

ON SOUTH AMERICAN MALACOPODA

by Eveline du Bois-Reymond Marcus

(with 4 plates)

The common title for a paper on two new species of *Oroperipatus*, *O. weyrauchi* and *O. omeyrus*, from Peru; a new marine Arthrotardigrade, *Orzeliscus belopus*, n. gen., n. sp., from Brazil; and a new occurrence of *Echiniscoides sigismundi* (M. Schultze) can be justified even without uniting Onychophora and Tardigrada in one Subcladus, as f. ex. the text-book by Claus, Grobben, and Kühn does. Also the chapter that discusses the systematic position of the Tardigrades in "Bronn" (Marcus 1929, p. 130-144) evidences several homologies in the two Classes, and Cuénot (1949, p. 59) assumes the origin of the Tardigrades not far from that of the Onychophores.

Dr. WOLFGANG K. WEYRAUCH (Lima) kindly sent us 3 tubes with Onychophores that he had collected at various localities of Peru. The material belongs to two new species of the genus *Oroperipatus* Cockerell 1908 (Clark 1913, p. 16). This genus corresponds to the so-called Andean group of species (Bouvier 1905, p. 69, 75), which exhibit great uniformity (Clark 1915, p. 13). They inhabit the Pacific slope of the Andes, but also the mountainous and low regions east of the watershed, extending north to Panama and Mexico.

Morphologically *Oroperipatus* is characterized by 4 or more pedal papillæ, while *Peripatus* has only 3. The second disjunctive feature, viz. the excretory tubercle within the third arc of the sole (*Oroperipatus*), and between the third and fourth arc, frequently attached to the third (*Peripatus*), is less rigorous (Dunn 1943, p. 2).

In comparison with Panama, from where not less than seven species of Peripatidæ are known (Clark & Zetek 1946), the number of two hitherto well known from Peru (Fuhrmann 1915; Brues 1917) is extraordinary small. It only proves that these animals have been little searched for in the latter country.

Oroperipatus weyrauchi, n. sp. (Plate 1)

The two animals measure 45 and 35 mm. in length; 5 and 4 mm. in breadth; and 3,5 and 2 mm. in height. Thus they are broader than high (Fig. 1, 2); the back is convex and the ventral side slightly concave. The bigger specimen is a female, the smaller one a male, as is frequent in Peripatids. The bigger female however has only 38 pairs of legs, whereas the smaller male has 40. Generally the males of the Peripatidæ have fewer legs than the females, but not rarely the maximum number of the males surpasses the minimum of the females (Zacher 1933, p. 105; Leitão de Carvalho 1942, p. 59-60).

The colour in alcohol is a delicate grayish brown with a darker brown pattern (Fig. 3) on the back. The colour is most intense on the tip of the accessory papillæ, where the brown knobs of the skin are densest, while the principal papillæ generally appear lighter than the rest of the skin. The light mid-line is distinct. It runs in a median stripe of light colour that is flanked by darker lines. These are widened laterally and form triangles over the legs. The tips of the dark triangles are directed each towards a conspicuous light principal papilla that marks the indentation of a lateral dark zone, the inner and outer parallel limits of which follow the outline of the medial triangles at a certain distance. On the flanks of the female a third dark design forms triangles with their points upwards and their bases in the intervals of the legs.

The legs are cream-coloured with dark papillæ, and the ventral side of the animals is also much lighter than the back. The feet are whitish with brown claws and yellow creeping pads. The antennæ have the same colour as the back. The oral papillæ are white.

The light organs ("organes claires" of Bouvier) are hardly visible. The plicæ of the back alternate in breadth. There are 12 to each segment, two of which are incomplete (Fig. 4) and end over the base of the leg. In some cases they reappear farther downwards. Seven plicæ of equal size pass between the legs; those beginning at the inner side of the legs are irregular and numerous, they flank the ventral organs (Fig. 10, v).

The principal skin papillæ are larger on the broad plicæ than on the narrow ones (Fig. 5). They vary greatly in size and show all intergradations to accessory papillæ, so that it is often difficult to decide whether a papilla is principal or accessory. The upper part of the primary papillæ is a slender cone (Fig. 6) topped with a bristle and about one third of the diameter of the quadrangular base. The accessory papillæ stand between the principal ones in a single row, never one beside the other.

The diameter of the eye is 0,3 mm. in both specimens. The antenna has about 43 broad rings. At the tip there are six broad rings, then four narrow and four broad ones alternate. These 10 broad rings have two rings of bristles each. The following rings have always only one row of papillæ. They are occasionally separated by accessory rings that are much reduced and often incomplete.

The external blade of the jaw (Fig. 7) has one big and two accessory teeth; the inner blade (Fig. 8) has two accessory teeth, a short diastema, and a saw of 10 denticles that diminish in size from the foremost to the last.

The number of legs is 38-40 pairs. As 40 pairs were found in a male, females may be expected to have even more. The sole has five arcs, the first of which is the broadest, the fifth the narrowest. The leg has 14 transverse rows of papillæ. The slit of the coxal gland is long, the gland is occasionally everted (Fig. 10, e). In the male there is one crural tubercle on each of the third and fourth legs from behind (Fig. 10, c). On the foot (Fig. 9) there are four papillæ, two anterior and two posterior ones; exceptionally there are five. The ventral tubercles of the foot have the distal pair one bristle each and the proximal pair three bristles.

The excretory tubercle on the 4. and 5. leg is united to the anterior part of the third arc and bent downwards, so that it emarginates the fourth arc (Fig. 9). The posterior part of the third arc is completely separated from the anterior. It is a little longer than high. The proportion of height to length varies, in the male it is 68,5% on the fourth left leg and 81,3% on the fifth right leg.

Occurrence : Peru, Yurac on river Aguaytia, left affluent of the Ucayali ; 300 m. In decaying trunk, one male and one female in June 1947.

The species is named in honour of the collector, Dr. WOLFGANG K. WEYRAUCH (Lima).

Discussion of *Oroperipatus weyrauchi*

Bouvier's monograph (1905) lists 12 species of the later genus *Oroperipatus*. Since then further five have been described by Fuhrmann (1914 ; 1915), Brues (1917), and Dunn (1943).

Five species of Bouvier's key (1905, p. 76-77) must be compared with *weyrauchi* ; the rest have fewer legs, equal plicæ, and the fifth arc of the sole is rudimentary or absent. Of the 5 species, *O. ecuadorensis* (Bouv.) and *O. lankesteri* (Bouv.) are at once distinguishable from the new species by more than 4 papillæ on most of their feet. In *O. tuberculatus* (Bouv.) several secondary skin-papillæ lie one beside the other ; in *O. quitensis* (Schmarda) these papillæ are very rare, nearly absent ; *O. cameranoi* (Bouv.) differs from *weyrauchi* by its dark colour, fewer legs (34-36 in females), rare occurrence of accessory papillæ between the primary ones, and rudimentary fifth arc of the sole.

Less numerous legs and an incomplete or absent fifth arc of the sole separate *O. bimbergi* (Fuhrmann 1913, p. 242 ; 1914, p. 177), *O. multipodes* (Fuhrmann 1913, p. 244 ; 1914, p. 184), and *O. clarki* (Dunn 1943, p. 2) from the present species.

The two earlier described valid peruvian species *O. bluntschlii* Fuhrmann (1915, p. 277) from low eastern and *O. peruvianus* Brues (1917, p. 383) from northern Peru (near Huancabamba, 1830 m.) resemble *O. weyrauchi* in the number of their legs (40 pairs in females of *bluntschlii* ; 36-37 in *peruvianus*), generally only 4, sometimes (*bluntschlii*) or very rarely (*peruvianus*) 5 pedal papillæ, and 5 complete arcs on the sole.

Important characters of *bluntschlii* that distinguish it from *weyrauchi* are : length 100 mm. ; colour light gray with a reddish brown tinge and dark reddish brown cutaneous papillæ ; pattern not developed ; light line nearly absent ; alternance of a broad and a narrow plica indistinct ; number of principal papillæ nearly the same on primary and secondary plicæ ; median ventral organs not recognizable ; and inner blade of the jaw with 4-5 accessory teeth and 9 denticles.

O. peruvianus differs from *weyrauchi* principally by the following characters : maximum number of legs in the female 37 pairs ; third arc of the sole not completely divided by the excretory tubercle ; little intergradation of size between bigger and smaller primary papillæ ; accessory papillæ nearly wanting ; and inner blade of the jaw with 3 accessory teeth and 7-8 denticles that follow immediately without a diastema.

A doubtful species from Peru (Bouvier 1907, p. 300) is *Peripatus peruanus* Grube 1876 that has 28 pairs of legs.

Oroperipatus omeyrus, n. sp. (Plate 2)

The present lots consist of 4 females from San José de Lourdes of 22, 20, 18, and 16 mm. length, and one from Sahuayaco of 18 mm. The breadth varies from 3-4,5 mm.; the height is slightly smaller. The back is evenly arched, the ventral side a little concave. The light mid-line is clearly visible; the light organs (Bouvier's "organes claires") are occasionally recognizable. The ventral organs are visible.

The colour of the back is a blackish red. Generally the tip of the papillæ is darkest; some lighter principal papillæ form 5 longitudinal rows on each side of the anterior part of the body; they stand on alternate plicæ. The ventral side is lighter and brownish. The legs are also lighter in four of my specimens; in the smallest they are as dark as the back. The antennæ have the same colour as the back; the oral papillæ are whitish.

The plicæ are of equal breadth in the middle of the back; there are 12 to each segment. They are not quite regular, sometimes rudimentary narrow intermediate folds with accessory papillæ occur between them (Fig. 13). Incomplete folds over the legs are extremely rare; 7 plicæ pass to the ventral side, where the plication is regular.

The principal papillæ vary in size, without a clear dominance of the biggest. On alternate plicæ they are bigger than on those between. The upper part of the principal papillæ is globular and as wide as the base (Fig. 14). Accessory papillæ are distributed between the principal ones. Generally they stand on the sides of the plica or even three one beside the other.

The diameter of the eye is 0,1 mm. The antennæ (Fig. 15) have about 30 broad rings, the seven outermost of which with 2 rows of bristles each. Then the broad rings alternate irregularly with more or less narrow ones, that are in part incomplete, in part nearly as big as the broad ones. Except the seven rings of the tip all have only a single row of papillæ.

The outer blade of the jaw (Fig. 16) has one big and a smaller accessory tooth; the inner blade (Fig. 17) has two accessory teeth, a very short and deep diastema, and a saw of 7-10 denticles, the innermost of which are smaller than the first.

The number of legs is 24-26 pairs in all the present females. The largest contains two well developed embryos, one with 26 pairs of legs, that is certainly also a female; and the other with 22 pairs, that is very probably a male.

The creeping sole has 4 arcs that diminish somewhat in height from the first to the last, and sometimes a rudimentary fifth (Fig. 18). The slit of the coxal glands, that are often everted, is long. There are four foot-papillæ, two on each side of the foot. All foot tubercles bear no more than one bristle in the present material.

The excretory tubercle of the fourth and fifth leg bisects the third arc and emarginates the fourth a little. The posterior part of the third arc is longer than high; the proportion varies, in the fourth right leg of the 16 mm. specimen it is 72%, in the fifth left leg of the same 63,3%.

Occurrence: Peru, Sahuayaco in the Urubamba Valley (between Abancay and Maras), 800 m.; San José de Lourdes, 1000 m. Four females from the first locality in december 1947, and one from the second in august 1948.

Discussion of *Oroperipatus omeyrus*

With less than 32 pairs of legs and with plicæ of equal breadth *O. omeyrus* belongs to the second group of Bouvier's key (1905, p. 77). Of this group the species *O. goudoti* (Bouv.), *soratanus* (Bouv.), *balzani* (Camerano), and *intermedius* (Bouv.) need not be compared, because their incomplete plicæ are disposed segmentally. *O. omeyrus* is more related to the three remaining species (*corradi*, *eisenii*, *belli*) of Bouvier's second group. As the description shows, *omeyrus* is indeed very similar to *O. corradi* (Camerano 1898, p. 310; 1898a, p. 2). As this original spelling cannot be attributed to a "lapsus calami", Clark & Zetek (1946, p. 208) are right to revalidate it. After Bouvier's diagnosis of *O. corradi* (1905, p. 120) the antenna, the inner blade of the jaw, and the number of legs show the principal differences against *omeyrus*. The intermediate rings of the antenna are much reduced in *corradi*; the saw of the inner blade of the jaw consists of 6-7 denticles; and the females have 26-29, generally 28, pairs of legs. Moreover the proximal of the ventral tubercles of the foot bear at least two bristles each in *corradi*. This species is known from Ecuador, where it was found on the coast (Guayaquil) as well as in the Cordillera (Balzar; Quito), and from Panama (Clark 1914; Brues 1925; Clark & Zetek 1946).

The range of *corradi* is overlapped by the distribution of *O. eisenii* (Wheeler 1898, p. 1), originally reported from Tepic in Mexico (1220 m. high), and later from Panama (Clark & Zetek 1946, p. 207), and a not specified brazilian locality on the river Purus (Fuhrmann 1914, p. 190). Also this species, that is "excessively similar" (Dunn 1943, p. 3) to *corradi*, must be discussed.

Bouvier (1905, p. 120, 128) examined specimens of *corradi* and *eisenii*, which he had received from Camerano and Wheeler, and distinguished the two species by three characteres: 1) the excretory tubercle lies within the third arc of the sole, perhaps a little nearer to the proximal border (*corradi*); the tubercle is united only to the proximal border of the third arc (*eisenii*); 2) the excretory tubercle divides the arc into two segments in both species, and in both the posterior part is smaller than the anterior, but in *corradi* this posterior segment is longer than high, and in *eisenii* nearly just as high as long; 3) the arcs (pads, bands) of the sole decrease in height from the first, the most distal, to the fourth (*corradi*), or are of equal height (*eisenii*).

In *omeyrus*, *corradi*, and *eisenii* the excretory tubercle bisects the third pad completely and may indent the fourth. With regard to the position of the tubercle *omeyrus* agrees with *corradi*, not with *eisenii*. For the examination of Bouvier's second character with security the fourth or fifth leg must be cut off and flattened. Bouvier's terms long and broad for the two extensions of the arcs have been used by Clark & Zetek (1946, p. 206) in a sense contrary to that of Bouvier. This may be an error. But Clark & Zetek may also have considered the direction between anterior and posterior

border of the arc as breadth, and that between the claws and the insertion of the leg as length. I call length the always longest extension of the arc, as Bouvier did, and height the shorter one, Bouvier's breadth. Also in the measurements of the posterior segment of the third arc *omeyrus* differs from *eisenii*. Moreover the legs of *eisenii* are more numerous, viz. 27-29 pairs in females, usually 28.

The third of the above mentioned characters that distinguishes *O. corradi* from *O. eisenii* is suppressed in Clark & Zetek's key. I think they are right. Also Brues (1925, p. 159) could not recognize the diminishing height of the four bands on the sole in his material from Panama, that evidently belongs to *corradi*, after the position of the tubercle and the length of the above discussed posterior segment of the third arc. Even in Bouvier's figure 64 the decrease of height from the first to the fourth arc is inconspicuous.

On the antenna of *O. eisenii* three intermediate rings are especially well developed behind the seven-ringed tip, and thus differ from those in *omeyrus*.

O. belli (Bouvier 1905, p. 136) from Ecuador differs from *omeyrus* by size (43 mm.), number of legs (28 in the only female), colour (gray with a slight pink tinge in alcohol), two accessory teeth of the outer mandibular blade, longitudinal furrows between the papillæ, and absence of a fifth arc on the sole.

In the following *Oroperipatus*-species described after the publication of Bouvier's monograph the females have more than 32 pairs of legs: *multi-podes* (Fuhrm.), *bluntschlii* Fuhrm., *peruvianus* Brues, and *weyrauchi*, n. sp.

O. bimbergi (Fuhrm.) with 27-28 pairs of legs is a big species (50-60 mm.), has eyes of 0,38-0,42 mm. in diameter, 3 accessory teeth on the outer blade of the jaw, and on the inner a big and one very small tooth besides a saw of 11-14, most frequently 12, denticles. The female of *O. clarki* (Dunn) has 31 pairs of legs, and the excretory tubercle lies between the third and the fourth arc of the sole. Little is known of *Peripatus peruanus* Grube (Bouvier 1907, p. 300); it is bigger (30 mm.) than *omeyrus* and has 28 pairs of legs.

A new marine Arthrotardigrade

In the last synopsis of the Tardigrada (Marcus 1936, p. 18) the Class is divided into 2 Orders, Heterotardigrada and Eutardigrada. The first are characterized by peculiar appendages of the head, 4-6 equal pedal terminations, uninterrupted cuticular ridges in the pharynx, separate genital and anal opening, and the absence of rectal glands ("Malpighian tubes").

Since then a peculiar animal was found in hot springs of Japan (Rahm 1937). It has a lateral cirrus and claws like a Heterotardigrade, placoids in the pharynx and rectal glands like an Eutardigrade. A new Order, Mesotardigrada, was erected for it.

In *Mopsechiniscus imberbis* (Richters 1907, p. 916) two broad and flat knobs and the two lateral cephalic cirri are the only appendages of the head (du Bois-Reymond Marcus 1944, p. 6). *Mopsechiniscus* however does

not invalidate the respective passage in the diagnosis of the Order, since the Eutardigrada have no lateral cirrus.

Pseudechiniscus islandicus (Richters 1904, p. 374) was described and figured with three series of three separate nuts in the pharynx. In the years that followed the first description this character was neither confirmed nor denied. John Murray, one of the best observers of the Tardigrada, examined *P. islandicus* from Scotland and Shetland (1907, p. 651) without discussing the pharyngeal rods, but in the following paper (1907a, p. 674) he mentions them as present. Coninck (1939, p. 197) figures *P. islandicus* (f. 9-13), but does not mention the presence or absence of the nuts in the pharynx. In any case it seems unavoidable to drop the passage referring to the pharyngeal ridges from the diagnosis of the Order Heterotardigrada.

Two Suborders of the Heterotardigrada are distinguished (Marcus 1936, p. 20), the Arthrotardigrada with toes between the shaft of the foot and its terminations, and the Echiniscoidea, the claws of which insert on the shaft by means of minute papillæ (Thulin 1928, f. 1). E. Schulz (1951, p. 92) modified the cited key a little to include his new *Stygarcetus* and described the pedal terminations of the Arthrotardigrada as: "either toe-shaped with a separate ending, or without toe-like formations but with long claws without secondary hooks." Perhaps the latter negative should be omitted in view of the "Tasthaare" on the inner claws of *St. bradyypus*. Schulz's explanation (p. 89) of the "Tasthaare" as modified toe papillæ is not satisfactory. In correctly refusing to interpret them as secondary claws Schulz only considers Echiniscoidea and Eutardigrada instead of the Onychopodidæ, the claw bearing ledges of which offer a suitable comparison.

The Arthrotardigrada were subdivided into 2 families (Marcus 1936, p. 20). In the first, the Discopodidæ, the 6 toes of each foot end with disc-like expansions. The only genus of this family is *Batillipes* Richters (1909, p. 37) with two species (Marcus 1936, p. 21; 1946).

The second family of the Arthrotardigrada was named Onychopodidæ (Marcus 1934, p. 863), because all species known at that time have claws. There are 4 toes on each foot of the Onychopodidæ. Although the pedal terminations of the species described in the following are finger- or peg-shaped, it is convenient to include it in the Onychopodidæ, as the number of its toes is four.

Two groups of genera can be separated in the family Onychopodidæ. In the first group the toes end with a simple terminal organ, not with a claw bearing secondary hooks. To this group belong *Halechiniscus* Richters (1908, p. 81), *Actinarcetus* Schulz (1935, p. 285; Grell 1937, p. 143), and the new genus *Orzeliscus*. The second group comprehends those genera whose claws are provided with one or more secondary hooks, viz. *Tetrakentron* Cuénot (1892, p. 16), *Bathyechiniscus* Steiner (1926, p. 479), and *Styraconyx* Thulin (1942, p. 3).

I follow Thulin (p. 9) in separating our *Bathyechiniscus tetronyx* (Marcus 1936, f. 35) from Steiner's. Our material found on Sargassum in the region of the Azores (l. c., p. 24) differs from the antarctic specimen by the form of the head and the position of the cephalic appendages. Steiner's drawings of the claws (1926, f. 3, 5) are not sufficiently detailed to reveal the presence or absence of the stalk (Thulin 1942, f. 3, 4). My re-examination of the spe-

cimens from the Azores proved that their claws really have stalks (Fig. 7, y), as Thulin supposed. To judge from the figures also the animals from the east coast of Spain and Mallorca (Rodríguez-Roda 1947, p. 103 f. 1, microf. 1; 1952, p. 48 f. 10, microf. 2), Catalonia (Rodríguez-Roda 1947, f. 1 on p. 103) and probably those from California (Mathews 1938, p. 624) and from Texas (Chitwood 1951, p. 111) come under *Styraconyx sargassi* Thulin (1942, p. 10).

E. Schulz (1951, p. 93) created a third family of the Arthrotardigrada, the Stygarctidæ, "without toes, with 4 claws that insert on the shaft of the foot with their full breadth."

Orzeliscus, gen. nov.

Head with median cirrus; lateral cirri and clavæ arising from common bases. Each leg ends with 4 toes that are provided with peg-shaped terminations.

Type of the genus: *Orzeliscus belopus*, spec. nov.

The common base of lateral cirrus and clava in the present species is frequent among the Arthrotardigrada (Thulin 1942, p. 9). The pedal terminations of *Orzeliscus* are so different from the hitherto known types of adhesive discs and claws, that I considered to introduce a new family. But as long as only one species with such legs is known, it may be classified among the Onychopodidæ, because it has toes and uniform terminations (against the Stygarctidæ) the number of which is four (against the Discopodidæ).

Orzeliscus belopus, n. sp. (Plate 3-4)

The stout body is about twice as long (0,2 mm.) as broad (0,09 mm.), nearly truncate in front, with a round hind end, and long legs (0,05 mm.).

The body is coloured by the brown contents of the intestine, and in some specimens by big cœlomatic yellow cells that are arranged in not always regular pairs. The paired origin of these storing cells ("fat-cells" or "blood-corpules" of the older authors) from the subepidermal layer, the somatic wall of the cœlome, was first described in *Echiniscoides sigismundi* (Marcus 1928, f. 5 on p. 117).

The dorsal skin is finely granulate. The pits are disposed in more or less regular quincunx, a little bigger in the middle and smaller towards the sides. The proximal parts of the legs are dotted still more finely.

In dorsal view (Fig. 1) the anterior border is nearly straight with salient angles, the bases of clava and cirrus lateralis. In lateral aspect (Fig. 4) the front is curved from the dorsal median cirrus to the mouth. The head bears one unpaired cirrus and 5 pairs of appendages, of which all the cirri have a widened basal end and can evidently be partly withdrawn into this base. The cirri are: the unpaired dorsal median cirrus (m), 16 micra long, 2) the two medial internal cirri (i), 16 micra long, on the anterior border, 3) the two medial external cirri (e), 16 micra long, ventrally between border and mouth (q), 4) the two lateral cirri (l), 25 micra long, on the angle of the anterior border, immediately in front of the clava (c). The latter is bolt-

-shaped, broader at the base than at the blunt tip, and 15 micra long. Between internal and external cirri of each side lies a convex disc (p) that represents the papilla cephalica. Behind the common basis of cirrus lateralis and clava the lateral border forms another slight prominence (n) that is also developed in *Batillipes mirus*.

There are no eyes.

Above the fourth legs occur 0,03 mm. long cirri (k), on the 1.-3. leg a small hair (z), 9 micra long, and on the fourth leg a 9 micra long papilla (h) with a small, terminal hair, the so-called distal papilla (Thulin 1942, p. 5).

The long legs consist of the three parts that are typical in the Arthrotardigrada. The basal part (v) is wide and sculptured; the median one (w), slender and smooth. The distal part is widened like a hand and bears the four toes (t). These have each a broad basis that is prolonged into a thin dorsal ledge (u) reaching the tip; their ventral side is a blunt peg of 15 micra length and 2 micra diameter, that is adhesive and slightly notched at the tip (Fig. 6). I could not find any glands connected with the toes. On the dorsal side of the median part a retracting muscle inserts (x) that draws the median and distal part into the proximal (basal) one.

The mouth is surrounded by a round plate (Fig. 2 q) with two slight indentations resembling those of *Actinarctus* (Grell 1937, f. 1, 7). It is situated on a very flat cone ("Mundkegel"). The gullet (mouth tube) is 25 micra long and 1,5 micra wide. The stylets (s) are straight and have very distinct bearers (b). The basal parts of the stylets are calcified; the furcæ (f) cuticular. The pharynx (g) is 22 micra long and nearly as broad. The proportion of gullet to pharynx is 1,1-1,2 : 1. The calcified pharyngeal ridges (r) are 14 micra long. They are not smooth as in most Heterotardigrada, but begin with knobs (kn) resembling those of *Batillipes pennaki* Marcus (1946, f. 2, k) and are irregularly dilated towards their ends. Two anterior pouches of the gut (j) flank the pharynx.

All the present specimens are females with a dorsal ovary (o) and an unpaired oviduct that opens (go) on the ventral side between the third and fourth pair of legs.

Measures in Thulin's terminology (1928, p. 248, note) :

Length of buccal apparatus 235 ms.
 Length of pharynx 110 ms.
 Length of fourth leg with termination 275 ms.
 Length of peg-shaped termination 30 ms.
 Length of gullet 113,6 cph.
 Diameter of gullet 9 cph.
 Breadth of pharynx 91 cph.

Occurrence : Coast of the Island of São Sebastião (State of São Paulo), in 3-5 m. depth, near Ilhabela, may and june 1950; november 1951. Ten animals were dredged with Mortensen's sledge-dredge, that brought up middle fine sand with rather much detritus. In the accompanying fauna Gastrotricha (*Thaumastoderma*-spec.) and Kinorhyncha, Nematoda and Ostracoda were seen as well as various Accela, Macrostomida and Rhabdocela.

The movements of *Orzeliscus belopus* are slow. Often all the toes of one leg are tilted over to the dorsal side in an awkward manner. The animals adhere to the watch-glass, not as firmly as *Batillipes*, but are not as easily washed out as *Actinarctus* (Grell 1937, p. 143).

***Echiniscoides sigismundi* (M. Schultze)**

The coast of the Island of Bonaire in the Caribbean Sea was hitherto the most southern locality of *E. sigismundi* (M. Sch.). In May 1952 however Prof. Dr. A. REMANE-Kiel (Germany) collected a Tardigrade at Itanhaen, 53 km. southwest of Santos, that I recognized as *Echiniscoides sigismundi*. The only specimen was found in the upper zone of Balanids, where threads of green algæ, diatoms, and some grains of sand retain a small amount of water during low tide. As Prof. REMANE kindly informed, the height of this zone corresponds to that of the Enteromorpha-zone in the western Baltic and the North Sea. Until now I had looked for *E. s.* in vain among Enteromorpha that is scarce in Santos and vicinities and occurs at the same level as the upper Balanids. Nor did I find it among *Ulva*, that grows at a lower level and is moistened by the brakens even at low tide.

My respectful thanks are due to the National Research Council, CONSELHO NACIONAL DE PESQUISAS, Rio de Janeiro, for their subsidy to our zoological research.

Resumo

Duas novas espécies de *Oroperipatus*, *O. weyrauchi* e *O. omeyrus*, encontradas em pequenas e médias (1000 m.) altitudes do Perú, são descritas e separadas das 17 outras do gênero. As espécies de *Oroperipatus* Cockerell 1908 são bastante uniformes. Habitam principalmente o lado pacífico dos Andes, mas, ocorrem também nas regiões montanhosas e baixas ao leste da divisa água e atingem, para o norte, Panamá e México.

Um novo Arthrotardígrado marinho, *Orzeliscus belopus*, gen. nov., spec. nov., foi dragado no litoral da Ilha de São Sebastião, perto de Ilhabela, em 3-5 m. de profundidade, em fundo arenoso com bastante detrito. Como há 4 terminações em cada extremidade, inseridas em "artelhos", a incorporação do gênero nas Onychopodidæ parece defensável, embora estas terminações tenham forma de pinos com crista dorsal, diferentes dos discos adhesivos das Discopodidæ e dos vários tipos de garras conhecidas das Onychopodidæ e Stygarctidæ. Os apêndices cefálicos correspondem, por princípio, aos dos outros Arthrotardigrada; a papila cefálica é um disco convexo (p); a clava (c) e o cirro lateral (l) são inseridos em base comum. A boca é circundada por placa (q) ligeiramente trifoliada. Os espessamentos faríngeos calcificados (r) começam com botões (kn) e terminam irregularmente dilatados. Os dez exemplares obtidos em vários meses são todos fêmeas, cujo oviduto ímpar se abre (go) entre as terceiras e quartas extremidades. Os animais locomovem-se lentamente e aderem ao substrato mais firmemente que *Actinarctus*, mas menos intimamente que *Batillipes*.

Echiniscoides sigismundi (M. Schultze) foi verificado na costa de Itanhaen, 53 km. ao sudoeste de Santos, na zona superior das cracas.

B I B L I O G R A P H Y

- du Bois-Reymond Marcus, E. 1944**, Sôbre Tardigrados Brasileiros. Com. Zool. Mus. Hist. Nat. v. 1, n.º 13, p. 1-19 t. 1-4. Montevideo. **Bouvier, E. L. 1905**, Monographie des Onychophores. Ann. Sci. Nat. Zool. sér. 9 v. 2, p. 1-383 t. 1-13. Paris. **1907**, Monographie des Onychophores. (suite). Ann. Sci. Nat. Zool. sér. 9 v. 5, p. 61-318. Paris. **Brues, C. T. 1917**, A new species of Peripatus from the mountains of Northern Peru. Bull. Mus. Comp. Zool. Harv. Coll. v. 61 n.º 10, p. 383-387, 1 t. Cambridge, Mass. **1925**, Notes on neotropical Onychophora. Psyche v. 32 n.º 3 (june 1925), p. 159-165. Boston, Mass. **Camerano, L. 1898**, Nuova specie di Peripatus dell'Ecuador. Atti R. Ac. Sci. Torino v. 33, p. 308-310. Torino. **1898a**, Viaggio del Dr. Enrico Festa . . . Ecuador, etc. VII. Onicofori. Boll. Mus. Zool. Anat. Comp. R. Univ. Torino v. 13 n.º 316, p. 1-3. Torino. **Chitwood, B. G. 1951**, A marine Tardigrade from the Gulf of Mexico. Texas Journ. Sci. v. 3 n.º 1, p. 111-112. Austin, Texas. **Clark, A. H. 1913**, (jan.), A revision of the american species of Peripatus. Proc. Biol. Soc. Wash. v. 26 (1914), p. 15-20. Washington, D. C. **1914**, Notes on some specimens of a species of Onychophore (*Oroperipatus corradoi*) new to the fauna of Panama. Smithson. Inst. Miscell. v. 63 n.º 2 (publ. 2261), p. 1-2. Washington, D. C. **1915**, The present distribution of the Onychophora, etc. Smithson. Inst. Misc. Coll. v. 65 n.º 1 (publ. 2319), p. 1-25. Washington, D. C. **Clark, A. H. & Zetek, J. 1946**, The Onychophores of Panama and the Canal Zone. Proc. U. S. Nat. Mus. v. 96 n.º 3197, p. 205-213. Washington, D. C. **Coninck, L. A. P. De 1939**, Scientific Results . . . Van Oye's Expedition in Iceland. VI. Tardigrades. Biologisch Jaarboek Natuurwetensch. Genootsch. Dodonea (Gent) 6. Jaarg., p. 190-218. Antwerpen. **Cuénot, L. 1892**, Tardigrada. Commensaux et Parasites des Echinodermes (I). Rev. Biol. Nord France v. 5, p. 16-19 t. 1 f. 4-5. Lille (1893). **1949**, Les Tardigrades. Pierre-P. Grassé, Traité de Zoologie v. 6, p. 39-59 f. 38-59. Paris (Masson & Cie.). **Dunn, E. R. 1943**, A new species of Peripatus. Zool. Res. Azuero Peninsula Panama Exp., etc. Notulæ Naturæ Ac. Nat. Sci. Philadelphia n. 123, p. 1-5. Philadelphia, Pa. **Fuhrmann, O. 1913**, Ueber einige neue neotropische Peripatus-Arten. Zool. Anz. v. 42, p. 241-248. Leipzig. **1914**, Quelques nouveaux Péripates américains. Voy. d'explor. scient. Colombie. Mém. Soc. neuchâtel. Sci. nat. v. 5, p. 176-192 Neuchâtel. **1915**, Ueber eine neue Peripatus-Art vom Oberlauf des Amazonas. Abh. Senckenb. Naturf. Ges. v. 36 fasc. 2, p. 275-283 t. 20. Frankfurt a. M. **Grell, K. G. 1937**, Beiträge zur Kenntnis von *Actinaretus doryphorus* E. Schulz, etc. Zool. Anz. v. 117, p. 143-154. Leipzig. **Leitão de Carvalho, A. 1942**, Sôbre "Peripatus heloiseæ", do Brasil Central. Bol. Mus. Nac. n. sér. Zool. n.º 2, p. 57-73 t. 1-19. Rio de Janeiro. **Marcus, E. 1928**, Zur vergleichenden Anatomie und Histologie der Tardigraden. Zool. Jahrb. Allg. Zool. Physiol. v. 45, p. 99-158 t. 6-9. Jena. **1929**, Tardigrada. Bronn, Kl. Ordn. Tier-Reichs v. 5 Abtlg. 4 Buch 3, VIII + 608 p. 398 f. 1 t. Leipzig (Akad. Verlagsges.). **1934**, Tardigrada. Handwörterb. Naturwiss. (2.^a ed.) v. 9, p. 859-864. Jena. **1936**, Tardigrada. Das Tierreich (Preuss. Ak. Wiss.) fasc. 66, XVI + 340 p. 306 f. Berlin & Leipzig (Gruyter).

1946, *Batillipes pennaki*, etc. Com. Zool. Mus. Hist. Nat. v. 2 n.º 33, p. 1-3. Montevideo.

Matthews, G. B. 1938, Tardigrada from North America. *Americ. Midl. Natural.* v. 19, p. 619-627. Notre Dame.

Murray, J. 1907, Scottish Tardigrada, collected by the Lake Survey. *Tr. R. Soc. Edinb.* v. 45 part 3 n.º 24, p. 641-668 t. 1-4. Edinburgh.

1907a, Arctic Tardigrada, collected by Wm. S. Bruce. *Tr. R. Soc. Edinb.* v. 45 part 3 n.º 25, p. 669-681 t. 1-2. Edinburgh.

Rahm, G. 1937, Eine neue Tardigraden-Ordnung aus den heissen Quellen von Unzen, Insel Kyushu, Japan. *Zool. Anz.* v. 120 fasc. 3-4, p. 65-71. Leipzig.

Richters, F. 1904, Isländische Tardigraden. *Zool. Anz.* v. 28 n.º 10, p. 373-377. Leipzig.

1907, Antarktische Tardigraden. *Zool. Anz.* v. 31, p. 915-916 (9. VII. 1907). Leipzig.

1908, Marine Tardigraden. *Zool. Anz.* v. 33 n.º 2-3, p. 77-85. Leipzig.

1909, Tardigraden-Studien. *Ber. Senckenberg. Naturf. Ges.* 1909, p. 28-45 t. 1-2. Leipzig.

Rodríguez-Roda, J. 1947, Contribución al estudio de los Tardigrados de España. Nota III. *Publ. Inst. Biol. Apl.* v. 4, p. 101-106, 1 t. Barcelona.

1952, Tardigrados de la Fauna Española. *Trab. Mus. Ci. Nat. Barcelona* n. s. v. 1 n.º 4, p. 1-87 t. 1-24. Barcelona.

Schulz, E. 1935, *Actinartus doryphorus* nov. gen. nov. spec., ein merkwürdiger Tardigrad aus der Nordsee. *Zool. Anz.* v. 111 fasc. 11-12, p. 285-288. Leipzig.

1951, Ueber *Stygartus bradypus* n. g. n. sp., einen Tardigraden aus dem Küstengrundwasser, und seine phylogenetische Bedeutung. *Kieler Meerésforschungen d. Inst. Meeresk. Univ. Kiel* v. 8 fasc. 1, p. 86-97 t. 28. Kiel.

Steiner, G. 1926, *Bathyechiniscus tetronyx* n. g. n. sp. ein neuer mariner Tardigrade. *Deutsch. Südpol. Exped.* v. 18 *Zool.* 10, p. 478-481, 5 f. Berlin & Leipzig.

Thulin, G. 1928, Ueber die Phylogenie und das System der Tardigraden. *Hereditas* v. 11, p. 207-266. Lund.

1942, Ein neuer mariner Tardigrad. *Meddel. Göteborgs Mus. Zool. Avdeln.* 99 (Göteb. Kungl. Vetensk. Vitterh. Samh. Handl. 7. Folge, Ser. B. v. 2 n.º 5), p. 1-10. Göteborg.

Wheeler, W. M. 1898, A new *Peripatus* from Mexico. *Journ. Morphol.* v. 75, p. 1-8 t. 1. Boston, Mass.

Zacher, F. 1933, Onychophora. *W. Kükenthal & Th. Krumbach, Handb. Zool.* v. 3 pars 2, p. 79-138. Berlin & Leipzig (Gruyter).

PLATE 1

Oroperipatus weyrauchi, n. sp.

- Fig. 1 — Female seen from the back.
Fig. 2 — Side view of the same.
Fig. 3 — Colour pattern of back of the same.
Fig. 4 — Skin of back of the male, enlarged.
Fig. 5 — The same, more highly magnified.
Fig. 6 — Principal papilla.
Fig. 7 — Outer blade of jaw.
Fig. 8 — Inner blade of jaw.
Fig. 9 — Fourth left leg, ventral view.
Fig. 10 — Hind end of male seen from the ventral side. a, anus. b, genital aperture. c, crural tubercle. d, slit of coxal gland. e, coxal gland everted. v, ventral organ.

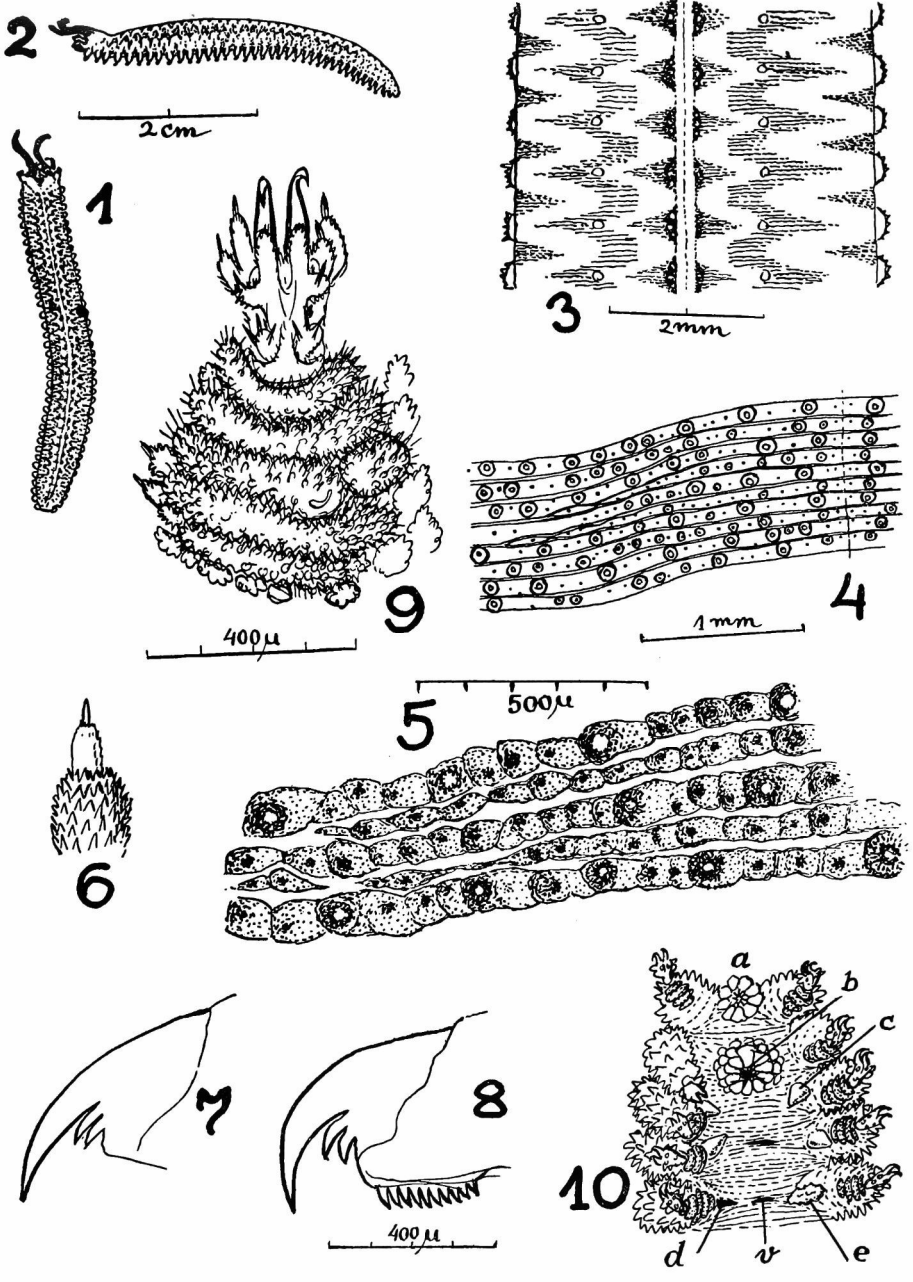


PLATE 2

Oroperipatus omeyrus, n. sp.

- Fig. 11 — Side view of female.
- Fig. 12 — Skin of back with light line, enlarged.
- Fig. 13 — Skin of back, more highly magnified.
- Fig. 14 — Principal papilla.
- Fig. 15 — Left antenna.
- Fig. 16 — Outer blade of jaw.
- Fig. 17 — Inner blade of jaw.
- Fig. 18 — Fourth right leg, ventral view.

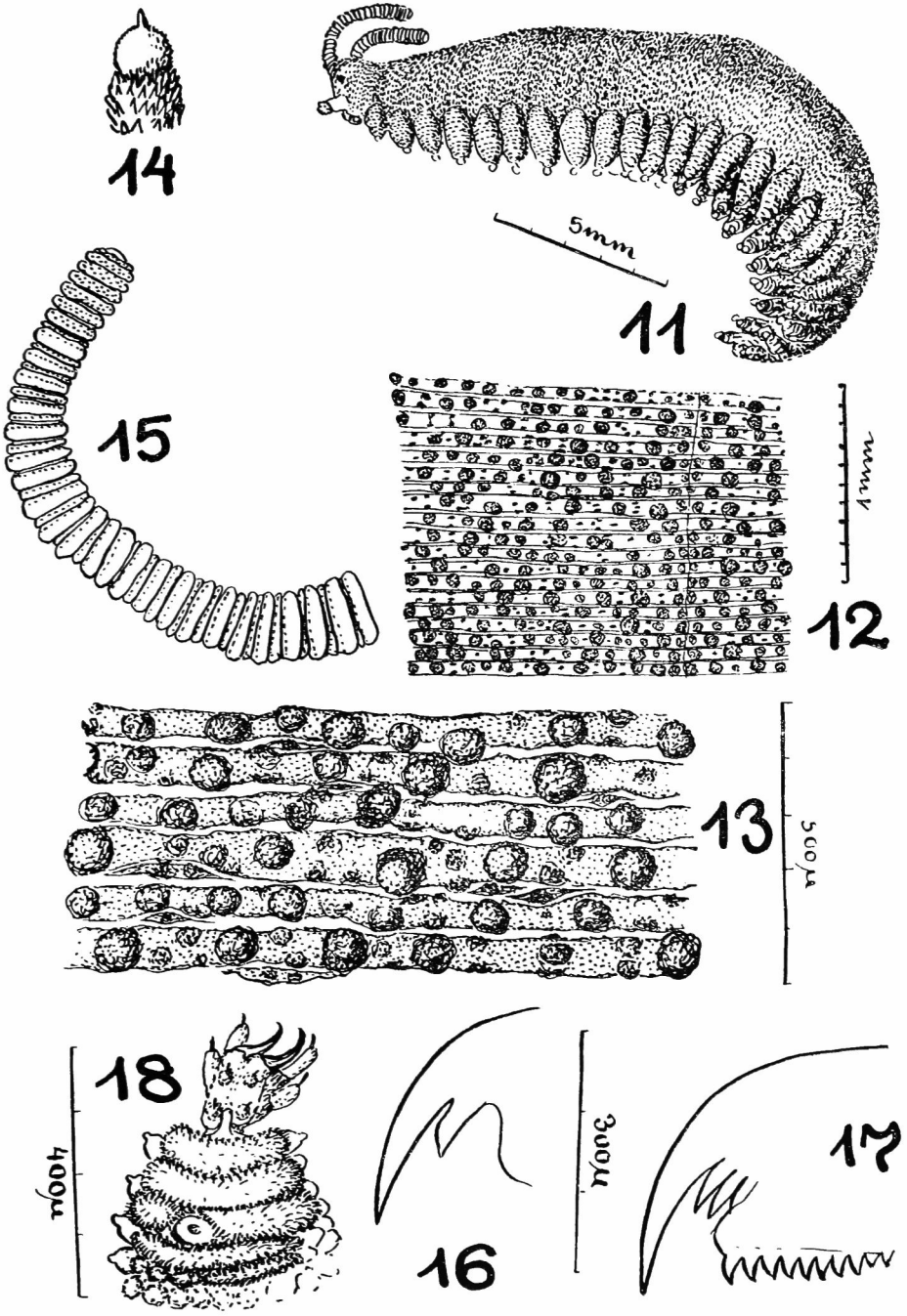


PLATE 3

Orzeliscus belopus, n. g., n. sp.

Fig. 1 — Dorsal view ; skin-pattern only drawn in the middle of the body.

Fig. 2 — Head seen from below.

Fig. 3 — Buccal apparatus.

a, anal opening. b, stylet-bearer. c, clava. ce, yellow cells. d, distal part of legs. e, external medial cirrus. f, furca. g, pharynx. go, opening of oviduct. h, distal papilla on 4th leg. i, internal medial cirrus. j, gut. k, hair above 4th leg. kn, knobs of pharyngeal ridges. l, lateral cirrus. m, median cirrus. n, lateral prominence of head. o, ovary. p, papilla cephalica. q, mouth plate. r, ridges of pharynx. s, stylet. t, toe. u, ledge of toe. v, basal (proximal) part of leg. w, median part of leg. x, insertion of retracting muscle. y, stalk of claw in *Styraconyx sargassi* Thul. z, hair on legs 1-3.

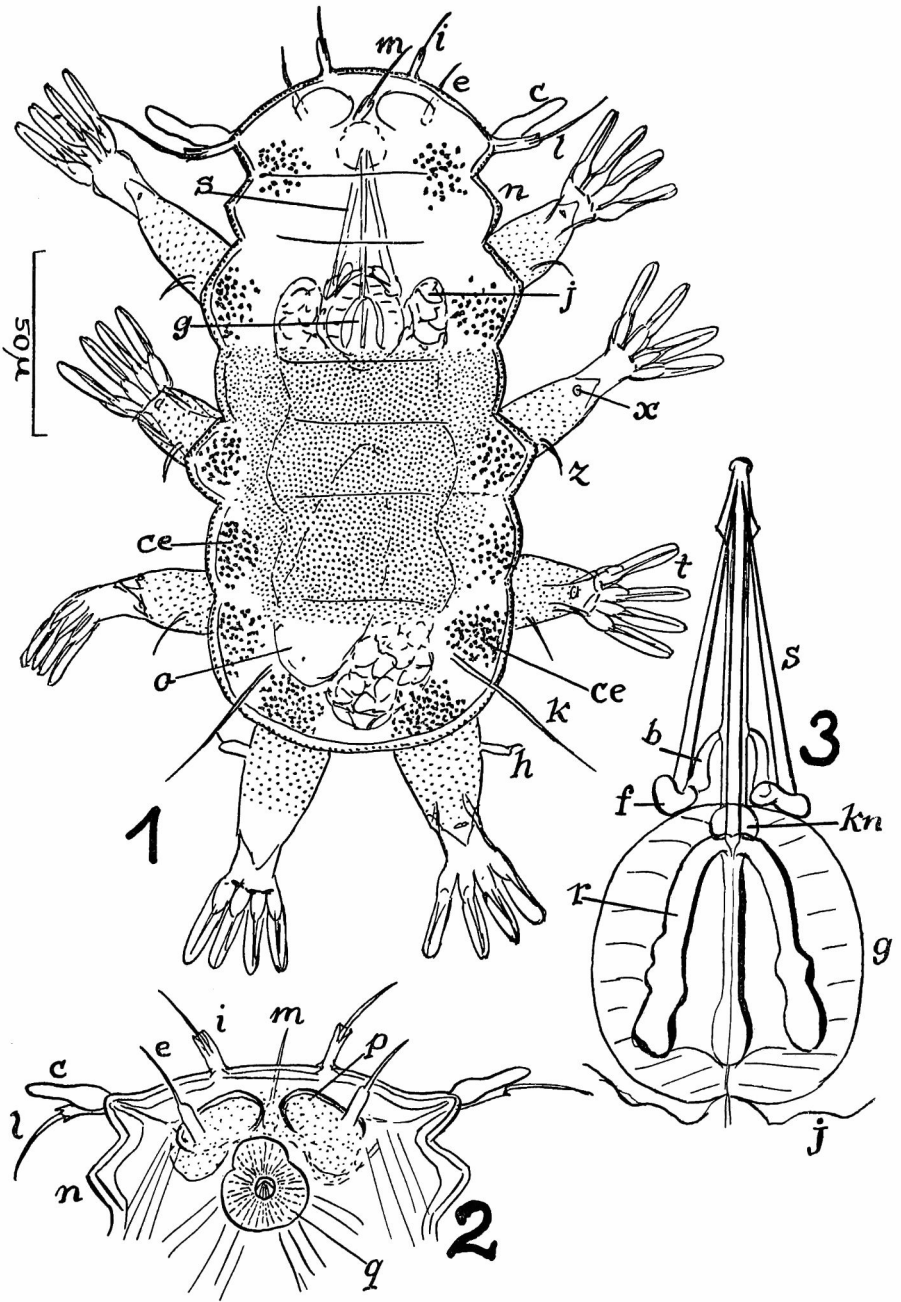


PLATE 4

Orzeliscus belopus, n. g., n. sp.

Fig. 4 — Lateral view.

Fig. 5 — Leg seen from above.

Fig. 6 — Lateral aspect of leg.

Styraconyx sargassi Thulin

Fig. 7 — Two toes.

For lettering see Plate 3.

