mu$  long, coverflap with a concentric line; seta 10  $\mu$  long.

Male not seen.

**Type locality:** Five miles west of Burgaw, North Carolina. **Collected** June 1, 1940, by the writer. **Host:** *Fagus grandiflora* Ehrh., Beech. **Relation to host:** The mites are found in the hairs and crevices along the midvein on the undersurface of the leaf. **Type slide**, so designated, with the above data. **Paratype slides**, two in number, as above.

### *Acarelliptus* Keifer, new genus

Rostrum small, projecting down. Legs with all setae present. Cephalothoracic shield broadly subtriangular, flattened, the anterior lobe small and short; a short rostrum mantle attached to the underside of the frontal lobe; dorsal tubercles well ahead of rear margin, the setae short and projecting upward. Abdomen with shield forming a subelliptical body outline from above; tergites broad, non-tuberculate, with a central furrow and a lateral longitudinal furrow on each side; sternites microtuberculate; caudal segments distinct from anterior segments and projecting obliquely down. Female genital coverflap with longitudinal furrows.

Genotype: *Acarelliptus cocciformis* n. sp.

*Caroloptes*, *Acarelliptus* and *Caliphytoptus*, all monotypic, and found on Fagaceous trees, have an obscure character not noted so far on other mites. This is a short projection or mantle from the front of, or from below, the anterior shield lobe. This was noted but not described for *Caliphytoptus*. In the case of *Caroloptes*, the shield structure makes this especially obscure. Other characters these genera have in common are: the short beak, the upward projecting shield

setae, and especially the distinct caudal section of the abdomen which abruptly projects down. *Caliphytoptus quercilobatae* and the above new species, sequester themselves in the hairs and crevices along the midvein. *Acarelliptus cocciformis* settles anywhere on the under-surface of the leaves.

### *Acarelliptus cocciformis* Keifer, new species

#### Plate 151

Female 130-140  $\mu$  long, 60-65  $\mu$  wide, 35-40  $\mu$  thick, color yellow, flat, sub-elliptical in dorsal view. Rostrum 20  $\mu$  long, small, projecting down. Shield 38  $\mu$  long, 55  $\mu$  wide, with the anterior lobe small, short, the pattern an open network; dorsal tubercles 20.5  $\mu$  apart, well ahead of rear margin; dorsal setae 9.5  $\mu$  long, projecting up. Forelegs 33  $\mu$  long, tibia 6.5  $\mu$  long, tarsus 8  $\mu$  long, claw 8  $\mu$  long, tapering, slightly knobbed, featherclaw 5-rayed. Hindlegs 32  $\mu$  long, tibia 6  $\mu$  long, tarsus 7  $\mu$  long, claw 8.5  $\mu$  long. Anterior coxae contiguous. Abdomen with the characters of the genus, the tergites non-tuberculate, the sternites strongly micro-tuberculate; 17 tergites; about 50 sternites. Lateral seta 18.5  $\mu$  long, on about sternite 5; first ventral 38  $\mu$  long, on about sternite 17; second ventral 17.5  $\mu$  long, on about sternite 29; third ventral 32  $\mu$  long, on about sternite 5 from rear; accessory seta present. Female genitalia 22.5  $\mu$  wide, 14.5  $\mu$  long, coverflap with about 8 furrows, seta 26  $\mu$  long.

Male not seen.

**Type locality:** Highway bridge, Ashley River, 5 miles southeast of Summerville, Dorchester County, South Carolina. **Collected** May 11, 1940, by the writer. **Host:** *Quercus prinus* L., Chestnut Oak. **Relation to host:** The mites attach themselves to the undersurface of the leaf, their body outline and habit causing them to simulate scale crawlers. **Type slide**, so designated, with the above data. **Paratype slides**, five in number, as above.

### *Rhyncaphytoptus castanifoliae* Keifer, new species

#### Plate 152

Female 160-170  $\mu$  long, 55-60  $\mu$  thick, yellowish, spindleform. Rostrum 42  $\mu$  long, antapical seta moderately long. Shield 35  $\mu$  long, 53  $\mu$  wide, design a network, anterior lobe over rostrum base; dorsal tubercles 29  $\mu$  apart, a little ahead of rear margin; dorsal setae 12  $\mu$  long, projecting forward. Forelegs 38  $\mu$  long, tibia 10.5  $\mu$  long, tarsus 9.5  $\mu$  long, claw 6.5  $\mu$  long, knobbed, featherclaw 5-rayed. Hindlegs 37  $\mu$  long, tibia 7.5  $\mu$  long, tarsus 8.5  $\mu$  long, claw 6.5  $\mu$  long. Sternal line short, forked posteriorly. Abdomen with a slight subdorsal furrow and tergites with small microtubercles along ridges; sternites microtuberculate; about 37 tergites; about 90 sternites. Lateral seta 20.5  $\mu$  long, on about sternite 22; first ventral 58  $\mu$  long, on about sternite 41; second ventral 13  $\mu$  long, on about sternite 59; third ventral 24  $\mu$  long, on about sternite 5 from rear; accessory seta present. Female genitalia 30  $\mu$  wide, 18  $\mu$  long, coverflap smooth, seta 18  $\mu$  long.

Male not seen.

**Type locality:** Grade about four miles west of Sperryville, Virginia. **Collected** June 4, 1940, by the writer. **Host:** *Castanea dentata* L., Chestnut. **Relation to host:** The mites are sparse undersurface vagrants. **Type slide**, so designated, with the above data. **Paratype slides**, two in number as above. This mite was taken from a small chestnut sprout on the northwest exposure on the east side of the first range of mountains west of Sperryville. The shield pattern, microtuberculate tergites and 5-rayed featherclaw, distinguish this mite.

### *Rhyncaphytoptus fagifoliae* Keifer, new species

#### Plate 153

Female 190-205  $\mu$  long, 60  $\mu$  thick, light yellowish, spindleform. Rostrum 46  $\mu$  long, antapical seta moderate. Shield 40  $\mu$  long, 62  $\mu$  wide, median line faint,

admedian and submedian lines distinct; anterior lobe truncate; dorsal tubercles  $38 \mu$  apart, but little ahead of rear margin; dorsal setae  $24 \mu$  long, projecting forward. Forelegs  $42 \mu$  long, tibia  $11.5 \mu$  long, tarsus  $8.5 \mu$  long, claw  $8.5 \mu$  long, knob oblique, featherclaw 5-rayed. Hindlegs  $39 \mu$  long, tibia  $7.5 \mu$  long, tarsus  $8.5 \mu$  long, claw  $9 \mu$  long. Anterior coxae contiguous. Abdomen with tergites bearing short spine-like microtubercles, the sternites microtuberculate; about 40 tergites; about 90 sternites. Lateral seta  $18.5 \mu$  long, on about sternite 19; first ventral  $24 \mu$  long, on about sternite 42; second ventral  $20.5 \mu$  long, on about sternite 61; third ventral  $28 \mu$  long, on about sternite 5 from rear; accessory seta present, small. Female genitalia  $29 \mu$  wide,  $20 \mu$  long, coverflap smooth, seta  $17 \mu$  long.

Male not seen.

**Type locality:** Benn's Church, Smithfield district, Virginia. **Collected** May 20, 1940, by the writer. **Host:** *Fagus grandiflora* Ehrh. Beech. **Relation to host:** The mites are undersurface leaf vagrants. **Type slide**, so designated, as above. **Paratype slides**, two in number, as above. The tergal spinules, shield pattern, claw knobs, and anterior coxae characterize this mite.

### *Diptilomiopus carolinensis* Keifer, new species

#### Plate 154

Female  $150-170 \mu$  long,  $60 \mu$  thick, yellowish amber, robust spindleform. Rostrum  $62 \mu$  long, attenuate. Shield  $38 \mu$  long,  $57 \mu$  wide, no anterior lobe, design a network, a posterior transverse ridge; dorsal tubercles and setae missing. Legs with femoral setae missing. Forelegs  $41 \mu$  long, tibia  $7 \mu$  long, foretibial set missing, tarsus  $12.5 \mu$  long, claw  $6.5 \mu$  long, knobbed, featherclaw 7-rayed. Hindlegs  $37 \mu$  long, patellar seta absent, tibia  $5.5 \mu$  long, tarsus  $11.5 \mu$  long, claw  $6 \mu$  long. Sternal ridge short; setae I missing. Abdomen with narrow tergites practically non-tuberculate, a short central anterior ridge; sternites microtuberculate; about 47 tergites; about 70 sternites. Lateral seta absent; first ventral  $57 \mu$  long, on about sternite 28; second ventral  $16 \mu$  long, on about sternite 40; third ventral  $42 \mu$  long, on about sternite 10 from rear; accessory seta present, very minute. Female genitalia  $33 \mu$  wide,  $18.5 \mu$  long, coverflap with a few faint fine lines, seta  $10 \mu$  long.

Male  $140-155 \mu$  long,  $55-60 \mu$  thick.

**Type of locality:** Magnolia district, Duplin County, North Carolina. **Collected** May 3, 1940, by the writer. **Host:** *Ilex coreacea* (Pursh). **Relation to host:** The mites form a moderately sparse population of undersurface leaf vagrants. **Type slide**, so designated, with the above data. **Paratype slides**, one in number, as above. The species is characterized by the ridge across the shield, and by the missing dorsal, lateral, foretibial, femoral, hind patellar, and anterior coxal setae I. The featherclaws are difficult to perceive properly but seem to be 7-rayed. The antapical rostral setae can not be distinguished; the basal rostral setae point upward.

### *Diptilomiopus aleyrodiformis* Keifer, new species

#### Plate 155

Female  $170-195 \mu$  long,  $60-65$  thick, yellow, spindleform, with rows of white waxy radiations concealing the body; a middorsal row divided anteriorly; lateral rows around body. Rostrum  $45 \mu$  long, antapical seta long. Shield  $46 \mu$  long,  $57 \mu$  wide, smooth, the anterior lobe truncate and curving down on each side of the rostrum base; dorsal tubercles  $29 \mu$  apart, well ahead of rear margin; dorsal setae  $13 \mu$  long, projecting forward. Legs lacking only femoral setae. Forelegs  $46 \mu$  long, tibia  $13 \mu$  long, tarsus  $9.5 \mu$  long, claw  $6.5 \mu$  long, large knob, featherclaw 5-rayed. Hindlegs  $41 \mu$  long, tibia  $9.5 \mu$  long, tarsus  $9.5 \mu$  long, claw  $7 \mu$  long. Sternal ridge broad; all coxal setae present. Abdomen with non-tuberculate tergites, the tergites formed into three wax-bearing ridges; the central ridge divided just behind shield and ending in dorsal trough about tergite 36; sternites microtuberculate; 50-55 tergites; about 85 sternites. Lateral seta  $22 \mu$  long, on about sternite 7; first ventral  $23.5 \mu$  long, on about sternite 26; second ventral  $14 \mu$  long, on about sternite 51; third ventral  $33 \mu$  long, on about sternite 8 from rear; accessory seta present, minute. Female genitalia  $31.5 \mu$  wide,  $20.5 \mu$  long, coverflap with thin basal lines, seta  $10 \mu$  long.

Male  $170-190 \mu$  long,  $60-65 \mu$  thick.

**Type locality:** Brunswick, Georgia. **Collected** May 14, 1940, by the writer. **Other localities:** Castle Hayne, Wilmington, N. C., May 5 and 8; Meggett, Charleston, S. C., May 11; Clayton, N. C., June 1, 1940, collected by the writer. **Host:** *Liquidambar styraciflua* L., Sweet Gum. **Relation to host:** The mites are undersurface leaf vagrants. **Type slide**, so designated, with the above indicated data. **Paratype slides**, two of mites from Brunswick, two from Meggett, and one from Castle Hayne, May 5, 1940. The back structure of this mite is like *Calepitrimerus*. Its specific name alludes to the similarity it bears, on a minute scale, to certain Aleyrodid larvae that cover themselves with white waxy radiations. It may be possible to segregate this mite generically from *Diptilomiopus*, but such a separation must at the moment await further study. *D. aleyrodiformis* inhabits the under-surface of the Sweet Gum leaves, while *Phyllocoptes liquidambaris* is on the upper side. Both of these mites are most numerous in, if not restricted to, shady swamps or proximity to the ocean. The individuals were observed to be progressively more numerous and easier to find as the writer traveled south from North Carolina.

#### GROUP AND GENERIC SYNOPSES

Shield always leaving the rostrum fully exposed above, body wormlike, with abdominal rings nearly always the same above and below, at least on part of the abdomen. Rostrum never large-----Eriophyinae Nal.

Contains the genera *Eriophyes*, *Phytoptus*, *Monochetus*, *Cecidodectes*, *Trichostigma*, *Phytoptochetus*, and *Paraphytoptus*.

Shield with anterior lobe over rostrum base, or with abdominal rings clearly differentiated into tergites (dorsal half-rings) and sternites (ventral half-rings), or most often both characteristics. Body less wormlike, more spindleform or wedge-shaped. Rostrum various, often large-----Phyllocoptinae Nal.

#### Phyllocoptinae

Rostrum large, long, usually rather attenuate, set at right angles to the cephalothorax, the chelicerae and chelicera sheath projecting anterior to the dorsal base of the rostrum proper, then recurving to rostrum; dorsal setae when present always projecting forward; female genital coverflap almost always smooth-----Diptilomiopini Keifer, new tribe

Contains the genera *Diptilomiopus*, *Rhyncaphytoptus*, *Abacoptes*, and possibly *Phyllocoptyches*.

Rostrum various, when large, curving downward but never set at right angles and chelicerae never much separated from rostrum, dorsal setae various, usually projecting caudad; female genital coverflap almost always furrowed-----Phyllocoptini Keifer, new tribe

#### Phyllocoptini

1. Frontolateral shield setae
  - a. Subdorsal abdominal setae-----*Sierraphytoptus* Keifer
  - b. No subdorsal abdominal setae-----*Mackiella* Keifer
1. No extra setae, or at most a central anterior shield seta-----2
2. Sublateral longitudinal furrow-----*Platyphytoptus* Keifer
2. No sublateral furrow-----3
3. Tergites in general outline evenly transversely arched, with at most a slight subdorsal anterior furrow, some species wax bearing—
  - a. Abdomen gradually tapering-----*Phyllocoptes* Nal.
  - b. Caudal section of abdomen suddenly bearing narrower rings-----*Anthocoptes* Nal.
  - c. Tergites with small lobes-----*Gammaphytoptus* Keifer
3. Flattened species or tergites bearing longitudinal furrows, ridges, or dorsal troughs-----4
4. Tergites narrower, microtuberculate or ridged, many species with wax-bearing ridges and tubercles—
  - a. Three to five ridges with furrows between, the ridges fading posteriorly; dorsal setae present-----*Eptrimerus* Nal.

- b. Three ridges, the central ridge ending abruptly before lateral ridges; dorsal setae; featherclaw simple.....*Calepitrimerus* Keifer  
 c. Three ridges, the central ridge ending abruptly before lateral ridges; dorsal setae; featherclaw divided.....*Acaricalus* Keifer  
 d. Three or five ridges gradually fading; no dorsal setae.....*Calacarus* Keifer  
 e. Dorsal lines of wax-bearing tubercles.....*Callyntrotus* Nal.
4. Tergites broader, not tuberculate, few wax-bearing species..... 5  
 5. Anterior portion of abdomen behind shield laterally inflated, the caudal two-thirds tapering normally; divided featherclaw; flat.....*Tumescoptes* Keifer  
 5. Abdomen tapering normally in dorsal view.....6  
 6. Tergites broad, with either lateral tooth-like projections or sloping from an acute longitudinal ridge or both—  
 a. Lateral tooth-like projections; a central ridge in some species.....*Oxypleurites* Nal.  
 b. No lateral projections; a central ridge.....*Tegonotus* Nal.
6. Tergites variously sculptured, no lateral teeth; if a central ridge present then caudal abdominal section projecting obliquely down.....7  
 7. A broad longitudinal tergal trough, edged laterally by a ridge; caudal section of abdomen curved down.....*Phyllocoptus* Keifer  
 7. Caudal section of abdomen projecting obliquely down—  
 a. Tergum flat, a central narrow ridge followed by a transverse depression.....*Caliphoptus* Keifer  
 b. Back flat ahead of rear oblique section.....*Caroloptes* Keifer  
 c. Subelliptical, flat, three narrow longitudinal furrows.....*Acarelliptus* Keifer

## HOST LIST

### BETULACEAE

- Alnus rugosa* (Du Roi), Alder  
*Oxypleurites simus* n. sp., undersurface vagrant

### FAGACEAE

- Fagus grandiflora* Ehrh., Beech  
*Caroloptes fagivagrans* n. sp., along midrib on underside  
*Rhyncaptoptus fagifoliae* n. sp., undersurface vagrant  
*Castanea dentata* L., Chestnut  
*Rhyncaptyoptus castanifoliae* n. sp., undersurface vagrant  
*Quercus prinus* L., Chestnut Oak  
*Acarelliptus cocciformis* n. sp., sessile on undersurface  
*Quercus kelloggii* Newb., Kellogg's Black Oak  
*Calacarus pulveriferus* n. sp.  
*Acaricalus secundus* n. sp., both uppersurface vagrants  
*Quercus agrifolia* Nee., Coast Live Oak  
*Acaricalus secundus* n. sp.

### HAMAMELIDACEAE

- Liquidambar styraciflua* L., Sweet Gum  
*Phyllocoptes liquidambaris* n. sp., uppersurface vagrant  
*Diptilomitus aleyrodiformis* n. sp., undersurface vagrant

### AQUIFOLIACEAE

- Ilex coreaceae* (Pursh), Large Gallberry  
*Diptilomitus carolinensis* n. sp., undersurface vagrant

### THEACEAE

- Camellia japonica* L.  
*Calacarus adornatus* K., leaf vagrants causing slight browning

### ERICACEAE

- Arctostaphylos* sp., Manzanita  
*Phyllocoptes manzanitae* n. sp., leaf vagrant  
*Azalea atlantica* Ashe, Dwarf Azalea  
*Phyllocoptes atlantazaleae* n. sp., around terminal buds  
*Rhododendron occidentale* Gray, Western Azalea  
*Phyllocoptes rhododendronis* n. sp., undersurface vagrant

### VACCINIACEAE

- Vaccinium amoenum* Ait., Blueberry  
*Phyllocoptes vandinei* n. sp., uppersurface vagrant  
*Vaccinium* aff. *atrocoecum* Gray  
*Calepitrimerus darrowi* n. sp., undersurface vagrant

### SOLANACEAE

- Lycopersicon esculentum* Mill., Tomato  
*Phyllocoptes destructor* n. sp., browning and shriveling of the leaves, russetting of fruit.

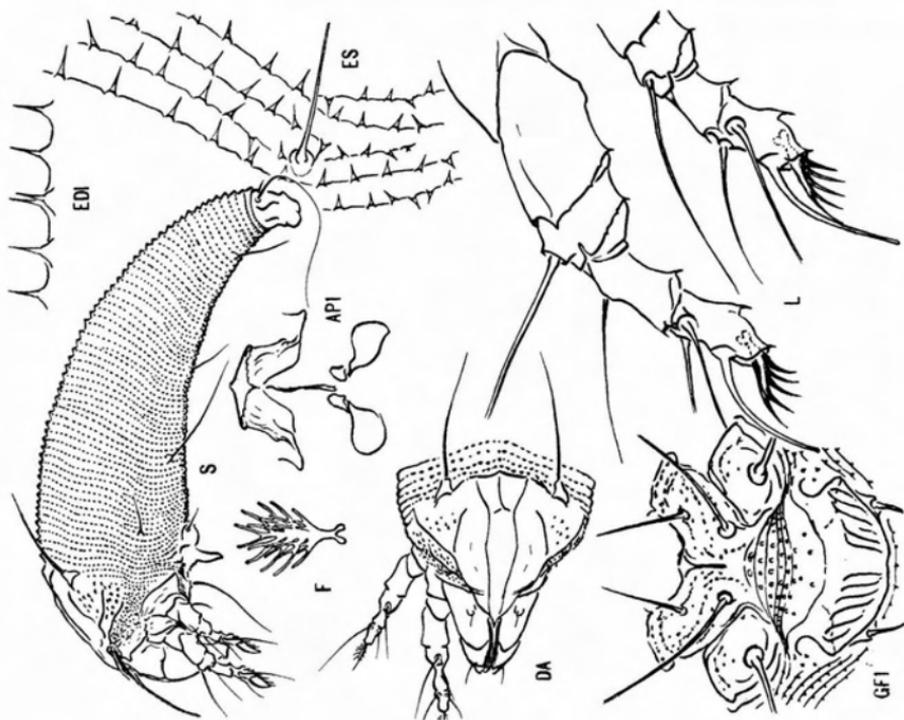


Plate 140, *Phyllocoptes manzanitae*, n. sp.

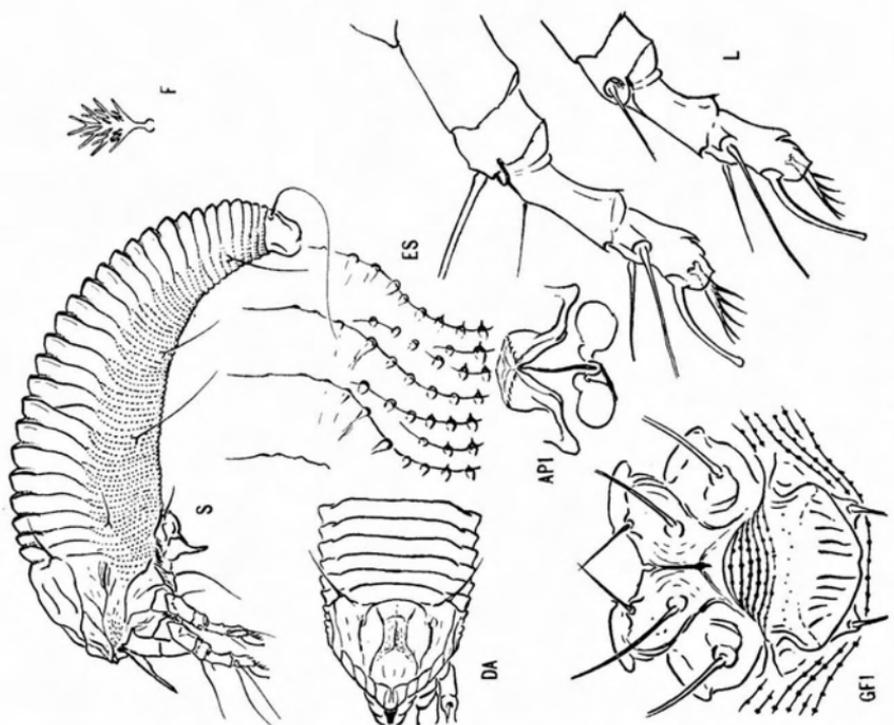


Plate 141, *Phyllocoptes destructor*, n. sp.

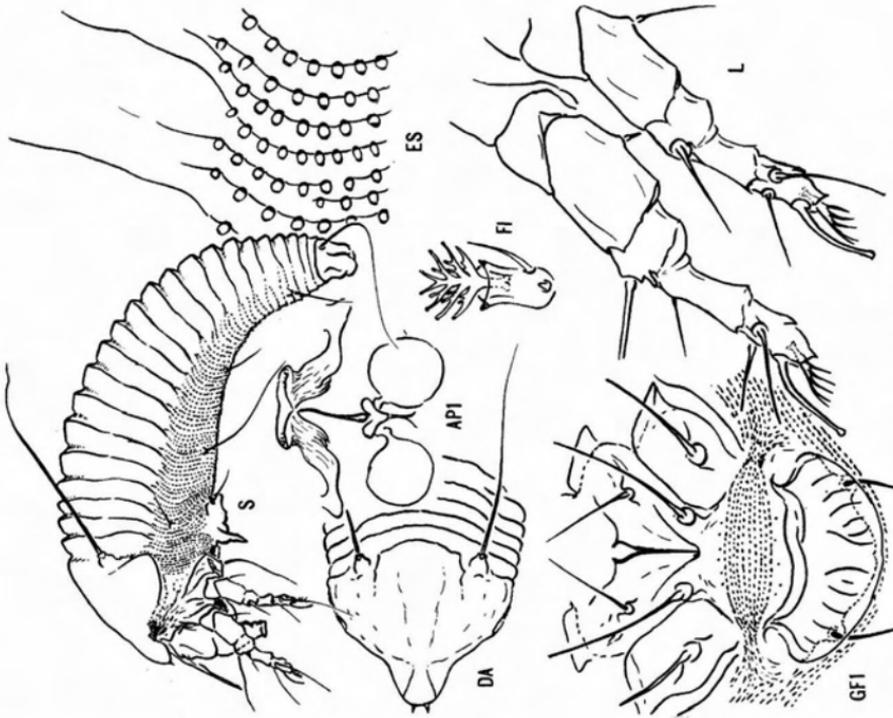


Plate 143, *Phyllocoptes rhododendronis*, n. sp.

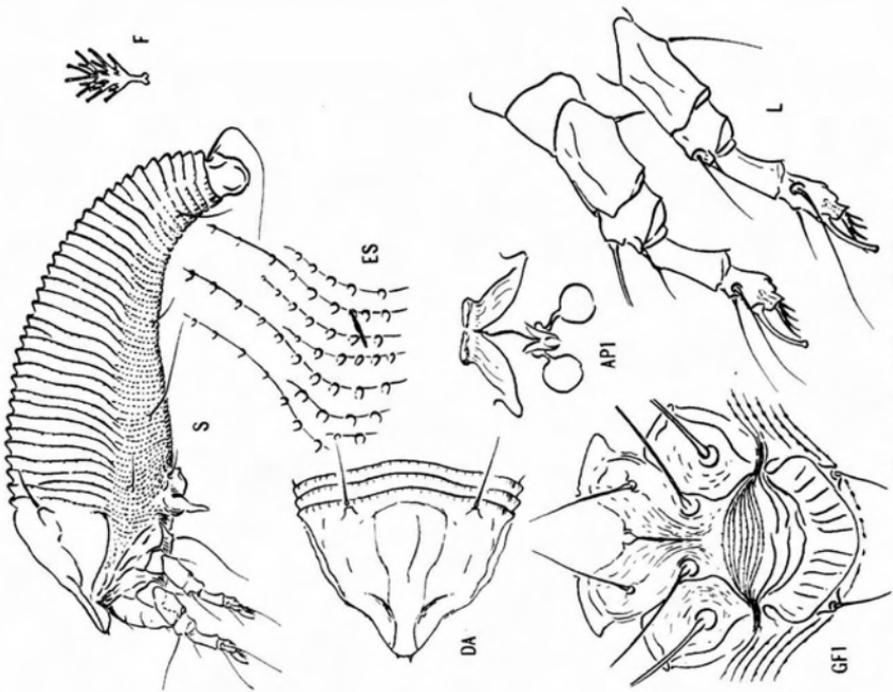
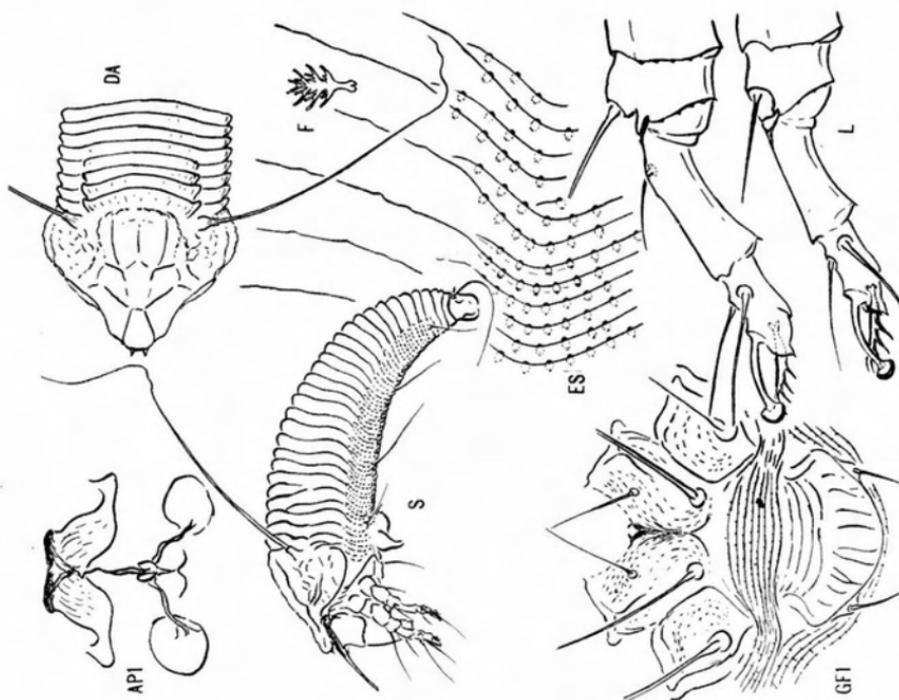
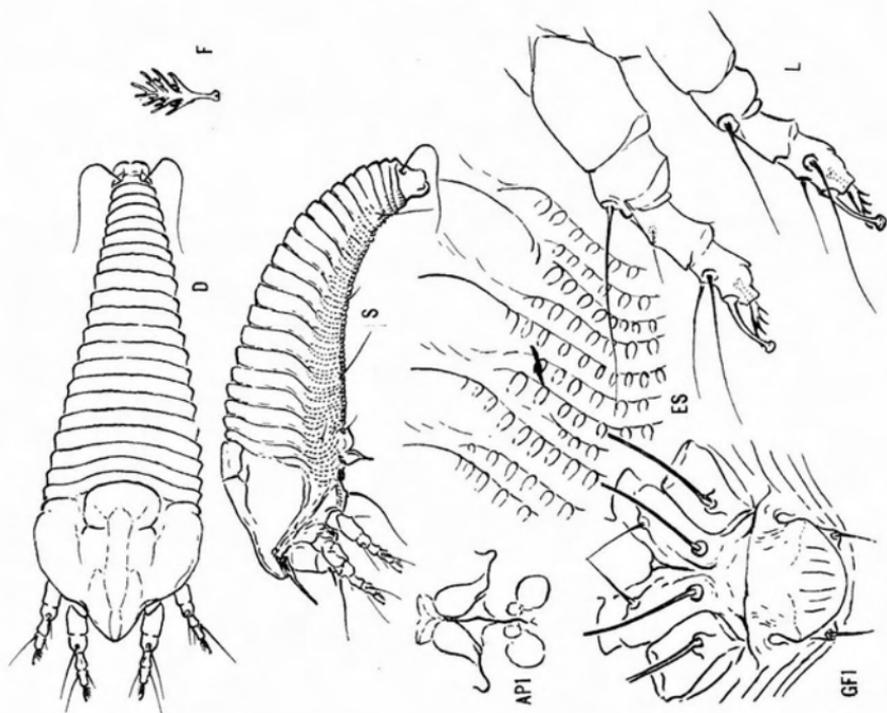


Plate 142, *Phyllocoptes atlantazaleae*, n. sp.



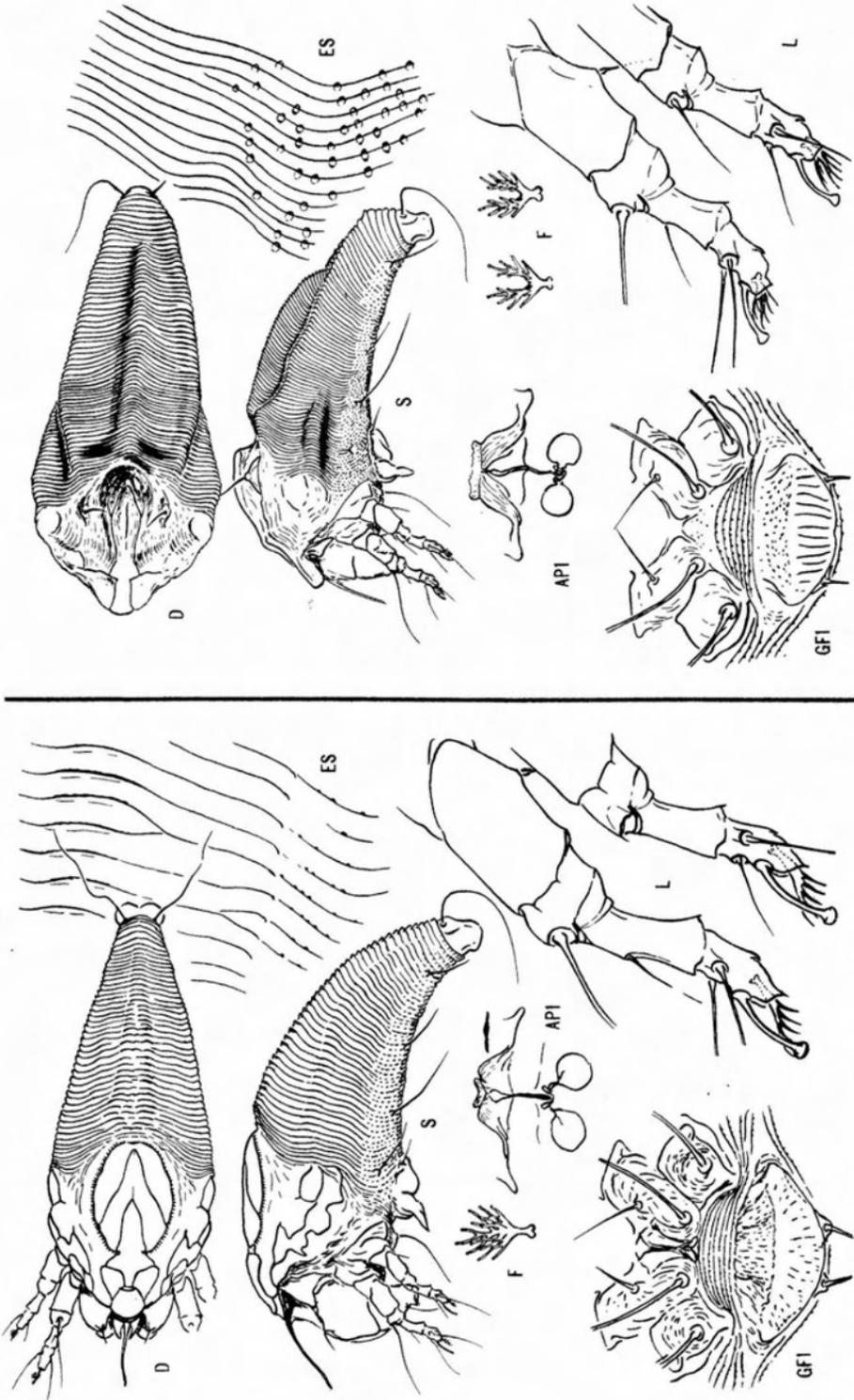


Plate 147, *Acaricatus segundus*, n. sp.

Plate 146, *Catacarus putviferus*, n. sp.

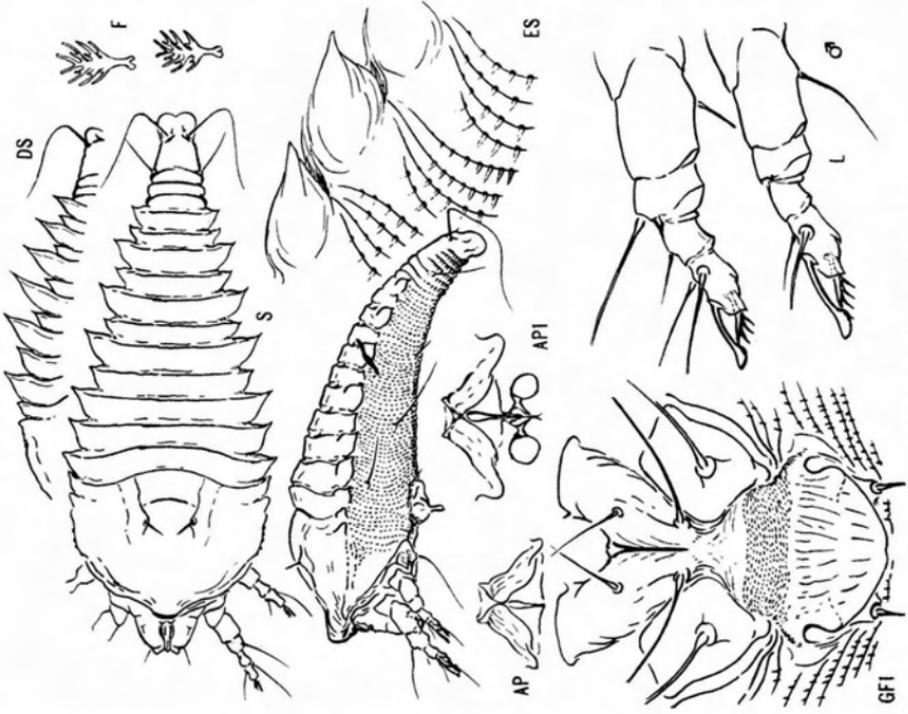


Plate 149, *Orypleurites sinus*, n. sp.

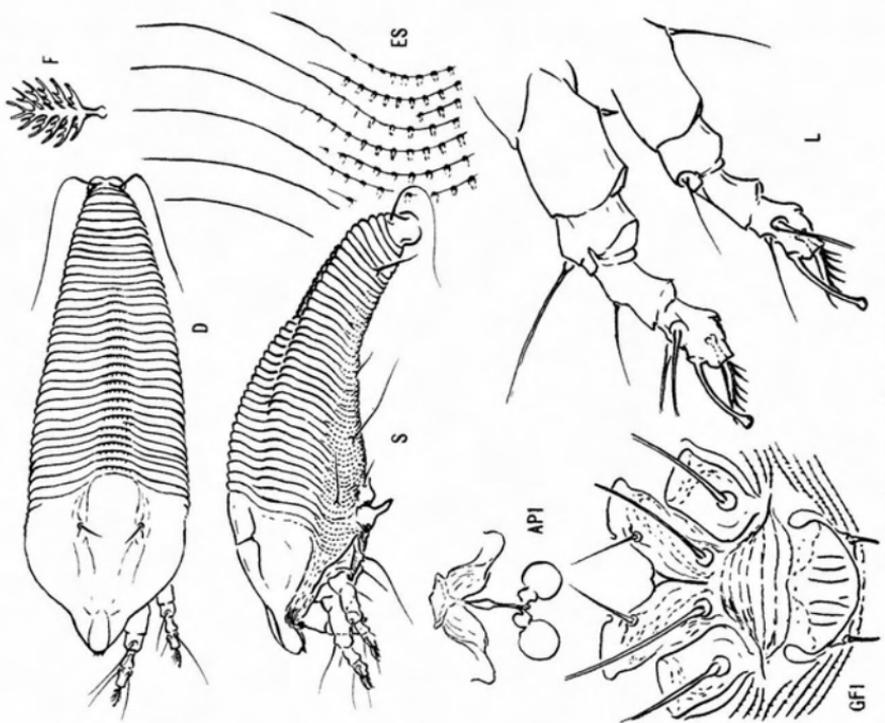


Plate 148, *Callepitrimerus darrowi*, n. sp.

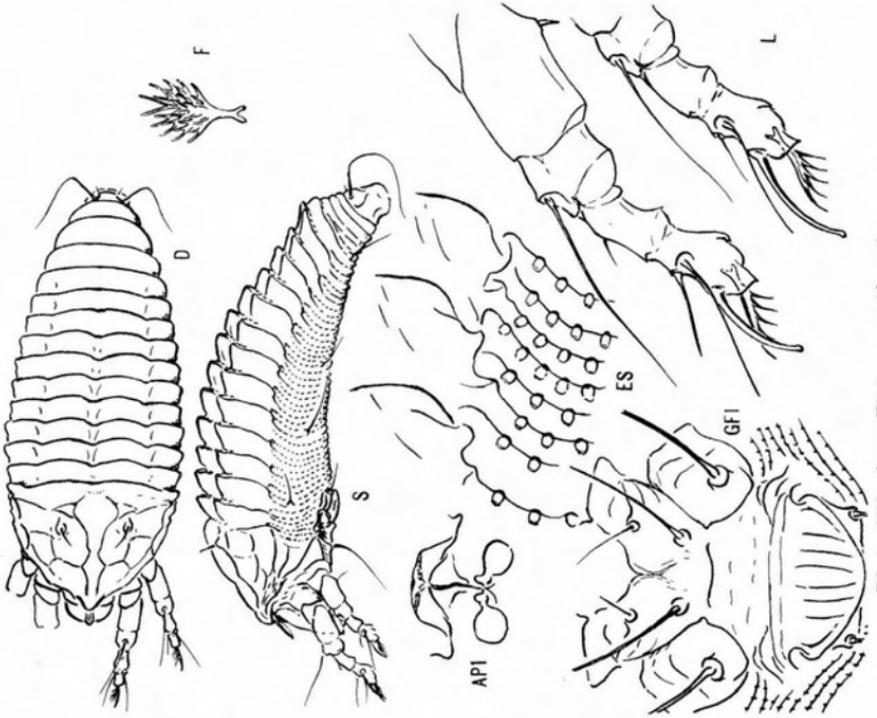


Plate 151, *Acarelliptus cocciformis*, n. sp.

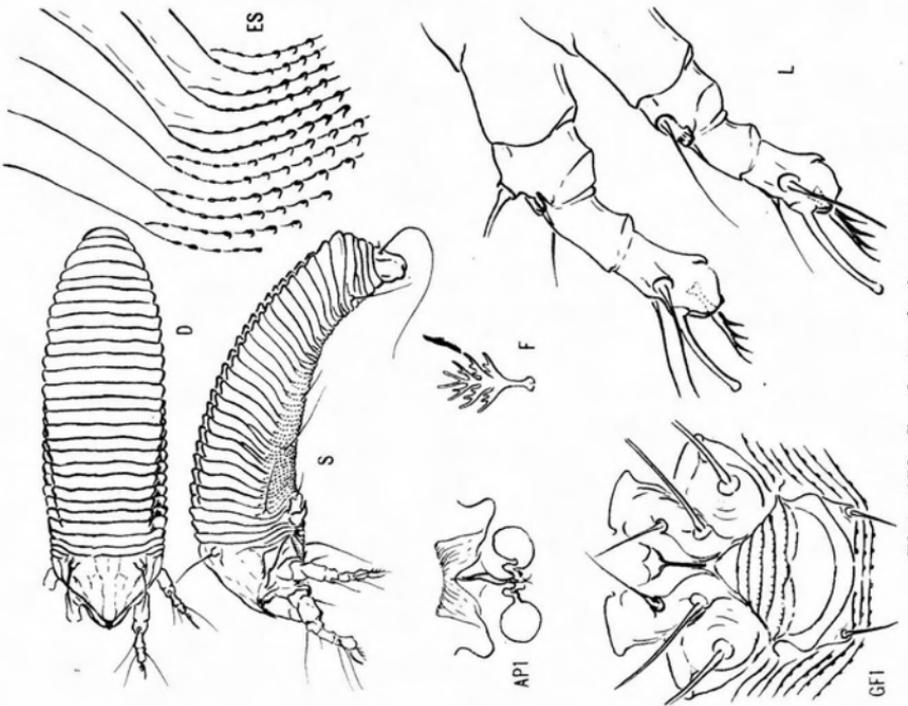


Plate 150, *Caroloptes fagivagrans*, n. sp.

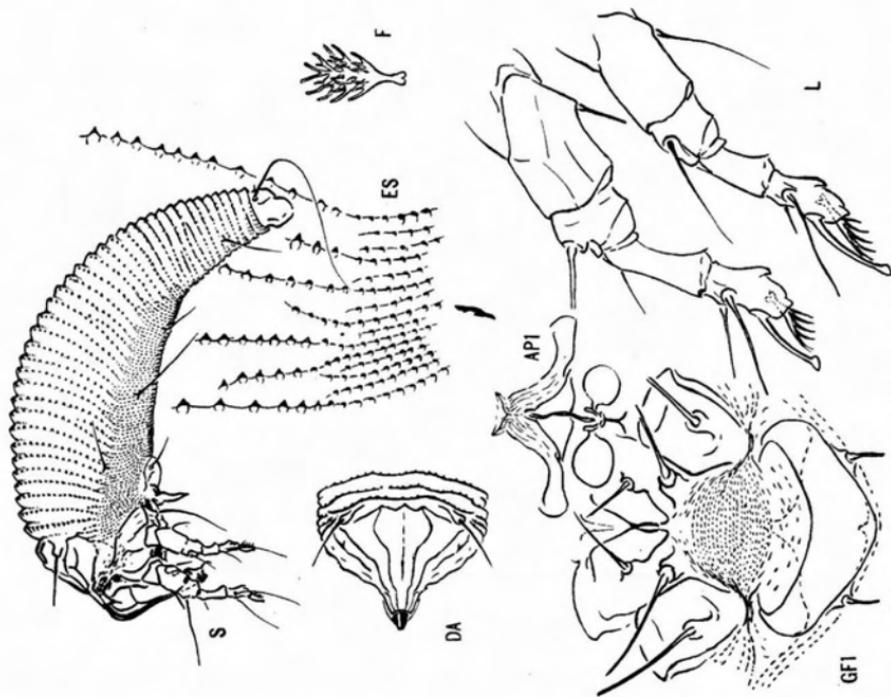


Plate 153, *Rhyncaphytoptus fagifoliae*, n. sp.

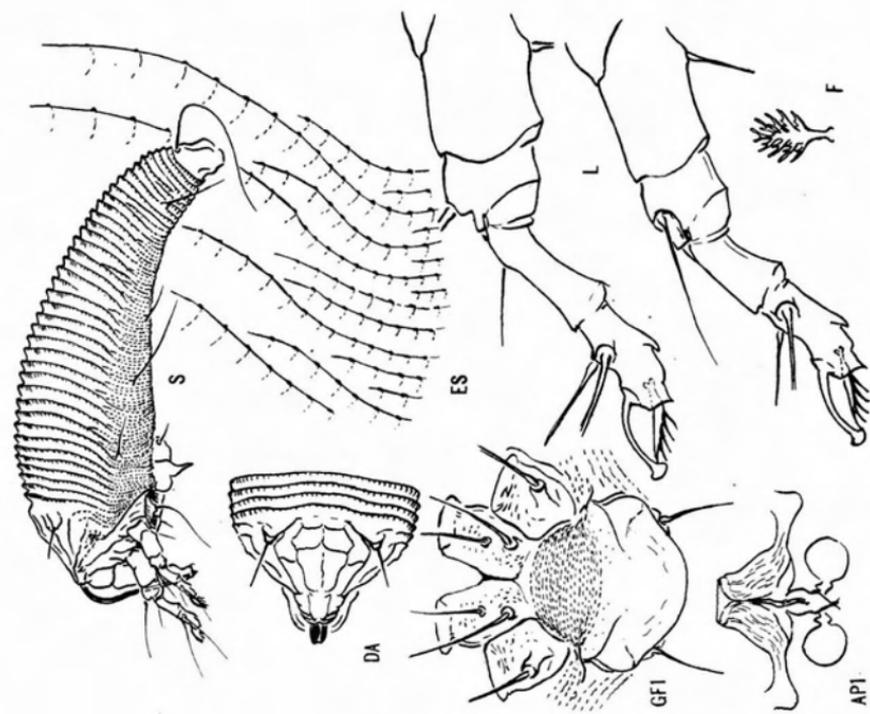


Plate 152, *Rhyncaphytoptus castanifoliae*, n. sp.

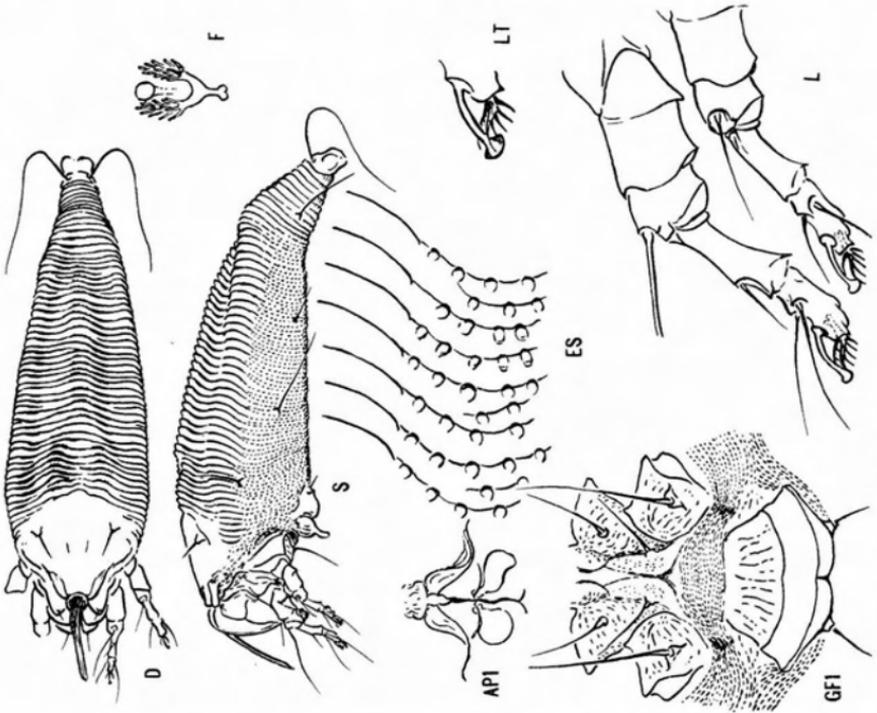


Plate 155, *Diptilomitopus ateyroditiformis*, n. sp.

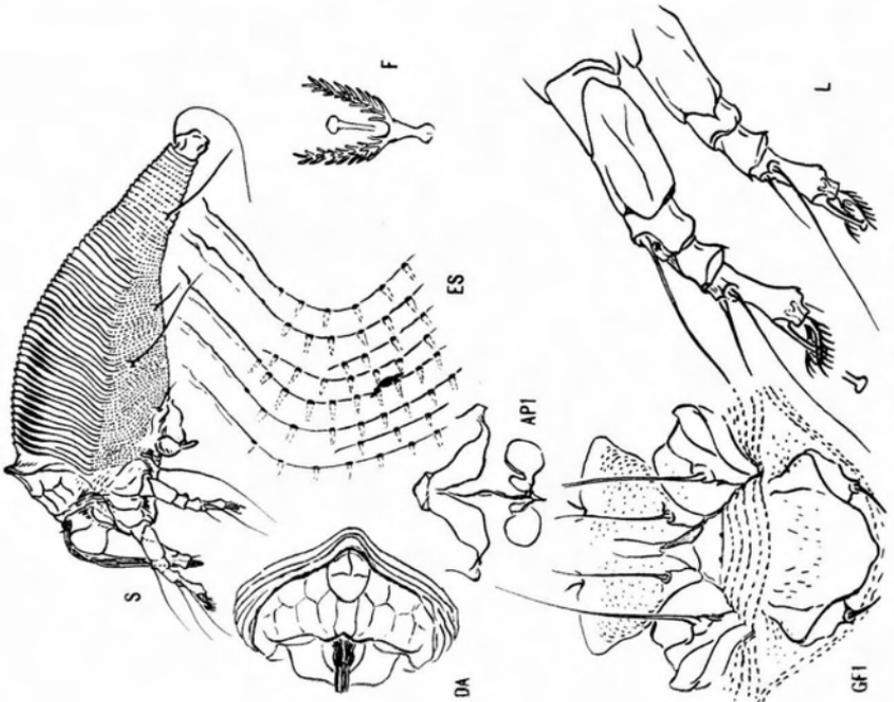


Plate 154, *Diptilomitopus carolinensis*, n. sp.

**DESIGNATIONS ON PLATES**

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- AP1** Internal female genitalia  
**D** Dorsal view of mite  
**DA** Dorsal view of anterior section of mite  
**DS** Left side in dorsal view  
**ED1** Dorsal skin in side view  
**ES** Side skin  
**F** Featherclaw  
**GF1** Female genitalia and coxae from below  
**L** Left legs  
**LT** Tarsal structures  
**S** Side view of mite