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**ERIOPHYID STUDIES XIX**

H. H. KEIFER  
California Department of Agriculture

The genus *Aceria*, which is the largest of the Eriophyid genera, continues to grow. This nineteenth installment describes six new *Aceria* species, four of which are Californian. The new species are: one on carnation in Southern California; a second *Aceria* which causes longitudinal folds in barberry leaves; the third is from Chile and has the unusual habit of producing bead galls on twigs of *Acacia*; the fourth *Aceria* damages greenhouse *Tradescantia* in Maryland; the fifth is a spiny mite on *Eriodictyon*; the sixth *Aceria* lives in the flower heads of iodine bush and salicornia. The other two described mites are: a *Paraphytoptus* on pine tree mistletoe; a species of *Tetra* on mountain mahogany.

The previous installment of Eriophyid Studies, XVIII, appeared in the Bulletin under date of March 18, 1952: Vol. 41, No. 1, p. 31.

***Aceria paradianthi* Keifer, new species**

Plate 211

Female 200 $\mu$  long, 50-55 $\mu$  thick, wormlike; color yellow. Rostrum 36 $\mu$  long, down-curved. Shield 35 $\mu$  long, 43 $\mu$  wide; design a network: Median line starting from a fork from the admedians at  $\frac{1}{3}$ , at  $\frac{2}{3}$  a transverse line runs across the shield from in front of dorsal tubercles on each side, two curved lines connect median line to admedians just ahead of rear margin; admedians curved, close together on front  $\frac{1}{3}$  ahead of median line; first submedian line extending to a point laterad of each dorsal tubercle where it connects by a cross line to the transverse line; second submedian line broken; shield with a well defined longitudinal granular area above the coxae; dorsal tubercles 25 $\mu$  apart; dorsal setae 25 $\mu$  long, projecting backward. Forelegs 38 $\mu$  long, tibia 9 $\mu$  long, tarsus 10 $\mu$  long, claw 9 $\mu$  long, curved, tapering; featherclaw 6-rayed. Hindlegs 35 $\mu$  long, tibia 6 $\mu$  long, tarsus 8 $\mu$  long, claw 9 $\mu$  long. Coxae somewhat granular, the first coxae hardly connate centrally. Abdomen with about 85 rings; the microtubercles equally developed dorsally and ventrally and each produced into a point. Lateral seta 45 $\mu$  long, on about ring 10; first ventral seta 55 $\mu$  long, on about ring 29; second ventral 45 $\mu$  long, on about ring 50; third ventral 43 $\mu$  long, on ring 8 from rear; accessory seta present. Female genitalia 28 $\mu$  wide, 17 $\mu$  long, coverflap with about 14 longitudinal furrows; seta 25 $\mu$  long.

Male not seen.

**Type locality:** Goleta, California. **Collected:** February 25, 1952, by R. J. Reid, Santa Barbara County Agricultural Inspector. **Host:** *Dianthus* sp., Carnation (Caryophyllaceae). **Relation to host:** The mites live between the leaf bases and stems, being especially numerous toward the lower sections of the plant. The result is a tendency toward stunting and basal sprouting. Infested plants are said to have a water-soaked appearance, but the writer has not seen damaged plants. Clippings would indicate a certain amount of yellowing results from the mites' activities. **Type material:** One designated type slide, and eight paratype slides; also the dry envelope material. *Aceria paradianthi* is characterized by the 6-rayed featherclaw and the transverse line across the shield at the  $\frac{2}{3}$  point. A species, *dianthi* Lindroth 1904, evidently referable to *Aceria*, is said to be free living on carnation in Europe, and to have a 5-rayed featherclaw. See Roivainen, *Animalia Fennica* #6, p. 94, 1951.

*Aceria caliberberis* Keifer, new species

## Plate 212

Female 170-195 $\mu$  long, 40-45 $\mu$  thick; color light yellow; body shape wormlike. Rostrum 28 $\mu$  long, curved down. Shield 30 $\mu$  long, 34 $\mu$  wide; central design mostly obsolete, the admedian lines distinct on the rear half; shield laterally with two diverging longitudinal lines which suddenly converge to rear of shield, and have two diagonal connecting lines; lateral granules nearly absent; dorsal tubercles 21 $\mu$  apart; dorsal setae projecting backwards 30 $\mu$ . Forelegs 33 $\mu$  long, tibia 7 $\mu$  long, with seta; tarsus 7.5 $\mu$  long, claw 10 $\mu$  long, tapering; featherclaw 5-rayed. Hindlegs 30 $\mu$  long, tibia 5 $\mu$  long, tarsus 7 $\mu$  long, claw 10 $\mu$  long. Abdomen with 50-55 rings, evenly set with microtubercles; the microtubercles rounded. Lateral seta 40 $\mu$  long, on about ring 6 behind shield; first ventral seta 60 $\mu$  long, on about ring 15; second ventral 14 $\mu$  long, on about ring 28; third ventral seta 35 $\mu$  long, on about ring 6 from rear; accessory seta present. Female genitalia 21 $\mu$  wide, 16 $\mu$  long, coverflap with about 12 longitudinal furrows; seta 45 $\mu$  long.

Male not seen.

**Type locality:** Garnet Peak, San Diego County, California. **Collected:** November 22, 1951, by Professor C. E. Norland, San Diego State College. **Host:** *Berberis californica* Jepson, Barberry (Berberidaceae). **Relation to host:** The mites make an irregular, sinuate fold in the leaves from the upper surface. This fold usually is longitudinal, but may occur on any part of the leaf from midrib to edge. **Type material:** A type slide and eight designated paratype slides; also the dry material from which the slides were made. The distinctive feature of this mite is the lateral design on the shield.

*Aceria rosas-costae* Keifer, new species

## Plate 213

Female 115-125 $\mu$  long, 30 $\mu$  thick, short, wormlike, red color. Rostrum 19 $\mu$  long, down-curved. Shield 22 $\mu$  long, 25 $\mu$  wide; design faint, the admedians distinct on the rear  $\frac{2}{3}$  of the shield; laterally the shield has a few large granules above the coxae. Dorsal tubercles 18 $\mu$  apart; dorsal setae projecting backwards 14 $\mu$ . Forelegs 23 $\mu$  long, tibia 5 $\mu$  long, with a seta; tarsus 6 $\mu$  long, claw 6 $\mu$  long, tapering; featherclaw 5-rayed. Hindlegs 22 $\mu$  long, tibia 4.5 $\mu$  long, tarsus 5.5 $\mu$  long, claw 6.5 $\mu$  long. Coxae connate. Abdomen with 40-45 rings, evenly set with microtubercles, the microtubercles rounded. Lateral seta 17 $\mu$  long, on about ring 7; first ventral seta 50 $\mu$  long, on about ring 15; second ventral 8.5 $\mu$  long, on about ring 22; third ventral 19 $\mu$  long, on about ring 5 from rear; accessory seta present. Female genitalia 16 $\mu$  wide, 8 $\mu$  long, coverflap with 6 or 7 diagonal furrows; seta 15 $\mu$  long.

Male not seen.

**Type locality:** Cachagua, La Lajuela, Chile. **Collected:** October 7, 1944 by T. Schudeck. **Host:** *Acacia cavenia* Mol., Leguminosae. **Relation to host:** The mites produce bead galls, with central openings, on the twigs. When the galls form, the twigs are presumable green. **Type material:** Type slide and twelve paratype slides; also the dry plant parts bearing the galls. Five of these paratype slides are being sent to Dr. J. A. Rosas Costa, Buenos Aires, who sent me the material, and for whom I am naming the species. The mite itself is rather nondescript, but the formation of bead galls on twigs is most unusual as far as our present acquaintance with Eriophyids goes.

*Aceria tradescantiae* Keifer, new species

## Plate 214

Female 200 $\mu$  long, 50-55 $\mu$  thick, wormlike, color light yellow. Rostrum 22 $\mu$  long, down-curved. Shield 38 $\mu$  long, 36 $\mu$  wide; median line distinct on rear half of shield; admedian lines gradually diverging toward rear; first submedian line forked twice in front of dorsal tubercles, with short dashes scattered between these lines; lateral granular band with a distinct line running along upper edge; dorsal tubercles 21 $\mu$  apart; dorsal setae 48 $\mu$  long, projecting backwards. Forelegs 37 $\mu$  long, tibia 8 $\mu$  long, with seta; tarsus 8 $\mu$  long, claw 9 $\mu$  long, tapering; featherclaw 8-rayed. Hindlegs 35 $\mu$  long, tibia 7 $\mu$  long, tarsus 8 $\mu$  long, claw 10 $\mu$  long. Coxae with granules and short dashes, the forecoxae connate. Abdomen with about 75 rings; microtubercles evenly spaced throughout and

rounded. Lateral seta  $48\mu$  long, on about ring 10; first ventral seta  $55\mu$  long, on about ring 26; second ventral  $50\mu$  long, on about ring 45; third ventral  $28\mu$  long, on about ring 5 from rear; accessory seta present. Female genitalia  $21\mu$  wide,  $11\mu$  long, coverflap with about fourteen longitudinal furrows; seta  $18\mu$  long.

Male not seen.

**Type locality:** College Park, Maryland. **Collected:** Mar. 17, 1952 by Professor H. S. McConnell of the University of Maryland. **Host:** *Tradescantia* spp., Wandering Jew (Commelinaceae). **Relation to host:** The mites presumably live at the leaf bases and cause stunting and drying of the plants. (Exact information on this point is not available at this writing.) **Type material:** Type slide and seven designated paratypes; also the dry material of the *Tradescantia* from which the slides were made. This mite came to the writer originally under U. S. Bureau of Entomology #52-2053. The mites attracted attention by damaging their host in a University of Maryland greenhouse. *Aceria tradescantiae* is close to *Aceria tulipae* (K.), but differs in having an 8-rayed feather-claw and has more short dashes on the shield.

### *Aceria eriodictyonis* Keifer, new species

#### Plate 215

Female  $170-180\mu$  long,  $45\mu$  thick, wormlike, yellowish. Rostrum  $25\mu$  long, directed downwards. Shield  $24\mu$  long,  $33\mu$  wide; design of longitudinal lines: median line present toward rear; admedians near each other anteriorly, curving outward in center; first submedian lines forked in front of tubercles; second and third submedians present; few lateral microtubercles. Dorsal tubercles  $17\mu$  apart on rear margin; dorsal setae  $19\mu$  long, projecting backward. Forelegs  $25\mu$  long, tibia  $5\mu$  long, with strong seta; tarsus  $7\mu$  long, claw  $10\mu$  long, slightly knobbed; featherclaw 4-rayed. Hindlegs  $23\mu$  long, tibia  $4\mu$  long, tarsus  $5\mu$  long, claw  $10\mu$  long. Abdomen with about 50 rings; completely microtuberculate, the microtubercles produced into moderately long spinules. Lateral seta  $10\mu$  long, on about ring 7; first ventral seta  $12\mu$  long, on ring 17; second ventral  $7\mu$  long, on ring 29; third ventral seta  $11\mu$  long, on about ring 6 from rear. Female genitalia  $22\mu$  wide,  $16\mu$  long, coverflap with about 8 longitudinal furrows; seta  $8\mu$  long.

Male not seen.

**Type locality:** Castaic, Los Angeles Co., Cal. **Collected:** Oct. 4, 1951, by L. E. Myers, of the Los Angeles Agricultural Commissioner's Office, and by the writer. **Host:** *Eriodictyon crassifolium* Benth., (Hydrophyllaceae). **Relation to host:** The mites occur on the thick sticky hairs on the small leaves immediately after they have emerged from the terminal bud. **Type material:** One type slide and fourteen paratype slides bear the above data. This mite has the longest microtubercle spinules of any Eriophyid yet discovered in California. These spinules, and those on other Eriophyids previously described, are apparently correlated with the sticky nature of the hosts, preventing the mites from becoming fatally trapped.

### *Aceria allenrolfeae* Keifer, new species

#### Plate 216

Female  $160\mu$  long,  $45\mu$  thick, wormlike, dull yellow-white. Rostrum  $23\mu$  long, curved down. Shield  $23\mu$  long,  $28\mu$  wide; the central design obsolete; laterally with an ocellar spot just ahead of the rings, with a line above it. Dorsal tubercles  $24\mu$  apart, dorsal setae  $28\mu$  long, projecting backward. Forelegs  $30\mu$  long, tibia  $6\mu$  long, with seta; tarsus  $8\mu$  long, claw  $9\mu$  long, tapering; featherclaw 6-rayed. Hindlegs  $27\mu$  long, tibia  $5\mu$  long, tarsus  $8\mu$  long, claw  $10\mu$  long. Forerexae contiguous, with no apparent granulations. Abdomen with 50-55 rings, some ventrad reduction in ring number; the rings set with rather large, rounded microtubercles. Lateral seta  $22\mu$  long, on about ring 7; first ventral  $45\mu$  long, on about ring 16; second ventral seta  $20\mu$  long, on about ring 27; third ventral seta  $29\mu$  long, on ring 5 from rear. Accessory seta present. Female genitalia  $20\mu$  wide,  $15\mu$  long, coverflap with about 8 longitudinal ridges; seta  $32\mu$  long.

Male not seen.

**Type locality:** Seventeen miles south of Bakersfield on highway just north of Wheeler Ridge. **Collected:** Nov. 18, 1951 by the writer. **Host:** *Allenrolfea occidentalis* (Wats.), Iodine bush (Chenopodiaceae). **Relation to host:** The mites live at the junction of the joints, and especially in the flower heads. The host is probably little damaged. **Type material:** A type slide and six paratype slides so designated. In addition there is a considerable amount of dry plant material from which the slides were made. What appears to be this same mite also occurs in *Salicornia* along the San Diego County coast. *Aceria salicorniae* (Nal.), described from Cyprus, is said to have a shield design of longitudinal lines and a 5-rayed featherclaw. *Aceria allenrolfeae* has unusually long genital setae.

### Paraphytoptus arceuthobii Keifer, new species

#### Plate 217

Female 160-170 $\mu$  long, 40-45 $\mu$  thick, stocky, yellowish. Rostrum 33 $\mu$  long, curved down. Shield 31 $\mu$  long, 43 $\mu$  wide; design a network: median line complete, receiving a dart-shaped mark at  $\frac{1}{2}$  and joining two convex lines at rear; submedian lines undulating, meeting the admedians in the middle, and the outer ends of the convex lines to the rear; second submedians curved and broadly forked in front of dorsal tubercle; large lateral granular area. Dorsal tubercles 26 $\mu$  apart, the setae projecting 20 $\mu$  backward. Forelegs 33 $\mu$  long, tibia 7 $\mu$  long, with strong seta; tarsus 8 $\mu$  long; claw 7 $\mu$  long, tapering; featherclaw 6-rayed. Hindleg 29 $\mu$  long, tibia 6 $\mu$  long, tarsus 7 $\mu$  long, claw 9 $\mu$  long. Coxae narrowly connate centrally, granular. Abdominal rings completely microtuberculate, the rear quarter of the abdomen with tergites differentiated from the sternites by being broader, with elongate microtubercles, and covering about two sternites each; 65-68 sternites, 55-60 tergites. Lateral seta 25 $\mu$  long, on about ring 11; first ventral 38 $\mu$  long, on ring 23; second ventral 8 $\mu$  long, on ring 38; third ventral 26 $\mu$  long, on ring 5 from rear. Accessory seta present. Female genitalia 15 $\mu$  long, 25 $\mu$  wide, coverflap with about 12 longitudinal furrows; seta 16 $\mu$  long.

Male not studied.

**Type locality:** Fallen Leaf Lake, El Dorado County, Cal. **Collected:** Sept. 13, 1951 by the writer. **Host:** *Arceuthobium campylopodium* Engelm., Pine tree mistletoe (Loranthaceae), growing on Jeffrey pine. **Relation to host:** The mites live in the pockets holding the staminate flowers; no damage was apparent. **Type slide:** So designated, with the above data. **Partype slides:** Nine in number. There is also dry plant material from which part of the slides were made. The 6-rayed featherclaw is partly distinctive for this mite. This is the first species of *Paraphytoptus* discovered in California that lives on a non-hairy host. In this case the mite functions entirely as a budmite, unlike the other members of the genus which are in part free-living. The species probably has a wide range in California on pine tree mistletoe, as illustrated by an additional record: Mt. Diablo, Contra Costa County, Cal., Sept. 20, 1951.

### Tetra cercocarpi Keifer, new species

#### Plate 218

Female 140 $\mu$  long, 45 $\mu$  wide, 40 $\mu$  thick, short-spindleform, yellowish. Rostrum 30 $\mu$  long, projecting down. Shield 43 $\mu$  long, 43 $\mu$  wide, with a moderately large lobe over rostrum; shield without an apparent design but with some slight granulations; dorsal tubercles 25 $\mu$  apart, on rear margin; dorsal setae 22 $\mu$  long, projecting up and backward. Legs with femoral setae present; foreleg 35 $\mu$  long, tibia 7 $\mu$  long, tarsus 7 $\mu$  long, claw 8 $\mu$  long, tapering; slightly knobbed; featherclaw 6-rayed. Hindleg 28 $\mu$  long, tibia 6 $\mu$  long, tarsus 6 $\mu$  long, claw 9 $\mu$  long. Anterior coxae contiguous. Abdomen with 27 tergites and 45 sternites; the tergites without microtubercles except on lateral lobes; the first two tergites produced upward to form a transverse ridge, with the remainder forming a broad central longitudinal trough flanked on each side by longitudinal ridge; sternites with pointed microtubercles. Lateral seta 10 $\mu$  long, on about sternite 6; first ventral 32 $\mu$  long, on about sternite 16; second ventral 11 $\mu$  long, on about sternite 27; third ventral 16 $\mu$  long, on sternite 5 from rear. Accessory seta present. Female genitalia 21 $\mu$  wide, 17 $\mu$  long, coverflap with 10-12 double-ranked longitudinal ridges; seta 17 $\mu$  long.

Male about the same size as the female.

**Type locality:** Rocky Camp, Hat Creek, Shasta County, Cal. **Collected:** Aug. 10, 1948, by the writer. **Host:** *Cercocarpus ledifolius* Nutt. (Rosaceae), Mountain mahogany. **Relation to host:** The mites are vagrants on the leaves in the undersurface pubescence. **Type slides:** A type slide and six paratype slides have been designated with the above data. In addition there is the dry material from which the slides were made. The type of this genus, *concaua* (K.), on elm, has much longer dorsal setae, the shield has a definite pattern and the transverse tergal ridge is on the third tergite. A third species in this genus, *Tetra rhamnii* Roivainen occurs on *Rhamnus cathartica* L. in Finland.

### RESORCINOL IN MITE MOUNTING MEDIA

Resorcinol (meta-dihydroxy benzene; 1,3, benzenediol) has certain characteristics that make it advantageous in the preparation of Eriophyid mites for study under the microscope.

Resorcinol belongs to the phenol type of chemicals, and its two nearest chemical "relatives" are hydroquinone and pyrocatechol. Neither of these latter chemicals have proven to be useful in the procedures herein described. Resorcinol is quite water soluble and, like phenol, it has a *strong clearing and expanding action on Eriophyids*. Its ability to clear all opaque material from the inside of Eriophyids becomes stronger than phenol as the result of aging, in some types of media. Mites left in such a medium will be destroyed much faster than those in chloral hydrate media without resorcinol.

A first step formula, incorporating resorcinol, with gum arabic as the thickener, and iodine as the stain, is as follows:

1. Gum arabic powder	-----	1.0	gram
2. Resorcinol crystals	-----	3.0	grams
3. Potassium iodide crystals	-----	0.2	gram
4. Iodine crystals	-----	0.2 to 0.35	gram
Grind in mortar, transfer powder to screw-cap vial			
5. Lactic acid, commercial solution	-----	10.0	cc
6. Hydrochloric acid	-----	8	drops

Heat this mixture in a 45° C. oven for 4 to 5 hours, or until the gum arabic is dissolved. Do not add glycerin as it forms a separate phase with the resorcinol. Do not add water as it destroys the isotonicity of the solution and the mites tend to shrivel.

The next step is that of putting the mites in this medium and the application of heat. This heat should be only enough to barely bring the solution to a boil, or even a little short of that. If plant material containing dry mites is simmered in this solution in a casserole, pour out the medium onto glass slides and recover the mites under the microscope with transmitted light.

Next we take advantage of the fact that resorcinol forms an insoluble polymer with formaldehyde at room temperature. This reaction is aided by the hydrochloric acid.

The following intermediate mixture is necessary in order to remove excess resorcinol, which would "foul up" the final mount.

1. Table sugar (sucrose)	-----	1.	gram
2. Chloral hydrate crystals	-----	8.	grams
3. Potassium iodide	-----	0.2	gram
4. Iodine crystals	-----	0.35	gram
Grind in mortar, transfer to screw-cap vial			
5. Formaldehyde, $\frac{1}{2}$ original strength	-----	30	drops ( $\frac{1}{3}$ cc)

Screw cap down tight to prevent escape of the HCHO and warm for 24 hours in a 45° C. oven.

When needling mites over into this intermediate medium be careful not to let the amount of resorcinol rise to the point where it will jell, as the mites are not readily removed from the jell. The mites can be left in this mixture for an indefinite period. After a day or two they are firm enough to be transferred to balsam or into casting plastic, if the operator wishes to go to that much trouble. They can be put directly into a casting plastic such as Selectron. To put the mites into balsam requires passage through alcohol and xylene, which is considerably more difficult.

The following permanent medium is designed to receive the mites when the excess resorcinol is gone. Usually an interval is advantageous before this transfer, but the worker can determine that by experience. In many cases immediate transfer will be successful, and no shriveling result.

1. Gum arabic powder-----	0.5	gram
2. Table sugar, sucrose-----	0.5	gram
3. Chloral hydrate crystals-----	7.0	grams
4. Potassium iodide crystals-----	0.2	gram
5. Iodine crystals-----	0.2 to 0.35	gram
Grind in mortar, transfer to screw-cap vial		
6. Formaldehyde, $\frac{1}{4}$ original strength-----	18	drops

It may be more advantageous to add 2 grams of chloral hydrate at first, then warm the mixture in a 45° C. oven until dissolved, and then add the remaining 5 grams of chloral hydrate. Gum arabic dissolves reluctantly in concentrations of chloral hydrate as shown in the above formula.

Mites placed in this medium can be oriented for a while, until the formaldehyde has hardened both them and the resorcinol. When hardened, further turning of them is either difficult or impossible.

All of the type slides, and one or two paratype slides each, of the species herein described have been sent to Dr. C. F. W. Muesebeck, for the mite collection of the U. S. Bureau of Entomology, Washington, D. C.

### DESIGNATIONS ON THE PLATES

- AP1—Internal female genital structures
- DA—Dorsal view of shield
- ES—Side skin structure
- F—Featherclaw
- GF1—Female genitalia and coxae from below
- S—Side view of mite
- SA—Side view of anterior section of mite

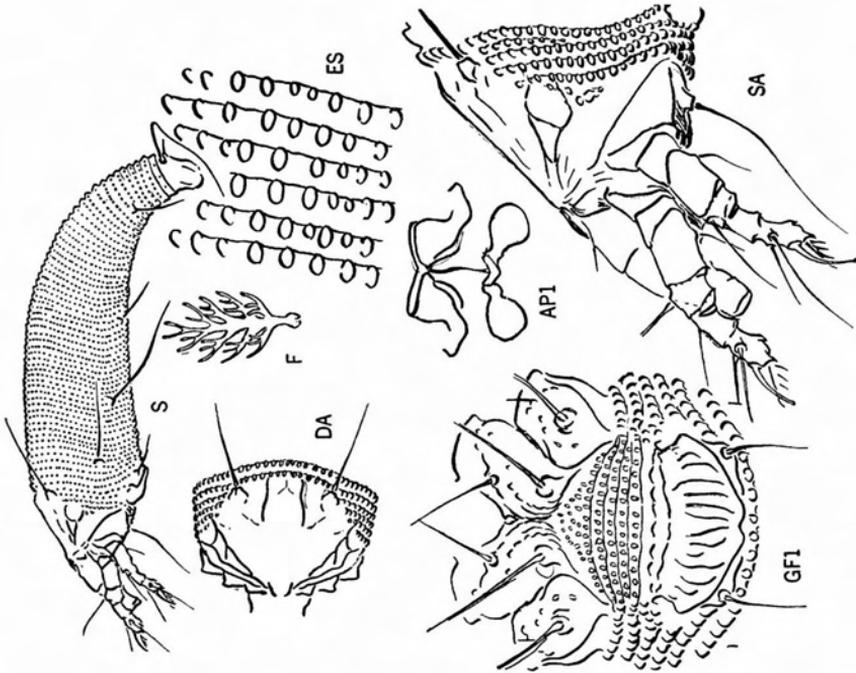


PLATE 212. *Aceria catiberberis* K., new species

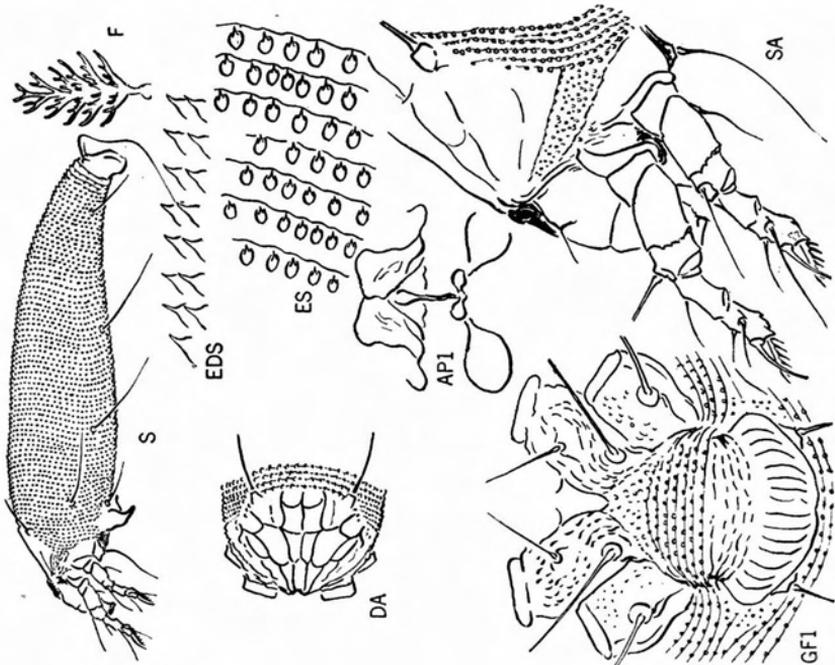


PLATE 211. *Aceria paradiantii* K., new species

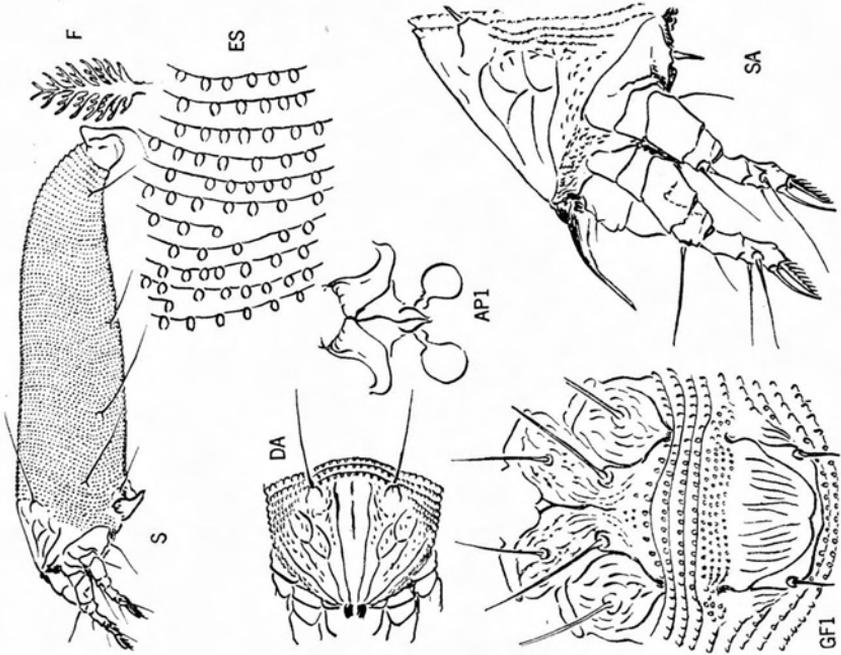


PLATE 214. *Accria tradescantiae* K., new species

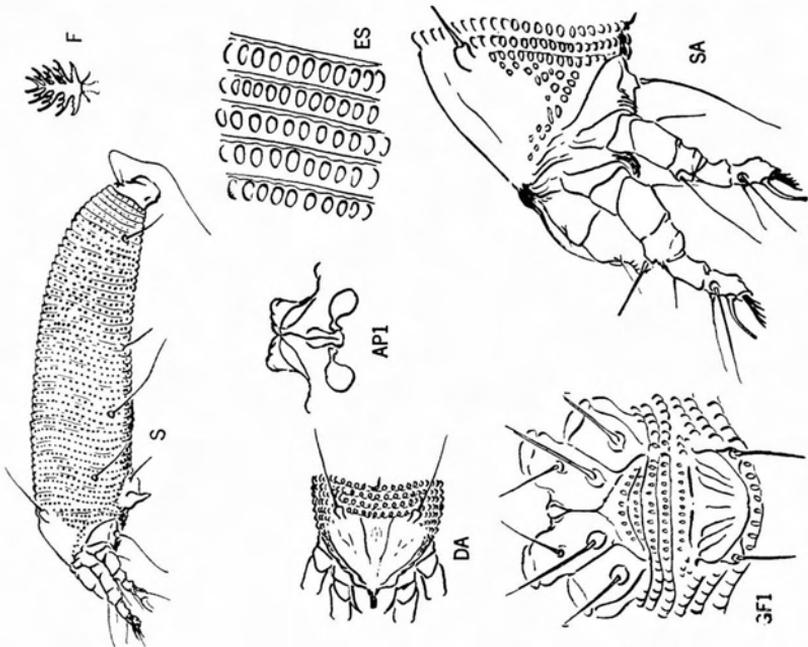


PLATE 213. *Accria rosas-costae* K., new species

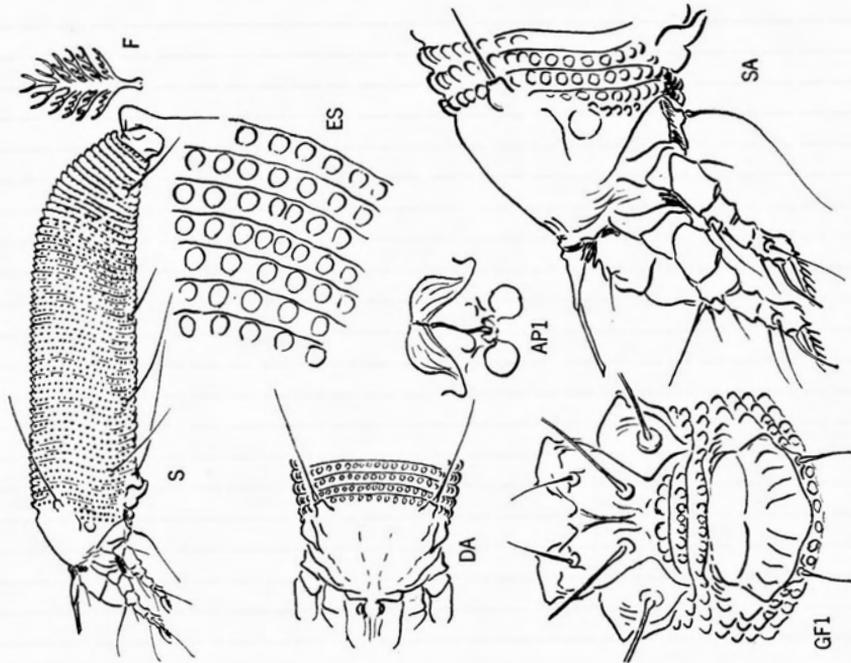


PLATE 216. *Aceria altenrolleae* K., new species

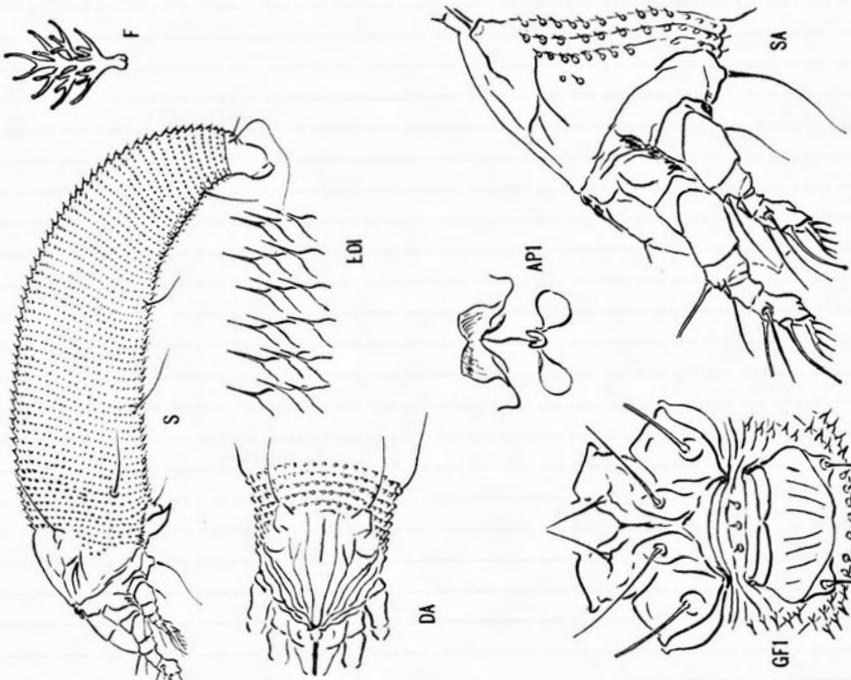


PLATE 215. *Aceria eriodyctyonis* K., new species

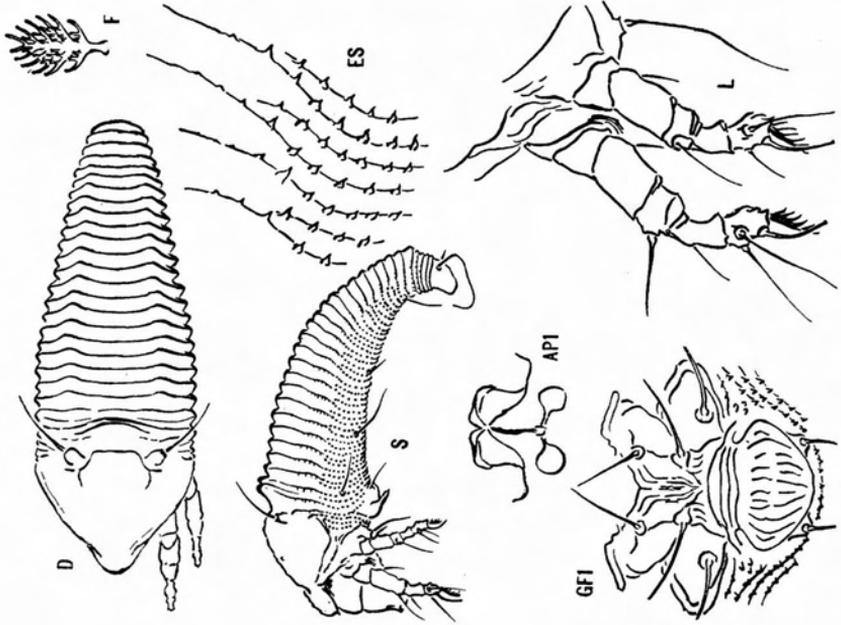


PLATE 218. *Tetra cervocarpi* K., new species

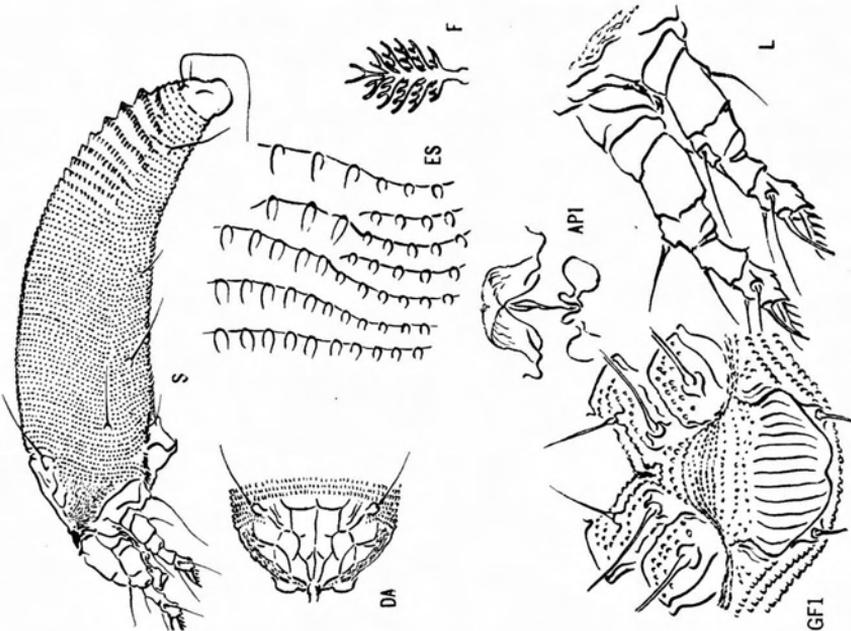


PLATE 217. *Paraphytophtus arcauthobii* K., new species

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