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TWO NEW SPECIES AND ADDITIONAL COLLECTION RECORDS FOR THE GENUS PROTODIASPIS

(Homoptera: Coccoidea: Diaspididae)

HOWARD L. McKENZIE and
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EVOLUTIONARY PATTERNS IN THE ARMORED SCALE INSECTS AND THEIR ALLIES

(Homoptera: Coccoidea: Diaspididae, Phoenicococcidae, and Asterolecaniidae)

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TWO NEW SPECIES AND ADDITIONAL COLLECTION RECORDS FOR THE GENUS *PROTODIASPIS* (Homoptera: Coccoidea: Diaspididae)[1]

HOWARD L. McKENZIE[2] and WALTER A. NELSON-REES[3]

INTRODUCTION

THE GENUS *Protodiaspis* is probably native to the Western Hemisphere, where it occurs almost exclusively on oaks. The genus includes a somewhat larger number of species than the average diaspidid genus of North America. Ferris (1937)[4] questioned the homogeneity of *Protodiaspis* but did not attempt to subdivide it. The genus is of special interest because the females are incompletely pupillarial; the molt of the second instar does not quite cover the adult female, which may also possess a rudimentary or woolly scale. The morphological diversity within the genus seems, however, to be simply due to increasing adaptation to the pupillarial type of existence (Brown and McKenzie, 1962, the second paper in this issue).

In addition to the evolutionary trends within the genus itself, forms similar to it may have been ancestral either to completely pupillarial types, or to forms with little or no covering; these possibilities have been further considered in relation to the chromosomal systems of the Diaspididae by Brown and McKenzie in the paper just cited. Many of the species of *Protodiaspis* are native to Mexico, where the oak forests are being destroyed to open land for cultivation. In view of the central position which *Protodiaspis* holds in current concepts of the evolution of the armored scales, it is to be hoped that entomologists will continue to collect it whenever possible.

DESCRIPTIONS OF TWO NEW SPECIES

One new species of *Protodiaspis* is described from Guatemala and the other from Arizona. Both show close relationship to other components of the genus, and thus provide further examples of evolutionary change in the group. Determination of the chromosome system and numbers in the first-described species not only aids in its proper identification, but also contributes to our understanding of the evolutionary sequence of these Coccoidea.

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[4] See "Literature Cited" for citations, referred to in the text by author and date.

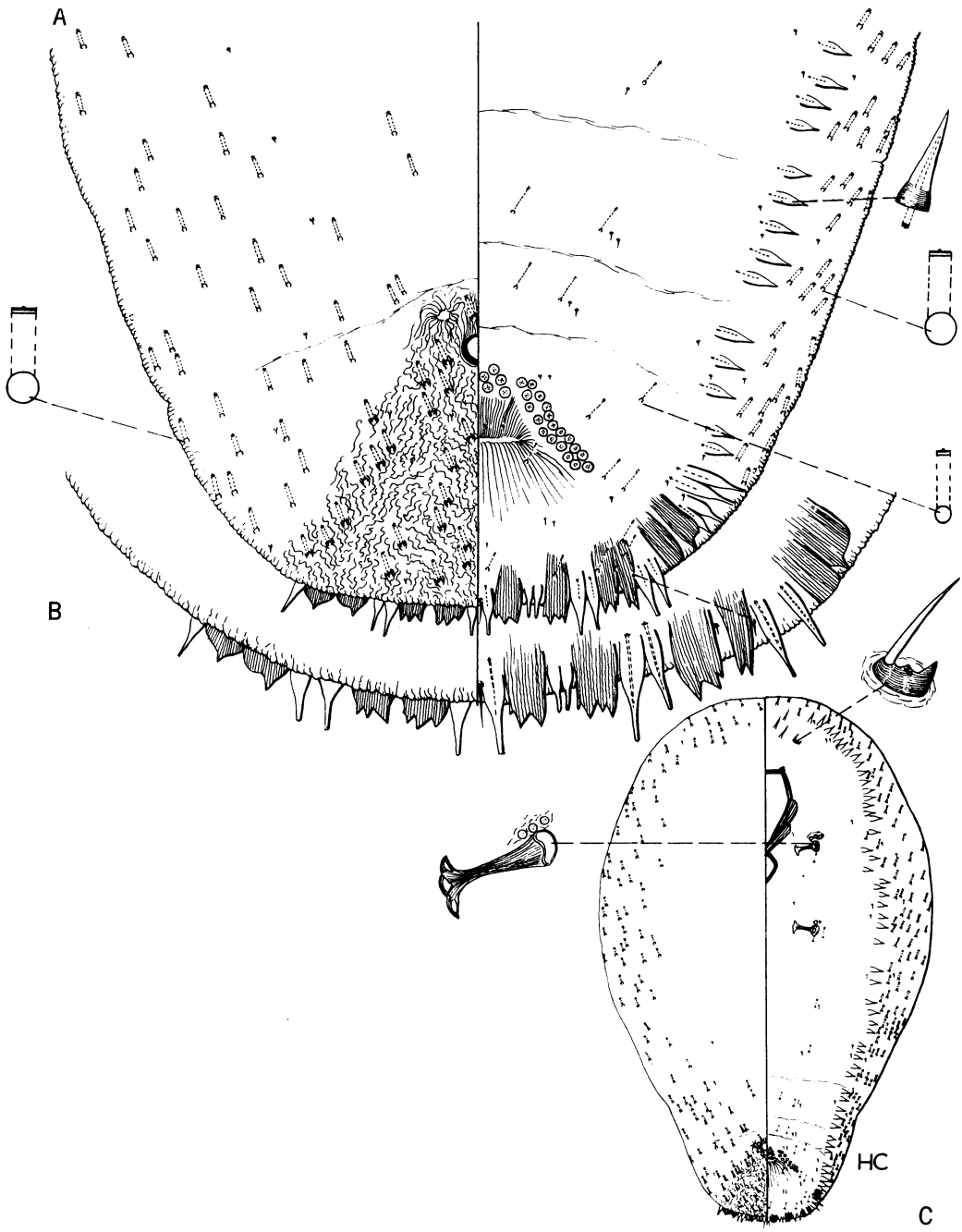


Fig. 1. *Protodiaspis chichi* McKenzie and Nelson-Rees, new species, collected in hill country between Santo Tomás Chichicastenango and Inter-American Highway, Sololá Province, Guatemala, July 24, 1960, on *Quercus crassifolia,* by W. A. Nelson-Rees and S. W. Brown. *A,* pygidium of adult female; *B,* details of the dorsal (left half) and ventral (right half) aspects of the pygidial margin; *C,* body of adult female.

Protodiaspis chichi McKenzie and Nelson-Rees, new species

(Figure 1)

This species is quite similar to *P. infidelis* Ferris in morphology, and a comparison of the two will follow the description of the new species.

Host and Distribution. Type from *Quercus crassifolia* H. and B. along the roadside in hill country between Santo Tomás Chichicastenango and the Inter-American Highway, Sololá Province, Guatemala, July 24, 1960, by W. A. Nelson-Rees and S. W. Brown.

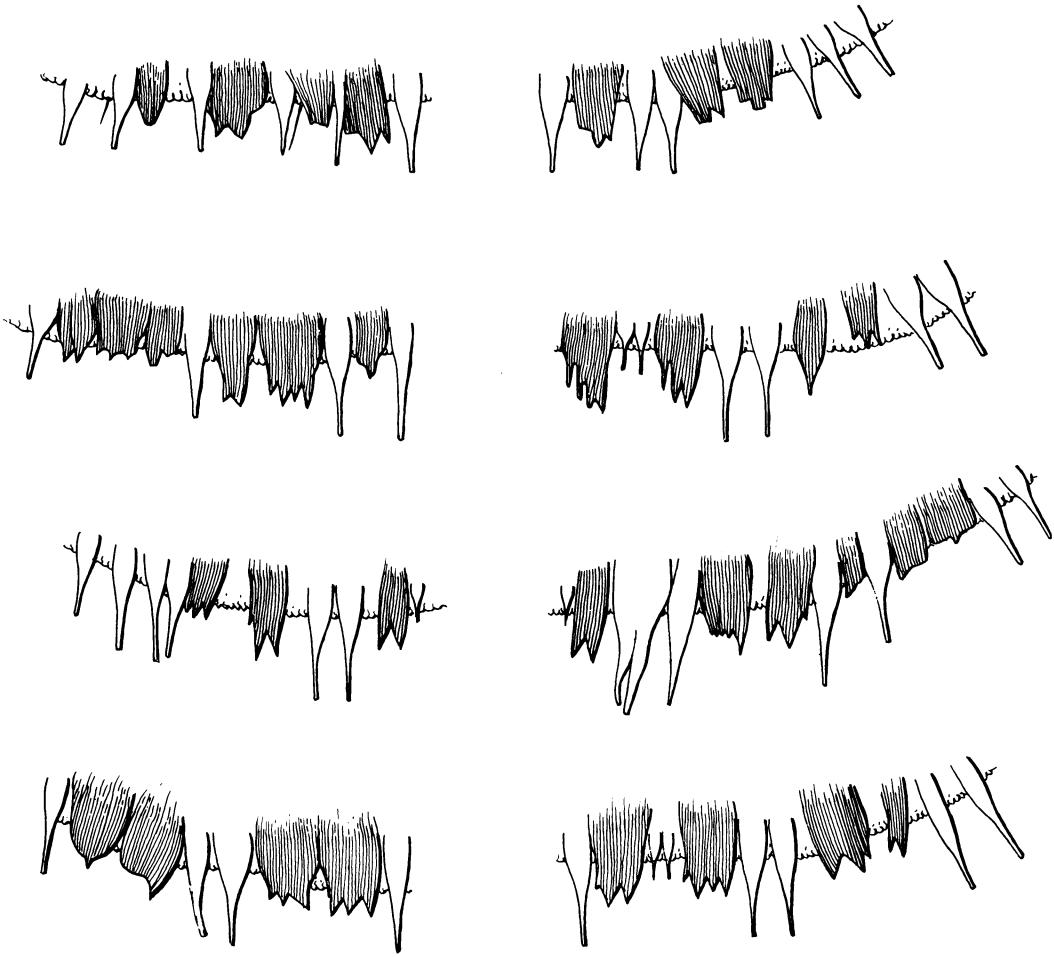
Type Material. Holotype adult female and paratypes of this species have been deposited in the museum of the University of California, Department of Entomology and Parasitology, Davis. Paratypes have also been placed in the United States National Collection of Coccoidea, Washington, D.C.

Habit. Both male and female scales in great abundance, deeply embedded in the thick tomentum of the underside of leaves, and of petioles and young stems.

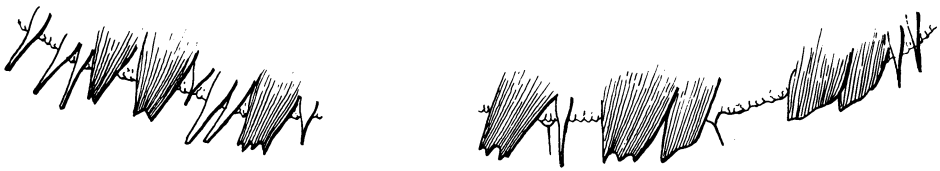
Recognition Characters. Adult female about 0.6 mm long on the slide. Form ovoid. Derm membranous except for area on dorsum of pygidium from anus to posterior margin. Sclerotized area wedge-shaped, median dorsal with apex at anus and extending toward posterior margin. Pygidial lobes various, usually three but second and third often divided; apical serration frequently irregular, asymmetric, and jagged. Dorsal ducts small and scattered. Perivulvar pores present in almost unbroken crescent. Gland spines extending submarginally from pygidium around entire body.

Notes. There seems no doubt that *Protodiaspis chichi* and *P. infidelis* are distinct entities. Although they occur in the same area (see collection records below for *P. infidelis*), they were collected from different hosts, and their patterns of distribution on these hosts were different. The haploid chromosome number of *P. chichi* is 4, which is the basic number of the armored scales, while that of *P. infidelis* is 3, a number so far found in only one other species of the Diaspididae, namely, *Ancepaspis tridentata* (Ferris) (Brown, unpubl.). In both *P. chichi* and *P. infidelis,* the presence of haploid embryos indicated that the males were produced according to the diaspid scheme of chromosome elimination described by Brown and Bennett (1957) and Bennett and Brown (1958).

If living material is available, the insects can be readily diagnosed on the basis of chromosome number. The only reliable external morphological criterion is the nature of the apical serrations of the pygidial lobes. These are jagged and uneven in *P. chichi,* but much less deeply incised and more regular in *P. infidelis,* especially when there are more than two teeth (see fig. 2). Also, the dorsal median area of prosoma in *P. chichi* appears to lack the small, tubular ducts, whereas these structures are present in this area in *P. infidelis.* The asymmetric serrations of the pygidial lobes in *P. chichi* probably constitute the most reliable feature identifying this species.



Protodiaspis chichi new species



Protodiaspis infidelis Ferris

HC

Fig. 2. Variations of the pygidial fringe of *Protodiaspis chichi* McKenzie and Nelson-Rees, new species (top four drawings), and the same for *Protodiaspis infidelis* Ferris (bottom drawings).

Protodiaspis didymus McKenzie and Nelson-Rees, new species

(Figure 3)

No male scales were observed, but the presence of sperm in the ovarian canal indicated that the species is sexual. Since the collection was made late in the season, the species most likely overwinters as the fertilized female.

Host and Distribution. Collected twenty-five miles north of Clifton, Greenlee County, Arizona, near Highway 666, September 7, 1960, on *Quercus grisea* Liebm. × *Q. turbinella* Greene, by W. A. Nelson-Rees and S. W. Brown.

Type Material. Holotype adult female and paratypes of this species have been deposited in the museum of the University of California, Department of Entomology and Parasitology, Davis. Paratypes have been placed in the United States National Collection of Coccoidea, Washington, D.C.

Habit. Female scales occurring on stems and leaves. Male scale not observed.

Recognition Characters. Adult female approximately 0.6 mm long on the slide. Body ovoid. Derm membranous. The margin of pygidium is quite regularly crenulate, without lobes, plates, or gland spines. Perivulvar pores absent. Minute tubular ducts abundant over entire dorsal and ventral surfaces, those on venter slightly smaller than on dorsum.

Notes. The new species is a "twin" of *Protodiaspis agrifoliae* Essig (hence the specific name, *didymus*), differing from it in the absence of perivulvar pores, these structures being present in *P. agrifoliae.*

ADDITIONAL COLLECTION RECORDS

Protodiaspis infidelis Ferris: This species was described by Ferris (1942) from a small collection on *Byrsonima crassifolia* (Malpighiaceae) and from a single specimen found on an undetermined oak. Some doubt arose as to the existence of males in this species. It was the first *Protodiaspis* to be found on anything other than an oak host. The present collection was made in July, 1960, two miles south of Panajachel, Sololá Province, Lake Atitlán, Guatemala, from *Quercus castanea* Nee. Males were found on leaves and small twigs and the females largely in cracks of stems and of small twigs.

Protodiaspis signata Ferris: Three collections were made of this species in August, 1960. The first from *Quercus obtusata* H. and B., eight miles north of Nueva Ixtapán, state of Mexico, Mexico, on Highway 15; the second from *Q. obtusata* also, but five miles west of Carapán, state of Michoacán, Mexico, on Highway 15; the third from the same site as the second, but from *Q. castanea* Nee. The third collection proved to be typical *P. signata,* while the second varied somewhat in having larger pygidial lobes, more extensive dorsal pygidial sclerotization, and a more anterior position of the vulva. The first collection, from a quite distinct locality, was intermediate between the other two in the characters just noted.

Previously, *P. signata* had been known only from Panama, where it had been found on an undetermined oak, and occurring completely sheathed by the mycelium of a *Septobasidium.* The Mexican material was not associated

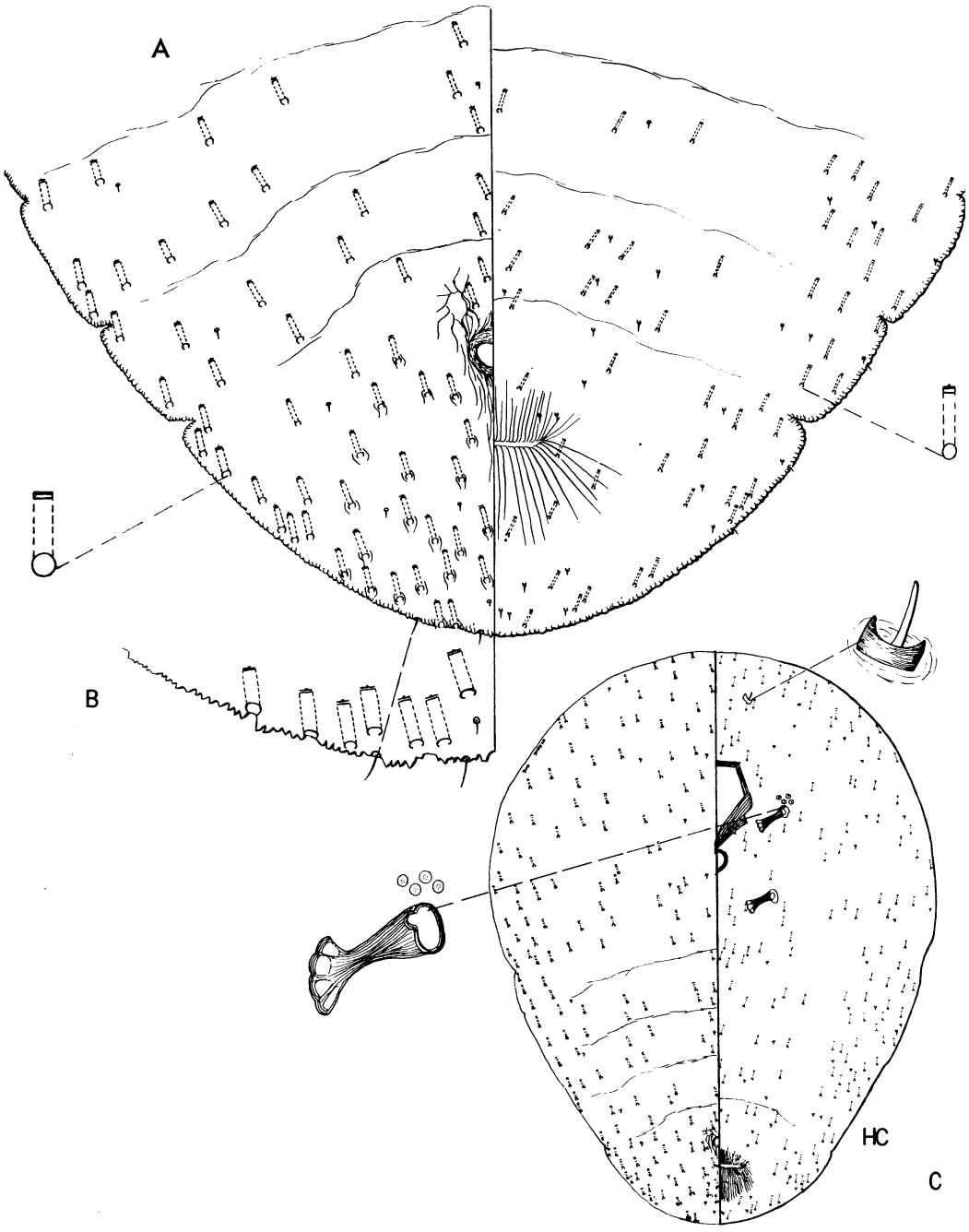


Fig. 3. *Protodiaspis didymus* McKenzie and Nelson-Rees, new species, collected twenty-five miles north of Clifton, Greenlee County, Arizona, near Highway 666, September 7, 1960, on *Quercus grisea* × *Q. turbinella,* by W. A. Nelson-Rees and S. W. Brown. *A,* pygidium of adult female; *B,* details of the dorsal (left half) and ventral (right half) aspects of the pygidial margin; *C,* body of adult female.

with fungus, and the females were found in small cracks in the bark. An association with fungus in part of the range of a species but not in another has been observed on several occasions for other species of coccids; the present observation, therefore, would not be unexpected.

Ferris (*Atlas:* Series III) neither pictured nor described males of *P. signata.* Males were not recovered in any of the present collections, but the occurrence of typical haploid embryos leaves no doubt that the species is sexual. The haploid chromosome number is 4.

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