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A NEW *GLENOGNATHA* (ARANEAE, TETRAGNATHIDAE) FROM NEW JERSEY, WITH REDESCRIPTIONS OF *G. CENTRALIS* AND *G. MINUTA*

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ABSTRACT

Both sexes of the tetragnathid spider *Glenognatha heleios* n. sp. are described and illustrated. Data about its natural history, ecology and phenology are included. A key to the *Glenognatha* species north of Mexico is presented. The types of two other *Glenognatha* species, *G. centralis* Chamberlin, 1925 and *G. minuta* Banks, 1898, from Panama and Baja California respectively, are redescribed and illustrated.

INTRODUCTION

The spider genus *Glenognatha* Simon, 1887 includes 12 named species from North, Central and South America, and the Caribbean and Galapagos Islands, but there are also undescribed representatives in tropical America and the Pacific Islands (Levi 1980; Hormiga unpublished data). *Glenognatha* species north of Mexico were revised by Levi (1980). Here both sexes of *G. heleios* n. sp. are described and illustrated, and some data on the species' natural history are presented. The male of *G. centralis* Chamberlin, 1925 and *G. minuta* Banks, 1898 are redescribed to provide adequate illustrations and descriptions because the original ones were not sufficient for identification purposes. It is not our purpose to assess or report the full range of the variation of *G. centralis* and *G. minuta* and therefore we did not study material other than the types. This paper is not meant to be a revision but it may serve as an addendum to Levi's revision (1980) of the *Glenognatha* north of Mexico.

According to the generic redescription given by Levi (1980), *Glenognatha* species have three teeth on the anterior margin of the chelicerae and four on the posterior. However we have examined specimens of an undescribed species from Venezuela that have five or six teeth on the anterior margin of the chelicerae and

six or seven on the posterior; these specimens also possess the pleural bars between coxae I-II and II-III, a character not common in *Glenognatha* (e.g., present in *G. mira* Bryant, 1945 between coxae II-III). These data suggest that the study of new species may add some changes to the diagnosis and description of *Glenognatha*.

METHODS

Specimens were examined and illustrated using a Wild M-5® stereoscopic microscope with a Wild 1.25X camera lucida; further details were studied using a Leitz Ortholux II® compound microscope. Female genitalia were cleaned by means of trypsin digestion after removal with sharpened needles. The male and female genitalia were mounted in Hoyer's medium on a microscope slide. Measurements are given in mm. Tarsal length of the male palp is given as the length of the cymbium. The left palp is illustrated, if not otherwise stated. Abbreviations used in the text are standard for Araneae.

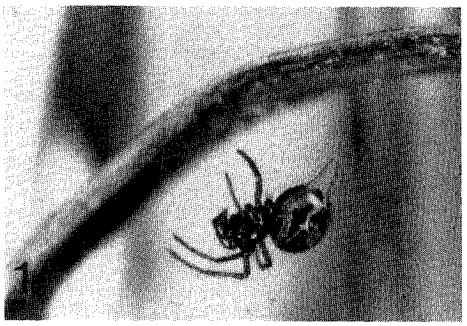
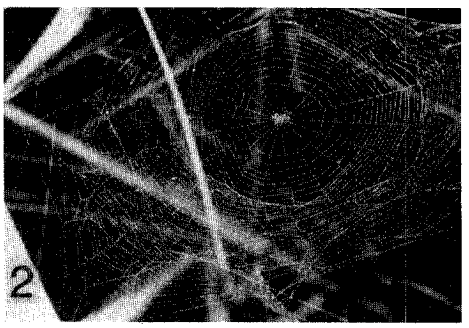
The research on the ecology of *G. heleios* was conducted in an extensive intertidal marsh in the Mullica River—Great Bay estuarine system where Great Bay Boulevard crosses over Little Thorofare Creek near Tuckerton, Ocean County, New Jersey. *G. heleios* was sampled in habitats dominated by *Spartina alterniflora* Lois., the salt marsh cordgrass, which occurs in three distinct growth forms over an elevational gradient from 1.5 m below mean high water level to mean high water level (Redfield 1972). On the low marsh tall form *S. alterniflora* (50 to more than 200 cm tall) grows with reduced culm density along tidal creeks and bay edges (Adams 1963; Blum 1968). Further up the elevational gradient the tall form of *S. alterniflora* grades into stands of an intermediate growth form (30-50 cm tall) with an increased culm density (Niering and Warren 1980). On the high marsh near mean high water level, short form *S. alterniflora* (10-30 cm tall) grows at high densities. A more detailed description will be published elsewhere (Döbel et al. in prep.).

Two study plots (each 100 m^2 and separated by $>$ 100 m) were established in each of the three *Spartina* habitats. On a bi-weekly basis from early May until late October, 1985 (11 dates in all), four samples were taken from each plot with a D-Vac® suction sampler (Dietrick 1961). Each sample consisted of four, 15 second random placements of a D-Vac® sampling head (0.0929 m^2) on the vegetation surface. Arthropods were killed with ethyl acetate and transferred into jars containing 90% ethanol. Spiders were sorted to species and age class (adults and immatures) and counted.

Levi's key to the *Glenognatha* north of Mexico (Levi 1980) is modified as follows to include *G. heleios* (figures 255-289 and map 8 refer to his cited work):

1. Less than 3.0 mm total length; female with chelicerae not enlarged (fig. 272; Fig. 13); male with spur on chelicerae (figs. 276, 285; Figs. 5-8); embolus and conductor minute on huge spherical tegulum (figs. 278, 287; Figs. 9-11); southern Canada to Central America and West Indies (map 8) 2

   Total length more than 3.5 mm; female with chelicerae enlarged (fig. 255); male without spur on chelicerae (fig. 266); embolus and conductor length greater than height of spherical tegulum (fig. 268); New Mexico, Arizona (map 8) ..... *emertoni*

Figures 1, 2.—*Glenognatha heleios* n. sp.: 1, subadult male; 2, web (web diameter about 10 cm).

2. Paracymbium with a tooth in its anterior margin (Fig. 9); male with hooked tooth on anterior margin of chelicerae (Figs. 5-8); tip of the embolus not coiled (Figs. 9-11); New Jersey ..... *heleios*
   Paracymbium without a tooth in its anterior margin 3

3. Female unknown; male with hooked tooth on anterior margin of chelicerae (fig. 285); tip of embolus coiled (fig. 289); Mississippi (map 8) ..... *iviei*
   Male without hooked tooth on anterior margin (fig. 276); tip of embolus not coiled (fig. 280); southern Canada to Central America, West Indies (map 8) ..... *foxi*

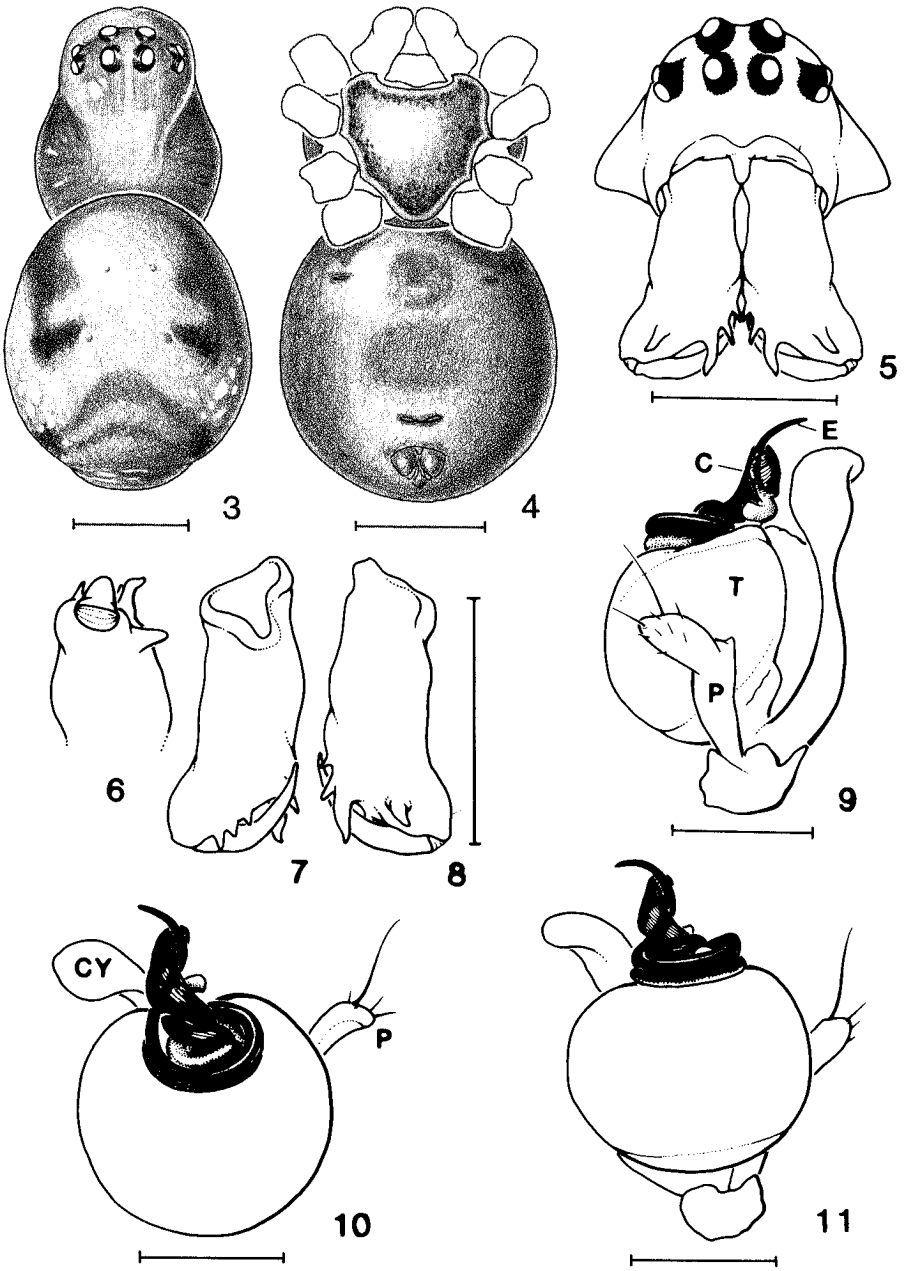
Glenognatha heleios, new species
Figures 1-17

Types.—Male holotype, four male paratypes and three female paratypes from New Jersey, Ocean Co., Tuckerton; collected on *Spartina alterniflora* in a lightly flooded salt marsh; 7 Nov. 1984 (8-1) (H. Döbel col.). Eight male and eight female paratypes from the same locality; 9 Oct. 1984 (8-2) (H. Döbel col.). Deposited in USNM; paratypes are also deposited in AMNH and MCZ. For nomenclatural purposes the senior author should be considered the author of the species description.

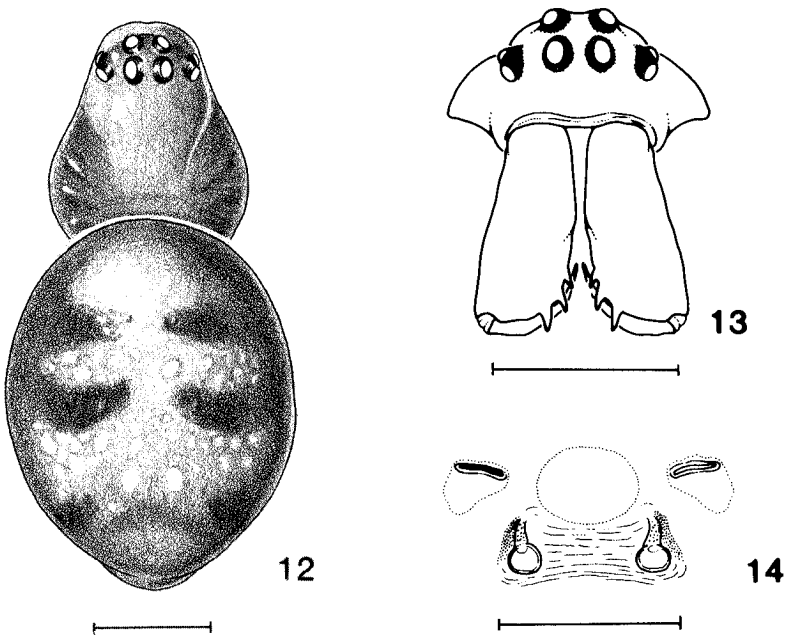
Etymology.—The specific epithet is from the Greek *helos* (marsh, meadow), hence *heleios* dwelling in a marsh, and refers to the known habitat of this species.

Diagnosis.—*Glenognatha heleios* differs from *G. iviei* Levi, 1980 in the shape of the paracymbium and the presence of a tooth on its anterior margin (Fig. 9). The larger body size and the shape of the hooked tooth on the chelicerae also separate *G. heleios* from *G. iviei* (Figs. 5-8).

Description.—Male (Holotype). Total length 2.04. Cephalothorax 1.03 long, 0.87 wide, 0.65 high. Sternum 0.50 long, 0.53 wide. Abdomen 1.25 long, 1.06 wide, 0.93 high. AME diameter 0.063; eyes of equal diameter; AME separation 1.25 times their diameter, PME separation 1.25 times their diameter; ALE, PLE juxtaposed; PME-PLE separation 1.75 times one PME diameter. Clypeus height 3.5 times one AME diameter. Chelicerae large (Figs. 5-8), four prolateral and four retrolateral teeth. Cephalothorax, chelicerae, sternum and legs light brown. Abdomen (Fig. 3, 4), dorsum light gray with black and white dorsal marks;



Figures 3-11.—*Glenognatha heleios* n. sp.: 3-5, holotype male; 3, dorsal; 4, ventral; 5, eye region and chelicerae; 6-8, left chelicera of male paratype; 6, distal portion, ectal; 7, posterior; 8, anterior; 9-11 palp of holotype male; 9, mesal; 10, posteroectal; 11, ectal. Abbreviations: C = conductor; CY = cymbium; E = embolus; P = paracymbium; T = tegulum. Scale bars: 0.5 mm for Figs. 3-8, 0.25 mm for Figs. 9-11.



Figures 12-14.—*Glenognatha heleios* n. sp., paratype female; 12, dorsal; 13, eye region and chelicerae; 14, genitalia, dorsal. Scale bars: 0.5 mm.

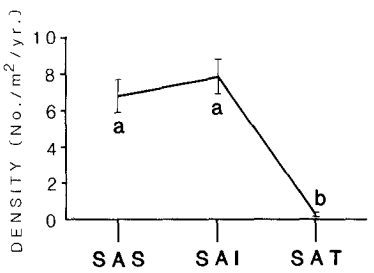
venter dark gray with light marks. Leg and pedipalp lengths of male described above:

	Fe	Pt	Ti	Mt	Ta	Total
I	1.12	0.34	1.12	0.87	0.53	3.98
II	1.03	0.34	0.97	0.81	0.47	3.62
III	0.65	0.28	0.47	0.47	0.31	2.18
IV	0.90	0.28	0.78	0.65	0.40	3.01
Pdp	0.47	0.19	0.12	—	0.59	1.37

Legs I>II>IV>III. Palp (Figs. 9-11).

Female (Paratype).—Total length 2.39. Cephalothorax 0.97 long, 0.84 wide, 0.65 high. Sternum 0.53 long, 0.59 wide. Abdomen 1.56 long, 1.25 wide, 1.25 high. AME diameter 0.063; eyes of equal diameter; AME separation 1.25 times their diameter, PME separation 1.25 times their diameter; ALE, PLE juxtaposed; PME-PLE separation 1.25 times one PME diameter. Clypeus height 2.4 times one AME diameter. Chelicerae (Fig. 13), three prolateral and three retrolateral teeth. Cephalothorax, chelicerae, sternum and legs light brown. Abdomen (Fig. 12), dorsum light gray with black and white marks, venter dark gray. Leg and pedipalp lengths of female described above:

	Fe	Pt	Ti	Mt	Ta	Total
I	1.02	0.31	0.90	0.84	0.50	3.57
II	0.93	0.31	0.81	0.68	0.47	3.20
III	0.65	0.25	0.43	0.47	0.50	2.30
IV	0.90	0.28	0.68	0.62	0.37	2.85
Pdp	0.31	0.12	0.25	—	0.25	0.93



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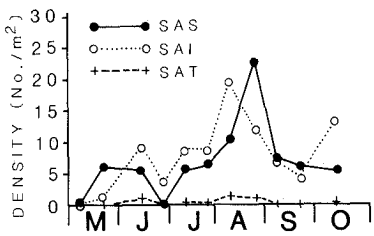

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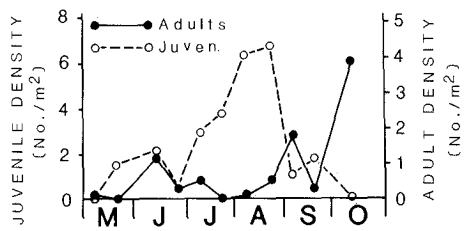

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Figures 15-17.—*Glenognatha heleios*, seasonal abundances at Tuckerton, New Jersey; 15, annual mean densities (no./m^2/yr) in the three *Spartina alterniflora* habitats along an elevational gradient. Means (± SE, $N = 22$) with different letters are significantly different ($P < 0.05$); 16, seasonal abundance (no./m^2) in the three *Spartina alterniflora* habitats. Plotted are the means of two plots for each habitat sampled on 11 dates from 7 May to 11 October 1985; 17, seasonal abundance (no./m^2, average across all habitats) of adults and juveniles. Abbreviations: SAS, short form *S. alterniflora*; SAI, intermediate form *S. alterniflora*; SAT, tall form *S. alterniflora*.

Legs I>II>IV>III. Vulva (Fig. 14).

Variation.—Male cephalothorax length ranges from 1.00 to 1.15 ($n = 13$), females from 0.90 to 1.03 ($n = 9$). Specimens in alcohol vary in abdominal pattern, with darker pigmentation of the dorsal pattern and more pronounced chevron marks in the posterior part of the abdomen; other specimens lack such marks. The dorsal white silver spots vary in size and number. In some specimens the abdominal pattern is hardly visible.

Natural history.—In general, *G. heleios* occurred at rather low densities, averaging six to eight individuals per m^2 each season. This species was most abundant in short and intermediate form *Spartina alterniflora* and very rare in tall form *Spartina* (Fig. 15). Peak densities of about 25 individuals per m^2 were reached in July/August (Fig. 16). In New Jersey *G. heleios* is a univoltine species producing juveniles from July to August followed by an adult peak in mid-October (Fig. 17). This species overwinters in the adult stage.

Webs were only found in the short and intermediate form of *Spartina alterniflora* where the amount of tidal flooding is very low (<0.5 cm). The web is located very close to the soil surface (1 to 5 cm) and oriented horizontally. The

sticky spiral is very closely spaced, leaving only minute gaps between two successive turns of the thread (Fig. 2).

Distribution.—*G. heleios* has been recorded only from a single locality, an intertidal salt marsh near Tuckerton, New Jersey where extensive sampling took place (Döbel et al. in prep.). Nevertheless it is likely that this species also will be found in other salt marshes with similar habitat structure and climatic pattern.

Material examined.—New Jersey: Ocean Co., Tuckerton; *S. alterniflora* salt marsh, lightly flooded (H. Döbel col.); 28 Aug. 1984 (8-4), 3 males; 25 Sep. 1984 (1-2), 2 males; 9 Oct. 1984 (8-4), 3 males; 7 Nov. 1984 (14-1), 4 males, 2 females; 7 Nov. 1984 (8-2), 3 males, 3 females; 7 Nov. 1984 (14-4), 3 males, 4 females; 11 Nov. 1984 (14-4), 4 males, 3 females. Deposited in USNM.

Glenognatha centralis Chamberlin, 1925
Figures 18-24

Glenognatha centralis Chamberlin, 1925: 216 (Male description, not illustrated). Female unknown.

Type.—Male holotype, label states "Glenognatha centralis Chamb. Male Holotype Panama (B. 1072) R. V. Chamberlin Coll." Deposited in MCZ, examined.

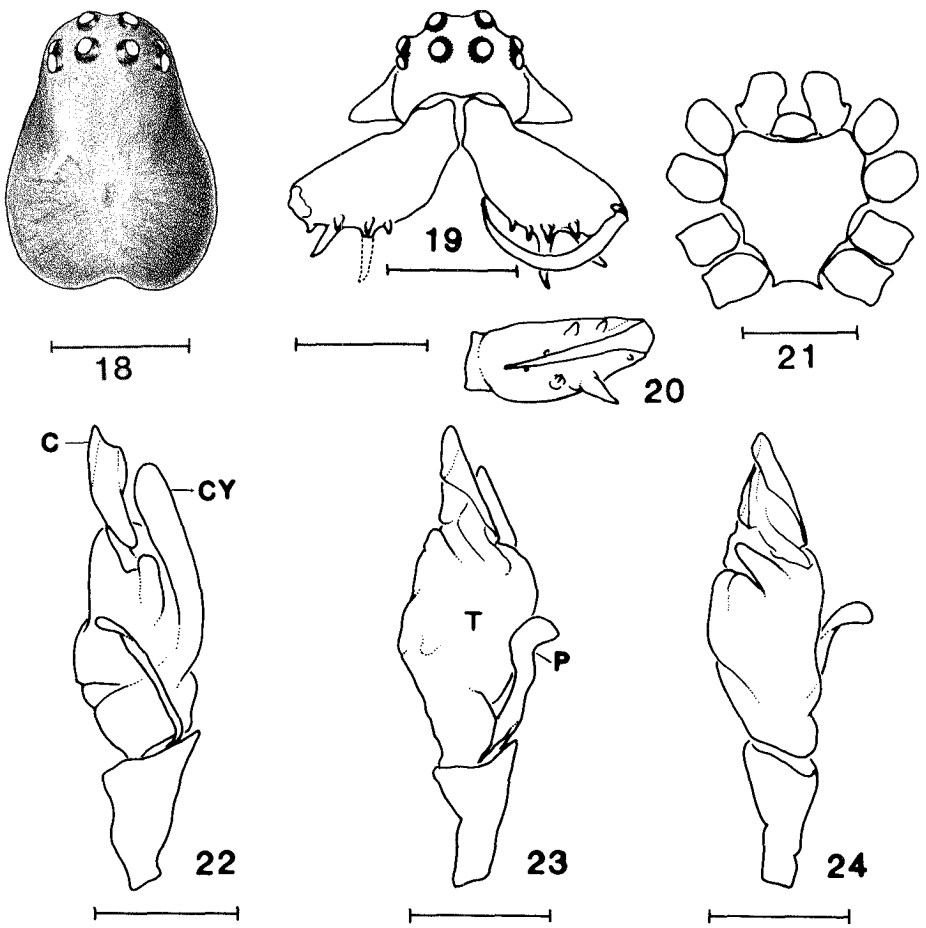
Note.—The type material of *G. centralis* (collected from the stomach of a toad, *Bufo* sp.) is in bad condition, missing many of the legs and the right pedipalp. The palpal characters are difficult to see because its morphology is distorted, probably due to the digestion process. The embolus is missing. We are not even sure whether the type material represents an adult or is a subadult before the last molt. After comparison with other Panamanian *Glenognatha* from the MCZ collection we have not found any specimen that matched *G. centralis* in any characters known to be useful for species diagnosis in *Glenognatha*. Therefore the description and diagnosis has to be based on this single specimen until new specimens are available for study.

Diagnosis.—*G. centralis* chelicerae (Fig. 19) are much more divergent than those of the other Central and North American species, and this divergence does not seem to be an artifact of preservation. The tegulum appears to be smaller than in other species of *Glenognatha* and the conductor shape seems unique to this species, being more elongated and its position more apical (Figs. 22-24).

Description.—Male (Holotype). Cephalothorax 0.97 long, 0.81 wide, 0.81 high. Sternum 0.53 long, 0.59 wide. AME diameter 0.156; eyes of equal diameter; AME separation one time their diameter, PME separation one time their diameter; ALE, PLE juxtaposed; PME-PLE separation 1.4 times one PME diameter. Clypeus height 2.2 times one AME diameter. Chelicerae large and strongly divergent (Figs. 19-20), three prolateral and four retrolateral teeth. Cephalothorax, chelicerae and sternum brownish, legs slightly lighter. Leg and pedipalp lengths of male described above:

	Fe	Pt	Ti	Mt	Ta
III	0.78	0.28	0.59	—	—
IV	1.09	0.34	0.87	—	—
Pdp	0.56	0.22	0.22	—	0.40

Palp (Figs. 22-24).



Figures 18-24.—*Glenognatha centralis* Chamberlin, holotype male; 18, carapace, dorsal; 19, eye region and chelicerae; 20, left chelicera, ventral; 21, sternum and coxae; 22-24, palp; 22, dorsal; 23, ectal; 24, ventral. Scale bars: 0.5 mm for Figs. 18-20; 0.25 mm for Figs. 22-24.

Distribution.—Only known from Panama (locality not specified in the label).

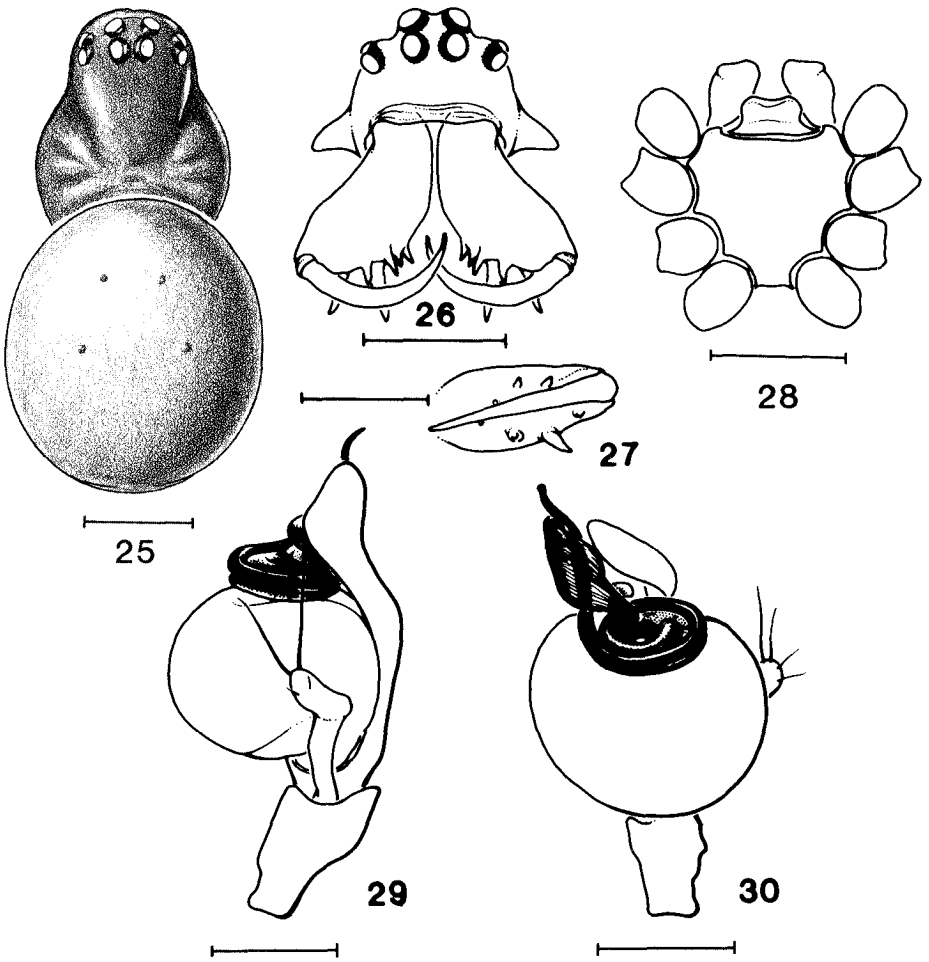
Material examined.—Only the holotype.

Glenognatha minuta Banks, 1898
Figures 25-30

Glenognatha minuta Banks, 1898: 248, pl. XV, fig. 15 (male lateral view and chelicera), female unknown.

Type.—Male syntype, labels state "Glenognatha minuta Bks Cotype San Jose del Cabo, Baja Calif. Eisen & Vaslit." and "Nathan Banks Coll." Deposited in MCZ.

Note.—*G. minuta* was described after two specimens, but no holotype was designated. The syntype series belonged to the California Academy of Sciences although Banks kept duplicate specimens. After the destruction of the specimens at the California Academy of Sciences during the earthquake in 1906 only the



Figures 25-30.—*Glenognatha minuta* Banks, syntype male; 25, dorsal; 26, eye region and chelicerae; 27, left chelicera, ventral; 28, sternum and coxae; 29, 30, palp; 29, mesal; 30, dorsoectal. Scale bars: 0.5 mm for Figs. 25-28; 0.25 mm for Figs. 29, 30.

duplicates have been available for study (Levi, pers. comm.). Therefore, although only one specimen survived, it should be considered as syntype. It does not seem appropriate to designate a lectotype.

Diagnosis.—*G. minuta* differs from other *Glenognatha* species in the shape of the embolus and the conductor (Figs. 29, 30). It also differs from other North American species by the cheliceral teeth (Fig. 26, 27).

Description.—Male syntype. Total length 2.28. Cephalothorax 1.15 long, 0.90 wide, 0.87 high. Sternum 0.56 long, 0.62 wide. Abdomen 1.37 long, 1.19 wide, 1.15 high. AME diameter 0.095; PME 0.83, PLE 0.83, ALE 0.83 times one AME diameter; AME separation one time their diameter, PME separation 1.4 times their diameter; ALE, PLE juxtaposed; PME-PLE separation 1.8 times one PME diameter. Clypeus height two times one AME diameter. Chelicerae large (Figs. 26, 27), three prolateral and four retrolateral teeth. Cephalothorax, chelicerae and sternum red-brown, legs light brown. Abdomen very light brown, no pattern visible. Leg and pedipalp lengths of male described above:

	Fe	Pt	Ti	Mt	Ta
I	1.56	0.56	1.53	—	—
II	1.50	0.34	—	—	—
III	1.03	—	—	—	—
IV	1.37	0.31	1.09	—	—
Pdp	0.59	0.22	0.22	—	0.56

Palp (Fig. 29-30).

Distribution.—Recorded from Baja California (San José del Cabo, type locality). Bryant (1940:358) misidentified a specimen from Cuba as *G. minuta*. The Cuban specimen belongs to a different species which has a longer embolus, thinner at its end and more curved. Its paracymbium is also different as Bryant noticed, with the basal part being wider than in the type specimen.

Material examined.—Only the syntype.

ACKNOWLEDGMENTS

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