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Dedicated to Mrs. W.S.S. van Benthem Jutting

Scale insects from the Netherlands Antilles

A. REYNE

To the Netherlands' Antilles belong the islands of Curaçao, Aruba, and Bonaire, near the coast of Venezuela, further among the Lesser Antilles Saba, St. Eustatius, and half of St. Martin (the other half is French territory).

As far as I know, only twice a note has been published on the scale insects of these islands. Dr. C. J. J. VAN HALL, who was appointed in 1903 to Inspector of Agriculture in the Dutch West Indies, published a short bulletin on scale insects damaging orange trees in 1905. Dr. H. J. VETH wrote a short article on Rhynchota in the "Encyclopaedie van Nederlandsch West-Indië" (1914/1917).

VAN HALL (1905) mentions *Chionaspis citri* as a pest of orange trees in Curaçao; this insect is at present known as *Unaspis citri* (Comstock, 1880). Further he found in Curacao and Surinam *Mytilaspis citricola*; its present name is *Lepidosaphes beckii* (Newman, 1869). *Lepidosaphes gloverii* (Packard, 1869) and *Pinnaspis buxi* (Bouché, 1851) are also mentioned. *Chionaspis minor* was found on cotton, *Ricinus*, and oleander, but not on *Citrus*. *Chionaspis minor* Maskell, 1884, often reported from tropical America, is a misidentification of *Pinnaspis strachani* (Cooley, 1899), a polyphagous insect, known from the West Indies, the Bahamas, Florida and Mexico.

All the above mentioned insects are common in the West Indies. For microscopical details of these insects see FERRIS' Atlas, vol. I—IV (*Pinnaspis strachani* was erroneously described by FERRIS as *Pinnaspis temporaria* n.sp.; see FERRIS & RAO, 1947).

VERSLUYS (1907) mentions a *Ceroplastes* sp. from Curaçao which is injurious to dividivi (*Caesalpinia coriaria* Willd.) It forms yellowish white rings of a waxy substance around the young twigs. Small animals, with a watery red body-fluid, were observed in this waxy substance, separated at a regular distance from each other. In the beginning of September young specimens were found which had already secreted a small quantity of wax. The inhabi-

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tants of Curaçao were well acquainted with this disease of dividivi whose pods were formerly exported to Europe and N. America on account of their high content of tannin; in the years 1903/12 the export of Curaçao, Aruba, and Bonaire amounted to 1022—2057 tons per year. Germany imported in 1911 3400 tons from Venezuela, and 2000 tons from Colombia.

VETH (1914/17) reports from Curaçao, besides the insects mentioned above, a root-inhabiting species, *Margarodes formicarum* Guilding, 1828, found near ant- and termite-nests. The pre-adult insects show a pearl-like lustre, and are known as ground-pearls or in Papiamento (the native dialect) as "perlas di forminga"[1]). These ground-pearls were formerly used by the natives to make necklaces. In the Museum of Natural History at Leiden this insect is represented by material collected in Curaçao by Prof. W. F. R. Suringar and Dr. Th. Lens. According to the label the insects were found by the natives under a dead guave-tree. It seems that this insect is no longer known in Curaçao; Prof. Suringar visited this island in the years 1884—1885. According to MAXWELL LEFROY (1902) *Margarodes formicarum* Guilding has been reported from Grenada, Barbados, Antigua, Mont Serrat, St. Kitts, and the Bahama Islands, further the variety *rileyi* Giard, 1894, from Jamaica and Florida. GUILDING (1828) reported the insects from Grenada and Union Island, a small island between Grenada and St. Vincent.

Protortonia cacti (L.) is reported by FERNALD (1903) from cactus in St. Eustatius as *Llaveia cacti* (L.). MORRISON (1928) assigned this species to the genus *Protortonia* Townsend, 1898; he describes and figures the larva of *P. cacti* (L.), and the adult female of *P. primitiva* Townsend, 1898, the type-species of this genus. Early authors have identified *Coccus cacti* L. with the cochineal insect, *Dactylopius coccus* Costa (1835). COCKERELL in his treatise on the scale-insects of Central America (1899), states that *Coccus cacti* belongs to the Monophlebinae. In 1902 he assigned this insect to the genus *Llaveia* Signoret, 1875. LINNAEUS' description of the legs and antennae of *Coccus cacti* (1758) certainly does not apply to the cochineal insect. According to DE GEER (1776) the antennae of *Coccus cacti* L. are 11-segmented, and of a dark, blackish colour like the legs. This points to the Monophlebinae and certainly not to the cochineal insect. *Coccus cacti* L. was collected in 1756 by Daniel Rolander from *Opuntia* in St. Eustatius. A living plant with these insects was sent to the botanical garden of Uppsala, and insects preserved in spirit to De Geer. The descriptions of LINNAEUS (1758) and DE GEER (1776) are based on the material sent by Rolander.

NEWSTEAD (1914) mentions *Conchaspis angraeci* Cockerell, 1893, from

[1]) The development of the female *Margarodes* is (according to later authors) as follows. Larva I feeds on the roots of its hostplant. Larva II, which has lost its antennae and legs, forms a cyst by the secretion of very thin lamellae of a waxy substance. In *M. vitium* Giard (1894) these lamellae are about $^1/_9$ mm thick. The second stage larva is still feeding on the roots, and growing. Finally it moults to larva III, the groundpearl. This groundpearl remains alive during many years when drought continues, but the imago emerges as soon as the soil is wetted by rains. In an experiment with *M. vitium* the pre-adult was still alive after keeping it during 17 years in dry soil.

Curaçao, where it had been collected by G. E. Bodkin in Jan. 1913 from an unknown food plant.

In recent years Dr. P. Wagenaar Hummelinck (Utrecht) made extensive zoological collections in the Dutch Antilles, of which the scale insects were transmitted to me for identification. Further I am indebted to Mr. B. DE Jong, a resident of Willemsstad in Curaçao, who collected a number of coccids for me.

Mr. R. H. Cobben of the Entomological Laboratory at Wageningen, who collected Rhynchota in the Dutch Antilles in 1957, kindly submitted to me the coccids for identification, 18 samples in all.

Among the collection of Dr. Wagenaar Hummelinck the following species were found:

(1) *Unaspis citri* (Comstock, 1880). On oranges trees in Curaçao (Groot Piscadera), 26.XI.1948.

(2) *Lepidosaphes beckii* (Newman, 1869). Like Nr. 1.

(3) *Ferrisiana virgata* (Cockerell, 1893). Curaçao (Koenoekoe Abau), 20.VIII.1948. Food plant not mentioned.

(4) *Coccus* sp. On *Agave* in Curaçao (Klein Berg), 24.VIII.1948. This species is probably the same as Nr. 14 from St. Martin, but I failed to identify the species.

(5) *Asterolecanium pustulans* Cockerell, 1892. On *Calotropis procera* (fam. Asclepiadaceae) in Curaçao (Parera), 20.I.1949.

(6) *Orthezia praelonga* Douglas, 1891. On the leaves of *Citrus* and *Achras sapota* in Curaçao (Groot St. Joris), 9.IV. 1949.

(7) *Diaspis echinocacti* (Bouché, 1833). On *Opuntia* in the garden of the Museum at Curaçao (coll. brother Arnoldo, 1946).

(8) *Acutaspis scutiformis* (Cockerell, 1893). On *Agave cocui* Trel. in Aruba (Tanki Leendert), 11.V.1955.

(9) *Aonidiella orientalis* (Newstead, 1894). Forming a crust on the fruits of *Tamarindus indica* L. Aruba (Arend), 11.V.1955.

(10) *Aonidomytilus albus* (Cockerell, 1893). Encrusting the branches of *Jatropha gossypifolia* L. Aruba (Santa Cruz), 11.V.1955.

(11) *Pseudaulacaspis pentagona* (Targioni-Tozzetti 1885, Only one specimen was found in sample Nr. 10.

(12) *Aspidiotus destructor* Signoret, 1869. Bonaire, on the leaves of *Terminalia catappa* L. (Fontein, 1955), and on the leaves of the coconut palm (Bronswinkel, 3.VI.1930).

(13) *Dysmicoccus brevipes* (Cockerell, 1893). On the root-collar of celery. Bonaire (Kralendijk, II.1949; Fontein, 26.III.1949).

(14) *Coccus* sp. On *Agave karatto* Mill. St. Martin (Fort Amsterdam), 24.VII.1949.

(15) *Saissetia nigra* (Nietner, 1861). On soursop *(Annona muricata* L.) in the Virgin Islands (St. Croix), 21.VI.1955.

(16) *Saissetia coffeae* (Walker, 1852), syn. *S. hemisphaerica* (Targ. Tozz., 1867). Same locality as Nr. 15.

(17) *Saissetia oleae* (Bernard, 1782). Same locality as Nr. 15.

One sample, collected on Bonaire at Kralendijk in October 1948, contained aphids, *Aphis nerii* Fonscolombe, 1841, according to Mr. D. Hille Ris Lambers. The same species was present in a sample from Islote Aves (west of the island of Dominica).

I am indebted to Dr. Harold Morrison (Washington, D.C.) who examined my slides with the Nrs. 4, 8, 10, and 14, as I was not certain about my identification of these species. His opinion was that Nr. 8 *Acutaspis* from *Agave*, was not *A. agavis* (Townsend & Cockerell, 1898), and that the assignment to *A. scutiformis* (Cockerell, 1893) might be acceptable. He states, however, that after FERRIS' treatment of this genus (1941, Atlas III) 2 new species have been described by MCKENZIE (1947), and 2 from Colombia by BALACHOWSKY (1959), further that in the collections at Washington, D.C. there are some species which seem to be different from those treated by FERRIS, so that a definite identification is not possible at present. After consulting the papers of MCKENZIE (1947) and BALACHOWSKY (1959) I have come to the conclusion that the *Acutaspis*-species which they describe are different from that of Curaçao. *A. subnigra* McKenzie, from *Persea gratissima* in Peru, resembles the species from Curaçao, but the pygidium of the latter seems to be more alike that of *A. scutiformis* (Ckll.) than of *A. subnigra.* The species from Curaçao is ovoviviparous.

Morrison stated that the indentification of Nr. 10 is probably correct, as he saw no morphological differences that would bar such a conclusion.

Morrison was also of opinion that Nrs. 4 and 14 represent the same species, and that it is associated with the *Coccus hesperidum*-complex, but not typical *C. hesperidum* Linn. He stated that there are a fair number of records for *C. hesperidum* from *Agave* from several localities in the world, as well as a few for *Coccus* sp.. As far as I see, the *Coccus* sp. from Nrs. 4 and 14 is not as flat as typical *C. hesperidum*, and more sclerotized. Its height is about ¼ of its width, and the colour is brown; dimensions from 2.2 × 1.8 to 3.0 × 2.5 mm. Dr. Morrison called my attention to the keys of DE LOTTO (1957, 1959) for African *Coccus* sp., but our *Coccus* cannot be identified with these keys.

All the above-mentioned scale insects (excepting Nrs. 4, 8, and 14) are more or less common in the West Indies, and are already mentioned by MAXWELL LEFROY (1902), except Nr. 9 Figures of the microscopical structure of Nrs. 1—3, 5, and 7—13 are given in FERRIS' Atlas, vol. I—VII; for Nr. 6 see MORRISON (1925, fig. 27), and for Nrs. 15—17 ZIMMERMAN (1948).

Mr. B. de Jong collected in Curaçao the following species:

(1) *Lepidosaphes beckii* (Newman 1869), *L. gloverii* (Packard, 1869), and *Orthezia praelonga* Douglas, 1891, from *Citrus* (Groot Piscadera, 28.XI. 1952).

(2) *Saissetia oleae* (Bernard, 1782) from *Ipomoea carnea* (Jongbloed, 5.V.1952).

(3) *Pulvinaria urbicola* Cockerell, 1893, from *Asystasia gangetica* (fam. Acanthaceae); Jongbloed, 14.VII.1955. The specimens were compared with

specimens from New Guinea which had formerly been compared with a topotype of Cockerell, collected in 1894, one year after his description of the species.

(4) *Phenacoccus solani* Ferris, 1918, from *Solanum melongenum* (Groot Piscadera, 28.XI.1952).

(5) *Eriococcus* sp. from *Malvastrum spicatum* (fam. Malvaceae); Jongbloed 5.V.1955. It is described in the following pages as *E. curassavicus* n.sp., though I suspect that the species is identical with or closely allied to *E. tucurincae* Laing, 1929, from Colombia. The data about the Colombia-species are too scanty for a certain identification.

(6) *Hemiberlesia diffinis* (Newstead, 1893). On small twigs of dividivi (*Caesalpinia coriaria*), infested with *Ceroplastes caesalpiniae* n.sp. which is described below, a few specimens of this species were found (Curaçao, Febr. 1963). The species is very similar to *H. rapax* (Comstock, 1881), but the second and third pygidial lobes are sclerotized and provided with notches (cf. FERRIS, Atlas II, and NEWSTEAD, 1893, p. 281). In my specimens the sclerotization of the second and third lobes is very slight in comparison with the median lobes, and only the second lobe has a faint notch. The pygidial fringe of our species shows, however, more resemblance to FERRIS' figure of *H. diffinis* than of *H. rapax*.

For figures of the microscopical structure of Nr. 3 see ZIMMERMAN (1948, pp. 340—341), and for Nr. 4 FERRIS' Atlas (vol. V, p. 158) and ZIMMERMAN (1948, pp. 166—167).

Mr. R. H. Cobben collected the following species:

(1) *Ceroplastes caesalpiniae* nov. spec. Surrounding small twigs of dividivi (*Caesalpinia coriaria* Willd.). Curaçao (Noordkant), 27.III.1957.

(2) *Protortonia crotonis* nov. spec. On small twigs of *Croton flavens* (L.), a wild plant which belongs to the fam. Euphorbiaceae. Bonaire (Washington), 31.V.1957.

(3) *Saissetia coffeae* (Walker, 1852), syn. *S. hemisphaerica* (Targioni-Tozzetti, 1867). Curaçao (hofje Blauw), 24.III.1957. This polyphagous species is common in the West-Indies, and elsewhere in the tropics.

(4) *Ceroplastes magnicauda* nov. spec. On small twigs of *Croton flavens* (L.), Curaçao (St. Christoffel), 22.III.1957.

A description of the new species Nrs. 1, 2, and 4 is given at the end of this paper.

(5) *Orthezia praelonga* Douglas, 1891. On different plants in gardens, Aruba (Lago colony), 23.IV.1957. This insect seems to be common in Curaçao; I have also received it from Surinam.

(6) *Pinnaspis strachani* (Cooley, 1899). The label of this sample was not legible, but the insect was certainly collected in the Dutch Antilles. This species is common in tropical America and polyphagous; it is reported by VAN HALL (1905) from Curaçao.

(7) *Saissetia coffeae* (Walker, 1852). On *Spondias mombin* L. (Anacardiaceae), Aruba (Savaneta), 20.IV.1957.

(8) *Dysmicoccus brevipes* (Cockerell, 1893). On pine-apple, Bonaire (Kralendijk), 4.IV.1957.

(9) *Pulvinaria* sp. Aruba (Picaron), 17.IV.1957. A large subrotund species (3—4 × 3 mm) which resembles *P. mammeae* Maskell, 1895, but 8-shaped pores on the dorsum, and granulated disk-pores in front of the anal plates are absent (cf. ZIMMERMAN, 1948).

(10) *Coccus* sp. On twigs of *Thespesia populnea* (fam. Malvaceae), Aruba (Eagle territory), 3.IV.1957. Dimensions 3—4 × 2 mm, ovoviviparous, body-margin sclerotic. The scanty material did not allow to make satisfactory preparations.

(11) *Icerya purchasi* Maskell, 1878. On *Tamarindus indica,* Curaçao (Julianadorp), 27.V.1957. Larvae and adult females certainly belong to *I. purchasi,* and not to *I. montserratensis* Riley, 1890, (reported from Mont Serrat, Grenada, Porto Rico, Trinidad, Colombia, and Colon).

(12) *Antonina graminis* (Maskell, 1897). On the root-collar of *Fimbristylis spathacea* Roll. (fam. Cyperaceae), Curaçao (Piscadera), 17.III.1957. I have received this species also from Surinam and Ecuador, where it killed grasses on meadows and lawns.

(13) *Saissetia coffeae* (Walker, 1852). On *Solanum nigrum,* var. *americanum.* Curaçao (Pietermaai), Febr. 1954, coll.brother Arnoldo.

(14) *Orthezia praelonga* Douglas 1891. On *Casuarina equisetifolia,* Curaçao (Pietermaai), Febr. 1954, coll. brother Arnoldo. This species is apparently common in Curaçao and Aruba, but only in the sample from *Casuarina* I have found male stages (prepupae, pupae, and adult males).

(15) *Pulvinaria urbicola* Cockerell, 1893. On a plant, belonging to the fam. Solanaceae. St. Martin (Little Bay), 29.XI.1956.

(16) *Orthezia insignis* Browne, 1887. On *Malpighia,* St. Eustatius, 1.I.1957, in the garden of Mr. O. Rijswijk. This species, which is common in Florida, was not found among the samples from Curaçao and Aruba, where *O. praelonga* seems to be a common species.

(17) *Saissetia oleae* (Bernard, 1782). On pigeon pea (*Cajanus indicus*). Same locality as Nr. 16.

(18) *Pseudaulacaspis pentagona* (Targioni, 1885). On the stem of *Carica papaya* in the same locality as Nr. 16.

For descriptions and figures of Nrs. 6 and 12 see FERRIS' Atlas, and of Nr. 16 MORRISON (1925). Nr. 6 is described in FERRIS' Atlas as *Pinnaspis temporaria* n.sp. which is a synonym of *P. strachani* (Cooley, 1899).

One sample collected by Mr. Cobben in Curaçao (Piscadera, 22.III.1957), from *Solanum nigrum* var. *americanum,* contained an aleyrodid which was identified as *Aleurotrachelus trachoides* (Back, 1912) by Miss Louise M. Russell at Washington D.C.

It is quite certain that the above-mentioned species (about 30) represent only a small part of the scale insects which occur in the Dutch Antilles. MAXWELL LEFROY (1902) reported 120 species from the West Indies, and MERRILL (1953) about 180 species from Florida.

Description of new species

In the following pages *Eriococcus curassavicus, Protortonia crotonis, Ceroplastes caesalpiniae*, and *Ceroplastes magnicauda* are described as new species. The *Ceroplastes*-species could not be identified from available literature, while the data about allied *Eriococcus*- and *Protortonia*-species were too scanty for a certain identification of our species.

Eriococcus curassavicus n.sp.

Introduction

Species of *Eriococcus* are not mentioned in Maxwell Lefroy's paper on the scale insects of the West-Indies (1902). Further I learned from the entomologists of the College of Tropical Agriculture in Trinidad that they were not acquainted with the occurrence of *Eriococcus*-species in the West Indies (in litt., 31.VII.1958). Morrison & Renk (1957) however, mention *Eriococcus amomidis* a species described by Gomez-Menor (1935), from the Dominican Republic. Dr. Morrison informed me (in litt., 14.V.1958) that he has examined an *Eriococcus* sp. from Haiti which he tentatively identified as *E. amomidis* Gomez-Menor, further that there are several unidentified species in the collections of the U.S. National Museum, Washington, D.C., some of which are probably new species.

According to Gomez-Menor (1935), *E. araucariae* Maskell, 1879, reported by H. E. Ballou, was the only *Eriococcus*-species known in 1935 from the Antilles (this species was certainly imported with its host, *Araucaria excelsa*).

It seems that no species of *Eriococcus* are known from the Guianas and Venezuela. As far as I know, the only species reported from the northern part of South America is *E. tucurincae* described by Laing (1929) from Tucurinca (Colombia). Lepage (1938) mentions 7 species from Brasil, all from the state of Sao Paulo. Lizer Y Trelles (1939) reports 5 species from Argentine, and Ferris (1955) 35 species from North America.

Dr. Harold Morrison called my attention to a paper of Balachowsky (1959) in which 2 new *Eriococcus*-species are described from Colombia, from a locality 30 km west of Popayan, i.e. about 1500 km from Curaçao. After consulting this paper I have come to the conclusion that these 2 species are different from that of Curaçao. Morrison informed me that in the paper of Figueroa Potes (1946) on the scale-insects of the Cauca-valley (Colombia) and in Lindinger's paper on the coccids of Peru (1942) no *Eriococcus*- species are reported. Among several samples of scale-insects, recently collected for me by Jhr. E. W. van Heurn in Peru, *Eriococcus*-species are also wanting.

The taxonomy of the genus *Eriococcus* Targioni Tozzetti, 1868, of which more than 150 species have been described, is in a state of chaos. It is largely based on the shape, size, and distribution of the dorsal spines in the adult females, but often no attention has been paid to the range of variation of

these spines in the same species. Some attention is usually directed to the distribution of the gland-pores, the anal lobes, and the posterior coxae which may show translucent pores. Antennae, legs, and labium, if not reduced, seldom offer reliable characters for separation of the species. Sometimes the first-stage larvae are described; their spine-pattern may show characteristic features. Little is known about the males, of which I could only find a description or mention in about 20 species. Data about the habit and biology, which may offer useful characters, are often not available in museum-specimens. I have some doubt whether it will be possible to make a reliable revision of the genus *Eriococcus*, based on the adult females as found in different museums. BORCHSENIUS (1949) has revised the genus *Eriococcus* and established some new genera, but his revision is only based on the species of the U.S.S.R.

Specimens of the *Eriococcus* from Curaçao were sent to Dr. Harold Morrison (Washington D.C.), Prof. J. Gomez-Menor (Madrid), and Dr. D. J. Williams (London). Gomez-Menor was of opinion that my species is certainly different from his *E. amomidis* from the Dominican Republic; Morrison also thought that the Curaçao-species is somewhat different from that of Haiti. Williams stated that my species comes close to *E. tucurincae* Laing from Colombia, but he observed some variations in the shape of the spines. The species from Curaçao is geographically probably most closely associated with *E. tucurincae* from Colombia, but at first I failed to find a locality Tucurinca in that country. The distance between Tucurinca and Curaçao, and the elevation of Tucurinca above sea-level is a question of some importance. Finally, after several inquiries had been in vain, Tucurinca could be located. The local director of the Rockefeller Foundation at Bogota informed me that Tucurinca is a small town in the municipality of Ciénaga, dept. of Magdalena. Ciénaga, a town on the N. coast of Colombia, is about 600 km distant from Curaçao. As stated above, I supposed that my *Eriococcus curassavicus* is closely allied to or identical with *E. tucurincae* Laing. This supposition gains in probability since the location of Tucurinca is known. Before a definite conclusion can be drawn about the identity of the Curaçao-species, of which all stages are described in this paper, it is desirable to collect more material of *E. tucurincae* in Colombia, as the larvae, adult males, and the habit are not yet known. Haiti and Santo Domingo are about 700 km distant from Curaçao, but *E. amomidis* of this region seems to be different from *E. tucurincae* and *E. curassavicus*.

I am indebted to Dr. Williams for the loan of a paratype of *E. tucurincae* (I.B.E., Nr. 1610), and to Prof. Gomez-Menor for a type-written copy of his description of *E. amomidis*, of which the types were left in the Dominican Republic.

Though the paratypes of *E. tucurincae* (2 adult females) come close to the species from Curaçao, of which all female and male stages are described in the following pages, I hesitate to identify my species with *E. tucurincae* Laing, as from the Colombia-species only the adult females are known, and not the adult males and larvae. Even the food-plant and habit are unkown.

In consequence of this I have described for the present the species from Curaçao as *Eriococcus curassavicus* n.sp., though I suspect that it is identical with *E. tucurincae* Laing, or very closely allied to that species.

According to BALACHOWSKY (1933) Laing has compared preparations of *E. henryi Balachowsky,* 1929, and *E. polyphagus* Goux, 1931, from France with *E. tucurincae* Laing, 1929, from Colombia, and came to the conclusion that *E. henryi* and *E. polyphagus* are synonyms of *E. tucurincae.* I doubt whether this statement is correct. GOUX (1931) was apparently of opinion that his new species *E. polyphagus* was different from *E. henryi* Balach. Considering descriptions and figures of both species, one would say that this statement is correct, but BALACHOWSKY (1933), after comparing the types of both French species, states that they are one and the same species. In my opinion *E. polyphagus* Goux shows more resemblance to the species from Curacao than *E. henryi* Balach. The antennae of the adult male in *E. polyphagus* resemble those of the male in the Curaçao species.

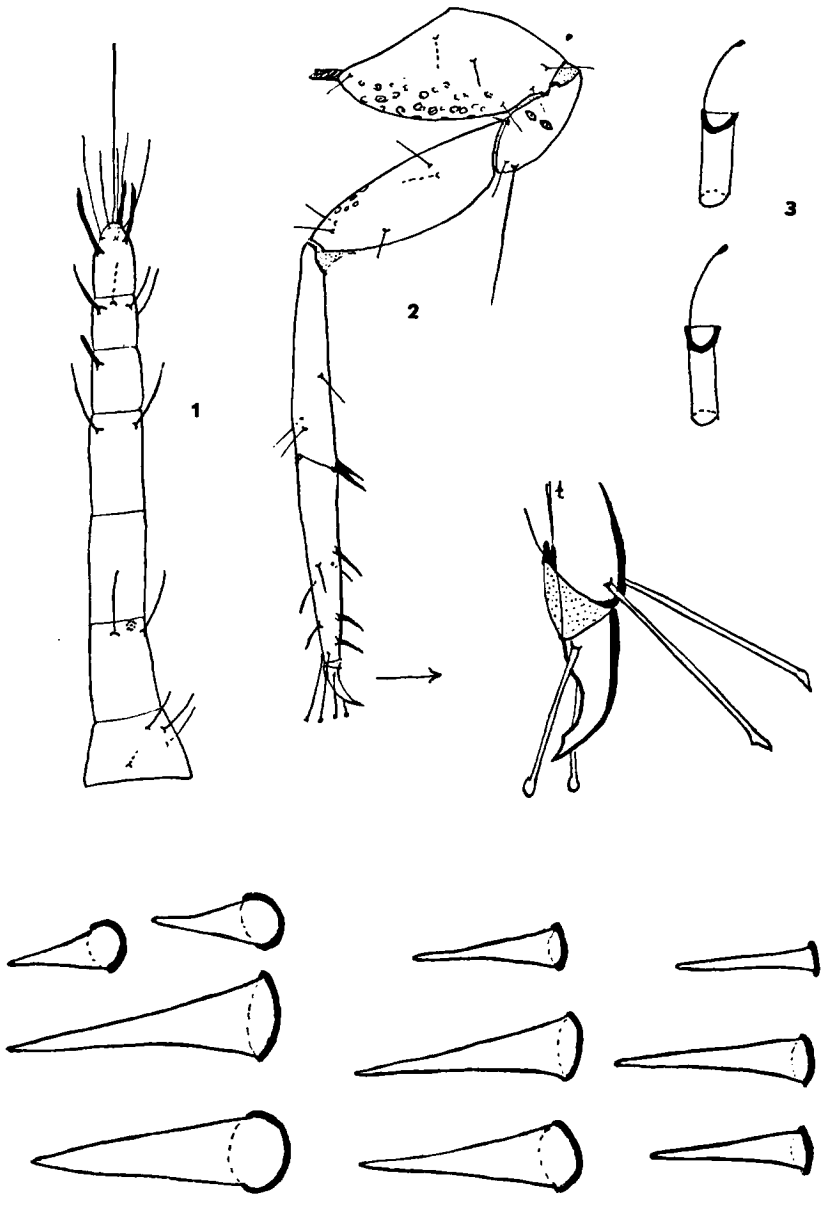
Adult female (♀ ad.)

Habit: Mature females in felty, white ovisacs with a hole at the posterior end, measuring about 3 × 1.5 mm. These ovisacs were densely crowded on thin twigs of the weed *Malvastrum spicatum* (fam. Malvaceae). The male cocoons were much smaller (about 1.6 × 0.8 mm), and attached separately to a thinner twig, but less crowded. The ovisacs of the female are produced in the same way as in *Eriococcus devoniensis* (Green, 1896); between the straight, pointed filaments (diameter 11—14 μ), which are produced by the dorsal spines, there is a tangle of winding filaments (diameter 6—10 μ) formed by the tubular ducts. The straight filaments produced by the glandular spines on the dorsum have a narrow central canal which is absent in the winding filaments of the tubular ducts (cf. REYNE, 1961). It seems that the male cocoons (formed by the male second-stage larva) are principally produced by the tubular ducts (diameter of filaments 3—5 μ); very few straight filaments, formed by the dorsal spines, were observed (diameter 9—10 μ).

Judging from specimens in alcohol the adult females have a greyish, white colour; the alcohol remained colourless. Though the ovisacs were extremely crowded on the host-plant, the twigs showed not the slightest sign of deformation.

Dimensions of adult females (on slide) from 1.5 × 1.0 to 2.3 × 1.4 mm.

Antennae 7-segmented (figs. 1 and 5);length 250—270 μ. The number of setae on the 5 basal segments was always the same; I (basal segment) with 4 setae, one of which is of small size, II with 2 setae and the common sensorium at the top (a line connecting the sensorium and the small seta of segment I is parallel to the axis of the antenna), III without setae, IV with 2 at the top, and V with one short blunt sensory seta. On segment VI there are 3 ordinary setae and a sensory seta, on VII 6—7 ordinary setae and 3 sensory setae. The sensory setae of the apical segment are more or less pointed and not easily distinguished from the ordinary ones; this is also the case with



FIGURES 1—4. *Eriococcus curassavicus* sp. nov. Adult female. 1, ventral view of right antenna (× 300), see also fig. 5; to show them clearly, the sensory setae in figs. 1 and 5 are drawn too thick; 2, ventral view of right hind leg (× 200); detail-fig. of claw (× 650), with digitules and tendon *t* which moves the claw (dotted part membranous); 3, tubular ducts (× 650) of dorsal side of abdomen (above), and of ventral side of abdomen (below); 4, dorsal spines (× 650); on the left from abdomen, in the middle from frons, and on the right from anal lobe (from top to bottom: medial, dorsal, and lateral spine).

the sensory seta of VI, but its basal part is thicker than in the ordinary setae, and the diameter of its socket about twice as large. A line connecting the sensory setae of V and VI is parallel to the axis of the antenna.

Cephalic vesicles at the inner side of the antennae are present as in *Eriococcus devoniensis* (Green) and other species, but they are usually invaginated in specimens preserved in alcohol, and rarely observed in microscopical preparations.

Legs (fig. 2). In the hind legs the femur has a length of 150—160 μ; the tibia and the tarsus are about equal in length (130—140 μ). The number of setae on the different segments is as follows: Coxa 6, trochanter 3, femur 5, tibia 5 (of which the 2 apical ones are most robust), tarsus 7 (3 on the inner side are more robust than the other ones). The claw has a distinct denticle. The digitules are slightly longer than the claw and knobbed. The trochanter is provided with 2 sensoria on each side, and the tarsus with a sensorium near its base. The coxa of the posterior leg shows large, round, translucent pores (3—5 μ); 4—6 similar pores are present at the distal end of the femur.

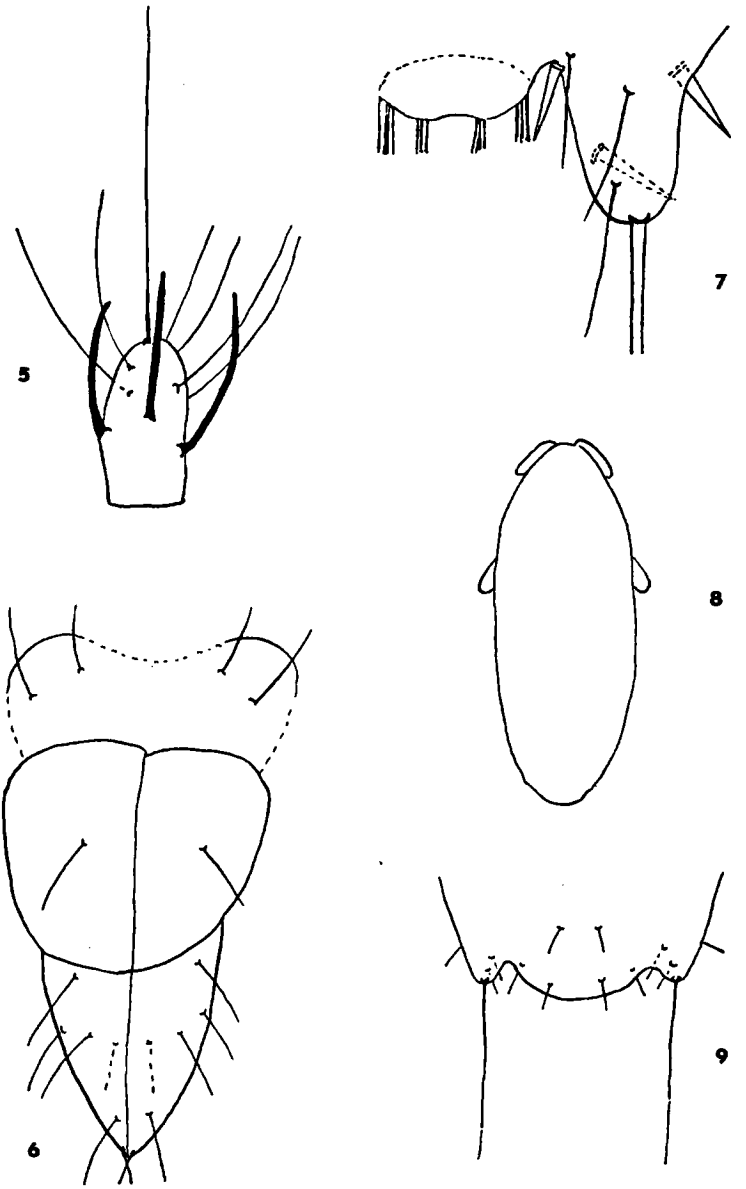
Labium (fig. 6) 2-segmented; width at base 75—85 μ, length 100—120 μ. On the apical segment 6 pairs of setae are present, of which one pair is on the dorsal side. The basal segment has one pair of setae. This segment has at its base 2 more or less sclerotized prolongations, each with one pair of setae. The rostral loop may reach the line of the posterior coxae, but usually ends between the middle and hind legs.

LAING (1929) states that in *Eriococcus tucurincae* from Colombia the labium is somewhat shorter than broad, but in the 2 paratypes examined its length is 105—115 μ, and its width at the base 80—85 μ.

Anal lobes (fig. 7) only slightly sclerotized. On the dorsal side 3 spines are present (length 25—40 μ); the medial spine is always thinner than the 2 other ones (fig. 4). Apical seta 250—280 μ. On the ventral side of the anal lobe 3 setae are present, one near the base of the apical seta (length 70—80 μ), one about the middle, and one at the base of the anal lobe (near the anal ring); see fig. 7.

Anal ring with a diameter of about 70 μ, and a single row of pores which is often partly doubled. Usually 8 anal setae are present; length 110—120 μ. In 3 out of 20 specimens examined I found only 6 anal setae, and in one specimen as many as 12 setae. In the latter case the setae were quite small, but 3 of them were somewhat larger than the rest. In the specimens with 6 anal setae sometimes one of the setae showed a smaller accessory one, so that 7 anal setae were present. The larvae have only 6 anal setae. Apparently one pair is doubled in the adult female. When alle 6 setae are doubled we get the abnormal stage mentioned above.

Dorsal surface with acute glandular spines of variable length (25—55 μ); diameter of base 10—15 μ (fig. 4). On the abdomen (behind the posterior coxae) 6 transversal bands of spines are present, and 5 on the thorax; on the head the arrangement of the spines is irregular. On the first abdominal segment 30—40 spines are present (average of 17 specimens 36; range of



FIGURES 5—9. *Eriococcus curassavicus* sp. nov. Adult female. 5, apical segment of antenna (× 650); 6, labium, ventral view (× 465); 7, left anal lobe, ventral view (× 300); on the left side the bases of the anal setae are shown. Prepupa. 8, dorsal view (× 45); 9, apex of abdomen, dorsal view (× 300) (see also fig. 11).

variation 23—47), on the third segment 25—35 spines (average 30; variation 23—36). On the sixth abdominal segment, the last one with spines, usually 12—14 spines are present (variation 11—15). The total number of spines on the abdominal segments is about 180. On the seventh segment, which lies behind the genital fissure, spines are wanting[2]). The eighth segment, that of the anal lobes, has 6 spines, 3 on each lobe (fig. 7). Large and small spines are rather irregularly distributed in the spine-bands on thorax and abdomen; the largest ones are usually observed on or near the margin of the body. No distinct groups of spines are present on the sides of the abdominal segments.

Tubular ducts are numerous on the dorsal side (fig. 3), almost as numerous as the spines; dimensions about 7—8 × 20 μ. Minute tubular ducts, as mentioned in a previous paper (REYNE, 1961, p. 131—133; figs. 21, 33) are distributed over the whole dorsum. As I noticed recently, these minute tubular ducts are already mentioned by MARCHAL (1908, p. 253) in his description of *Eriococcus aceris* (Signoret, 1875). GOUX (1936) found these minute ducts ("micropores tubulaires") in all *Eriococcus*-species which he examined.

Ventral surface with transversal rows of 6—12 setae of variable length (40—60 μ). On the abdomen 7 rows of these setae are present; the posterior row lies behind the genital fissure, on the seventh segment behind the posterior coxae. The eighth segment, which forms the anal lobes, has 3 setae on each lobe. Tubular ducts are present on the whole ventral surface, but less numerous than on the dorsum (fig. 3). On the abdominal segments usually 5—10 tubular ducts per segment are present, but on the 2 posterior segments sometimes 12—14 are observed. Quinquelocular pores are distributed over the whole ventral surface, especially on the segments near the genital fissure (diameter 4—5 μ). On the anterior abdominal segments only 1—2 rows of scattered quinquelocular pores are present. Near the spiracles usually 8—12 of these pores are observed, and groups of 3—4 near the bases of the legs; only few are present between the mouthparts and the antennae.

Adult male (♂ ad.)

Length 1.00—1.20 mm, average of 7 specicens 1.10 mm. Colour probably red (at least of the abdomen), as far as could be observed in specimens preserved in alcohol. Wax-covering of body not known; wax-tails at the end of the abdomen certainly present, as indicated by crowded wax-pores at the base of 2 pairs of long, robust setae. The male cocoons are described above in connection with the female cocoons or ovisacs.

Antennae (fig. 10) 10-segmented; length 550—600 μ, average of 7 specimens 580 μ. The third segment is the longest one; the 4 apical segments are

[2]) In some species, for example *Eriococcus aceris* (Signoret, 1875) and *E. spurius* (Modeer, 1778), this segment shows some small spines on the middle of the dorsum (4—5 in *E. aceris*, 6—8 in *E. spurius*).

subrotund. All segments, except the basal one, are provided with sensory setae; on segments III—IX they are more numerous than the ordinary setae.

Legs (fig. 15) slender, with some sensory setae, similar to those of the antennae. The number of these setae is usually as follows: coxa 6—9, trochanter 0—2, femur 10—15, tibia 10—13, tarsus 0—3; on trochanter and tarsus the usual number is 1. No sensory setae were observed on the body. The trochanter has 3 sensoria on each side, and one sensorium is found at the base of the tarsus. Digitules slightly longer than the claw; the tarsal ones are distinctly knobbed, the ungual digitules only faintly or not at all. There is a minute denticle at the tip of the claw, but it is difficult to observe.

Wings about 1 mm long; halteres with only 1 hooked seta (fig. 18).

Head (fig. 13) with 3 pairs of eyes, a dorsal and a ventral pair (diameter about 50 μ), and 2 small lateral eyes (diameter ca. 20 μ). Between the dorsal and between the ventral eyes 8—10 setae are present.

Copulatory apparatus with a bluntly pointed penis (fig. 17). On the dorsal side (fig. 16) a faintly sclerotized ring is present which SILVESTRI (1939, figs. 651 and 653) has interpreted as a rest of the anal ring. I have also observed this ring or opening in the males of *Eriococcus devoniensis* (Green, 1896) and *Haematococcus obtusispinus* (cf. REYNE, 1961, fig. 24).

Waxpores are only observed near the apex of the abdomen, where a pair of robust, long setae (140—160 μ) is present on each side of the body. These setae are placed in pits with crowded waxpores which are disc-pores with 5—6 loculi and a diameter of about 5 μ. These pores are also present outside the pits (fig. 16); this was also observed in the males of *Eriococcus devoniensis* (Green), but not in those of *Haematococcus obtusispinus* Reyne. I failed to find any waxpores outside this region, though the pupa, which is described below, shows about 60 disc-pores, distributed over its dorsal and ventral side.

Eggs

The eggs measure from 300 × 150 to 330 × 165 μ on the slide. In the available material the embryos had at most reached the S-stage, with a beginning segmentation.

First stage larva (larva I)

Only 5 larvae of this stage were available; 4 of them, which were ready to moult to stage II, had a length of 0.65—0.70 mm, the fifth specimen had a length of 0.58 mm and was probably younger as no trace of the next stage was visible.

Antennae 6-segmented; length 110—130 μ. The segments of the antennae have the same setae as in the adult female, but segments III and IV are still fused in larva I and larva II ♀.

In the posterior legs the tibia is 45—50 μ long, and the tarsus (without claw) 60—65 μ.

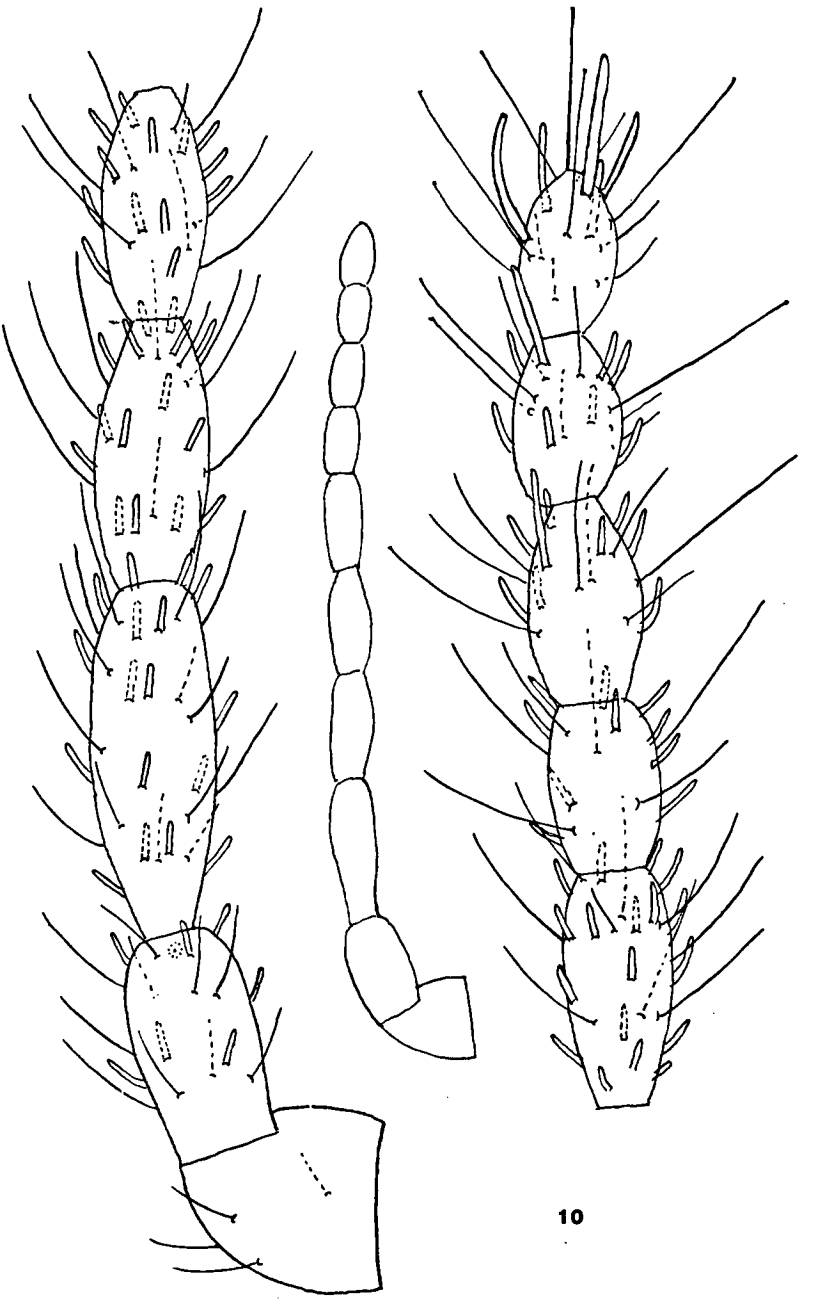


FIGURE 10. *Eriococcus curassavicus* sp. nov. Adult male. 10, ventral view of the left antenna with its setae (× 500); on the left the 5 basal segments, and on the right the 5 apical ones; in the middle the antenna in outline (× 200).

The labium shows the same shape and setae as in the adult female, but it is much smaller; width at base 30 μ, length 50 μ.

The anal lobes are provided with 3 small spines on the dorsal side, and with 2 setae on the ventral side, one near the apical seta and one near the anal ring. The apical seta has a length of 150—160 μ. The anal ring is provided with 6 setae; length 45—55 μ.

On the dorsal side of the abdomen and thorax 6 longitudinal rows of spines are observed; 2 of these rows are found on the sides of the body, 2 in a sublateral position, and 2 on the middle of the body. In the middle series the spines have the same size as the lateral ones with exception of 3—4 pairs of smaller spines on the middle segments of the abdomen. The 6 longitudinal rows of spines form 11 transversal rows of which 6 on the abdomen and 5 on the thorax; on the head the position of the spines is less regular. In the lateral row 15 spines are observed between eye and apex of abdomen, excluding the spines of the anal lobe. The largest spines measure 18—22 μ.

The ventral side of larvae I shows 7 transversal rows of small setae on the abdomen. There is one quinquelocular pore near each of the spiracles; sometimes 1—3 of these pores were also observed on the abdomen.

Second stage larva of female (larva II ♀)

Length of available specimens 0.70—1.15 mm; a specimen of 1.15 mm was ready to moult to adult female, but another specimen of 1.10 mm not yet.

Antennae 6-segmented; length about 175 μ; number and position of setae like those of larva I.

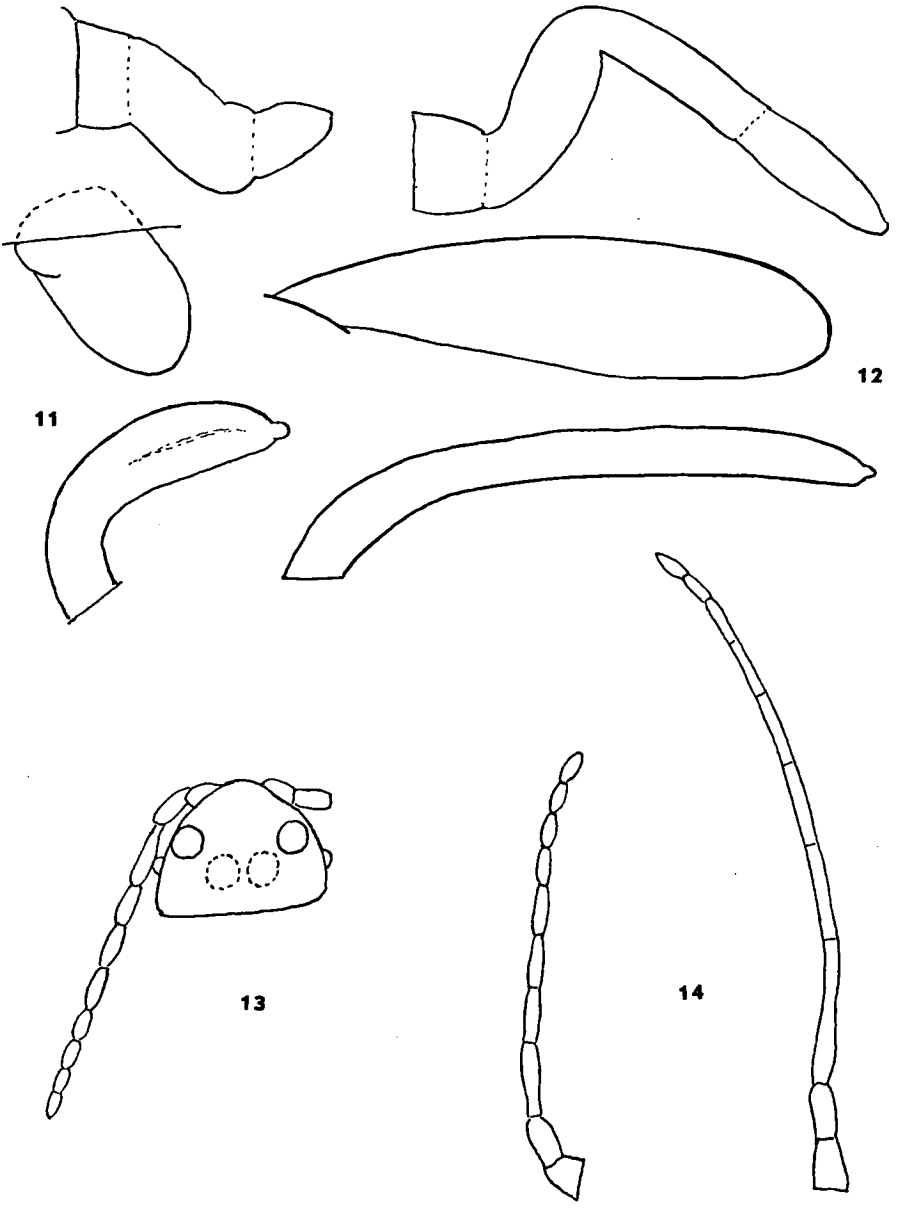
In the posterior legs the tibia has a length of about 75 μ, the tarsus of 100 μ.

Labium like that of larva I, but larger; base 50—60 μ, length 70—75 μ. The rostral loop reaches beyond the line of the posterior coxae.

In the anal lobe the apical seta has a length of 180—200 μ; 3 setae are present on the ventral side, one subapical, one near the anal ring, and one between these 2 setae. Among the 3 dorsal spines of the anal lobe the medial spine is thinner than the 2 other ones, which is also the case in the adult female.

In the dorsal spine-pattern the number of spines is larger than in larva I. On the abdomen the spines are still arranged in single transversal rows. On the 2 posterior segments 6 spines are present as in larva I, but on the anterior abdominal segments 8—10 spines are observed; all abdominal spines are about of the same size. On the mesothorax 16—20 spines were counted, on the metathorax at least 12; the position is no longer in regular transversal rows as in larva I, where the rows on the thorax as well as those on the abdomen comprise only 6 spines.

On the ventral side a number of quinquelocular pores is present on the abdomen; on the posterior segments 3—6 of these pores were observed. Near



FIGURES 11—14. *Eriococcus curassavicus* sp. nov. 11, prepupa; from top to bottom: hind leg, wing-pad, and antenna (× 200) (see also figs. 8 and 9); 12, pupa; from top to bottom: hind leg, wing-pad, and antenna (× 200) (see also figs. 19 and 20); 13, adult male: head with eyes and antenna, seen from the dorsal side (× 90); 14, antenna of adult male of *E. curassavicus*, on the left, compared with that of *E. devoniensis* (Green), on the right (× 100).

each spiracle 2—4 quinquelocular pores are present. Tubular ducts are wanting on the dorsal as well as on the ventral side.

Larvae I and II can be most easily separated by their spine-pattern.

Second stage larva of the male (larva II ♂)

This stage resembles larva II ♀, but it shows numerous tubular ducts on the dorsal side, about as many as spines. These ducts serve to construct the male cocoon (see above). The male larvae in the cocoons measured from 1.1 × 0.4 to 1.2 × 0.5 mm, the cocoons themselves were 1.6 × 0.8 mm. Further larva II ♂ differs from larva II ♀ by its 7-segmented antennae, as the third antennal segment has been divided in 2 segments.

Prepupa (III ♂)

Length of body 1.1—1.2 mm. Mouthparts wanting. Antennae and legs very short, without segmentation (fig. 11). Short wing-pads present (figs. 8 and 11). Spines wanting on dorsal side, but short setae present; the setae on the ventral side are about twice as long and more acute.

Disc-pores with 10—12 loculi are present on the dorsal and ventral side. About 35 of these pores were observed on the dorsum (abdomen 20—23, thorax 12, head 2), and about 40 on the venter (abdomen 20—27, thorax 12—16, head 1—4). Anal lobes almost obsolete; no trace of anal ring visible (fig. 9).

Pupa (IV ♂)

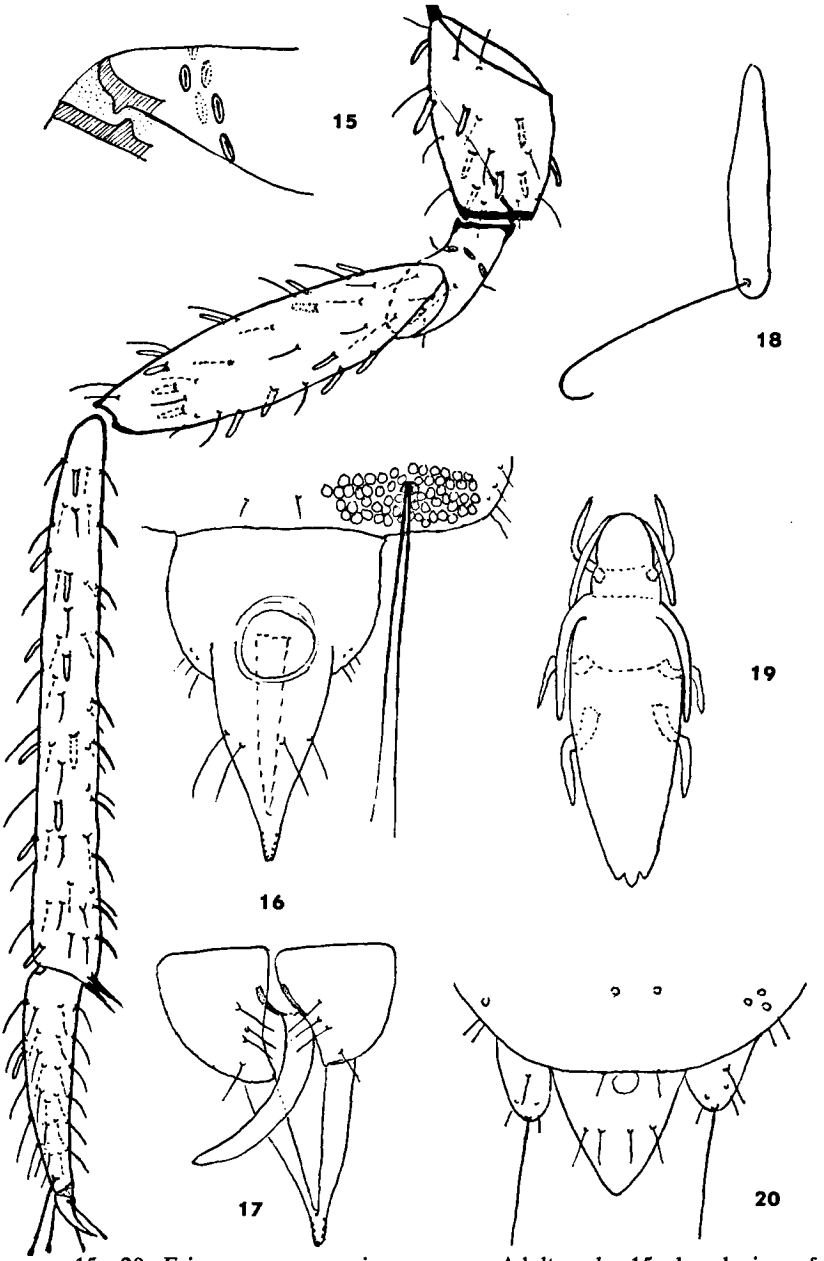
Length of body 1.1—1.2 mm. Antennae, legs, and wing-pads much longer than in the prepupa (cf. figs. 12 and 11). The wing-pads reach the posterior coxae (fig. 19), and have a length of 0.37—0.39 mm; in the prepupa they are only 0.13—0.16 mm long. Anal lobes and apex of abdomen longer than in the prepupa; a trace of the anal ring is usually visible, though less distinct than in the adult male (fig. 20).

About 17—18 disc-pores were observed on the dorsum (abdomen 6—7, thorax 11, head 0), and 40—46 on the venter (abdomen 28—29, thorax 12—17, head 0).

The species was collected by Mr. B. de Jong on the island of Curaçao (Jongbloed, 5.V.1955) from the weed *Malvastrum spicatum* (fam. Malvaceae). Types in the Zoological Museum at Amsterdam. Some specimens of the adult female were sent to the U.S. Dept. of Agriculture (Entomological Research Division), and to the Commonwealth Institute of Entomology in London.

Discussion

I have compared *E. curassavicus* with *E. devoniensis* (Green), of which larvae and adult males were available. The main differences are as follows:



FIGURES 15—20. *Eriococcus curassavicus* sp. nov. Adult male. 15, dorsal view of left hind leg (× 300); detail-fig.: base of trochanter with its 6 sensoria (× 650); 16, copulatory apparatus, seen from the dorsal side (× 300); the remainder of the anal ring and the penis (broken line) are shown, further the wax-pores at the base of the robust double seta; 17, copulatory apparatus with penis protruded, seen from the ventral side (× 300); 18, haltere with hooked seta (× 300). — Pupa. 19, dorsal view (× 45); 20, apex of abdomen, dorsal view (× 200); the six circlets represent disc-pores.

(1) The females of *devoniensis* are found single or at most in groups of 5 specimens on the young shoots of *Erica tetralix*, usually on or near the deformed parts of the stem. The females of *curassavicus* occur very crowded on the stem of *Malvastrum spicatum* without causing any deformation.

(2) The largest spines of *E. devoniensis* ♀ ad. are usually truncated, those of *E. curassavicus* are acute. Sometimes, however, the truncation in *E. devoniensis* is scarcely observable, even in localities where specimens with distinctly truncated spines occur.

(3) The antennae of *E. devoniensis* ♂ ad. have the segments II—VIII much elongated. In *E. curassavicus* only the segments III—VI are longer than the other ones; the antenna of the male is in *E. devoniensis* about 1.5 times as long as in *E. curassavicus* (fig. 14).

(4) In larva I of *E. devoniensis* only the marginal spines are well developed; the spines in the 4 other longitudinal rows are very minute. In *E. curassavicus* the lateral and dorsal spines of larva I are about of the same size.

According to the system of BORCHSENIUS (1949) *E. devoniensis* and *E. curassavicus* belong to the same genus *Acanthococcus* Signoret, 1875 (type-species *A. aceris* Sign.), of which 146 species have been described.

As was already stated, no essential differences were observed in comparing the adult females of *E. curassavicus* with 2 paratypes of *E. tucurincae* LAING. It seemed that the largest spines in the latter species were slightly larger than in that from Curaçao; the same seemed to be the case with the dorsal spines of the anal lobes. I think that no weight may be laid on such small differences. In *E. devoniensis,* of which I have examined many specimens, the variation in the length and truncation of the spines is rather large. In the 2 examined paratypes of *E. tucurincae* the spine-pattern is not quite the same; in one specimen the largest spines are observed in a lateral and sub-lateral position, in the other specimen the largest spines are also present mediodorsally. In studying a holotype or a few paratypes one cannot form an idea of the range of variation of the characters, so that individual features are sometimes taken for specific characters.

Ceroplastes caesalpiniae spec. nov.

Surrounds small twigs of dividivi (*Caesalpinia coriaria* Willd.), Curaçao (Noordkant), 27.III.1957, leg. R. H. Cobben (plate I). The following description is mainly based on the abundant material which Mr. B. de Jong collected on my request in February 1963.

Habit: The wax-test of the largest specimens (10—15 mm in diameter) consists of an irregular, globular lump of wax which surrounds the twigs and is provided with 10—20 pits or nuclei (plate 1). Smaller specimens of about 5 mm have 6—8 pits, but the smallest specimens (1—2 mm) only one. It appears that the number of pits indicates the number of insects in the wax-test. Some tests of 2.5 mm already surround thin twigs. Even the smallest wax-tests show no division into plates.

Two small specimens, measuring 1.5 × 1.2 and 1.8 × 1.4 mm, with only

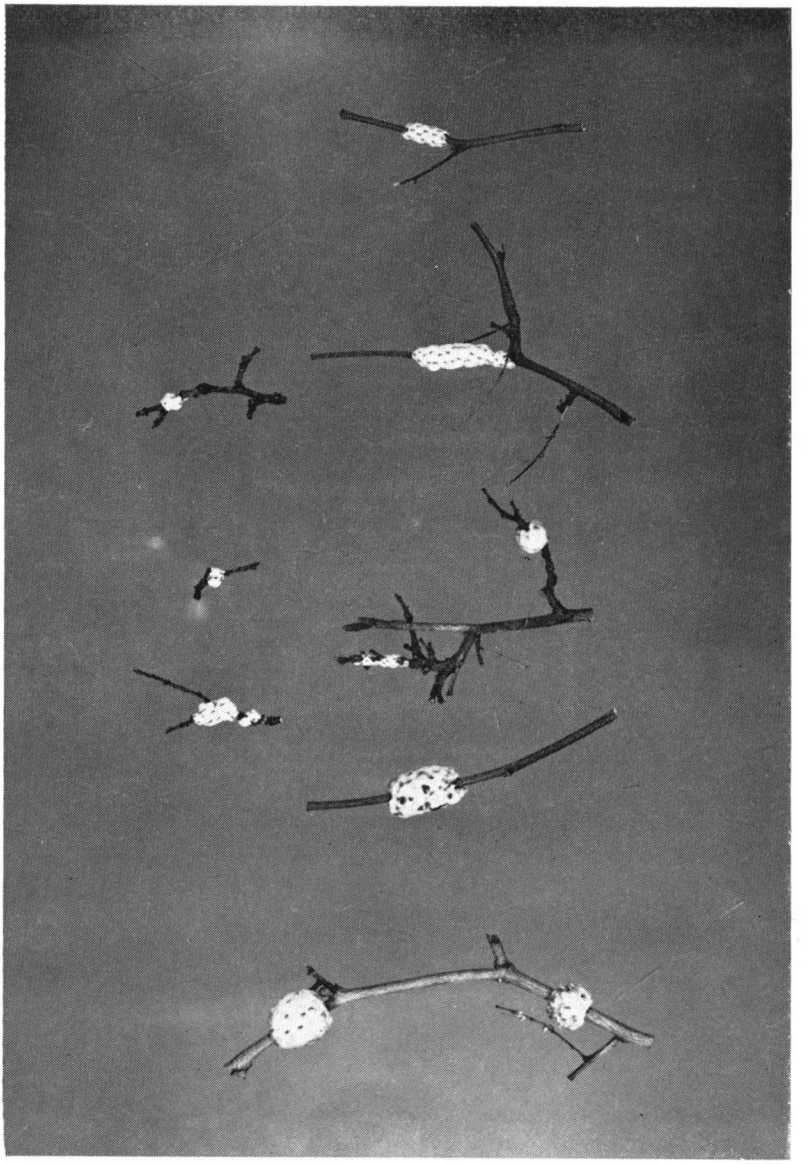


PLATE 1. Habit of *Ceroplastes caesalpiniae* nov. spec., infesting young twigs of dividivi (*Caesalpinia coriaria* Willd.). In half natural size.

one nucleus, were examined more closely. The nucleus, i.e. the mediodorsal part which is not covered by wax, had a length of 0.80—0.85 mm, and contained the anal plates which were conspicuous by their darker colour. The remainder of the nucleus was light brown, and seemed to correspond with the mediodorsal sclerotic plate of the adult female as described below (figs. 21 and 22). This part showed already faint traces of wax. It seems that finally the whole bare area is covered with a thin layer of wax with exception of the anal plates. The white wax-tests are slightly greyish, but 4 snow-white strips (width 0.10—0.18 mm) arise from the stigmatic furrows, and reach, or almost reach, the dorsal nucleus.

The larvae have a tendency to accumulate before they settle. Besides more or less globular wax-tests cylindrical ones are also observed. On plate 1 two are shown; one contains about 40 and the other 20 young insects. The wax-tests of these insects have a diameter of 1—2 mm; they touch each other, but the individual tests can still be recognized.

Some tests have small round holes, made by parasites which were also found within the body of some of the insects. Two emerged adult parasites were found, with 4-segmented antennae, and wings with a long fringe of setae. They show some resemblance to *Thysanus* Walker, 1839, as figured by CLAUSEN (1940, fig. 81), but the body is shorter and broader, about 1.0 × 0.5 mm.

Production of honey-dew is probably scarce or lacking, as sooty fungus was nowhere found, except on a thin twig which contained 3 young specimens of this insect. According to VERSLUYS (1907) young specimens are attended by ants.

According to Mr. de Jong this insect is rather common on dividivi in Curaçao, and always found on twigs and petioles, but never on the leaves.

Adult female (♀ ad.)

Dimensions from 1.1 × 0.9 to 2.5 × 2.0 mm on the slide. In the smallest specimens the anal region is already strongly sclerotized. In larger specimens the whole mediodorsal region is covered by a sclerotic plate which is partly perforated or marked by pits, especially along its margin. In the largest specimen (length 2.5 mm) this plate is flanked on both sides by 3 small sclerotized areas (fig. 23). Finally the whole dorsum is strongly sclerotized.

Antennae 7-segmented, length about 250 μ (fig. 26). Legs normally developed; length of hind legs 360—370 μ (femur 120—130, tibia 80—90, tarsus without claw 70—80 μ). Digitules much longer than claw, and knobbed (fig. 27). Anal process short, blunt conical (fig. 22). Length of anal plates 130—140 μ (fig. 25). Labium or rostrum with 4 pairs of long setae (fig. 29); rostral loop ending between middle and hind legs. Spiracles with a bar (fig. 28). The stigmatic spines are almost hemispherical, and arranged in 2 groups of about 80—100 (sometimes only 60) spines on both sides of the body (figs. 23 and 24). Further the body-margin is provided with a few common setae.

The dorsal surface shows minute wax-pores (2—3 μ). These pores are thick-walled (fig. 30), and usually provided with a triangular or cross-shaped opening which probably contains 3 or 4 minute loculi. The pores are rather scarce; mutual distance 15—30 μ, and even more. A few minute cylindrical setae are also present on the dorsal surface (fig. 30). On the ventral surface a broad row of quinquelocular pores (diameter about 4 μ) is observed in the stigmatic furrows, and a group of multilocular pores near the vulva. The latter pores are 5—6 μ in diameter, and have about 12 loculi. The multilocular pores are crowded (distance 1—2 × diameter of pores); in 4 specimens from 80 to 130 of these pores were visible.

Eggs

Dimensions about 0.35 × 0.16 mm. Eggs were abundant in the available material, but undeveloped. Only one old female (diameter 3 mm) was found which was wholly filled with fully developed embryos ready to emerge, and showing all characters of the first stage larva (larva I). Only one free larva I was found in our material, and a few larvae II and III, in which development had been arrested by parasites.

Larva I

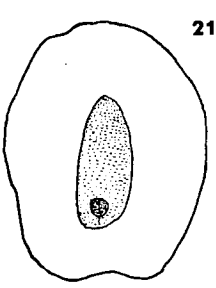
Dimensions about 0.45 × 0.22 mm. Antenna 6-segmented, 110—120 μ long, with a long seta (about 130 μ) on the apical segment. Hind legs 160—170 μ long (femur about 45, tibia 40—45, and tarsus without claw 30—35 μ). Digitules much longer than the claw and faintly knobbed (fig. 33). Anal plates ca. 40 μ long, with a robust apical seta (about 250 μ), and 4 small setae (fig. 31). Anal ring 20 μ in diameter, with 6 anal setae (45—50 μ long). Diameter of eye 10 μ, of pigment-spot 20 μ. The body margin is surrounded by 30 small setae (7—8 μ); on the abdomen each segment has 2 marginal setae. Opposite the spiracles 3 stigmatic spines are present; the middle spine is about twice as thick as the lateral ones (fig. 32). Of the 30 marginal setae 10 are found before the anterior stigmatic spines, and 16 behind the posterior ones; the remaining 4 are placed between the stigmatic spines (2 on each side).

Larva II

Dimensions of a parasitized specimen 1.15 × 0.70 mm. Length of anal plates ca. 80 μ. The principal difference with larva I is the number of stigmatic spines; 8—10 of these spines are present opposite each spiracle, but sometimes only 6.

Larva III

Length of parasitized specimens 1.2—1.3 mm. In one specimen 36—37 stigmatic spines were observed in each group. In a second specimen the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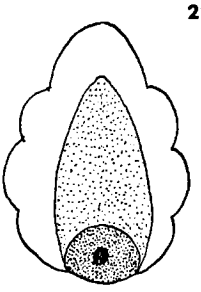
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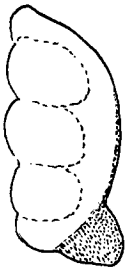

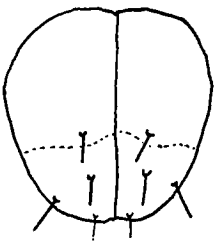
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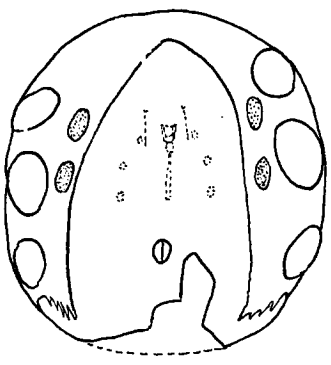
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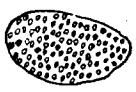

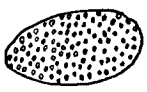

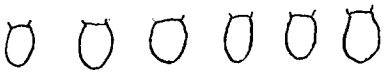
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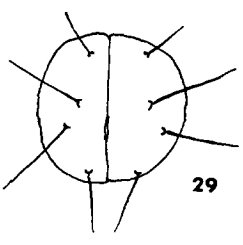
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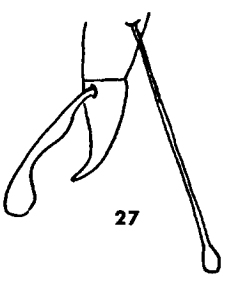
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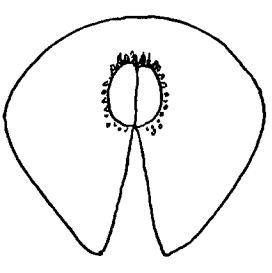
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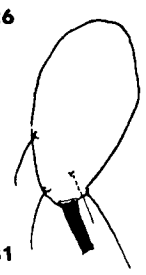
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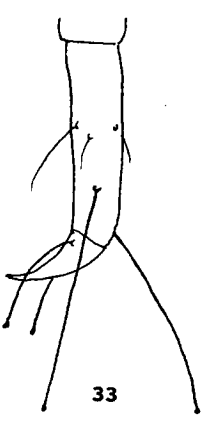
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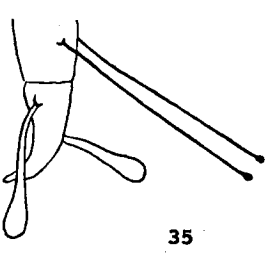
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anterior group contained 37 spines, but the posterior group only 20. Anal plates about 100 μ long, anal region sclerotized (fig. 34). Antennae 200—220 μ, and probably 7-segmented. The ungual digitules have already the same shape as in the adult female (fig. 35).

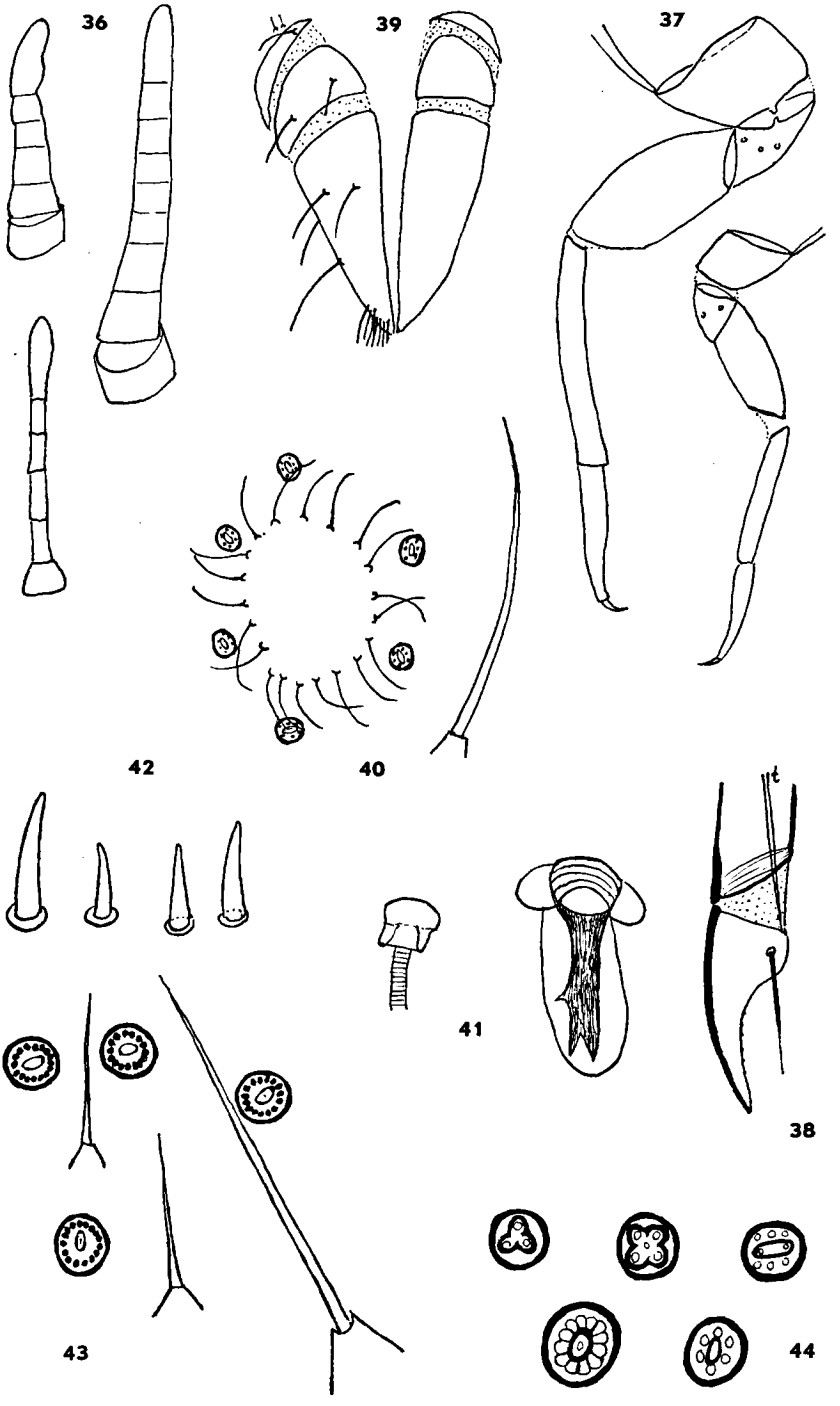
Male stages were not found, and are probably absent in the material at hand.

I failed to identify the *Ceroplastes* from dividivi with any described species. In the Review of applied Entomology (1913—1960) no *Ceroplastes*-species are reported from *Caesalpinia coriaria* (dividi). As mentioned above VERSLUYS (1907) has already reported a *Ceroplastes* sp. as being injurious to dividivi in Curaçao. It is almost certain that he referred to the species which is described above, as its habit is the same (cf. plate 1). Recognition characters of the present species are the shape of its wax-test, and the shape and distribution of the stigmatic spines; see plate 1, and figs. 23 and 24

More than 120 species of *Ceroplastes* have been described, but very few are definitely identificable from existing literature, as FERRIS (1950) rightly observes. LEPAGE (1938) reports from Brasil no less than 34 species, a large number, considering that from tropical Asia about a dozen species are known. A special difficulty with regard to the identification of *Ceroplastes*-species is their variability in habit and microscopical structure, as is shown by *C. ceriferus* (Anderson, 1790) which has often been described in detail. The males and larvae have only been described of a few species, for example *C. rusci* (Linn.), *C. rubens* Maskell (1893), *C. ceriferus* (Anderson), and *C. floridensis* var. *japonicus* Green (1921).

Types of *Ceroplastes caesalpiniae* in the Zoological Museum at Amsterdam.

FIGURES 21—35. *Ceroplastes caesalpiniae* nov. spec. 21, young female, with its waxy covering; the mediodorsal part with the anal plates (dotted) is not, or very thinly covered by wax (× 20); 22, a similar specimen after removal of the wax, seen from the dorsal and the lateral side; dotted parts are sclerotized (× 20); 23, a mature adult female (on slide), seen from the dorsal side; besides the mediodorsal part 3 small areas along the margin of the body are also sclerotized; the areas with stigmatic spines are dotted (see fig. 24); antennae, mouthparts, and bases of the legs on the ventral side are shown by broken lines (× 20); 24, adult female; areas with stigmatic spines opposite anterior and posterior spiracle (× 65); lower fig. shows some separate stigmatic spines (× 650); 25, adult female; anal plates (× 200); 26, adult female; outline of antenna (× 200); 27, adult female; claw with digitules; the digitules of the other side are of the same shape and size (× 650); 28, adult female; anterior spiracle (× 200); 29, adult female; labium, ventral view (× 300); 30, adult female, dorsal pores (× 1000), and a cylindrical seta from dorsum (× 650). — First stage larva. 31, anal plate (× 650) with base of apical seta (total length ca. 250 μ); 32, stigmatic spines; upper fig. anterior, lower fig. posterior group; in the middle a common marginal seta (× 650); 33, tarsus with digitules (× 650). — Third stage larva. 34, sclerotized anal region with anal plates; the part bordering the margin of the anal plates is pitted and partly perforated (× 65); 35, claw with digitules (× 650).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Some material of this species has been sent to the U.S. Dept. of Agriculture (Entomological Research Division), and to the Commonwealth Institute of Entomology in London. Dr. D. J. Williams (London) informed me that our *Ceroplastes* from dividivi was not present in the collections of the Institute of Entomology or the British Museum.

I am indebted to Miss Louise M. Russell (Washington D.C.) for checking the type-specimens of *Ceroplastes utilis* COCKERELL, 1893, against my figures of *C. caesalpiniae* n.sp. from Curaçao. *C. utilis* is only known from the island of Grand Turk (ca. 160 km north of Haiti). It was collected from an unidentified shrub with entire leaves which almost certainly did not belong to the Leguminosae. In *C. utilis* the wax also surrounds the twigs. COCKERELL reports a wax-mass of 28 × 1 cm around a twig of 4 mm; in the available material of *C. caesalpiniae* the longest wax-mass was 2 × 1 cm. A separate insect with its wax measured 7 × 5 mm, and was 4 mm high; in *C. caesalpiniae* separate wax-tests have a diameter of only 1.5—1.8 mm. COCKERELL observed no legs or antennae in the adult females of *C. utilis*, but this was certainly due to his preparations.

Miss Russell informed me that the type-specimens of *C. utilis* are fragmentary or poor. In one specimen the stigmatic spines are present. They are short, stout, apically rounded, and vary in size. There are approximately 25 spines in each group, but the specimen is small. The spines are slightly longer than in my figure of *C. caesalpiniae* (in my figure they were drawn somewhat too short; the average dimensions of the larger stigmatic spines are 10 μ long, and 7 μ wide).

Miss Russell also called my attention to *Ceroplastes bruneri* Cockerell, 1902, which is reported from *Caesalpinia* and has also stigmatic spines with rounded tops. After examining the literature on this species I obtained the

FIGURES 36—44. *Protortonia crotonis* nov. spec. 36, outline of antenna, on the left of larva II, on the right of larva III (× 90); lower fig.: outline of antenna (× 77) in larva I of *P. cacti* (Linn.) according to MORRISON (1928, fig. 102 B); this antenna is longer and more slender than the antenna of larva II in *P. crotonis*; 37, outline of hind leg, on the left of larva III, on the right of larva II (× 90); 38, claw of hind leg in adult female (× 300); *t* is the tendon which moves the claw; the dotted part remains membranous; 39, labium of larva III, seen from the ventral side (× 200); of the 16 minute setae at the top 8 are bluntly pointed; 40, anal opening of larva II (× 650); the opening is surrounded by a whorl of small setae and some wax-pores (cf. fig. 44); 41, spiracles of larva III; on the left an abdominal spiracle (×460), on the right anterior spiracle of the thorax (× 200); 42, submarginal spines on dorsum of larvae II and III (× 650); on the left 2 spines from larva III, on the right 2 from larva II; 43, multilocular pores and setae on dorsum of adult female (× 650); 44, wax-pores of larvae II and III (× 1400); the trilocular and quadrilocular pores in the upper row are distributed over the whole dorsum, the elliptical pores seem to be restricted to the anal region of the abdomen; lower row: pores surrounding the anal opening, on the left from larva III, on the right from larva II.

following data. Restricted to Leguminosae. Main area of distribution the large plain (El Gran Chaco) between the Andes and the rivers Parana and Paraguay. Most southern locality reported 31° S. (Cordoba, Argentina), most northern locality 13° S (Santa Ana, Peru). The position of Curaçao is about 12° N. so that the distance to the main area of distribution of *C. bruneri* is ca. 4000 km. According to the original description the adult female of *C. bruneri* is larger than that of *C. caesalpiniae* (*bruneri* 4 mm long, 5 mm wide, 5.25 mm high; *caesalpiniae* at most 3 mm in diameter on the slide).

For the present it seems advisable to maintain the species *C. caesalpiniae*, though it is certainly allied to *C. bruneri* and *C. utilis*. From the northern part of Venezuela and Colombia, where *C. caesalpiniae* might be expected to occur, no *Ceroplastes*-species have been reported, as far as I know.

Protortonia crotonis spec. nov.

On small twigs of *Croton flavens*, a wild plant which belongs to the Euphorbiaceae; Bonaire (Washington), 31.V.1957, leg. R. H. Cobben. Only second and third stage larvae are available, but one larva of the third stage is moulting, so that some characters of the adult female can be observed. The specimens, preserved in alcohol, are devoid of a waxy covering.

Second stage larva (larva II)

The smallest larvae have 6-segmented antennae with a length of 350—400 μ (fig. 36), and 3 circuli with a diameter of 60—70 μ. Length of body (on slide) of the 4 available specimens 1.6, 1.7, 1.9, and 3.0 mm. The latter is on the point of moulting; the claws of the next stage (larva III) are about 50 μ long, those of larva II 35 μ. The legs of the second stage larva (fig. 37) have 2 sensoria on both sides of the trochanter, and 2—3 indistinct denticles on the inner side of the claw. As far as could be observed in the available specimens, the ungual digitules are acute and sometimes reach the top of the claw. The labium or rostrum is probably 2-segmented; its shape is that of an equilateral triangle. On the top of the labium about 10—12 short setae are present, some of which are bluntly pointed. The anal opening is surrounded by a whorl of 20—25 small setae (of about 20 μ), and 5—6 wax-pores (fig. 40). The anal tube is short; no polygonal wax-cells are visible on the chitin-band at the inner end, but this may be due to insufficient preparation; disk-pores near the opening were not observed.

Among the setae of the body-margin 3 pairs near the apex of the abdomen are conspicuous by their length (170—250 μ) which applies also to a long seta (210—300 μ) opposite the fore leg. Wax-pores on dorsum and venter are scarce in comparison with the number of setae; this applies also to larva III and the adult female. The wax-pores in larva II are usually quadri- or trilocular, similar to those of larva III (cf. fig. 44). Pores in which the central figure is a pentagon or hexagon with 5 or 6 loculi inside its angles are sometimes observed, but they are very scarce. Pores in which the central figure is

an ellips, surrounded by 6 loculi, seem to be restricted to the anal region (figs. 40 and 44). In one larva II 6 abdominal spiracles could be observed on one side of the abdomen (diameter ca. 9 μ). The spiracles of the thorax show a bar in all stages which were examined (cf. fig. 41). Width of peritreme in the anterior spiracles 50—60 μ, in the posterior ones 60—70 μ; the opening of the spiracles is about half as wide as the peritreme.

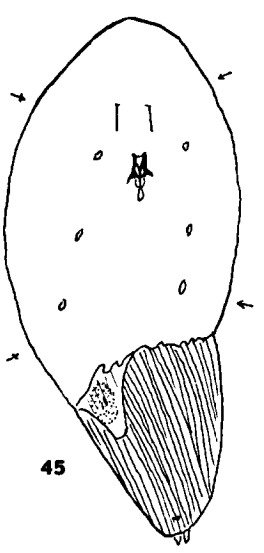
I have interpreted the larvae with 6-segmented antennae as larvae of the second stage. The first stage larva of *Protortonia cacti* (L.), as figured by MORRISON (1928, fig. 102), is about 0.65 mm long, and has only one circulus with a diameter of ca. 30 μ. The marginal setae of our larvae II, the presence of only 3 circuli in all available stages (larvae II, III, and adult female), the indistinct denticles on their claws, and the absence of a concentration of pores in front of the thoracical spiracles of the adult female point to *Protortonia* Townsend, 1898, and not to *Llaveia* Signoret, 1875, or *Llaveiella* Morrison, 1928; the anal region with its whorl of small setae also points to *Protortonia* (see MORRISON 1928, figs. 96, 98, and 101—104).

Third stage larva (larva III)

Length of body 3.0—4.5 mm. Antennae (fig. 36) about 600 μ long, and 7—9-segmented. The legs (fig. 37) have 3 sensoria on both sides of the trochanter. The claws have a length of about 50 μ, and acute digitules which do not reach the tip of the claw. The labium is 3-segmented (fig. 39); on its tip 14—16 small setae are present, of which 4—8 are bluntly pointed. The rostral loop certainly reaches the line of the middle coxae, as the length of protruded mouthsetae is about 2.5 mm, and the distance between tip of labium and middle coxae at most 1.0 mm. The anal region shows the same picture as in larva II (cf. fig. 40). It is surrounded by ca. 30 small setae (ca. 30 μ), and about 10 wax-pores with 8—12 loculi (fig. 44); diameter of these and the other pores 6—8 μ. Three circuli are present; diameter of the middle circulus ca. 200 × 120 μ, of the lateral ones 120 × 80 μ. The circuli are provided with a faintly sclerotized rim, so that they are difficult to observe or seem to be absent when the abdomen is not well stretched. Muscle-insertions on the abdominal segments are conspicuous (also in larva II), and should not be confounded with the circuli, as would be possible by a superficial examination. In one larva III 7 abdominal spiracles were observed on both sides of the abdomen (fig. 41); diameter about 16 μ. Opening of the posterior spiracles of the thorax ca. 50 μ, diameter of the peritreme 90—100 μ; in the anterior spiracles the dimensions are slightly smaller (fig. 41). Wax-pores are more numerous than in larva II, but of the same shape (fig. 44); the central triangular or cross-shaped figure is sometimes surrounded by 6—8 loculi.

Adult female (♀ ad.)

One larva III with 9-segmented antennae was just engaged in moulting. The next stage is the adult female, as the genital fissure with its radiating



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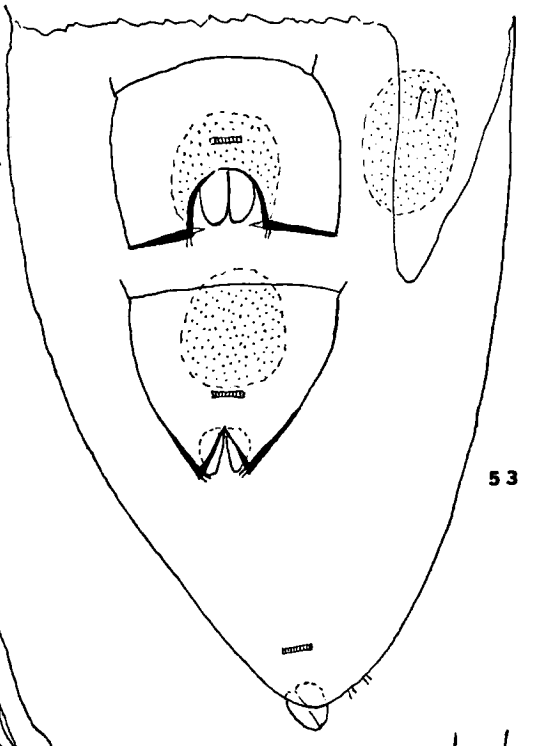

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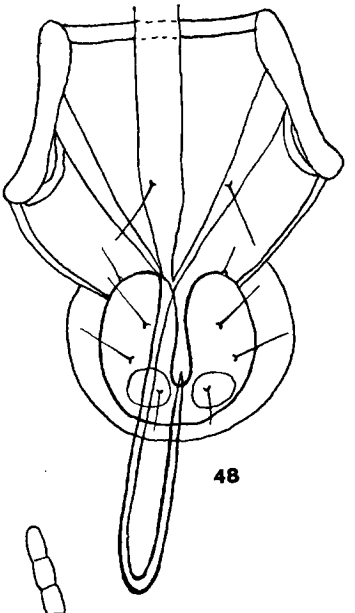

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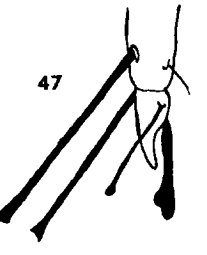

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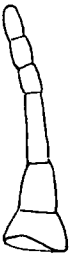

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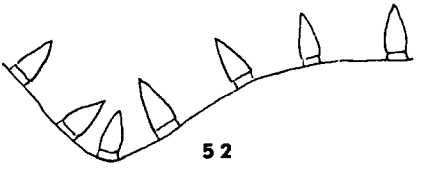

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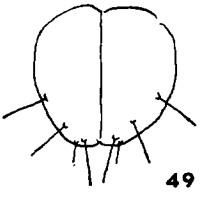

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wrinkles is clearly visible. The antennae of this adult female are still quite membranous and contracted, so that the number of segments cannot be determined; length about 850 μ, but certainly longer when fully developed. Total length of the 4 apical segments (which are recognizable) about 450 μ, in larva III ca. 275 μ. The claws of the adult female have a length of 80—90 μ, and are provided with about 6 indistinct denticles on the inner side (fig. 38). Only one abdominal spiracle was visible, diameter ca. 20 μ. The posterior spiracle of the thorax has an opening of ca. 80 μ, diameter of the peritreme 140 μ. There is no concentration of wax-pores in front of the thoracical spiracles as observed in the genera *Llaveia* and *Llaveiella* (cf. MORRISON 1928, figs. 96 and 103) Of the circuli 2 are visible. Diameter of the middle circulus ca. 235 μ; dimensions of the lateral circulus, which is only vaguely visible and not well stretched, about 260 × 160 μ. Setae and wax-pores are numerous (fig. 43). The pores have a diameter of 10—12 μ; they have an elliptical opening in the centre which is single or divided in two, and surrounded by 16 or more loculi. Tri- and quadrilocular pores, as found in larvae II and III (fig. 44), seem to be absent. The anal opening is surrounded by a whorl of small setae like that of the larval stages (cf. fig. 40).

Male stages were not found in this sample from Bonaire. In *Protortonia primitiva* Townsend males are rather common (SCHRADER, 1930). MORRISON (1928) reports only 2 species of the genus *Protortonia*, namely *P. primitiva* Townsend, 1898, from Mexico, and *P. cacti* (Linn.) from St. Eustatius. No other species are reported in the Zoological Record from 1928 to 1960. Spines as described and figured by MORRISON (1928) for larva I of *P. cacti*, and the pre-adult of *P. primitiva*, were not observed in the specimens from

FIGURES 45—53. *Ceroplastes magnicauda* nov. spec. Adult female. 45, large specimen (length 3.3 mm), with anal process fully developed (cf. fig. 53), seen from the ventral side (× 20); antennae, mouthparts, and position of legs are figured; region with multilocular pores dotted. The margin of the body between the arrows is provided with a single row of stigmatic spines (cf. fig. 52); 46, outline of antenna (× 200); 47, claw of hind leg with digitules (× 650); the ungual digitules are very unequal in thickness, the tarsal ones only slightly; 48, mouthparts with labium and rostral loop, ventral view (× 300); only the labium with its 8 setae, and the 2 large setae in front of them, are visible on the surface, but the deeper lying mouthparts are also shown (of the mouthsetae only one pair); the medial tube represents the pharynx; 49, the anal plates × 200); 50, anterior spiracle (× 200); 51, waxpores on dorsum (× 650); 52, part of the row of stigmatic spines (× 650) (cf. fig. 45); 53, development of the anal process (× 65); besides the anal plates the anal ring (horizontal strip), and the region with multilocular pores (dotted) are shown; upper figure: small specimen (length 1.4 mm), with apex of abdomen introverted; lower figure: larger specimen (1.7 mm), with apex of abdomen everted; enclosing figure: large specimen (3.3 mm), with anal process fully developed. Note position of anal ring and multilocular pores; anal plates and anal ring remain at the tip of the anal process, but the region of the multilocular pores follows the growing base of the anal process.

Bonaire. Short setae of a spine-like character are present in larvae II and III from Bonaire (fig. 42), especially along the margin of the body, but a reticulation at the base of the spines, as figured by MORRISON (1928, fig. 102 J), was nowhere observed. It seems that the species from Bonaire has not yet been described, so that for the present I propose the name *Protortonia crotonis* nov. spec.

MORRISON (1928) states that of the 2 described *Protortonia*-species only very limited material was available, and that they seem to be quite closely allied. No tangible differences were observed in the adult females, excepting that the setae in *cacti* are shorter than in *primitiva*. According to SCHRADER (1930) *primitiva* lives in Guatemala on *Urera baccifera*, a shrub with stinging hairs which belongs to the Urticaceae, and is used in hedges. In the original description of this species TOWNSEND (1898) mentions the "nettle-tree" as the food-plant in Mexico. SCHRADER states that, when the thin coating of waxy secretion is removed, the insects show a conspicuous black and fiery red colour. This is not applicable to *P. crotonis*, found on *Croton flavens*, a plant which belongs to the Euphorbiaceae. *P. cacti* is at present only known from Cactaceae; the antenna of its larva I (MORRISON, 1928, fig. 102 B) suggests that larva II of *P. crotonis* belongs another species (cf. fig. 36).

A definite conclusion about the position of the species *cacti, primitiva*, and *crotonis* in the genus *Protortonia* is only possible, when more material, collected in different localities of the neotropical region, is available.

Larvae II and III of *P. crotonis* are represented in the Zoological Museum at Amsterdam, larvae III also in the collection of the U.S. Dept. of Agriculture at Washington, D.C.

Ceroplastes magnicauda nov. spec.

On twigs of *Croton flavens* (L.), a wild plant which belongs to the Euphorbiaceae. Curaçao (St. Christoffel), 22.III.1957, leg. R. H. Cobben.

The wax-test of the larger specimens is shaped like a coffeebean, and 5—7 mm long; in the groove the insect is visible. The test is white and smooth; with a hand-lens fine dividing lines are visible, and a pit or nucleus on the top. This applies also to smaller specimens of 3—5 mm. The smallest specimens with a length of 2—3 mm have the wax-test divided into plates, 6 marginal plates, and one dorsal plate. Sometimes the anterior and posterior marginal plate seem to be double. Pits or nuclei are observed on the dorsal plate, and usually also on the marginal plates but they are less distinct. As the microscopical structure of small specimens of 2—3 mm is quite the same as that of large specimens of 5—7 mm, I accept that they belong to the same species. In both cases multilocular pores are abundant. This points to adult females, but eggs or embryos were not observed in our specimens. In all cases examined the wax-test contains only a single insect. Larval stages and adult males were absent in the material at hand.

Adult females prepared from the largest wax-tests measure from 2.5 × 1.5 and to 3.3 × 1.6 mm on the slide, including the stout anal process which is

strongly sclerotized (length 1.0—1.3 mm, width at base 0.8—1.0 mm); see fig. 45. Hind legs about 275 μ (femur ca. 80, tibia 60, and tarsus without claw 60 μ). The ungual digitules are very unequal in thickness (fig. 47). Antennae 6-segmented, and about 170 μ long (fig. 46). Labium with 4 pairs of setae; rostral loop short, about as long as the labium (fig. 48). Length of anal plates 90—100 μ (fig. 49). Diameter of anal ring 60 μ; with 6 anal setae (130—160 μ). The anal tube shows 3 pairs of short anal fringe setae. Width of spiracles 50—60 μ; bar present (fig. 50). The stigmatic spines are bullet-shaped (fig. 52); the anterior and posterior group form one single continuous row of about 50—55 spines. Opposite the spiracles some of these spines may be less sharply or bluntly pointed; they are somewhat larger than the spines outside this region (length 10—15 μ). On the dorsum many elliptical pores with 2—3 loculi are present (fig. 51); diameter 5—7 μ. The ventral side shows numerous multilocular pores near the base of the anal process (fig. 53). The pores are crowded (intervening space 1 to 2 times their diameter). They have 10—12 loculi, and a diameter of ca. 6 μ. Sometimes about 200 multilocular pores could be counted. Further quinquelocular pores are present in the stigmatic furrows; they are most numerous near the body-margin, their diameter is about 4 μ. A few tubular ducts (ca. 10 $\times$ 3 μ) were observed on the ventral side, on the posterior segments of the abdomen, and on the head, but more than 10—12 were nowhere observed on the whole venter. Dorsum and venter are devoid, or almost devoid, of setae. On the ventral side a pair of setae is present near or among the multilocular pores, further a pair near each antenna. About 3—5 common setae were observed in the row of stigmatic spines.

Adult females prepared from the smallest wax-tests measure only from 1.4 $\times$ 1.0 to 1.7 $\times$ 1.0 mm, while the largest female in the first series measures 3.3 $\times$ 1.6 mm. The microscopical structure of antennae, legs, stigmatic spines, and wax-pores is quite the same, but in the smaller specimens the anal process and the wax-test is in its first stage of development. The development of the anal process is remarkable. In the smallest specimen (length 1.4 mm) the apex of the abdomen with its anal plates is introverted. In a somewhat larger specimen (1.7 mm) this portion is everted (fig. 53), after which a strong development of the base of the anal process begins as is shown in a specimen of 3.3 mm length (fig. 53). With exception of the strongly sclerotized anal process the cuticle of the body is quite membranous.

At present I am not able to identify this species from available literature, though the shape of the wax-test, and the robust anal process in older females are quite characteristic.

Types in the Zoological Museum at Amsterdam. Some specimens were sent to the U.S. Dept. of Agriculture (Entomological Research Division) at Washington, D.C.

Summary

The following species have been reported from the Netherlands' Antilles:
Margarodes formicarum Guilding, collected in 1884 or 1885 by Prof. W. F. R.

Suringar in Curaçao; specimens in the State Museum of Natural History at Leiden. *Protortonia cacti* (Linn.), collected in 1756 by Daniel Rolander in St. Eustatius, and described by LINNAEUS (1758) and DE GEER (1776). *Protortonia crotonis* n. sp. from Bonaire. *Icerya purchasi* Maskell from Curaçao.

Orthezia praelonga Douglas, common in Curaçao and Aruba. *O. insignis* Browne is in our collection only represented from St. Eustatius.

Coccus sp. (not *C. agavis* Towns. & Ckll.) from Agave in Curaçao and St. Martin. *Saissetia oleae* (Bern.) from Curaçao and St. Eustatius. *Saissetia coffeae* (Walker), syn. *S. hemisphaerica* (Targ. Tozz.) from Curaçao and Aruba. *Ceroplastes caesalpiniae* n. sp. from dividivi (*Caesalpinia coriaria*) in Curaçao. This *Ceroplastes* is already mentioned by VERSLUYS (1907) as a pest of dividivi, but it seems that the species has not yet been described. *Ceroplastes magnicauda* n. sp. from Curaçao; not identificable from available literature. *Pulvinaria urbicola* Ckll. from Curaçao and St. Martin. *Pulvinaria* sp. from Aruba; resembles *P. mammeae* Maskell, but different. *Coccus* sp. from *Thespesia populnea* (Malvaceae) in Aruba; material too scanty for identification or description.

Dysmicoccus brevipes (Ckll.) from Bonaire. *Ferrisiana virgata* (Ckll.) and *Phenacoccus solani* Ferris from Curaçao. *Antonina graminis* Maskell on the rootcollar of *Fimbristylus spathacea* (Cyperaceae) in Curaçao. *Eriococcus curassavicus* n. sp. is probably identical with or closely allied to *E. tucurincae* Laing from Colombia; all female and male stages of the Curaçao-species are described. *Asterolecanium pustulans* Ckll. from Curaçao. *Conchaspis angraeci* Ckll. has been collected in Curaçao by G. E. Bodkin.

Aspidiotus destructor Sign. from Bonaire. *Acutaspis scutiformis* (Ckll.), *Aonidiella orientalis* (Newst.), and *Lepidosaphes alba* Ckll. from Aruba. *Unaspis citri* (Comstock), *Lepidosaphes beckii* (Newman), and *L. gloverii* (Packard) are common on *Citrus* in Curaçao. *Diaspis echinocacti* (Bouché) from *Opuntia* in Curaçao. *Pseudaulacaspis pentagona* (Targ. Tozz.) from Aruba and St. Eustatius. *Hemiberlesia diffinis* Newst. was found on dividi in Curaçao, *Pinnaspis strachani* (Cooley); label not legible, but certainly from the Dutch Antilles; this species is already reported by VAN HALL (1905) from Curaçao.

The 4 new species, *Eriococcus curassavicus, Protortonia crotonis, Ceroplastes caesalpiniae,* and *C. magnicauda* are described above.

An aphid from Bonaire was identified by Mr. D. Hille Ris Lambers as *Aphis nerii* Fonsc., and an aleyrodid from Curaçao by Miss Louise M. Russell as *Aleurotrachelus trachoides* (Back).

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Dr. A. REYNE
Zoölogisch Museum van de Universiteit van Amsterdam
Entomologische Afdeling
Zeeburgerdijk 21
Amsterdam-O. — The Netherlands.

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