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THE ONYCHOPHORES OF PANAMA AND THE
CANAL ZONE

By AUSTIN H. CLARK and JAMES ZETEK

For the past dozen years the junior author has been interested in collecting and observing the several species of Onychophora occurring in Panama and the Canal Zone. He sent to the senior author a collection including 82 specimens from various localities, among which were representatives of all but one (*Peripatus ruber*) of the species recorded from the region; this omission, however, was more than compensated by the presence of two species (*Oroperipatus eisenii* and *Epiperipatus biolleyi*) not previously known from this area, although the first has been reported both from farther north and from farther south.

The number of species of Onychophora now known from Panama and the Canal Zone is unusually large for a region of such limited extent, amounting to no less than seven, distributed in four genera. These seven species are: *Oroperipatus eisenii*, *O. corradi*, *Macroperipatus geayi*, *Peripatus ruber*, *Epiperipatus brasiliensis*, *E. edwardsii*, and *E. biolleyi*.

The richest locality was at El Cermeno, where four species, *Oroperipatus eisenii*, *O. corradi*, *Epiperipatus edwardsii*, and *E. biolleyi*, were found. Here the coconut habitat was the most productive, and they were rather common. These palms were not more than 5 years old, and the sheaths of the fronds were usually a foot or two from the ground. All it was necessary to do was to pull off these dead sheaths.

It is quite damp where the onychophores are found. There were not many rocks or boards on the ground, which may account for the presence of these creatures under the coconut-palm sheaths.

From Barro Colorado Island three species are now known, *Oroperipatus corradi*, *Macroperipatus geayi*, and *Epiperipatus brasiliensis* var. *vagans*.

Dr. Waldo L. Schmitt has found onychophores in the dry season under rocks where the soil remained moist in a dry stream bed, and *O. eisenii* and *E. biolleyi* have been found under stones by the sides of streams. One species has been found in bromelias in Central America, though not in Panama.

As the records of the species of Onychophora known from Panama and the Canal Zone are widely scattered, it has seemed worth while to include all of them herein, together with a key for their identification and a bibliography.

KEY TO THE ONYCHOPHORA OCCURRING IN PANAMA AND THE CANAL ZONE

- a*¹. Urinary papilla of legs IV and V included in third arc of ambulatory pad; 4 foot papillae, 2 on each side of foot.
- b*¹. Urinary papillae of legs IV and V dividing third arc into 2 segments of which the posterior is smaller than the anterior, though much broader than long; urinary tubercle wholly united to anterior portion of arc; 26-29 (usually 28) pairs of legs in females, 24-25 (usually 25) in males; length 14-39 mm.-----**Oroperipatus corradi**
- b*². Urinary papillae of legs IV and V dividing third arc into 2 segments of which the posterior is very small, scarcely broader than long; urinary tubercle more or less independent of anterior segment; 27-29 (usually 28) pairs of legs in females, 23-26 (usually 25) in males; length 13-70 mm.-----**Oroperipatus eisenii**
- a*². Urinary papilla on legs IV and V below third arc, deeply indenting fourth; 3 foot papillae, 2 anterior and 1 posterior.
- b*¹. Papillae of dorsal surface each on an oblong or squarish base, the oblong bases elongated in direction of long axis of animal; 30-33 pairs of legs in females, 28 in males; length 27-100 mm.----**Macroperipatus geayi**
- b*². Papillae of dorsal surface on highly irregular bases, the plications usually appearing undivided.
- c*¹. Principal papillae of dorsal surface of very different sizes, some very conspicuous and cylindrical, others smaller and conical, usually 3 of the smaller between 2 of the larger; papillae separated by rather broad intervals in which accessory papillae occur; males usually with crural tubercles on more than 2 pregenital pairs of legs; 29-30 (usually 30) pairs of legs in females; length 29-52 mm.-----**Peripatus ruber**
- c*². Principal papillae of dorsal surface all of same type, passing through all intermediate stages from large to small; papillae closely set, though with occasional accessory papillae between them; in small individuals some of the papillae predominant; crural tubercles of males on 2 pregenital pairs of legs.
- d*¹. On dorsal surface above each pair of legs a few short incomplete plications, tapering to a point on each side intercalated between the others.

e¹. Fourth arc on legs IV and V strongly arched beneath urinary papilla, but not divided into segments; urinary papilla attached to third arc by a narrow band at deepest point in incision in latter; 29-34 pairs of legs in females, 28-30 in males; length 23-56 mm.

Epiperipatus edwardsii

e². Fourth arc on legs IV and V broken into 2 or 3 well-separated unequal parts; urinary papilla wholly independent of third arc; 30 pairs of legs in females, 26-28 in males; length 25-36 mm.

Epiperipatus biolleyi

d². No short incomplete plications on the dorsal surface visible in dorsal view, the plications appearing wholly regular; 31-32 pairs of legs in females, 29 in males; length 37-80 mm. *Epiperipatus brasiliensis*

Genus OROPERIPATUS Cockerell

OROPERIPATUS EISENII (Wheeler)

Peripatus eisenii WHEELER, Journ. Morph., vol. 15, pp. 1-8, pl. 1, 1898 (Tepic, Mexico).—FÜRHMANN, Mém. Soc. Neuchât. Sci. Nat., vol. 5, pp. 176-192, 1912 (Rio Purús, Brazil).

Oroperipatus eiseni A. H. CLARK, Proc. Biol. Soc. Washington, vol. 26, p. 16, 1913 (listed).

New records.—El Cermeno, Panama; J. Zetek, July 8, 1941. *Females*: (1) 55 mm. long, 4 mm. broad, 28 pairs of legs. (2) 52 mm. long, 3.5 mm. broad, 28 pairs of legs. (3) 47 mm. long, 3 mm. broad, 28 pairs of legs. (4) 46 mm. long, 3 mm. broad, 27 pairs of legs. (5) 45 mm. long, 3 mm. broad, 29 pairs of legs. (6) 45 mm. long, 2.5 mm. broad, 28 pairs of legs. (7) 42 mm. long, 2.5 mm. broad, 28 pairs of legs. (8) 37 mm. long, 2 mm. broad, 29 pairs of legs. (9) 30 mm. long, 2 mm. broad, 28 pairs of legs.

El Cermeno, Panama; J. Zetek, July 15, 1941. *Females*: (1) 60 mm. long, 3.5 mm. broad, 28 pairs of legs. (2) 59 mm. long, 3.5 mm. broad, 28 pairs of legs. (3) 55 mm. long, 3.5 mm. broad, 28 pairs of legs. (4) 53 mm. long, 3.5 mm. broad, 28 pairs of legs. (5) 52 mm. long, 3.5 mm. broad, 28 pairs of legs. (6) 50 mm. long, 3.5 mm. broad, 28 pairs of legs. (7) 48 mm. long, 4 mm. broad, 28 pairs of legs. (8) 43 mm. long, 4 mm. broad, 28 pairs of legs. *Male*: (1) 30 mm. long, 2 mm. broad, 25 pairs of legs.

El Cermeno, Panama; J. Zetek, August 5, 1941. *Females*: (1) 60 mm. long, 3.5 mm. broad, 28 pairs of legs. (2) 55 mm. long, 3 mm. broad, 28 pairs of legs.

Panama City, Panama; J. Zetek, September 1939. *Females*: (1) 70 mm. long, 3.5 mm. broad, 28 pairs of legs. (2) 69 mm. long, 4 mm. broad, 28 pairs of legs. (3) 65 mm. long, 3.5 mm. broad, 28 pairs of legs. (4) 64 mm. long, 3 mm. broad, 28 pairs of legs. (5) 61 mm. long, 3.5 mm. broad, 28 pairs of legs. (6) 60 mm. long, 3 mm. broad, 28 pairs of legs.

Range.—Mexico (Tepic); Panama (El Cermeno, Panama City); Brazil (Rio Purús).

Note.—At El Cermeno this species was found in situations similar to those favored by *O. corradi*.

OROPERIPATUS CORRADI (Camerano)

Peripatus corradi CAMERANO, Boll. Mus. Zool. Anat. Comp. Univ. Torino, vol. 13, No. 316, pp. 2, 3, 1898 (Ecuador).—BOUVIER, Ann. Sci. Nat., ser. 9, zool., vol. 2, p. 120, pl. 3, fig. 15, pl. 4, figs. 29, 30, text figs. 6, p. 15, 18, p. 20, 42, p. 38, 63, p. 124, and 64, 65, p. 125, 1905.

Oroperipatus corradoi A. H. CLARK, Proc. Biol. Soc. Washington, vol. 26, p. 18, 1913 (listed); Smithsonian Misc. Coll., vol. 63, No. 2, p. 1, 1914 (Ancon, Canal Zone; notes); Zool. Anz., vol. 45, No. 4, p. 146, 1914 (Ancon).—FUHRMANN, Abh. Senck. naturf. Ges., vol. 36, Heft 2, pp. 277–283, 1915.—BRUES, Psyche, vol. 32, No. 3, p. 159, 1925 (Canal Zone).

New records.—El Cermeno, Panama; J. Zetek, July 8, 1941. *Females*: (1) 32 mm. long, 2 mm. broad, 28 pairs of legs. (2) 30 mm. long, 2.5 mm. broad, 28 pairs of legs. (3) 28 mm. long, 2.5 mm. broad, 27 pairs of legs. (4) 25 mm. long, 1.5 mm. broad, 28 pairs of legs. (5) 16 mm. long, 1.5 mm. broad, 28 pairs of legs. (6) 15 mm. long, 1 mm. broad, 29 pairs of legs. *Males*: (1) 31 mm. long, 2 mm. broad, 25 pairs of legs. (2) 30 mm. long, 2 mm. broad, 25 pairs of legs. (3) 28 mm. long, 2 mm. broad, 25 pairs of legs. (4) 28 mm. long, 2 mm. broad, 25 pairs of legs. (5) 27 mm. long, 2 mm. broad, 25 pairs of legs. (6) 27 mm. long, 2 mm. broad, 25 pairs of legs. (7) 26 mm. long, 1.5 mm. broad, 25 pairs of legs. (8) 23 mm. long, 1.5 mm. broad, 25 pairs of legs. (9) 18 mm. long, 1.5 mm. broad, 25 pairs of legs. (10) 18 mm. long, 1.5 mm. broad, 25 pairs of legs. (11) 18 mm. long, 1.5 mm. broad, 25 pairs of legs. (12) 17 mm. long, 1.3 mm. broad, 25 pairs of legs. (13) 15 mm. long, 1 mm. broad, 25 pairs of legs.

Barro Colorado Island, Canal Zone; J. Zetek, August 1933. *Males*: (1) 33 mm. long, 2.5 mm. broad, 25 pairs of legs. (2) 30 mm. long, 2.5 mm. broad, 25 pairs of legs.

Range.—Ecuador (Quito, Balzar, Guayaquil); Canal Zone (Ancon, Barro Colorado Island); Panama (El Cermeno).

Notes.—At El Cermeno this species was found between the broad sheaths of old fronds and the trunks of coconut palms roughly 5 years old, and also under boards resting on the ground. On Barro Colorado Island it was usually met with under logs and stones and occasionally with the ground-termite stakes. At Ancon it was found in earth to the depth of about 1 foot about roots of papaya.

Genus MACROPERIPATUS A. H. Clark

MACROPERIPATUS GEAYI (Bouvier)

Peripatus geayi BOUVIER, Comptes Rendus Acad. Sci. Paris, vol. 128, p. 1345, 1899 (French Guiana); Ann. Sci. Nat., ser. 9, zool., vol. 2, p. 200, pl. 6, figs. 42, 43, text figs. 1, p. 36, and 86, p. 203, 1905.

Macroperipatus geayi A. H. CLARK, Proc. Biol. Soc. Washington, vol. 26, p. 17, 1913 (listed); Smithsonian Misc. Coll., vol. 63, No. 2, p. 2, 1914 (from Clark, 1913); vol. 65, No. 1, p. 23, 1915 (from Clark, 1913).

Peripatus (Macroperipatus) geayi A. H. CLARK, Smithsonian Misc. Coll., vol. 60, No. 17, pp. 1-5, 1913 (La Chorrera, Panama; notes).—BRUES, Psyche, vol. 32, No. 3, p. 160, 1925 (from Clark, 1913).

New records.—Barro Colorado Island, Canal Zone; J. Zetek, July 1941. *Females*: (1) 100 mm. long, 8 mm. broad, 33 pairs of legs. (2) 70 mm. long, 4.5 mm. broad, 31 pairs of legs. (3) 70 mm. long, 4 mm. broad, 30 pairs of legs. (4) 64 mm. long, 4 mm. broad, 30 pairs of legs. (5) 38 mm. long, 3 mm. broad, 33 pairs of legs.

Pedro Miguel, Canal Zone; J. Zetek, April 1938. *Females*: (1) 84 mm. long, 5 mm. broad, 32 pairs of legs. (2) 59 mm. long, 3 mm. broad, 31 pairs of legs. *Males*: (1) 30 mm. long, 2 mm. broad, 28 pairs of legs. (2) 27 mm. long, 1.5 mm. broad, 28 pairs of legs.

Balboa, Canal Zone; J. Zetek, 1944. *Female*: (1) 76 mm. long with 33 pairs of legs.

Range.—French Guiana; Colombia; Panama (La Chorrera); Canal Zone (Barro Colorado Island, Pedro Miguel, Balboa).

Notes.—On Barro Colorado Island this species occurred under fallen logs and in leaf mold, at Pedro Miguel under stones and boards on the ground. Large onychophores from the Orsini citrus orchard close to La Campana were collected under fallen logs and under stones. These were not seen by the senior author but were presumably of this species.

Genus PERIPATUS Guilding

PERIPATUS RUBER Fuhrmann

Peripatus ruber FUHRMANN, Mém. Soc. Neuchât. Sci. Nat., vol. 5, p. 190, 1912 (Rancho Redondo, Costa Rica); Zool. Anz., vol. 42, No. 6, p. 247, figs. 12-14, p. 248, 1913 (redescribed).—A. H. CLARK, Smithsonian Misc. Coll., vol. 65, No. 1, p. 24, 1915 (Lino; from Clark, 1914).—FUHRMANN, Abh. Senck. naturf. Ges., vol. 36, Heft 2, pp. 277-283, 1915.

?*Peripatus (Epi-peripatus) biolleyi* var. *betheli* COCKERELL, Proc. Biol. Soc. Washington, vol. 26, p. 87, 1913 (Puerto Barrios, Guatemala).

Peripatus (Peripatus) ruber A. H. CLARK, Zool. Anz., vol. 45, No. 4, p. 145, 1914 (Lino, near Bouquete, Province of Chiriquí, Panama; 4,100-4,500 feet; notes on 3 specimens).

Range.—Costa Rica (Rancho Redondo); Panama (Lino, near Bouquete, Province of Chiriquí, 4,100-4,500 feet); ?Guatemala (Puerto Barrios).

Note.—From the description Professor Cockerell's *Peripatus (Epi-peripatus) biolleyi* var. *betheli* appears to be *Peripatus ruber*. His type specimen is not at present available for reexamination.

Genus EPIPERIPATUS A. H. Clark

EPIPERIPATUS BRASILIENSIS (Bouvier)

Peripatus brasiliensis BOUVIER, Comptes Rendus Acad. Sci., Paris, vol. 129, p. 1031, 1899; Ann. Sci. Nat., ser. 9, zool., vol. 2, p. 269, pl. 7, fig. 63,

pl. 8, figs. 64, 65, text figs. 100-103, p. 273, 1905 (Santarém; ?San Pablo, Panama); Bull. Soc. Philomatique, ser. 9, vol. 10, pp. 50-52, 1908 (Mérida, Venezuela; San Pablo, Panama, confirmed).—FUHRMANN, Mém. Soc. Neuchât. Sci. Nat., vol. 5, p. 190, 1912 (Brazil and Guiana to Panama).

Epiperipatus brasiliensis A. H. CLARK, Proc. Biol. Soc. Washington, vol. 26, p. 18, 1913 (listed); Smithsonian Misc. Coll., vol. 63, No. 2, p. 2, 1914 (listed from Panama); vol. 65, No. 1, p. 23, 1915 (San Pablo, Panama; from Bouvier).—FUHRMANN, Abh. Senck. naturf. Ges., vol. 36, Heft 2, pp. 277-283, 1915.

Peripatus (Epiperipatus) brasiliensis var. *vagans* BRUES, Psyche, vol. 32, No. 3, p. 162, 1925 (Barro Colorado Island, Las Cascadas, Fort Sherman, and Chinilla, Canal Zone; Río Tapia, Panama; description).

New records.—Barro Colorado Island, Canal Zone; J. Zetek, January-May, 1942. *Females*: (1) 50 mm. long, 3.5 mm. broad, 33 pairs of legs. (2) 40 mm. long, 3 mm. broad, 33 pairs of legs. (3) 30 mm. long, 2 mm. broad, 31 pairs of legs. (4) 23 mm. long, 2 mm. broad, 33 pairs of legs. *Males*: (1) 30 mm. long, 2.5 mm. broad, 29 pairs of legs. (2) 18 mm. long, 2 mm. broad, 29 pairs of legs. (3) 17 mm. long, 2 mm. broad, 29 pairs of legs.

Barro Colorado Island, Canal Zone; J. Zetek, August 1933. *Male*: 42 mm. long, 2.5 mm. broad, 29 pairs of legs.

Balboa, Canal Zone; J. Zetek, 1944. *Females*: (1) 55 mm. long, 32 pairs of legs. (2) 52 mm. long, 32 pairs of legs. (3) 13 mm. long, 31 pairs of legs.

Range.—Brazil (Santarém); Venezuela (Mérida); Panama (San Pablo, Río Tapia); Canal Zone (Barro Colorado Island, Balboa, Las Cascadas, Fort Sherman, Río Chinilla).

Notes.—Individuals from Panama and the Canal Zone represent the variety *vagans* Brues.

On Barro Colorado island this species was usually found under fallen logs in the forest and in leaf mold, occurring also between the broad sheaths of old fronds and the trunk of several of the large palms. It was met with occasionally in the ground-termite nests where it was discovered when the test stakes were pulled up.

EPIPERIPATUS EDWARDSII (Blanchard)

Peripatus edwardsii BLANCHARD, Ann. Sci. Nat., zool., ser. 3, vol. 8, p. 140, 1847 (Cayenne); Rech. Anat. et Zool. faites pendant un Voyage en Sicile, pt. 3, p. 64, 1849.

Peripatus edwardsi BOUVIER, Ann. Sci. Nat., zool., ser. 9, vol. 2, p. 301, pl. 9, figs. 74-79, text figs. 5, p. 15, and 111, p. 308, 1905 (Panama; Darién).—FUHRMANN, Mém. Soc. Neuchât. Sci. Nat., vol. 5, p. 190, 1912 (Brazil and Guiana to Panama).

Epiperipatus edwardsi A. H. CLARK, Proc. Biol. Soc. Washington, vol. 26, p. 18, 1913 (listed); Smithsonian Misc. Coll., vol. 63, No. 2, p. 2, 1914 (Isthmus of Panama; from Bouvier); vol. 65, No. 1, p. 23, 1915 (Panama; Darién; from Bouvier).—FUHRMANN, Abh. Senck. naturf. Ges., vol. 36, Heft 2, pp. 277-283, 1915 (listed).

New Records.—El Cermeno, Panama; J. Zetek, July 8, 1941.
Female: (1) 35 mm. long, 2 mm. broad, 30 pairs of legs.

Balboa; J. Zetek, 1944. *Females*: (1) 50 mm. long, 34 pairs of legs.
 (2) 50 mm. long, 33 pairs of legs. (3) 45 mm. long, 33 pairs of legs.
 (4) 35 mm. long, 33 pairs of legs. (5) 25 mm. long, 33 pairs of legs.
Males: (1) 28 mm. long, 29 pairs of legs. (2) 27 mm. long, 29 pairs
 of legs. (3) 25 mm. long, 30 pairs of legs. (4) 25 mm. long, 29
 pairs of legs. (5) 25 mm. long, 29 pairs of legs.

Range.—Cayenne; Surinam (Paramaribo); Venezuela (Caracas,
 Mérida, Valencia, Haut-Sarare, Bas Sarare); Colombia (Santa
 Marta); Panama (El Cermeno, Panama Station, Panama Railway);
 Canal Zone (Balboa); Darién.

Notes.—At El Cermeno this species was found in situations similar
 to those frequented by *Oroperipatus corradi*, though more often under
 boards resting on the ground.

EPIPERIPATUS BIOLLEYI (Bouvier)

Peripatus biolleyi BOUVIER, Bull. Soc. Ent. France, 1902, p. 258 (San José, Costa
 Rica); Ann. Sci. Nat., ser. 9, zool., vol. 2, p. 321, pl. 10, fig. 85, text figs. 115,
 116, p. 323, and figs. 117, 118, p. 324, 1905.

Epiperipatus biolleyi A. H. CLARK, Proc. Biol. Soc. Washington, vol. 26, p. 18,
 1913.—FUHRMANN, Abh. Senck. naturf. Ges., vol. 36, Heft 2, pp. 277-283,
 1915.—A. H. CLARK, Proc. U. S. Nat. Mus., vol. 85, p. 3, 1937 (Parismina
 and La Caja, San José, Costa Rica).

New record.—El Cermeno, Panama; J. Zetek, July 1941. *Females*:
 (1) 41 mm. long, 4 mm. broad, 30 pairs of legs. (2) 38 mm. long,
 3 mm. broad, 30 pairs of legs.

Range.—Costa Rica (San José, and La Caja, San José, Surubres
 near San Mateo, and Parismina); Panama (El Cermeno).

Note.—At El Cermeno this species occurred in much the same
 situations as *E. edwardsii*.

ADDENDUM

Dr. Otto Fuhrmann (1912, p. 190) gives *Epiperipatus simoni*
 (Bouvier) as ranging from Brazil and Guiana to Panama. There are
 no published records of this species from anywhere west of Venezuela.
 He also included "Brazil" in the range of *Epiperipatus edwardsii*, but
 we know of no record of this species from that country.

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1906. Observation biologique. Le *Peripatus edwardsi* au Brésil. *Bull. Soc. Ent. France*, 1906, p. 268.
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1917. A new species of *Peripatus* from the mountains of northern Peru. *Bull. Mus. Comp. Zool.*, vol. 61, pp. 383-387, 1 pl.
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