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On Central American *Cryptocellus* (Arachnida, Ricinulei)

NORMAN I. PLATNICK¹ AND MOHAMMAD U. SHADAB²

ABSTRACT

The nine species of *Cryptocellus* known from Central America are diagnosed and illustrations of the male tarsal process and female spermathecae are provided. The male of *C. centralis* Fage is redescribed and the female allotype of *C. fagei*

Cooke and Shadab is transferred to *C. centralis*. The female of *C. striatipes* Cooke and Shadab is described for the first time. Four new species (*C. osa*, *C. goodnighti*, *C. chiriqui*, and *C. gamboa*) are described from Costa Rica and Panama.

INTRODUCTION

This paper, the fifth in a series on the arachnid order Ricinulei, reviews the Central American fauna of the genus *Cryptocellus* and completes our coverage of that genus. In the preceding paper in this series (Platnick, 1980), about half of the 40 nominal species previously assigned to *Cryptocellus* (including five of the 11 nominal Central American species) were transferred to the genus *Pseudocellus*, and they will be reviewed in future papers.

The first record of a ricinuleid from Central America was Fage's (1921) description

of a male of *Cryptocellus centralis* from Costa Rica. Ewing (1929) described a second species, *Cryptocellus emarginatus*, from a single Costa Rican nymph; he was evidently unaware of Fage's paper and provided no characters to differentiate *C. emarginatus* from *C. centralis*. No additional specimens are known from the type locality of *C. emarginatus* (Navarro Farms, Cartago, Costa Rica) and an attempt to recollect the species there by Dr. Carlos E. Valerio in 1979 was unsuccessful (the area is now well developed and the original forest is gone). Because the

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species cannot be recognized from the holotype nymph alone, *C. emarginatus* is here regarded as a *nomen dubium*.

There have been few subsequent studies of Central American species actually belonging to *Cryptocellus*. Fage (1938) reported on two additional Costa Rican collections of *C. centralis*. One, taken by Silvestri in 1916, includes only two deutonymphs and therefore cannot be definitively identified. The other, taken by Nevermann in 1935 from a mound of the ant *Eciton hamatum*, was said to include one female and one juvenile. The latter collection has not been available for study, but the locality (Hamburg Farm, near the Río Reventazón in Limón) is near other records of *C. centralis* listed below.

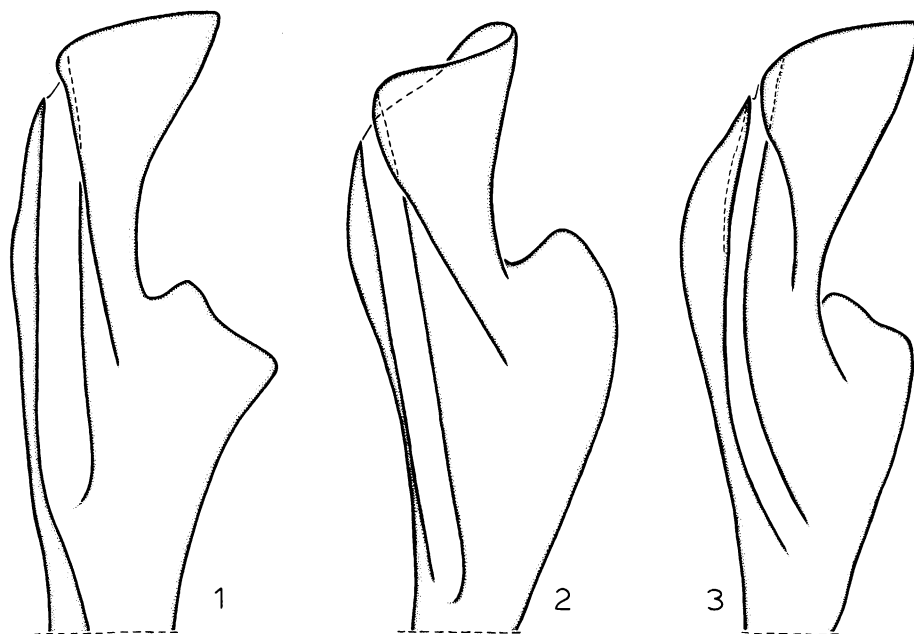
Subsequently, an additional female from El Salvador was assigned to *C. centralis* by Roewer (1956); Cooke (1967) indicated that this assignment is incorrect and the specimen was later (erroneously) transferred to *Cryptocellus boneti* Bolívar y Peltain by Beck and Schubart (1968) and (correctly) described as *Cryptocellus dissimulans* by Cooke and Shadab (1973), and is now placed in *Pseudocellus*. Similarly, a Costa Rican male assigned to *C. centralis* by Beck and Schubart (1968) is shown below to belong instead to *Cryptocellus striatipes* Cooke and Shadab. As pointed out by Brignoli (1974, p. 164), the "attribution of all the Costa Rican specimens of *Cryptocellus* to *C. centralis* is based on no solid foundation whatsoever" Much of this confusion was resolved by the description of four additional species of *Cryptocellus* from Central America by Cooke and Shadab (1973), and the material reported on here brings to nine the number of diagnosable Central American forms (at least six of which occur in Costa Rica).

All nine of these species have a peculiar anteroventral ledge on the male tarsal process (figs. 1–9) that projects out at a right angle from the main body of the process. It seems likely that this ledge represents a synapomorphy of a monophyletic species group (the *centralis* group), for it is generally lacking in other ricinuleids; males of the African

genus *Ricinoides* have a lateral lobe in a similar position on the tarsal process (Legg, 1976, figs. 26, 27), but that lobe has a different shape. There is, however, one other species (*Cryptocellus glenoides* Cooke and Shadab, from Colombia) which has an anteroventral ledge; that species has previously (Platnick and Paz, 1979) been placed in the *magnus* species group because of the straight and massive accessory piece of its tarsal process (another apparently synapomorphic character). Because *C. glenoides* is placed as the most plesiomorphic branch of the *magnus* group (Platnick and Paz, 1979, fig. 1), and only on the basis of this one character, it is quite possible that the straight and massive accessory piece has evolved in parallel and that *C. glenoides* is actually a member of the *centralis* group. Additional synapomorphies are needed to resolve this character contradiction and determine the placement of *C. glenoides*.

The species of the *centralis* group are rather uniform in somatic morphology, and their general appearance has been well illustrated by Cooke and Shadab (1973, figs. 5–10). The few detected somatic differences are so minor, involving such variable characters as the degree of tuberculation and depth of the pygidial notch, that no key is provided below; we recommend that identifications be made with reference to the details of the male and female genitalia, which are illustrated for each known sex of each species. Comments on the interrelationships of the species can be found in the diagnoses below.

We are particularly indebted to Drs. Charles, Clarence, and Marie Goodnight, Sally Levings, Stewart B. Peck, and Vincent D. Roth for donating specimens of these rare arachnids. In addition to material in the American Museum of Natural History (AMNH), we have examined specimens provided by the following curators and institutions: Drs. M. Grasshoff, Natur-Museum Senckenberg (NMS); J. Gruber, Naturhistorisches Museum Wien (NMW); M. Hubert, Muséum National d'Histoire Naturelle (MNHN); D. Kavanaugh, California Academy of Sciences (CAS); J. Kethley, Field



FIGS. 1-3. Left male tarsal process, dorsal view, accessory piece removed. 1. *Cryptocellus centralis* Fage. 2. *C. hanseni* Cooke and Shadab. 3. *C. fagei* Cooke and Shadab.

Museum of Natural History (FMNH); H. W. Levi, Museum of Comparative Zoology (MCZ); and C. E. Valerio, Universidad de Costa Rica (UCR).

All measurements presented below are in millimeters.

Cryptocellus centralis Fage

Figures 1, 10, 11

Cryptocellus centralis Fage, 1921, p. 527, figs. A-G (male holotype from La Caja, Heredia, Costa Rica, in MNHN, examined).

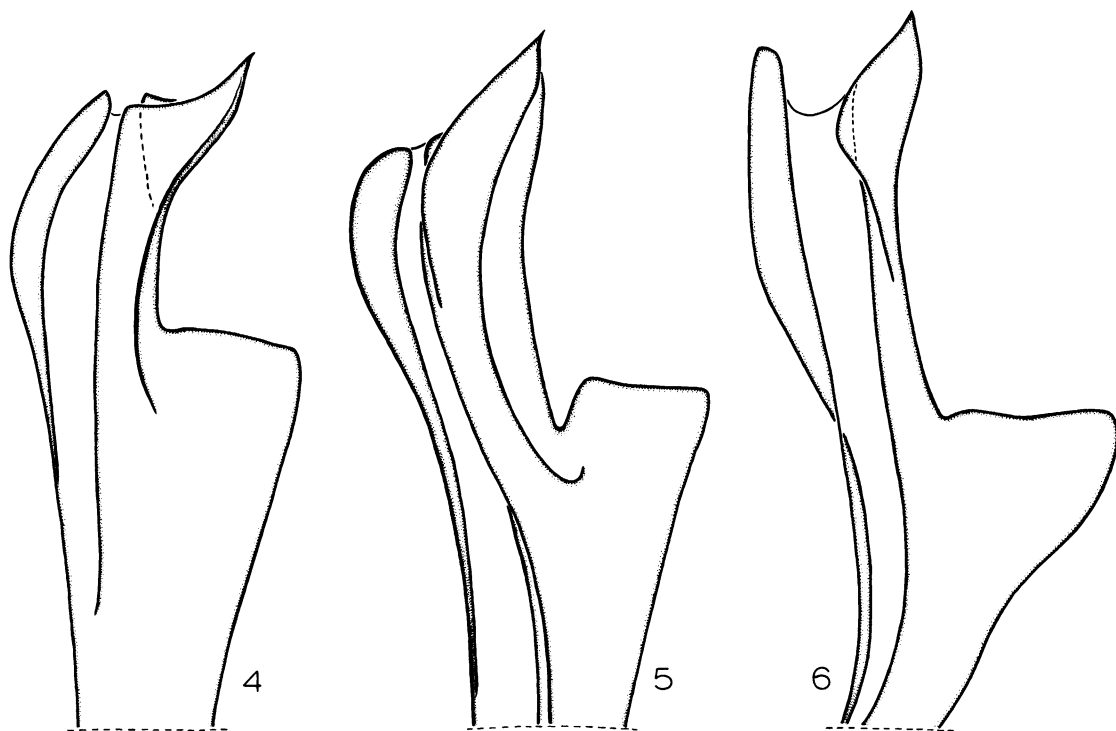
Cryptocellus fagei (misidentification, in part): Cooke and Shadab, 1973, p. 21 (female allotype only, from Colombiana, Limón, Costa Rica, in AMNH, examined).

DIAGNOSIS: *Cryptocellus centralis* seems most closely related to *C. hanseni*; in both species the retrolateral ridge of the male tarsal process is narrowed and the prolateral ridge originates near the groove and overlaps the groove distally (figs. 1, 2). Males of *C. centralis* can be distinguished by the out-

wardly curved tip of the prolateral ridge (fig. 1), females by the approximate spermathecae (figs. 10, 11).

FEMALE: Described (as *C. fagei*) by Cooke and Shadab (1973). Those authors correctly noted that although the female allotype of *C. fagei* was collected at the same time and place as the male holotype of *C. striatipes*, the two specimens cannot be considered conspecific. Their assignment of the female specimen to *C. fagei* was not unreasonable, given the material then available, but both the collection site (in northern Costa Rica) and the great similarity of the spermathecal structure to that of the northern species *C. hanseni* suggest that the specimen is more appropriately placed in *C. centralis* than in the southern Costa Rican species *C. fagei*. It is worth noting that in addition to the Colombiana locality, *C. centralis* has been collected together with *C. striatipes* at Jiménez, Costa Rica.

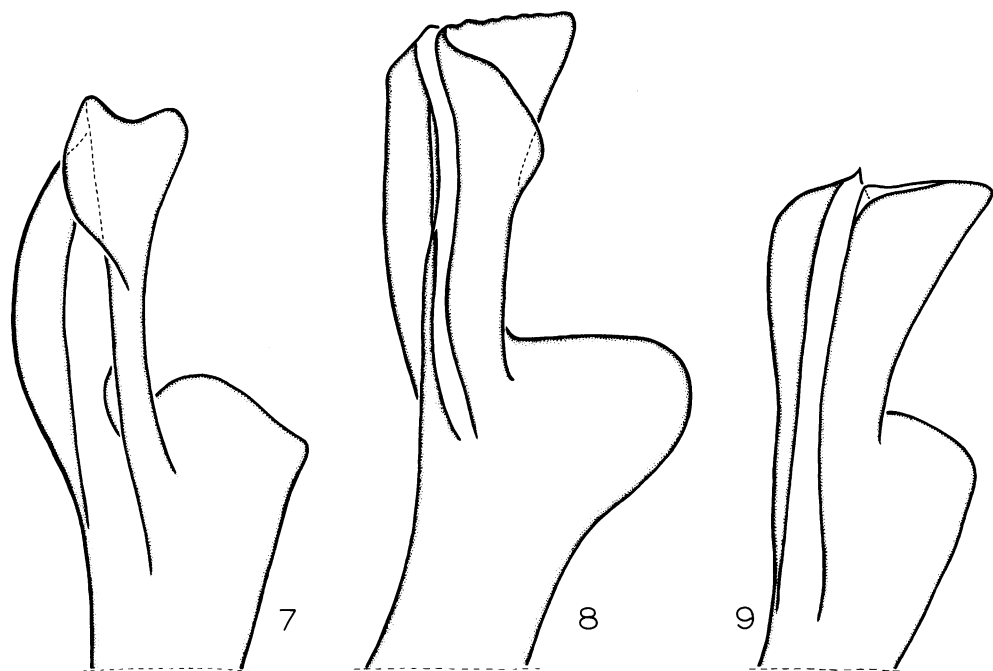
MALE (LA SELVA): Total length, excluding



FIGS. 4-6. Left male tarsal process, dorsal view, accessory piece removed. 4. *Cryptocellus striatipes* Cooke and Shadab. 5. *C. osa*, new species. 6. *C. goodnighti*, new species.

pygidium, 4.57. Carapace 1.69 long, 1.81 wide near rear of coxae II, where widest, dark reddish brown with darkened borders and small rectangular yellow translucent areas at margins opposite space between coxae I and II; surface coated with long white setae but without conspicuous tubercles. Cucullus 0.83 long, 0.94 wide, dark reddish brown proximally, lighter distally, with long white setae densest distally, median distal triangular patch of few tubercles, and only slightly protuberant lateral lobes. Left chelicera: movable finger concave posteriorly, not widened transversely, armed with 10 teeth of which most distal is largest, most proximal reduced to denticle, others subequal; fixed finger armed with five teeth of which most distal is much the largest, second and third most proximal reduced to denticles. Sternal region with coxae I not meeting tritosternum; coxae II meeting along their

posterior three-fourths, their suture line about as long as that of coxae III; coxae IV meeting along their length. Abdomen 3.10 long, 2.32 wide near front of tergite 12, where widest, coloration and setation as in carapace except for orange articular membranes, with tubercles restricted to paired lateral depressions of median plates near middle of tergite 11 and rear of tergites 12 and 13 and unpaired lateral depressions near inner margin of lateral plates of all tergites; corresponding sternite depressions near front of sternites, median area between depressions darkened on sternites 11 and 12; median plates of tergites 11-13 much wider than long. Pygidium with shallow notch in posterior dorsal margin of basal segment. Palpal coxae red, second trochanters dark orange, other segments orange; trochanters and femora with few ventral tubercles; paired thick coxal setae not evident. Leg for-



FIGS. 7-9. Left male tarsal process, dorsal view, accessory piece removed. 7. *Cryptocellus chiriqui*, new species. 8. *C. isthmius* Cooke and Shadab. 9. *C. gamboa*, new species.

mula 2341. Legs dark reddish brown, tarsi lightest, coated with long white setae, with few tubercles concentrated ventrally on tibiae, dorsally on metatarsi and tarsi. Measurements:

	I	II	III	IV	Palp
Coxa	0.61	0.99	0.85	0.77	0.36
Trochanter I	0.50	0.70	0.56	0.65	0.47
Trochanter II	—	—	0.58	0.50	0.41
Femur	1.04	1.82	1.29	1.30	0.86
Patella	0.58	1.04	0.84	0.81	—
Tibia	0.79	1.47	0.83	0.86	1.19
Metatarsus	0.86	1.70	0.87	0.97	—
Tarsus	0.43	1.69	1.26	0.92	0.18
Total	4.81	9.41	7.08	6.78	3.47

Second legs not widened; femur I about two and one-half, femur II about four times as long as wide. Tarsal claws thin, evenly curved. Tarsal process as in figure 1.

MATERIAL EXAMINED: **Costa Rica:** *Heredia*: La Caja, 1920 (P. Serre, MNHN), 1♂ (holotype); La Selva Research Station, Feb.

11, 1976 (V. Roth, R. Schroepfer, AMNH), 4♂. *Limón*: Colombiana, 1924 (W. M. Mann, AMNH), 1♀ (allotype, *C. fagei*); Jiménez, 1930 (E. Reimoser, NMW), 1♂.

DISTRIBUTION: Northeastern Costa Rica.

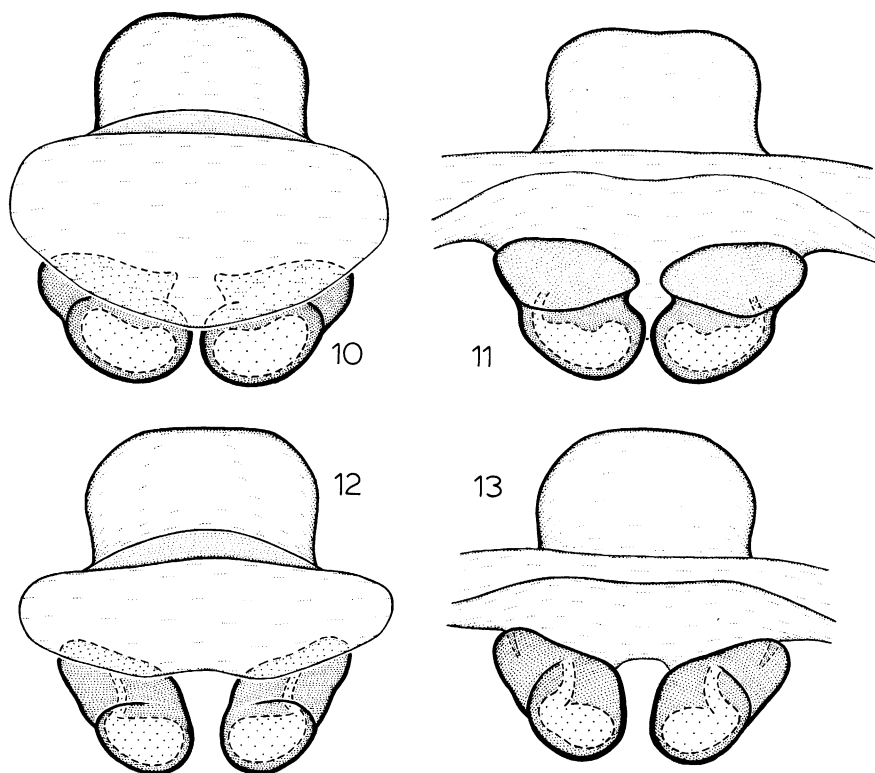
Cryptocellus henseni Cooke and Shadab
Figures 2, 12, 13

Cryptocellus henseni Cooke and Shadab, 1973, p. 22, figs. 9, 10, 14, 17, 33, 36 (male holotype from Musawas, Zelaya, Nicaragua, in AMNH, examined).

DIAGNOSIS: *Cryptocellus henseni* seems closest to *C. centralis* but can be distinguished by the inwardly curved tip of the prolateral ridge of the tarsal process (fig. 2) and the widely separated spermathecae (figs. 12, 13).

FEMALE: Described by Cooke and Shadab (1973).

MALE: Described by Cooke and Shadab (1973).



FIGS. 10–13. Posterior genital lip and spermathecae, anterior (left) and posterior (right) views. 10, 11. *Cryptocellus centralis* Fage. 12, 13. *C. hanseni* Cooke and Shadab.

MATERIAL EXAMINED: **Honduras:** *Olancho*: 175 mi. up Río Patuca, elevation 350 feet (C. W. Cook, AMNH), 2♂, 3♀, 4 tritonymphs, 2 deutonymphs (paratypes). **Nicaragua:** *Zelaya*: Musawas, Río Waspuk, Oct. 29, 1955, swept or shaken from dry, rotten foliage (B. Malkin, AMNH), 1♂ (holotype); Department unknown: “B. Marinis” (AMNH), 1♂.

DISTRIBUTION: Nicaragua and Honduras.

Cryptocellus fagei Cooke and Shadab
Figure 3

Cryptocellus fagei Cooke and Shadab, 1973, p. 19, figs. 8, 11, 19, 25, 26, 32 (male holotype from Golfito, Puntarenas, Costa Rica, in AMNH, examined; not female).

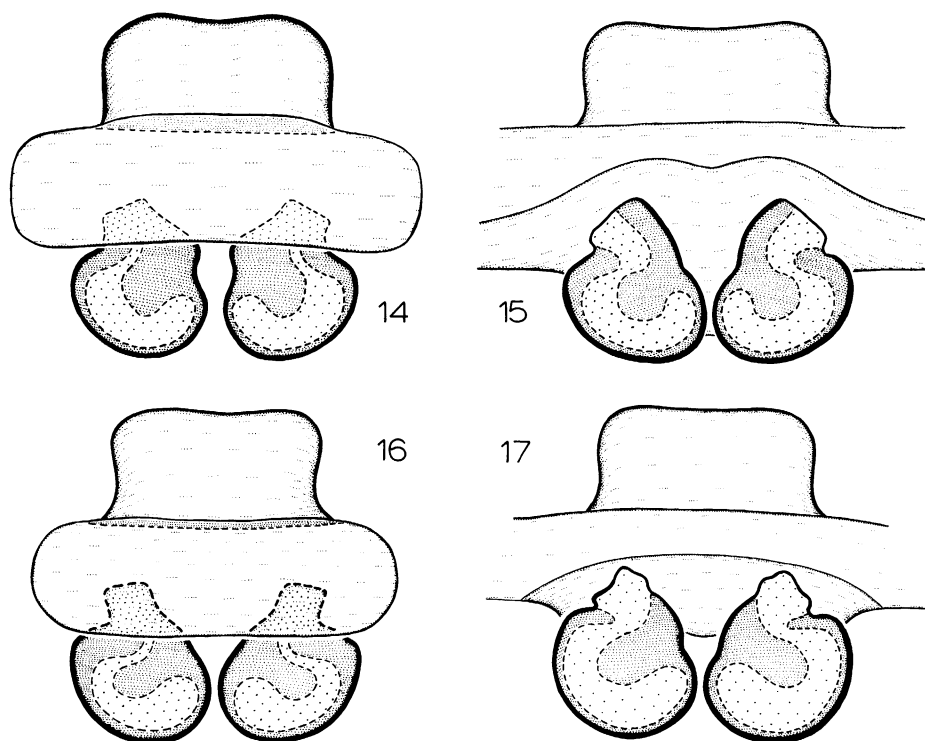
DIAGNOSIS: *Cryptocellus fagei* seems most closely related to *C. centralis* and *C. hanseni*; in all three species the tip of the prolateral ridge of the tarsal process is distally rounded and expanded (figs. 1–3). Females of *C. fagei* are unknown; males can be distinguished by the wide retrolateral ridge and prolateral origin of the prolateral ridge of the tarsal process (fig. 3).

FEMALE: Unknown; the female allotype described by Cooke and Shadab (1973) is here transferred to *C. centralis*.

MALE: Described by Cooke and Shadab (1973).

MATERIAL EXAMINED: Only the type series (1♂, 3 tritonymphs, 1 deutonymph, and 2 protonymphs) taken in leaf mold on September 17, 1957, by E. Dixon (AMNH).

DISTRIBUTION: Southern Costa Rica.



FIGS. 14–17. Posterior genital lip and spermathecae, anterior (left) and posterior (right) views. 14, 15. *Cryptocellus striatipes* Cooke and Shadab. 16, 17. *C. osa*, new species.

Cryptocellus striatipes Cooke and Shadab
Figures 4, 14, 15

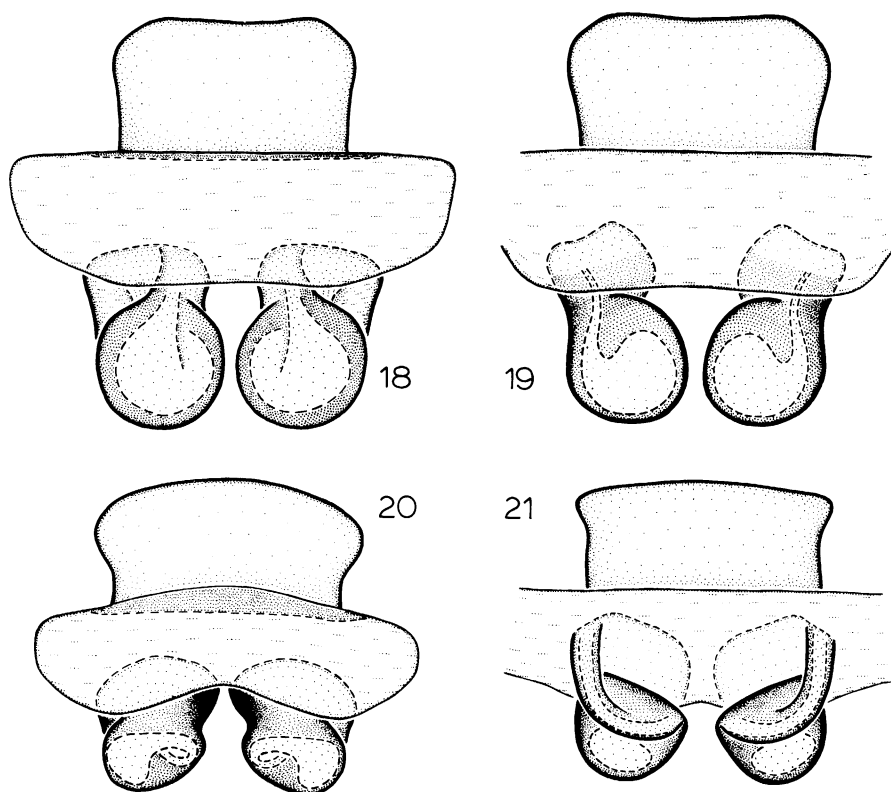
Cryptocellus centralis (misidentification): Beck and Schubart, 1968, p. 77, figs. 4, 11, 16, 21.

Cryptocellus striatipes Cooke and Shadab, 1973, p. 15, figs. 6, 13, 18, 23, 24, 34, 38 (male holotype from Colombiana, Limón, Costa Rica, in AMNH, examined).

DIAGNOSIS: *Cryptocellus striatipes* seems most closely related to *C. osa*; in both species the prolateral ridge of the male tarsal process is elevated over the body of the process and prolonged prolaterally at its tip (figs. 4, 5). Males of *C. striatipes* can be distinguished by the inwardly curved tip of the prolateral ridge (fig. 4), females by having the prolongations of the spermathecae nearest the genital lip relatively large and smoothly bordered (figs. 14, 15). The striped legs and

relatively light color of the holotype are juvenile characteristics almost certainly retained because of preservation of the specimen soon after its final molt, and are not diagnostic.

FEMALE (JIMÉNEZ): Total length, excluding pygidium, 4.68. Carapace 1.49 long, 1.62 wide near middle of coxae III, where widest, dark red, darkest at sides, with small yellow translucent areas at margins opposite front of coxae II; surface sparsely coated with long white setae, with tubercles scattered over posterior half; longitudinal median and oblique lateral depressions very shallow. Cucullus 0.65 long, 0.86 wide, coloration and setation as in carapace, with few scattered tubercles and only slightly protuberant lateral lobes. Left chelicera: movable finger flattened posteriorly, not widened transversely, armed with eight teeth of which



FIGS. 18–21. Posterior genital lip and spermathecae, anterior (left) and posterior (right) views. 18, 19. *Cryptocellus isthmius* Cooke and Shadab. 20, 21. *C. gamboa*, new species.

proximal half reduced to denticles, others subequal; fixed finger armed with five teeth of which most distal is much the largest. Sternal region with coxae I not meeting tritosternum; coxae II meeting along their posterior four-fifths, their suture line about one and one-half times as long as that of coxae III; coxae IV meeting anteriorly. Abdomen 3.02 long, 2.23 wide near front of tergite 12, where widest, coloration and setation as in carapace except for dark orange articular membranes; tubercles scattered over entire surface of tergites and posterior margins of sternites; median plates of tergites 11–13 much wider than long, with paired oblique lateral depressions situated near middle on tergite 11, near front corners on tergites 12 and 13, corresponding sternites with similarly placed depressions. Pygidium without

notch in posterior dorsal margin of basal segment, with deep notch in ventral margin. Palpal coxae red, other segments orange; trochanters with few tubercles; coxae each with two thick white setae posteriorly along inner margin. Leg formula 2431. Legs red, tarsi lightest, anterior pairs darkest, coated with long white setae; tubercles few, scattered, scarcely concentrated even on ridges. Measurements:

	I	II	III	IV	Palp
Coxa	0.53	0.88	0.78	0.73	0.32
Trochanter I	0.43	0.61	0.52	0.54	0.32
Trochanter II	—	—	0.47	0.49	0.26
Femur	0.86	1.61	1.08	1.13	0.82
Patella	0.53	0.83	0.61	0.58	—
Tibia	0.61	1.22	0.72	0.77	1.12
Metatarsus	0.86	1.40	0.86	0.84	—
Tarsus	0.43	1.18	0.65	0.77	0.16
Total	4.25	7.73	5.69	5.85	3.00

Second legs slightly widened; femur I two and one-half, femur II more than three times as long as wide. Tarsal claws very thin, evenly curved. Posterior genital lip and spermathecae as in figures 14, 15.

MALE: Described by Cooke and Shadab (1973).

MATERIAL EXAMINED: **Costa Rica:** *Limon*: Colombiana, 1924 (W. M. Mann, AMNH), 1♂ (holotype); Jiménez, 1930 (E. Reimoser, NMW), 1♀, 1938 (C. Roewer, NMS), 1♂.

DISTRIBUTION: Northeastern Costa Rica.

***Cryptocellus osa*, new species**

Figures 5, 16, 17

TYPES: Male holotype and female paratype from Llorona, Península de Osa, Puntarenas, Costa Rica (August 9, 1978; Charles Goodnight), deposited in AMNH.

ETYMOLOGY: The specific name is a noun in apposition taken from the type locality.

DIAGNOSIS: *Cryptocellus osa* seems closest to *C. striatipes* but can be distinguished by the outwardly curved tip of the prolateral ridge of the male tarsal process (fig. 5) and by having the prolongations of the female spermathecae nearest the genital lip relatively small and irregularly bordered (figs. 16, 17).

FEMALE (PARATYPE): Total length, excluding pygidium, 4.39. Carapace 1.57 long, 1.79 wide near front of coxae III, where widest, dark reddish brown, sides and posterior margin darkest, with small yellow translucent areas at margins opposite rear of coxae I; surface sparsely coated with long white setae, longest at margins, with patch of tubercles on each side covering anterior three-fourths of space behind translucent areas; also few tubercles near rear of deep depression running along midline and occupying central one-third of carapace length. Cucullus 0.83 long, 0.95 wide, reddish brown, with long white setae sparsest proximally, tubercles along midline, sides, and distal margin, and only slightly protuberant lateral lobes. Left chelicera: movable finger concave posteriorly, not widened transversely, armed with 10 teeth of which seven most proximal

reduced to denticles, others but slightly longer; fixed finger armed with six teeth of which most distal is much the largest, four most proximal reduced to denticles. Sternal region with coxae I not meeting tritosternum; coxae II meeting along their posterior three-quarters, their suture line about one and one-half times as long as that of coxae III; coxae IV meeting along their extremely short median surfaces. Abdomen 3.17 long, 2.41 wide near middle of tergite 12, where widest, coloration as in carapace except for orange articular membranes, white setae short except at outer sides of lateral plates, with few tubercles along outer sides of lateral plates, lateral depressions of median plates, and scattered around midline of median plates of tergites 12 and 13; lateral depressions of median plates situated near middle of tergite 11, near front of tergites 12 and 13, corresponding sternite depressions near front of sternites; median plates of tergites 11–13 much wider than long; sternite 13 bordered with tubercles. Pygidium without notch in posterior dorsal or ventral margins of basal segment. Palpal coxae and second trochanters dark red, other segments lighter; coxae, trochanters, and base of femora with few tubercles; coxae each with two thick white setae posteriorly along inner margin. Leg formula 2431. Legs dark reddish brown with tarsi lightest, coated with long white setae, with few tubercles concentrated on ventral ridges of tibiae and dorsal ridges of metatarsi and tarsi. Measurements:

	I	II	III	IV	Palp
Coxa	0.60	0.95	0.81	0.78	0.38
Trochanter I	0.47	0.64	0.49	0.52	0.42
Trochanter II	—	—	0.50	0.49	0.25
Femur	0.97	1.71	1.15	1.17	0.83
Patella	0.52	0.88	0.58	0.65	—
Tibia	0.81	1.26	0.81	0.84	1.22
Metatarsus	0.97	1.48	0.83	0.95	—
Tarsus	0.44	1.44	0.76	0.86	0.20
Total	4.87	8.36	5.93	6.26	3.30

Second legs slightly widened; femur I about twice, femur II about three times as long as wide. Tarsal claws large, evenly curved. Posterior genital lip and spermathecae as in figures 16, 17.

MALE (HOLOTYPE): As in female, except for the following: Total length, excluding pygidium, 4.64. Carapace 1.55 long, 1.78 wide near rear of coxae II, where widest. Cucullus 0.72 long, 0.88 wide. Movable finger of left chelicera with only four most proximal teeth reduced to denticles, fixed finger missing two most proximal denticles. Coxae II meeting along their posterior seven-eighths, their suture line about twice as long as that of coxae III; coxae IV meeting anteriorly. Abdomen 3.28 long, 2.33 wide. Palpal tarsus with few ventral tubercles. Leg formula 2341. Measurements:

	I	II	III	IV	Palp
Coxa	0.59	0.94	0.83	0.70	0.34
Trochanter I	0.50	0.74	0.54	0.59	0.46
Trochanter II	—	—	0.56	0.52	0.41
Femur	1.12	1.91	1.19	1.26	0.81
Patella	0.54	0.94	0.73	0.66	—
Tibia	0.87	1.48	0.83	0.88	1.22
Metatarsus	1.01	1.55	0.86	0.94	—
Tarsus	<u>0.50</u>	<u>1.45</u>	<u>1.28</u>	<u>0.86</u>	<u>0.16</u>
Total	5.13	9.01	6.82	6.41	3.40

Tarsal process as in figure 5.

OTHER MATERIAL EXAMINED: One male and one protonymph taken with the types (AMNH), plus the following (all from the Península de Osa, Puntarenas, Costa Rica): Rincón de Osa, litter, Aug. 15, 1966 (S. Peck, AMNH), 1♂, Aug. 10, 1968 (C. E. Valerio, UCR), 1♀, 1 tritonymph; 5 km. W Rincón de Osa, Berlese sample of floor litter from dry forest slope, Mar. 26, 1973 (J. Wagner, J. Kethley, FMNH), 1♀; Sirena, Aug. 9, 1978 (Charles Goodnight, AMNH), 1♀, 1 tritonymph, July 2–6, 1979 (C. E. Valerio, UCR), 1♀.

DISTRIBUTION: Known only from the Osa Peninsula of southwestern Costa Rica.

***Cryptocellus goodnighti*, new species**

Figure 6

TYPE: Male holotype from La Selva, Heredia, Costa Rica (July 4, 1975; Charles Goodnight), deposited in AMNH.

ETYMOLOGY: The specific name is a patronym in honor of the collector of the type and many other interesting ricinuleids.

DIAGNOSIS: *Cryptocellus goodnighti* is a distinctive species easily recognized by the incised tip and distally shortened groove of the male tarsal process (fig. 6); it may be closely related to *C. striatipes* and *C. osa* (as indicated by the sharply pointed tip of the prolateral ridge of the tarsal process).

FEMALE: Unknown.

MALE (HOLOTYPE): Total length, excluding pygidium, 4.77. Carapace 1.72 long, 1.91 wide at rear of coxae II, where widest, dark red, darkest at sides and rear margin, with small yellow translucent areas at margins opposite coxae I; surface thickly coated with long white setae, with tubercles only along median longitudinal depression, paired lateral oblique depressions, and posterior margin. Cucullus 0.84 long, 0.97 wide, coloration and setation as in carapace, with scattered tubercles along sides and distal margin, and only slightly protuberant lateral lobes. Left chelicera: movable finger concave posteriorly, very slightly widened transversely, armed with 12 teeth becoming slightly longer distally; fixed finger armed with four teeth becoming much larger distally. Sternal region with coxae I not reaching tritosternum; coxae II meeting along their posterior eight-ninths, their suture line about one and one-third times as long as that of coxae III; coxae IV meeting anteriorly. Abdomen 3.15 long, 2.32 wide near front of tergite 12, where widest, coloration and setation as in carapace except for light orange articular membranes and blackish red anterolateral depressions on median plates of tergites 11–13; tubercles restricted to transverse band on tergite 9, depressions of median plates, corresponding depressions of sternites 11–13, and anterior and posterior margins of sternite 10; median plates of tergites 11 and 12 much longer, of tergite 13 longer, than wide. Pygidium with notch in posterior dorsal margin of basal segment, without notch in ventral margin. Palps orange, basal segments with few ventral tubercles; coxae each with two thick white setae posteriorly along inner margin. Leg formula 2341. Legs red, lightest distally, anterior pairs darkest, coated with long white setae; few tubercles scattered on dor-

sal surface, more concentrated on ventral tibial ridges, dorsal metatarsal ridges, and tarsomeres. Measurements:

	I	II	III	IV	Palp
Coxa	0.60	1.01	0.88	0.79	0.40
Trochanter I	0.45	0.71	0.61	0.65	0.48
Trochanter II	—	—	0.65	0.55	0.47
Femur	1.15	1.91	1.33	1.37	0.88
Patella	0.65	1.07	0.86	0.85	—
Tibia	0.88	1.49	0.86	0.97	1.21
Metatarsus	1.08	1.74	1.02	1.03	—
Tarsus	0.46	2.05	1.44	0.94	0.16
Total	5.27	9.98	7.65	7.15	3.60

Second legs slightly widened; femur I twice, femur II three times as long as wide. Tarsal claws thin, evenly curved. Tarsal process as in figure 6.

OTHER MATERIAL EXAMINED: Two deutonymphs taken with the type (AMNH), plus the following: **Costa Rica: Heredia:** La Selva Research Station, Feb. 11, 1976 (V. Roth, R. Schroeffer, AMNH), 1♂. **Cartago:** Turrialba, Aug. 29, 1966 (R. Andrews, AMNH), 2♂.

DISTRIBUTION: Northeastern Costa Rica.

Cryptocellus chiriqui, new species

Figure 7

TYPE: Male holotype from dung trap at an elevation of 1500 m. at Hartmann Finca, 15 km. northwest of Hato del Volcán, Chiriquí, Panama (May 20–25, 1977; S. Peck), deposited in AMNH.

ETYMOLOGY: The specific name is a noun in apposition taken from the type locality.

DIAGNOSIS: *Cryptocellus chiriqui* is a distinctive species easily recognized by the invaginated tip of the prolateral ridge of the male tarsal process (fig. 7); it may be closely related to *C. goodnighti* (as indicated by the very narrow prolateral ridge).

FEMALE: Unknown.

MALE (HOLOTYPE): Total length, excluding pygidium, 3.96. Carapace 1.42 long, 1.58 wide at middle of coxae III, where widest, blackish red, darkest at sides, with small yellow translucent areas at margins opposite coxae II; surface sparsely coated with long white setae, with tubercles in anterolateral

and posterolateral patches and along longitudinal median and paired oblique lateral depressions. Cucullus 0.72 long, 0.86 wide, coloration and setation as in carapace, with three longitudinal rows of tubercles proximally, evenly covered with tubercles distally, with only slightly protuberant lateral lobes. Left chelicera: movable finger flattened posteriorly, not widened transversely, armed with nine teeth of which two most proximal reduced to denticles, others subequal; fixed finger armed with five teeth of which most distal is greatly enlarged, others subequal. Sternal region with coxae I not meeting tritosternum; coxae II meeting along their posterior four-fifths, their suture line almost twice as long as that of coxae III; coxae IV meeting anteriorly. Abdomen 2.66 long, 2.07 wide near middle of tergite 12, where widest, coloration and setation as in carapace except for dark orange articular membranes, with tubercles along paired outwardly curved lateral depressions of median plates of tergites 11–13 and posteriorly on sternite 13; median plates of all tergites wider than long; sternites 11 and 12 darkened medially. Pygidium without notch in posterior dorsal or ventral margin of basal segment. Palpal coxae red, other segments orange; all segments with sparse ventral tubercles; coxae apparently without enlarged setae. Leg formula 2341. Legs red, lightest distally, leg II darkest; all segments coated with long white setae and tubercles. Measurements:

	I	II	III	IV	Palp
Coxa	0.47	0.86	0.73	0.65	0.39
Trochanter I	0.47	0.61	0.47	0.47	0.44
Trochanter II	—	—	0.50	0.47	0.36
Femur	0.90	1.60	1.08	1.19	0.77
Patella	0.56	0.64	0.55	0.61	—
Tibia	0.72	1.26	0.70	0.73	1.08
Metatarsus	0.88	1.54	0.83	0.91	—
Tarsus	0.41	1.36	1.24	0.83	0.18
Total	4.41	7.87	6.10	5.86	3.22

Second legs not widened; femur I less than four, femur II about four and one-half times as long as wide. Tarsal claws evenly curved, largest on legs III and IV. Tarsal process as in figure 7.

OTHER MATERIAL EXAMINED: One male, one tritonymph, and one larva taken at San Vito de Java, Coto Brus, Puntarenas, Costa Rica, on July 29, 1969, by C. E. Valerio (UCR).

DISTRIBUTION: Northern Panama and southern Costa Rica.

Cryptocellus isthmius Cooke and Shadab
Figures 8, 18, 19

Cryptocellus isthmius Cooke and Shadab, 1973, p. 17, figs. 7, 22, 29, 30, 35, 39 (male holotype from Gatún, Canal Zone, Panama, in CAS, examined). Platnick and Shadab, 1976, pp. 2, 4, 7, fig. 16.

Cryptocellus glenoides (misidentification, in part): Cooke and Shadab, 1973, p. 14, figs. 5, 15 (female allotype only, from Cerro Campana, Panamá, Panama, in MCZ, examined).

DIAGNOSIS: *Cryptocellus isthmius* is a distinctive species easily recognized by the folded prolateral ridge of the male tarsal process (fig. 8) and the elongated spermathecae (figs. 18, 19); it may be closely related to *C. goodnighti* (as indicated by the very wide anteroventral ledge of the tarsal process).

FEMALE: Described by Cooke and Shadab (1973). Reasons for associating the female allotype of *C. glenoides* with the male holotype of *C. isthmius* are detailed in Platnick and Shadab (1976).

MALE: Described by Cooke and Shadab (1973).

MATERIAL EXAMINED: Only the types (the male was taken in March, 1930, by T. O. Zschokke, the female in September, 1962, by W. L. Brown). The paratype male taken at an unspecified locality in Panama in April, 1924, by F. R. Swift (AMNH) and described by Cooke and Shadab (1973, p. 19) is almost certainly not conspecific with the holotype, but its condition is too poor (having apparently been boiled in some caustic agent) to allow reliable placement.

DISTRIBUTION: Central Panama.

Cryptocellus gamboa, new species
Figures 9, 20, 21

TYPES: Male holotype and female paratype from a Berlese sample of a deep accumula-

tion of leaf litter at Gamboa Pipeline, Canal Zone, Panama (July 25, 1976; S. Levings), deposited in AMNH.

ETYMOLOGY: The specific name is a noun in apposition taken from the type locality.

DIAGNOSIS: *Cryptocellus gamboa* can be recognized by the prolonged tip of the prolateral ridge of the male tarsal process (fig. 9) and the dorsoventrally divided spermathecae (figs. 20, 21); its relationships are obscure.

FEMALE (PARATYPE): Total length, excluding pygidium, 4.77. Carapace 1.62 long, 1.79 wide at front of coxae III, where widest, blackish red, darkest at sides, with small yellow translucent areas at margins opposite coxae II; surface sparsely coated with long white setae, with tubercles only along posterior margin, with median longitudinal and paired lateral oblique depressions. Cucullus 0.79 long, 0.95 wide, coloration and setation as in carapace, with about eight tubercles along distal margin and only slightly protuberant lateral lobes. Left chelicera: movable finger flattened posteriorly, very slightly widened transversely, armed with nine teeth of which middle one is greatly reduced, others subequal; fixed finger armed with five teeth of which most distal is greatly enlarged, others subequal. Sternal region with coxae I not reaching tritosternum; coxae II meeting along their posterior five-sevenths, their suture line almost twice as long as that of coxae III; coxae IV meeting anteriorly. Abdomen 3.36 long, 2.39 wide near middle of tergite 12, where widest, coloration and setation as in carapace except for dark orange articular membranes; tubercles restricted to transverse band on tergite 9 and anterior half of sternite 10; median plates of tergites 11–13 with paired oblique anterolateral depressions, those of tergites 11 and 12 much wider than long, of tergite 13 as long as wide; corresponding sternites with similar depressions. Pygidium without notch in posterior dorsal margin of basal segment, with slight notch in ventral margin. Palpal coxae red, other segments orange; trochanters with few scattered tubercles; coxae each with two thick white setae posteriorly along inner margin. Leg formula 2431. Leg II blackish

red, other legs lighter, tarsi lightest, coated with long white setae; tubercles very few, scattered, clustered only on metatarsal ridges and tarsomeres. Measurements:

	I	II	III	IV	Palp
Coxa	0.70	0.96	0.86	0.79	0.37
Trochanter I	0.45	0.72	0.53	0.53	0.34
Trochanter II	—	—	0.51	0.52	0.34
Femur	1.04	1.73	1.16	1.22	0.83
Patella	0.64	0.92	0.76	0.77	—
Tibia	0.82	1.37	0.83	0.86	1.28
Metatarsus	0.97	1.53	0.86	0.93	—
Tarsus	0.47	1.51	0.78	0.88	0.20
Total	5.09	8.74	6.29	6.50	3.36

Second legs slightly widened; femur I less than three, femur II about three and one-half times as long as wide. Tarsal claws large, evenly curved. Posterior genital lip and spermathecae as in figures 20, 21.

MALE (HOLOTYPE): As in female, except for the following: Total length 4.39. Carapace 1.55 long, 1.73 wide. Cucullus 0.73 long, 0.94 wide, without distal tubercles. Movable finger of left chelicera with additional denticle between third and fourth most proximal tooth. Abdomen 3.02 long, 2.28 wide; median plate of tergite 13 slightly longer than wide. Pygidium without ventral notch. Palpal femur with scattered proximal tubercles. Leg formula 2341. Measurements:

	I	II	III	IV	Palp
Coxa	0.62	0.90	0.83	0.74	0.40
Trochanter I	0.40	0.54	0.50	0.54	0.39
Trochanter II	—	—	0.56	0.53	0.29
Femur	1.04	1.84	1.26	1.37	0.86
Patella	0.61	0.99	0.75	0.78	—
Tibia	0.79	1.36	0.79	0.84	1.22
Metatarsus	0.90	1.55	0.83	0.95	—
Tarsus	0.42	1.63	1.30	0.86	0.16
Total	4.78	8.81	6.82	6.61	3.32

Tarsal process as in figure 9.

OTHER MATERIAL EXAMINED: One deutonymph taken with the types (AMNH).
DISTRIBUTION: Central Panama.

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