



On American '*Micromerys*' and *Metagonia* (Araneae, Pholcidae), with notes on natural history and genital mechanics

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Two American pholcids previously assigned to *Micromerys* Bradley are redescribed and transferred to *Metagonia*: *Me. conica* (Simon, 1893) comb. n. (Venezuela), and *Me. delicata* (Cambridge, 1895) comb. n. (Central America). Two close relatives of *Me. delicata* are newly described: *Me. uvita* sp. n. and *Me. talamanca* sp. n. (both from Costa Rica). The name *Me. turrialba* Gertsch, 1986 is synonymized with *Me. rica* Gertsch, 1986 (Costa Rica) which is redescribed. Four additional representatives of *Metagonia* are described as new: *Me. reventazona* sp. n. (Costa Rica, Panama), *Me. toro* sp. n. (Panama), *Me. hitoy* sp. n. and *Me. hondura* sp. n. (Costa Rica). *Leptopholcus dalei* (Petrunkewitsch, 1929) from Puerto Rico, which was originally described as *Micromerys dalei*, is redescribed and its closeness to 'true' Old World *Leptopholcus* is supported. Arguments are presented to justify the transfer of the American '*Micromerys*' species to *Metagonia*. Notes on the natural history of *Me. rica* are presented, and a detailed account on copulation and genital mechanics is given as a basis for future comparison. © 1997 The Norwegian Academy of Science and Letters

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Introduction

Pholcid spiders are quite strictly separated biogeographically into two groups (Huber submitted a): a probably monophyletic 'Old World group' with only a few (mostly synanthropic) species in the New World; and a 'New World group' which is probably not monophyletic and which has only two synanthropic species outside the Americas (*Psiolchorus simoni* (Berland) — Fürst & Blandenier 1993; Huber 1994; *Hedypsilus culicinus* Simon — Huber 1997). Most genera that were originally thought to be cosmopolitan proved to be polyphyletic. For example, of the 31 *Pholcus* species described from the New World, most have been transferred to various New World genera or synonymized with one of only four remaining species. Of these, one is a synanthropic cosmopolitan (*Pholcus phalangioides* (Fuesslin)), and at least one is probably misplaced (*Pholcus dubiomaculatus* Mello-Leitão). The same is evidently true of East Asian and Australian '*Psiolchorus*' which are more closely related to certain Old World genera than to the 'real' American *Psiolchorus* (Deeleman-Reinhold 1994; Huber submitted a). Another such supposedly cosmopolitan genus is *Micromerys*. Some authors have suggested that American *Micromerys* species are not closely related with the 'true' *Micromerys* from the Indo-Australian region (Deeleman-Reinhold 1986a, 1986b; Brignoli 1980) and a relationship with the American genus *Metagonia* was proposed by the same authors. However, no convincing arguments have been presented to relate the American *Micromerys* species

to *Metagonia* or another New World genus. Moreover, the existing descriptions of American *Micromerys* species are old and in part almost unusable. *Micromerys conica* Simon, 1893 was only briefly mentioned in the diagnosis of the genus, without illustration, and has never been redescribed. *Micromerys occidentalis* (Mello-Leitão, 1929) was described from a single female, and the description reveals nothing about its relationship. Only *Mi. delicata* Cambridge, 1895 was described with considerable accuracy, with small but useful figures (see also F. Cambridge 1902) and refound at least twice (Deeleman-Reinhold 1986b; Nentwig 1993). The female, however, has never been described.

The present paper redescribes two of these species (I could not examine the type of *Mi. occidentalis*) and provides the description of two new species closely related to *Mi. delicata*. In order to evaluate the possible relationship with *Metagonia*, one 'typical' *Metagonia* is redescribed in detail (*Me. rica* Gertsch, 1986), and descriptions of four new species are given. Details of copulatory mechanics have proven useful to detect phylogenetic relationships in pholcids (Huber 1995, submitted b). Only the first step for a comparison can be taken in the present study: an analysis of genitalic functioning in *Me. rica*. Future analyses of American and 'true' *Micromerys* should complete this line of research.

Leptopholcus dalei (Petrunkewitsch, 1929) from Puerto Rico is included in this study because it was originally described as *Micromerys* and some confusion exists as to its generic placement. Brignoli (1980) speculated about a

relationship with *Metagonia*, whereas Deeleman-Reinhold (1986b) suggested a close relationship with 'true' Old World *Leptopholcus*; both, however, without presenting convincing arguments.

Material and methods

This study is largely based on material collected by the author in Central America. In addition, types and vouchers from the following people and institutions were studied: C. L. Deeleman Reinhold; American Museum of Natural History, New York (AMNH); Landessammlungen für Naturkunde Karlsruhe (LNK); Museum of Comparative Zoology, Cambridge (MCZ); Muséum National d'Histoire Naturelle, Paris (MNHN); British Museum of Natural History, London (BMNH); Universidad de Costa Rica, San José (UCR); Instituto Nacional de Biodiversidad de Costa Rica (INBIO). Types of new species are deposited in the AMNH.

Drawings were made with a compound microscope with camera lucida. Measurements (all in mm) were taken with ocular micrometers in a compound or a dissecting microscope. One or two decimals are given, with an accuracy of ± 0.03 mm. Prosoma length was defined as the distance between frontal face of eye region and posterior border of carapace medially, but it varies widely with the angle at which the prosoma is viewed. 'Carapace' is referred to as the dorsal part of the prosoma. The most accurate indicators of size are probably prosoma width and tibia length. Total size is simply the sum of prosoma length and opisthosoma length, regardless of the petiolus, and is given as an approximate indication of overall size. The tibia index ('tibind') is the length of the tibia divided by its width at the middle, and is so a measure of the 'slenderness' of the legs.

Reproductive behaviour was observed under a dissecting microscope. Genital morphology and copulatory mechanics were studied by freezing-fixing copulating pairs with liquid nitrogen (six pairs) and preparation of semithin ($1 \mu\text{m}$) serial sections of the clased genitalia (two pairs) (for details of method, see Huber 1993). For drawings of the internal female genitalia, these were treated with KOH and put on a slide with water.

Family PHOLCIDAE

Genus *Metagonia* Simon, 1893

Type species: *Metagonia bifida* Simon, 1893

Diagnosis. Gertsch (1986: 40–41) gave an extensive diagnosis for Central American and West Indian representatives of the genus. No changes need to be made to encompass the two American '*Micromerys*' species redescribed in the present paper and their two newly described close relatives. Only a few remarks and corrections appear justified: (1) *Metagonia* is probably not a representative of Pholcinae in the sense of Petrunkevitch (1939) (see discussion below). (2) Gertsch's 'spinules' on the male chelicerae are called club-shaped hairs in the present paper. (3) Gertsch's statement "genitalia of haplogyne type" requires a more detailed discussion (see below). (4) Gertsch used the terms "accessory process", "inner process" and "hinged process" for the same structure (the last term is used in the present paper). (5) Gertsch interpreted the structures in the female uterus externus as devices to guide the embolus — they are instead used to lock the procturus (see below).

Metagonia conica (Simon, 1893) comb. n. (Figs 1, 2)

Micromerys conica Simon, 1893: 472–474.

Material examined. Male lectotype (designated herein following suggestion on a label by P. Brignoli from 1971) and male paralectotype

(MNHN, 11022), with Simon's label "11022 Mic. conica E.S. Tovar!". Tovar (Aragua, Venezuela) lies 70 km W of Caracas, at an elevation of about 1800 m. Simon collected there in January and February 1888 (Levi 1964).

Diagnosis. Small pale species with characteristic apophyses on male clypeus (Fig. 1C), male chelicerae with club-shaped hairs, without distal apophyses (Fig. 1D), procturus with distinctive s-shaped apophyses (Fig. 2).

Redescription. Male: carapace pale ochre yellow, with brown ocular area, and darker stripe behind it, which is absent in paralectotype (Fig. 1A–B). Clypeus, sternum and opisthosoma pale without markings. Legs whitish, only 'knees' (pat, tib-met) slightly darker. Six eyes in two triads, on slightly elevated ocular area (Fig. 1A–B). Legs without spines. Clypeus with small apophyses (Fig. 1C) just above chelicerae. Chelicerae with small club-shaped hairs on each side (Fig. 1D), hardly visible in dissecting microscope. Pedipalps as shown in Fig. 2, procturus with short s-shaped apophysis and ventral hinged process, bulb with simple embolus, ending with short spine (Fig. 2A).

Female not known.

Measurements of male lectotype

Total length: 2.6; prosoma length: 0.8; width: 0.9; opisthosoma length: 1.8

Legs:	1	2	3	4
fem	—	4.7	2.8	4.4
pat	—	0.3	0.3	0.3
tib	—	4.1	2.5	3.9
met	—	6.7	3.9	6.6
tar	—	0.7	0.7	0.7
total	—	16.5	10.2	15.9
tibind	—	43	26	41

Legs of male paralectotype

	1	2	3	4
fem	7.0	4.8	3.1	—
pat	0.3	0.3	0.3	—
tib	7.2	4.4	2.8	—
met	12.1	7.9	4.2	—
tar	1.6	0.9	0.7	—
total	28.2	18.3	11.1	—
tibind	76	46	29	—

Metagonia delicata (Cambridge, 1895) comb. n. (Figs 3–7, 25A, 26D)

Micromerys delicatus Cambridge, 1895: 149–150; plate 21, figs 7, 7a–c; F. Cambridge 1902: 370; plate 35, figs 6, 6a; Deeleman-Reinhold 1986b: 47; Nentwig 1993: 97.

Material examined (in author's collection unless otherwise noted). Male paratype from Teapa (Tabasco, Mexico), in BMNH (BM 1905.1008). 3 males, 7 females from Tikal (Dep. Petén, Guatemala), Sept. 21, 1996 (B. A. Huber). 1 male, 8 females from 1 km E Rio Dulce (Dep. Izabal, Guatemala), elev. 100 m, Sept. 24, 1996 (B. A. Huber). 1 male from Jardín Lancetilla near Tela (Dep. Atlántida, Honduras), elev. 50 m, Sept. 28, 1996 (B. A. Huber). 4 males, 5 females from Parque Nacional Carpio y Calentura near Trujillo (Dep. Colón, Honduras), elev. 150 m, Sept. 30, 1996 (B. A. Huber). 8 males, 9 females from Pancasan near Bluefields (Dep. Zelaya Sur, Nicaragua), elev. 50 m, Oct. 6, 1996 (B. A. Huber). 4 males, 2 females from Turrialba (Prov. Turrialba, Costa Rica), about 2 km E of the town at the Rio Azul, and about 4 km E of the town at the Rio Reventazon, elev. about 500–600 m, March 15, 1996 (B. A. Huber). 3 males, 7 females from Hitoy Cerere Biological Reserve (Prov. Limón,

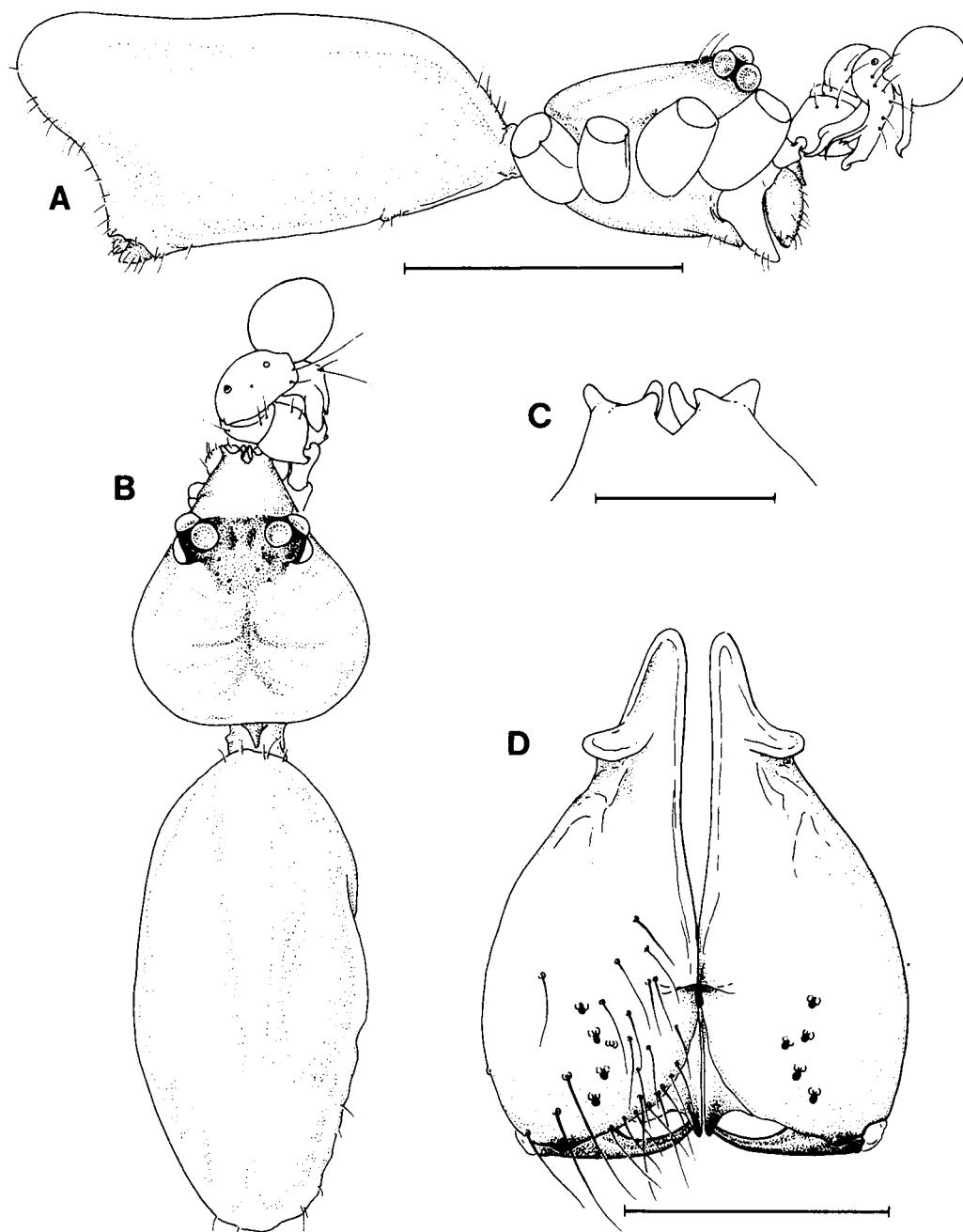


Fig. 1. *Metagonia conica* (Simon), male.—A. Lateral view.—B. Dorsal view.—C. Clypeus, dorsal view.—D. Chelicerae, frontal view. Scale lines: (A,B) 1 mm; (C,D) 0.2 mm.

Costa Rica), elev. 200 m, Sept. 7, 1996 (B. A. Huber). 10 males, 17 females from Bocas del Toro Island (Province Bocas del Toro, Panama), at sea level, April 23, 1995 (B. A. Huber).

Type locality. Mexico: Tabasco: Teapa.

Other material. Deeleman-Reinhold (1986b) and Nentwig (1993) report the species from the Canal Zone, Panama (not examined).

Diagnosis. Small pale species readily distinguished by the long s-shaped apophysis on the male proctiger (Figs 4, 5). Male chelicerae with club-shaped hairs and pair of distal apophyses (Fig. 6). Female only distinguishable by cleared preparation of internal genitalia (Fig. 7).

Redescription. Male (Bocas del Toro, Panama): live spiders pale greenish to ochre yellow, in ethanol pale whitish. Opisthosoma varying from pale whitish to grayish ochre, in some specimens with two longitudinal bands of darker

(rarely black) spots dorsally (as in illustrated male, Fig. 3A–B). Six eyes in two triads (Fig. 3), pedipalps as shown in Fig. 4, with characteristic s-shaped apophyses on proctiger. Chelicerae with club-shaped hairs anteriorly, and pair of apophyses overhanging fangs (Fig. 6). Legs without spines. Genitalia and overall appearance agree exactly with paratype.

Female (Bocas del Toro, Panama): colours as in male, opisthosoma typically without spots, only seminal receptacle shines through ventrally as slightly darker structure. Vulva asymmetric (Fig. 7), with single receptacle either on left or right side (from 13 females, 7 were left-sided, 6 right-sided). In most other localities there was an imbalance towards left-sided females: Tikal (l: 7, r: 0), Rio Dulce (l: 7, r: 1), Trujillo (l: 5, r: 0), Pancasan (l: 8, r: 1), Turrialba (l: 2, r: 0), Hitoy Cerere (l: 4, r: 3). Legs without spines.

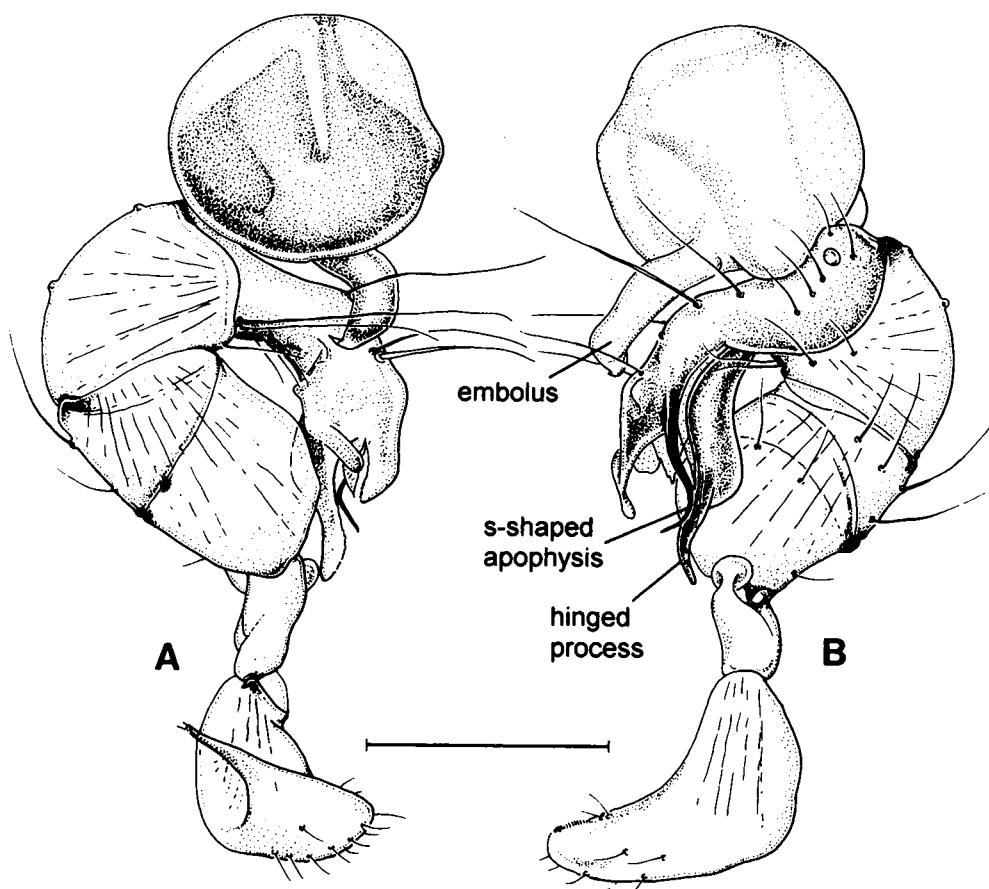


Fig. 2. *Metagonia conica* (Simon), left male pedipalp.—A. Prolateral view.—B. Retrolateral view. Scale line: 0.3 mm.

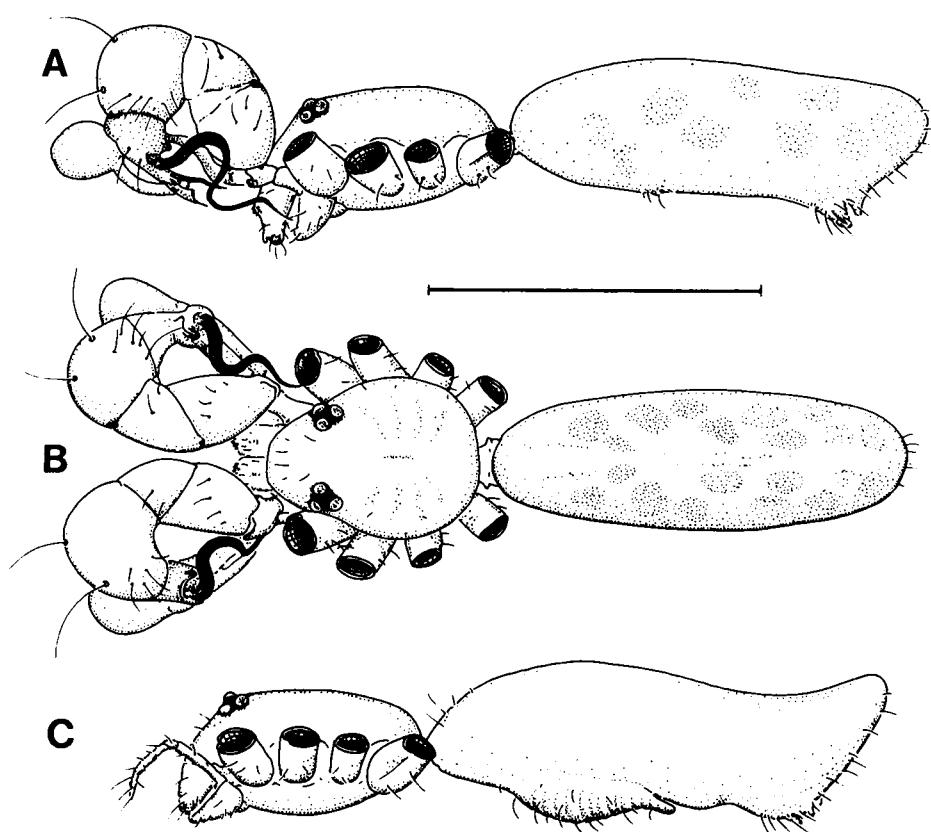


Fig. 3. *Metagonia delicata* (Cambridge).—A. Male, lateral view.—B. Male, dorsal view.—C. Female, lateral view. Scale line: 1 mm.

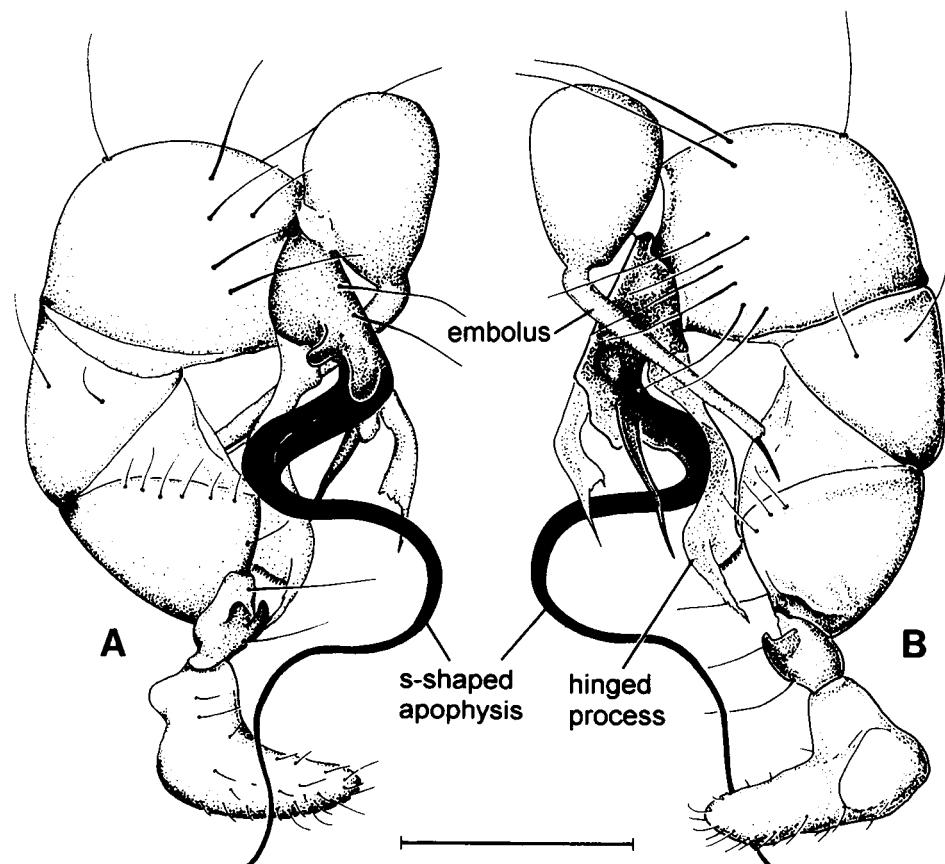


Fig. 4. *Metagonia delicata* (Cambridge), right male pedipalp.—A. Retrolateral view.—B. Prolateral view. Scale line: 0.3 mm.

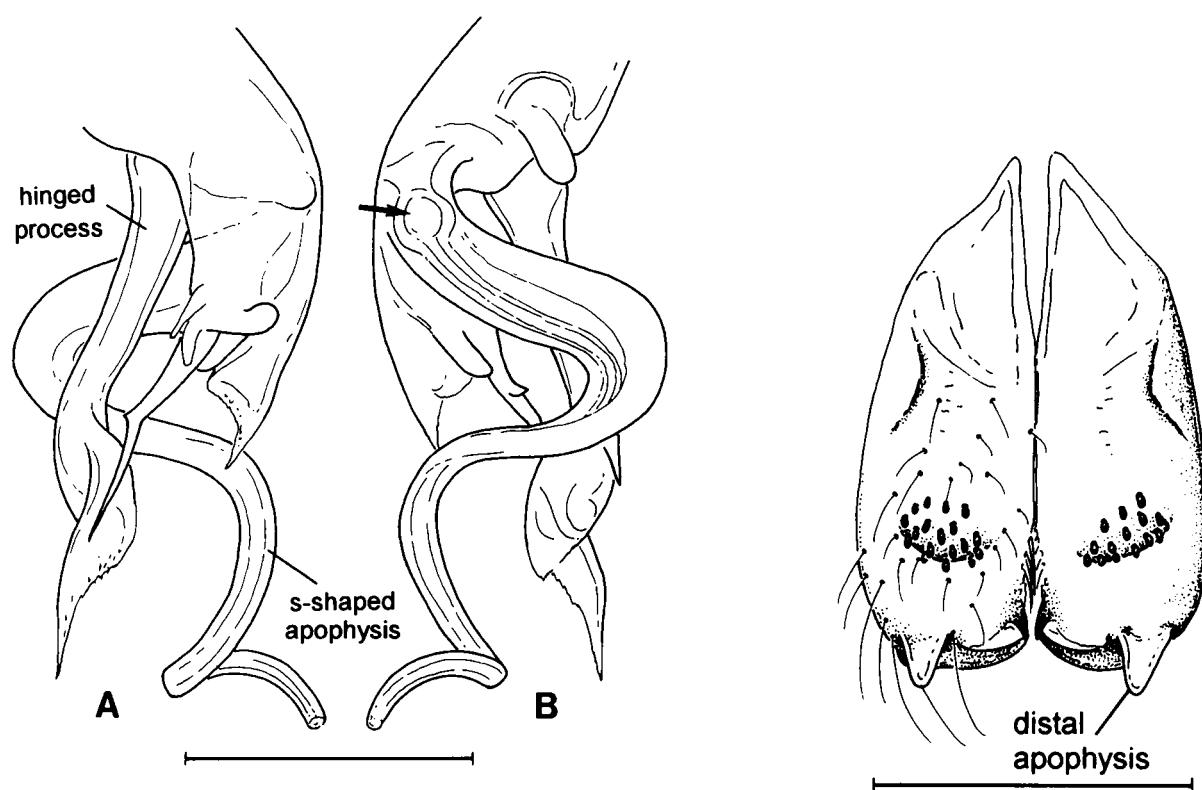


Fig. 5. *Metagonia delicata* (Cambridge), left procursus.—A. Prolateral view.—B. Retrolateral view. Arrow points to 'reservoir'. Scale line: 0.2 mm.

Fig. 6. *Metagonia delicata* (Cambridge), male chelicerae, frontal view. Scale line: 0.2 mm.

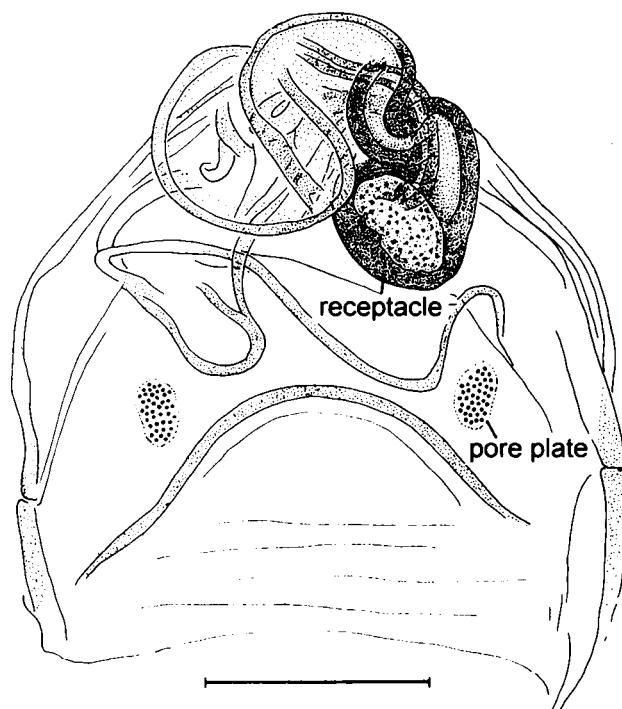


Fig. 7. *Metagonia delicata* (Cambridge), internal genitalia of a 'right-sided' female, dorsal view. Scale line: 0.1 mm.

Measurements of male paratype

Total length: 2.1; prosoma length: 0.7; width: 0.67; opisthosoma length: 1.4; fem 1: 3.9 (tib 1 missing); tib 2: 2.3; tib 3: 1.1; tib 4: 2.3

Measurements of a male from Bocas del Toro

Total length: 1.8, prosoma length: 0.6, width: 0.60, opisthosoma length: 1.2

Legs	1	2	3	4
fem	3.8	2.4	1.4	2.8
pat	0.2	0.2	0.2	0.2
tib	3.8	2.2	1.2	2.3
met	5.5	3.1	1.6	3.3
tar	1.2	0.8	0.5	0.7
total	14.5	8.7	4.9	9.3
tibind	66	40	22	40

Measurements of a female from Bocas del Toro

Total length: 1.8, prosoma length: 0.6, width: 0.57, opisthosoma length: 1.3

Legs	1	2	3	4
fem	3.3	2.2	1.3	2.7
pat	0.2	0.2	0.2	0.2
tib	3.2	1.9	1.1	2.2
met	4.7	2.8	1.5	3.1
tar	1.1	0.6	0.5	0.6
total	12.5	7.7	4.6	8.8
tibind	56	36	19	38

Tibia 1 in other material

Tikal: 3 males: 3.6, 3.9, 4.0; 7 females: $\bar{x} = 3.3$ (3.1–3.6)

Rio Dulce: 1 male: 3.6; 8 females: $\bar{x} = 3.3$ (3.0–3.5)

Tela: 1 male: 4.1

Trujillo: 4 males: 3.5, 3.6, 3.6, 3.8; 5 females: $\bar{x} = 3.2$ (3.2–3.3)

Pancasan: 8 males: $\bar{x} = 3.9$ (3.7–4.2); 9 females: $\bar{x} = 3.3$ (3.1–3.5)

Turrialba: 3 males: 3.6, 3.7, 4.0; 2 females: 3.2, 3.4

Hitoy Cerere: 3 males: 4.1, 4.3, 4.4; 7 females: $\bar{x} = 3.3$ (3.1–3.5)

Bocas del Toro: 8 males: $\bar{x} = 3.50$ (3.28–3.69); 13 females: $\bar{x} = 3.10$ (2.93–3.21)

Genital morphology. The procursus bears a number of processes of which only the s-shaped apophysis and the hinged process are named in this paper (Fig. 5). At the basis of the s-shaped apophysis there is a 'reservoir' (arrow in Fig. 5) from which a duct runs all through the apophysis unto its tip. This is visible in cleared whole mounts of the palp and was confirmed by serial sections. The sections revealed no glandular tissue in connection with the 'reservoir'. Such a 'reservoir' plus duct also occurs in the closely related *Me. uvita* sp. n. and *Me. talamanca* sp. n. (I did not pay attention to it when examining *Me. conica*), but it is absent in the other *Metagonia* species treated in this paper.

Sagittal and cross sections were prepared to resolve the complex structure of the internal female genitalia. The complexity is due to a ventral fold in the uterus externus that is spirally wound and at one point connected with the unpaired seminal receptacle (Fig. 25A). The receptacle is provided with glands, and is, by a second duct, connected to the central part of the 'valve' that separates the uterus externus from the uterus internus. The 'valve' shows the principal morphology of Old World pholcids (Huber submitted a; c.f. Figure 26A–B) but is much less well developed (Fig. 26D). Dorsally in the uterus externus a pair of small pore plates marks the position of the vulval glands (Fig. 7). The female genitalia have no external sclerotized structures.

Remark. While it was easy to maintain *Me. rica* in the laboratory for several months and to observe their reproductive behaviour (see below), I had no success with *Me. delicata*. Males that were introduced into containers with females showed no response, and the spiders usually died within a few weeks. In the field they were found on the underside of leaves, extremely well camouflaged, so that I often saw the dark sclerotized parts of the male palps first and only then the whole spider. Males were often sitting only a few body-lengths from a female, and in some cases I found several (up to about 5) individuals on one large leaf. No web was visible at the leaves, but in the capturing and maintaining jars they spun a few irregular threads close to the upper surface. Prey capture was not visibly different from that in *Me. rica* (see below).

Metagonia uvita sp. n. (Figs 8, 9)

Holotype. Male, deposited in AMNH.

Type locality. Uvita, Quebrada Colonia, about 3 km E of Uvita village (Prov. Puntarenas, Costa Rica), elev. about 20–60 m, in humid forest, February 14, 1996 (B. A. Huber).

Paratype. Female, same collection data, in AMNH.

Other material (in author's collection unless otherwise noted). Two males, 11 females from type locality, same collection data. 13 males, 23 females, 5 juveniles from Esquinas Rainforest, La Gamba (Prov. Puntarenas, Costa Rica), elev. about 100 m, July 3, 1996 (B. A. Huber). 3 males, 7 females, 2 juv. from Wilson Botanical Gardens, Las Cruces (4 km S San Vito de Coto Brus, Prov. Puntarenas, Costa Rica), elev. 1000–1100 m, July 5, 1996 (B. A. Huber). 9 males, 7 females from San Vito de Coto Brus, Quebrada Pavona (Prov. Puntarenas, Costa Rica), elev. about 980 m, July 5, 1996 (B. A. Huber). 4 males, 5 females from Manuel Antonio (Prov. Puntarenas, Costa Rica), elev. about 20 m, Dec. 7, 1996 (B. A. Huber). 1 female, tentatively assigned to this species from Rincon de Osa (Prov. Puntarenas, Costa Rica), July 29, 1968 (collected by OTS course), in UCR.

Habitat. On the underside of large leaves.

Etymology. Specific name from type locality.

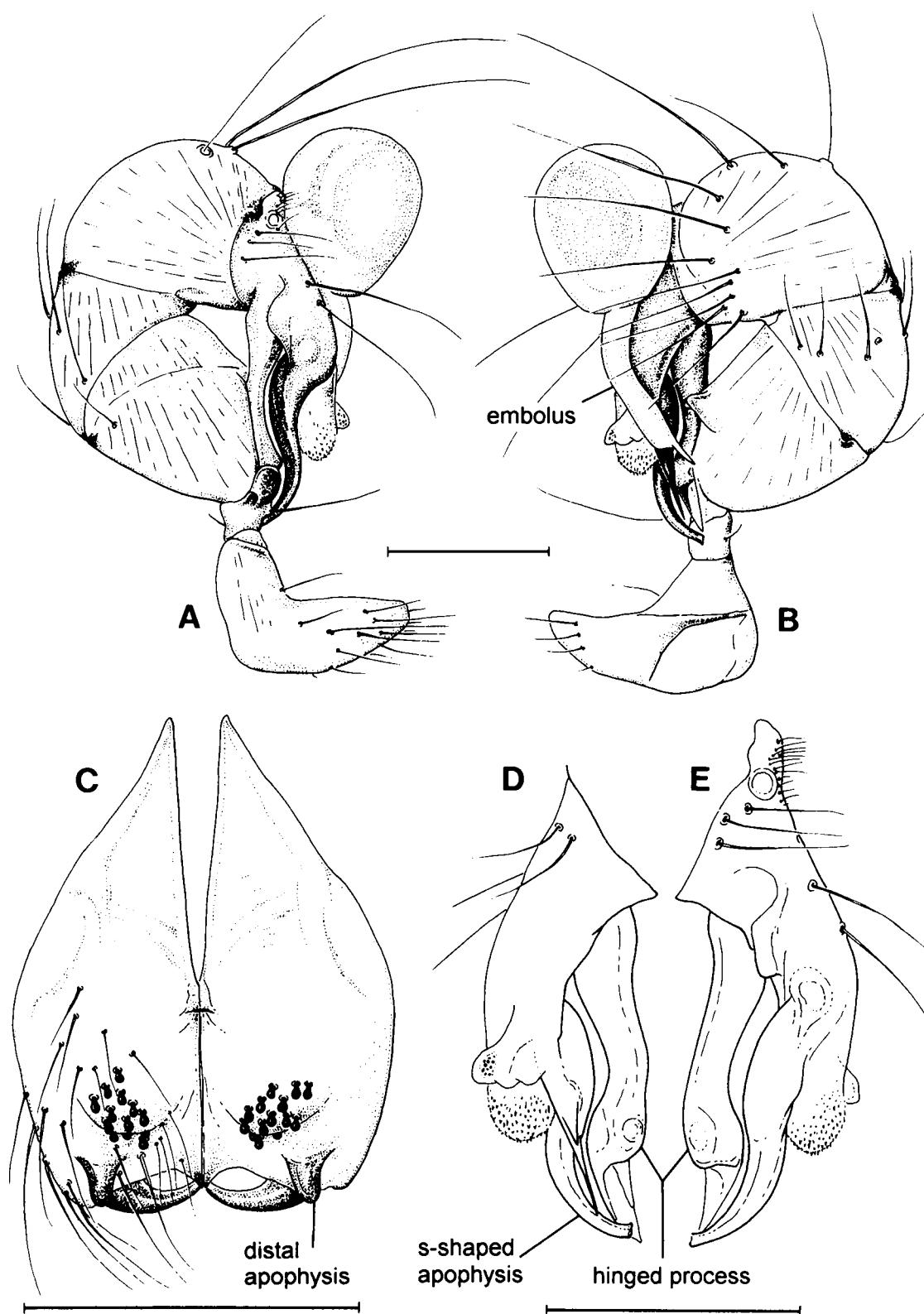


Fig. 8. *Metagonia uvita* sp. n., male.—A. Right pedipalp, retrolateral view.—B. Right pedipalp, prolateral view.—C. Chelicerae, frontal view.—D. Cymbium with proctersus, prolateral view.—E. Cymbium with proctersus, retrolateral view. Scale lines: 0.2 mm.

Diagnosis. Small pale species with distinctive s-shaped apophysis and lobes on the proctersus (Fig. 8D–E), club-shaped hairs and pair of apophyses on male chelicerae (Fig. 8C). Female only distinguishable by cleared preparations of internal genitalia (Fig. 9).

Description. Male: live spiders pale greenish to ochre yellow, in ethanol pale whitish. Opisthosoma varying

from pale whitish and orange to grayish ochre, in some specimens with 4 or 6 dark (rarely black) spots dorsally anteriorly. Overall appearance not different from *Me. delicata* (c.f. Fig. 3) and *Me. talamanca* sp. n.. Pedipalps as shown in Fig. 8A–B, with stout s-shaped apophysis on proctersus. Chelicerae with club-shaped hairs anteriorly, and pair of apophyses overhanging fangs (Fig. 8C). Legs without spines.

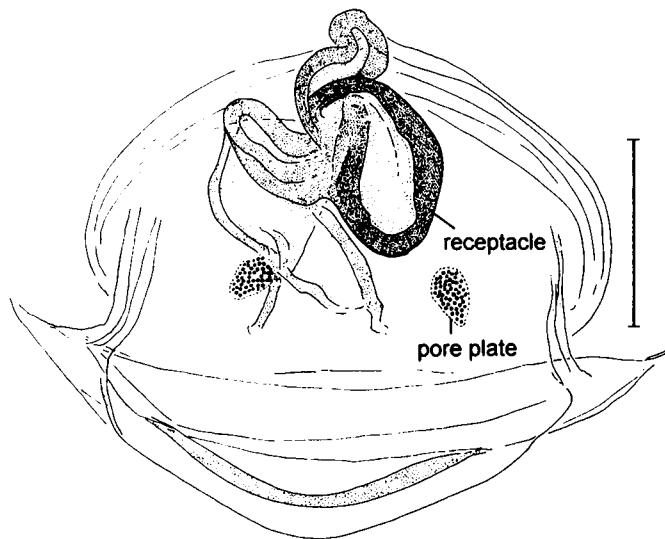


Fig. 9. *Metagonia uvita* sp. n., internal genitalia of a 'right-sided' female, dorsal view. Scale line: 0.1 mm.

Female: colours as in male, only seminal receptacle shines through ventrally as slightly darker structure. Vulva asymmetric (Fig. 9), with single unpaired receptacle either on left or right side (from 54 females investigated, 32 were left-sided, 22 right-sided). Legs without spines.

Measurements of male holotype

Total length: 1.8, prosoma length: 0.6, width: 0.63, opisthosoma length: 1.2.

Legs	1	2	3	4
fem	4.6	2.9	1.7	3.4
pat	0.2	0.2	0.2	0.2
tib	4.6	2.6	1.4	2.7
met	6.9	3.8	2.2	3.9
tar	1.3	0.8	0.6	0.7
total	17.6	10.3	6.1	10.9
tibind	73	42	24	46

Measurements of female paratype

Total length: 1.8, prosoma length: 0.6, width: 0.57, opisthosoma length: 1.2.

Legs	1	2	3	4
fem	3.5	2.4	1.2	2.8
pat	0.2	0.2	0.2	0.2
tib	3.5	2.1	1.1	2.3
met	5.2	3.1	1.7	3.4
tar	1.2	0.8	0.5	0.7
total	13.6	8.6	4.7	9.4
tibind	55	36	22	43

Tibia I in other material:

Uvita: 1 male: 4.4; 10 females: $\bar{x} = 3.6$ (3.5–3.8)

Wilson Gardens: 3 males: 4.3, 4.4, 4.4; 7 females: $\bar{x} = 3.6$ (3.5–3.8)

La Gamba: 13 males: $\bar{x} = 4.2$ (3.9–4.4); 23 females: $\bar{x} = 3.6$ (3.3–3.8)

San Vito: 8 males: $\bar{x} = 4.2$ (3.9–4.5); 7 females: $\bar{x} = 3.6$ (3.3–3.7)

Manuel Antonio: 3 males: 4.0, 4.0, 4.1; 2 females: 3.2, 3.3

Metagonia talamanca sp. n. (Figs 10, 11)

Holotype. Male, deposited in AMNH.

Type locality. Zurqui, 17 km NNE of San José (Prov. San José, Costa Rica), elev. about 1600 m, June–Oct. 1995 (B. A. Huber).

Paratype. Female, same collection data, in AMNH.

Other material. 4 males, 14 females from type locality, same collection data, in author's collection. 1 male from Tapantí, Quebrada Segunda (Prov. Cartago, Costa Rica), elev. 1300 m, March 1995 (G. Mora), in INBIO. 1 male, 1 female from Estación Pittier (Prov. Puntarenas, Costa Rica), elev. 1750 m, June 8, 1995 (collected by a parataxonomist's course), in INBIO.

Habitat. On the underside of large leaves.

Etymology. Specific name from the Cordillera de Talamanca, the mountain range in south-eastern Costa Rica that includes two of the three known localities.

Diagnosis. Small pale species with distinctive s-shaped apophysis and other processes on the proctiger (Figs 10, 11A–B), otherwise not distinguishable from *Me. delicata* and *Me. uvita* sp. n. Female only distinguishable by cleared preparations of internal genitalia (Fig. 11C).

Description. Male: colours and habitus as in *Me. delicata* (see above). Pedipalps as shown in Fig. 10, with distinctive s-shaped apophysis on proctiger (Fig. 11A–B). Chelicerae as in *Me. delicata* (c.f. Fig. 6). Legs without spines.

Female: vulva asymmetric (Fig. 11C), with single unpaired receptacle either on left or right side (from 14 females investigated, 9 were left-sided, 5 right-sided). Legs without spines.

Measurements of male holotype

Total length: 2.2, prosoma length: 0.7, width: 0.73, opisthosoma length: 1.5.

Legs	1	2	3	4
fem	4.5	3.0	1.7	3.4
pat	0.3	0.3	0.3	0.3
tib	4.5	2.7	1.5	2.9
met	6.6	4.1	2.2	4.1
tar	1.2	0.8	0.6	0.7
total	17.1	10.9	6.3	11.4
tibind	57	43	24	41

Measurements of female paratype

Total length: 2.2, prosoma length: 0.7, width: 0.70, opisthosoma length: 1.5.

Legs	1	2	3	4
fem	3.8	2.8	1.6	3.2
pat	0.3	0.3	0.2	0.3
tib	3.8	2.4	1.4	2.6
met	5.5	3.5	1.9	3.7
tar	1.2	0.7	0.6	0.7
total	14.6	9.7	5.7	10.5
tibind	54	38	22	37

Tibia I in other material:

Zurqui: 4 males: 4.2, 4.4, 4.6, 4.6; 13 females: $\bar{x} = 3.8$ (3.7–4.1)

Estación Pittier: 1 male: 5.0; 1 female: 4.1

Metagonia rica Gertsch, 1986 (Figs 12–15, 25B, 26C, 27–28)

Metagonia rica Gertsch, 1986: 59, figs 45–47.

Metagonia turrialba Gertsch, 1986: 59, figs 51–52, syn. n.

Material examined (in author's collection unless otherwise noted). *Metagonia rica*: male holotype from Finca La Selva (Prov. Heredia, Costa Rica), elev. about 50 m, January 1978 (W. G. Eberhard), in MCZ. 6 males, 5 females, 10 juv. from type locality, January 10, 1996 (B. A. Huber). 15 males, 11 females, 1 juv. from Reserva Biológica San Ramón (25 km NW of San Ramón, Prov. Alajuela, Costa Rica), within the building, not in the surrounding forest, March 19, 1996 (B. A. Huber). About 40 males and 15 females from Quebrada González (35 km NNE of San José, Prov. San José, Costa Rica), elev. about 500 m, January 17 and

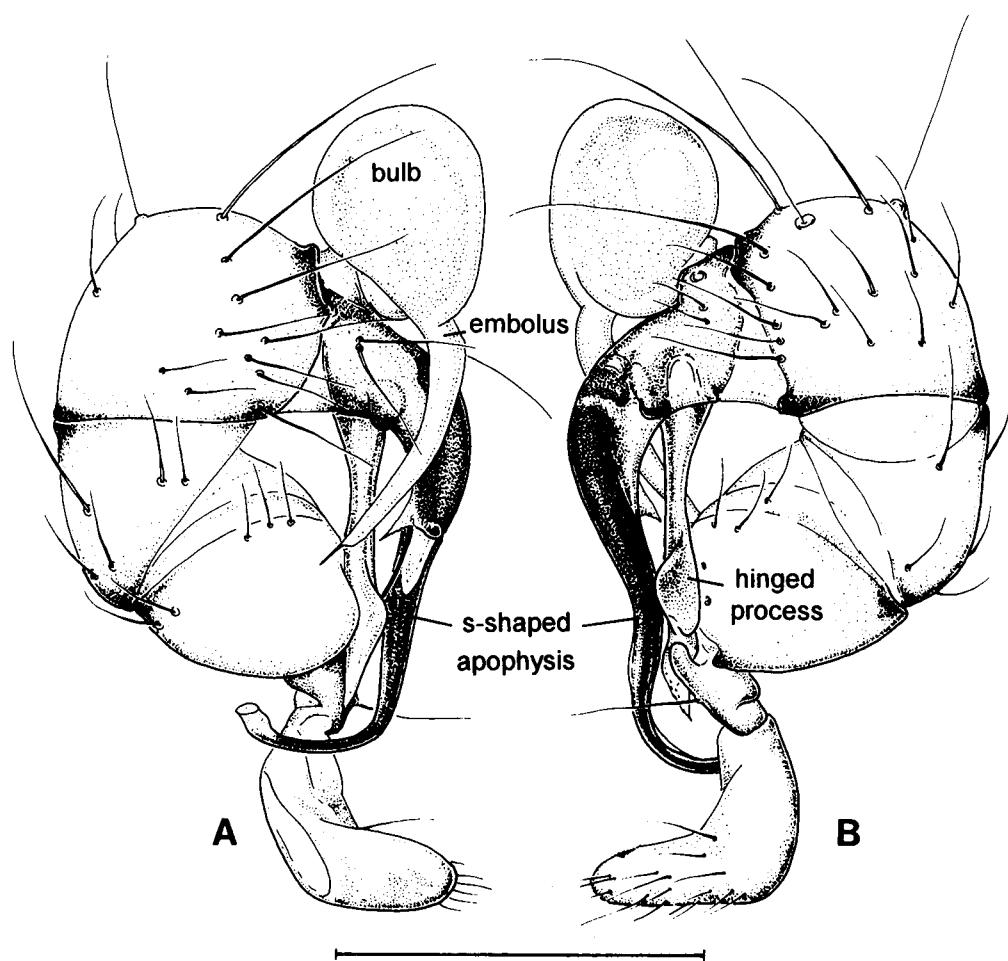


Fig. 10. *Metagonia talamanca* sp. n., left male pedipalp.—A. Prolateral view.—B. Retrolateral view. Scale line: 0.5 mm.

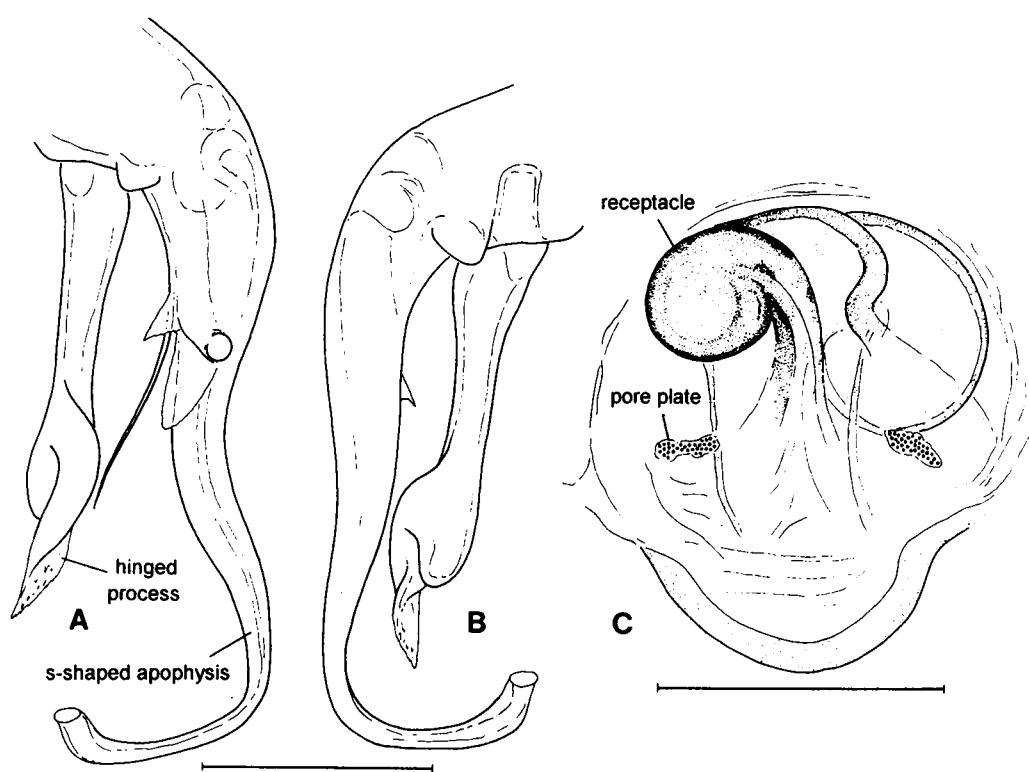


Fig. 11. *Metagonia talamanca* sp. n.—A. Left procursus, prolateral view, slightly squeezed.—B. Left procursus, retrolateral view.—C. Internal genitalia of a left-sided female, dorsal view. Scale lines: 0.2 mm.

26, 1996 (B. A. Huber). 1 female from El Cedral, Navarro (Prov. Cartago, Costa Rica), Nov. 29, 1979 (C. E. Valerio), in UCR. 1 female, 1 juv. from 2 km S of Arenal (Prov. Guanacaste, Costa Rica), elev. about 600 m, Jan. 1, 1969 (C. E. Valerio), in UCR. 6 males, 5 females from Tortuguero (Prov. Limón, Costa Rica), at sea level, Aug. 8, 1996 (B. A. Huber). 5 males, 3 females from Siquirres, at Rio Pacuare (Prov. Limón, Costa Rica), Sept. 9, 1996 (B. A. Huber). 4 females, 3 juv. from Cariari (Prov. Limón, Costa Rica), elev. about 70 m, March 3, 1968 (C. E. Valerio), in UCR. 5 males, 3 females from Bocas del Toro Island (Prov. Bocas del Toro, Panama), at sea level, April 23, 1996 (B. A. Huber). *Metagonia turrialba*: female holotype from Turrialba (Prov. Cartago, Costa Rica), July 25-Aug. 15, 1965 (A. M. Chickering), in MCZ.

Diagnosis. Medium sized *Metagonia* with pair of rounded apophyses on male clypeus (Fig. 12B), distinctive apophyses on male procursus (Fig. 14C-F), female internal genitalia with large receptacle and wounded ducts in front of it (Fig. 15).

Redescription. Male: live spider pale greenish to ochre yellow, in ethanol whitish to ochre-yellow, eye region sometimes darker (not in holotype), sternum dark brown to black (most localities), or ochre-yellow (Bocas del Toro). Legs ochre yellow, with dark 'knees' (pat, tibmet), opisthosoma very variable (c.f. Figs 12A, 13A) from pale ochre yellow with or without black spots to dark greenish gray with large black smuts, sometimes also with white spots. Six eyes in two triads (Figs 12, 13), pedipalps as in Fig. 14, procursus as in Fig. 14C-F, chelicerae with club-shaped hairs on frontal face (Fig. 12B), clypeus with pair of rounded apophyses (Fig. 12B). Legs without spines.

Female: colours as in male, with eye region never darkened, sternum usually only medially darker. Internal genitalia with single receptacle and duct (Fig. 15) faintly shining through ventral cuticle. Legs without spines.

Measurements of male holotype
Prosoma width: 0.79; tib3: 2.3; tib4: 3.6. Gertsch (1986) gives the measurements of leg 1 which is missing (tib1: 6.3)

Measurements of male from La Selva (type locality)
Total length: 2.9, prosoma length: 0.8, width: 0.70, opisthosoma length: 2.1

Legs	1	2	3	4
fem	6.2	3.9	2.8	4.3
pat	0.4	0.4	0.3	0.4
tib	6.2	3.6	2.2	3.5
met	11.1	5.7	3.2	5.7
tar	1.6	1.0	0.7	0.7
total	25.5	14.6	9.2	14.6
tibbind	79	45	27	44

Measurements of female holotype of *M. turrialba*
Prosoma width: 0.73; tib1: 4.2; tib2: 2.5; tib3: 1.6; tib4: 2.5

Measurements of female from La Selva

Total length: 2.5, prosoma length: 0.7, width: 0.76, opisthosoma length: 1.8

Legs	1	2	3	4
fem	4.9	3.5	2.0	3.9
pat	0.4	0.3	0.3	0.3
tib	4.7	3.0	1.7	3.0
met	7.8	4.5	2.6	4.4
tar	1.5	0.9	0.7	0.7
total	19.3	12.2	7.3	12.3
tibbind	60	38	22	38

Tibia 1 in other material

La Selva: 5 males: $\bar{x} = 6.2$ (5.7–6.5); 4 females: 4.7, 4.9, 5.0, 5.2

San Ramon: 15 males: $\bar{x} = 6.7$ (6.0–7.3); 10 females: $\bar{x} = 5.4$ (5.0–5.8)

Quebrada Gonzalez: 30 males: $\bar{x} = 8.0$ (6.9–9.0); 9 females: $\bar{x} = 6.3$ (5.8–6.7)

El Cedral: 1 female: 5.2

Arenal: 1 female: 5.2

Tortuguero: 6 males: $\bar{x} = 6.2$ (6.0–6.3); 5 females: $\bar{x} = 5.0$ (4.9–5.2)

Siquirres: 5 males: $\bar{x} = 6.6$ (6.1–6.9); 3 females: 5.1, 5.2, 5.4

Cariari: 4 females: 4.6, 5.0, 5.1, 5.4

Bocas del Toro: 4 males: 5.2, 5.7, 5.7, 6.0; 1 female: 4.5

Justification of the synonymy of *Me. rica* and *Me. turrialba*. Gertsch (1986) already speculated that the single female

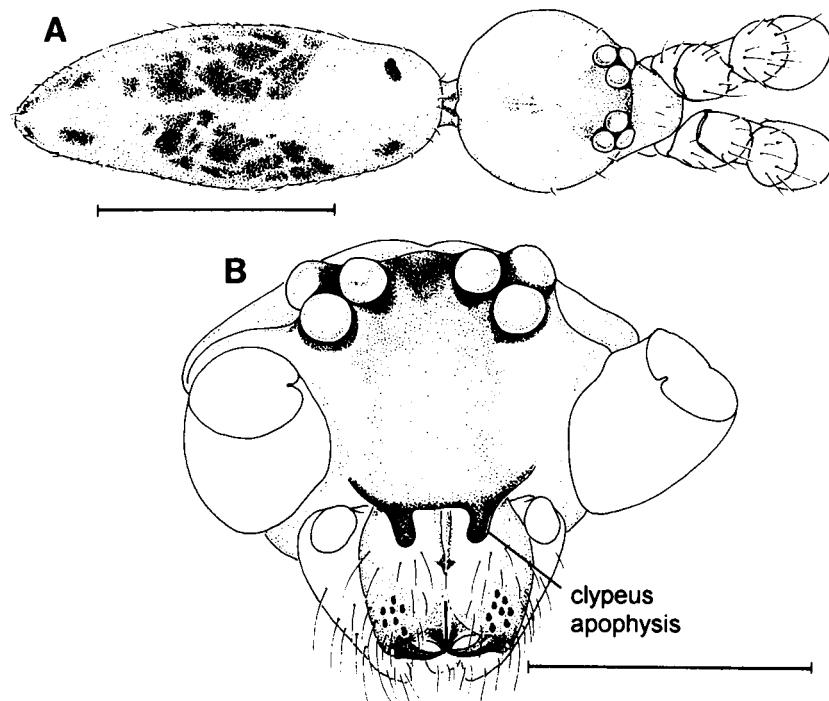


Fig. 12. *Metagonia rica* Gertsch, male from La Selva.—A. Dorsal view.—B. Frontal view. Scale lines (A) 1 mm; (B) 0.5 mm.

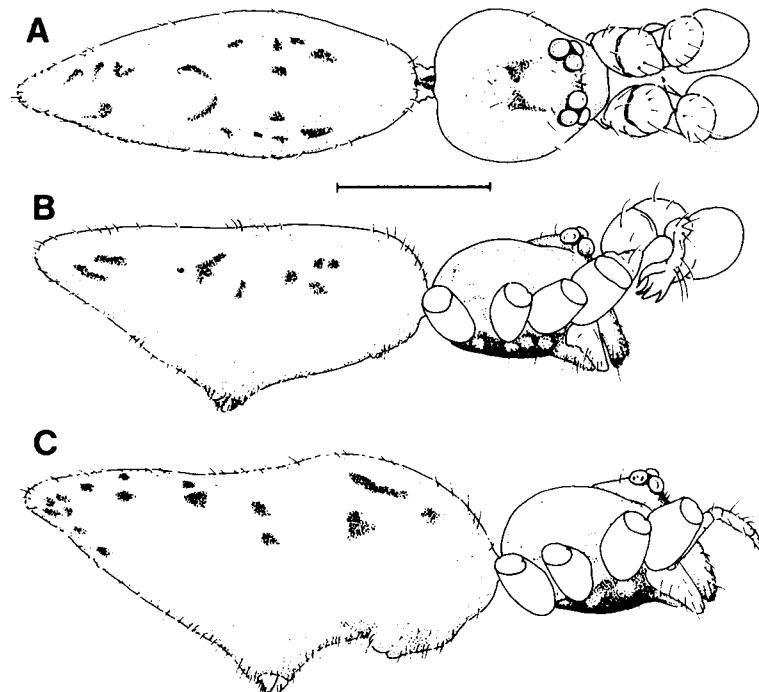


Fig. 13. *Metagonia rica* Gertsch, from Bocas del Toro.—A. Male, dorsal view.—B. Male, lateral view.—C. Female, lateral view. Scale line: 1 mm.

specimen of *Me. turrialba* available to him might be the female of the single male specimen of *Me. rica*. The larger collections now available clearly prove him right.

Genital morphology. The genitalia of this species are here described in more detail, and various structures are named as a basis for the chapter on genital mechanics (see below). Data are based on whole mounts and semithin serial sections.

The procursus (Fig. 14C–F) is provided ventrally with a branch that can easily be moved against the main part—the ‘hinged process’. Distally on the prolateral side the procursus ends with a ‘tooth-row’. Three conspicuous apophyses are visible from the retrolateral side: the ‘dorsal apophysis’, ‘apophysis a’, and ‘apophysis b’. A membranous ‘bulge’ that is set with hyaline fringes is extended between the tooth-row and the retrolateral apophyses. The bulb (Fig. 14A–B) is provided with only one appendage, the weakly sclerotized embolus with the pore of the sperm duct at the base of a spine at the tip.

The female uterus externus (copulatory chamber) is at rest a narrow slit with little space between the dorsal and ventral walls. The dorsal wall bears the pore plates through which the vulval glands discharge their product (Fig. 15). A dorsal fold is situated posterior to the pore plates (Fig. 28B). Frontally the uterus externus is connected via the ‘valve’ to the membranous uterus internus (oviduct). This valve is far simpler than that of any Old World pholcid examined (Huber submitted a; c.f. Fig. 26A–B) but still has the principal morphology of that group (Fig. 26C). Ventrally in the uterus externus there is a pair of sclerotized pouches (where the male ‘apophyses b’ are locked; Fig. 28B) and in front of these the entrance to the seminal receptacle. The seminal receptacle is poorly provided with glands and is connected to the ‘valve’ by a wound

sclerotized duct (Fig. 25B). The present species has no ‘epigynum’ in the sense of external sclerotized structures that aid coupling with the male.

Metagonia reventazona sp. n. (Figs 16, 17)

Holotype. Male, deposited in AMNH.

Type locality. 4 km E of Turrialba, at the Rio Reventazon (Prov. Cartago, Costa Rica), elev. about 500 m, on the underside of large leaves in a narrow stripe of forest between the river and sugarcane plantations, March 15, 1996 (B. A. Huber).

Paratype. Female, same collection data, in AMNH.

Other material (in author’s collection). Two males, 4 females from type locality, same collection data. 6 males, 4 females from Hitoy Cerere Biological Reserve (Prov. Limón, Costa Rica), elev. 150–200 m, Sept. 7, 1996 (B. A. Huber). 2 males, 1 female from Siquirres, at Rio Pacuare (Prov. Limón, Costa Rica), Sept. 9, 1996 (B. A. Huber). 1 male, 7 females from Bocas del Toro Island (Prov. Bocas del Toro, Panama), in the forest at sea level, April 23, 1995 (B. A. Huber).

Habitat. Underside of leaves.

Etymology. Specific name from type locality.

Diagnosis. Medium-sized *Metagonia* with short blunt horn on the male clypeus (Fig. 16 A,C), proximal apophyses on the male chelicerae (Fig. 16 C–D), and distinctive female internal genitalia (Fig. 17E).

Description. Male: prosoma pale ochre-yellow, legs with dark ‘knees’ (pat, tib-met), opisthosoma usually with group of black spots on both sides behind middle (Fig. 16A–B), but sometimes without spots or with more black and also with white spots. Six eyes in two triads (Fig. 16A–B), clypeus with blunt median horn (Fig. 16A–C), chelicerae with pair of apophyses proximally, set with club-shaped hairs (Fig. 16C–D). Pedipalps as in Fig. 17A–B, procursus as in Fig. 17C–D.

Female: colours as in male, internal genitalia as in Fig. 17E.

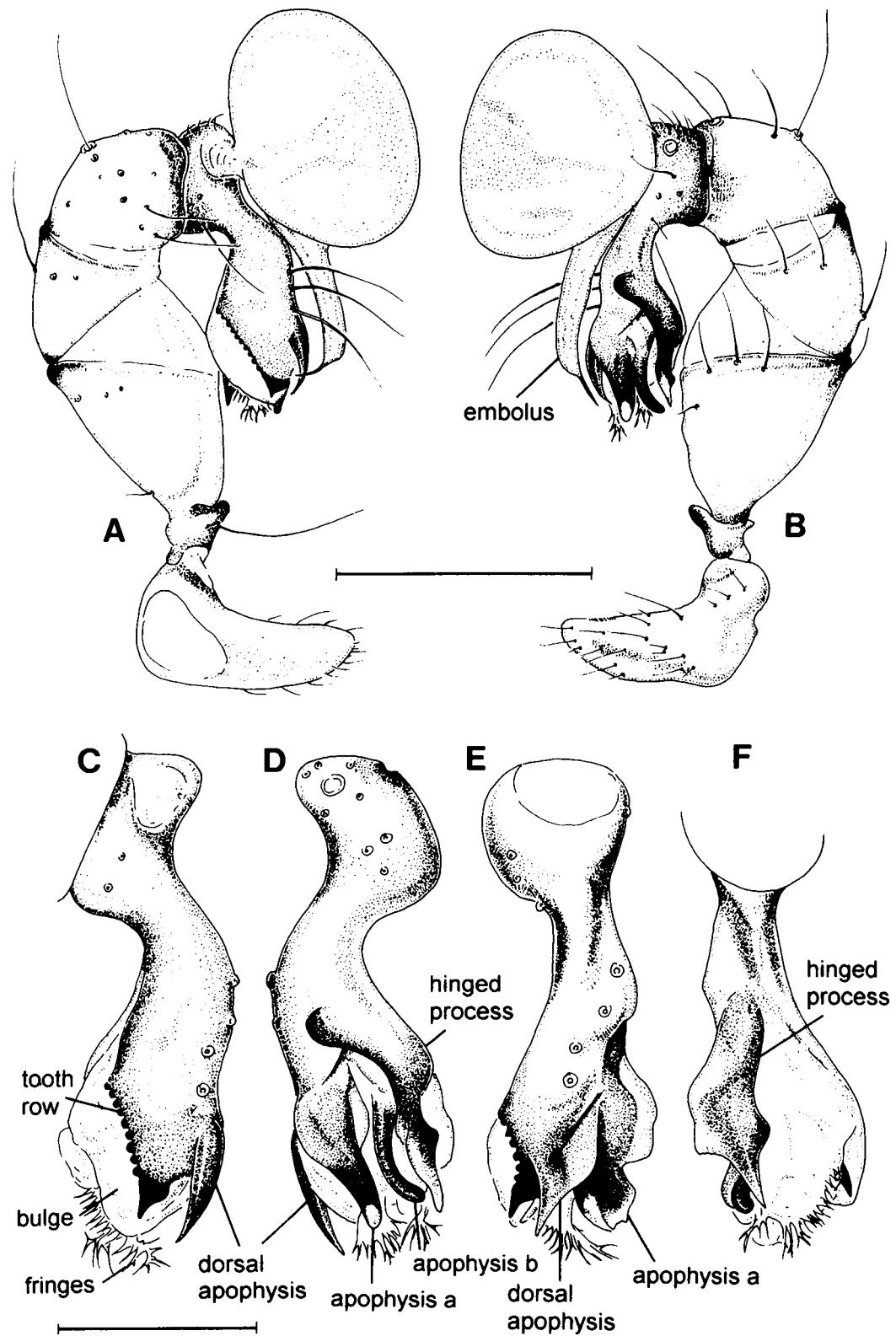


Fig. 14. *Metagonia rica* Gertsch, male from Bocas del Toro (A,B) and La Selva (C-F).—A. Left pedipalp, prolateral view.—B. Left pedipalp, retrolateral view.—C-F. Cymbium with procursus in prolateral (C), retrolateral (D), dorsal (E), and ventral (F) view. Scale lines (A-B) 0.4 mm; (C-F) 0.2 mm.

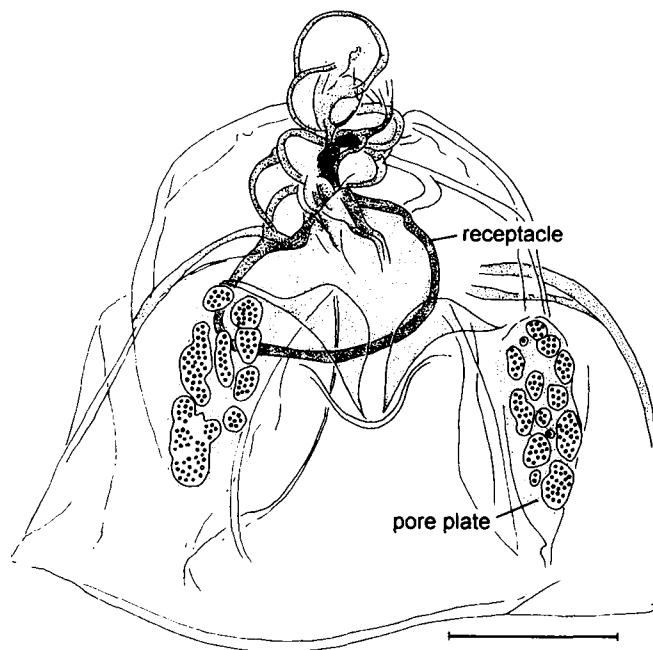


Fig. 15. *Metagonia rica* Gertsch, internal female genitalia, dorsal view. Scale line: 0.1 mm.

Measurements of male holotype

Total length: 2.6, prosoma length: 0.8, width: 0.83, opisthosoma length: 1.8

Legs	1	2	3	4
fem	5.6	3.8	2.3	3.8
pat	0.4	0.4	0.3	0.4
tib	5.7	3.3	1.9	3.0
met	8.8	4.8	2.8	4.4
tar	1.5	1.0	0.6	0.6
total	22.0	13.3	7.9	12.2
tibind	72	41	26	38

Measurements of female paratype

Total length: 2.9, prosoma length: 0.8, width: 0.79, opisthosoma length: 2.1

Legs	1	2	3	4
fem	4.6	3.2	2.2	3.6
pat	0.4	0.4	0.3	0.4
tib	4.7	2.9	1.8	3.0
met	7.1	4.2	2.5	3.9
tar	1.5	0.9	0.7	0.7
total	18.3	11.6	7.5	11.6
tibind	60	37	23	38

Tibia I in other material

Rio Reventazon: 1 male: 5.4; 4 females: 4.2, 4.4, 4.4, 4.5
Hitoy Cerere: 6 males: $\bar{x} = 5.5$ (5.3–5.9); 3 females: 4.6, 4.6, 4.7
Siquirres: 2 males: 5.5, 5.7; 1 female: 4.3
Bocas del Toro: 1 male: 5.2; 7 females: $\bar{x} = 4.0$ (3.6–4.3)

Metagonia hitoy sp. n. (Fig. 18)

Holotype. Male, deposited in AMNH.

Type locality. Hitoy Cerere Biological Reserve (Prov. Limón, Costa Rica), elev. about 150–200 m, on the underside of leaves, Sept. 7, 1996 (B. A. Huber).

Paratype. Female, same collection data, in AMNH.

Other material. 1 male, 3 females from type locality, same collection data, in author's collection.

Etymology. Species name from type locality.

Diagnosis. Medium sized *Metagonia* with dark ring dorsally on prosoma (Fig. 18A), distinctive shape of procursus (Fig. 18B–C) and internal female genitalia (Fig. 18E).

Description. Male: basic colour clear ochre-yellow, with dark ring on carapace and dark spots on opisthosoma (Fig. 18A). Legs with dark 'knees' (pat, tib-met). Six eyes in two triads (Fig. 18A,D). Clypeus with weak median protrusion (Fig. 18D). Procursus as shown in Fig. 18B–C, chelicerae with club shaped hairs (Fig. 18D).

Female: colours and habitus as in male. Internal genitalia as in Fig. 18E.

Measurements of male holotype

Total length: 2.8, prosoma length: 0.9, width: 0.89, opisthosoma length: 1.9

Legs:

	1	2	3	4
fem	7.2	4.9	2.9	4.8
pat	0.4	0.4	0.4	0.4
tib	7.2	4.4	2.7	3.8
met	12.8	7.0	3.6	5.8
tar	1.7	1.2	0.7	0.7
total	29.3	17.9	10.3	15.5
tibind	75	49	32	40

Measurements of female paratype

Total length: 3.2, prosoma length: 1.0, width: 0.86, opisthosoma length: 2.2

Legs:

	1	2	3	4
fem	5.4	3.7	2.5	3.9
pat	0.4	0.4	0.4	0.4
tib	5.1	3.2	2.3	3.3
met	8.6	5.0	2.8	4.7
tar	1.5	0.9	0.7	0.7
total	21.0	13.2	8.7	13.0
tibind	54	34	24	35

Tibia I in other females: 4.9, 5.1, 5.3

Metagonia toro sp. n. (Figs 19, 20)

Holotype. Male, deposited in AMNH.

Type locality. Bocas del Toro Island (Prov. Bocas del Toro, Panama), in the forest at sea level, on the underside of large leaves, April 23, 1995 (B. A. Huber).

Etymology. Specific name from type locality, and from Spanish 'toro' (bull), in allusion to the horns on the male clypeus (Fig. 19C).

Diagnosis. Medium sized *Metagonia*, closely related to *M. reventazona* sp. n. (see above), but with a pair of characteristic horns on male clypeus (Fig. 19C).

Description. Male: carapace whitish, clypeus darker, sternum also whitish. Opisthosoma grayish ochre, with black spots dorsally (Fig. 19A–B). Legs pale, with dark 'knees' (pat, tib-met). Six eyes in two triads (Fig. 19), pedipalps very similar to *M. reventazona* sp. n. (c.f. Figure 17A,B), with slight differences in procursus (Fig. 20A–C). Clypeus with characteristic horns (Fig. 19). Legs without spines.

Female unknown.

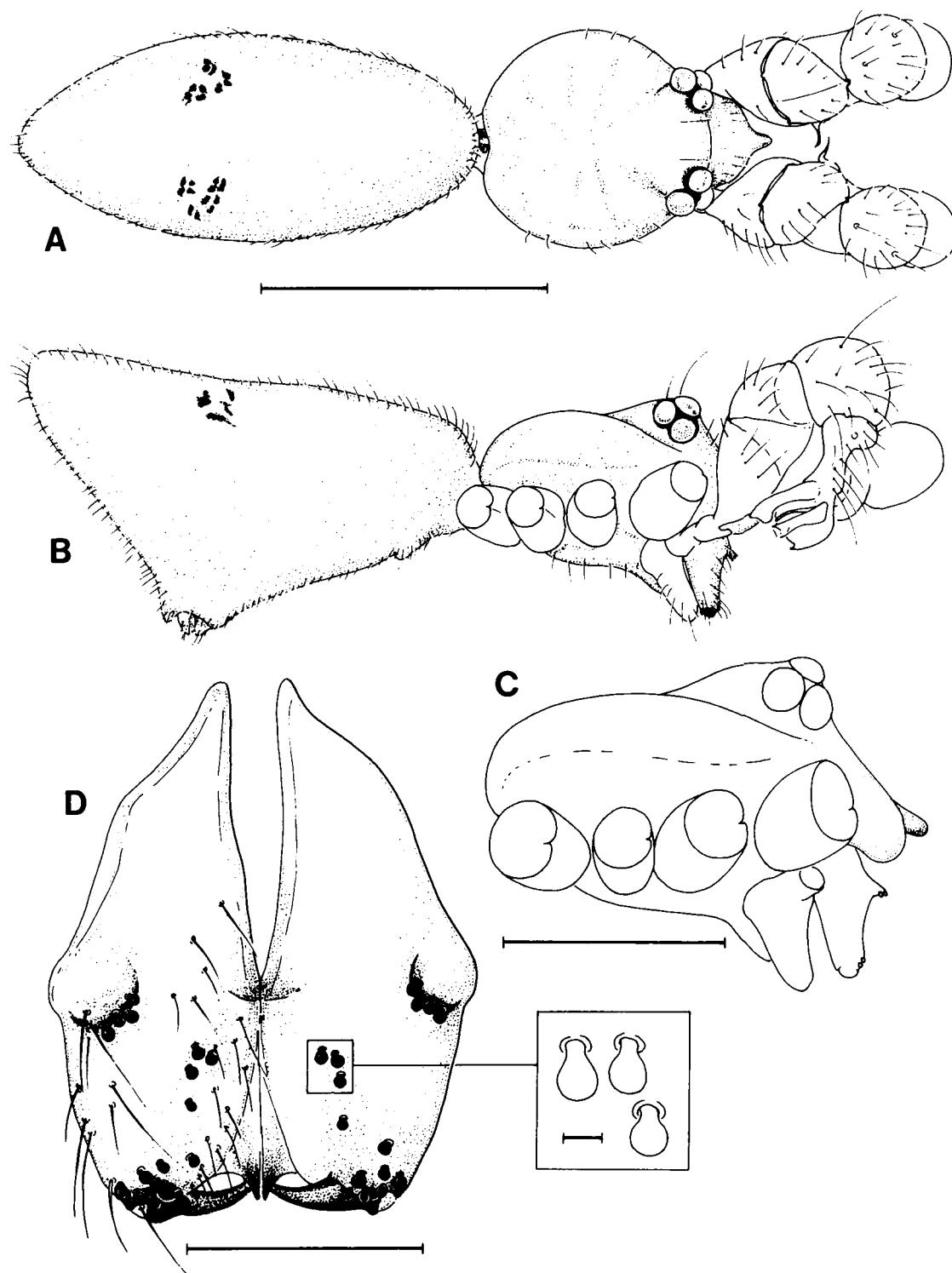


Fig. 16. *Metagonia revertazona* sp. n., male.—A. Dorsal view.—B. Lateral view.—C. Prosoma, lateral view.—D. Chelicerae, frontal view, with three club-shaped hairs enlarged. Scale lines (A–B) 1 mm; (C) 0.5 mm; (D) 0.2 mm (inset 0.01 mm).

Measurements of male holotype

Total length: 2.1, prosoma length: 0.7, width: 0.73, opisthosoma length: 1.4

Legs	1	2	3	4
fem	5.1	3.3	2.0	3.5
pat	0.4	0.3	0.3	0.3
tib	5.1	3.0	1.7	2.9
met	8.6	4.5	2.6	4.1
tar	1.5	0.9	0.6	0.7
total	20.7	12.0	7.2	11.5
tibind	65	38	22	40

Metagonia hondura sp. n. (Fig. 21)

Holotype. Female, deposited in AMNH.

Type locality. Bajo La Hondura (15 km NE of San José, Prov. San José, Costa Rica), elev. about 1200 m, on the underside of leaves, November 3, 1995 (B. A. Huber).

Other material. Two females from type locality (same collection data), in author's collection.

Etymology. Specific name from type locality.

Diagnosis. Small *Metagonia* with high opisthosoma (Fig. 21B) and distinctive female internal genitalia (Fig. 21C).

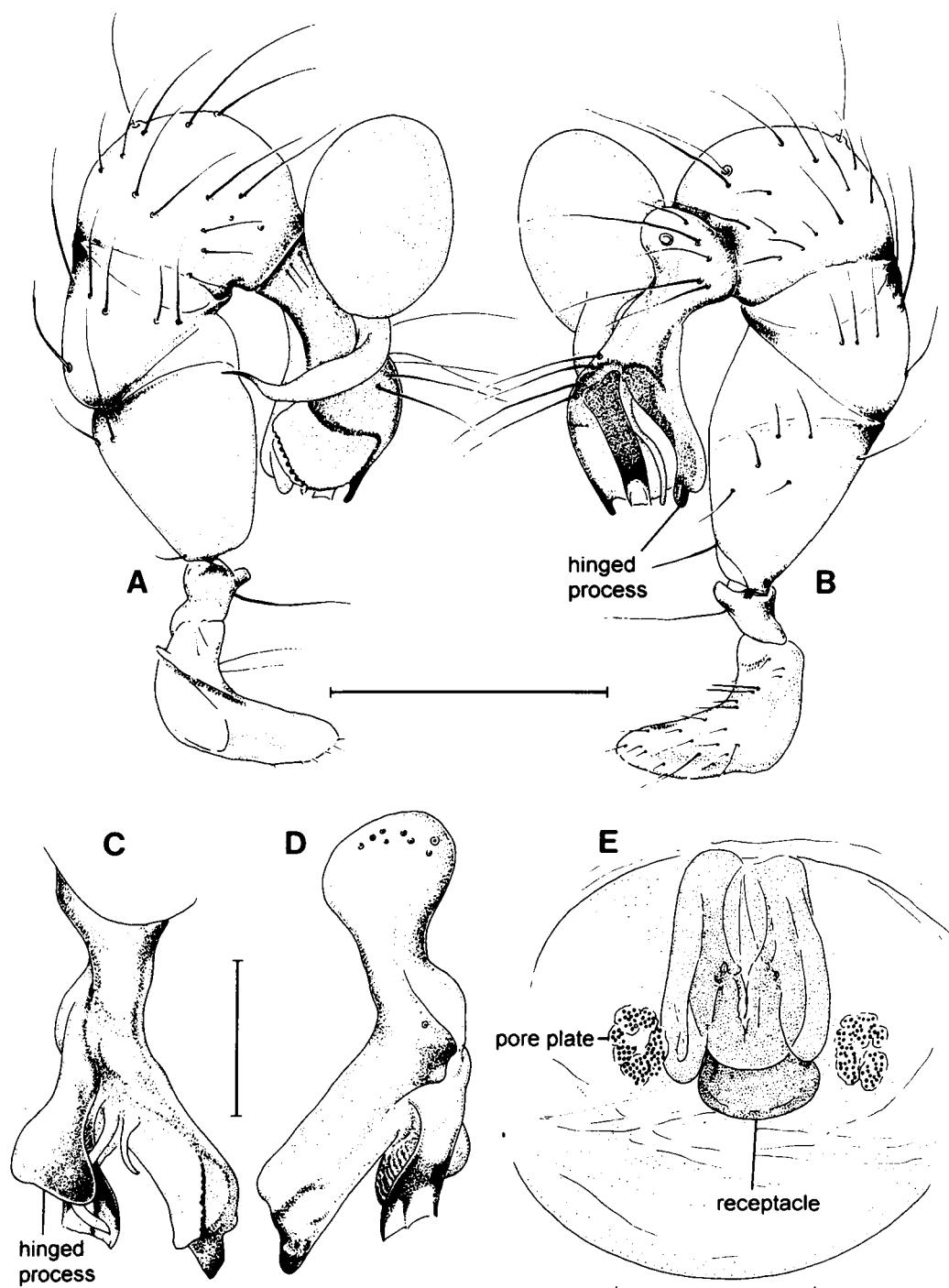


Fig. 17. *Metagonia revertazona* sp. n.—A. Left male pedipalp, prolateral view.—B. Left male pedipalp, retrolateral view.—C. Cymbium with procursus, ventral view.—D. Cymbium with procursus, dorsal view.—E. Internal female genitalia, dorsal view. Scale lines: (A,B) 0.5 mm; (C-E) 0.2 mm.

Description. Female: live spider pale greenish to ochre yellow, in ethanol pale ochre-yellow to whitish. Legs same colour, without darker rings. Opisthosoma grayish, without markings. Six eyes in two triads (Fig. 21A), opisthosoma relatively high (Fig. 21B), internal genitalia as in Fig. 21C.

Male unknown.

Legs	1	2	3	4
fem	3.7	2.6	1.8	2.7
pat	0.3	0.3	0.3	0.3
tib	3.7	2.4	1.6	2.5
met	5.9	3.5	2.2	3.5
tar	1.5	0.9	0.6	0.7
total	15.1	9.7	6.5	9.7
tibind	59	38	25	40

Measurements of female holotype
Total length: 1.9, prosoma length: 0.6, width: 0.67, opisthosoma length: 1.3

Tibia 1 in other females: 3.3, 3.6

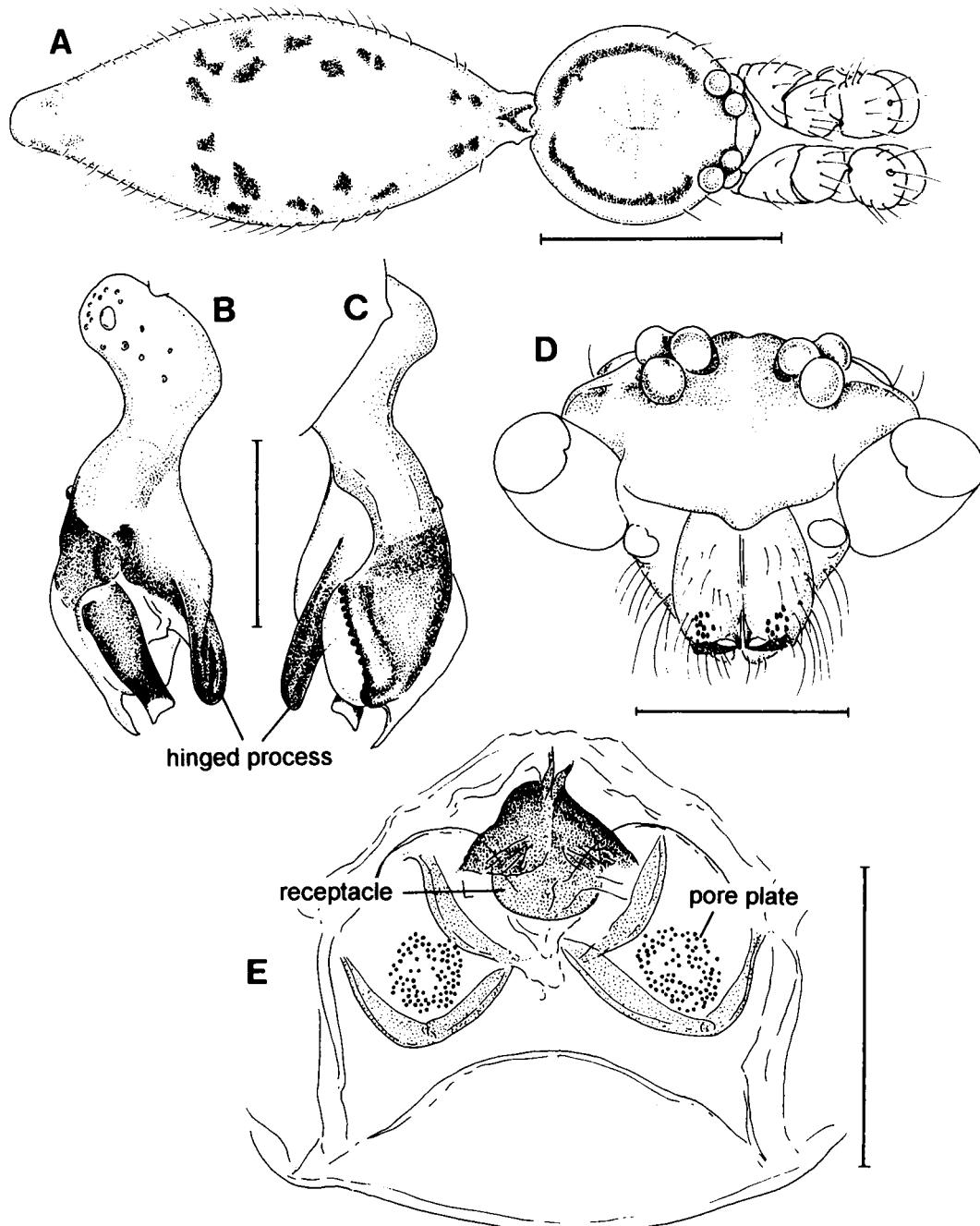


Fig. 18. *Metagonia hitoy* sp. n.—A. Male, dorsal view.—B. Left procursus, retrolateral view.—C. Left procursus, prolateral view.—D. Male, frontal view.—E. Internal female genitalia, dorsal view. Scale lines: (A) 1 mm; (B-C,E) 0.2 mm; (D) 0.5 mm.

Leptopholcus dalei (Petrunkevitch, 1929) (Figs 22–24, 26A)

Micromerys dalei Petrunkevitch, 1929: 150–154, figs 144–148; Bryant 1940: 296–297; *Leptopholcus dalei* Deeleman-Reinhold 1986b: 47.

Material examined. One male, 1 juv. from Aibonito, Puerto Rico (AMNH, 3708), no collection data; 1 female from Mayagüez, Puerto Rico (AMNH, 3725), no collection data; 1 female (?; genital area removed) from Arecibo, Puerto Rico (AMNH, 3522), March 1–4, 1914; 1 male, 1 female from N of L is Marias, Montañas de Uroyan, Puerto Rico (AMNH, 1958), July 30, 1959 (A. F. Archer); 1 female, 1 juv. from Collazu Falls, W of San Sebastian, Puerto Rico (AMNH), July 30, 1958 (A. F. Archer); 1 male, 2 females, 2 juv. from Estacion Experimental (botanical garden) Mayagüez, Puerto Rico (AMNH), June–Aug. 1958 (A. F. Archer).

Distribution and habitat. The species is reported from Puerto Rico (Petrunkevitch 1929) and Cuba (Bryant 1940). Bryant's material from Cuba may not be conspecific with the specimens from Puerto Rico (see below), but her material cannot be found in the MCZ. According to the

many localities listed in Petrunkevitch (1929) the species is not synanthropic but lives under leaves in 'dense woods'.

Diagnosis. Large (about 4 mm) pale yellow pholcid with 6 eyes in two triads (Fig. 22), long cylindrical opisthosoma (Fig. 22A–B), with distal and basal apophyses on the male chelicerae (Fig. 24), long apophyses on the male pedipalpal trochanters (Fig. 23), and distinctive male bulbal apophyses (Fig. 23).

Redescription. The original description of Petrunkevitch (1929) is extensive and accurate. Only two characters that have not been noted previously but are essential for the systematic position of this species are given here: female internal genitalia with complex valve (Fig. 26A). Male

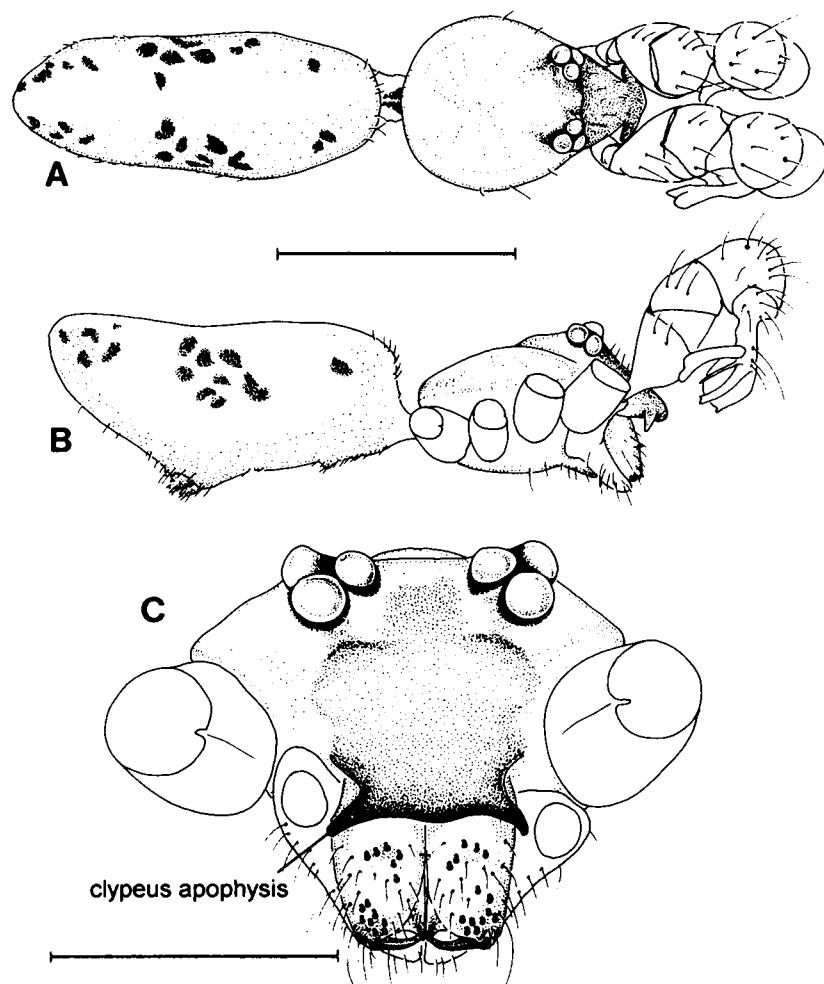


Fig. 19. *Metagonia toro* sp. n., male.—A. Dorsal view.—B. Lateral view.—C. Frontal view. Scale lines: (A–B) 1 mm; (C) 0.5 mm.

chelicerae with a proximal pair of apophyses in addition to the distal pair (Fig. 24).

Taxonomic notes. The female valve proves the species to be a representative of the 'Old World group' of pholcids (Huber submitted a). The male proximal cheliceral apophyses together with the apophyses on the palpal

trochanter are the key characters of the Old World *Pholcus* group (Huber 1995). Thus, although it is beyond the scope of this paper to prove the generic position of the present species (I have not seen the type species of *Leptopholcus*), it is evident that there is no close relationship with American 'Micromerys' or *Metagonia*. Instead, the species is part of a genus group that has almost

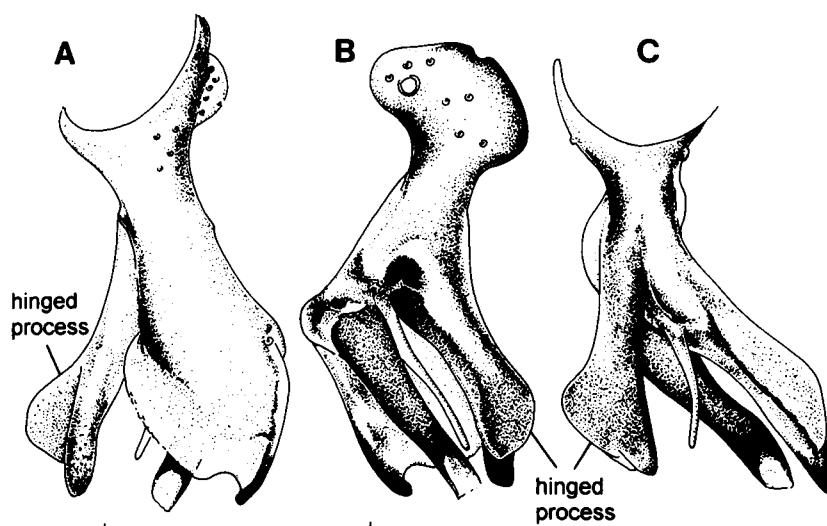


Fig. 20. *Metagonia toro* sp. n., left cymbium with procursus in prolateral (A), retrolateral (B), and ventral (C) view. Scale line: 0.3 mm.

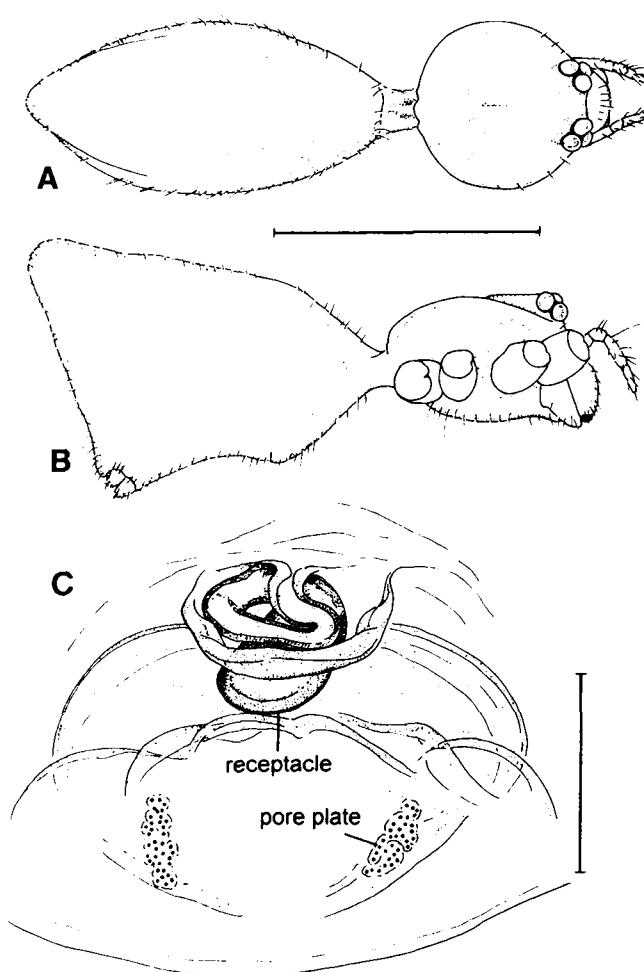


Fig. 21. *Metagonia hondura* sp. n., female.—A. Dorsal view.—B. Lateral view.—C. Internal genitalia, dorsal view. Scale lines (A,B) 1 mm; (C) 0.1 mm.

exclusively an Old World distribution and contains, among 10 other named genera, also *Leptopholcus* and 'true' *Micromerys* (Huber 1995).

Bryant (1940) synonymized two *Leptopholcus* species described by Franganillo (*L. delicatus* F., 1930, and *L. conicus* F., 1931) with the present species (without seeing Franganillo's types). These were poorly described, and have never been redescribed. Thus, it cannot be ruled out that there is another species of *Leptopholcus* in Cuba (A. Pérez González pers. comm.).

Justification of the transfer of American 'Micromerys' species to *Metagonia*

The examined American 'Micromerys' species share the following apomorphies with Central American representatives of the genus *Metagonia*, but not with 'true' *Micromerys* (for 'true' *Micromerys* see Deeleman-Reinhold 1986a): (1) dorsal attachment of the bulb to the cymbium (in contrast to the usual prolateral attachment); (2) long, weakly sclerotized embolus ending in a spine; (3) female genitalia with a single seminal receptacle of conduit morphology, ventral to the uterus externus (Fig. 25). This represents a unique character in pholcids and is probably

the strongest synapomorphy. Functionally it seems to represent a parallel invention of the entelegyne vulva, in the sense that sperm enters the receptacle through one duct and leaves it through another one. This route of sperm is suggested by the morphology and was not experimentally proved, but the same is true of almost all entelegyne spiders.

It might appear a flaw to compare the American 'Micromerys' species with Central American representatives of *Metagonia* and not with the type species which is from Brazil. However, the type species, *Metagonia bifida* Simon, 1893 is known only from the female, and in a recent redescription (Huber in press) I preferred not to make a KOH preparation of the genitalia of the single existing specimen. Thus, it is not possible to check any of the mentioned synapomorphies with the type species. Instead, I follow the as yet unproved statement of Gertsch (1986: 40) that "South American taxa [of *Metagonia*] are somewhat stouter than those of North America but their genitalic features mark them as fully congeneric". Some evidence for this assumption comes from the three South American (excluding Galapagos) species in which the male is known (seven others are only known from females): *M. auberti* di Caporiacco, 1954 (French Guyana), *M. heraldica* Mello-Leitão, 1922 (Brazil), and *M. strinatii* (Brignoli, 1972) (Argentine). In all of these, the male pedipalp shows the principal features of Central American *Metagonia* (as far as can be judged from the figures). The same is true of a male from Brazil, Reserva Flor. A. Ducke (near Manaus, 2°55' S, 59°59' W) in the collection LNK (March 9, 1992; T. R. Gasnier & H. Höfer) (unpubl. data).

On the other hand, American 'Micromerys' do not share the traits of 'true' Indo-Australian *Micromerys* that prove the latter to be representatives of the Old World *Pholcus* group: a complicated valve in the internal genitalia of the female (Huber submitted a; c.f. Fig. 26), and apophyses on the male pedipalpal trochanter and on the basal half of the chelicerae (Huber 1995). Similarities in overall appearance are probably due to the type of habitat shared by both groups: the underside of leaves (Deeleman-Reinhold 1986b). However, the genera *Micromerys*, *Paramicromerys*, *Metagonia*, and American 'Micromerys' share two genitalic characters that are not easily explained in terms of adaptations to similar habitats: (1) the reduction of bulbal apophyses (the only appendage is the embolus); and, most remarkably, (2) an articulating side branch of the procturus — the 'hinged process' of the present paper (see Deeleman-Reinhold (1986a) for 'true' *Micromerys*; Timm (1976) for *Paramicromerys madagascariensis* (Simon, 1893)). Following the principle of parsimony these similarities have to be considered homoplasies.

Simon (1893) created the genus *Metagonia* based on two species that were (and still are) only known from the female: *M. bifida* Simon, 1893 and *M. bicornis* (Keyserling, 1891). This may explain why he included *Metagonia* in his 'Pholceae' together with four genera that are now considered representatives of the 'Old World group' (Huber submitted a). Of these, only *Spermophora* shared with *Metagonia* the reduced number of six eyes. This has caused some confusion as to the relationship of these genera (e.g. Brignoli 1972a, b). However, *Spermophora* is part of the Old World *Pholcus* group (Huber 1995), which

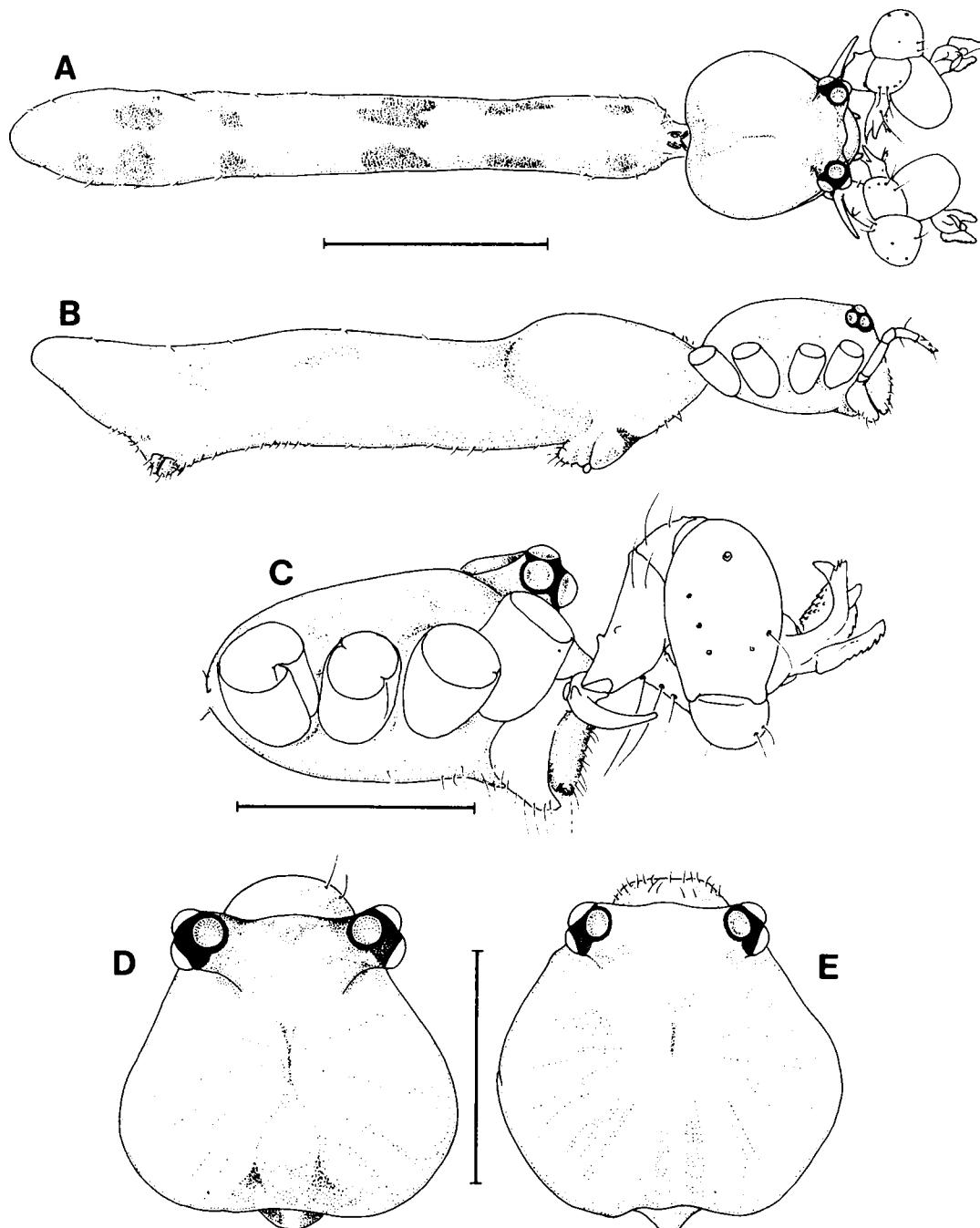


Fig. 22. *Leptopholcus dalei* (Petrunkevitch).—A. Male, dorsal view.—B. Female, lateral view.—C. Male prosoma, lateral view.—D. Male prosoma, dorsal view.—E. Female prosoma, dorsal view. Scale lines: (A–B) 1 mm; (C–E) 0.5 mm.

is not the case for *Metagonia* and American 'Micromerys' species.

Concluding, *Metagonia* and American 'Micromerys' are considered congeneric and closer relationships with Old World *Micromerys* are doubted.

Natural history of *Metagonia rica*

The data reported here were obtained with specimens collected at Quebrada González in the Braulio Carrillo National Park, Costa Rica. The spiders were collected from the underside of large leaves from various species of plants in the tropical wet forest. In most cases the spiders sat in a typical resting position, with their body and legs

flatly pressed against the leaf surface, often beside a main leaf vein. Males were often found near females, and both sexes were found in approximately equal numbers (c.f. leaf-dwelling pholcids in Indo-Australian rainforests — Deeleman-Reinhold 1986a, b; Deeleman-Reinhold & Deeleman 1983).

In the laboratory the spiders were kept in plastic cups with a diameter of 8 cm, with the bottom filled with a mixture of gypsum and activated carbon, and closed with a perforated plastic foil. They spun a few irregular threads close to the plastic foil, and assumed the resting position. Prey capture in the laboratory was observed many times (*Drosophila* as prey) and the specific behaviour pattern seems to be a very conservative trait in the family (c.f. prey capture in *Pholcus phalangioides* — Jackson & Brassington

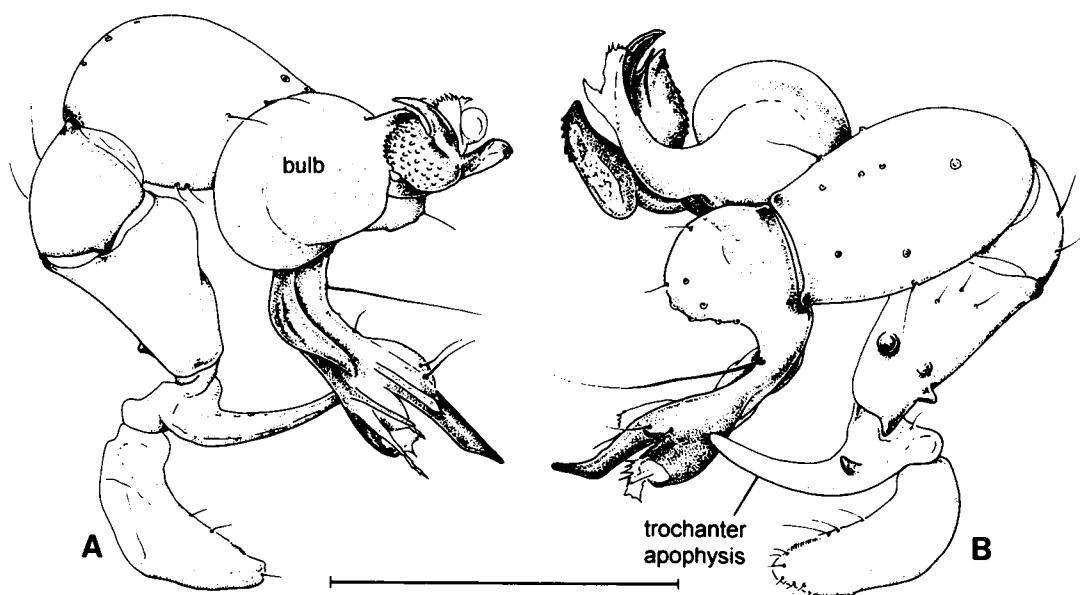


Fig. 23. *Leptopholcus dalei* (Petr.), left male pedipalp.—A. Prolateral view.—B. Retrolateral view. Scale line: 0.5 mm.

1987). The spiders swiftly attacked entangled flies, and hanging on their first legs they applied silk with alternate movements of the fourth legs, manipulating the fly with the third legs and holding the threads at which the fly was suspended with the second legs. Only after wrapping the fly for about 15–30 sec did the spiders apply some bites, after which they continued wrapping their prey. Females with egg-sacs were less likely to attack flies, but a few times I saw females feeding on a fly with a suspended egg-sac nearby.

Successful courtship was observed 8 times, and mainly consisted of rhythmic movements of the male opisthosoma. The details of the movements varied, ranging from

slow up and down bobbing to rapid single jerks or short vibrations. In some cases the male tapped the female with his anterior legs (I and II), usually shortly before the final approach. Receptive females responded with gentle opisthosoma bobbing and with turning towards the male. From 11 non-virgin females without egg-sac, 6 accepted the male; from 3 virgin females, two accepted the male. In three pairs the female was carrying an egg-sac; in these the males did not court. From the resulting 8 copulations, only 2 were observed until the end; 6 pairs were freeze fixed during various stages of copulation.

A few seconds before an attempt to couple, the males rotated their palps in the coxa-trochanter joint, in a way characteristic for all pholcids studied so far (reviewed in Huber & Eberhard in press), but to a lesser extent so that the palps were not bent ventrally but laterally (Fig. 27). Coupling was accomplished after 1–5 trials, but in one case a male made 9 unsuccessful attempts and then stopped. Soon after insertion the palps were moved nonrhythmically, which resulted in conspicuous movements of the proctarsi in the female genital cavity. After 12 and 16 min respectively (in the two copulations that were observed until the end) the movement changed to a rhythmic pattern in which a pair of successive lateral twists (produced by stretching the pedipalp at the femur-patella joint) alternated with simultaneous inward thrusts of the emboli (Fig. 27B–E). These movements slowed during copulation from about 4 sec/cycle to about 9 sec/cycle. During every other inward thrust the males very consistently made a short jerk by flexing their legs I–III. The tarsi of these legs were usually in contact with the respective contralateral tarsi of the female (right tarsus I of male with left tarsus I of female). Both spiders hang from the threads on legs IV only. Copulation duration was 19 and 56 min respectively. The longer copulation (with a non-virgin female) was terminated by the male, and both spiders peacefully engaged in cleaning their legs and genitalia. The shorter copulation (with a virgin female) was terminated by the female, which attacked the male and caused him to autotomize two legs. This male apparently did not dare

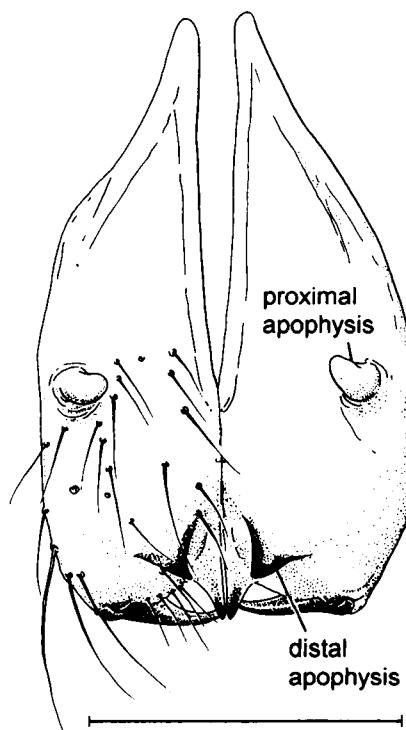


Fig. 24. *Leptopholcus dalei* (Petr.), male chelicerae, frontal view. Scale line: 0.2 mm.

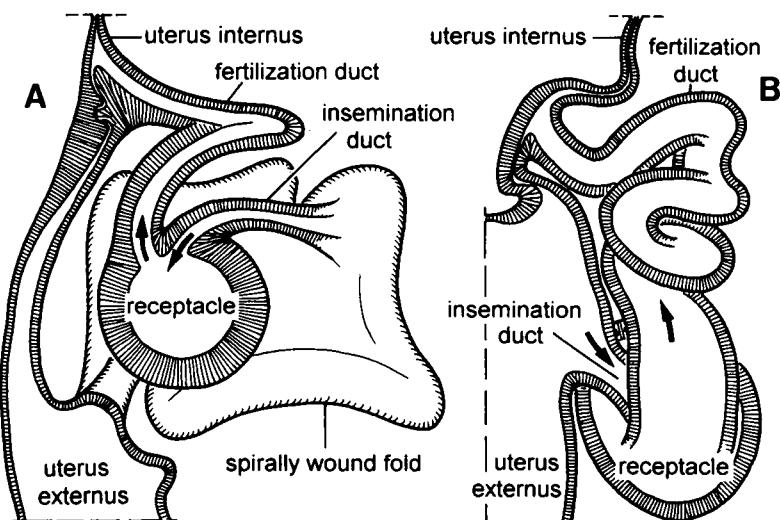


Fig. 25. Schematic representation of the internal female genitalia of *Metagonia delicata* (A) and *Metagonia rica* (B). The conduit nature of the system is indicated by the arrows.

to make any movement for several minutes after copulation until the spiders were separated.

Egg-sacs were elongate, but were not consistently carried as a prolongation of the body (c.f. Deeleman-Reinhold 1986a, b). Twelve females which were kept for up to 11 months in the laboratory produced a total of 39 egg-sacs. From 19 of these, no spiderlings emerged. However, the first egg-sac produced by each individual was always fertile, and resulted in an average of 16.6 (range 6–25) spiderlings hatched. Only later the egg-sacs became infertile, or the number of spiderlings tended to become

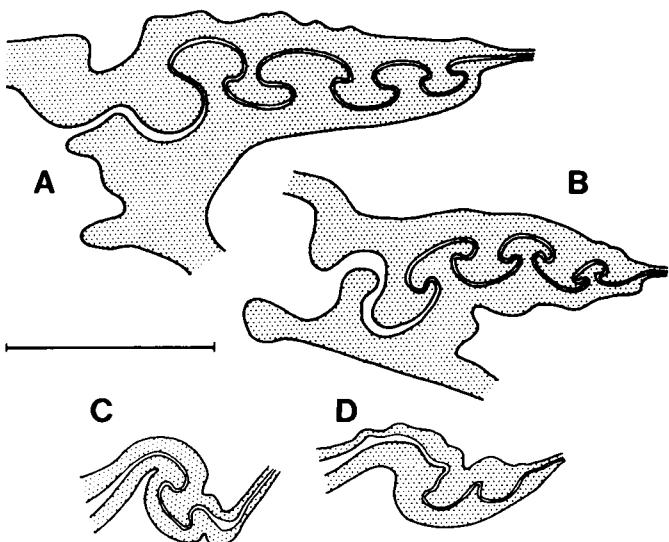


Fig. 26. Sagittal sections of the 'valves' in the internal female genitalia, separating the uterus externus (on left side) from the uterus internus (right side). See Fig. 28B for general position of this structure in the female. Those sections from each series were drawn which showed the most complex design.—A. *Leptopholcus dalei*.—B. 'true' *Micromerys* sp. from Australia.—C. *Metagonia rica*.—D. *Metagonia ('Micromerys') delicata*. Scale line: 0.05mm.

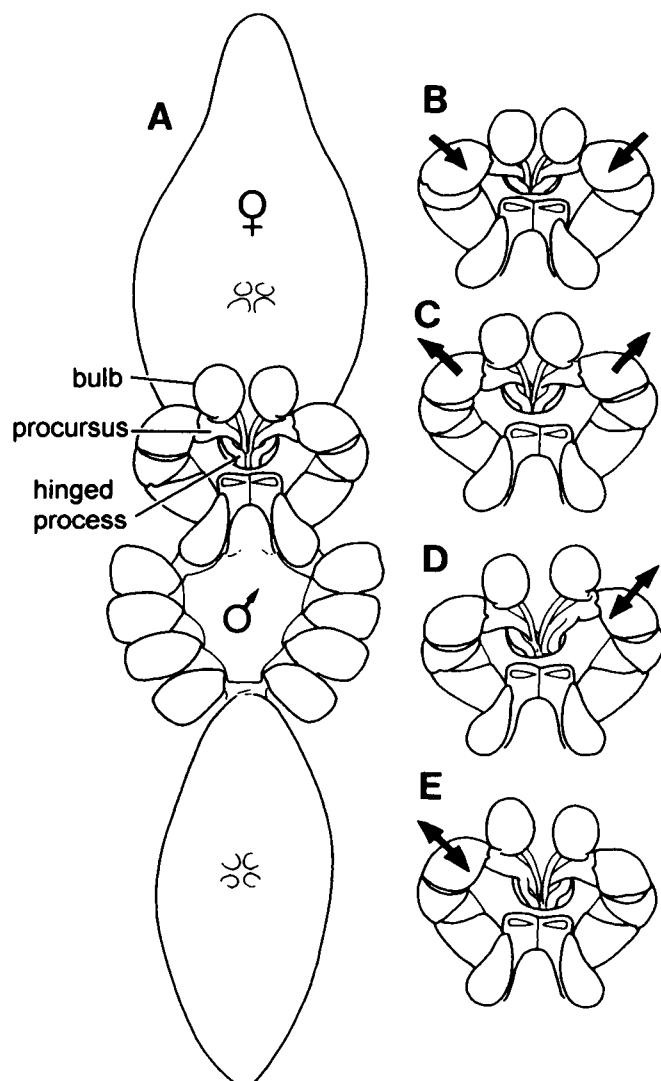


Fig. 27. *Metagonia rica*.—A. Copulatory position in ventral view.—B–E. Rhythmic genitalic movements during copulation, (B) 'in-position', (C) 'out-position', (D) left palp is stretched, (E) right palp is stretched. Arrows indicate rhythmic pedipalpal movements.

lower (from second and third egg-sacs an average of 10.6 spiderlings hatched). Whether this decrease was the result of sperm depletion in the receptacles, or of the unnatural conditions in the laboratory, is not clear. In two cases, females laid two infertile egg-sacs consecutively and then produced fertile egg-sacs again (9 and 13 spiderlings hatched respectively).

Genital mechanics in *Metagonia rica* (Fig. 28)

As in all pholcids studied (Uhl *et al.* 1995; Huber 1994, 1995, submitted b; Huber & Eberhard in press) the copulatory position corresponds to the 'position of web spiders' (von Helversen 1976). The pedipalps are rotated to a lateral position (Fig. 28A) and kept in this position by interaction of the short trochanter apophyses with sclerotized indentations on the rear side of the chelicerae (Fig. 28B). This is the plesiomorphic type of pedipalp locking, which occurs in all pholcids studied except in representatives of the *Pholcus* group (including 'true' *Micromerys*! —

Huber 1995, submitted b; Huber & Eberhard in press). The following description refers to the position of the genitalic structures during the 'in-position' (c.f. Fig. 27B).

The procti are inserted symmetrically into the uterus externus. The male dorsal apophysis is inserted into the female dorsal fold. The tooth-row is pressed against the dorsal wall. 'Apophysis b' is bent for about 90° and stabilized in this position by 'apophysis a' that presses it laterally against the female sclerotized pouch. The tip of 'apophysis a' is close to the opening to the seminal receptacle. The distal membranes and fringes are in contact with the pore plates and the entrance to the valve. The hinged process is bent about 90° and spreads open the uterus externus. The emboli are not in specific contact with any female structures but are guided by the procti in a way as to bring their pores close to the entrance to the seminal receptacle. It could be argued that at some point during rhythmic pedipalpal movements the tips of the emboli might contact or even be inserted into the duct leading to the seminal receptacle. However, in the two pairs freeze-fixed and sectioned, the mixture of sperm and

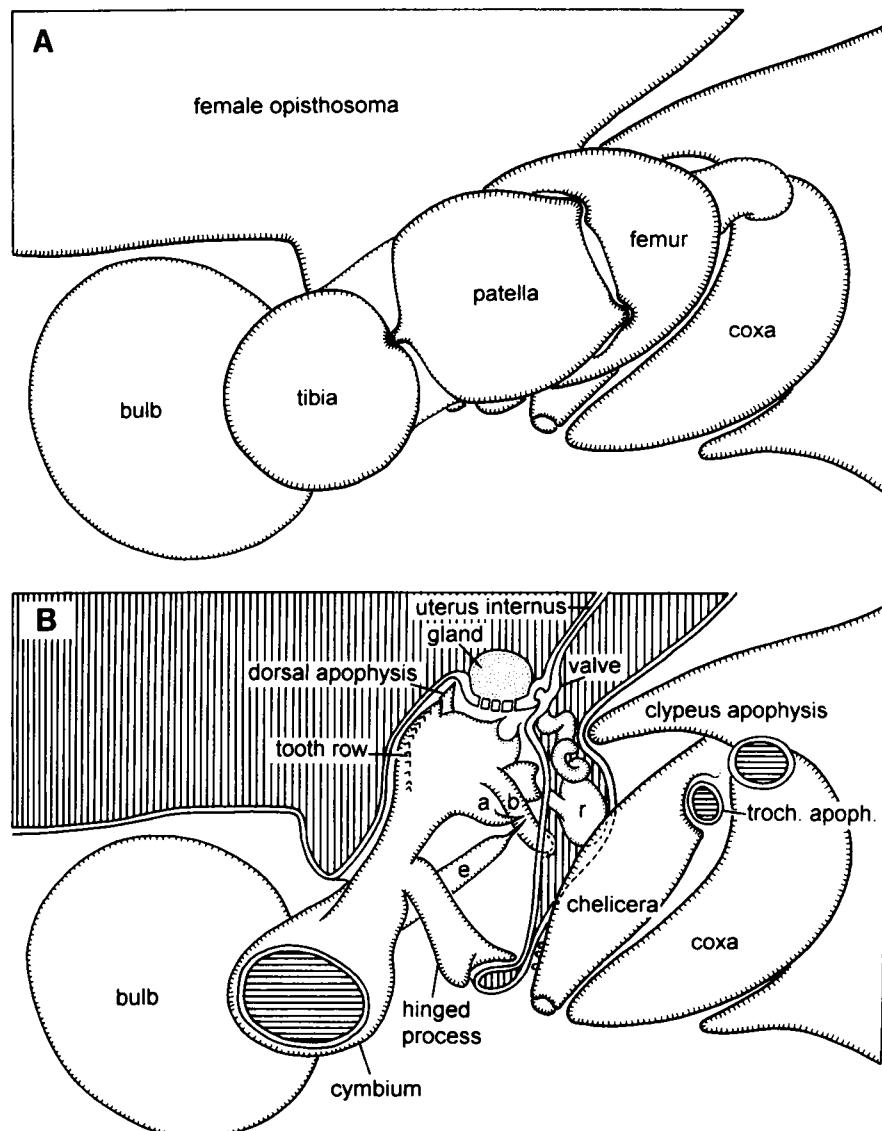


Fig. 28. *Metagonia rica*, schematic drawings of the genitalia in functional contact, lateral view.—A. Left pedipalp in natural position.—B. Left pedipalp partly removed, and female opened to show the position of the male genitalia in the uterus externus during the 'in-position' (c.f. Fig. 27B). a: 'apophysis a'; b: 'apophysis b'; e: embolus; r: receptacle.

matrix ejaculated from the male's bulb filled the entire uterus externus, indicating that sperm had not primarily been ejaculated into the receptacle. In one female that was fixed as it was collected in the field, sperm was not present in the uterus externus, but very tightly packed (almost without matrix) in the seminal receptacle. Thus, it may be the female herself who is responsible for sperm transfer from the uterus externus to the receptacle, as suggested also for other spiders (e.g. Huber 1993).

Externally the male clypeus apophyses oppose the pressure of the main parts of the proctiger, while the male chelicerae oppose the pressure of the hinged processes. The male chelicerae contact the female in exactly the position where the club-shaped hairs are situated.

The statements of Gertsch (1986) that the 'ridges and grooves' in the uterus externus "aid in guiding the embolus to the receptacles" and of Gertsch & Peck (1992) that "the entire chitinized palp is not inserted into the female's genital opening, but only the internal membranous embolus is everted into the opening" are incorrect for the present species, and probably for all *Metagonia*.

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