

PUERTO RICAN SPECIES OF *SEIRA* (COLLEMBOLA: ENTOMOBRYIDAE)

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ABSTRACT

Four species of *Seira* are reported from Puerto Rico; two of them are new to science: *Seira distincta* and *S. blanca*. *Seira brasiliana* (Arlé) 1939 and *Seira caheni* Jacquemart 1976 are new records for the island. The possible identities of *S. brasiliana* with *S. subannulata* (Denis) 1933 and of *S. caheni* with *S. dowlingi* (Wray) 1953 are discussed. *Lepidocyrtinus domesticus* f. *colorata* Denis 1931 is raised to species status.

RESUMEN

Se reportan cuatro especies de *Seira* de Puerto Rico, dos de las cuales son nuevas para la ciencia: *Seira distincta* y *S. blanca*. *Seira brasiliana* (Arlé) 1939 y *S. caheni* Jacquemart 1976 son citas nuevas para la isla. Se discute la posible identidad de *S. brasiliana* con *S. subannulata* (Denis) 1933 y de *S. caheni* con *S. dowlingi* (Wray) 1953. Se otorga rango de especie a *Lepidocyrtinus domesticus* f. *colorata* Denis 1931.

INTRODUCTION

The first species of *Seira* identified from Puerto Rico was *S. dowlingi*, reported by Wray in 1959 from San Juan. This record, however, is based on specimens found on yams intercepted at a port of entry (provenance of the yams not given) and the species has not been actually collected on the island. Mari Mutt (1986a) reported *S. subannulata* from grasses in the campus of the University of Puerto Rico at **Mayagüez** but it is suggested below that this determination may be erroneous.

The present study is based on specimens from my collection of local springtails. However, this collection almost certainly does not contain all or perhaps most of the local species because most of my early collecting was biased towards leaf litter samples and

species of *Seira* are frequently found on the vegetation.

I would like to call attention in the introduction to a valuable character not used previously in the taxonomy of the genus. On the distal ventral side of the manubrium there are four setae which, depending on the species, are inserted in a straight line (Fig. 11) or with outer pair inserted above the inner pair (Fig. 28). In two species (Fig. 23, 31) the inner setae are absent (actually replaced by scales). Proximal to these setae there are three pairs of similar setae and a median unpaired seta near the base of the manubrium. These other setae are present in the same positions in all the species studied.

It should also be pointed out that in Puerto Rico species of *Seira* may be found sympatrically and it must not be concluded that all the specimens from the same sample belong to a single species. *Seira caheni* and *S. distincta* were found together under dead leaves along the stems of banana plants in

Mayagüez. *Seira brasiliiana* and *S. caheni* were taken together under dry cow dung in Guayanilla. *Seira brasiliiana* and *S. distincta* were collected together in sugarcane in **Guánica** and in leaf litter in Quebradillas.

Unless otherwise stated, all the specimens studied were collected by myself and remain in my personal collection.

DESCRIPTIONS

Seira Lubbock, 1869

Pseudosira Schött, 1893

Lepidocyrtinus Börner, 1903

Drepanocyrtus Handschin, 1924

Entomobryidae with scales on the body and appendages, falcate mucrones and 3 + 3 bothriotricha on the fourth abdominal segment.

Seira caheni Jacquemart

Seira caheni Jacquemart 1976: 149-151, Fig. 6; Galapagos Islands. Gruia 1983:200-201; Pl. 6, Fig. 1-6; Cuba, descr. notes.

Length to 1.9 mm. Live specimens iridescent grayish-brown. Extent of pigmentation in preserved specimens variable. Most specimens with violet pigment on sides of Th. 2, Th. 3 and on lateral posterior angle of Abd. 4 (Fig. 1). Some individuals with pigment forming an almost continuous band along side of body (Fig. 4). A specimen from **Mayagüez** (L. J. Joly Tinoco, cot.) has much wider lateral bands (Fig. 9) but body is dorsally unpigmented; this specimen has a V-shaped spot on dorsum of head. Dorsum of Ant. 1, Ant. 2 and proximal third of Ant. 3 with scales; ventrally these segments possess only ciliated setae. Scales present on legs down to tibiotarsi and on all sides of manubrium. Ant. 4 not annulated, its apex with an ever-visible bilobed papilla (Fig. 19, 20) and without pin seta. Head macrochaetotaxy as in Fig. 14. Interocular chaetotaxy as in Fig. 10; eyes g and h much smaller than others. Prelabral setae ciliated, labral setae smooth. Median seta of third labral row about ½x length of other setae on this row (Fig. 12). Labral intrusion broad, Labral papillae end in sharp points; inner pair of papillae larger than outer pair (Fig. 3). Labial chaetotaxy formula: a1-a5, M1M2r (reduced) EL1L2 (Fig. 6). Setae on maxillary palp similar in length and shape (Fig. 7). Maxillary lobe with 3 smooth

setae. Differentiated seta of outer labial papilla thick and long, clearly surpassing apex of its papilla (Fig. 5). Along ventral groove, near posterior margin of head, 1 + 1 ciliated setae (Fig. 2); between these setae and postlabial quadrangle (anterior 4 setae) four scales are inserted. All setae of venter of head very finely ciliated. Body macrochaetotaxy as in Fig. 15. Chaetotaxy of Abd. 2, Abd. 3 and setae associated with anterior bothriotricha of Abd. 4 as in Fig. 16-18. Trochanteral organ rectangular, with up to 32 slender setae. Outer margin of tibiotarsus with a long, slender seta about 3.8x length of unguis (see Fig. 29). Structure of claws as in Fig. 13, one outer unguicular lamella with very small striations. Tenaculum with one large seta. Ventral manubrial chaetotaxy as in Fig. 11, distal four setae arranged in a straight line. Dentes without erect apically rounded setae. Mucro as in Fig. 8. Male genital plate circinate, with 15 smooth setae forming a circle around the genital pore; within this circle at least 1 + 1 short smooth setae.

Variation. Cephalic seta M (Fig. 14) is a microchaeta in 8 of 10 specimens examined and a macrochaeta in the remaining individuals. The setae with arrows on the right side of Th. 2 (Fig. 15) may be absent on one or both sides of this segment. The seta signalled in Figure 17 is occasionally absent or substituted by a scale. The seta signalled in Figure 18 is absent in some specimens. One individual has six feathered setae above the anterior bothriotrix of Abd. 4 instead of the usual four.

Almost all the specimens from **Mayagüez** are lighter than the lightest specimens from Guayanilla. The former lack pigment on the body except for a small pale band on the lateral-posterior angles of Th. 2 and Abd. 4.

Discussion. It is with considerable apprehension that I have referred the Puerto Rican specimens to *Seira caheni*, described by Jacquemart in 1976 from specimens collected in the Galapagos Islands. The original description is limited to a general statement of pigmentation and to a discussion of the head and body macrochaetotaxy. My lighter, and most common, specimens agree with Jacquemart's description but I would have preferred to compare many other details before deciding the identity of the Puerto Rican material.

Seira caheni was redescribed by Gruia (1983) from Cuban specimens but her figure

of the pigmentation does not agree very closely with the description of Jacquemart. Gruia's figure, however, is reminiscent of the one given by Wray (1953) for his species *Seira dowlingi*, described from specimens collected in the Dominican Republic and reported in 1959 by the same author from Puerto Rico. It is possible that Gruia's specimens belong to *S. dowlingi* and not to *S. caheni*.

Jacquemart's and Wray's species may be identical but due to the incompleteness of their descriptions, the matter can only be settled after the corresponding types are studied. My specimens were not identified as *S. dowlingi* because, although the darker Puerto Rican specimens agree with the description of color pattern given by Wray, none resemble very closely his figure of coloration.

Material Examined. Guayanilla, under dry cow dung, 30.III.1985, 12 specimens on slides and 13 in alcohol. **Mayagüez**, 11 de Agosto 224, author's home, leaf litter in backyard, 28. I. 1974, 1 on slide. As preceding but collected under dead leaves along the stem of banana plants, 19.I.1986, 1 on slide and 3 in alcohol. As preceding but collected inside the house, **Mayagüez**, 2. VII. I 970, L. J. Joly Tinoco, 1 on slide. 7.I.1974, 1 on slide.

Seira distincta new species

This species differs from *S. caheni* only by the following characters: Violet pigment limited to lateral portions of Th. 3 to Abd. 2 (Fig. 2 1). Body macrochaetotaxy as in Figure 22; 2 + 2 macrochaetae on Abd. 1, macrochaeta above pseudopore of Abd. 4 absent. Inner distal setae on venter of manubrium absent (Fig. 23).

Variation. Setae with arrows in Th. 2 (Fig. 22) are absent in some specimens. The seta signalled in Abd. 4 is present on one side of the body of one specimen.

Discussion. My specimens are virtually identical to those found in greenhouses in New York by Maynard (1951) and identified by him as *Seira domestica* f. *colorata*. The latter form was described by Denis (1931) from Costa Rica but the Costa Rican specimens exhibit a variation in coloration that

does not occur in the Puerto Rican populations, nor apparently in the specimens from New York.

It is unlikely that Denis' specimens belong to a variety of the European species *Seira domestica*. Gisin and Gama (1962), and others thereafter, have described the head and body chaetotaxy of this species. It is very different from that of the Neotropical species studied so far. My opinion is that Denis' specimens belong to a different species and that his variety should be raised to species status: *Seira colorata* Denis 1931.

Material Examined. **Bayamón**, Santa Mónica housing project, in the backyard of a house, under leaves along the stem of banana plants and beating other vegetation, 9.1.1977, holotype and 9 paratypes on slides, and 11 paratypes in alcohol. **Guánica**, Rd. 333 km 0.5, beating sugarcane, 5.1.1977, 1 paratype on slide. Quebradillas, Guajataca, forest leaf litter, 8.VIII.1973, 1 on slide. **Mayagüez**, 11 de Agosto 224, author's home, 19.1.1986, under dead leaves along the stem of banana plants, 5 specimens on slides and many in alcohol.

Seira brasiliiana (Arlé)

Pseudosira brasiliiana Arlé 1939: 297-299, Fig. 21-23, 25-28; Brazil,

Seira brasiliiana - Marcus 1949: 61; combination, Bolivia.

Seira subannulata - Mari Mutt 1986: 76; Puerto Rico, misidentification (but see discussion).

This species is similar in overall appearance to *S. caheni* and *S. colorata* but it may be immediately distinguished from them by the color pattern, which is constant and distinct (Fig. 24). The dorsal central area of the head (Fig. 25) bears four macrochaetae instead of the seven present in *S. caheni* and *S. distincta*; cephalic macrochaeta PI is also absent in these other species. The body macrochaetotaxy is very similar to that of *S. distincta* but in *S. brasiliiana* there is a macrochaeta inserted above the pseudopore of Abd. 4 (Fig. 26) and the usual number of macrochaetae on Th. 3 is six while in *S. distincta* it is eight. These three species possess an almost identical chaetotaxy on Abd. 2 but in *S. brasiliiana* we find a microchaeta between the second and third macrochaetae (cf. Fig. 16, 30- on both sides of the body of two specimens this microchaeta is substituted by a

macrochaeta). In *S. caheni* the terminal group of ventral manubrial setae consists of four setae placed in a straight line (Fig. 11), in *S. brasiliana* the outer setae are inserted above the inner setae (Fig. 28), and in *S. distincta* the inner setae are absent (Fig. 23). The claw structure (Fig. 27) is similar to that of the preceding species.

Variation. Cephalic seta M (Fig. 25) is a microchaeta on both sides of the head of 1 of the 10 specimens examined and on one side of the head of two specimens. Seta P1 is present in all the specimens but P2 is present in only one specimen (both sides of the head). The left side of the body in Figure 26 presents the usual distribution of macrochaetae; setae with arrows on the right side are absent from one or both sides of the body in some specimens. Seta a in Figure 30, as stated previously, is a macrochaeta in two specimens; seta b is absent in one side of the body of one specimen; seta c is present on one side of the body in about 20% of the sides examined.

Discussion. In 1939 Arlé reported the Costa Rican species *Lepidocyrtinus subannulatus* Denis 1933 from the Brazilian State of Espírito Sante, stating that it also occurs in Rio de Janeiro. Arlé made the identification with reserve because the pigmentation of his specimens was not in complete agreement with that figured by Denis. Arlé's specimens had some pigment laterally on Th. 3 to Abd. 2 and three abdominal segments and, his specimens also had a spot of pigment latero-ventrally on Abd. 4 that was not figured by Denis. Arlé suggested that his specimens could represent a different species, albeit one closely related to *L. subannulatus*.

In another paper published in the same year (1939b), Arlé proposed the name *Pseudosira brasiliana* for the specimens previously identified as *Lepidocyrtinus subannulatus*, now reported also from the States of Mato Grosso and Sao Paulo. In the diagnosis of his new species Arlé mentioned its similarity with *L. subannulatus* but failed to point out diagnostic characters other than the previous differences in coloration.

Based on the preceding discussion one may conclude that Arlé's and Denis' species are identical and the slight differences in coloration have no diagnostic importance. However, Cuban specimens of *Seira subannulata* described by Gruia (1983) exhibit the

exact coloration of those from Costa Rica, while my Puerto Rican specimens possess the pigmentation described by Arlé, including the conspicuous latero-ventral spot on Abd. 4. In addition, Gruia's specimens lack cephalic macrochaeta PI (Fig. 26) which is present in all my specimens. Seta P2, figured by Gruia, is present in only one of the Puerto Rican specimens studied.

Material Examined. **Mayagüez**, University of Puerto Rico campus, on grasses, IV.1984, 10 specimens on slides and 10 in alcohol. **Mayagüez**, University campus, behind the Entomological Research Laboratory, on soil covered with dry grass, IV.1973, 3 on slides. **Mayagüez**, University campus, on leaves of soybean plants in a greenhouse, 9.VII.1977, H. Ruiz, 1 on slide and 5 in alcohol. **Mayagüez**, road to Zoo, near the University parking lot, on grasses, 1.II.1984, 2 on slides. **Aguadilla**, Borinquen Beach, Ramey, litter far from shore, 23.XII.1976, 16 in alcohol. **Cabo Rojo**, Rd. 301 km 2.1, beating grasses, 24.XII.1976, 5 in alcohol. **Coamo** to **Aibonito** road (14), km 44.1, beating grasses growing along the road, 7.I.1982, 101 in alcohol. **Dorado**, dry coconut leaves behind a beach house, 3.VI.1974, 1 on slide. **Guánica**, Rd. 332 km 1.4, beating grasses, 7.I.1982, 9 in alcohol, **Guánica**, Rd. 333 km 0.5, sugarcane litter, 2.VII.1974, 7 on slides. As preceding but beating sugarcane, 5.I.1977, 36 in alcohol. **Guayanilla**, under dry cow dung, 30.III.1985, 3 on slides. **Hormigueros**, Rd. 114 km 2.3, beating grasses, 26.XII.1976, 1 in alcohol. **Isabela**, Agricultural Experiment Station, sticky traps on soybean var. B. Williams, 23.V.1975, M. E. Irwin and E. H. Paschal, 3 on slides. **Quebradillas**, Guajataca, forest leaf litter, 8.VIII.1973, 4 on slides. **Ponce**, Rd. 52 km 98.2, beating grasses, 9.I.1982, 23 in alcohol.

Seira blanca new species

Length to 2.0 mm. Ant, 1 and proximal 1/3 of Ant. 2 dorsally with scales, ventrally only with ciliated setae. Body unpigmented except for antennae and very small spot anterior to eyes (Fig. 36). Apex of Ant. 4 with slightly bilobed papilla and without pin seta (Fig. 34). Head macrochaetotaxy as in Figure 37, 11 setae in the central group. Interocular chaetotaxy as in preceding species, eyes g and h not very reduced (Fig. 42). Prelabral

setae ciliated. Labral setae smooth, median seta of second row not much shorter than other setae of this row. Labral intrusion as in *S. caheni*. Labral papillae rectangular, without apical spinelike projections (Fig. 33). Labial chaetotaxy as in *S. caheni* and other Puerto Rican species except that seta r is long and ciliated, not reduced (cf. Fig. 6, 44). Setae of maxillary palp as in *S. caheni*. Differentiated seta of outer labial papilla set in a distinct lateral projection and not reaching apex of its papilla (Fig. 35). Along ventral cephalic groove, behind postlabial quadrangle, 1 + 1 ciliated setae (one may be substituted by a scale) and a posterior group of 2-3 ciliated setae per side (Fig. 32). Body macrochaetotaxy as in Figure 38; Abd. 1 with 5 macrochaetae per side, Abd. 3 with 2 macrochaetae between first two bothriotricha. Chaetotaxy of Abd. 2, Abd. 3, and distribution of setae associated with anterior bothriotricha of Abd. 4 as in Figures 39-41, note reduced number of setae as compared with *S. caheni*. Trochanteral organ V-shaped, with up to 12 setae (Fig. 45). Tibiotarsi without outstanding long setae. Claws as in Figure 43, unguis slightly thicker than in preceding species. Ventral manubrial chaetotaxy as in Figure 31, inner setae of distal group absent (cf. Figure 28). Mucro typical of genus.

Variation. The seta with an arrow on Abd. 2 (Fig. 41) is present in two specimens (both sides of the body). The two setae signalled on Abd. 3 (Fig. 40) are absent in some specimens. On Abd. 4 (Fig. 39) the anterior two setae signalled are present in 4 of 10 specimens while the third seta is absent only in the specimen from **Guánica**.

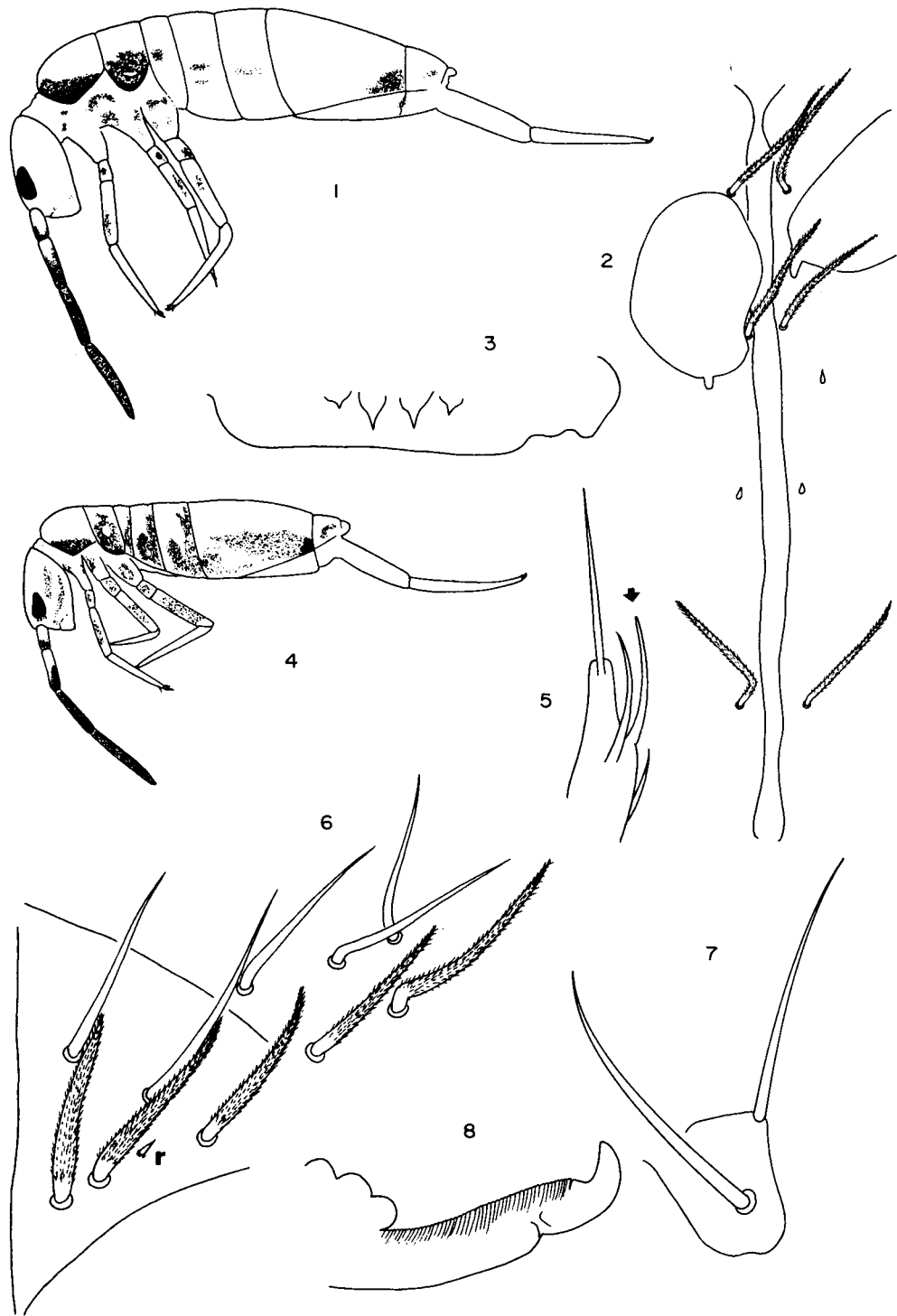
Diagnosis. Many characters isolate *Seira blanca* from the other Puerto Rican species. The most obvious are almost complete absence of pigmentation, more macrochaetae in the central group of cephalic setae, presence of five macrochaetae on the first abdominal segment and two such setae between the first two bothriotricha of Abd. 3, eyes g and h not markedly reduced, labral papillae without denticles, labial seta r long instead of very reduced, differentiated seta of outer labial papilla not reaching apex of its papilla, and trochanteral with no more than 12 setae. The chaetotaxy of *S. blanca* differs from that of all the New World species whose setal patterns are known.

Comments. This species has been collected only near the seashore of various beaches. It lives upshore, where the sand and beach litter remain dry. The specimens do not exhibit morphological adaptations found in typical littoral springtails, with the possible exception of a slightly thickened unguis.

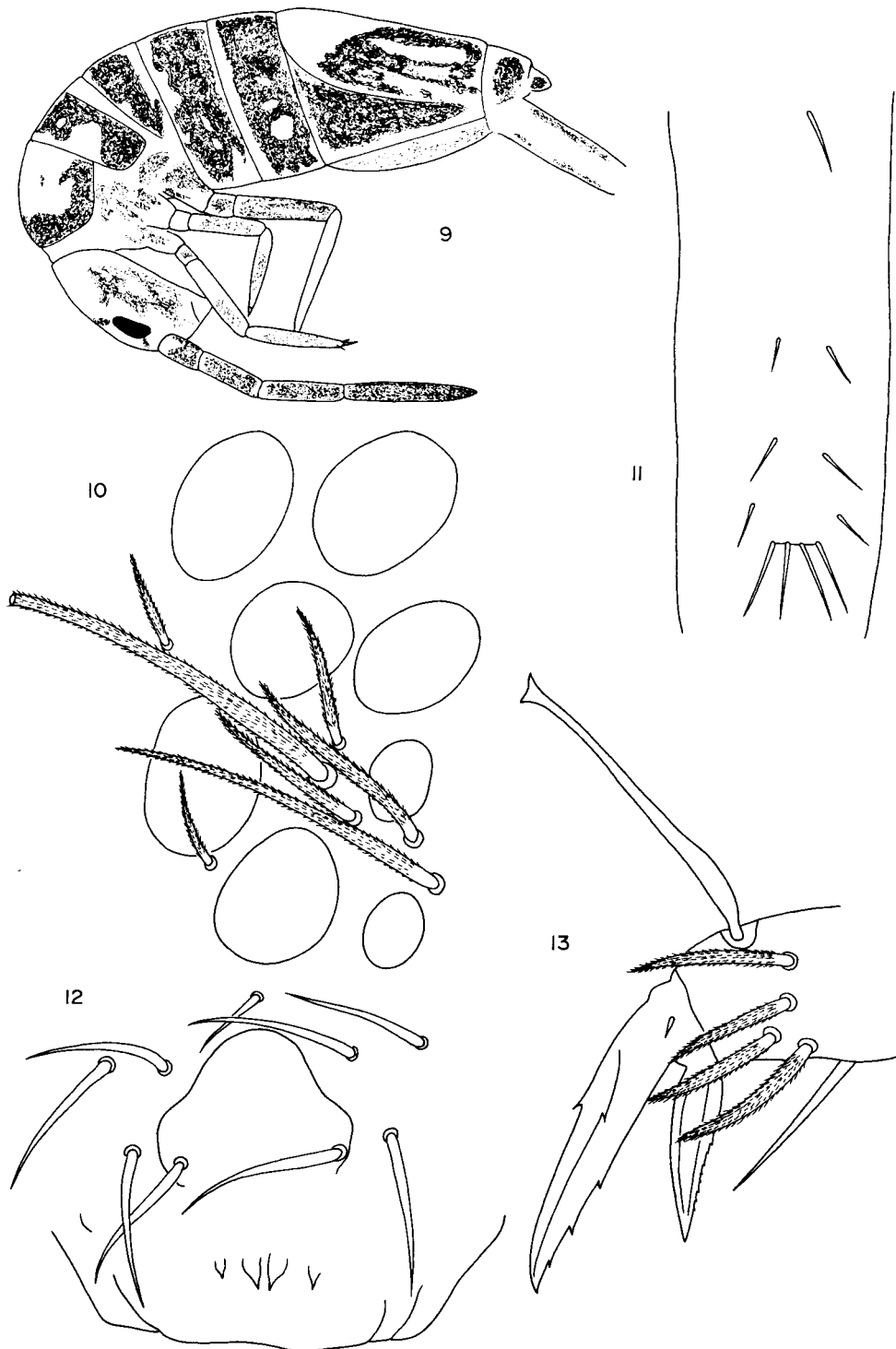
Material Examined. **Guánica**, Rd. 333 km 10.0, *Thalassia* litter, 10. VI. I 1981, holotype on slide. Aguadilla, Punta Borinquen, dry litter of seaweeds, 26.II.1986, F. Soto, 142 specimens in alcohol. **Manatí**, Mar Chiquita Beach, ground litter near shore, 15.IV.1974, R. Vega Soler, 9 paratypes on slides. **Mayagüez**, Punta Arenas, Rd. 102 km 9.9, dry litter of seaweeds, 7.III.1986, F. Soto, 107 specimens. Vieques Island, Front Beach Garcia Naval Base, 24.III.1986, F. Soto, 23 specimens in alcohol.

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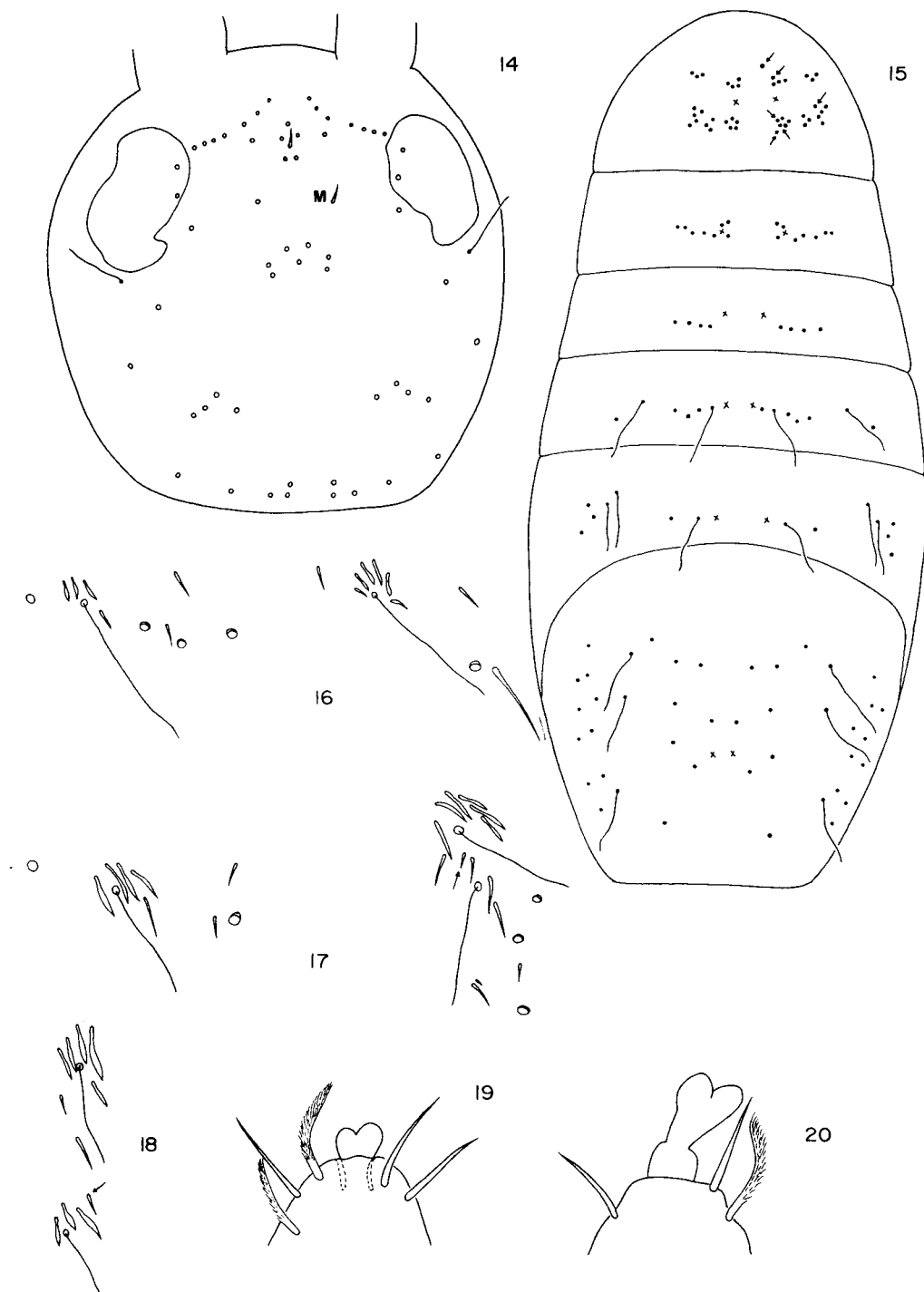
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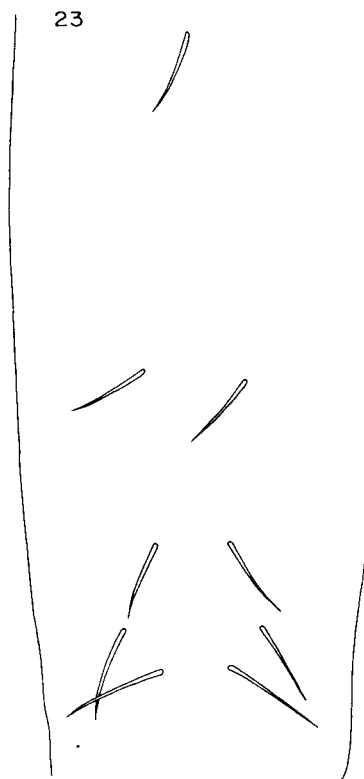
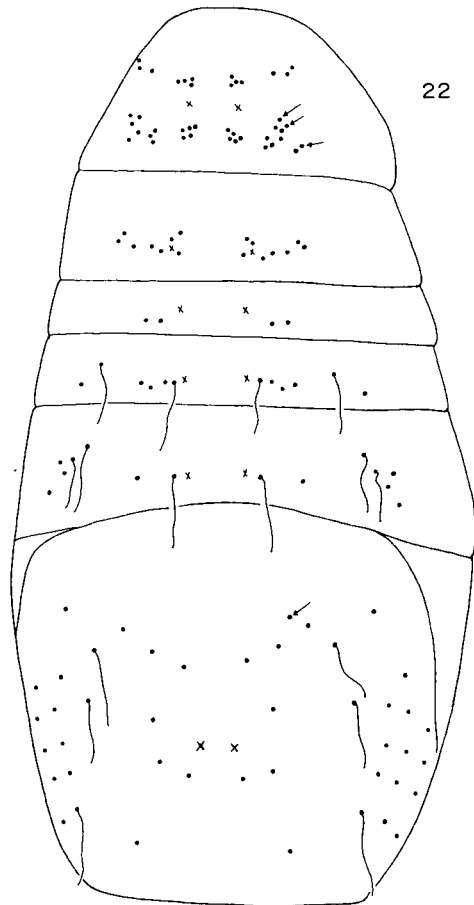
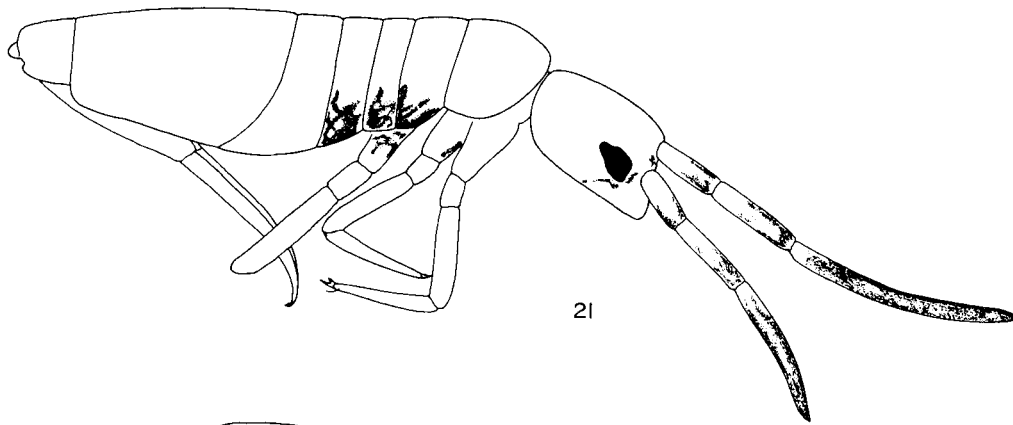
FIGURES 1-8. *Seira caheni*. 1. Distribution of pigment in most frequent color form. 2. Setae along cephalic groove. 3. Labral papillae. 4. Distribution of pigment in a dark individual from the same sample as specimen in Figure 1. 5. Outer labial papilla, arrow signals the differentiated seta. 6. Labial chaetotaxy. 7. Maxillary palp. 8. Mucro.



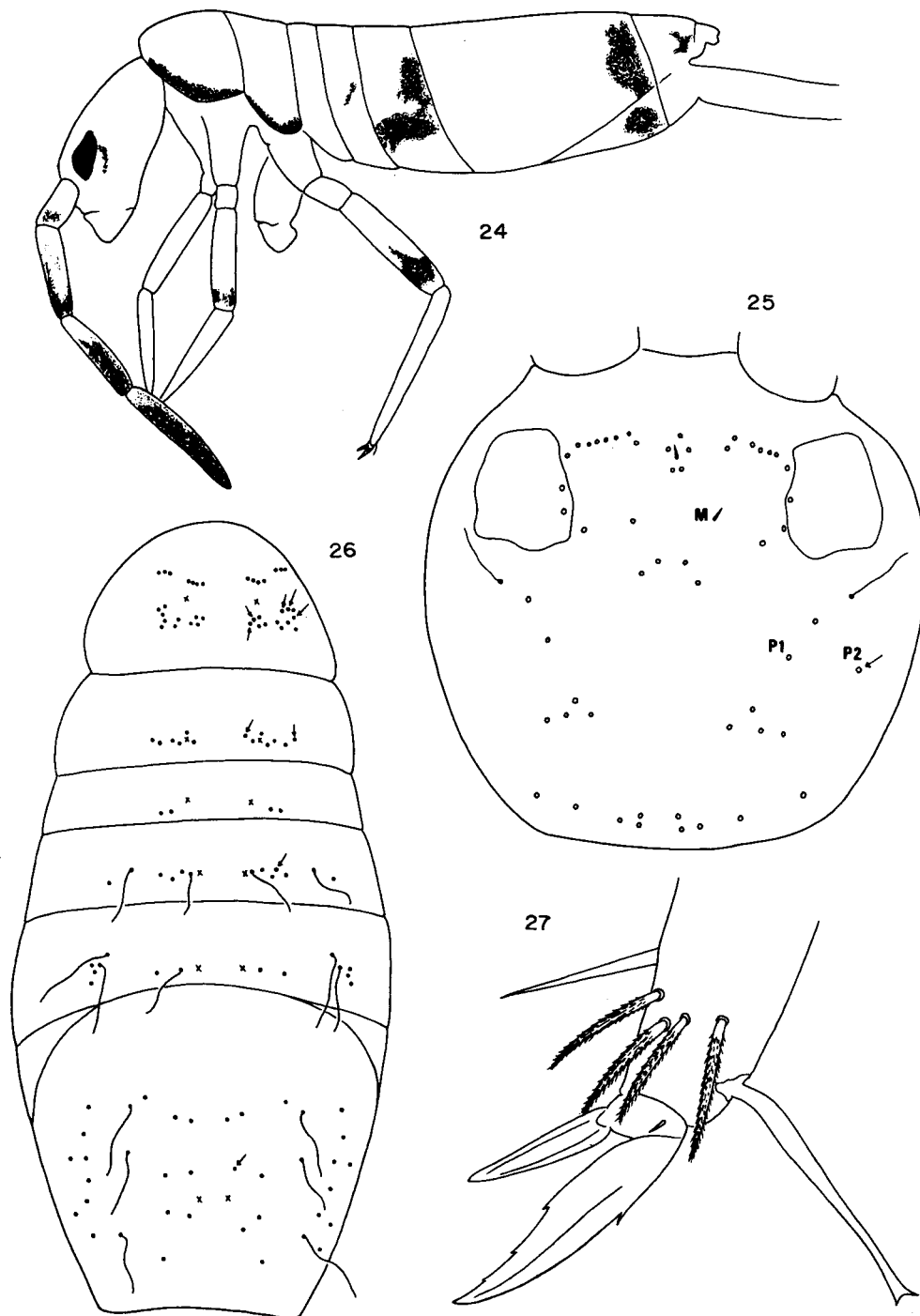
FIGURES 9-13. *Seira caheni*. 9. Very dark specimen from Mayagüez. 10. Eyes and interocular chaetotaxy. 11. Ventral manubrial chaetotaxy. 12. Distal two rows of labral setae. 13. Metathoracic claws.



FIGURES 14-20. *Seira caheni*. 14. Head macrochaetotaxy. 15. Body macrochaetotaxy and distribution of pseudopores (x). 16. Chaetotaxy of Abd. 2. 17. Chaetotaxy of Abd. 3. 18. Distribution of setae associated with the anterior bothriotricha of Abd. 4. See discussion of variation for meaning of arrows in Figures 15-18. 19-20. Apex of Ant. 4 showing eversible bilobed papilla.



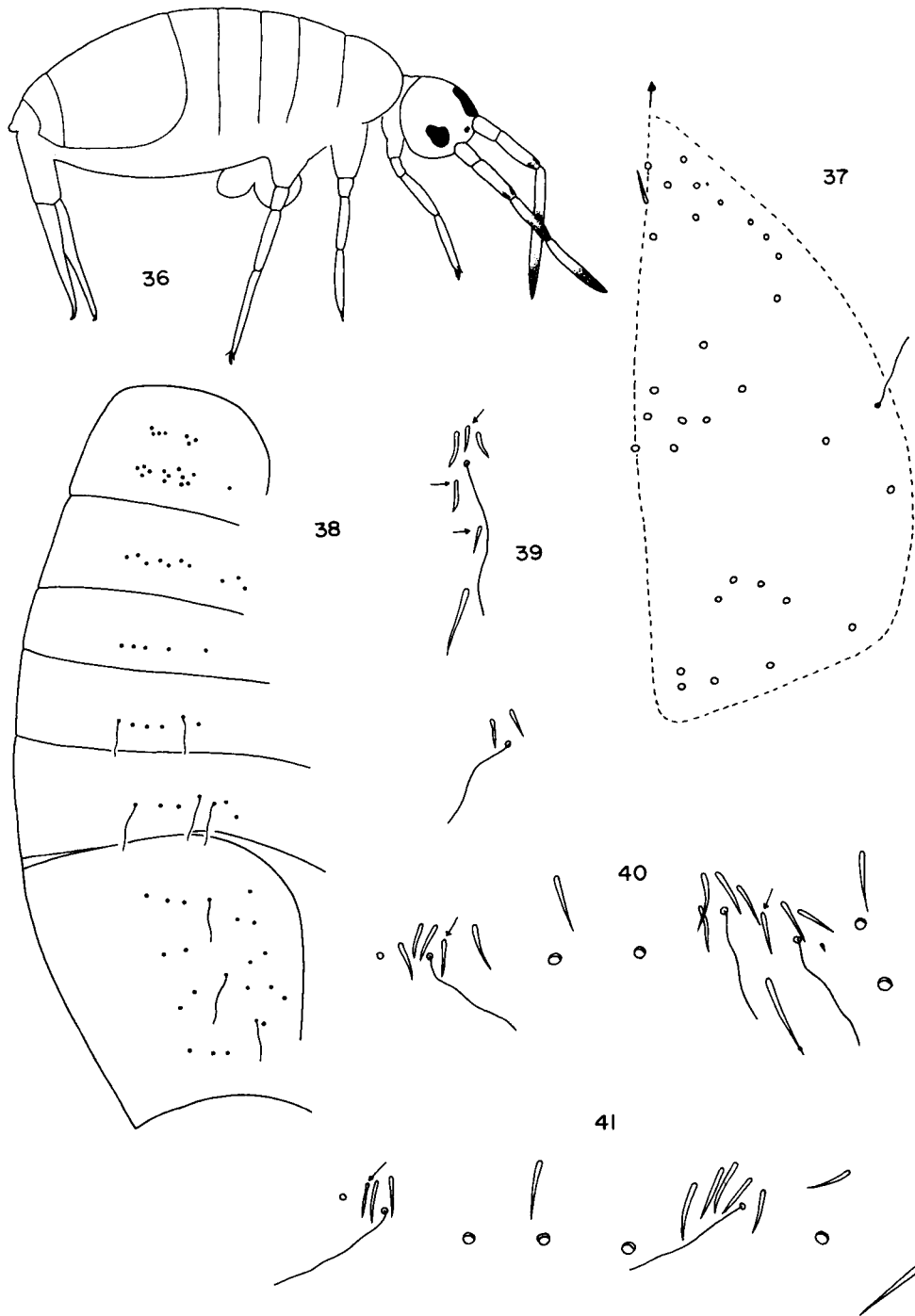
FIGURES 21-23. *Seira distincta*. 21. Distribution of pigment. 22. Body macrochaetotaxy and distribution of pseudopores (x), see discussion of variation for meaning of arrows. 23. Ventral manubrial chaetotaxy.



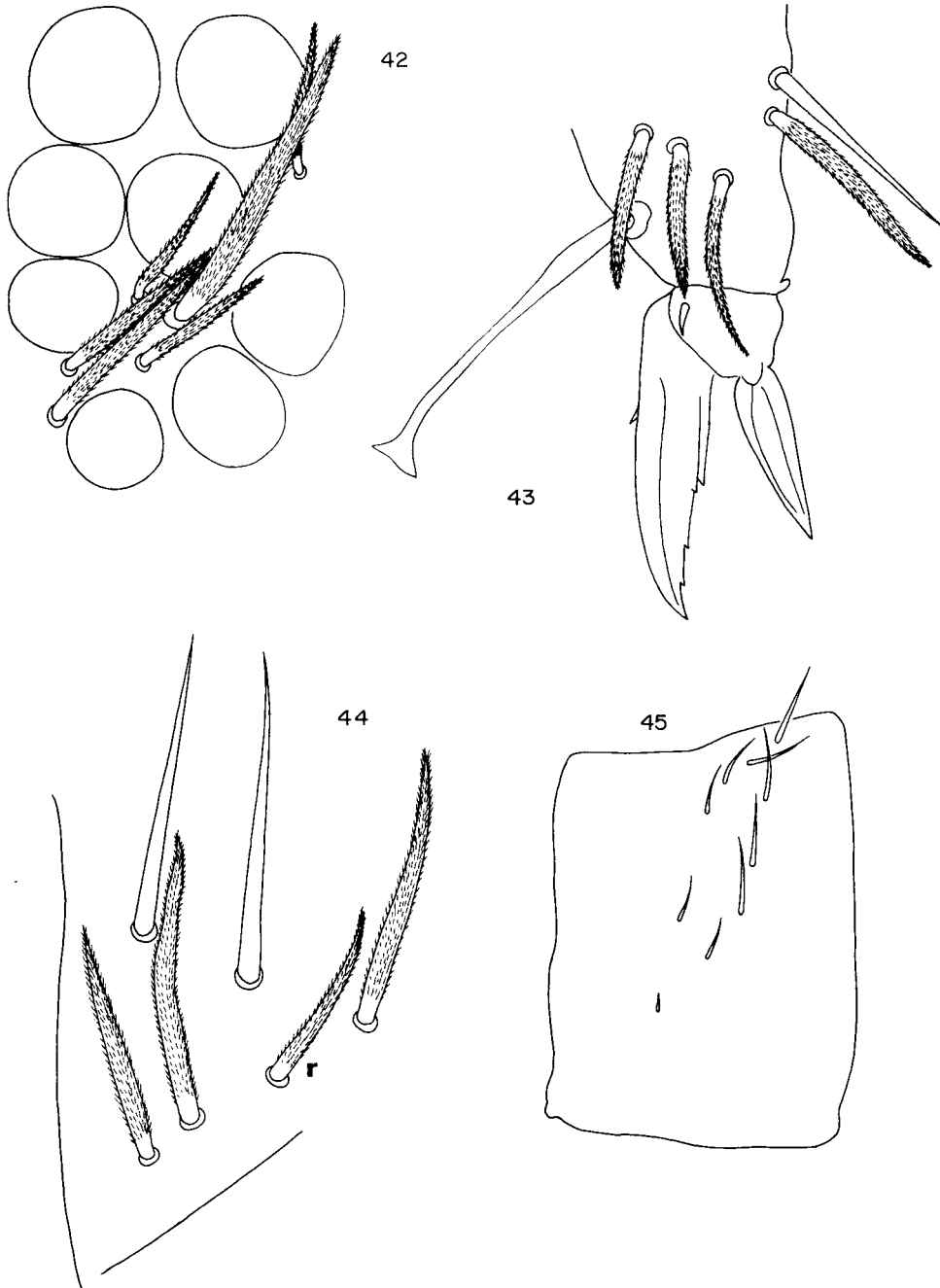
FIGURES 24-27. *Seira brasiliana*. 24. Distribution of pigment. 25. Head macrochaetotaxy. 26. Body macrochaetotaxy and distribution of pseudopores (x). See discussion of variation for meaning of arrows in Figures 25 and 26. 27. Metathoracic claws.



FIGURES 28-30. *Seira brasiliensis*. 28. Ventral manubrial chaetotaxy. 29. Metathoracic leg, arrow points to the seta whose length is measured relative to the length of the unguis. 30. Chaetotaxy of Abd. 2. FIGURES 31-35. *Seira blanca*. 31. Ventral manubrial chaetotaxy. 32. Setae along cephalic groove. 33. Labral papillae. 34. Apex of Ant. 4. 35. Differentiated seta of outer labial papilla.



FIGURES 36-41. *Seira blanca*. 36. Habitus. 37. Distribution of macrochaetae on right side of head. 38. Body macrochaetotaxy. 39. Setae associated with anterior bothriotricha of Abd. 4. 40. Chaetotaxy of Abd. 3. 41. Chaetotaxy of Abd. 2.



FIGURES 42-45. *Seira blanca*. 42. Eyes and interocular chaetotaxy. 43. Metathoracic claws. 44. Inner labial chaetotaxy. 45. Trochanteral organ.

TABLE 1 .- Main diagnostic characters for the Puerto Rican species of *Seira*
 + = present, — = absent, NA = not applicable.

Characters	Species			
	<i>caheni</i>	<i>distincta</i>	<i>brasiliiana</i>	<i>blanca</i>
No. macrochaetae on middle center of head	7	7	4	11
Head macrochaeta P ₁	.	—	+	—
No. macrochaetae on Abd. 1	4	2	2	5
Macrochaeta above pseudopore of Abd. 4	+	—	+	+
No. dorsal macrochaetae on Abd. 3	1	1	1	2
Inner distal setae on venter of manubrium	+	—	+	—
Position of outer vs. inner setae venter of manubrium	level w. inner setae	NA	above inner setae	NA
Labral papillae	pointed	pointed	pointed	flat
Labial setae	reduced	reduced	reduced	long
Color pattern	variable	sides of Th. 3 -Abd. 2	sides of thorax + abdomen, apex of metafemur	white, only eyes + antennae