THE ORB-WEAVER GENUS *WITICA* (ARANEAE: ARANEIDAE).*

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Two species of neotropical orb-weavers, *"Edricus" crassicauda* and *Witica talis,* have each been known from a single sex, the first from females only, the second from males. The male of *Edricus spinigerus,* suspected by F.P.-Cambridge (1904) to belong with the female *Epeira crassicauda,* has never been collected with it, although Cambridge's suspicion was the reason for placing the female *E. crassicauda* in the genus *Edricus.* While parthenogenesis could account for absence of males in *E. crassicauda,* the absence of females in *Witica* was more perplexing. The large females of *Epeira crassicauda* have a tail with a constriction (Fig. 1), the minute males of *Witica talis* (Fig. 5) have a round, subspherical abdomen bearing a glossy plate. The two placed in different subfamilies did not appear to be likely mates.

Surveying our collections, I found males of *Witica* to have been collected in Cuba, Puerto Rico, Central and northern South America, roughly the same distribution as the female specimens named *"Edricus" crassicauda.* Both are fairly common on Barro Colorado Island in Gatun Lake of Panama, from which large collections are available.

Unexpected evidence for existence of males in *E. crassicauda* turned up: a male palpal part was found in the microscope slide preparation of the seminal receptacles. When expanding the palpus of *Witica talis,* I noticed that the structure first considered to be the conductor, and which is sometimes missing from specimens, is actually an appendage of the embolus. Further, its structure is remarkable, including a hand with many fine teeth, presumably functioning as a hold-fast inside the female genital duct (Fig. 11). Subsequently,

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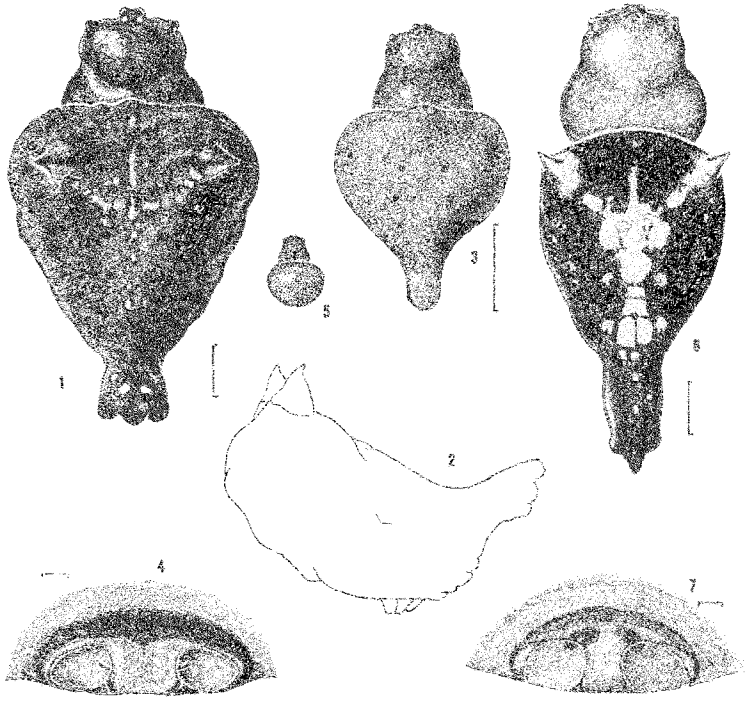
I examined a female epigynum in ventral view with the pigmented integument carefully removed. The mystery suddenly resolved itself when I found the same structure embedded in the female genital duct (Fig. 8), proving that *Witica talis,* placed in the group Witicae close to *Hypognatha* and Cyrtarachneae by Simon (1895) and Roewer (1942), is in fact the male of *"Edricus" crassicauda,* placed in Cycloseae by the same two authors.

In examining all available males, I noted certain differences in the appendage of the embolus in males from Trinidad and some South American localities (Fig. 14). This different structure was found in females (Fig. 13) from the same areas, further proof that *Witica* males belong with females of *"Edricus,"* and also providing evidence that there are two species, the females of which look quite similar except for the contents of the genital duct.

Only one embolus tip was found on each side in each female duct, never two. Are they there to protect a male's sperm and prevent further mating by the female? Or might they be spermatophores with sperm inside the tips? Or do they just function to block the ducts? Only one or two males with broken emboli were in collections suggesting that males do not survive mating. Males with broken tips could not be determined to species.

The relationship and placement of the two species of *Witica* is uncertain. The male palpus lacks a median apophysis and terminal apophysis, but I expect this to be a secondary loss rather than a primitive absence, perhaps correlated with the minute size of the males. The female genitalia are unusual in being lightly sclerotized and lacking a scape and other projections; the epigynum resembles the epigynum of *Pronous.* The enormous difference in size of the sexes, the total length of females being more than 4.5 times that of the male, is found in some other orb-weaver genera, such as *Gasteracantha* and *Nephila* (the latter probably belonging to the family Tetragnathidae). Also, males of *Arachnura* are dwarf. The females of *Arachnura* have a tail, perhaps a synapomorphy. A male *Arachnura logio* Yaginuma from Japan examined also has a spherical abdomen with a sclerotized dorsal plate, but has a median apophysis and terminal apophysis in the palpus. The anterior median eyes of males and females of *Arachnura* are more projecting than those of *Witica.*



Figures 1–5. *Witica crassicauda* (Keyserling). 1. Female, legs removed. 2. Female abdomen from side. 3. Immature female. 4. Epigynum. 5. Male in same magnification as female.

Figures 6–7. *W. cayana* (Taczanowski). 6. Female. 7. Epigynum.

Size indicators: 1.0 mm, except Figures 4, 7, 0.1 mm.

Witica O.P.-Cambridge

Salassia Gétaz, 1893: 105. Type species by monotypy *S. tricuspis* Gétaz. (Name preoccupied by *Salassia* Folin, 1871, a mollusk.)

Witica O.P.-Cambridge, 1895: 160. Type species by monotypy *Witica talis* O.P.-Cambridge, 1895. NEW SYNONYMY.

Salassina Simon, 1895: 784. Type species by original designation and monotypy *S. crassicauda* Keyserling, 1865.

Physiola Simon, 1895: 875. Type species by original designation and monotypy. *P. nigrans* Simon, 1895. Synonymized with *Witica* by Simon, 1903.

Bion O.P.-Cambridge, 1898: 244, pl. 30. Type species by monotypy *B. brevis* O.P.-Cambridge, 1898. First synonymized with *Witica* by Simon, 1903.

SYNONYMY. Simon (1903: 1003) synonymized his *Physiola* published in 1895 with *Witica* published the same year, as an objective synonym. I do not know the month of the publications; Simon presumably did and *Witica* was published earlier. Thus since *Salassina* was published at the same time as *Physiola* it must also have been published after *Witica.*

F.P.-Cambridge (1904: 500) placed *Epeira crassicauda* described from a female into the genus *Edricus. Edricus* O.P.-Cambridge, 1890, has as type species *Edricus spinigerus,* 1890. *Edricus spinigerus* was described from a large male similar and perhaps congeneric with *Wagneriana tauricornis* F.P.-Cambridge, 1904. F.P.-Cambridge thought that *Edricus spinigerus* might be the unknown male of *Epeira crassicauda.* This proved to be an error.

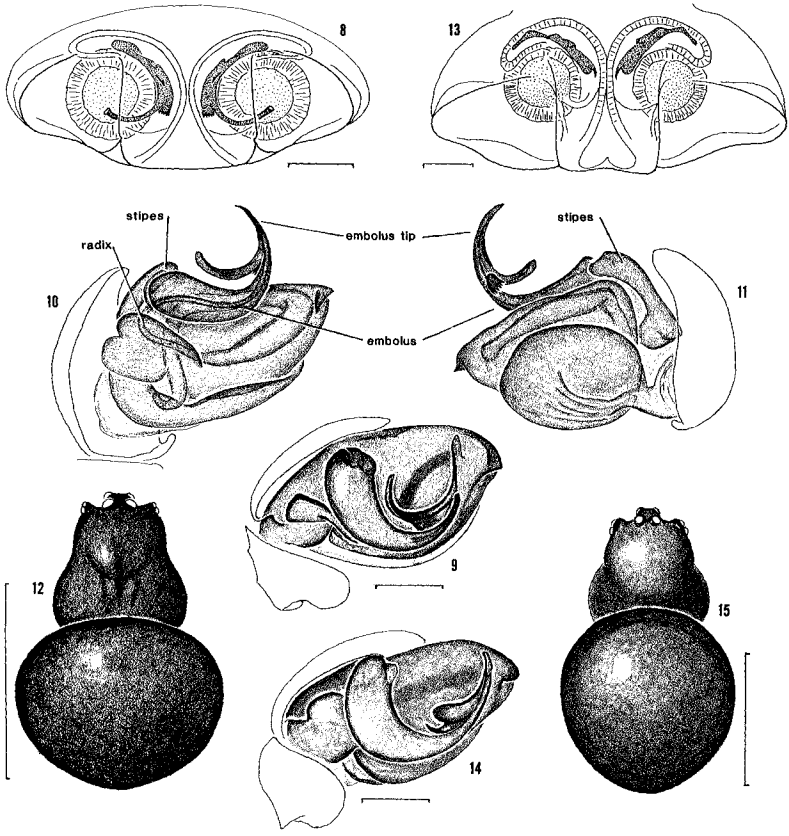
Diagnosis. Unlike the females of most Araneidae, the abdomen has a tail usually constricted at its base (Figs. 1, 6) and the epigynum is flat, lightly sclerotized, with a pair of depressions, (Figs. 4, 7). The male is separated from other Araneidae by the minute size, 1.5–1.9 mm (Fig. 5), sclerotized abdomen (Figs. 12, 15) and lacking a median apophysis and conductor of the palpus and having a large embolus tip which is transferred and plugs the female's ducts (Figs. 9, 14).

Description. Female. Carapace, sternum dark brown. Legs light with contrasting dark rings. Dorsum of abdomen black with variable white patches, venter black with a pair of small, white spots. Eyes subequal in size. Chelicerae with three teeth on anterior, three on posterior margin. First legs longer than fourth, second and fourth subequal, third shortest. Abdomen with a pair of anterior blunt spines and a tail of variable shape (Figs. 1, 6). The tail is constricted at its base and distally has three lobes.

Male. Carapace shiny brown, sternum, legs dark brown. Dorsum of abdomen shiny brown, venter black. Eyes subequal in size. Median eyes their diameter apart. Cheliceral teeth as in female, leg proportions as in female. Endites without tooth, palpal femora without tooth, first coxae without hook. Abdomen with round convex dorsal shield, sometimes wider than long or longer than wide.

Genitalia. Female epigynum has openings on each side of a flat septum in a depression (Figs. 4, 7), short connecting ducts lead into seminal receptacles (Figs. 8, 13).

The male palpus has a radix, embolus and, between them, a stipes. Median apophysis and conductor have been lost, probably secondarily (Figs. 10, 11). The embolus is large and has a distal



Figures 8–12. *Witica crassicauda* (Keyserling). 8. Epigynum cleared showing embolus tip. 9. Left male palpus. 10, 11. Male palpus expanded. 10. Mesal. 11. Lateral. 12. Male.

Figures 13–15. *W. cayana* (Taczanowski). 13. Epigynum cleared showing embolus tip. 14. Male palpus. 15. Male.

Size indicators: 0.1 mm, except Figures 12, 15, 1.0 mm.

curved tip which breaks off in mating and remains in the female connecting duct. Whether it serves only as a plug or perhaps is a spermatophore is not known.

Almost all females had one tip on each side in the epigynum, none were seen with two. Females appear to mate only once. Very few males with a missing tip are in collections. Apparently they do not survive mating.

Variation. Dorsal coloration of the abdomen of females of both species is quite variable, sometimes all white (in alcohol). The tail of the female abdomen may be shortened or blunt or long and is at times turned up.

Habits. The web of *Witica crassicauda* was found to be fairly common in a coffee plantation at about 1000 m altitude in Puerto Rico. It is built between trees about 1.5 meters apart, the hub 1.5 meters above the ground, the orb 30 to 35 cm horizontal diameter. The hub is open. There is a short vertical stabilimentum and the frame threads below the orb have whitish decorations, flattened threads as seen under a magnifying lens. The spider hangs in the hub, head down (Figure 17); there is no retreat. In Panama and Costa Rica the spider is common in low elevation forests; it does not make a stabilimentum, nor decorations on lines. The egg-sac, made in a vial, was fluffy, yellowish white, the size of the spider and contained about 200–250 lemon-yellow eggs.

Key to species

1 Females 2
_ Males 3
2(1) Median septum of epigynum as wide or wider than depression on each side (Figs. 4, 8); mated females show tubes, the ends of embolus tip on sides of septum (Figs. 4, 8); West Indies, Mexico to South America (Map)..... *crassicauda.*
Median septum of epigynum narrower than depressions (Figs. 7, 13); tip of embolus never visible in depressions. Trinidad, South America (Map) ..... *cayana.*
3(1) Base of tip of palpal embolus swollen and with spur (Fig. 14); Trinidad, South America (Map) ..... *cavana.*
___ Base of tip of palpal embolus a curved tube (Fig. 9); West Indies, Mexico to South America (Map) ..... *crassicauda.*

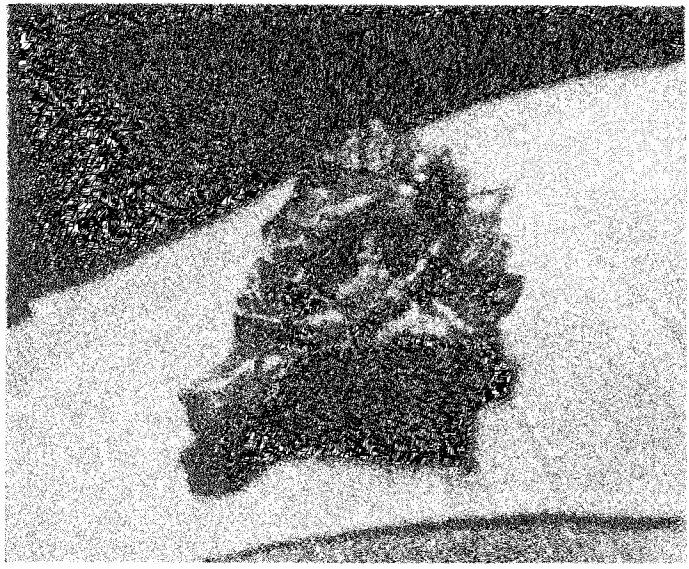


Figure 16. *Witica crassicauda.* Female on a leaf from Panama.

Witica crassicauda (Keyserling)
Figures 1–5, 8–12, 16, 17; Map

Epeira crassicauda Keyserling, 1865; 806, pl. 18, fig. 3, 4, ♀. Female specimen from New Granada (BMNH) examined.

Cyclosa crassicauda:—Keyserling, 1893: 270, pl. 14, fig. 200, ♀.

Witica talis O.P.-Cambridge, 1895: 160, pl. 16, fig. 13, ♂. Male lectotype from Teapa, Tabasco, Mexico (BMNH) here designated. Simon, 1903: 1003. Petrunkevitch, 1930: 337, figs. 225, 226, ♂. Roewer, 1942: 894. NEW SYNONYMY.

Salassia tricuspis Gétaz, 1893: 105. Female holotype from Uruca, Costa Rica (P. Biolley), lost. NEW SYNONYMY.

Salassina crassicauda:—Simon, 1895: 784, fig. 853, ♀.

Salassina tricuspis:—Simon, 1895: 784.

Physiola nigrans Simon, 1895: 876, figs. 938, 939, ♂. Lectotype male, two males, one immature and fragments of immatures paralectotypes from forest San Esteban, Venezuela (MNHN), here designated. First synonymized with *Witica* by Simon, 1903.

Bion brevis O.P.-Cambridge, 1898: 244, pl. 30, fig. 5, ♂. Male from Teapa, Tabasco, Mexico (BMNH), not examined. First synonymized with *Witica* by Simon, 1903.

Edricus crassicauda:—F.P.-Cambridge, 1904: 500, pl. 47, fig. 21, ♀. Roewer, 1942: 762

Edricus tricuspis:—F.P.-Cambridge, 1904: 500. Roewer, 1942: 762.

SYNONYMY. *Salassia tricuspis* is synonymized with *crassicauda* since the description fits the latter species with which Gétaz compares it. Also only one species is known from Costa Rica. The immature *Physiola nigrans* were thought by Simon to be adult females.

Female. Total length, 7.8 mm. Carapace, 3.2 mm long, 2.7 wide. First femur, 3.5 mm; patella and tibia, 3.7; metatarsus, 2.1; tarsus, 0.9. Second patella and tibia, 3.3 mm; third, 2.0; fourth, 3.3.

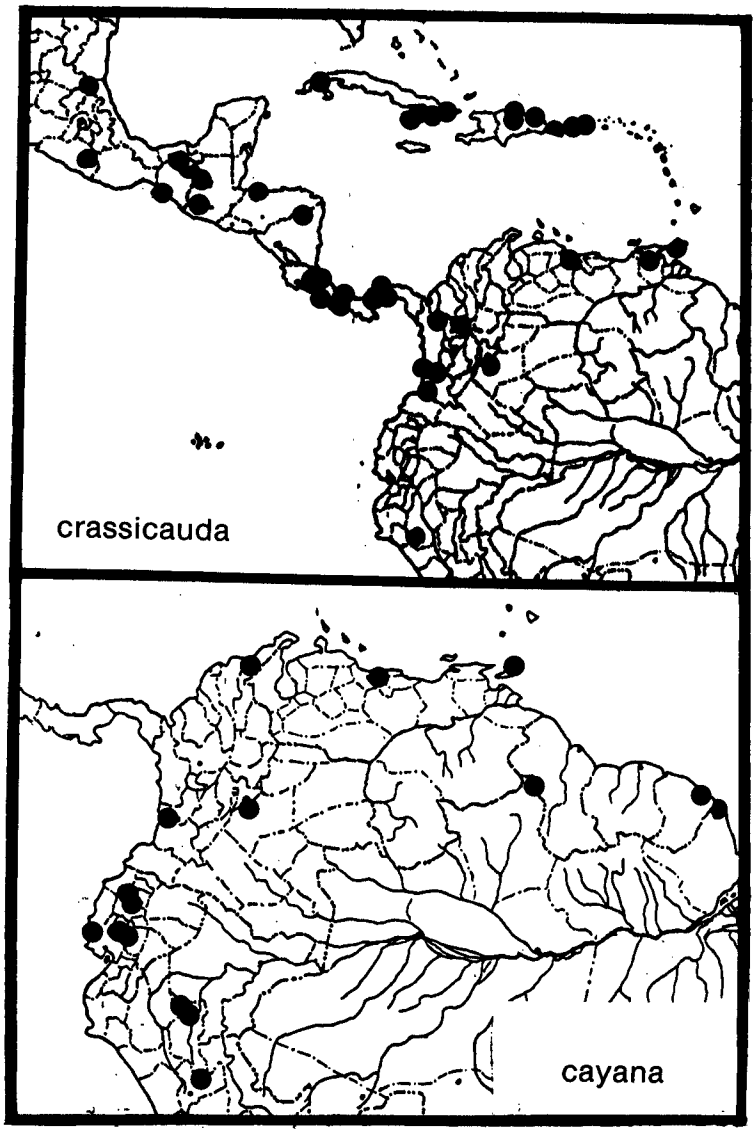
Male. Total length, 1.4 mm. Carapace, 0.9 mm long, 0.7 wide. First femur, 0.8 mm; patella and tibia, 0.8; metatarsus, 0.4; tarsus, 0.3. Second patella and tibia, 0.7 mm; third, 0.4; fourth, 0.6.

Diagnosis. The median septum of the epigynum is as wide or wider than the depressions on each side (Fig. 4); the male has a curved tube on the base of the embolus tip (Fig. 9).

Variation. Dorsal color, pattern and shape of abdomen of females are variable. Total length of female 6.5 to 12.0 mm, males, 1.4 to 1.7.

Habits and Distribution. Forests from Mexico to Venezuela and Peru, Greater Antilles (Map).

RECORDS. MEXICO *San Luis Potosí:* Huichihuayán, June 1941, immat. (H. Dybas, AMNH). *Guerrero:* S of Acahuizotla, 17 Nov. 1946, ♀(E. S. Ross, CAS). *Tabasco:* Teapa, 16 July 1947, ♂ (C. M. Goodnight, AMNH). *Chiapas:* San Quintín, Feb. 1966, ♀ (G. Ball, D. R. Whitehead, RL); Palenque ruins, 28 May 1980, ♀ (J. Coddington, MCZ). GUATEMALA Moca, 31 Aug. 1947, ♀ (C. P. Vaurie, AMNH). HONDURAS *Atlantida:* Lancetilla, July, 1929, ♀ (A. M. Chickering, MCZ). NICARAGUA Musawas, Waspuc Riv., Sept. 1955, ♀ (B. Malkin, AMNH). COSTA RICA *Heredia:* La Selva, 4 ♂ (MCZ). *Puntarenas:* Corcovado Natl. Park, 2 ♀ (MCZ). *Limón:* Río Reventazón, imm. (AMNH). *San José*: San José, 3 ♂ (AMNH). *Cartago:* Turrialba, dense jungle, ♀ (EPC). PANAMA *Bocas del Toro:* Río Changuinola, 2 ♀ (AMNH). *Chiriquí:* ♀ (AMNH). *Panamá*: Canal area, very common (MIUP, MCZ, CAS, AMNH).



Map. Distribution of *Witica* species.

CUBA. *Pinar del Río.* common (MCZ). *Oriente:* common (MCZ, AMNH). DOMINICAN REPUBLIC. Sánchez; Puerto Plata, S of Santiago (all MCZ). MONA ISL. (MCZ). PUERTO RICO. very common (MCZ, AMNH, JC)

TRINIDAD. ♀ (MCZ). VENEZUELA. *Monagas:* Caripito, Aug. 1942, ♀ (AMNH). *Carabobo:* San Esteban, 21 Jan. 1940, ♀ (CUC). COLOMBIA *Antioquia:* Mutatá, Dec. 1963, ♀ (MCZ); Remedios, 20 Dec. 1984; ♀ (MCZ). *Meta:* Caño Grande, Sept. 1944, ♀ (AMNH). *Valle:* Río Jamundi, 1000 m; Anchicayá; E. of Buenaventura, 3 ♀ (all MCZ). *Cauca:* Guapi, Aug. 1975, ♀ (W. Eberhard, MCZ). PERU. *Cajamarca:* Nanchoc, Caserío Bolívar, 30 April 1967, ♀ (C. Mazabel, AMNH).

Witica cayana (Taczanowski), new combination
Figures 6, 7, 13–15; Map.

Epeira cayana Taczanowski, 1873: 135, pl. 5, fig. 15, ♀. Female holotype from Cayenne, French Guiana (PAN). Specimens examined came from Uassa (Uaça, Amapa, Brazil) in the Taczanowski collection, PAN.

Female. Total length, 9.0 mm. Carapace, 3.1 mm long, 2.8 wide. First femur, 3.6 mm; patella and tibia, 4.0; metatarsus, 2.4; tarsus, 1.0. Second patella and tibia, 3.5 mm; third, 2.0; fourth, 3.6.

Male. Total length, 1.6 mm. Carapace, 1.0 mm long, 1.0 wide. First femur, 1.1 mm; patella and tibia, 1.1; metatarsus; 0.6; tarsus, 0.4. Second patella and tibia, 0.9 mm; third, 0.5; fourth, 0.8.

Diagnosis. The median septum of the epigynum is narrower than the depression on each side (Fig. 7). Base of embolus tip is a lobe (Fig. 14).

Variation. The color, pattern, and shape of the female abdomen are variable. Females vary 6.8 to 10.5 mm total length, males 1.4 to 1.6.

Habits and Distribution. Probably from forest, Trinidad and Venezuela to Peru (Map).

RECORDS. TRINIDAD 16 km from Arima, 27 Feb. 1959, ♂; Arima Rd, 29 Dec. 1945, ♂ (both A. M. Nadler, AMNH); Tucuche, 12 Nov. 1944, ♀ (R. H. Montgomery, AMNH). VENEZUELA *Aragua:* Rancho Grande, 1945, 1946, 4 ♀ (W. Beebe, AMNH). BRAZIL *Roraima:* Rio Irene, Aug. 1911, ♀ (AMNH). COLOMBIA *Magdalena:* San Pedro, 8 Feb. 1974, ♀ (J. A. Kochalka, IBNA). *Meta:* Villavicencio, 11 March 1955, 2 ♀ (E. I. Schlinger, E. S. Ross, CAS).

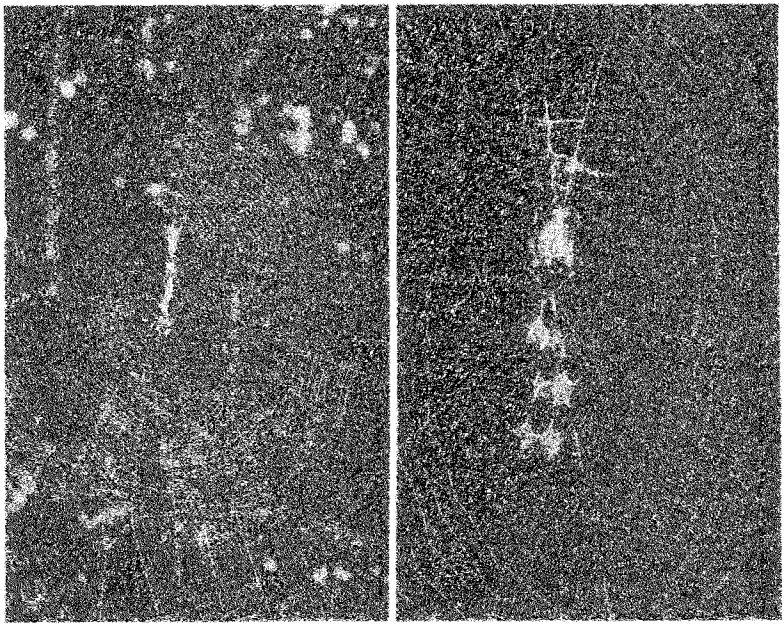


Figure 17. *Witica crassicauda.* Left: web of female in Puerto Rico, orb 32 cm horizontal diameter. Right: hub of another web with female. Webs dusted with corn starch.

ECUADOR *Pichincha:* Via Pto. Quito, km 113, 1984, 1985, 4 ♀ (L. Avilés, MECN); 16 km SE San Domingo Tinalandia, June, 1975, ♀, ♂ (S. and J. Peck, MCZ). *Guayas.* 16 km N Manglaralto, 30 Jan. 1955, 3 ♀ (E. I. Schlinger, E. S. Ross, CAS). *Los Ríos:* Juan Montalvo, March 1938, 3 ♀ (W. Clarke-Macintyre, AMNH). *Bolívar:* Balzapamba, 1938, 1939, 3 ♀, ♂ (W. Clarke-Macintyre, AMNH, MCZ). PERU *San Martín:* 20 km NE Moyobamba; SE Moyobamba; Ekin, E. of Tarapoto, 1947, 6 ♀ (all F. Woytkowski, AMNH). *Huánuco:* Monson Valley, Tingo María, 18 Dec 1954, ♀ (E. I. Schlinger, E. S. Ross, CAS).

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