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THE SPIDER GENUS *CYBAEOTA* (ARANEAE, AGELENIDAE)

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ABSTRACT

Cybaeota Chamberlin and Ivie, 1933 (a genus of small, Nearctic, woodland spiders) is revised to include four species: *Cybaeota calcarata*, the type species, was described by Emerton in 1911, and *C. nana, C. munda*, and *C. shastae* were described by Chamberlin and Ivie in 1937. *Cybaeota concolor* Chamberlin and Ivie, 1937 is synonymized under *C. nana. Cybaeota vancouverana* and *C. wasatchensis* (both of Chamberlin and Ivie, 1937) are synonymized under *C. shastae*. The relationship of *Cybaeota* to other Cybaeinae is discussed.

INTRODUCTION

In 1911 J. H. Emerton described what is now the type species of *Cybaeota* as *Liocranum calcaratum*. He placed it in the Clubionidae, apparently because of the similarity of this cryptic, eastern North American species to certain clubionid spiders (e.g., *Scotinella* Banks) in size and the possession of conspicuous pairs of ventral macrosetae on various leg segments. Some years later R. V. Chamberlin and W. Ivie (1933), citing the presence of an unpaired third tarsal claw and the general similarity of the male palpus to that of *Cybaeus* L. Koch, transferred this species to the Agelenidae and placed it in a new genus *Cybaeota*. Since 1933 *Cybaeota* usually has been considered a member of the subfamily Cybaeinae (currently considered to encompass the genera *Cybaeina*, *Cybaeota*, and *Cybaeozyga* of Chamberlin and Ivie, and *Cybaeus*) of the Agelenidae (Roewer 1954; Bonnet 1956; but see Lehtinen 1967 and Brignoli 1983).

Subsequently Chamberlin and Ivie (1937) described *C. concolor, C. munda, C. nana, C. shastae, C. vancouverana* and *C. wasatchensis* from about a dozen specimens collected from British Columbia, California, and Utah. These species were diagnosed on the basis of abdominal pigmentation variations and small genitalic differences. As is often found in the taxonomic work of Chamberlin (in particular) and Ivie the descriptions are terse and vague and the drawings difficult to interpret for specimen identification. The present paper is the first in a series planned to sort out the general tangle of cybaeine systematics and test the hypothesis of cybaeine monophyly.

Cybaeota is a distinct grouping and is probably monophyletic. Genitalic apomorphies of the genus are: (1) the structure of the retrolateral tibial apophyses and the position of the bristly seta between them (Fig. 17), and (2) the structure and placement of the spermathecae and connecting ducts (Figs. 25, 28, 38).

The putative monophyly of the taxon Cybaeinae including *Cybaeota* is less well-supported. The similarities in the general structure of the male palpus shared by *Cybaeota* and *Cybaeus* are also seen in other, more distantly related genera such as *Altella* and *Devade* (both of Simon) in the Dictynidae, or *Cicurina* Menge and *Tegenaria* Latreille in the Agelenidae. *Cybaeota* strongly resembles *Cybaeina* in the arrangement of the ventral tibial and metatarsal macrosetae (Fig. 9) and in the fine structure of their sockets (Fig. 10), but these characters are also seen in various clubionid genera (e.g., *Scotinella* as mentioned above) and some other divergent agelenids (e.g., *Ethobuella* Chamberlin and Ivie and *Cicurina*) as well as in *Liocranoides* Keyserling (Tengellidae) and *Ischnothyreus* Simon (Oonopidae). These characters are probably present in combination in other genera as well. Conspicuous, paired, ventral tibial macrosetae are of widespread but scattered distribution amongst spiders and the socket reinforcements are present in all genera possessing such macrosetae of which I had specimens to study (i.e., those listed above). The intriguing distribution of these characters suggests that they are homoplasies (or perhaps shared plesiomorphies) and probably are not indicators of close relationship. Although no good synapomorphies can be found to support the inclusion of *Cybaeota* in the Cybaeinae, neither have any been found which demonstrate a closer relationship of *Cybaeota* to any other taxa. *Cybaeota* is therefore left in the Cybaeinae.

In this revision three new synonyms are proposed, reducing the number of recognized species of *Cybaeota* from "seven species described and several others known" (Roth and Brame 1972) to four. *Cybaeota concolor* is synonymized under *C. nana*; and *C. wasatchensis* and *C. vancouverana* under *C. shastae*. The collecting activities of V. D. Roth and W. J. Gertsch have been largely responsible for boosting the number of *Cybaeota* specimens available for study. Because of this increase, pigmentation differences used by Chamberlin and Ivie to delimit various species can be seen to be clinal variations within species.

This revision has resulted from the study of about 350 specimens from my personal collection (RGB) or kindly lent by the following institutions and individuals: the American Museum of Natural History (AMNH), Dr. N. I. Platnick; the California Academy of Sciences (CAS), Dr. W. J. Pulawski; the Canadian National Collection of Insects, Arachnids, and Nematodes (CNC), Dr. C. D. Dondale; the Museum of Comparative Zoology (MCZ), Dr. H. W. Levi; Dr. Robin E. Leech (REL); and Mr. Vincent D. Roth (VDR).

Methods.—Specimens were examined and measured under a stereo dissecting microscope with an ocular micrometer reticle attached. Measurements are accurate to 0.01 mm. Identifications were made through the examination of male and female genitalia (dissected from the spiders and cleared in clove oil) under a compound microscope. The small size of these spiders makes identification with a dissecting microscope difficult. Drawings were made either with the aid of a drawing tube attached to the compound microscope or a squared grid reticle in one eyepiece of the dissecting microscope. Scanning electron micrographs were made with a Hitachi S-570 SEM.

Abbreviations used in text are as follows: CL, CW (carapace length and width); SL, SW (sternum length and width). Other abbreviations are explained in figure legends. Standard postal abbreviations are used for states and provinces. Statistics are presented as sample range (mean $\pm$ standard deviation). Measurements are in millimeters.

Genus *Cybaeota* Chamberlin and Ivie

Liocranum (in part): Emerton, 1911:402, Plate V, figs. 4, 4a-f.

Cybaeota Chamberlin and Ivie, 1933:3, figs. 1-10, type species *Liocranum calcaratum* Emerton, 1911, by monotypy; Chamberlin and Ivie, 1937:226, figs. 68-84; Roewer, 1954:87; Bonnet, 1956:1298; Lehtinen, 1967:226; Roth and Brame, 1972:17, figs. 5, 23-24; Brignoli, 1983:483; Roth and Brown, 1986:3.

Diagnosis.—Male with characteristic distal and medial retrolateral tibial apophyses, with single bristly seta located between them (Fig. 17); female with simple genitalia, copulatory opening single, with two, short connecting ducts each leading to single, large, circular, heavily sclerotized spermatheca (Figs. 25, 28, 38).

Description.—Small spiders, with carapace lengths averaging 0.74 (male) to 1.08 mm (female); females usually slightly larger than males. Carapace (Figs. 1, 3) darkly pigmented around eyes, pale yellow elsewhere, longer than wide, glabrous except for small number of setae along midline and around eyes; dorsal groove short, longitudinal. Usually eight eyes (Figs. 1, 3) in two rows (one specimen of *C. shastae* known with posterior median eyes missing); posterior row longer than anterior; both rows slightly recurved in dorsal view; in frontal view anterior row straight, posterior row recurved; anterior median eyes reduced; anterior laterals largest; posteriors subequal, somewhat smaller than anterior laterals; median ocular quadrangle widest posteriorly, about twice height of clypeus. Promargin of cheliceral fang furrow with three subequal teeth (Fig. 3), retromargin with two to five small teeth.

Sternum (Fig. 2) shield-shaped, extending posteriorly short distance between coxae IV, nearly as wide as long, pale yellow, lightly clothed with fine setae. Labium (Fig. 2) short, wider than long. Serrula (Fig. 16) well developed.

Legs pale yellow, without markings; I and IV longest, subequal, III shortest; I and II conspicuously setose, femur I with two (occasionally 1) distal prolateral macrosetae, other macrosetae ventral, tibia I 2-2-2-2-2, metatarsus I 2-2-2, tibia II 2-2-2-2-1, metatarsus II 2-2-1, tibia III 1-2-1; all tibial and metatarsal macrosetal sockets reinforced (as in Fig. 10). Each tarsus and metatarsus usually with two trichobothria dorsally (Fig. 13), arranged as in typical agelenids, with distal one longer than proximal. Trichobothrial sockets and tarsal organs typically araneomorph (Figs. 14, 15).

Abdomen (Figs. 1, 2) rounded, unornamented, concolorous to strongly patterned (variable within species, Figs. 6-8), lightly clothed with fine setae; spiracle (Figs. 2, 11) just anterior to and as wide as colulus, which is represented by two setae; anterior spinnerets (Figs. 2, 12) broad, separated by about width of colulus, as long as posterior spinnerets; posterior spinnerets narrow, separated by width of anal tubercle; median spinnerets small, contiguous; apical segments of all spinnerets subequal, much shorter than basal segments.

Epigynum simple, externally marked by transverse (Fig. 25) or inverted "U-shaped" (Fig. 27) copulatory opening; shape and position of spermathecae and connecting ducts usually discernible through integument (Figs. 2, 30-34); bursa a shallow pocket (Fig. 25) or nearly absent; connecting ducts short, sinuous (most noticeably in anterior or posterior view), separately joined to anterior margin of bursa (Fig. 25) or to anterolateral (Figs. 36, 37) or posterolateral (Fig. 27) margins of copulatory opening when bursa reduced; spermathecae simple, large,

rounded, heavily sclerotized, contiguous (Figs. 25, 26) or moderately separated; single fertilization duct exiting each spermatheca posteriorly (Fig. 27).

Male pedipalp (see Fig. 4 for view of expanded palpal organ) simple, without patellar apophyses, with distal and medial retrolateral tibial apophyses uniform among species (Fig. 17); basal haematodocha well-developed (with petiole apparently incorporated onto proximal surface), merging with narrow ringlike subtegulum; subtegulum connected to broad, rounded tegulum by inconspicuous middle haematodocha; embolus short, stout, continuous with surface of tegulum (Fig. 19) (Gering [1953] incorrectly described the embolus of *Cybaeota* as terminating in a long filament such as in *Wadotes* Chamberlin; see Bennett 1987); conductor (Figs. 21, 22) flexibly attached (by distal haematodocha?) to surface of tegulum, with broad, shallowly excavated plate dorsal to tip of embolus, with two arms, prolateral arm varying according to species, retrolateral arm dagger-shaped; receptaculum seminis (Fig. 5) visible in palpi cleared in clove oil, well-sclerotized throughout, coiled through ~540°, fundus "s-shaped", lying deep within subtegulum, reservoir in close association with outer margin of tegulum through ~360°, ejaculatory duct "s-shaped" at base of embolus, opening just proximal to embolus tip.

Natural history notes.—The orientation of palpal sclerites on the partially expanded palpus of one male *C. nana* (Fig. 18) suggests a functional relationship between the retrolateral arm of the conductor and the medial retrolateral tibial apophysis. During inflation of the basal haematodocha the conductor is forced proximally along the tibia until the retrolateral arm of the conductor and the medial retrolateral tibial apophysis engage. This action should impart some amount of rigidity to the cymbium as the embolus is inserted into the epigynum.

The cryptic nature of all species of *Cybaeota* is probably responsible for their rare appearance in collections. However, within particular microhabitats, species of this genus may be dominant members of the arthropod community as has been demonstrated for other "rare" organisms (e.g., see Bennett 1985 and discussion under *C. shastae*).

The tiny spiders of this genus are found in leaf litter, moss on tree trunks, and other debris on the floor of Nearctic forests. The species are concentrated in western North America from Utah west to California and coastally north to Alaska (Figs. 40-42). One species occurs in the northeastern United States and adjacent regions of Canada (Fig. 39).

KEY TO SPECIES OF *CYBAEOTA*

(Male of *C. munda* unknown)

1. Prolateral arm of conductor bifid (Fig. 19). Spermathecae large, nearly contiguous (Figs. 25, 26). NE. USA and adjacent areas of ON and PQ (Fig. 39)..... *calcarata*

   Prolateral arm of conductor not bifid. Spermathecae smaller, separated by about one-half their diameter. W. North America.....2

2. Prolateral arm of conductor pointed and directed towards retrolateral arm (Figs. 21, 22). Connecting ducts joining copulatory opening posterolaterally (Figs. 27-29). AK to S. CA with (apparently) disjunct population in UT (Figs. 41, 42)..... *shastae*

Prolateral arm of conductor otherwise. Connecting ducts joining copulatory opening anterolaterally. Not known north of S. BC (Fig. 40).....3

3. Prolateral arm of conductor knob-like and directed ventrally (Figs. 23, 24). Connecting ducts not extending well into spermathecae in ventral view (Figs. 37, 38). Relatively small species (avg. female carapace length 0.8 mm). S. BC to S. CA and N. UT (Fig. 40).....*nana*

Male unknown. Connecting ducts extending well into spermathecae in ventral view (Figs. 35, 36). Relatively large species (avg. female carapace length 1.1 mm). S. OR and mid-coastal CA (Fig. 40).....*munda*

Cybaeota calcarata (Emerton)
Figs. 19, 20, 25, 26, 30, 39

Liocranum calcaratum Emerton, 1911:402, Plate V, figs. 4, 4a-f.
C. calcarata: Chamberlin and Ivie 1933:4, figs. 1-10; Roewer 1954:87; Bonnet 1956:1298; Roth and Brown 1986:3.
C. calcaratum: Kaston 1976:37, figs. 31-32.

Diagnosis.—Male with bifid tip on prolateral arm of conductor (Fig. 19). Female with relatively large, nearly contiguous spermathecae (Figs. 25-26).

Description.—As for genus. *Male*: *N*=7 including male syntype. CL 0.92-1.13 (0.99±0.07), CW 0.77-0.88(0.80±0.04), SL 0.60-0.70(0.63±0.04), SW 0.57-0.62 (0.60±0.02). Syntype CL 1.13, CW 0.88, SL 0.70, SW 0.62. Retrolateral arm of conductor with ventral longitudinal keel.

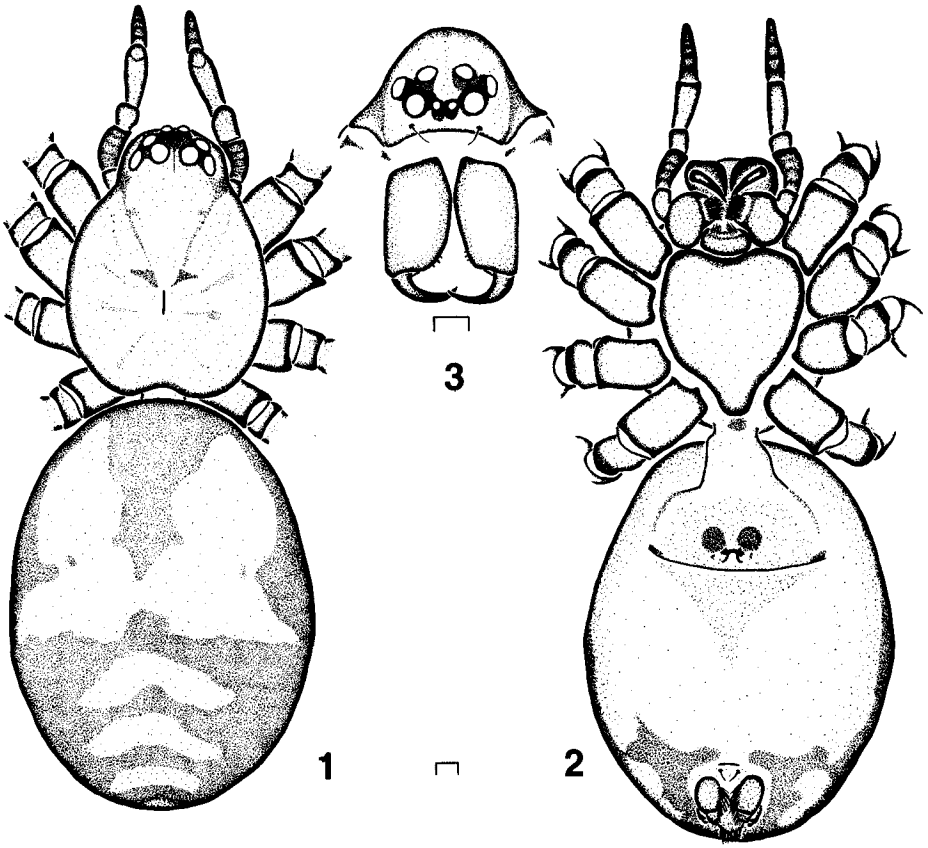
Female: *N*=20 including female syntype. CL 0.96-1.13 (1.04±0.04), CW 0.73-0.90 (0.83±0.04), SL 0.59-0.70 (0.66±0.03), SW 0.56-0.65 (0.61±0.02). Syntype CL 1.13, CW 0.87, SL 0.70, SW 0.62.

Distribution and natural history.—*Cybaeota calcarata* is the only species in this genus known from eastern North America (Fig. 39). It has been collected from forest floor litter and moss in widely scattered locales in Ontario, southern Quebec, Newfoundland, northern Michigan (Chickering 1935), New York, New Hampshire, and Massachusetts (Kaston 1948).

Collection evidence suggests a year-round presence of both sexes with mature males being common only in the summer.

Material examined.—*Type series*: two syntypes, NEW HAMPSHIRE; *Coos Co.*, Great Gulf, Mt. Washington, 1 VIII 1910 (J. H. Emerton), 1 male, 1 female (MCZ). *Note*: Following Coddington (1986:4) I prefer, in this case, not to designate a lectotype and paralectotype from the syntypes.

CANADA: NF; Baie Verte Jct., 14 VIII 1984 (L. Hollett), 1 male (CNC), E of Daniels Hbr., 16 VIII 1984 (L. Hollett), 1 male, 1 female (CNC) 7 km S Pasadena, 49°00″N/57°36″W, 17 VIII 1984 (L. Hollett), 1 female (CNC), Little Barachois Brook, 20 VIII 1984 (L. Hollett), 2 females (CNC), Caribou Lk., 48°38″N/55°01″W, 24 IX 1984 (L. Hollett), 1 male (CNC), Crabbes R., 48°13″N/58°52″W, 14 VIII 1985 (L. Hollett), 2 males, 1 female (CNC). ON; *Algoma*, Batchawana, 29 VII 1948 (W. Gertsch, W. Ivie, T. B. Kurata), 1 female (AMNH); *Nipissing*, Sproule Bay, Lk. Opeongo, Algonquin Pk., 26 VI-7 VII 1945 (W. Ivie, T. B. Kurata), 1 male, 4 females (AMNH), S Tea Lk., Algonquin Pk., 3-10 VII 1945 (W. Ivie, T. B. Kurata), 1 male, 1 female (AMNH), point W of Ko-Ko-Ko Bay, Lk. Temagami, 15-25 VIII 1948 (W. J. Gertsch, W. Ivie, T. B. Kurata), 1 male, 2 females (AMNH), Lk. Opeongo, Algonquin Pk., 17 VIII 1948 (W. J. Gertsch, T. B. Kurata), 1 male, 5 females (AMNH); *Ottawa/Carleton*, Kinburn, in pine duff, 8 IV 1962 (J. E. H. Martin), 1 male (CNC); *Thunder Bay*, 3 mi. NW Finmark, N48:34/W89:50, 23 VII 1965 (J. and W. Ivie), 1 female (AMNH). PQ; St. Hippolyte, 25 VI 1974 (M.-C. Tarrisants), 1 female (CNC). USA: NH; *Cheshire*, Mt. Monadnock, 13 VI 1947 (A. M. Chickering), 1 female (MCZ). NY; *Albany*, Rensselaerville, Huych Preserve, 8 VII



Figs. 1, 2.—*Cybaeota munda*, female, Pinnacles Nat. Mon. CA: 1, dorsal view; 2, ventral view. Fig. 3.—*Cybaeota nana*, female, Josephine Co. OR, face and chelicerae, frontal view. Scale markers = 0.1 mm.

1948 (Bishop), 1 female (AMNH); *Tompkins*, 1 male, 1 female (AMNH). NO LOCALE; AC 3222, #1425 (Horace Britcher), 1 female (AMNH).

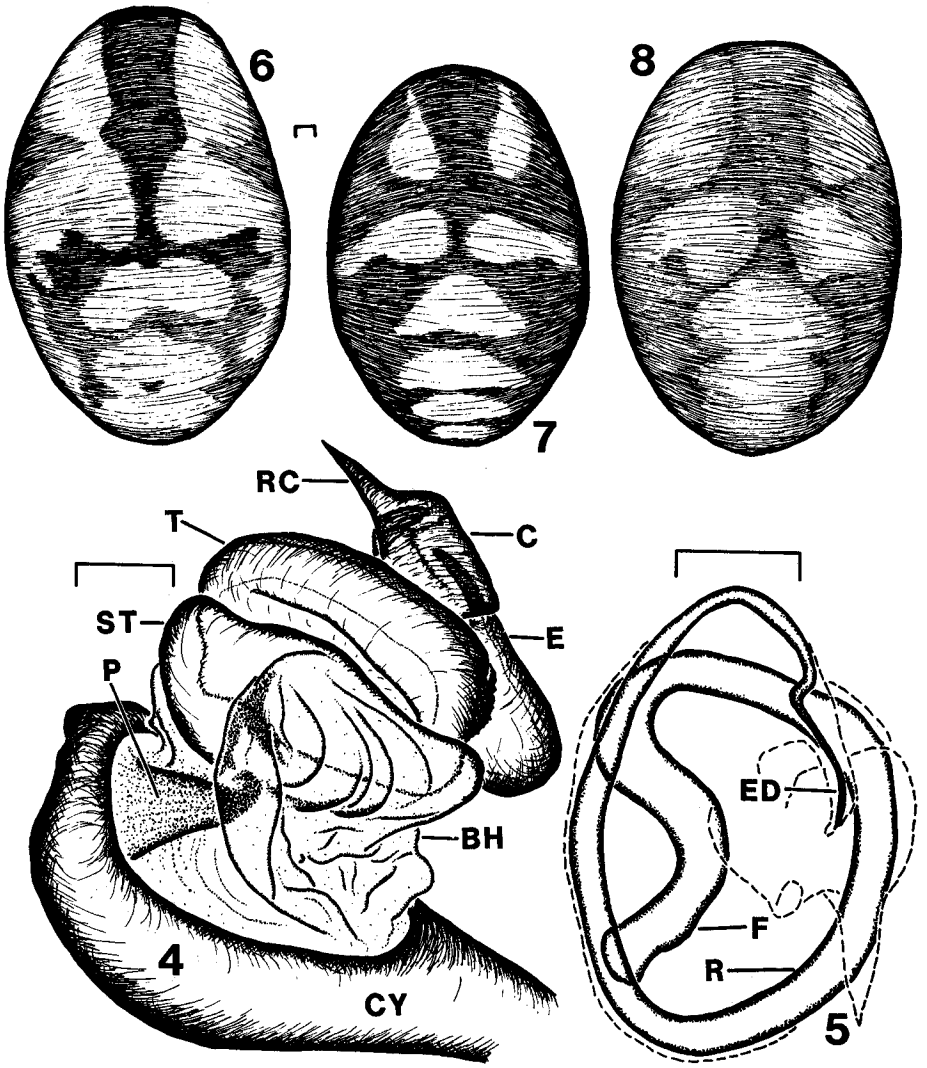
Cybaeota nana Chamberlin and Ivie
Figs. 3, 4-8, 18, 23, 24, 34, 37, 38, 40

Cybaeota concolor Chamberlin and Ivie, 1937:227, figs. 77, 78; Roewer 1954:87; Bonnet 1956:1298; Roth and Brown 1986:3. **NEW SYNONYMY**

C. nana Chamberlin and Ivie, 1937:229, figs. 74, 75, 79, 80; Roewer 1954:87; Bonnet 1956:1298; Roth and Brown 1986:3.

Diagnosis.—Male with retrolateral arm of conductor smoothly curved, ventrally directed, knob-like (Figs. 23, 24). Female with spermathecae separated by approximately one-half their diameter, and with connecting ducts joined to copulatory opening anterolaterally (Figs. 37, 38).

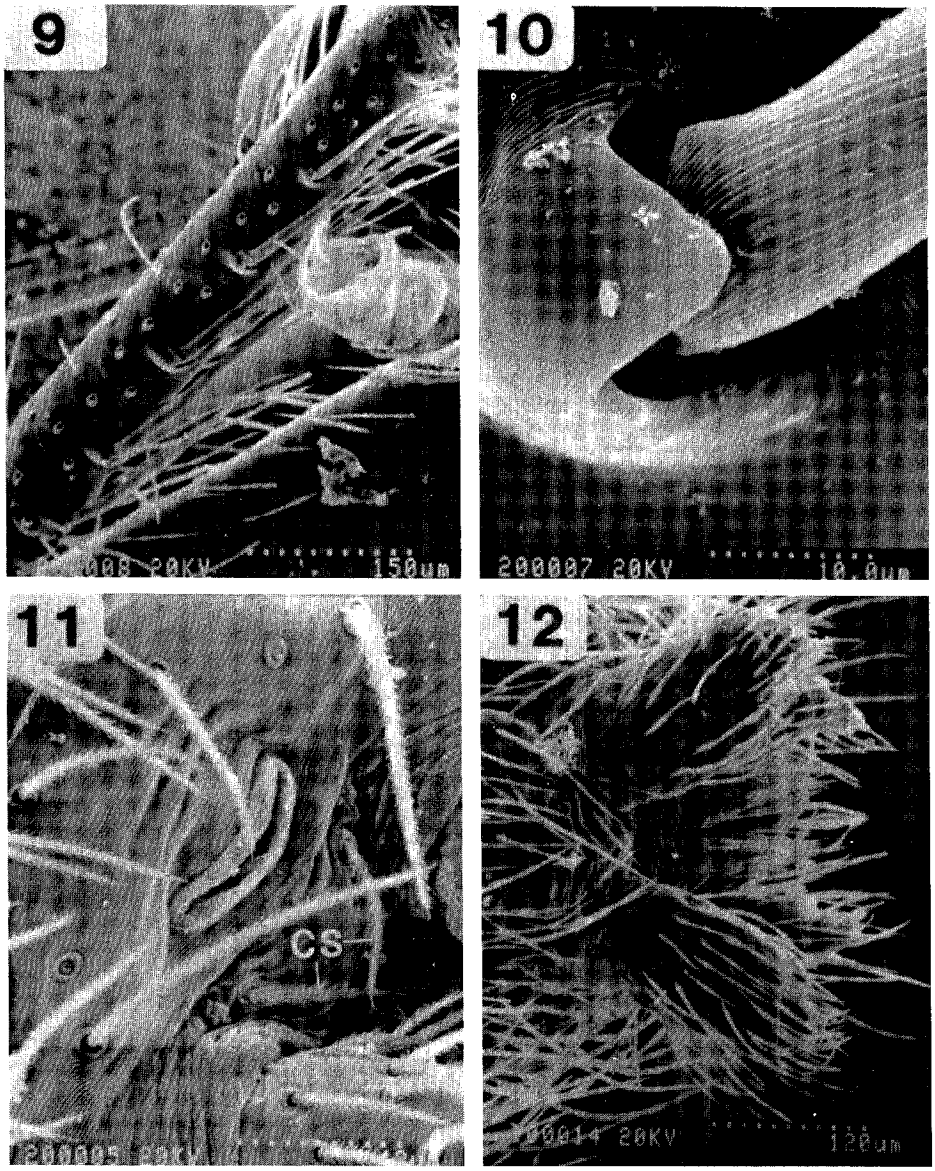
Description.—As for genus. *Male*: *N*=21 including holotype. CL 0.66-0.92 (0.75±0.05), CW 0.55-0.73 (0.60±0.04), SL 0.43-0.61 (0.49±0.03), SW 0.43-0.53 (0.47±0.02). Holotype CL 0.70, CW 0.55, SL 0.43, SW 0.43.



Figs. 4-8.—*Cybaeota nana*: 4, left male palpal tarsus with partially expanded genital bulb, retrolateral view; 5, receptaculum seminis of left genital bulb, ventral view, relative positions of conductor, embolus and tegulum indicated by dotted lines; 6-8, female abdomens, dorsal views indicating pattern variation within single population, Lost Lk. ID. Scale markers = 0.05 mm. BH=basal haematodocha, C=conductor, CY=cymbium, E=embolus, ED=ejaculatory duct, F=fundus, P=petiole, R=reservoir, RC=retrolateral arm of conductor, ST=subtegulum, T=tegulum.

Female: *N*=44 including holotype of *C. concolor*. CL 0.77-0.91 (0.83±.04), CW 0.60-0.73 (0.66±0.03), SL 0.47-0.57 (0.53±0.03), SW 0.46-0.55 (0.50±0.02). Holotype of *C. concolor* CL 0.90, CW 0.74, SL 0.56, SW 0.53.

Distribution and natural history.—This species is known from extreme SW British Columbia south to S California with scattered inland records from E Washington, W Idaho, and N Utah (Fig. 40). *Cybaeota nana* appears to be absent from mid-coastal California. With the probable exception of the S California coast, *C. shastae* is sympatric with *C. nana* throughout the range of the latter.

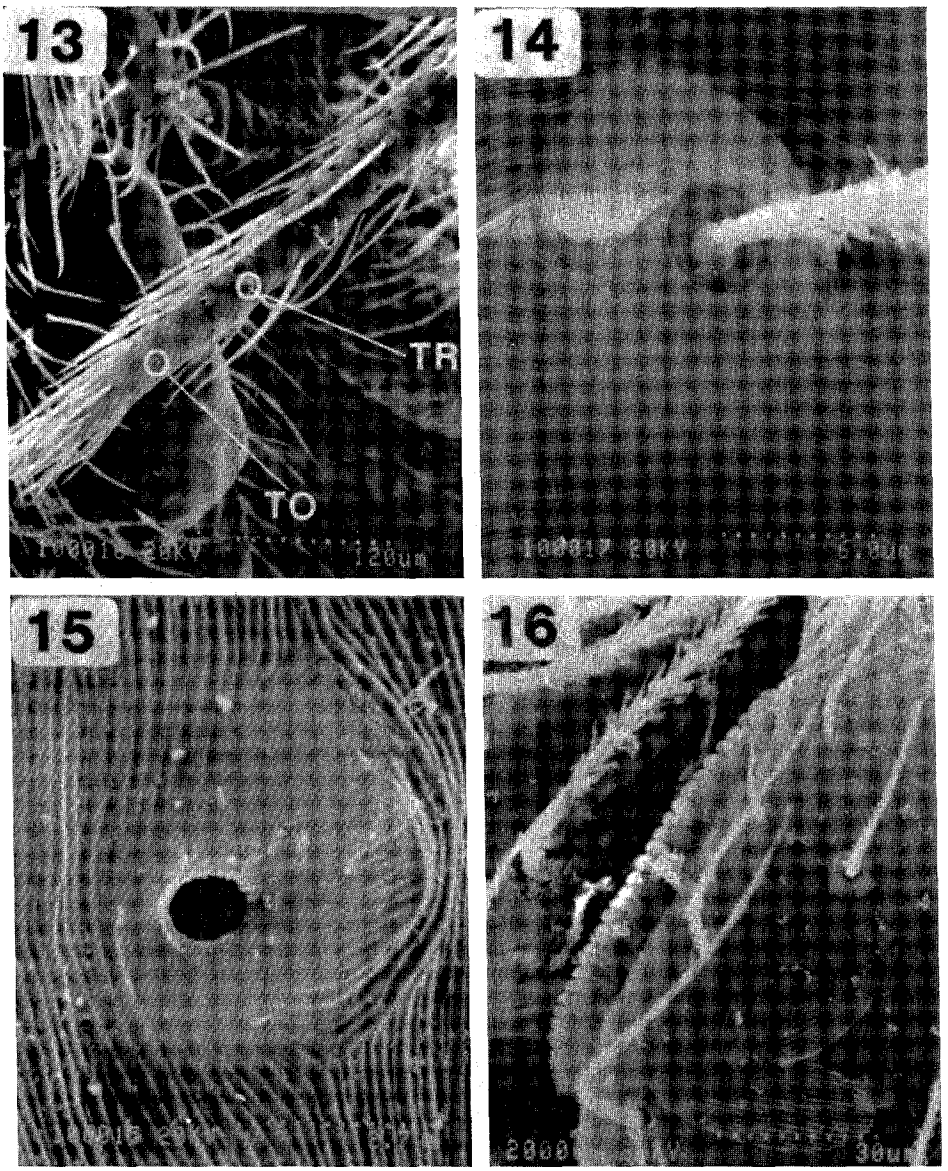


Figs. 9-11.—*Cybaeota shastae*, male, Victoria BC: 9, left tibia I, prolateral view; 10, same, macroseta base and socket; 11, colulus setae and spiracle, ventral view. Fig. 12.—*C. shastae*, female, Josephine Co. OR, spinnerets, ventral view. CS=colulus setae.

Specimens are usually taken from forest floor litter. At Corvallis, Oregon three females were found in a wood rat nest. Both sexes have been collected year-round but mature males are rarely collected in the first half of the year.

Notes on synonymy.—*Cybaeota concolor* has page precedence over *C. nana* but, if retained, the former name could lead to the erroneous supposition that this species is concolorous.

Chamberlin and Ivie (1937) named *C. nana* for a pair of spiders which they perceived as abdominal coloration variants of *C. shastae*. It is virtually impossible



Figs. 13-15.—*Cybaeota shastae*, female, Josephine Co. OR, tarsus IV: 13, dorsal view; 14, bothrium and hair; 15, tarsal organ. Fig. 16.—*C. shastae*, male, Victoria BC, serrula, right palpal endite, ventral view. TO=tarsal organ, TR=trichobothrial base.

non-arbitrarily to assign specimens of *Cybaeota* to any particular species on the basis of abdominal pattern and coloration. The genitalia of *C. nana* and *C. concolor* are identical and examination of all specimens with "nana/concolor"-like genitalia has shown a wide range of abdominal patterns. Groups of specimens from single collection locales (e.g., Cedar Lake, Stevens Co., WA; Lost Lake, ID; and City Creek, Salt Lake Co., UT) show great variability (Figs. 6-8), in one case from virtually concolorous to heavily patterned. There is a clinal trend observable across the range of this species: concolorous abdomens are

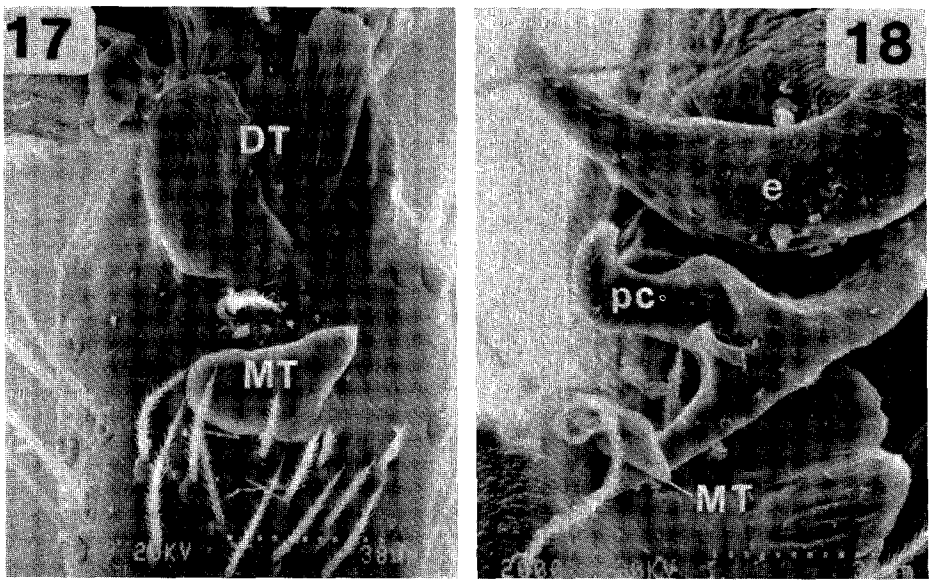
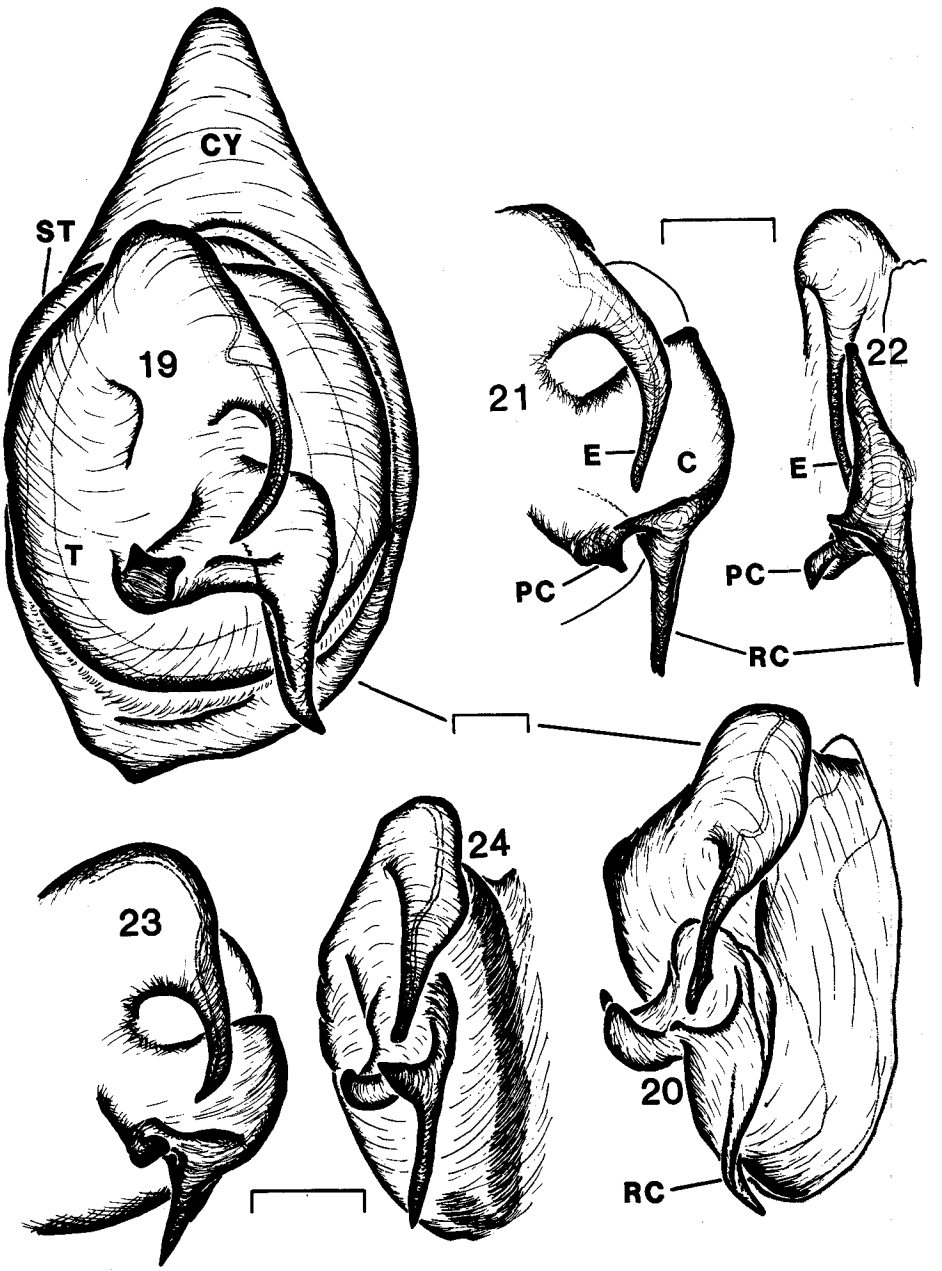


Fig. 17.—*Cybaeota shastae*, male, Josephine Co. OR, left palpal tibia, retrolateral view. Fig. 18.—*C. nana*, male, Los Angeles Co. CA, left palpal tibia and genital bulb, retrolateral view, showing interlocking of retrolateral arm of conductor with medial retrolateral tibial apophysis. DT, MT=distal and medial retrolateral tibial apophyses, PC=prolateral arm of conductor.

prevalent in the eastern part of the range (Utah), to the west abdominal patterns become more distinct and common as the coast is approached. (There is also an east-west clinal gradation in size: larger individuals are generally eastern—Utah females average CL 0.87 mm, coastal females average CL 0.81 mm.) The conformity of genitalia of specimens previously assigned to *C. nana* and *C. concolor* combined with the clinical variability in abdominal pigmentation justifies the synonymy of *C. concolor* under *C. nana*.

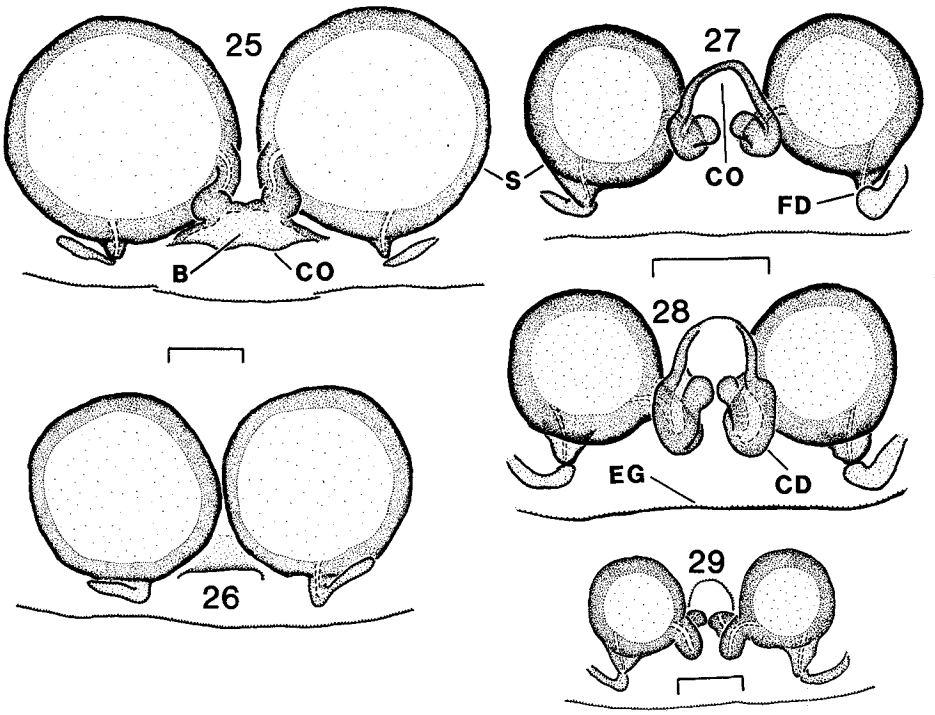
Material examined.—*Types*: Holotype of *C. nana*, BRITISH COLUMBIA; west side of Saanich Inlet, near Victoria, 14 IX 1935 (R. V. Chamberlin and W. Ivie), 1 male (and 1 allotype female) (AMNH). Holotype of *C. concolor*, UTAH; *Salt Lake Co.*, Mill Creek Canyon, Wasatch Mtns., near Salt Lake City, no date (R. V. Chamberlin), 1 female (AMNH).

USA: CA; *Humboldt*, Carlotta, 15 IX 1961 (W. Ivie, W. Gertsch), 1 male, 1 female (AMNH); *Los Angeles*, Los Angeles Nat. For., 22 VI 1957 (I. Newell), 2 males, 3 females, 2 imm. (AMNH), 6 VII 1957 (I. Newell), 3 males, 3 females (AMNH); *Nevada*, Sardine Valley, 14 mi. NNE Truckee (A. Grigarick), 2 females, 1 imm. male (AMNH); *Riverside*, San Jacinto Mtns., VII 1952 (R. X. Schick), 1 female (AMNH); *Shasta*, Burney Falls, 18 VI 1954 (E. Schuster), 2 males, 2 females (AMNH); *Tulare*, 10 mi. W Johnsondale, 15 IX 1959 (W. Gertsch, V. Roth), 2 males, 1 female (AMNH); *Ventura*, summit Mt. Pinos, W of Lebec, 15 IX 1959 (W. Gertsch, V. Roth), 1 male, 6 females (AMNH). ID; Lost Lk., 27 VII 1939 (W. Ivie), 2 males, 5 females, 2 imm. (AMNH); *Adams*, Evergreen Camp, upper Weiser R., 17 X 1944, 4 females (AMNH). NE; *Washoe*, Hwy 27, 19 mi. SW Tahoe Jctn., 8420′, 15 VIII 1968 (R. E. and A. V. Leech), 1 male (REL). OR; *Benton*, N of Corvallis, McDonald For., 3 XI 1949 (V. D. Roth), 1 female, 1 imm. (CAS), W of Corvallis, 44′33″N/123′22″W, 20 III 1937 (J. C. Chamberlin), 1 male, 1 female (AMNH), Corvallis, 24 IV 1949 (V. D. Roth), 1 female (CAS), 26 XI 1950 (V. D. Roth), 2 males, 6 females, 3 imm. (CAS), 21 V 1952 (Roth, Birge), 3 females (CAS), 9 mi. W Philomath, 29 VII 1953 (W. J. and J. W. Gertsch), 2 females (AMNH); *Josephine*, summit of Wolf Ck. Rd., 42′38″N/123′23″W, 12 V 1947 (I. M. Newell), 1 female (AMNH); *Marion*, Marion, 24 IV 1941 (J. C. Chamberlin), 1 male, 2 females (AMNH); *Washington*, Hillsboro, N45:30/W122:58, 1937 (J. C. Chamberlin), 2 females (AMNH). UT; *Daggett*, Rt. 44, 38 mi. N Vernal, 7200′, 2 VIII 1959 (C. C. Hoff), 1 female (AMNH); *Salt Lake*, 3 mi. up City Ck. Cn., 40′47″N/



Figs. 19, 20.—*Cybaeota calcarata*, male syntype, Coos Co. NH, genital bulb: 19, ventral view including cymbium; 20, retrolateral view. Figs. 21, 22.—*C. shastae*, holotype male, Siskiyou Co. CA, conductor and embolus: 21, ventral view; 22, retrolateral view. Figs. 23, 24.—*C. nana*, male: 23, holotype, Saanich Inlet BC, conductor and embolus, ventral view; 24, "Redwoods" CA, genital bulb, retrolateral view. Scale markers=0.05 mm.

111′48″W, 25 VI 1962 (W. Ivie), 21 males, 8 females (AMNH), Mill Ck. Cn., 40′40″N/111′45″W, 1910-1925 (R. V. Chamberlin), 1 female (AMNH), 25 V 1924 (R. V. Chamberlin), 1 female (AMNH); *Utah*, Timpanogos Pk., American Fork Cn., 19 VIII 1941 (J. C. Chamberlin, W. Ivie), 1 female (AMNH). WA; *Kitsap*, N48/W123, 1 male (AMNH); *Pierce*, Tacoma, 9 VIII 1929 (R. V. Chamberlin), 1 female



Figs. 25, 26.—*Cybaeota calcarata*, cleared epigyna: 25, ventral view; 26, St. Hippolyte PQ, dorsal view. Figs. 27-29.—*C. shastae*, cleared epigyna: 27, Yosemite Nat. Pk., ventral view; 28, Weed CA, slightly posterior of ventral view; 29, same, dorsal view. Scale markers=0.05 mm. B=bursa, CD=connecting duct, CO=copulatory opening, EG=epigastric groove, FD=fertilization duct, S=spermatheca.

(AMNH); *Stevens*, 10 IX 1963 (J. and W. Ivie), 1 female, 1 imm. (AMNH), Cedar Lk., 48′45″N/117′36″W (J. and W. Ivie), 4 females (AMNH), 48′55″N/117′36″W, V 1962 (W. Ivie), 1 female (AMNH), 48′56″N/117′36″W, 30 IX 1964 (J. and W. Ivie), 5 females (AMNH).

Cybaeota munda Chamberlin and Ivie
Figs. 1, 2, 33, 35, 36, 40

Cybaeota munda Chamberlin and Ivie, 1937:228, figs. 83, 84; Roewer 1954:87; Bonnet 1956:1298; Roth and Brown 1986:3.

Diagnosis.—Male unknown. Female with connecting ducts intruding into spermathecae (Figs. 35, 36).

Description.—As for genus. *Female*: *N*=4. CL 1.01-1.17 (1.11), CW 0.81-0.92 (0.87), SL 0.62-0.75 (0.70), SW 0.59-0.65 (0.62). Holotype CL 1.13, CW 0.86, SL 0.68, SW 0.61.

Distribution.—*Cybaeota munda* has been collected near San Francisco and from southwestern Oregon (Fig. 40). It is the only *Cybaeota* species known from mid-coastal California. In Oregon, *C. munda* is sympatric with both *C. nana* and *C. shastae*.

Material examined.—*Holotype*: CALIFORNIA; *San Mateo Co.*, La Honda, 1920-1921 (J. C. Chamberlin), 1 female (AMNH).

USA: CA; *San Benito*, Pinnacles Nat. Mon. (W. Gertsch, V. D. Roth), 1 female (AMNH). OR; *Douglas*, 5 mi. W Drain, 29 V 1948 (Roth, Brown), 1 female (CAS); *Josephine*, Grave Ck., 10 mi. E Placer, 22 VII 1962 (V. D. Roth), 1 female (CAS).

Cybaeota shastae Chamberlin and Ivie
Figs. 9-17, 21, 22, 27-29, 31, 32, 41, 42

Cybaeota shastae Chamberlin and Ivie, 1937:227, figs. 68-70; Roewer 1954:87; Bonnet 1956:1298; Roth and Brown 1986:3.

C. wasatchensis Chamberlin and Ivie, 1937:227, figs. 71-73, 76; Roewer 1954:88; Bonnet 1956:1298; Roth and Brown 1986:3. **NEW SYNONYMY**

C. vancouverana Chamberlin and Ivie, 1937:228, figs. 81, 82; Roewer 1954:87; Bonnet 1956:1298; Roth and Brown 1986:3. **NEW SYNONYMY**

Diagnosis.—Male with pointed prolateral arm of conductor deflected towards retrolateral arm (Figs. 21, 22). Female with spermathecae separated by about one-half their diameter, connecting ducts attached to posterolateral margins of copulatory opening (Figs. 27-29).

Description.—As for genus. *Male*: *N*=24 including holotypes of *C. shastae* and *C. wasatchensis*. CL 0.81-0.96 (0.87±0.04), CW 0.62-0.78 (0.68±0.04), SL 0.53-0.62 (0.57±0.02), SW 0.48-0.59 (0.52±0.03). Holotype CL 0.81, CW 0.64, SL 0.55, SW 0.52. Holotype of *C. wasatchensis* CL 0.94, CW 0.78, SL 0.61, SW 0.59.

Female: *N*=61 including holotype of *C. vancouverana*. CL 0.86-1.09 (0.92±0.06), CW 0.65-0.87 (0.72±0.05), SL 0.55-0.73 (0.59±0.03), SW 0.51-0.65 (0.55±0.03). Holotype of *C. vancouverana* CL 0.87, CW 0.68, SL 0.57, SW 0.52.

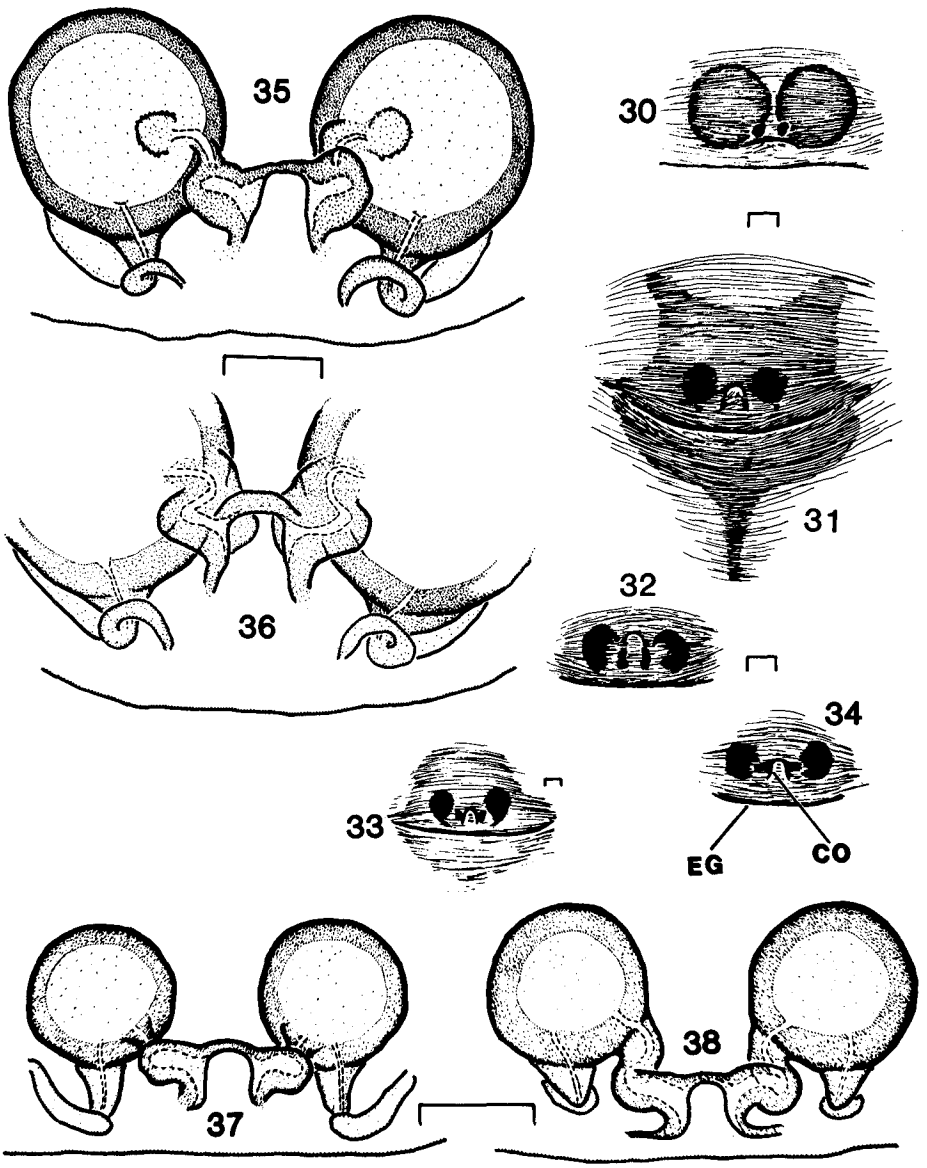
One male (CA; Shasta Co., Lassen Pk., 19 IX 1961) lacks posterior median eyes.

Distribution and natural history.—This is the most commonly collected species of *Cybaeota*. It is known from scattered locales along the Alaska panhandle, on Vancouver Island (British Columbia), and the Olympic Peninsula of Washington (Fig. 42). South from Washington, this species is found along the coast and inland to N California and south through the Sierra Nevada to S California (Fig. 41). A possibly disjunct population is known from the vicinity of Salt Lake City, Utah. *Cybaeota nana* is sympatric with *C. shastae* from S Vancouver Island southwards throughout the range of the latter.

Cybaeota shastae is probably common all along the British Columbia and Alaska panhandle coastlines. Berlese funnels produced good samples of this species (as well as other "rare" spiders such as *Ethobuella tuonops*) from moss taken from the trunks of red alder (*Alnus rubra* Bong.) and broadleaf maple (*Acer macrophyllum* Pursh) on S Vancouver Island. Mossy red alders are common along the BC and Alaska panhandle coasts. *Cybaeota shastae* was the most numerous spider in these Berlese samples.

Both sexes have been collected throughout the year. However, mature males are common only in late summer and fall. Mature males apparently appear earlier in more northerly parts of the species' range.

Notes on synonymy.—The three names *C. shastae, C. wasatchensis*, and *C. vancouverana* all refer to specific locales where each putative species was found. As there is no other reason to prefer one name over the others, *C. shastae* is



Figs. 30-34.—*Cybaeota*, uncleared epigyna, ventral views: 30, *C. calcarata*, St. Hippolyte PQ; 31, *C. shastae* with "vancouverana"-type pattern, Victoria BC; 32, *C. shastae* with no pattern, Weed CA; 33, holotype of *C. munda* with vestige of "vancouverana"-type pattern, La Honda CA; 34, *C. nana*, Stevens Co. WA. Figs. 35, 36.—*C. munda*, cleared epigyna, ventral views: 35, holotype, La Honda CA; 36, Josephine Co. OR. Figs. 37, 38.—*C. nana*, cleared epigyna, ventral views: 37, Lost Lk. ID; 38, Tacoma WA. Scale markers=0.05 mm.

chosen as senior synonym because of its page precedence. These new synonyms are here established for the same reasons as discussed under *C. nana.*

Variability from nearly concolorous to strongly patterned abdomens is seen in groups of specimens from Echo Summit, Eldorado Co., CA; Hughes Canyon, Salt Lake Co., Utah; and especially Shaver Lake, Fresno Co., CA. However, specimens from Alaska, British Columbia, and Washington are all strongly

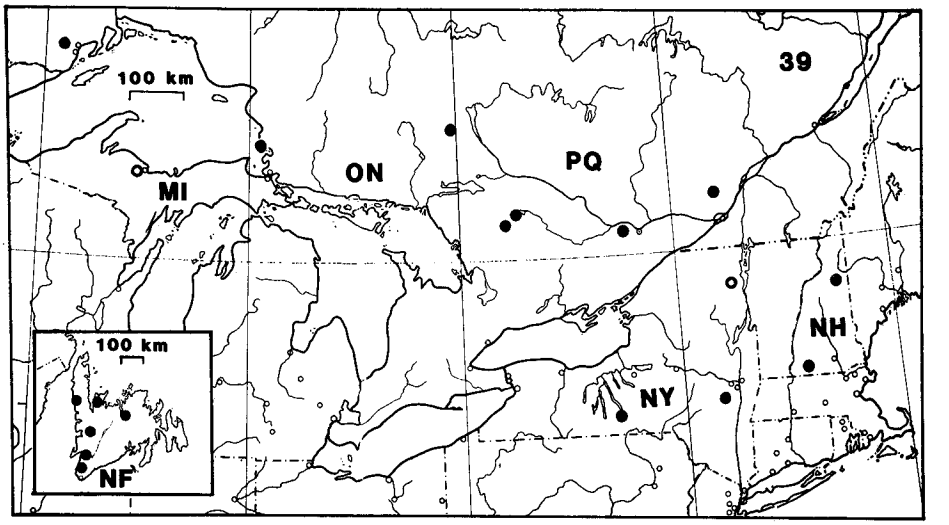


Fig. 39.—Distribution of *Cybaeota calcarata* in eastern North America (inset-Newfoundland). Hollow circles-literature records (Chickering 1935; Crosby and Bishop 1928).

patterned with the spinnerets encircled with pigment and a typical "cheshire cat face" on the epigastric area. As well, most concolorous or faintly patterned individuals come from the possibly disjunct population in Utah (originally described as *C. wasatchensis*). Spiders from this population are generally larger than the coastal spiders (average female CL 1.05 mm versus 0.91 mm).

The lack of specimens from S Idaho and N Nevada makes a definite conclusion with respect to the clinal nature of the variability of size and abdominal pattern (as well as the disjunct nature of the Utah population) difficult. Still, I feel the observed pattern variability in other species of *Cybaeota* and the clinal variation in pattern and size observed in *C. nana* over the range it shares with *C. shastae* coupled with the identical morphology of the genitalia of specimens previously placed in *C. wasatchensis, C. vancouverana*, and *C. shastae* justifies the identity of all such species with *C. shastae*.

Material examined.—*Types*: Holotype of *C. shastae*, CALIFORNIA; *Siskiyou Co.*, Weed, 8 IX 1935 (W. Ivie and R. V. Chamberlin), 1 male, 2 females (allotype and paratype) (AMNH). Holotype of *C. wasatchensis*, UTAH; *Salt Lake Co.*, Hughes Canyon, Wasatch Mtns., 20 V 1934 (Ivie and Rasmussen), 1 male (plus 1 female allotype) (AMNH). Holotype of *C. vancouverana*, BRITISH COLUMBIA; Sidney, 16 IX 1935 (R. V. Chamberlin and W. Ivie), 1 female (AMNH).

CANADA: BC; *Vancouver Is.*, Bowser, 25 VI 1955, 1 female (CNC), Cowichan Lk. Exp. Stat., 25 VII 1975 (REL), 2 females, 3 imm. (CNC), Kyuquot, 50'00"N/127'25"W, 2 V 1952 (S. L. Neave), 1 female (CNC), 22 IV 1959, 1 female (AMNH), 19 V 1959, 2 females, 1 imm. male (AMNH), Shawnigan Lk., 9.1 mi. W E+N RR tracks, Pt. Renfrew Rd., 14 VIII 1985 (R. G. Bennett), 4 females, 17 imm. (RGB), Sidney, 16 IX 1935 (R. V. Chamberlin, W. Ivie), 1 female (AMNH), Victoria, XI 1975 (D. State), 1 female (CNC), Victoria, Francis Regional Pk., Munn's Rd., 2-12 VIII 1985 (R. G. Bennett), 12 males, 23 females, 13 imm. (RGB), Victoria, Goldstream Pk. (A. P. Mackie), 16 I 1975, 1 female, 14 IV 1975, 2 females, 24 IV 1975, 2 females, 23 VII 1975, 1 female, 7 VIII 1975, 1 male, 1 imm. (all CNC), 23 IX 1975 (B. Ainscough), 1 female (CNC). USA: AK; Admiralty Is., Middle Hbr., 20 VI 1932 (A. Hasselborg), 2 males (AMNH), Admiralty Is., VI 1933 (Sheppard), 1 male, 1 female (AMNH), Juneau, 28-29 IV 1945 (J. C. Chamberlin), 1 imm. (AMNH). CA; "Redwoods", 1 male (AMNH); *Eldorado*, Lk. Tahoe, Echo Summit, 7382', 2 IX 1961 (W. J. Gertsch, W. Ivie), 1 male, 1 female (AMNH), Meyers, 7000', 25 VI 1953 (V. Roth), 1 male (CAS); *Fresno*, Shaver Lk., 12 IX 1959 (W. J. Gertsch, V. Roth), 7 males, 6 females, 1 imm. (AMNH); *Humboldt*, Trinidad, 16 VII 1968 (W. Ivie), 2 females (AMNH); *Shasta*, Lassen Volc. Nat. Pk. 7000', 19 IX 1961 (W. J. Gertsch, W. Ivie), 1

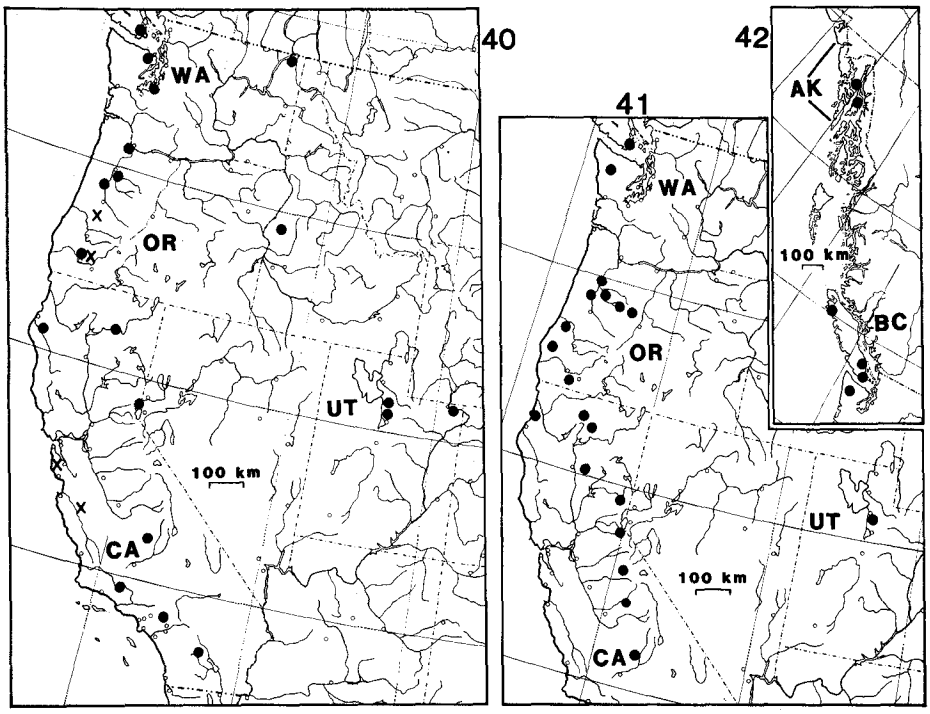


Fig. 40.—Distribution of *Cybaeota munda* (crosses) and *C. nana* (circles) in western North America. Figs. 41, 42.—Distribution of *C. shastae*: 41, western USA; 42, BC and southern AK.

male (AMNH), Lassen Pk., 2 mi. NE Manzanita Lk., 6150′, 8 VIII 1968 (R. E. and A. V. Leech), 1 male (REL); *Sierra*, 2 mi. N Calpine, 6 IX 1959 (W. J. Gertsch, V. Roth), 2 females (AMNH); *Siskiyou*, Bartle, 18 IX 1961 (W. Ivie, W. J. Gertsch), 1 female (AMNH), Mt. Shasta, Panther Meadow Rd., 41′23″N/122′12″W, 17 IX 1961 (W. J. Gertsch, W. Ivie), 1 female (AMNH), Weed, 8 IX 1935 (R. V. Chamberlin, W. Ivie), 1 female (AMNH); *Tulare*, 6 mi. W Johnsondale, Double Bunk Meadows, 15 IX 1959 (V. Roth, W. J. Gertsch), 1 female (AMNH); *Tuolumne*, Yosemite Nat. Pk., Aspen Valley, 11 VIII 1931 (W. Ivie), 2 males, 2 females (AMNH). OR: Boyer (45N/123W ?), 10 VIII 1933 (J. C. Dirks), 1 female AMNH, 15 mi. W Burnt Woods, 30 XII 1945 (R. Post), 1 female (AMNH); *Benton*, Corvallis, 12 V 1953 (V. Roth), 1 female (CAS), 9 mi. W Philomath, 29 VII 1953 (W. J. and J. W. Gertsch), 1 female (AMNH); *Coos*, Bridge, Myrtlewood Camp, 27 VII-4 VIII 1955 (V. Roth), 1 female (CAS); *Douglas*, Loon Lk., 1 VII 1959 (L. M. Smith), 1 female (AMNH); *Jackson*, 20 mi. NE Ashland, 1 IX 1959 (W. J. Gertsch, V. Roth), 1 female (AMNH); *Linn*, Berlin, 23 IV 1954 (Roth, Davis), 1 female (CAS), Santiam Pass, Suttle Lk., 27 V 1947 (V. Roth, F. Beer), 1 female (CAS), Santiam Pass, Tombstone Prairie, 13 VIII 1949 (V. Roth), 1 female (CAS); *Josephine*, 1 male, 1 female, 2 imm. (AMNH); *Marion*, Salem, 1 V 1954 (V. Roth), 1 female (CAS). UT: *Salt Lake*, 40′N/111′W, 3 males, 5 females (AMNH), Hughes Can., nr. Holladay, 20 V 1934 (W. Ivie), 1 male, 2 females (AMNH), Mill Ck. Can., 8 IV 1932 (W. Ivie), 1 female (AMNH), 1-2 mi. up Mill Ck. Can., 21 VIII 1941 (J. C. Chamberlin), 1 male, 1 female (AMNH). WA; *Jefferson*, Olympic Nat. Pk. Hoh R., 3 VIII 1954 (C. J. Goodnight), 4 females (AMNH).

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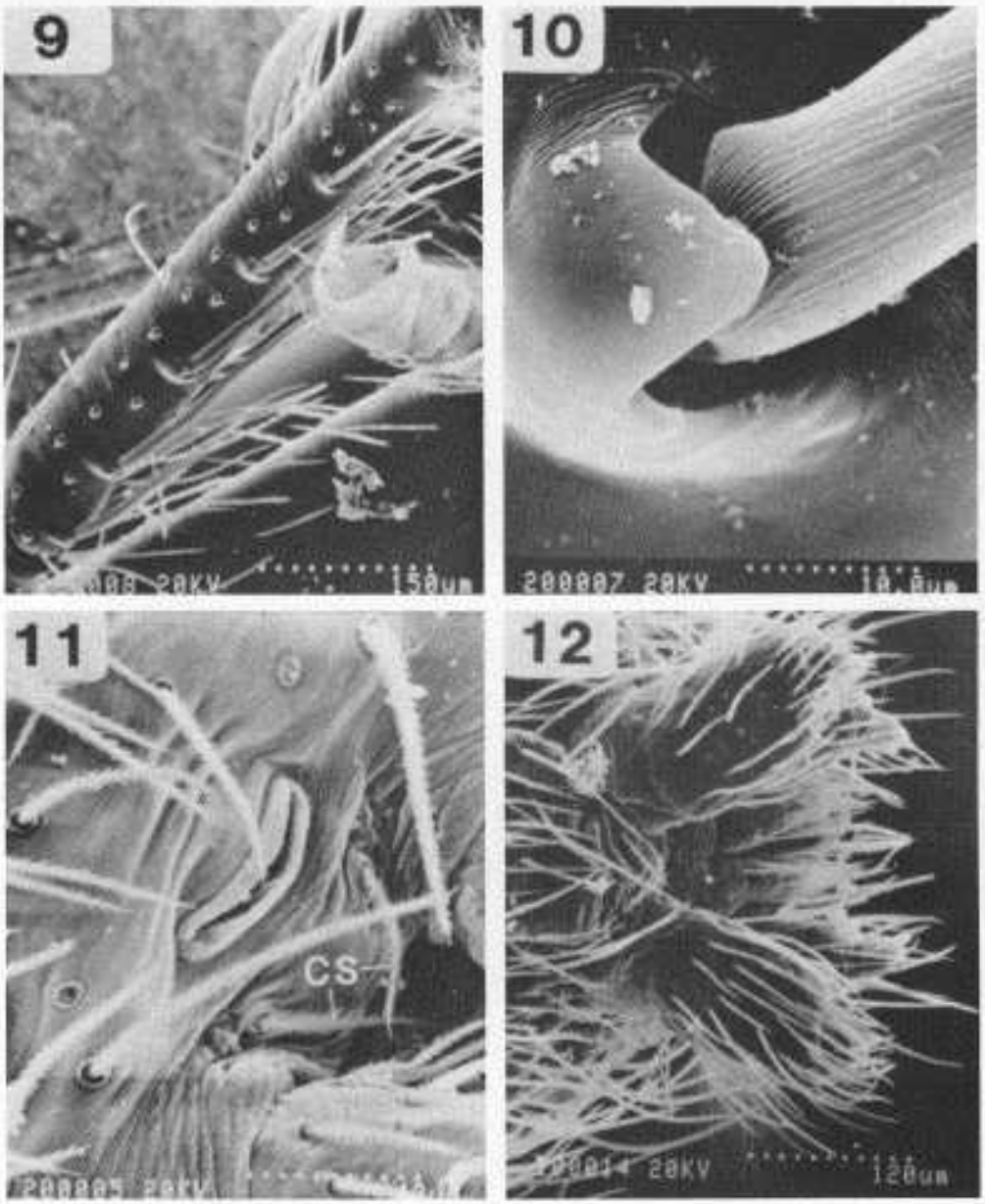
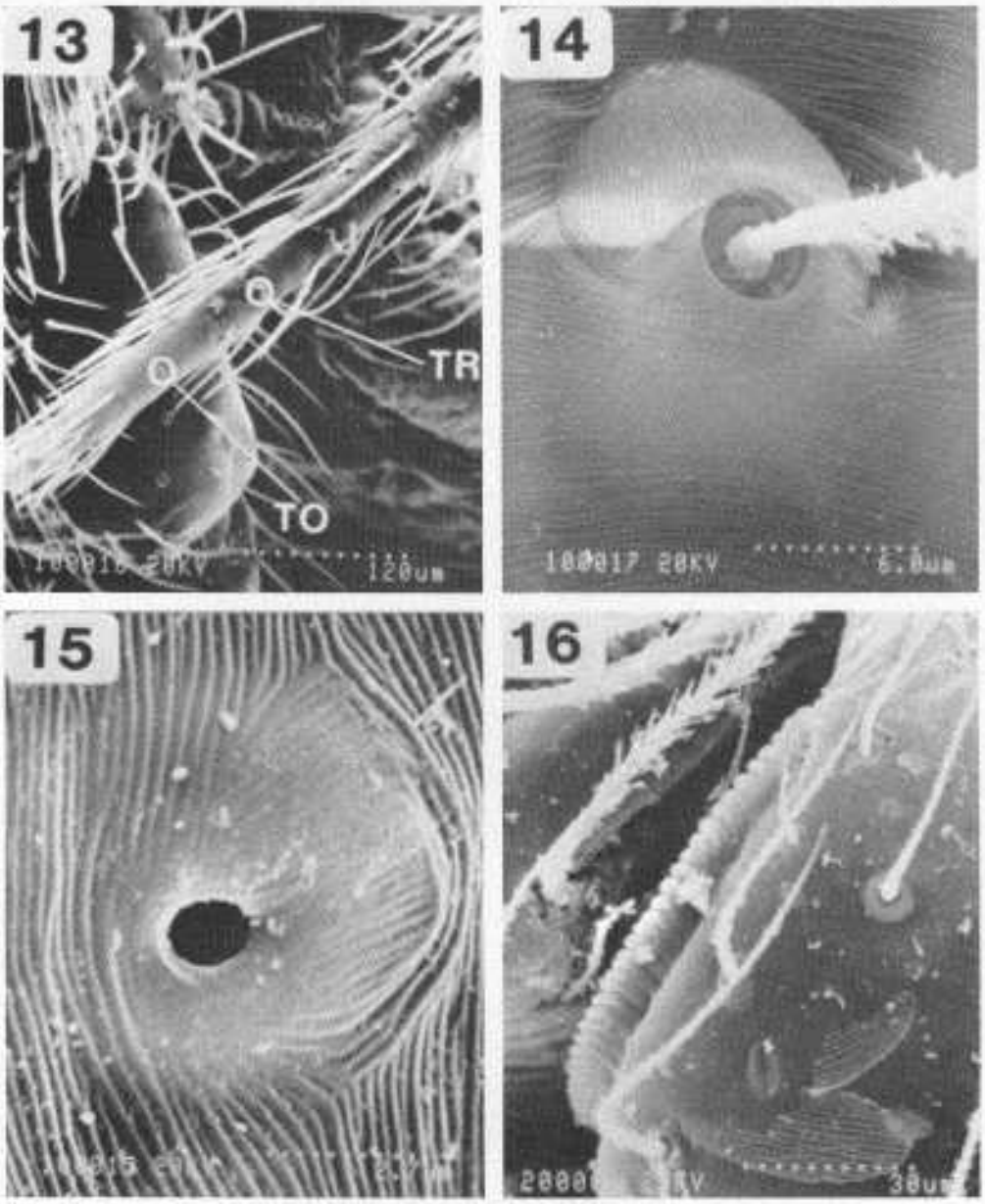


Figs. 9-11.—*Cybaeota shastae*, male, Victoria BC; 9, left tibia 1, prolateral view; 10, same, macroseta base and socket; 11, colulus setae and spiracle, ventral view. Fig. 12.—*C. shastae*, female, Josephine Co. OR, spinnerets, ventral view. CS=colulus setae.

Specimens are usually taken from forest floor litter. At Corvallis, Oregon three females were found in a wood rat nest. Both sexes have been collected year-round but mature males are rarely collected in the first half of the year.

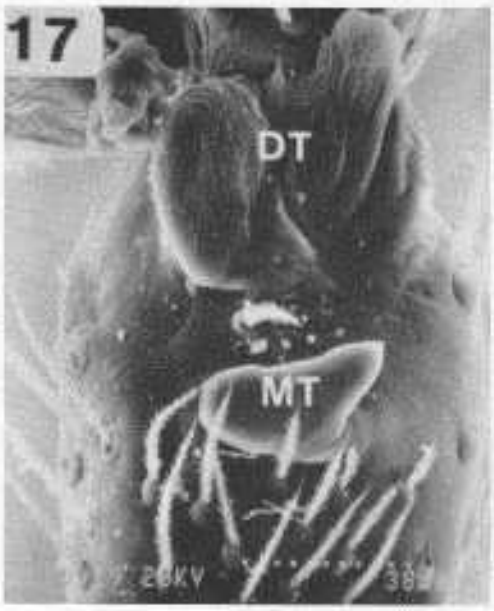
Notes on synonymy.—*Cybaeota concolor* has page precedence over *C. nana* but, if retained, the former name could lead to the erroneous supposition that this species is concolorous.

Chamberlin and Ivie (1937) named *C. nana* for a pair of spiders which they perceived as abdominal coloration variants of *C. shastae*. It is virtually impossible



Figs. 13-15.—*Cybaeota shastae*, female, Josephine Co. OR, tarsus IV: 13, dorsal view; 14, bothrium and hair; 15, tarsal organ. Fig. 16.—*C. shastae*, male, Victoria BC, serrula, right palpal endite, ventral view. TO=tarsal organ, TR=trichobothrial base.

non-arbitrarily to assign specimens of *Cybaeota* to any particular species on the basis of abdominal pattern and coloration. The genitalia of *C. nana* and *C. concolor* are identical and examination of all specimens with "nana/concolor"-like genitalia has shown a wide range of abdominal patterns. Groups of specimens from single collection locales (e.g., Cedar Lake, Stevens Co., WA; Lost Lake, ID; and City Creek, Salt Lake Co., UT) show great variability (Figs. 6-8), in one case from virtually concolorous to heavily patterned. There is a clinal trend observable across the range of this species: concolorous abdomens are



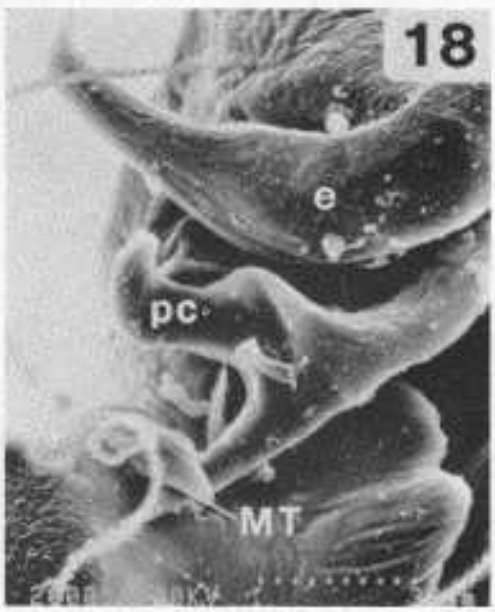


Fig. 17.—*Cybaeota shastae*, male, Josephine Co. OR, left palpal tibia, retrolateral view. Fig. 18.—*C. nana*, male, Los Angeles Co. CA, left palpal tibia and genital bulb, retrolateral view, showing interlocking of retrolateral arm of conductor with medial retrolateral tibial apophysis. DT, MT=distal and medial retrolateral tibial apophyses, PC=prolateral arm of conductor.

prevalent in the eastern part of the range (Utah), to the west abdominal patterns become more distinct and common as the coast is approached. (There is also an east-west clinal gradation in size: larger individuals are generally eastern—Utah females average CL 0.87 mm, coastal females average CL 0.81 mm.) The conformity of genitalia of specimens previously assigned to *C. nana* and *C. concolor* combined with the clinical variability in abdominal pigmentation justifies the synonymy of *C. concolor* under *C. nana*.

Material examined.—*Types*: Holotype of *C. nana*, BRITISH COLUMBIA; west side of Saanich Inlet, near Victoria, 14 IX 1935 (R. V. Chamberlin and W. Ivie), 1 male (and 1 allotype female) (AMNH). Holotype of *C. concolor*, UTAH; *Salt Lake Co.*, Mill Creek Canyon, Wasatch Mtns., near Salt Lake City, no date (R. V. Chamberlin), 1 female (AMNH).

USA: CA; *Humboldt*, Carlotta, 15 IX 1961 (W. Ivie, W. Gertsch), 1 male, 1 female (AMNH); *Los Angeles*, Los Angeles Nat. For., 22 VI 1957 (I. Newell), 2 males, 3 females, 2 imm. (AMNH), 6 VII 1957 (I. Newell), 3 males, 3 females (AMNH); *Nevada*, Sardine Valley, 14 mi. NNE Truckee (A. Grigarick), 2 females, 1 imm. male (AMNH); *Riverside*, San Jacinto Mtns., VII 1952 (R. X. Schick), 1 female (AMNH); *Shasta*, Burney Falls, 18 VI 1954 (E. Schuster), 2 males, 2 females (AMNH); *Tulare*, 10 mi. W Johnsondale, 15 IX 1959 (W. Gertsch, V. Roth), 2 males, 1 female (AMNH); *Ventura*, summit Mt. Pinos, W of Lebec, 15 IX 1959 (W. Gertsch, V. Roth), 1 male, 6 females (AMNH). ID: Lost Lk., 27 VII 1939 (W. Ivie), 2 males, 5 females, 2 imm. (AMNH); *Adams*, Evergreen Camp, upper Weiser R., 17 X 1944, 4 females (AMNH). NE; *Washoe*, Hwy 27, 19 mi. SW Tahoe Jctn., 8420′, 15 VIII 1968 (R. E. and A. V. Leech), 1 male (REL). OR; *Benton*, N of Corvallis, McDonald For., 3 XI 1949 (V. D. Roth), 1 female, 1 imm. (CAS), W of Corvallis, 44°33″N/123°22″W, 20 III 1937 (J. C. Chamberlin), 1 male, 1 female (AMNH), Corvallis, 24 IV 1949 (V. D. Roth), 1 female (CAS), 26 XI 1950 (V. D. Roth), 2 males, 6 females, 3 imm. (CAS), 21 V 1952 (Roth, Birge), 3 females (CAS), 9 mi. W Philomath, 29 VII 1953 (W. J. and J. W. Gertsch), 2 females (AMNH); *Josephine*, summit of Wolf Ck. Rd., 42°38″N/123°23″W, 12 V 1947 (I. M. Newell), 1 female (AMNH); *Marion*, Marion, 24 IV 1941 (J. C. Chamberlin), 1 male, 2 females (AMNH); *Washington*, Hillsboro, N45:30/W122:58, 1937 (J. C. Chamberlin), 2 females (AMNH). UT; *Daggett*, Rt. 44, 38 mi. N Vernal, 7200′, 2 VIII 1959 (C. C. Hoff), 1 female (AMNH); *Salt Lake*, 3 mi. up City Ck. Cn., 40°47″N/