

NEW SPECIES OF CHIONASPIS.

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At the request of Prof. T. D. A. Cockerell, through correspondence with Prof. Fernald, I was induced to take up the study of the genus *Chionaspis*, and Prof. Lull the genus *Pulvinaria*. Prof. Fernald prepared and sent out a circular letter to all entomologists whose addresses could be obtained, in this and other countries, and personal letters were also sent to the leading coccidologists, asking for as many species as possible to aid in the preparation of monographs of these two genera. The result has been most gratifying, for already a very large amount of material has been received.

In the material before me the following new species of *Chionaspis* have been found, and are published now in preference to waiting till the monograph is issued. The studies on these insects are being made in Prof. Fernald's entomological laboratory connected with the Massachusetts Agricultural College, where every possible facility is afforded for breeding and studying insects, together with very complete literature of the subject.

Chionaspis Cockerelli, n. sp.

Scale of female.—The female scale is about 3.2 mm. long, straight or very slightly curved, moderately thick in texture, slightly convex, white, with the exuviae pale yellowish-brown, the second skin being covered with secretion.

Female.—The pygidium is distinctly notched at the end, the sides of the notch being formed by the divergent median lobes. These lobes are firmly united at the base and have serrate edges. Two distinct parallel spines arising from the bottom of the notch are about as long as the distance between the inner edges of the lobes at the base. Compared with the other lobes of the pygidium the median ones are larger and extend farther into the body. Each lobe of the second pair is composed of two well rounded and distinct lobules, the incision between them extending to the base of the lobe. The inner lobule is larger and extends posteriorly about even with the median lobes. The third pair of lobes may be present or aborted; when present they are broad and low, with an elongated pore anterior to the base of each. Between the median and second pair is a minute spine, followed by a plate which is about as long as the second pair of lobes, and following these is a conical projection bearing a marginal pore. Outside of the second lobe is a spine, a plate

29¹² 1897
 body

This statement, published in April, 1878, is strikingly at variance with his former notes upon this species in part 9 of Butt. N. A., I., issued in January, 1872, pages 117-118 of the volume, where, after recounting the large number of enemies which prey upon it, he says, "It is doubtful if much more than two per cent. of the eggs laid produce butterflies."

Mr. Winn collected early in September from off the fence over which his hop vine grew 32 chrysalids, being the result of the eggs laid 3rd and 4th August, which he had left upon the vine. From these only two butterflies emerged, both on 18th September, and, curiously enough, one was a ♂ *Umbrosa* and the other a ♀ *Fabricii*. All the others were attacked by parasites, which Mr. W. H. Harrington determined as *Pteromalus puparum*, Linn.

The following notes upon the eggs were made by Mr. Lyman :

In regard to the colour, number of ribs, etc., of the eggs, there is considerable divergence among the authorities.

In regard to the colour, Scudder, quoting Riley, says that at first they are dull bluish-green, afterwards becoming grayish-green with silvery reflection. Edwards and Fernald call them "pale green," and this I consider correct, as I could see no trace of blue-green about them. Edwards says that the eggs have eight or nine vertical ribs, and is followed by Fernald. Edwards also says that the eggs laid in strings have always the same number of ribs, and hence Scudder deduces the theory that individual butterflies always lay eggs of the same number of ribs, but the latter author gives the number of ribs as "nine to eleven, commonly ten."

Of the 101 eggs laid by my butterfly in confinement, 24 were laid on the leaves, 3 being above and 21 below, and the rest, except 2, on the gauze.

There were ten strings of two, four strings of three, one pyramid formed of two below and one above, and another formed by one standing upright upon one on its side, and sixty-four singles. Some of the strings were very irregular, and some had apparently been laid at different times.

Of 52 eggs examined, 31 had 9 ribs and 21 had 10. One of 9 ribs, with larva nearly ready to hatch, had a green newly laid egg with 10 ribs on top of it.

In striking contrast to its abundance in 1896, only one specimen of this butterfly was seen during the season of 1897 by Mr. Winn.

and a marginal pore, this plate being a little larger than the first one. Following the third lobe, when it is present, or a space when it is absent, there are two spines, one above and one below. These are followed by a plate and a distinct marginal pore, and after an interval interrupted by one or two spines, another plate, and following this another interval, terminated by a group of about three plates.

The spinnerets are in five groups: median, 7-9; anterior laterals, 17-23; posterior laterals, 23-34.

Described from dead and shrunken specimens.

Scale of male.—Length, 1.2 mm.; feebly carinated, white, with the larval skin almost colourless.

Described from a single imperfect specimen.

Male.—Male insect unknown.

The specimens were taken by Mr. Alexander Craw, on palm imported from China to San Francisco, Cal., July 11, 1897.

I take pleasure in naming this insect after Prof. T. D. A. Cockerell, who has made extensive and valuable contributions to our knowledge of the Coccidæ, and has shown me many kindnesses in my work on this group of insects.

Chionaspis aucubæ, n. sp.

Scale of female.—The female scale somewhat resembles that of *Chionaspis Lintneri* in outline, being strongly broadened posteriorly and abruptly rounded at the extremity. It is moderately convex, about 3 mm. in length and about 2 mm. in width. The exuviae at the apex of the scale have the first skin very pale yellow, and the second yellowish or brownish. The second skin is covered with a slight secretion. The scale itself is white and very thick and strong. There is a partial ventral scale at the anterior end.

Female.—As I had only dead and dry specimens of this insect, I made no attempt to describe anything but the pygidium of the female. Median lobes moderate in size, divergent, united at the base, with their inner edges distinctly serrate. Each lobe of the second pair is composed of two rounded lobules, the incision between the two reaching nearly or quite to the base of the lobe. The inner lobule is larger and projects farther posteriorly than the outer, sometimes surpassing the median lobes. The third lobe is simple and sometimes rudimentary. Between the bases of the median lobes is a pair of minute convergent spines. On each side between the median and second lobes are a spine, a plate and a marginal

pore, and between the second and third lobes two spines, one above and one below, followed first by one or two plates, and then by a conical projection bearing a marginal pore. Outside of the third lobe are a spine and from one to three plates, then a slight notch, immediately followed by a marginal pore and after a space two unequal spines and about three plates. Following these plates are a notch and a marginal pore, then after a space a group of about five plates.

Spinnerets arranged in five groups: median, 8-14; anterior laterals, 19-28; posterior laterals, 19-33.

Scale of male.—The male scales are much more numerous than those of the female. They are white, delicate in texture, about 1.2 mm. in length, the larval skin at the anterior end being colourless or slightly yellowish. The scale itself may be parallel sided or slightly broadened posteriorly, and is indistinctly carinated.

Male.—Male insect unknown.

On Aucuba from Japan. Discovered by Mr. Craw in the course of his quarantine work at San Francisco. The scales are grouped together on one side of the leaf beneath, and the edge of the leaf is folded under, almost completely hiding them from view.

Chionaspis wistariæ, n. sp.

Scale of female.—The female scale is about 2 mm. in length, though some specimens are slightly longer, moderately broadened, dirty white in colour and delicate in texture, being a close imitation of the epidermis of the bark on which it rests. The scales usually occur in the longitudinal cracks of the bark, and are partially concealed under the epidermis. They are very often pressed out of the normal form. The exuviae are brownish, and the second skin is covered with secretion.

Female.—The following description of the female was made from dead and shriveled insects. The median pair of lobes is large and conspicuous, the second pair considerably smaller, and the third pair obsolete. The median lobes are darker in colour than any other part of the pygidium, firmly joined at the base, their inner edges parallel and nearly touching each other for about half their length, then diverging at about a right angle, with the exposed edges serrate. The second lobe is composed of two lobules, the inner one being the larger. Within the outer edge of each of the median lobes is a spine, and next to this a short blunt plate, followed by a marginal pore. Between the lobules of the second lobe is a spine, and outside of the second lobe are a plate and

two marginal pores, followed first by a spine and then by a plate, which is about as long as the median lobes, and often forked at the tip. Outside of this plate are two marginal pores, followed by a spine and one or two plates, then after another marginal pore a group of about four plates.

There are five groups of spinnerets : median, 8-15 ; anterior laterals, 19-31 ; posterior laterals, 13-23.

Scale of male.—The male scale, as in all other species of this genus, is elongated in form and white in colour. The sides are nearly parallel, and it is distinctly tri-carinated. Length, about 1 mm. The larval skin resembles the anterior or smaller one of the female scale.

Male.—Male insect unknown.

Discovered by Mr. Craw, July 8, 1897, at San Francisco, on the bark of Wistaria from Japan.

Chionaspis pinifoliae heterophyllae, n var.

Scale of female.—The scale of the female is indistinguishable from that of *pinifoliae*, Fitch, having the same range of form and size, the colour of the scale and exuviae being the same. The scales vary in size from 2 mm. to 3.4 mm., the average length being about 2.5 mm. The scale is white, strongly convex, with the exuviae at the anterior extremity yellow, both skins being naked.

Female.—The description of the female is made from dead and shriveled specimens. At the anterior end of the body are two distinct, curved bristles, which may be the rudiments of the antennae ; these are found also in *pinifoliae*. The last segment terminates in a median notch, the sides of which are formed by the divergent median lobes. The lobes of the second pair are low and inconspicuous, and each one is composed of two lobules of about equal size. Two minute spines, one above and one below, arise from near each median lobe, though back from the edge of the segment. Contiguous to each median lobe is a simple plate, outside of which is a marginal pore. Between the lobules of the second lobe is a distinct spine, and outside of this lobe is a plate with a spine at its base, followed by a marginal pore. Outside of the rudimentary third lobe is a marginal pore, followed by a spine and a plate with a spine at its base. Then follows a pronounced marginal pore, a short interval, another space and a long interval, interrupted only by a spine, and terminated by the fourth and last plate.

There are five groups of spinnerets : median, 4-8 ; anterior laterals, 12-18 ; posterior laterals, 14-16. The chief characters by which *pinifoliae*

and the variety can be separated are the presence of the median notch in the variety and the larger size and more rounded form of the lobes in *pinifolia*.

Scale of male.—The male scale cannot be distinguished from that of *pinifolia*. It is slightly more than 1 mm. long and .4 mm. wide at the posterior end, where it attains its greatest width. The scale is white, with a moderately distinct median carina. The larval skin is like the first one of the female.

Male.—Male insect unknown.

On Cuban pine, *Pinus heterophylla*, from Florida. I am indebted to Prof. A. L. Quaintance for a bountiful supply of specimens, as well as to Prof. Cockerell, who first called my attention to this insect and sent me specimens.

The scales are found chiefly at the bases of the very long, slender leaves, and mostly on the inner surface. A few specimens occur also on the stems of the new growth. There were circular openings in a few of the female scales, from which parasites had emerged.

The following original description, which has never been published, was sent to me by Prof. Cockerell to be added to this paper :

Chionaspis latissima, Ckll.

C. latissima, Ckll., Calif. Fruit Grower, June 5, 1897, pp. 4-5. (Descriptive note ; no full description.)

"Female scale circular, 2 mm. diam., white, semitransparent, with the light ocreous exuviae to one side, first skin half overlapping second, second skin oval. Eggs shining, pale pink.

"♂ scale linear, white, with a very feeble median keel.

"♀ when boiled in caustic soda turns yellow, marbled and suffused with bright blue-green ; the mouth-parts remain a warm brown. Under pressure the ♀ becomes greatly elongated. Anal orifice level with the lower (caudad) edge of the cephalolateral glands. Five groups of ventral glands, median of 8, cephalolaterals of 18, caudolaterals of 20. Lateral dorsal rows of elongated pores. General characters of *chinensis*, *nyssæ*, etc. Differs from *chinensis* by the median lobes being not or barely brownish, and being decidedly produced, and the second and third lobes each represented by three distinct lobules. The lobes are much more produced than in *nyssæ*. The spinelike plates are large. The scale is very similar to *vitis*, Green, but is smaller than that or *varicosa*, Green.

"On under sides of leaves of *Distylium racemosum*, from Japan, found by Mr. Alex. Craw, April, 1897, in the course of his quarantine work at San Francisco."