A New Species of Gall-mite (Acarina: Eriophyidae) and an Account of Its Life Cycle*

By G. W. Ramsay

Zoology Department, Victoria University, Wellington

[*Received by Editor, May 29, 1957.*]

Abstract

A new species of gall-mite, *Aceria victoriae,* is described and a brief account of its life-cycle, which is simple and similar to that described for other Eriophyid mites, given Attention is drawn to the fact that one of the main characteristics of the genus *Aceria,* the backward projection of the dorsal setae, is different in the first larva, in which these setae project forward, thereby emphasising the close relationship between the genera *Aceria* and *Eriophyes*

Introduction

During the summer of 1955–56 specimens of *Haloragis erecta* Schindler, being grown for study in the Victoria University Botany Department glasshouse, were attacked by a species of gall-mite which caused extensive bud-gall formation.

The mite attacks both axillary and terminal buds, which then become distorted and often pink or red in colour, swelling up to five or six times the normal size. The average measurements of an axillary bud gall are 2·0 x 3 0 mm and those of a typical apical bud gall 4 0 x 5 0 mm, but great variation in size and degree of distortion occurs; very young leaves tend to thicken, and in cases of severe infestation the bud becomes completely deformed, resulting in a compact mass of contorted leaves In less severe infestations leaves develop further but always remain more or less deformed Sometimes additional buds develop in the axils of deformed lateral buds and, becoming infested by the mite, contribute towards the mass of deformed tissue.

The mites inhabit the spaces between the deformed leaves, especially those at the apex A large gall, collected in September, contained 228 adult mites, 140 larvae and 337 eggs, while small axillary galls usually contained 12–20 adult mites, 3–7 larvae and 9–15 eggs.

The worm-like body with similar tergites and sternites, the presence of two setiferous tubercles, and the absence of an anterior projection on the dorsal shield are characters which place this mite in the subfamily Eriophyinae of Nalepa, 1898. As the dorsal setae project posteriorly over the abdomen from tubercles situated on the rear margin of the shield and the abdominal rings are similar for the full length of the abdomen, the mite belongs to the genus *Aceria* Keifer, 1944

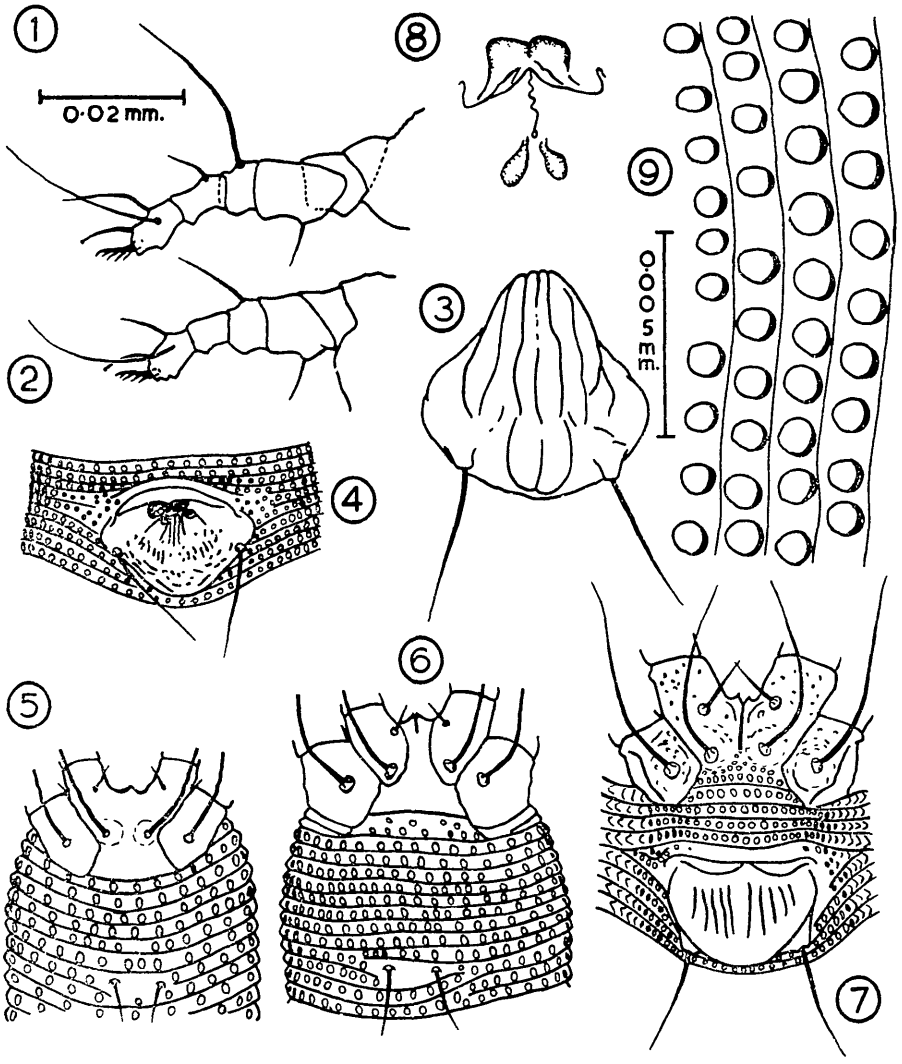
This genus is large and homogeneous, containing more than 53 species separated from one another by minute structural differences. The high degree of host specificity, however, is a character of great value in identifying the species. The host genus *Haloragis* is Australasian and Antarctic in distribution (Rendle, 1938, p. 392) to date only one other species of eriophyid mite having been discovered parasitising it.

* This paper was prepared during the tenure of a New Zealand University Research Fellowship.

Aceria victoriae n.sp. (Figs. 1-14)

FEMALE (Fig. 14). Body 170–220μ long, 36–45μ wide, vermiform, tapering slightly posteriorly and circular in cross-section. Rostrum 17–20μ long and downwardly curved; rostral setae 6–8μ long. Dorsal shield (Fig. 3) subtriangular in outline, 28.8–30.4μ long and 30 0–38.4μ wide, bearing a characteristic pattern of solid lines comprising a broken median line which almost reaches to the posterior margin, admedian lines which bulge outwards and then curve inwards to join the median line posteriorly, submedian lines lateral to these and only present on the anterior two-thirds of the shield and in some specimens only, a few short supernumerary lines. The tubercles on the posterior margin of the dorsal shield are 20–30μ apart and the dorsal setae arising from them 20–22μ long.

Fore-legs (Fig. 1) 36–38μ long, tibia 6.5μ, tarsus 8μ, claw 8μ tapering and bearing a distal knob. Feather claw (Fig. 10) five-rayed and 6.5μ long. Hind-legs (Fig. 2) are 35–36μ long, tibia 5μ, tarsus 8μ, and claw 8μ. All usual limb setae are present. Coxae (Fig. 7) sparingly



TEXT-FIG 1.—Fig 1—Left anterior leg. Fig. 2—Left posterior leg. Fig. 3—Dorsal shield Fig. 4—Male genitalia from below. Fig. 5—First larva, genital setae and coxae from below Fig. 6—Second larva, genital setae and coxae from below. Fig. 7—Female, genitalia and coxae from below Fig. 8—Internal female genitalia. Fig. 9—Detail of skin structure. Figs 1–8 drawn to same scale.

microtuberculate, sternum simple. Thoracic seta I, 8μ long, projecting anterio-medially, thoracic seta II 21–26μ, projecting anterio-laterally, seta III 38–44μ long, parallel to seta II.

Abdomen with about 70–80 dorsal rings, this number ventrally reduced to about 65–72, all rings microtuberculate, the tubercles being bluntly pointed and approximately 1.6μ apart (Fig. 9) The posterior 12–13 rings are slightly broader than the rest and their tubercles elongated The lateral seta, situated on about ring 11, is 48–50μ long, first ventral seta on about ring 21, 51–57μ long; second ventral seta on about ring 38, 19–22μ long; third ventral seta on about ring 60, or seventh ring from the rear, 22–27μ long. Caudal seta 59–64μ, and accessory seta 4–5μ long.

Epigynum (Fig. 7) 19–22μ wide and 14–17μ long, bowl-shaped and located a moderate distance behind the coxae The genital operculum has five lines arranged in a transverse row on either side. Genital seta 20–24μ long. The anterior genital apodeme (Fig. 8) not shortened in ventral view.

MALE. Body is 171–185μ long, 41–44μ wide, more tapering than that of the female. Rostrum 19μ and rostral setae 4–5μ long. Dorsal shield 28 8μ long and 30 0μ wide, the pattern being the same as that described for the female. Dorsal setae 16–17μ long and tubercles set 22–24μ apart.

Fore-legs are 35μ long, tibia 6 5μ, tarsus 8μ, claw 8μ and bearing a distal knob. Feather claw the same as that of the female. Hind-legs are 32μ long, tibia 4 8μ, tarsus 8μ and claw 8μ long

Abdomen with about 70–78 rings dorsally, this number reduced to 65–67 ventrally. Lateral seta on about ring 11, 35–36μ long; first ventral seta on about ring 23, 40–41μ long; second ventral seta on about ring 40, 14–15μ long, and third ventral seta on about ring 60, 19μ long. Caudal seta 44–48μ and accessory seta 4μ long

Epiandrium (Fig 4) 19μ wide and 14μ long, with a number of elongated markings in the posterior portion, some longitudinal, others transverse. Genital seta 16–17μ long.

TYPE LOCALITY. Victoria University Botany Department glasshouse, Wellington

DISTRIBUTION. Galls containing these mites were first observed on plants collected from Waipukurau. Similar galls have since been seen on plants from Pukerua Bay (Wellington), Gore Bay (Cheviot) and Lake Rotokawau (Rotorua).

HOST. *Haloragis erecta* Schindler.

COLLECTED. 24/4/56, 22/6/56, 9/9/56.

RELATION TO HOST. Parasitic, causing bud galls

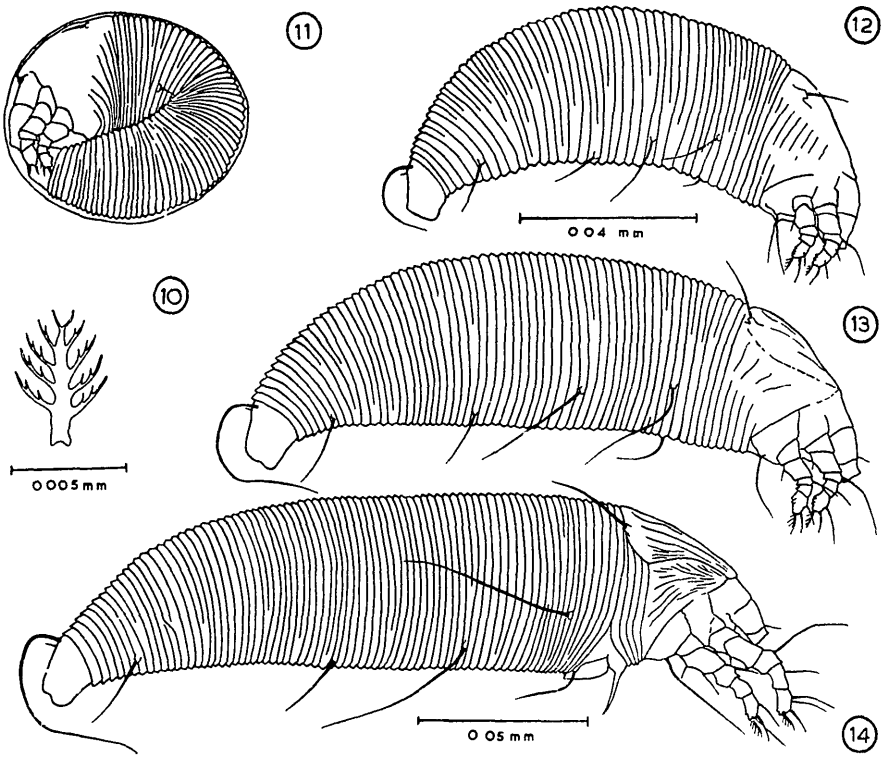
TYPE MATERIAL. Twelve slides distributed as follows: holotype female, collected 24/4/56, 2 paratype females and 2 paratype males, Dominion Museum, Wellington; three paratype females and 1 paratype male, Plant Diseases Division, D.S.I.R., Auckland; one paratype female, J. T. Salmon collection; two paratype females, Victoria University Zoology Dept.; five tubes containing preserved galls and mites, Dominion Museum.

This species is one of the larger New Zealand representatives of the genus *Aceria,* and is characterised by its distinctive dorsal shield pattern and the relatively great length of its lateral seta, which is almost equal to the length of the first ventral seta (1:1 06). In all other New Zealand species so far described the lateral seta is much shorter than the first ventral seta. The thoracic setae are also relatively long when compared with other body setae. The dorsal shield pattern superficially resembles that of *Aceria diospyri* Keifer from the persimmon, *Diospyros kaki* L. in California, but in other characters—e.g., length of ventral setae, etc., it is quite distinct.

Little is known of the eriophyid mites of Australia, and Mr H. H. Womersley (Pers. comm.) informs me that what few records there are are mainly agricultural and in need of systematic revision.

Apart from the reproductive structures, the male differs from the female in the slightly smaller and more tapering body and the relative shortness of the dorsal, lateral, ventral, caudal and genital setae.

Aceria victoriae is the second gall mite to be described, parasitising plants of the family Haloragaceae, the other species also being a parasite of *Haloragis.* The latter species, *Tegonotus haloragi* (Lamb), of the subfamily Phyllocoptinae, causes bud and leaf galls on *Haloragis depressa* Walp, and may be easily distinguished from *A. victoriae,* firstly, by its broad abdominal tergites lacking microtubercles, and other sub-family characters, and secondly by the different species of host plant utilised.



TEXT-FIG. 2.—Fig. 10—Featherclaw Fig. 11—Embryo within egg. Fig. 12—First larva, lateral view. Fig 13—Second larva, lateral view. Fig. 14—Adult female, lateral view Figs 11–14 drawn to same scale.

Another species of Phyllocoptine mite which, however, does not produce galls, has been observed in the Victoria University glasshouse on the leaves of *H. erecta,* upon which it causes the formation of a sooty deposit.

Tegonotus haloragi was described by Lamb (1953) as a species of the genus *Thamnacus* Keifer, 1944, which has now, however, been synonymised with *Tegonotus* Nalepa, 1890 (Keifer, 1952).

Both host plants are distributed throughout New Zealand (Cheeseman, 1925), but *T. haloragi* has been recorded only from Auckland.

LIFE-CYCLE. The life-cycle is simple (Keifer, 1952, p. 2), only one type of female being produced, as would be expected of a mite parasitising an evergreen shrub. Eggs have been laid during June and September under artificial conditions.

EGG. The eggs, which measure 49.5–51μ by 40–44μ, are large when compared with the size of the adult and are laid singly in the protected spaces amongst the leaf bases and petioles enclosed in the gall. The majority are nearly spherical in shape, though some are slightly tapered at one end. They are hyaline and lustrous, with a smooth chorion which is sometimes thickened towards one end of the egg. As the embryo develops it completely fills the egg (Fig. 11), becoming curled ventrally so that the posterior portion of the body comes to lie close to the head.

FIRST LARVA (Fig. 12). The body, elongate, arched, circular in cross-section, 100–110μ long and 30–35μ wide. Rostrum 14–16μ long and curved downward; rostral setae absent Dorsal shield approximately 24μ long,, and while not clearly defined laterally, approximately 20–24μ wide. It bears an indistinct pattern consisting of a few faint grooves Dorsal setae, which are 8μ long, are usually directed anteriorly and slightly medially, but never posteriorly, and arise from tubercles dorso-lateral in position and 16μ apart

Fore-legs 20–21μ long, tibia 3μ, tarsus 4–5μ and claw 4–5μ long. Feather claw is four-rayed and 3–4μ long. Hind-legs are 17–19μ long, tibia 2–2.5μ, tarsus 3.5–4μ and claw 4–5μ. The fore coxae have not yet approximated and the sternal line is absent (Fig. 5). Thoracic seta I, 2–3μ long, seta II 8–9μ, and seta III 11–17μ long. The tubercles of setae II and III lie at approximately the same distance from the anterior end of the animal

Abdomen with about 60–64 dorsal rings, the number reduced ventrally to about 35; microtubercles are more widely spaced than those of the adult, being 2.5μ apart. Lateral seta on about ring 8, 11–14μ long; first ventral seta on about ring 14, 12–16μ long; second ventral seta on about ring 20, 8–9.5μ long; third ventral seta on about ring 31, 11μ long. Caudal seta 20–27μ and accessory seta 2–3μ long. The external genitalia (Fig. 5) are represented on ring 8 by two short posteriorly directed setae, 3–4μ long and 5–6μ apart.

SECOND LARVA (NYMPH). (Fig. 13.) Body 126–164μ long and 35–42μ wide. Rostrum 16–18μ long and rostral setae 3–4μ. Dorsal shield 25–28μ long and approximately 24–28μ wide, bearing a distinct pattern similar to that of the adult. Dorsal setae 12–14μ long directed posteriorly and upwards, the tubercles set 16–17μ apart.

Fore-legs 25–28μ long, tibia 4–4.8μ, tarsus 4.8–6 4μ and claw 6.4μ long. Featherclaw five-rayed and 4.8μ long. Hind-legs 24–25.6μ long, tibia 3.2μ, tarsus 4 8–5 6μ, and claw 5.6–6.4μ long. Sternal line partly formed between the two anterior coxae (Fig 6). Thoracic seta I, 4–4 8μ long, seta II 16–18μ long, seta III 19–20μ long. The tubercles of seta II now lie nearer to the anterior than do those of seta III—an approach to the adult condition.

Abdomen with 65–70 dorsal rings, the number reduced to 54–60 ventrally. Microtubercles more regularly arranged and, being 1.6–2.4μ apart, lie closer together than those of the first larva. Lateral seta on about ring 11, 24–27μ long; first ventral seta on about ring 22, 27–32μ long; second ventral seta on about ring 34; 11–14μ long; third ventral seta on about ring 52, 16–19μ long. Caudal seta 30–36μ and accessory seta 2–3μ long The external genitalia represented by two genital setae situated upon a slight swelling of ring 11, each being 11μ long and 6–8μ apart.

Excepting size, the most striking difference between the larvae and the adult is the relatively great disparity between the number of ventral rings and the number of dorsal rings, especially in the first larva. The adult number of ventral rings is approximately seven-eighths of the dorsal number, but the first larva ventral number is only approximately half the dorsal number—a fact possibly related to the arched form of its body. A second and important distinction between the larvae and the adult is the different position of the dorsal shield setae at each stage In the first larva these setae are directed anteriorly, in the second larva posteriorly and upwards, and in the adult, posteriorly. It therefore rotates through an arc of almost 180° during growth from larva to adult. An important generic character therefore is of no taxonomic value during the first larval stage, and there is little to prevent the first larva from being placed in the genus *Eriophyes* von Siebold, 1850.

The arrangement of the microtubercles also changes during growth from first larva to adult. In the former they are somewhat irregularly arranged and widely spaced, but in the second larva they become more regularly arranged and more closely spaced, finally becoming closely spaced and regularly arranged when the adult stage is reached. The second larva has other characters intermediate between 1st larva and adult—e.g., size, number of abdominal rings, relative positions of thoracic setal tubercles and degree of development of the sternum.

Moulting.

Two individuals have been studied moulting, the process following the pattern described by Hassan (1928).

Parthenogenesis

The fact that out of 111 specimens of this mite studied in detail, 22 were first or second stage larvae, 86 adult female and only 3 adult male, suggests that *Aceria victoriae* may be able to reproduce facultatively by parthenogenesis, a phenomenon also noted in other members of the Eriophyidae.

Dispersal

Wind is probably the main dispersal agent, but the following behaviour exhibited by this species indicates that other methods may also be used. Under adverse conditions, such as the dryness that occurs after a gall has been picked for a day or so, mites may be seen moving over the withered surface of the gall, sometimes pausing

to attach themselves to this surface by their anal sucker, before raising the body to a vertical position. They then actively commence to swing the body about, simultaneously waving their spread legs. This possibly gives the mites a better opportunity to attach themselves to some passing object and thereby gain dispersal to a fresh host plant. Similar behaviour has been observed in the Fig-mite, *Eriophyes ficus* Cotte, by Baker (1939). A likely vector in the case of *A. victoriae* would be the weevil *Rhadinosomus acuminatus* Schonherr, which sometimes occurs in numbers upon the leaves of *Haloragis erecta* (see Hudson, 1934, p. 133).

Acknowledgments

I acknowledge with gratitude advice and criticism received from Dr. J. T. Salmon and Professor L. R. Richardson during the preparation of this work, and the helpful information concerning Australian Eriophyidae kindly supplied by Mr H. H. Womersley, South Australian Museum, Adelaide.

Literature Cited

Baker, E. W., 1939. The Fig Mite, *Eriophyes ficus* Cotte, and other Mites of the Fig Tree, *Ficus carica* Linn. *Bull. Dept.* Agr. Calif. XXVIII (4): 266–275.

Cheeseman, T. F., 1925. Manual of the New Zealand Flora, 2nd Edition 1163 pp., Govt. Printer, Wellington.

Hassan, A. S., 1928. The Biology of the Eriophyidae with Special Reference to *Eriophyes tristriatus* (N.). *Univ. Calif. Pub. Ent.* 4 (11): 341–394, Pl. 9–14

Hudson, G. V., 1934. New Zealand Beetles and their Larvae. 236 pp, 17 Pl Ferguson & Osborn, Wellington.

Keifer, H. H, 1944. Eriophyid Studies XIV. *Bull. Dept. Agr Calif.* XXXIII (1): 18-38

——— 1952. The Eriophyid Mites of California. *Bull. Calif. Insect Survey* 2 (1): 123 pp

Lamb, K., 1952. New Plant Galls: I. Mite and Insect Galls. *Trans. Roy. Soc N.Z.* 79 (3 & 4): 349–362.

——— 1953. New Plant Galls: II. Description of Seven New Species of Gall-mites and the Galls which they Cause. *Trans. Roy. Soc. N Z.* 80 (3 & 4): 371–382.

Rendle, A. B., 1938. The Classification of the Flowering Plants. Vol. II. 640 pp. Cambridge Univ. Press.

G. W. Ramsay,
Zoology Department,
Victoria University,
Wellington, N Z.