

A Revision of the Spider Genus *Paradamoetas* (Araneae, Salticidae)

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ABSTRACT

The three known species of *Paradamoetas* are redescribed. The synonymy of *P. cara* (Peckham and Peckham) with *P. formicina* Peckham and Peckham is disclaimed. Natural history data suggest that *P. cara* is associated with *Acacia* and is a predator of *Pseudomyrmex* ants. *Parada-*

moetas fontana is a wetland species. The enlarged male chelicerae of *P. cara* do not vary allometrically when compared to carapace length. Scale structure proved useful in associating related genera.

INTRODUCTION

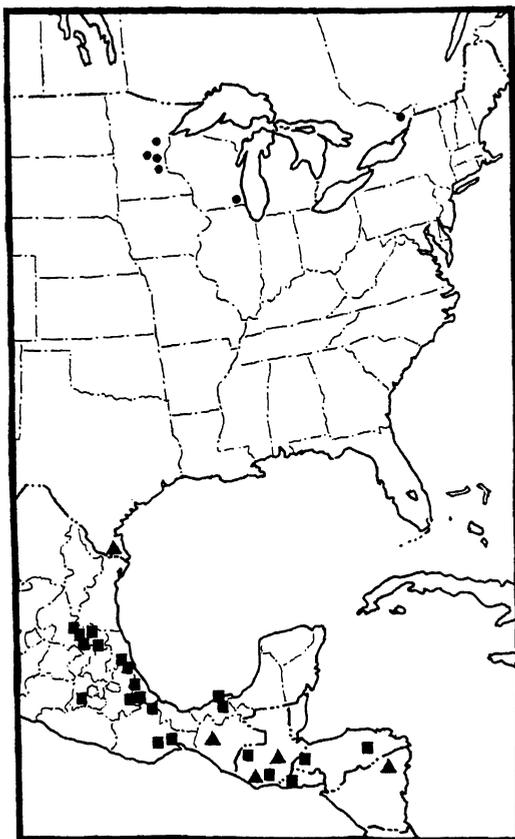
The taxonomy of the Salticidae has long been recognized to be in an unsatisfactory state. In the Americas, the genera structurally similar to *Dendryphantes* are the ones most in need of revision, because of the difficulty of distinguishing among them and because of their overwhelming importance in the salticid fauna of the area, especially in North America. Fully 55 percent of the 293 species listed by Richman and Cutler (1977) belong to this group of genera (including *Eris*, *Icius*, *Metaphidippus*, *Paradamoetas*, *Phidippus*, *Poultonella*, *Sassacus*, and *Tutelina*). One of the smaller genera, exhibiting a derived general appearance, is *Paradamoetas*. In addition to various structural similarities, the three members of the genus have an antlike habitus. Superficially, members of the genera *Sassacus* and *Tutelina* bear the most resemblance to *Paradamoetas*.

In many of the genera in this group there is an excavation on the retrolateral side of the cymbium of the male palpus, in which the tibial apophysis lies. In *Paradamoetas*, the excavation is enlarged, and its ventral edge is extensively rebordered (figs. 6, 8–10), so that it overhangs the distal edge of the tibia in that area. In addition (unlike *Sassa-*

cus), the palpal bulb does not overhang the tibia. The structure of the female copulatory tubes (figs. 12, 14, 16) differs from *Sassacus* and *Tutelina*, being initially lateral with openings facing medially, and opening into a large medial depression. The retromarginal cheliceral tooth in the male of *P. fontana* (Levi) is basal (fig. 24), as in all female *Paradamoetas*, as well as in both sexes of *Sassacus* and *Tutelina*. In male *P. cara* (Peckham and Peckham) (figs. 18–20) and *P. formicina* Peckham and Peckham (fig. 22) the tooth is distal. The female of *P. fontana* (when not gravid or engorged) has an unstricted opisthosoma (fig. 26), which is constricted in nongravid or nonengorged females of the other two species (fig. 25). The one obvious derived character in *P. fontana*, relative to the other species, is the deeply excavated fang grooves in the male, which also sets the species apart from the male of *Sassacus papenhoei* Peckham and Peckham. *Paradamoetas cara* and *P. formicina* are so similar that no somatic characters could be found to separate them. However, the genitalic characters are distinct, and the two species have not been found at the same localities (map 1).

In this genus, the modified setae, referred

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MAP 1. Eastern North America, showing distribution of *Paradamoetas cara* (squares), *P. fontana* (circles), and *P. formicina* (triangles). Several localities could not be found and were not plotted.

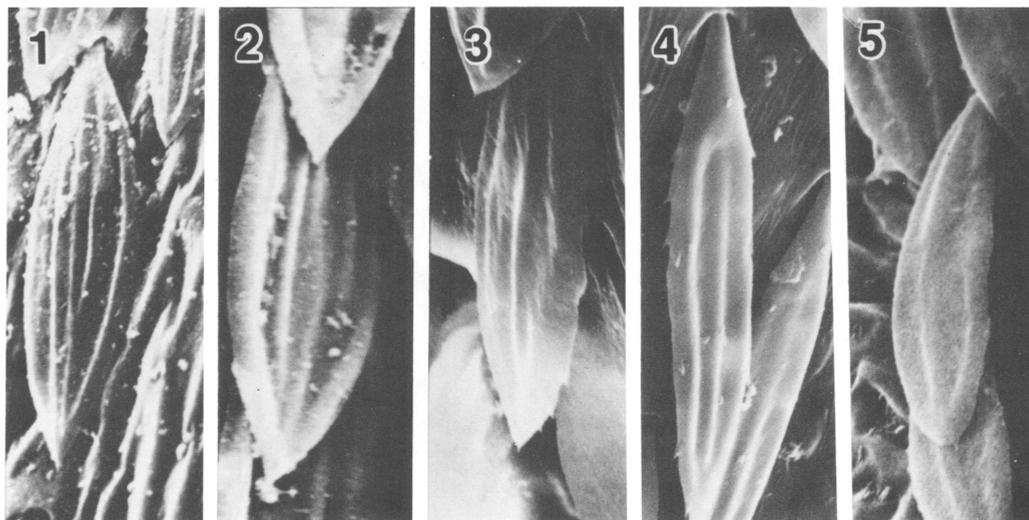
to as scales, are white and restricted, for the most part, to the lateral margins of the carapace. Their microstructure indicates a clear affinity with other "dendryphantine" genera. Scales of *P. formicina* (fig. 1) and *P. cara* (fig. 2) resemble those of *S. papenhoei* (fig. 5). The general structure is the same, but the two species of *Paradamoetas* have two lateral keels in addition to the central keel. The scales of *P. fontana* (fig. 3) differ, and resemble the scales of *Tutelina formicaria* (Emerton) (fig. 4) in being slightly serrate at the edge. Unpublished micrographs of scales of *Metaphidippus arizonensis*

(Peckham and Peckham) show scales similar in structure to those of *P. fontana*, including the presence of extra keels. There is variability in scale structure, often on a single specimen. The scales of *P. fontana* may have one, two, or three median keels, although one is the most prevalent number. Despite this variability, there is a general similarity in all "dendryphantine" scales (see also Hill, 1979). They are excavated on the upper surface, with a minimum of one keel. This is in contrast to the scales of other antlike salticids I have examined (such as *Myrmarachne*, *Peckhamia*, *Synageles*, and *Synemosyna*) which have a much greater length/width ratio, and are not excavated on the upper surface. In the species I have examined, the body scales have the same microstructure in both males and females, but this may not hold for scales of appendages in more sexually dimorphic species. Hill (1979) noted that iridescent scales are relatively uniform, and exhibit few surface features, and the same was noted in this study for the scales which give these spiders their metallic sheen.

In summary, *Paradamoetas* is a genus probably derived from forms similar to *Sas-sacus* or *Tutelina*. Among its species, *P. fontana* is the most plesiomorphic, and *P. cara* and *P. formicina* are more apomorphic.

It is a privilege to be able to contribute a paper to this festschrift for Willis Gertsch. We first met more than 25 years ago, and during the years I lived in New York City, we were sporadically in contact. While I learned much about spiders and taxonomy from this relationship, looking back, the interruptions must have been a great nuisance to Willis, yet he was always patient, and gave freely of his time. In later years he acted as an intermediary on my behalf, and suggested my thesis topic. Coincidentally, we both received doctorates from the University of Minnesota. It is in memory of the kindness shown to a young arachnologist that this paper is dedicated.

I thank the following for freely providing access to specimens in their care: Dr. Norman I. Platnick of the American Museum of Natural History (AMNH), who also invited



FIGS. 1-5. Marginal carapace scales, scanning electron micrographs. 1. *Paradamoetas formicina* Peckham and Peckham, male, 1000 \times . 2. *P. cara* (Peckham and Peckham), male, 1400 \times . 3. *P. fontana* (Levi), male, 1300 \times . 4. *Tutelina formicaria* (Emerton), immature, 1000 \times . 5. *Sassacus papenhoei* Peckham and Peckham, male, 1000 \times .

me to contribute to this Bulletin; Dr. Herbert W. Levi of the Museum of Comparative Zoology (MCZ); and Mr. Wayne Maddison of Burlington, Ontario (WM), who first noted that *Icius fontanus* was more correctly placed in *Paradamoetas*. I also thank Drs. Edwin F. Cook of the University of Minnesota for nomenclatorial help, Daniel H. Janzen of the University of Pennsylvania for biological notes on *P. cara*, and especially Dennis McGinley of the St. Paul Ramsey Medical Center, who gave freely of his expertise and time with scanning electron microscopy. Some of the specimens mentioned below are in my personal collection (BC). All measurements are in millimeters.

PARADAMOETAS PECKHAM AND PECKHAM

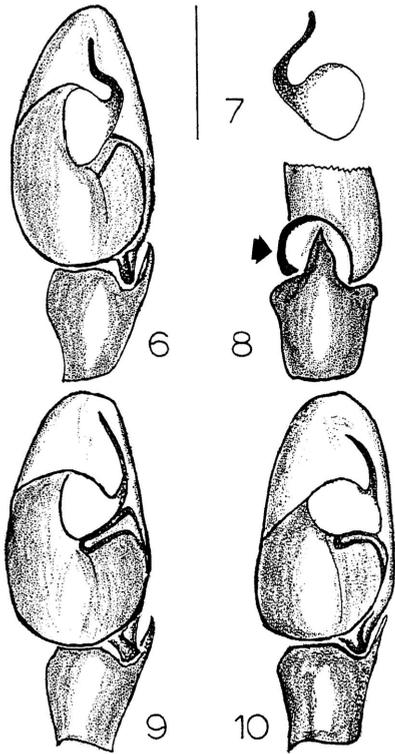
Paradamoetas Peckham and Peckham, 1885, p. 78 (type species by monotypy *P. formicina* Peckham and Peckham). Roewer, 1954, p. 1223. Bonnet, 1958, p. 3324.

DIAGNOSIS: Specimens of *Paradamoetas* may be recognized by the general antlike appearance and iridescent body coloration with white margins along the lower sides of the

carapace. Males have enlarged chelicerae with one retrolateral and two promarginal teeth. The male palpus has the embolus arising distally on the retrolateral side of the bulb, which does not overhang the tibia, and the ventral edge of the cymbial depression on the lower retrolateral side is elaborated. Females have a median depressed area in the epigynum, the entrances to the copulatory tubes facing medially, and the copulatory tubes lateral in position.

Considerable confusion surrounds the type species and *P. cara*. After the original description of *P. formicina*, all subsequent descriptions and illustrations of male *P. formicina* are actually of male *P. cara*. The epigyna illustrated in the literature are of *P. formicina*. *Paradamoetas cara* was originally described in the genus *Keyserlingella*. When Galiano (1971) synonymized *Keyserlingella* with *Fluda*, she transferred *K. cara* to *Paradamoetas*, but considered it a synonym of *P. formicina*.

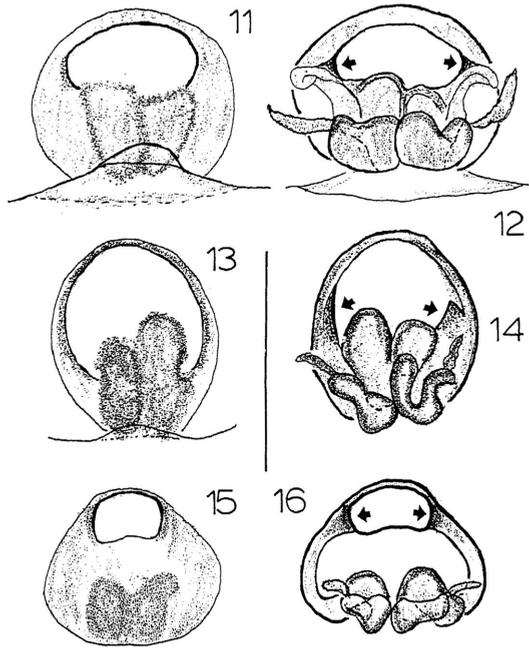
Bonnet (1958) indicated that the generic name is masculine. However, it is feminine, and the original orthography of the Peckhams is retained.



FIGS. 6-10. 6-8. *Paradamoetas formicina* Peckham and Peckham, male. 6. Ventral view of palpus, specimen from Tumahu, Guatemala. 7. Ventral view of embolus, specimen from south Texas. 8. Retrolateral view of tibial apophysis, specimen from Tumahu; arrow points to rebordered ventral margin of cymbium opposite tibial apophysis. 9. *P. cara* (Peckham and Peckham), ventral view of palpus, specimen from Temascal, Mexico. 10. *P. fontana* (Levi), ventral view of palpus, specimen from Solana State Forest, Minnesota. Scale line = 0.17 mm.

KEY TO SPECIES OF *PARADAMOETAS*

1. Males 2
 Females (best differentiated by internal details of the epigynum) 4
2. Cheliceral fang groove deeply excavated, retromarginal cheliceral tooth basal (fig. 24) *fontana*
 Cheliceral fang groove not deeply excavated, retromarginal cheliceral tooth distal (figs. 18-20, 22) 3



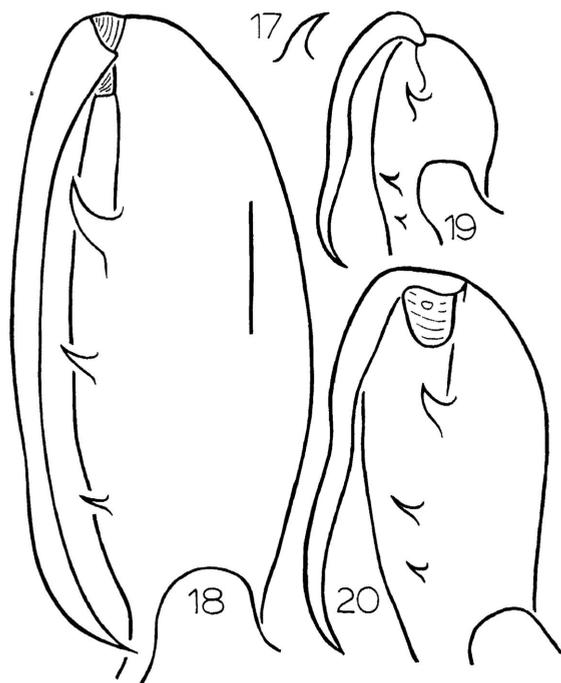
FIGS. 11-16. 11, 12. *Paradamoetas formicina* Peckham and Peckham, specimen from Tumahu, Guatemala. 13, 14. *P. cara* (Peckham and Peckham), specimen from Temascal, Mexico. 15, 16. *P. fontana* (Levi), specimen from Solana State Forest, Minnesota. 11, 13, 15. External views of epigynum. 12, 14, 16. Internal views of epigynum; arrows point to external openings of copulatory tubes. Scale line = 0.17 mm.

3. Embolus with a simple curve, with one bend (fig. 9) *cara*
 Embolus sinuous, with two bends (figs. 6, 7) *formicina*
4. Epigynum elongated parallel to longitudinal axis of opisthosoma (fig. 13) *cara*
 Epigynum elongated parallel to transverse axis of opisthosoma (figs. 11, 15) 5
5. Epigynum as in figures 11, 12 *formicina*
 Epigynum as in figures 15, 16 *fontana*

Paradamoetas formicina
 Peckham and Peckham

Figures 1, 6-8, 11, 12, 21, 22; Map 1

Paradamoetas formicina Peckham and Peckham, 1885, p. 79, figs. 10, 10a (male holotype from Guatemala, in MCZ, examined); 1892, p. 74, pl. 6, figs. 2a-2c (female only). F. O. P.-Cam-



FIGS. 17–20. Left chelicerae of male *Paradamoetas cara* (Peckham and Peckham). 17. Retromarginal cheliceral tooth of specimen from Temascal, Mexico. 18. Specimen from Tuxpan, Mexico. 19. Specimen from Copan, Honduras. 20. Specimen from Temascal, Mexico. Scale line = 0.17 mm.

bridge, 1901, p. 177, pl. 12, figs. 6–6c (female only). Edwards, 1977, p. 22.

DIAGNOSIS: This species resembles *P. cara* but may be distinguished by the sinuous embolus with two bends in males, and by the form of the epigynum and copulatory tubes in females (figs. 11, 12).

MALE (Tumahu): Total length 2.91, carapace 1.42 long, 1.02 wide. Eyerow I width 0.82, eyerow III width 0.87, eyefield length 0.69. Eye diameters: AME 0.25, ALE 0.13, PME 0.03, PLE 0.12. Distance ALE–PME 0.20, PLE–PME 0.28. Femora lengths: I 0.85, II 0.57, III 0.62, IV 0.84. Leg formula 1432. Spines, leg I: dorsal femoral 4, tibia 3–3, metatarsal 2–2. Range of carapace length in five males 1.49–1.62. Coloration as in *P. cara*.

FEMALE (Tumahu): Total length 3.04, carapace 1.37 long, 1.04 wide. Eyerow I width 0.92, eyerow III width 0.85, eyefield length 0.84. Eye diameters: AME 0.28, ALE 0.15, PME 0.03, PLE 0.12. Distance ALE–PME 0.15, PLE–PME 0.27. Femora lengths: I 0.72, II 0.50, III 0.56, IV 0.85. Leg formula 4123. Range of carapace length in six females 1.25–1.63. Spination and coloration as in male.

MATERIAL EXAMINED: **United States:** *Texas:* southern part of state, nr. Mexico (MCZ), 1♂, 3♀. **Mexico:** *Chiapas:* Tuxtla Gutierrez, June 6, 1955 (R. B. and J. M. Selander, AMNH), 1♀. **Guatemala:** Tumahu, 3000 ft., July 10–11, 1974 (C. and P. Vaurie, AMNH), 1♂, 1♀; Tiquisate, 200 ft., June 26–29, 1947 (C. and P. Vaurie, AMNH), 1♀; Tucuru, July 12–13, 1947 (C. and P. Vaurie, AMNH), 1♂. **Nicaragua:** Musawas, Waspuc River, Oct. 10–31, 1955 (B. Malkin, AMNH), 2♂.

NOTE: The specimens from Texas were collected in the first decade of this century, or the last decade of the nineteenth century. They are separated by about 1500 km. from all other known specimens of the species. No other specimens from Texas have been found. Since all specimens from Mexico north of Chiapas are of *P. cara*, some doubt should be attached to the Texas record. I have examined the Panamanian specimen of Banks (1929), and it does not belong to the genus. Thus, Nicaragua marks the known southern limit of the genus.

Paradamoetas cara

(Peckham and Peckham), new combination

Figures 2, 9, 13, 14, 17–20, 25; Map 1

Keyserlingella cara Peckham and Peckham, 1892, p. 71, pl. 5, figs. 8–8a (male holotype from Guatemala, in MCZ, examined). F. O. P.-Cambridge, 1901, p. 177, pl. 12, figs. 9–9a.

Paradamoetas formicina (misidentification): Peckham and Peckham, 1892, p. 74, pl. 6, fig. 2d (male only); 1909, p. 375, pl. 49, fig. 2d (male only). F. O. P.-Cambridge, 1901, p. 177, pl. 12, fig. 5 (male only). Galiano, 1971, p. 599.

DIAGNOSIS: This species can be distinguished from *P. fontana* by the distal retromarginal cheliceral tooth and less excavated

fang groove in the male, from *P. formicina* males by the simple curve of the embolus (fig. 9) and from the other species, in the female, by details of the epigynum (figs. 13, 14).

MALE (Picolo): Total length 3.27, carapace 1.55 long, 1.09 wide. Eyerow I width 0.87, eyerow III width 0.84, eyefield length 0.67. Eye diameters: AME 0.22, ALE 0.12, PME 0.03, PLE 0.13. Distance ALE-PME 0.20, PLE-PME 0.26. Femora lengths: I 0.78, II 0.70, III 0.65, IV 1.05. Leg formula 4123. Spines, leg I: dorsal femoral 4, tibial 3-3, metatarsal 2-2. Range of carapace length in 47 males 1.25-2.05. Carapace dark brown, thin line of white scales around lower side, sparse scattered white scales in cephalic area. Chelicerae dark brown, palpi light brown. Legs pale brown with brown pro-lateral stripes on tibia I and II, infuscated ventral and dorsal on all legs from patella to tarsus. Opisthosoma brown.

FEMALE (Picolo): Total length 4.17, carapace 1.70 long, 0.90 wide. Eyerow I width 0.72, eyerow III width 0.80, eyefield length 0.58. Eye diameters: AME 0.23, ALE 0.13, PME 0.03, PLE 0.13. Distance ALE-PME 0.18, PLE-PME 0.25. Femora lengths: I 0.72, II 0.65, III 0.50, IV 0.96. Leg formula and spination as in male. Range of carapace length in 44 females 1.35-1.65. Coloration as in male.

MATERIAL EXAMINED (all specimens in AMNH, unless otherwise specified): **Mexico:** *México:* San Rafael (MCZ). *Oaxaca:* Playa Hati, Río Tonto; Temascal, 5 mi. E Oaxaca. *San Luis Potosí:* 20 mi. E Ciudad del Maíz; Huichichuya; Picolo; 8 mi. W San Joaquín; Tamazunchale, Xilitla. *Tabasco:* Baños de Sulfre, nr. Teapa; east of Frontera. *Veracruz:* Álamo; Conejos; El Tajin; Fortín; Jalapa; Tecolutla; Tuxpan; Veracruz. **Guatemala:** Capetillo; Finca Santa Adelaida, 8 mi. N Santa Bárbara. **El Salvador:** Candelaira. **Honduras:** Chichicaste, Paraíso; Copán.

DISTRIBUTION: Eastern Mexico from San Luis Potosí south to eastern Honduras (map 1).

VARIATION: The large variation in cheliceral size (figs. 18-20) in males of this species raises the possibility of allometric growth.

However, after the parameters carapace length without the chelicerae (y-axis) versus cheliceral length (x-axis) were plotted, no evidence of separate peaks was observed and a smooth linear plot was obtained. For 47 specimens, the average carapace length was 1.56, standard deviation 0.13, range 1.25-2.05; the average cheliceral length was 0.93, standard deviation 0.24, range 0.35-1.57. The calculated correlation coefficient of 0.79 indicates a strong correlation between the two parameters measured; using the *r* test, a "validity" of better than 99 percent is obtained. The equation best fitting the data is $y = 0.49x + 1.11$.

NATURAL HISTORY: This information was supplied by Daniel H. Janzen, based on his observations of the species on twigs and thorns of *Acacia cornigera* Linnaeus in old fields at Temascal, near Oaxaca, Mexico. The spiders were collected foraging on these small trees, which were occupied by colonies of the ant *Pseudomyrmex ferruginea* F. Smith, an active, aggressive species. *Paradamoetas cara* was taken with *Pseudomyrmex ferruginea* as prey, and is somehow able to avoid capture by the ants. However, *P. cara* does not resemble *P. ferruginea* in appearance, but is more like an ant of the genus *Paracryptocerus* found on the foliage of other plants in the old fields (but not on *A. cornigera*). The map in Janzen (1967) showing the distribution of swollen thorn acacias—obligate acacia-ant interactions in Central America corresponds roughly to the distribution of *P. cara*. More biological work would be necessary to establish a definite relationship between the ant and the spider.

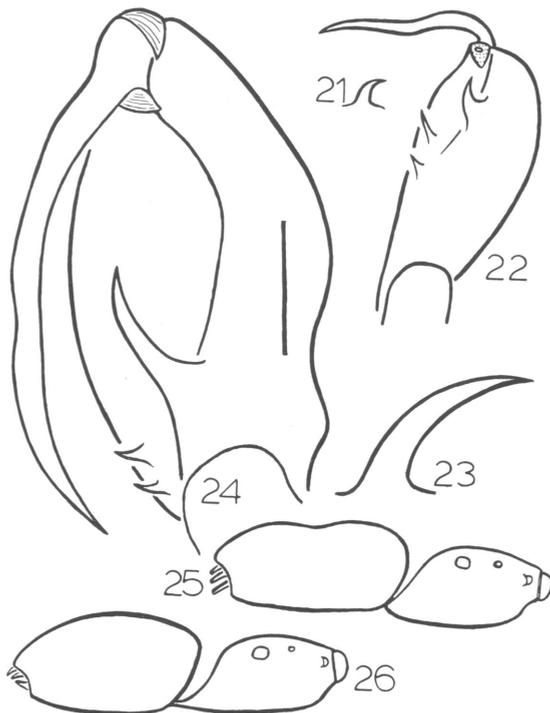
Paradamoetas fontana (Levi)

Figures 3, 10, 15, 16, 26, 27; Map 1

Icius fontanus Levi, 1951, p. 33, figs. 43-45 (male holotype from bog, Lake Geneva outlet at Fontana, Walworth County, Wisconsin, in AMNH, examined).

Paradamoetas fontanus: Richman and Cutler, 1978, p. 91.

DIAGNOSIS: This species is distinguished from others in the genus in both sexes by having serrate white scales on the margin of



FIGS. 21–26. 21, 22. *Paradamoetas formicina* Peckham and Peckham, specimen from Tumahu, Guatemala. 21. Retromarginal cheliceral tooth. 22. Left chelicera. 23, 24. *P. fontana* (Levi), specimen from Solana State Forest, Minnesota. 23. Retromarginal cheliceral tooth. 24. Left chelicera. 25. Lateral view of female *P. cara* (Peckham and Peckham). 26. Lateral view of female *P. fontana* (Levi). Scale line = 0.17 mm. (figs. 21–24 only).

the carapace with a single median keel (fig. 3); also, males have chelicerae with a basal retromarginal tooth and a deeply excavated fang groove, females a distinctive epigynum (figs. 15, 16) and a non-constricted opisthosoma.

MALE (Solana State Forest): Total length 2.92, carapace 1.49 long, 1.20 wide. Eyerow I width 0.99, eyerow III width 1.09, eyefield length 0.73. Eye diameters: AME 0.28, ALE 0.15, PME 0.03, PLE 0.15. Distance ALE–PME 0.25, PLE–PME 0.25. Femora lengths: I 0.92, II 0.72, III 0.68, IV 0.85. Leg formula 1432. Spines, leg I: dorsal femoral 4, tibial 3-3, metatarsal 2-2. Range of carapace length in 25 males 1.40–1.90. Carapace and opistho-



FIG. 27. Sedge bog habitat of *Paradamoetas fontana* (Levi) in Solana State Forest, Minnesota (East White Pine Truck Trail, facing ESE). Road is roughly 2 m. wide. Shrubs (as at right) are willows (*Salix* sp.). Trees along skyline are spruces (*Picea glauca* Voss.) on higher ground. Standing water about ½ m. deep starts 1 m. to side of road. *Paradamoetas fontana* is taken sweeping forbs and sedges by side of road. Other salticids found in this habitat are *Eris marginata* (Walckenaer), *Metaphidippus protervus* (Walckenaer), *Phidippus clarus* Keyserling, and *Tutelinia similis* (Banks).

soma colored as in *P. cara*. Legs dark brown except tarsi II, III, IV and metatarsus IV light brown.

FEMALE (same locality): Total length 3.51, carapace 1.60 long, 1.19 wide. Eyerow I width 0.95, eyerow III width 0.92, eyefield length 0.75. Eye diameters: AME 0.27, ALE 0.13, PME 0.03, PLE 0.15. Distance ALE–PME 0.17, PME–PLE 0.23. Femora lengths: I 0.80, II 0.63, III 0.58, IV 0.89. Leg formula 4123. Spines, leg I: dorsal femoral 3, tibial 3-3, metatarsal 2-2. Range of carapace length in 13 females 1.40–1.67. Coloration as in male except leg I dark yellow, legs II, III, IV yellow. Dorsal brown stripe on patellae and tibiae of all legs.

MATERIAL EXAMINED: **Canada:** *Ontario:* 3 mi. S Richmond (nr. Ottawa), in calcareous bog, on ground among mosses and dead grasses, and sweeping, June 21, 1978 (D. Maddison, H. Goulet, WM), 2♀, Aug. 2, 1978 (D. Maddison, H. Goulet), 6♂, 5♀. **United States:** *Minnesota:* Aitkin Co.: Solana State Forest, E White Pine Truck Trail, approx. 7 mi. N McGrath, ½ mi. E Highway 65, sweeping forbs and sedges at margin of sedge bog, July 9, 1967 (B. Cutler, AMNH, BC), 12♂, 4♀, Aug. 12, 1967 (B. Cutler, BC), 4♂, July 5, 1980 (B. Cutler, BC), 1♂,

4♀; W White Pine Truck Trail, 1 mi. W Highway 65, sweeping vegetation at margin of bog, July 9, 1967 (B. Cutler, BC), 1♀, July 4, 1971 (B. Cutler, BC), 1♂. Stearns Co.: Rockville Tamarack Bog Nature Conservancy Area, nr. Rockville, on *Symphoricarpos* in old field near *Larix* bog, May 11, 1977 (R. Dana, BC), 1♂. Anoka Co.: Cedar Creek Natural History Area, 2½ mi. E East Bethel, Cedar Bog Lake, Sept. 10, 1977 (B. Cutler, BC), 1 penultimate ♂ on boat dock, matured Nov. 11, 1♀ sweeping bog vegetation. Ramsey Co.: Roseville, sweeping sedges and grasses in marsh, June 25, 1967 (D. Jennings, BC), 1♂. Wisconsin: Walworth Co.: bog, Lake Geneva outlet at Fontana, July 3, 1938 (D. C. Lowrie, AMNH), 1♂ (holotype).

NATURAL HISTORY: All collecting records of this species indicate it is associated with wetlands, particularly bogs. Figure 27 illustrates the most productive locality known in Minnesota. However, *P. fontana* has not been found in most of the bogs or sedge marshes collected in Minnesota.

In captivity, females survive well in small vials, with *Drosophila* as prey, and build typical salticid retreats. Collected females

were released in pots containing sedges, grasses, and forbs. Most individuals were in active motion soon after release, running over the upper vegetation. The front legs were elevated and waved while running, with minor palpal movements, and minor opisthosomal raising and wagging. Gaps two to three times the length of the spider were readily crossed by jumping. They would pause for variable intervals, up to around 15 minutes, right side up, near a node on a grass blade or on the leaf of a forb near the stem. About half the time they would pause upside down on a grass or sedge blade, so that they were hidden from above.

A typical hunting sequence involved noticing an aphid, about 2 mm. long on the same grass blade roughly 5 cm. away. The aphid was followed, by running up to within about 3–4 mm., then it was pounced on. An interesting interaction occurred when an ant (*Lasius* sp.) worker about 4 mm. long ran up to a spider at rest. The spider struck at the ant with the front part of the body and the first pair of legs. The ant turned and ran off; the spider remained at rest with no attempt at pursuit.

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