

Euptyctimous mites from the Galapagos Islands, Cocos Island, and
Central America
(Acari: Oribatida)

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ABSTRACT. Records of 37 species of the families *Oribotritiidae*, *Euphthiracaridae*, *Phthiracaridae* and *Steganacaridae* from the Galapagos Islands (Ecuador), Cocos Island (Costa Rica), Belize, Guatemala and Costa Rica are given. *Oribotritia attenuata* sp. n. (Cocos I.), *O. didyma* sp. n. (Guatemala, Galapagos I.), *O. serrula* sp. n. (Cocos I.), *O. trisetosa* sp. n. (Cocos I., Belize), *Mesotritia breviseta* sp. n. (Lesser Antilles, Belize), *Indotritia bellingeri* sp. n. (Cuba, Venezuela, Galapagos I.), *I. retusa* sp. n. (Galapagos I.), *Euphthiracarus fusticulus* sp. n. (Cocos I.), *Pocsia* (?) *dubia* sp. n. (Guatemala), *Rhysotritia dinota* sp. n. (Galapagos I., Belize), *Rh. dikra* sp. n. (Guatemala), *Rh. dixia* sp. n. (Guatemala), *Rh. ejuncida* sp. n. (Galapagos), *Hoplophthiracarus mutabilis* sp. n. (Guatemala), *Protophthiracarus tripartitus* sp. n. (Belize), *P. varius* sp. n. (Belize), and *Atropacarus (Hoplophorella) tuberosus* sp. n. (Guatemala) are described and illustrated. The following synonyms are proposed: *Indotritia krakatauensis* (SELLNICK, 1923) = *I. acanthophora* MÄRKEL, 1964 = *I. sellnicki* AOKI, 1965. A zoogeographic discussion is provided.

Key words: acarology, taxonomy, zoogeography, *Oribatida*, euptyctimous mites, Central America, Galapagos Is., Cocos Is.

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INTRODUCTION

During a study on the soil arthropod fauna in the Galapagos Islands (SCHATZ 1994, SCHATZ & SCHATZ 1988), several collecting expeditions were carried out, reaching all major islands and different vegetation zones of the archipelago. The investigations were extended to some places in Central America as a possible source of the Galapagos fauna, and include collections from the Cocos Island, Costa Rica. Thanks to cooperation of other collectors a considerable material of oribatid mites is available for studies.

In this paper records of 37 species of euptyctimous oribatid mites from the Galapagos Islands, from Cocos Island and from Central America (Belize, Guatemala, Costa Rica), as well as single records from the Antilles are presented. If not indicated otherwise, the material was collected by the junior author. The type material is deposited in the Department of Animal Taxonomy and Ecology, A. Mickiewicz University, Poznań, Poland, and in the Universidad Católica, Quito, Ecuador.

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BACKGROUND

1. Galapagos Islands (Ecuador)

The Galapagos Islands are situated in the Pacific Ocean, ca. 1000 km W of the South American coast, and 750 km SW of the Cocos Island. They consist of 14 larger and numerous small islands and rocks, of a total surface area of 7882 km². The islands are of volcanic origin; the age of the oldest subaerally deposited basaltic rocks is estimated at not more than ca. 4 My. The western part of the archipelago is situated on a hot spot; the islands in the SE part are the oldest, while the westernmost islands Isabela and Fernandina are not older than 0.7 My., with considerable volcanic activity (SIMKIN 1984). Vast lava flows cover large parts of several islands. The highest point is Volcán Wolf, 1710 m a.s.l., on Isla Isabela. Older sea mount east of Galapagos suggest an older age of the archipelago. There is no geological evidence that the islands have ever been connected, even by a chain of islands, with the mainland (SIMKIN 1984).

Although the islands are situated on the equator, the climate is not tropical. The Galapagos Islands lie at the edge of the Central Pacific dry zone. Cool oceanic currents and upwellings are responsible for the formation of an inversion layer and cause arid conditions in the lower parts of the islands up to 150 m from May to December. The warm Panama current reaches the islands only between December and May bringing tropical rain showers.

Subject to altitude and exposure to the trade winds, a number of vegetation zones have evolved on higher parts of the islands. The most extensive is the arid zone, with cacti, dry shrub, and *Bursera* forest. This is followed by a transition zone which is partially used for agriculture on the inhabited islands. Cloud forests have developed on the SE slopes of higher islands, where the trade winds release their humidity and drizzle is frequent all year round. This humid zone is dominated by endemic *Psychotria* and *Scalesia* shrubs and elfin trees. The wind-exposed summits are often covered by a fern-sedge vegetation on deep soils. A detailed description of the Galapagos vegetation zones is given by WIGGINS & PORTER (1971).

2. Cocos Island (Costa Rica)

The Cocos Island is situated in the Pacific Ocean at 5°32'N and 87°04'W, ca. 500 km SW of Costa Rica and ca. 630 km NE of the Galapagos Islands. It covers an area of ca. 25 km², the highest point, Cerro Iglesias, reaches an altitude of 624 m. The island is volcanic, probably of Pleistocene origin. The surface is composed of volcanic agglomerate tuffs and lava flows. The Cocos Island lies in the eastward flowing equatorial countercurrent. The climate is tropical, the air temperature ranges from 20° to 35°C. Heavy rainfalls occur throughout the year, with an annual precipitation of ca. 8000 mm. Numerous streams and rivers drain the island. The

dense forests which cover most of the island are diverse in aspect but contain relatively few species of plants; palms and *Cecropia* trees are conspicuous. Wet moss and large fern species form the undergrowth (HERTLEIN 1963, HOGUE & MILLER, 1981)

3. Central America

Biogeographically, Central America between Guatemala and Columbia forms the Panamanian Region with a recent origin. The first faunal exchange between North and South America ended with the break-up of the Pangaea in the Jurassic. A chain of volcanic islands that would later become Central America, was formed by the movements of the Maya and Chortis blocks and of the Caribbean plate. A continuous land bridge, probably the result of tectonic uplift, was not formed until the Pliocene, when these islands connected, forming the present Panamanian region and northern Colombia. Once the land bridge formed, interchange was possible by organisms that could traverse the narrow land bridge and establish the various range of habitats and climatic zones present in the region (DONNELLY 1992, KIMSEY 1992).

Although Central America is situated in the tropics, its geomorphology, oceanic currents, and wind systems form several different climatic and vegetation zones. In general, highland ridges are wet, the windward slopes in the northeast are the wettest, while the leeward slopes in the southwest are dry. Most regions have a rainy and a dry season. High mountain chains reach into the orobiome of the "cold tropics".

SPECIES DESCRIPTIONS AND RECORDS

Family *Oribotritiidae* GRANDJEAN, 1954

Oribotritia attenuata sp. nov.

(figs 1-6)

DESCRIPTION

Measurements of holotype: prodorsum: length 507, width 374, height 133, sensillus 152, setae: interlamellar 234, lamellar 101, rostral 158, exobothridial 50.7; notogaster: length 930, width 707, height 651, setae: c_1 177, h_1 158, ps_1 149; genitoaggenital plate 222 x 101, anoanal plate 450 x 69.7^{*)}.

Colour brown. Integument finely porose.

Prodorsum with strong lateral carinae. Sensilli fairly strong and rigid. Setae long, especially erect interlamellar and rostral setae, smooth and attenuate, comparative lengths: $in > ro > le > ex$.

Notogaster with 14 pairs of setae, long ($c_1/c_1-d_1 = 0.82$), attenuate, setae c_1-3 remote from anterior margin. Openings of latero-opisthosomal glands, lyrifissures and vestigial setae present.

^{*)} All measurements are given in μm

Ventral region: Infracapitulum, palp, epimeral setal formula typical for the genus. Genital plates with 10 pairs of genital setae, 3 in progenital position. Aggenital plates with 2 pairs of setae. Anal plate discrete with 2 setae proximally. Adanal plates with 3 pairs of setae.

Legs: setal and solenidial formulae (without tarsi): I: 1-3-5(2)-5(1), II: 1-4-4(1)-5(1), III: 3-2-3(1)-3(1), IV: 3-2-2(1)-3(1). Dorso-anterior spine on femur I weak. Tarsi tridactylous, heterodactylous.

Holotype: COC 27, 1 paratype: COC 25.

Comparison: The most distinctive character separating this species from its congeners is the presence of the long and flexible setae on the body.

Etymology: The species epithet "*attenuatus*" is Latin for "weakened", "reduced" and alludes to the attenuate shape of the gastronotal setae.

Records from Cocos Island:

COC 85-25, 1985-06-24: 1 ind.; Chatham Bay, 90 m a.s.l., fairly open undergrowth, at base of tree fern; dry litter; COC85-27: 1 ind.; *ibid.*, 85 m, fairly sparse trees; dry leaf litter (leg. M. ASPINALL).

General distribution:

Known only from the Cocos Island. Probably endemic.

Oribotritia didyma sp. nov.

(figs 7-14)

DESCRIPTION

Measurements of holotype: prodorsum: length 308, width 222, height 116, sensillus 98.7, setae: interlamellar 55.7, lamellar 58.2, rostral 35.4, exobothridial 27.8; notogaster: length 539, width 399, height 415, setae: c_1 63.2, h_1 and ps_1 58.2; genitoaggenital plate 136 x 65.6, anoadanal plate 278 x 55.5.

Colour brown. Integument finely punctate.

Prodorsum with two well developed carinae (the name of the species *didyma*, is latinized Greek meaning "double", or "twofold" and refers to this character). Dorsal carina stronger than the ventral one. Sensilli setiform, moderately long, smooth and tapering gradually. Setae moderately long, fine, interlamellars and rostrals erect but lamellars procumbent, comparative lengths: $le > in > ro > ex$.

Notogaster with 14 pairs of short setae ($c_1/c_1-d_1 = 0.52$), covered with thin spines in their distal half. Only setae c_3 are longer and smooth, situated close to anterior margin. Setae c_1 and c_2 remote from this margin. Openings of latero-opisthosomal glands, five lyrifissures and two vestigial setae present and positioned normally on both sides.

Ventral region typical for the family. Chaetotaxy of palps 0-2-0-2-9(1). Genital plates with nine setae each. Distance between genital setae 7 and 8 longer than between the remaining setae. Two pairs of aggenital setae. Anal plates discrete, each

with two setae. Two pairs of adanal setae. Adanal fissure (iad) lies posterior and antiaxially to seta ad_2 .

Legs: setal and solenidial formulae (without tarsi): I: 1-4-5(2)-5(1), II: 1-4-4(1)-3(1), III: 3-2-3(1)-3(1), IV: 3-2-2(1)-3(1). Tarsi tridactylous, heterodactylous.

Holotype: GAL 761, 2 paratypes GAL 763.

Comparison: The most distinctive character separating this species from its congeners is the presence of two lateral carinae on the prodorsum. In this respect the new species resembles *O. bicarinata* NIEDBALA, 1993 from Togo, but differs in the longer interlamellar and rostral setae, shorter lamellar setae and, most distinctly, in the presence of 2 anal setae.

Records from Galapagos: (fig. 196)

Isla Santa Cruz: GAL 765, 1987-03-08: 1 ind., and GAL 766: 5 ind.; 1987-03-08, transition zone below Bella Vista, 90 m a.s.l.; moist, well-decayed leaf litter under *Psidium galapageium* and *Zanthoxylum fagara*; GAL 740, 1987-03-06: 1 ind.; cultivated area above Bella Vista, 400 m; moist, well-decayed leaf litter under *Persea americana*; GAL 763, 1987-03-08: 2 ind.; cultivated area near Santa Rosa, 340 m; moist, well-decayed leaf litter with humus under *Cedrela odorata* and *Pteridium aquilinum*; GAL 761, 1987-03-08: 1 ind.; *Scalesia* forest near Los Gemelos, 500 m; moist, partly-decayed leaf litter with pieces of wood and humus under *Scalesia pedunculata*, *Xanthoxylum fagara*, and *Psychotria rufipes*.

Isla Floreana: GAL 532, 1987-01-18: 1 ind.; moist highland N of Cerro Pajas, near Finca, 330 m; moist leaf litter with pieces of wood and humus under *Psidium guajava*, *Zanthoxylum fagara*, and *Croton scouleri* var. *brevifolius*; GAL 534: 1 ind.; *ibid.*, 340 m; moist leaf litter, partially decayed, under *Kalanchoe pinnata*; GAL 537: 1 ind., and GAL G052: 1 ind.; *ibid.*, moist, well-decayed leaf litter and humus in *Commelina diffusa* under *Croton*, *Acacia*, and *Scalesia pedunculata*; GAL G050: 1 ind.; *ibid.*, 320 m; dry to moist, partly-decayed leaf litter and humus under *Lantana camara*.

Isla Santa Fe: GAL 365, 1985-04-09: 1 ind.; arid zone in NE part near cliff, 15 m; dry grass and leaf litter under *Waltheria ovata*.

Isla Isabela, Volcán Sierra Negra: GAL 514, 1987-01-15: 1 ind.; W of Puerto Villamil, littoral zone, in forest of *Conocarpus erecta*; dry to moist, well-decayed mangrove leaf litter and humus; GAL 631, 1987-02-29: 1 ind.; above Santo Tomás, cultivated area, 340 m; moist, decayed leaf litter under *Persea americana* and *Coffea arabica*; GAL 632: 1 ind.; *ibid.*, 360 m, moist, decayed leaf litter and roots under *Persea americana* and *Pteridium aquilinum*; GAL 653, 1987-02-12: 2 ind.; in *Guayaba* forest in "Trocha", 340 m; moist leaf litter and moss under *Psidium guajava* and *Pteridium aquilinum*; GAL 658: 1 ind.; *ibid.*, 370 m; moist, decayed leaf litter.

A total of 22 specimens were found in 16 samples from four islands, mostly in leaf litter in or near agricultural areas. Only the records from Santa Fe and from the littoral zone of Southern Isabela do not fall into this pattern and could be accidental

findings. The species is not known from the mainland yet, but it was probably introduced by man.

Record from Central America:

Guatemala: (fig. 200) GUA 90-30, 1990-02-02: 1 ind.; Rio Dulce - Golfete, in Manatee Biotope Chocon Machacas, 5 m, hardwood tropical forest at Rancho; moist, decayed leaf litter.

General distribution:

Central America: known from E Guatemala and the Galapagos Islands.

Oribotritia serrula sp. nov.

(figs 15-20)

DESCRIPTION

Measurements of holotype: prodorsum: length 429, width 323, height 167, sensillus 167, setae: interlamellar 70.7, lamellar and rostral 60.7, exobothridial 20.2; notogaster: length 772, width 595, height 588, setae: c_1 95.9, h_1 90.9, ps_1 85.8; genitoaggenital plate 212 x 95.9, anoadanal plate 313 x 68.2.

Colour brown. Integument finely punctate.

Prodorsum with a single pair of strong lateral carinae. Sensilli long, rigid, smooth and gradually tapering. Interlamellar and rostral setae erect, stout and rough, lamellar setae finer, smooth and procumbent, comparative lengths: $in > le = ro > ex$.

Notogaster with 14 pairs of short setae ($c_1/c_1-d_1 = 0.57$), rough and rigid. Setae c_1 and c_2 remote from anterior margin, setae c_3 close to margin. Openings of latero-opisthosomal glands, five lyrifissures and two vestigial setae on both sides present and positioned normally.

Ventral region: Setae h of mentum very long. Palps five-segmented with setal formula 0-2-2-9 and one solenidion on tarsus. Epimeral setation 3-0-2-2. Genital plates with 9 pairs of setae, 5 pairs in progenital position, aggenital plates with 3 pairs of setae. Each anal and adanal plate with two setae. Anal setae somewhat remote from each other.

Legs: setal and solenidial formulae (without tarsi): I: 1-3-5(2)-5(1), II: 1-4-4(1)-3(1), III: 3-2-3(1)-3(1), IV: 3-2-2(1)-3(1). Femur I with dorso-anterior spine, stout and serrate at the end. Tarsi tridactylous, heterodactylous.

Holotype and 1 paratype: COC 2.

Comparison: This species differs from its congeners in the following features: the interlamellar and rostral setae short, erect, rigid and rough; the presence of 3 pairs of aggenital setae and 2 pairs of anal setae, as well as the serrate spine on femur I.

Etymology: The name "*serrula*" is Latin for "a saw" and describes the shape of the spine on femur I.

Record from Cocos Island:

COC 85-2, 1985-06-19; 2 ind.; Chatham Bay, 15 m behind beach; moist leaf litter and humus (leg. M. ASPINALL).

General distribution:

Known only from the type locality on the Cocos Island. Probably endemic.

***Oribotritia trisetosa* sp. nov.**

(figs 21-28)

DESCRIPTION

Measurements of holotype: prodorsum: length 456, width 336, height 172, sensillus 158, setae: interlamellar 196, lamellar 69.7, rostral 152, exobothridial 50.7; notogaster: length 837, width 635, height 616, setae: c_1 139, h_1 127, ps_1 120; genitoaggenital plate 209 x 133, anoanal plate 380 x 108.

Colour brown. Integument finely porose.

Prodorsum with a single pair of well-developed lateral carinae. Sensilli long, smooth, tapering gradually. Interlamellar and rostral setae long, stout, smooth, erect. Lamellar and exobothridial setae shorter and narrower, comparative lengths: $in > ro > le > ex$.

Notogaster with 14 pairs of setae, short ($c_1/c_1-d_1 = 0.68$), rigid, sparsely rough. Setae c_{1-3} remote from anterior margin. Setae c_3 shorter than the remaining ones. Openings of latero-opisthosomal glands, lyrifissures and vestigial setae present and positioned normally.

Ventral region: Setae h of mentum very long. Palps five-segmented with setal and solenidial formula 0-3-0-2-9(1). Epimeral region with setal formula 3-0-2-2. Genital plate with 10 genital setae each, 3 setae in progenital position. Two pairs of aggenital setae present. Anal plate with 2 setae, situated proximally. Adanal plate with 3 setae.

Legs: setal and solenidial formulae (without tarsi): I: 1-4-5(2)-5(1), II: 1-4-4(1)-5(1), III: 3-2-3(1)-4(1), IV: 3-2-2(1)-3(1). Tarsi tridactylous, heterodactylous.

Holotype: BEL 18.

Comparison: The new species can be distinguished from its congeners by the following combination of characters: strong gastronotal setae, short setae c_3 , presence of 3 pairs of aggenital setae, 2 anal setae, presence of 5 setae on tibia II and 4 setae on tibia III.

Etymology: The specific epithet "trisetosus" refers to the 3 setae on the femur of the palp and the 3 pairs of adanal setae.

Records from Cocos Island:

COC 85-7, 1985-06-19: 1 ind.; Chatham Bay, area next to a stream, always above water level, 75 m a.s.l.; moist moss, rotten branch; COC 85-8: 1 ind.; *ibid*, 80

m behind beach, 4 m a.s.l.; moist leaves and humus, partially covered by a large rock; COC 85-13, 1985-06-24: 4 ind.; *ibid.*, 5 m from a stream, 35 m a.s.l.; in moist grass and ferns, shaded by trees; COC 85-16: 3 ind.; *ibid.*, forest gap, 55 m; dry to moist grass litter; COC 85-18: 2 ind.; *ibid.*, next to a stream, 65 m; moist leaf litter (leg. M. ASPINALL).

Records from Central America:

Belize: (fig. 200) BEL 89-18, 1989-02-14: 1 ind.; Maya Mountains, at Blue Hole, ca. 100 m a.s.l., in tropical primeval rainforest; moist, decayed leaf litter; BEL 90-36, 1990-02-26: 1 ind.; Maya Mountains, Mountain Pine Ridge at Augustine, near Rio Frio Cave, 460 m, hardwood tropical forest; moist, well-decayed leaf litter under *Protium cobal*.

General distribution:

Central America: known from Belize and Cocos Island.

Mesotritia breviseta sp. nov.

(figs 29-33)

DESCRIPTION

Measurements of holotype: prodorsum: length 354, width 277, height 154, sensillus 48, setae: interlamellar 126, lamellar 102, rostral 111, exobothridial 63; notogaster: length 762, width 531, height 508, setae: c_1 , h_1 , and ps_1 48.0; genitoaggenital plate 181 x 26.9, anoadanal plate 354 x 61.6.

Colour brown. Integument punctate.

Prodorsum with a single pair of lateral carinae. Sensilli short, fusiform, smooth. Lamellar and rostral setae arising laterally but distance between lamellar setae greater than between rostral setae. Interlamellar setae close together. Exobothridial setae relatively long, comparative lengths: $in > ro > le > ex$.

Notogaster with 14 pairs of fine, simple, short setae ($c_1/c_1-d_1 = 0.24$). Setae of row c remote from anterior margin, c_1 further, c_3 closer. Five pairs of lyrifissures and two pairs of vestigial setae present. Vestigial setae f_1 situated dorsad to setae h_1 .

Ventral region: Epimeral setal formula 3-0-2-2. Setae h of infracapitulum longer than their mutual distance. Palps three-segmented, setation 1-2-8(1). Seven pairs of genital setae (in holotype one seta absent on the right side), and two pairs of aggenital setae. Two pairs of anal and three pairs of adanal setae present. Setae ad_1 the longest. Lyrifissure iad located at the level of an_2 setae.

Legs: setal and solenidial formulae: I: 1-3-4(2)-4(1)-17(3), II: 1-3-3(1)-4(1)-11(2), III: 2-3-2(1)-3(1)-11, IV: 2-3-2-2(1)-10. Tarsi tridactylous, heterodactylous.

Holotype and one paratype: Antilles, St. Eustatius, Compagnie E of Quill, 50 m, 13 VII 1973 (Hummelinck - Utrecht).

Comparison: The new species differs from all its congeners in the arrangement of prodorsal, anal and adanal setae, and in the position of lyrifissures iad.

Record from Central America:

Belize: (fig. 200) BEL 89-12, 1989-02-09: 1 ind.; Half Moon Cay, Light House Reef: dense tree and bush vegetation in the interior of the island; well-decayed, moist leaf litter under uppermost layer.

General distribution:

Central America: known from the Lesser Antilles: St. Eustatius, and Belize.

Indotritia bellingeri sp. nov.

(figs 34-49)

This "species" was collected and named by Dr. G.W. RAMSAY, but never described.

Material examined: a microscopic slide labelled: *Indotritia bellingeri* 1969/52 PARATYPE CUBA Havana Jardin Botanico 29 X 1957 G. "Underwood" (courtesy Dr. A.S. BAKER, Department of Entomology, British Museum (Natural History)); one specimen from Margarita Island, Venezuela.

DESCRIPTION

Measurements of paratype: prodorsum: length 328, height 108, sensillus 83.5, setae: interlamellar 50.6, lamellar 88.5, rostral 45.5, exobothridial 27.8; notogaster: length 621, height 412, setae: c_1 65.8, c_3 121, h_1 83.5, ps_1 81.0; length of genitoaggenital plate 171, length of anoadanal plate 304. Measurements of specimen from Margarita Island: prodorsum: length 303, width 242, height 111, sensillus 91.1, setae: interlamellar 48.1, lamellar 63.2, rostral 37.9, exobothridial 12.6; notogaster: length 571, width 444, height 412, setae: c_1 60.6, c_3 121, h_1 75.7, ps_1 70.7; genitoaggenital plate 156 x 70.7, anoadanal plate 263 x 55.5.

Colour light brown. Integument finely porose.

Prodorsum with double lateral carinae, sensilli filiform, setae fine, comparative lengths: $le > in > ro > ex$.

Notogaster with 14 relatively short ($c_1/c_1-d_1 = 0.5$), rough setae, setae c_1 and c_2 remote from anterior border, setae c_3 the longest, near anterior border. Five pairs of lyrifissures and two pairs of vestigial setae present. Vestigial setae f_1 situated ventrad of setae e_1 .

Ventral region: Epimeral setal formula 3-0-2-2. Setal chaetotaxy of palps 0-2-0-2-9(1). Nine pairs of genital, 2 pairs of aggenital, 2 pairs of anal and 2 pairs of adanal setae present. Lyrifissure iad at the level of ad_2 setae.

Legs: setal and solenidial formulae (without tarsi): I: 1-3-5(2)-5(1), II: 1-4-4(1)-3(1), III: 3-2-3(1)-3(1), IV: 3-2-2(1)-3(1).

Holotype and paratype from Cuba, deposited at the British Museum (Natural History); one specimen from Venezuela, Isla Margarita, below the Toma de Agua del Valle, wooded with large trees, mainly *Clusia*, short undergrowth in moistened layer of decaying leaves of *C. rosea*, 4 VII 1936 P. W. HUMMELINCK (Coll.No. 143).

Comparison: This species can be distinguished from the very similar *Indotritia krakatauensis* (SELLNICK, 1923) by a greater distance between interlamellar setae, longer interlamellar setae, presence of exobothridial setae and presence of only 2 pairs of aggenital setae.

Note: Perhaps *I. krakatauensis* is in the process of radiation on the American islands.

Records from Galapagos: (fig. 196)

Isla Santa Cruz: GAL 821, 1988-03-10: 1 ind.; littoral zone in Bahía Academy, Puerto Ayora, under *Laguncularia racemosa* and *Rhizophora mangle*; moist, partly-decayed mangrove leaf litter; ECU 160, 1985-05-14: 48 ind.; cultivated area 2 km N of Bella Vista, 360 m a.s.l.; leaf and fruit litter under *Persea americana*; ECU 204, 1985-07-03: 40 ind.; transition forest 1 km E of Bella Vista, 210 m; cave ravine litter (leg. S. and J. PECK).

Isla Floreana: GAL H.151, 1987-01-21: 1 ind.; moist highland at base of Cerro Pajas, 360 m; in pitfall trap in moist litter under *Psidium guajava*, *Zanthoxylum fagara*, and *Croton scouleri*.

Isla Isabela, Volcán Sierra Negra: ECU 209, 1985-07-07: 2 ind.; near Santo Tomás, cultivated area with mixed forest, 350 m; fern litter and humus (leg. S. and J. PECK).

A total of 92 specimens were found in 5 samples from three islands, in or near agricultural areas. The species was probably introduced by man.

General distribution:

Central America: known from Cuba, Venezuela: Isla Margarita, and Galapagos Islands.

Indotritia krakatauensis (SELLNICK, 1923)

(figs 50-66)

Tritia krakatauensis SELLNICK, 1923

Indotritia acanthophora MÄRKEL, 1964 **syn. nov.**

Indotritia sellnicki AOKI, 1965 **syn. nov.**

MATERIAL EXAMINED

A specimen in alcohol labelled: "1. *Indotritia acanthophora* MÄRKEL Tiefland-Regenwaldgebiet im Amazonasbecken; Insel Muyuy bei Iquito (105 m) Peru, Urwald, Streu, Typus, Notogaster" and the microscopic slides labelled: "*Indotritia*

acanthophora MÄRKEL, P1 Aspis Typus, P2 Chelicerae Typus, P3 Subcapitulum Typus, P4 Bein I Typus, P5 Bein II Typus, P6 Bein III Typus, P7 Bein IV Typus" (courtesy Dr. P.J. VAN HELSDINGEN, Curator of Entomology, Rijksmuseum van Natuurlijke Historie, Leiden). A microscopic slide labelled: "NSMT-Ac-1844 THAILAND Nakon Pathom 27-IX-1961, G. IMADATE, *Indotritia sellnicki* AOKI, 1965 (Paratypus) det. J. AOKI" (courtesy Dr. S.I. UÉNO, National Science Museum, Tokyo).

Measurements of *I. acanthophora*: prodorsum: length 404, width 298, sensillus 147, setae: interlamellar 35.4, lamellar 120, rostral 25.3, distance between in-in = 50.6, distance between ro-ro = 58.2; notogaster: length 828, width 593, height 570, setae: c_1 65.6, h_1 60.6, ps_1 50.5, c_1/c_1-d_1 = 0.38; genitoaggenital plate 190 x 98.3, anoadanal plate 342 x 79.2.

Measurements of *I. sellnicki*: prodorsum: length 374, width 353, sensillus 126, setae: interlamellar 30.4, lamellar 43.0, rostral 50.6, setae: c_1 60.7, c_1/c_1-d_1 = 0.41; genitoaggenital plate 192 x 95.9, anoadanal plate 313 x 55.5.

DIAGNOSIS

Prodorsum with double lateral carinae, sensilli long, narrow and smooth, setae of prodorsum relatively short, fine, interlamellar setae bent posteriorly, gastronotal setae also relatively short but covered with small spines, setal formula of palps 0-2-0-2-9(1), 9 pairs of genital, 3 pairs of aggenital, 2 pairs of anal and 2 pairs of adanal setae, lyrifissures iad slightly dorsad to setae ad_2 .

Legs: setal and solenidial formulae (without tarsi I and II): I: 1-3-5(2)-5(1), II: 1-4-4(1)-3(1), III: 3-2-3(1)-3(1)-14, IV: 3-2-2(1)-3(1)-11. All tarsi heterodactylous. Dorsal spine of femur I is very sharp.

REMARKS

The characters given by MÄRKEL (1964) and AOKI (1965) distinguishing *I. acanthophora* and *I. sellnicki* from their congeners are covered by the variability range of *I. krakatauensis*.

Records from Central America:

Belize: (fig. 200) BEL 89-13, 1989-02-09: 3 ind.; Half Moon Cay, Light House Reef: dense tree and bush vegetation in the interior of the island; well-decayed, moist leaf litter.

Costa Rica: COR 86-7, 1986-03-12: 1 ind.; Parque Nacional Manuel Antonio near Pto. Quepos; sendero Catedral, 20 m a.s.l.; rotten wood, dry to moist.

General distribution:

Gondwanan: SE Asia (AOKI 1965); South America: Peruvian Andes (MÄRKEL 1964); Belize, Costa Rica (see note on *I. bellingeri*).

Indotritia retusa sp. nov.

(figs 67-74)

DESCRIPTION

Measurements of holotype: prodorsum: length 515, width 425, height 215, sensillus 88.8, setae: interlamellar 88.8, lamellar 82.4, rostral 63.4, exobothridial 38.0; notogaster: length 948, height 690, seta c_1 78.4.

Colour dark brown to black. Integument finely punctate.

Prodorsum with a single pair of strong, lateral carinae. Sensilli fairly short, rigid, smooth and blunt distally. Setae short, rigid and rough. Interlamellar setae arising perpendicular to the surface, comparative lengths: in>le>ro>ex.

Notogaster with 14 pairs of setae, short ($c_1/c_1-d_1 = 0.25$), rigid, rough, except setae c_3 which are longer, narrower and smooth. Setae c_1 and c_2 considerably remote from anterior margin, setae c_3 situated close to margin. Openings of latero-opisthosomal glands, lyrifissures and vestigial setae present.

Ventral region typical for the family. Genitoaggenital plates with 9 genital setae each, 5 in progenital position, and with 2 aggenital setae. Anal plates with one seta each, adanal plates with 3 setae each. Lyrifissures iad located between setae ad_2 and ad_3 .

Legs: setal and solenidial formulae (without tarsi): I: 1-4-5(2)-5(2), II: 1-4-4(1)-3(1), III: 3-2-3(1)-3(1), IV: 3-2-2(1)-3(1). Anterio-dorsal spine on femur I hooked. All tarsi tridactylous, heterodactylous.

Holotype and paratype: ECU 172 (Isla Santa Cruz, *Miconia* zone at Media Luna).

Comparison: This species can be distinguished from other known species of *Indotritia* by the following combination of characters: sensilli short, rigid, and obtuse; prodorsal setae short, rigid, and rough; one pair of anal and 3 pairs of adanal setae present.

Etymology: The name of this species "*retusus*" is Latin for "dulled", or "made blunt" and alludes to the shape of its sensilli.

Records from Galapagos: (fig. 196)

Numerous records from the following islands: Isla Santa Cruz: arid zone near Puerto Ayora, and in higher parts of the island, in *Scalesia* (frequent), *Miconia*, and fern-sedge zone, between 590 and 860 m. Isla San Cristóbal: *Miconia* and fern-sedge zone around lake El Junco (frequent) and on Cerro San Joaquín. Isla Floreana: moist highland around Cerro Pajas (frequent), partially cultivated areas. Isla Pinzón: arid zone, *Scalesia* and fern-sedge zone, between 140 and 460 m. Isla Pinta: upper dry, humid, and fern-sedge zones, between 380 and 600 m. Isla Isabela, Volcán Alcedo: moist highland, crater rim with *Psychotria*, fern-sedge and elfin forest. Volcán Sierra Negra: cultivated areas around Santo Tomás, 350 m, fern-sedge zone (leg. S. and J. PECK). Isla Fernandina: humid (*Psychotria*) zone, 450 m a.s.l. (leg. S. ABEDRABBO).

A total of 165 specimens were found in 53 samples from eight islands or volcanoes, mostly at medium to higher altitudes between 300 and 1100 m. This species was mainly found in moderately moist leaf and fern litter, but is also frequent in moss.

General distribution:

Known only from the Galapagos Islands. Probably endemic.

Family *Eupthiracaridae* JACOT, 1930

Eupthiracarus fusticulus sp. nov.

(figs 75-80)

DESCRIPTION

Measurements of holotype: prodorsum: length 232, width 162, height 95.9, sensillus 60.6, setae: interlamellar 111, lamellar 60.6, rostral 55.5; notogaster: length 409, width 288, height 293, setae: c_1 45.4, cp and h_1 65.6, ps_1 55.5; genitoaggenital plate 146 x 55.5, anoadanal plate 202 x 48.0.

Colour light yellow. Integument densely porose.

Prodorsum with a single pair of long and distinct lateral carinae. Sensilli long, club-like, covered distally with well-developed spines. Setae (except minute exobothridials) long, smooth, tapering gradually, comparative lengths: $in > le > ro > ex$.

Notogaster with 14 pairs of rigid, rough, short setae, anterior ones shorter ($c_1/c_1-d_1 = 0.49$) than the posterior. Setae c_{1-3} considerably remote from anterior margin, setae c_1 further than setae c_2 and c_3 . Openings of latero-opisthosomal glands, lyrifissures and vestigial setae present and positioned typically for the genus.

Ventral region typically eupthiracaroid. Genitoaggenital plates with 9 genital setae each, 4 in progenital position, and with 2 aggenital setae, 3 pairs of anal and 3 pairs of adanal setae present.

Legs: setal and solenidial formulae (without tarsi): I: 1-3-5(2)-5(1), II: 1-4-3(1)-5(1), III: 2-2-2(1)-2(1), IV: 2-1-2(1)-2(1).

Holotype and 1 paratype: COC 29.

Comparison: This species is easily distinguished from its congeners by the club-like shape of the sensilli.

Etymology: The specific name "*fusticulus*" is Latin for "knobbed stick", or "club" and alludes to the shape of the sensillus of the prodorsum.

Records from Cocos Island:

COC 85-27, 1985-06-24: 6 ind.; Chatham Bay, 85 m a.s.l., fairly sparse trees; dry leaf litter; COC 85-29: 2 ind.; *ibid.*, 60 m, sunny area; dry moss from top of log (leg. M. ASPINALL).

General distribution:

Known only from the Cocos Island. Probably endemic.

***Pocsia (?) dubia* sp. nov.**

(figs 81-84)

DESCRIPTION

Measurements of holotype: prodorsum: length 419, width 263, height 156, sensillus 101, setae: interlamellar 114, lamellar 60.7, rostral 65.8, exobothridial 20.2; notogaster: length 846, width 520, height 626, setae: c_1 83.5, h_1 and ps_1 43.0; genitoaggenital plate 273 x 75.7, anoadanal plate 394 x 70.7.

Colour light brown. Surface of integument covered with small holes.

Prodorsum with two pairs of lateral carinae, upper carinae longer and more distinct. Sensilli setose but stout, tapering gradually. Setae fine and attenuate, comparative lengths: $in > ro > le > ex$, lamellar setae in a position typical for *Euphthiracarus*, between interlamellar and rostral setae. Distance between interlamellar setae larger than between rostral setae.

Notogaster with 14 pairs of fine, short setae. Setae $c_{1,3}$ remote from anterior margin, setae $c_{1,2}$ further than setae c_3 . Lyrifissures and vestigial setae present and positioned typically for the genus *Pocsia*.

Ventral elements and anogenital suture typical for the genus *Pocsia*. Seven pairs of genital and one pair of aggenital setae of unequal size present. Anoadanal plates with 3 anal setae and 3 adanal setae each. Setae an_1 and an_2 remote from each other. Setae an_3 and ad_3 situated close to each other. Lyrifissures iad positioned posteriorly to setae an_3 .

Legs: setal and solenidial formulae (without tarsi): I: 1-3-5(2)-5(1), II: 1-4-3(1)-5(1), III: 2-2-3(1)-2(1), IV: 2-1-2(1)-2(1). Tarsi tridactylous, heterodactylous.

Holotype: GUA 30.

Comparison: This is a unique species, with prodorsal setae arranged like in *Euphthiracarus*, but with the anogenital suture typical for the genus *Pocsia*.

Etymology: The specific epithet "*dubius*" is Latin for "uncertain" and alludes to the unclear taxonomic status of this species.

Record from Central America:

Guatemala: (fig. 200) GUA 90-30, 1990-02-02: 1 ind.; Rio Dulce - Golfete, in Manatee Biotope Chocon Machacas, 5 m, hardwood tropical forest at Rancho; moist, decayed leaf litter.

General distribution:

Only a single specimen is known from the type locality in Guatemala. Probably endemic.

***Rhysotritia ardua* (C.L. KOCH, 1841)**

Records from Galapagos: (fig. 197)

Isla Santa Cruz: GAL 726, 1987-03-06: 1 ind.; *Scalesia* forest near Cerro Crocker, 700 m; moist pads of *Lycopodium dichotomum* on a branch with roots and mosses at *Zanthoxylum fagara*; GAL 736: 5 ind.; river bed near Media Luna, 570 m; moist leaf litter, moss and humus under *Miconia robinsoniana* and *Pteridium aquilinum*.

Isla San Cristóbal: GAL 445, 1987-01-01: 1 ind.; *Miconia* zone around lake El Junco, 660 m; moist, decayed leaf and fern litter under *Psidium guajava* and *Pteridium aquilinum*; GAL 465: 4 ind.; *ibid.*, small spring in valley SE of lake El Junco, 540m.; moist, decayed leaf litter under *Miconia robinsoniana*; GAL 468: 11 ind.; *ibid.*, in Encañada with small stream, 500 m; moist, well-decayed leaf litter and roots under *Miconia robinsoniana* and *Pteridium aquilinum*. GAL G029, 1985-03-30: 2 ind.; fern-sedge zone at San Joaquin hill, 700 m, crevice under *Cyathea weatherbyana*; moist to wet, well-decayed fern litter and pieces of wood.

Isla Floreana: GAL 541, 1987-01-19: 24 ind.; on crater rim of Cerro Pajas, moist highland, 555 m; moist, decayed leaf litter with roots and humus under *Zanthoxylum fagara*, *Cordia leucophlyctis*, and *Lantana camara*; GAL 542: 2 ind.; *ibid.*, 570 m; moist moss from ground under *Z. fagara*; GAL 543: 12 ind.; *ibid.*, 550 m; moist, partly-decayed leaf litter under *Z. fagara* and *Croton scouleri*; GAL 544: 1 ind.; *ibid.*, 575 m; moist to wet moss with roots and *Peperomia* from bark of *Z. fagara*.

A total of 63 specimens were found in 10 samples from three islands. In Galapagos, this species occurs at elevations between 500 and 700 m, mainly in moist leaf litter and moss.

Record from Central America: Belize: (fig. 200) BEL 89-16, 1989-02-14: 1 ind.; Maya Mountains, S of Belmopan near Hummingbird Highway, ca. 100 m a.s.l., beside road under ferns; moist to wet fern litter.

General distribution:

Semicosmopolitan: Europe, N and E Africa, S and E Asia, Polynesia, North America; Belize, Galapagos Islands.

***Rhysotritia clavata* MÄRKEL, 1964**

(figs 85-97)

Material examined: a specimen in alcohol labelled: "7. *Rhysotritia clavata* MÄRKEL, Nebelwaldgebiet bei Oxapampa, Rio Esperanza, Peru, Typus, total" and the microscopic slides labelled: "P 37 Paratypus Aspis, P 38 subcapitulum, P 39 Bein I, P 40 Bein II, P 41 Bein III, P 42 Bein IV" (courtesy Dr. P.J. VAN HELSDINGEN, Curator of Entomology, Rijksmuseum van Natuurlijke Historie, Leiden).

Measurements of "Type": prodorsum: length 202, width 137, height 70.8, sensillus 37.9, setae: interlamellar 86, lamellar 48.1, rostral 40.5; notogaster: length 338, width 237, height 222, setae: c_1 32.9, h_1 43, ps_1 35.4, $c_1/c_1-d_1 = 0.43$; genitoaggenital plate 131 x 50.6, anoadanal plate 137 x 32.9. Measurements of aspis of paratype: length 185, width 154, sensillus 43, setae: interlamellar 101, lamellar 55.7, rostral 40.5. Measurements of specimen from Cocos Island: prodorsum: length 186, width 133, height 73.1, sensillus 42.6, setae: interlamellar 78.1, lamellar 47.9, rostral 40.3, exobothridial 11.3; notogaster: length 338, width 217, height 212, setae: c_1 30.2, h_1 50.4, ps_1 35.3; genitoaggenital plate 118 x 37.8, anoadanal plate 144 x 31.5.

Small species. Colour light yellow. Integument densely punctate.

Prodorsum with a single pair of lateral carinae, fine but distinct. Sensilli with narrow stalk and spindle-shaped head, spinose distally. Setae fine, rough, comparative lengths: $in > le > ro > ex$.

Notogaster with 14 pairs of fine but rigid setae, short ($c_1/c_1-d_1 = 0.40$). Setae c_1 and c_2 considerably remote from anterior margin, setae c_3 closer to margin. Openings of latero-opisthosomal glands, five lyrifissures and two vestigial setae present on both sides, situated typically for the genus.

Ventral region: Infracapitulum with setae h longer than the distance between them. Palps three-segmented, with setal formula 2-2-7 and one solenidion on tarsus. Epimera and anoadanal plate typical for the family. Genitoaggenital plates with 6 pairs (4 pairs in specimens from Cocos Island) of genital setae and two pairs of aggenital setae.

Legs: setal and solenidial formulae (without tarsi): I: 1-3-4(2)-5(1), II: 1-3-3(1)-4(1), III: 2-2-2(1)-3(1), IV: 2-1-1-2(1). Tarsi monodactylous.

Records from Galapagos: (fig. 197)

Numerous records from the following islands: Isla Santa Cruz: in all vegetation zones: littoral zone around the island, dry and transition zone, cultivated areas, *Scalesia*, *Miconia*, and fern-sedge zone on SE slope between 90 and 860 m. Isla San Cristóbal: littoral zone S of Wreck Bay, *Miconia* and fern-sedge zone around lake El Junco and on Cerro San Joaquín. Isla Floreana: moist highland and cultivated areas between Cerro Pajas and Asilo de la Paz, between 340 and 475 m. Isla Pinzón, Central Valley: Upper arid zone, grass litter, at 270 m. Isla Isabela, Volcán Wolf: dry and humid highland at 1000 and 1200 m a.s.l. (leg. L. BAERT, K. DESENDER, J.P. MAELFAIT). Volcán Alcedo: moist highland, on crater rim and inside the crater, humid (*Psychotria*) zone, fern-sedge and elfin forest (frequent). Volcán Sierra Negra: SE slope from 230 to 1000 m, in *Scalesia*, transition and fern-sedge zone, in pastures and cultivated areas. Isla Fernandina: Littoral zone at Cabo Hammond, grass litter of *Sporobolus virginicus*; W slope from 450 to 1290 m, in dry and humid zones and in fern-sedge zone.

A total of 224 specimens were found in 54 samples from eight islands or volcanoes. In Galapagos, this species occurs in all vegetation zones, from the littoral zone to the top of the islands; in grass, leaf and fern litter, moss and humus.

Records from Cocos Island:

COC 85-6, 1985-06-19: 2 ind.; Chatham Bay, 75 m behind beach, beside stream (temporally flooded area); moist weeds and humus; COC 85-17, 1985-06-24: 1 ind.; *ibid.*, 60 m a.s.l.; moist growth from under rotten tree stump; COC 85-18: 1 ind.; *ibid.*, 65 m, next to a stream; moist leaf litter; COC 85-25: 2 ind.; *ibid.*, 90 m, fairly open undergrowth, at base of tree fern; dry litter; COC 85-29: 2 ind.; *ibid.*, 60 m, sunny area; dry moss from top of log (leg. M. ASPINALL).

Records from Central America:

Belize: (fig. 200) BEL 89-15, 1989-02-14: 1 ind.; between Belize City and Belmopan, in *Pinus caribbea* forest, 30 m a.s.l.; needle and leaf litter; BEL 89-17, 1989-02-14: 2 ind.; Maya Mountains, at Blue Hole, tropical rainforest, ca. 100 m; moist, partly-decayed leaf litter; BEL 90-35, 1990-02-26: 2 ind.; Maya Mountains, Mountain Pine Ridge, at Rio On Creek in *Pinus caribbea* forest, 500 m; moist, well-decayed coniferous litter and humus.

Guatemala: GUA 86-9, 1986-02-15: 2 ind.; Peten, Tikal, rainforest, 200 m a.s.l.; moist leaf litter under palm; GUA 86-16, 1986-02-19: 1 ind.; Baja Verapaz, Quetzal Biotope S of Purulha, cloud forest, 1600 m; moist moss from tree trunk; GUA 86-18: 1 ind.; *ibid.*; moist, decayed leaf litter.

Costa Rica: COR 86-4, 1986-03-02: 1 ind.; Cordillera de Tilarán, Biological Reserve Monteverde, cloud forest, 1600 m a.s.l.; moist, decayed leaf litter.

General distribution:

Neotropical: Central America: Belize, Guatemala, Costa Rica, Cocos Island, and South America: Peruvian Andes (MÄRKEL 1964), Galapagos Islands.

***Rhysotritia comteae* MAHUNKA, 1983**

(figs 98-102)

Measurements of one specimen from Galapagos Islands, Ecuador: prodorsum: length 288, width 202, height 111, sensillus 65.8, setae: interlamellar 167, lamellar 101, rostral 93.6, exobothridial 27.8; notogaster: length 577, width 368, height 402, setae: c_1 and h_1 88.5, $c_1/c_1-d_1 = 0.64$; genitoaggenital plate 177 x 65.6, anoanal plate 263 x 53.0.

Diagnosis: lateral carinae of prodorsum bifurcate, sensillus gradually thickened and head covered with spines, 9 pairs of genital and 2 pairs of aggenital setae, tarsi of leg I bidactylous, of leg II-IV tridactylous.

Records from Galapagos: (fig. 197)

Numerous records from the following islands: Isla Santa Cruz: in all vegetation zones on SE slope: littoral zone, dry and transition zone, cultivated areas, *Scaevola* (frequent), *Miconia*, and fern-sedge zone up to 860 m a.s.l. Isla San Cristóbal: littoral zone S of Wreck Bay; *Miconia* and fern-sedge zone around lake El Junco

(frequent) and on Cerro San Joaquín. Isla Santa Fe: arid zone on NE part of the island, near cliff. Isla Floreana: moist highland and cultivated areas (frequent) between Cerro Pajas and Asilo de la Paz, between 340 and 475 m. Isla Pinzón: fern-sedge zone at 300 m. Isla Rábida: littoral zone around flamingo lagoon, mangrove leaf litter. Isla Santiago, Playa Espumilla: littoral zone, mangrove leaf litter; dry forest on W side, at 300 m, and moist highland around Los Aguacates, 550 m, and central pampa, 700 m (leg. S. ABEDRABBO). Isla Isabela, Volcán Wolf: highland in upper dry and humid zone, between 600 and 1200 m a.s.l. (leg. L. BAERT, K. DESENDER, J.P. MAELFAIT). Volcán Alcedo: upper arid zone at 780 m; moist highland, on crater rim and inside the crater in humid (*Psychotria*) zone, fern-sedge and elfin forest (frequent). Volcán Sierra Negra: SE slope from the littoral zone near Puerto Villamil up to 1000 m, in fern-sedge zone and on pastures. Volcán Cerro Azul: upper arid zone around crater rim at 1530 m (leg. L. BAERT, K. DESENDER, J.P. MAELFAIT). Isla Fernandina: W slope from 450 to 1290 m, in dry and humid zones and in fern-sedge zone.

A total of 693 specimens were found in 105 samples from 12 islands or volcanoes. In Galapagos, this species occurs in all vegetation zones, from the littoral zone to the top of the islands, in a wide variety of habitats: in grass, leaf and fern litter, moss, lichens, humus, and saline soil.

Records from Central America:

Belize: (fig. 200) BEL 89-15, 1989-02-14: 7 ind.; between Belize City and Belmopan, in *Pinus caribbea* forest, 30 m a.s.l.; needle and leaf litter; BEL 89-21: 4 ind.; *ibid.*, E of Belmopan; dry to moist leaf litter and humus; BEL 90-34, 1990-02-26: 1 ind.; Maya Mountains, Mountain Pine Ridge Forest Reserve, 680 m, near Hidden Fall in *Pinus caribbea* forest; moist, decayed fern litter.

Guatemala: GUA 86-7, 1986-02-09: 2 ind.; Quiche, near Chichicastenango, 2100 m, in pine forest at Pascual Abaj; dry to moist, decayed leaf litter and moss.

Costa Rica: COR 86-1, 1986-03-02: 5 ind.; Cordillera de Tilarán, Biological Reserve Monteverde, cloud forest, 1600 m a.s.l.; moist, well-decayed leaf litter; COR 86-4: 2 ind.; *ibid.*; moist, decayed fern litter.

General distribution:

Central America: Mexico: Chiapas (MAHUNKA 1983), Belize, Guatemala, Costa Rica, N Venezuela (BEHAN-PELLETIER et al. 1993), Galapagos Islands.

Rhysotritia dinota sp. nov.

(figs 103-110)

DESCRIPTION

Measurements of holotype: prodorsum: length 273, width 195, height 109, sensillus 35.4, setae: interlamellar 121, lamellar 70.8, rostral 63.2, exobothridial 22.8; notogaster: length 555, width 353, height 378, setae: c_1 83.5, h_1 and ps_1 81.0; genitoaggenital plate 167 x 65.8, anoadanal plate 266 x 50.6.

Colour brown. Integument finely punctate.

Prodorsum with a single pair of long lateral carinae. Sensilli with narrow stalk and globular head, covered distally with small spines. Setae rigid, covered with small spines in the distal half, comparative lengths: $in > le > ro > ex$.

Notogaster with 14 pairs of moderately short setae ($c_1/c_1-d_1 = 0.73$), sparsely setose distally. Setae c_1 and c_2 remote from the anterior margin, setae c_2 further than c_1 , setae c_3 closer to anterior margin. One pair of openings of latero-opisthosomal glands, five pairs of lyrifissures and two pairs of vestigial setae present.

Ventral region typical for the genus. Genitoaggenital plates with 9 genital setae each, one pair in progenital position, and 2 pairs of aggenital setae.

Leg chaetotaxy typical for the genus. Tarsus I bidactylous, tarsi II-IV tridactylous, all tarsi heterodactylous.

Holotype: GAL 753.

Comparison: The species differs from *Rhysotritia ardua* in the shape of the sensillum with its globular head.

Etymology: The specific name “*dinota*” is a latinized Greek for “rounded” or “rotund”, and alludes to the shape of the head of the sensillum.

Records from Galapagos: (fig. 197)

Isla Santa Cruz: GAL G020, 1985-03-10: 1 ind.; above Bella Vista, cultivated area, 360 m a.s.l.; moist, well-decayed leaf litter under *Persea americana* and *Psidium guajava*; GAL 753, 1987-03-08: 1 ind.; near Los Gemelos, *Scalesia* forest, 590 m; moist moss from dead *Scalesia* trunk; GAL G067, 1 ind.; below Media Luna, *Miconia* zone, 570 m; moist pads of moss from branch of *M. robinsoniana*; GAL G005, 1985-02-07: 3 ind.; near Puntudo, fern-sedge zone, 730 m; moist fern litter.

Isla San Cristóbal: GAL 477, 1987-01-04: 1 ind.; littoral zone S of Wreck Bay, under *Conocarpus erecta* and *Laguncularia racemosa*; moist and salty mangrove leaf litter.

A total of 7 specimens were found in 5 samples from two islands. This species occurs on Isla Santa Cruz in the moist region on the SE slope. The single record in the littoral zone on San Cristóbal could be accidental.

Records from Central America:

Belize: (fig. 200) BEL 90-34, 1990-02-26: 3 ind.; Maya Mountains, Mountain Pine Ridge Forest Reserve, 680 m, near Hidden Fall in *Pinus caribbea* forest; moist, decayed fern litter; BEL 90-35, 1990-02-26: 2 ind.; Maya Mountains, Mountain Pine Ridge, at Rio On Creek in *Pinus caribbea* forest, 500 m; moist, well-decayed coniferous litter and humus.

General distribution:

Central America: known from Belize and from the Galapagos Islands.

***Rhysotritia dikra* sp. nov.**

(figs 111-117)

DESCRIPTION

Measurements of holotype: prodorsum: length 313, width 222, height 116, sensillus 83.5, setae: interlamellar 147, lamellar 81.0, rostral 63.2, exobothridial 17.7; notogaster: length 666, width 444, height 456, setae: c_1 78.4, h_1 86.0, ps_1 96.1; genitoaggenital plate 217 x 65.6, anoadanal plate 303 x 40.4.

Colour light brown. Integument generally punctate.

Prodorsum with lateral carinae forked distally. Sensilli setiform with a few spines on the distal part. Setae fine, sparsely setose, comparative lengths: $in > le > ro > ex$.

Notogaster with 14 pairs of short setae ($c_1/c_1-d_1 = 0.52$), covered with small spines distally, setae c_1 and c_2 considerably remote from anterior margin, setae c_3 only half that distance from margin. Openings of the latero-opisthosomal glands, lyrifissures and vestigial setae present and positioned typically.

Ventral region: Setae h of the mentum longer than the distance between them. Three-segmented palp with formula 2-2-8(1). Epimeral formula 1-0-2-3. Genitoaggenital plates with 9 genital setae each, 2 setae in progenital position. Two pairs of aggenital setae present. Arrangement of anal and adanal setae normal.

Legs: setal and solenidial formulae (without tarsi): I: 1-3-4(2)-5(1), II: 1-3-3(1)-4(1), III: 2-2-2(1)-3(1), IV: 2-1-2-2(1). Tarsus I bidactylous, tarsi II-IV tridactylous, all tarsi heterodactylous.

Holotype: GUA 86-25.

Comparison: The new species differs from *Rhysotritia ardua* in the setiform shape of the sensillus and forked lateral carinae of the prodorsum.

Etymology: The specific name "*dikra*" is a latinized Greek for "forked" and refers to the shape of the lateral carinae of the prodorsum.

Record from Central America:

Guatemala: (fig. 200) GUA 86-25, 1986-02-23: 1 ind.; Rio Dulce - Golfete, in Manatee Biotope Chocon Machacas, at Laguna Calix, 5 m, under *Inga micheliana*; dry to moist, decayed leaf litter.

General distribution: Hitherto only a single specimen is known from the type locality in Guatemala. Probably endemic.

***Rhysotritia dixia* sp. nov.**

(figs 118-126)

DESCRIPTION

Measurements of holotype: prodorsum: length 260, width 197, height 101, sensillus 50.6, setae: interlamellar 137, lamellar 81.0, rostral 68.3, exobothridial 12.6; notogaster: length 540, width 384, height 358, setae: c_1 75.9, h_1 88.5, ps_1 83.5; genitoaggenital plate 177 x 65.6, anoadanal plate 257 x 45.4.

Colour light brown. Integument finely punctate.

Prodorsum with distinct lateral carinae forked distally. Sensilli with narrow stalk and rounded head, covered densely with small spines. Nevertheless, in some paratypes the head of the sensillus is not round but only swollen, covered with small spines. Setae rigid, covered with small spines on the distal half, in>le>ro>ex.

Notogaster with fine, short setae ($c_1/c_1-d_1 = 0.59$), covered with small spines in their distal part. Setae c_1 and c_2 somewhat remote from anterior margin, setae c_2 more so than c_1 , setae c_3 closer to anterior margin. One pair of openings of latero-opisthosomal glands, five pairs of lyrifissures and two pairs of vestigial setae present and positioned normally.

Ventral region with features typical for the genus. Genitoaggenital plates with 9 genital setae each, one in progenital position, 2 aggenital setae.

Leg chaetotaxy typical for the genus. All tarsi monodactylous.

Holotype and 7 paratypes: GUA 23.

Comparison: The species differs from *Rhysotritia ardua* in the forked lateral carinae of the prodorsum, shape of sensilli and monodactylous tarsi.

Etymology: The specific epithet "*dixa*" is a latinized Greek for "forked" and alludes to the shape of the lateral carinae of the prodorsum.

Records from Central America:

Guatemala: GUA 86-19, 1986-02-19: 1 ind.; Baja Verapaz, Quetzal Biotope S of Purulha, cloud forest. 1600 m a.s.l.; moist, well-decayed leaf and fern litter; GUA 86-23, 1986-02-22: 8 ind., Rio Dulce - Golfete, in Manatee Biotope Chocon Machacas, 5 m; decayed leaf litter in mangrove belt.

General distribution:

Hitherto known only from two localities in E Guatemala. Probably endemic.

Rhysotritia ejuncida sp. nov.

(figs 127-133)

DESCRIPTION

Measurements of holotype: prodorsum: length 253, width 177, height 104, sensillus 73.4, setae: interlamellar 109, lamellar 75.9, rostral 60.7, exobothridial 15.2; notogaster: length 505, width 172, height 182, setae: c_1 75.9, h_1 91.1, ps_1 70.8; genitoaggenital plate 167 x 36.6, anoadanal plate 207 x 21.5.

Colour light brown. Integument finely punctate.

Prodorsum with a single pair of distinct lateral carinae. Sensilli setiform, covered with small spines in their distal half. Setae fine, setiform distally, comparative lengths: in>le>ro>ex.

Notogaster with 14 pairs of fine, short setae ($c_1/c_1-d_1 = 0.67$), spinose in their distal half. Setae $c_{1,3}$ considerably remote from anterior margin, setae c_2 more so

than setae c_1 and c_3 . Openings of the latero-opisthosomal glands, lyrifissures and vestigial setae present and positioned typically.

Ventral region: Setae h of the mentum considerably longer than the distance between them. Palp three-segmented with formula 2-2-8(1). Epimeral formula 1-0-2-3. Chaetotaxy of anoadanal plate typical for the genus. Genitoaggenital plates with 9 genital setae each, all posterior to genital furrow. Two pairs of aggenital setae present.

Leg chaetotaxy typical for the genus. Tarsi monodactylous.

Holotype: GAL-HER # 06144.

Comparison: The new species differs from *Rhysotritia ardua* in the setiform shape of the sensillus and in the monodactylous tarsi.

Etymology: The name of this species "*ejuncida*" means "lean" or "slender" and refers to the shape of the sensillus and lateral carinae of the prodorsum.

Record from Galapagos: (fig. 197)

Isla Isabela, Volcán Sierra Negra: GAL-HER # 01644: 1 ind.; Santo Tomás, Cueva de Sucre (leg. J.J. HERNANDEZ).

General distribution:

Hitherto known only as a single specimen from the Galapagos Islands. Probably endemic.

Microtritia tropica MÄRKEL, 1964

(figs 134-140)

Material examined: a specimen in alcohol labelled: "4. *Microtritia tropica* MÄRKEL, Bergwaldgebiet bei Tingo Maria, Peru, Typus, total" and microscopic slides labelled: "P 20 Paratypus Aspis, P 21 Paratypus subcapitulum, P 22 Bein I, P 23 Bein II, P 24 Bein III, P 25 Bein IV" (courtesy Dr. P.J. VAN HELSDINGEN, Curator of Entomology, Rijksmuseum van Natuurlijke Historie, Leiden).

Measurements of "Type": prodorsum: length 190, width 147, height 75.9, sensillus 75.9, setae: lamellar 35.4, rostral 32.9; notogaster: length 328, width 227, height 242, setae: c_1 43.0, h_1 37.9, ps_1 35.4, $c_1/c_1-d_1 = 0.61$; genitoaggenital plate 86.0 x 48.1, anoadanal plate 142 x 37.9.

DIAGNOSIS

Prodorsum with a single pair of lateral carinae, sensillus long, narrow but robust, covered with very small spines, interlamellar setae very small, distance between rostral setae greater than between lamellar setae, $h > h-h$, palp setation 2-1-7(1), 5 pairs of genital setae.

Legs: seta I and solenidial formulae (without tarsi): I: 1-2-3(2)-5(1), II: 1-2-2(1)-3(1), III: 1-2-2(1)-2(1), IV: 1-1-1-2(1). In fig. 10e from MÄRKEL (1964) the ventral seta of tibia II is absent. Tarsi monodactylous.

Record from Cocos Island:

COC 85-3, 1985-06-19: 1 ind.; Chatham Bay, 25 m behind beach, 5 m a.s.l., at base of hill; moist leaf litter and humus (leg. M. ASPINALL).

General distribution:

Gondwanan; Cocos Island.

Family *Phthiracaridae* PERTY, 1841

Phthiracarus anonymus GRANDJEAN, 1934

Records from Galapagos: (fig. 198)

Isla Santa Cruz: GAL 725, 1987-03-06: 2 ind.; *Scalesia* forest near Cerro Crocker, 700 m a.s.l.; moist leaf litter; GAL G 005, 1985-02-07: 1 ind.; fern-sedge zone near Puntudo, 730 m; moist fern litter.

Isla San Cristóbal: GAL 458, 1987-01-01: 1 ind.; GAL 465: 8 ind., GAL 468: 1 ind., GAL G 044: 1 ind., GAL G 045: 1 ind.; *Miconia* zone around lake El Junco, 500-650 m; moist, decayed leaf litter under *Miconia robinsoniana* and *Pteridium aquilinum*.

A total of 15 specimens were found in 7 samples from the higher regions of two islands. Parts of both islands are used for intensive agriculture. It is probable that the species has been introduced by man.

General distribution:

Semicosmopolitan: Europe, Caucasus, N and E Africa, SE Asia; in the Neotropics known from Mexico: Chiapas, and Peruvian Andes (NIEDBALA 1992); Galapagos Islands.

Phthiracarus pygmaeus BALOGH, 1958

Record from Galapagos: (fig. 198)

Isla Seymour Norte: GAL 404, 1986-12-24: 1 ind.; arid zone in the interior of the island, under *Bursera malacophylla* and *Cryptocarpus pyriformis*; dry sandy litter and humus.

Records from Cocos Island:

COC 85-22, 1985-06-24: 1 ind., COC 85-25: 8 ind., COC 85-27: 2 ind.; Chatham Bay, 85 m a.s.l., open area, at base of tree fern; dry leaf litter (leg.: M. ASPINALL).

General distribution:

Gondwanan: SW Africa (Angola: BALOGH 1958); in the Neotropics known from Cuba (*Archiphthiracarus minutissimus*: BALOGH et MAHUNKA 1980); Cocos Island, Galapagos Islands.

Family *Steganacaridae* NIEDBALA, 1986*Plonaphacarus kugohi* (AOKI, 1959)

Records from Galapagos: (fig. 198)

Isla San Cristóbal: GAL 465, 1987-01-01: 1 ind.; small spring in valley near lake El Junco, *Miconia* zone, 540 m a.s.l.; moist, decayed leaf litter under *Miconia robinsoniana*.

Isla Fernandina: GAL 168, 1985-02-20: 1 ind.; Punta Espinosa, Littoral zone, under *Laguncularia racemosa* and *Rhizophora mangle*; moist, well-decayed mangrove leaf litter.

Records from Cocos Island:

COC 85-3, 1985-06-19: 7 ind., and COC 85-4: 2 ind.; Chatham Bay, 25-40 m behind beach, at base of hill; dry to moist leaf litter and humus; COC 85-7: 26 ind., *ibid.*, area next to a stream, always above water level, 75 m a.s.l.; moist moss, rotten branch; COC 85-12, 1985-06-24: 3 ind.; *ibid.*, 100 m behind beach, 30 m, shady area, vines and trees; moist leaf litter; COC 85-16: 2 ind., *ibid.*, gap in the rainforest, 55 m, dry grass litter; COC 85-25: 26 ind.; *ibid.*, 90 m, fairly open undergrowth, at base of a tree fern; dry litter (leg.: M. ASPINALL).

Records from Central America:

Belize: (fig. 200) BEL 89-15, 1989-02-14: 5 ind.; between Belize City and Belmopan, in *Pinus caribbea* forest, 30 m a.s.l.; coniferous and leaf litter; BEL 89-20, 1989-02-14: 7 ind., Maya Mountains, E of Blue Hole National Park, in secondary forest under *Artiocarpus* and palm trees; moist leaf litter.

Guatemala: (fig. 200) GUA 86-23, 1986-02-22: 2 ind.; Rio Dulce - Golfete, in Manatee Biotope Chocon Machacas, 5 m; decayed leaf litter in mangrove belt.

General distribution:

Semicosmopolitan: S and E Asia, E Africa, Australia, Papua New Guinea; in Central America known from the Lesser Antilles: St. Eustatius, Panamá (NIEDBALA 1992); Belize, Guatemala, Cocos Island, Galapagos Islands.

Hoplophthiracarus mutabilis sp. nov.

(figs 141-148)

DESCRIPTION

Measurements of holotype: prodorsum: length 155, width 128, height 66.4, sensillus 62.0, setae: interlamellar 8.9, lamellar 11.1, rostral 31.0, exobothridial 8.9; notogaster: length 310, width 228, height 199, setae: c_1 50.9, h_1 37.6, ps_1 42.1; genitoagenital plate 70.9 x 62.0, anoanal plate 137 x 75.5.

A light brown, relatively small species. Microsculpture of integument in form of mosaic, more marked along notogastral margins. Genitoaggenital and anoanal plates finely foveolate.

Prodorsum with regions weakly developed; lateral carinae long, reaching beyond sinus. Sensilli long, curved, rough in their distal half. Setae spiniform, rough, comparative lengths: $ro > le > ex > in$.

Notogaster with 15 pairs of setae, short ($c_1/c_1-d_1 = 0.57$), stout, expanded distally and covered with small spines. Setae are curved characteristically in a wavy form, particularly those of rows c and d. Setae c_1 situated near anterior margin, setae c_2 and c_3 positioned considerably further back, setae c_2 more so than c_3 . Vestigial setae fl at the level of setae h_1 . Lyrifissures invisible.

Ventral region: Setae h of mentum shorter than the distance between them. Genitoaggenital plates with 9 setae each, formula 4+2:3. Anoanal plate with 2 or 3 anal and 3 stout, rough adanal setae, $ad_2 > ad_1 > an = ad_3$.

Legs: Formula of setae and solenidia of "incomplete type"; seta l on genu IV absent, seta d on femur I situated distally, setae a" on tarsus I, a" and fl" on tarsus II straight distally.

Holotype and 2 paratypes: GUA 20.

Comparison: The most distinctive character separating this species from its congeners is the presence of a mosaic-like microsculpture of the integument.

Etymology: The specific name "*mutabilis*" is Latin for "changeable" and alludes to the variable number of anal setae.

Record from Central America:

Guatemala: GUA 86-19, 1986-02-19: 4 ind.; Baja Verapaz, Quetzal Biotope S of Purulha, cloud forest, 1600 m a.s.l.; moist, well-decayed leaf and fern litter; GUA 86-20: 3 ind.; *ibid.*, 1550 m; moist fern litter.

General distribution:

Hitherto known only from the type locality in E Guatemala. Probably endemic.

Arphthycarus brasiliensis (NIEDBALA, 1988)

Record from Central America:

Guatemala: GUA 86-20, 1986-02-19: 1 ind.; Baja Verapaz, Quetzal Biotope S of Purulha, cloud forest, 1550 m a.s.l.; moist fern litter.

General distribution:

Neotropical: known from Brasil: Manaus (NIEDBALA 1988), and from Guatemala.

Arphthycarus inelegans (NIEDBALA, 1986)

(figs 149-157)

This species was hitherto known only from a single, badly preserved specimen from Costa Rica (NIEDBALA 1986, 1992). Figures 149-157 show a specimen from Galapagos (GAL 459: Isla San Cristóbal, around lake El Junco).

Measurements of specimen from GAL 459: prodorsum: length 288, width 204, height 100, sensillus 71, setae: interlamellar 97, lamellar 35.4, rostral 39.9; notogaster: length 545, width 376, height 332, setae c_1 111, h_1 and ps_1 106, relation of length of c_1 to distance $c_1-d_1 = 1.06$; genitoaggenital plate 142 x 102, anoadanal plate 230 x 128.

Records from Galapagos: (fig. 198)

Numerous records from the following islands: Isla Santa Cruz: cultivated areas, *Scalesia* (frequent), *Miconia*, and fern-sedge zone (frequent) on SE slope between 360 and 860 m. Isla San Cristóbal: *Miconia* and fern-sedge zone around lake El Junco and cultivated areas near El Progreso. Isla Isabela, Volcán Wolf: highland in upper dry and humid zones at 1000 m (leg. L. BAERT, K. DESENDER, J.P. MAELFAIT). Volcán Alcedo: moist highland, on crater rim and inside the crater, humid (*Psychotria*) zone, fern-sedge and elfin forest. Volcán Sierra Negra: pastures at 900 m (leg. S. ABEDRABBO).

A total of 52 specimens were found in 31 samples from five islands or volcanoes, at medium to higher altitudes between 360 and 1030 m. The species was mainly found in moist leaf and fern litter.

Record from Central America:

Belize: (fig. 200) BEL 90-35, 1990-02-26: 1 ind.; Maya Mountains, Mountain Pine Ridge at Rio On Creek, in *Pinus caribbea* forest, 500 m a.s.l.; moist, well-decayed coniferous litter and humus.

General distribution:

Central America: Costa Rica (Parque Nacional Braulio Carillo, NIEDBALA 1986), Belize: Maya Mountains, and Galapagos Islands.

Protophthiracarus bernini NIEDBALA, 1991

Records from Central America:

Belize: (fig. 200) BEL 89-16, 1989-02-14: 3 ind.; Maya Mountains, S of Belmopan near Hummingbird Highway, ca. 120 m a.s.l., beside road under ferns; moist to wet fern litter; BEL 89-19: 1 ind., and BEL 89-20: 4 ind.; *ibid.*, E of Blue Hole, under palm trees and *Artiocarpus*; moist leaf litter.

General distribution:

Hitherto known only from two localities in the Maya Mountains in Belize (NIEDBALA 1991). Probably endemic.

***Protophthiracarus permirus* NIEDBALA, 1991**

Record from Central America:

Costa Rica: COR 86-4, 1986-03-02: 1 ind.; Cordillera de Tilarán, Biological Reserve Monteverde, cloud forest, 1600 m a.s.l.; moist, decayed leaf litter.

General distribution:

Hitherto only a single specimen is known from the type locality in Costa Rica (NIEDBALA 1991). Probably endemic.

***Protophthiracarus reductus* NIEDBALA, 1991**

Record from Central America:

Guatemala: (fig. 200) GUA 86-18, 1986-02-19: 1 ind.; Baja Verapaz, Quetzal Biotope S of Purulha, cloud forest, 1600 m a.s.l.; moist, decayed leaf litter; GUA 86-21: 1 ind.; *ibid.*, 1550 m; moist fern litter.

General distribution:

Hitherto known only from the type locality in E Guatemala (NIEDBALA 1991). Probably endemic.

***Protophthiracarus tripartitus* sp. nov.**

(figs 158-167)

DESCRIPTION

Measurements of holotype: prodorsum: length 395, width 283, height 208, sensillus 55.4, setae: interlamellar 70.9, lamellar 39.9, rostral 62.0, exobothridial 31.0; notogaster: length 837, width 646, height 558, setae: c_1 , h_1 and ps_1 81.9; genitoaggenital plate 182 x 177, anoadanal plate 279 x 221.

Relatively large species. Colour dark brown; sculpture of body strongly-developed, foveolate.

Prodorsum with a very large, humped dorsal carina divided anteriorly into three lobes medial to rostral setae. Lateral carinae reaching as far as sinus. Regions invisible, covered by foveolate microsculpture. Furrows of posterior prodorsum distinct. Sensilli short, with narrow stalk and small globose head with irregular margin. Setae spiniform, rough, but setae in and le obtuse distally; comparative lengths: in>ro>le>ex.

Notogaster with 15 pairs of setae, moderately short ($c_1/c_1-d_1 = 0.38$). All setae (except c_1 which is jagged distally) spiniform, rough, but slightly blunted distally. Setae c_{1-3} remote from anterior margin, setae c_2 farthest. All lyrifissures ia, im, ip, ips present, but vestigial setae f_1 and f_2 invisible.

Ventral region: Genital setal formula 4+2:3; anoanal formula 3:2, setae rough; comparative lengths: $ad_1 > an_1 > an_2 > ad_2 > ad_3$.

Legs: Formulae of setae and solenidia of "complete type", seta d on femur I remote from distal end; setae a" on tarsus I and a" on tarsus II curved distally, ft" on tarsus II straight.

Holotype: BEL 36 and 1 paratype: BEL 37

Comparison: The species is easily distinguished from its congeners by the shape of prodorsum with humped dorsal carina with three lobes.

Etymology: The specific name "*tripartitus*" is Latin for "of three parts" and refers to the three lobes of the anterior dorsal carina.

Record from Central America:

Belize: (fig. 200) BEL 90-36: 1 ind., and BEL 90-37: 1 ind.; 1990-02-26, Maya Mountains, Mountain Pine Ridge at Augustine, 460-470 m a.s.l., near Rio Frio Cave, Hardwood tropical forest; moist, well-decayed leaf litter.

General distribution:

Hitherto known only from the type locality in the Maya Mountains in Belize. Probably endemic.

***Protophthiracarus varius* sp. nov.**

(figs 168-180)

DESCRIPTION

Measurements of holotype: prodorsum: length 332, width 239, height 137, sensillus 62.0, setae: interlamellar 62.0, lamellar 39.9, rostral 66.4; notogaster: length 616, width 420, height 403, setae: c_1 79.7, ps_1 106; genitoaggenital plate 186 x 120, anoanal plate 177 x 133.

Relatively large species. Colour light to dark brown. Microsculpture of integument strongly foveolate.

Prodorsum: Dorsal carina well developed; regions narrow and long. Furrows in the posterior part well visible. Sensilli spindle-shaped, with small setae distally. Setae in and le short, robust, spinose in the distal half, setae ro spiniform, rough; setae ex vestigial.

Notogaster with 15 pairs of short setae ($c_1/c_1-d_1 = 0.4$), variable in form: mostly large, stout, with small spinules in the distal half; setae c_2 , cp, h_3 broadened distally and covered with small spinules, setae c_3 small, also broadened distally, setae ps_3 and ps_4 lanceolate in form, covered with small spines, ps_3 more so than ps_4 . Setae c_1 and

c_3 positioned near anterior margin, setae c_2 further back. Two pairs of lyrifissures ia and im present. Vestigial setae f_1 invisible.

Ventral region: Setae h of mentum shorter than the distance between them. Formula of genital setae: 4+2:3. Formula of anoanal setae: 3:2, setae ad_2 the longest and largest, rough; $ad_2 > ad_1 = an > ad_3$.

Legs: Formulae of setae and solenidia of "complete type", seta d on femur somewhat remote from distal end; setae a" on tarsus I and II and ft" on tarsus II curved distally.

Holotype and 10 paratypes: BEL 90-34.

Comparison: The new species can be easily distinguished from its congeners by the setae of notogaster which are variable in form. It is somewhat similar to *Protophthiracarus bernini* NIEDBAŁA, 1991, but differs in the shape of setae of the prodorsum and notogaster.

Etymology: The specific epithet "*varius*" is Latin for "varying", "changing", "different" and refers to the variable shape of the gastronotal setae.

Records from Central America:

Belize: (fig. 200) BEL 90-34, 1990-02-26: 11 ind.; Maya Mountains, Mountain Pine Ridge Forest Reserve, 680 m a.s.l., near Hidden Fall in *Pinus caribbea* forest; moist, decayed fern litter; BEL 90-37, *ibid.*: 5 ind.; Maya Mountains, Mountain Pine Ridge at Augustine, 470 m a.s.l., near Rio Frio Cave, Hardwood tropical forest; moist, well-decayed leaf litter.

General distribution:

Hitherto known only from two localities in the Maya Mountains in Belize. Probably endemic.

Notophthiracarus schatzii NIEDBAŁA, 1989

Record from Galapagos: (fig. 198)

Isla Fernandina, Punta Espinoza: GAL 168, 1985-02-20: 3 ind.; littoral zone, under *Laguncularia racemosa* and *Rhizophora mangle*; moist, well-decayed mangrove leaf litter.

General distribution:

Hitherto known only from the type locality in the Galapagos Islands (NIEDBAŁA 1989). Probably endemic.

Atropacarus (Hoplophorella) andrei (BALOGH, 1958)

Atropacarus (Hoplophorella) scapellata (AOKI, 1965)

Records from Galapagos: (fig. 199)

Numerous records from the following islands: Isla Santa Cruz: transition zone and cultivated areas around Bella Vista and Santa Rosa, *Scalesia*, *Miconia*, and fern-sedge zone, between 90 m and 730 m. Isla San Cristóbal: *Miconia* zone around lake El Junco, and cultivated areas near El Progreso, at 460 m. Isla Floreana: moist highland and cultivated areas between Cerro Pajas and Asilo de la Paz, between 320 and 360 m. Isla Santiago: dry forest on W side, at 300 m, and moist highland at Los Aguacates, 550 m, in forest (leg. S. ABEDRABBO). Isla Pinta: humid zone at 450 and 560 m, in forest of *Zanthoxylum fagara*. Isla Isabela, Volcán Alcedo: upper arid zone at 780 m; moist highland, on crater rim and inside the crater in humid (*Psychotria*) zone, fern-sedge and elfin forest (frequent). Volcán Sierra Negra: SE slope from the arid zone near Puerto Villamil at 10 m up to 900 m, in *Scalesia* forest and on pastures. Volcán Cerro Azul: Pampa at 400 m (leg. L. BAERT, K. DESENDER, J.P. MAELFAIT). Isla Fernandina: W slope from 450 to 1290 m, in dry and humid zones and in fern-sedge zone.

A total of 102 specimens were found in 53 samples from nine islands or volcanoes, mostly at medium to higher altitudes. In Galapagos, this species occurs in all vegetation zones, except in the littoral zone. It was frequently found in cultivated areas as well as in moist habitats at medium to higher altitudes between 100 and 900 m. It was mainly found in leaf and fern litter and in humus.

Record from Cocos Island:

COC 85-12, 1986-06-24: 1 ind.; Chatham Bay, 100 m behind beach, 30 m, shaded area, vines and trees; moist leaf litter (leg. M. ASPINALL).

Records from Central America:

Belize: (fig. 200) BEL 89-12: 1 ind., and BEL 89-14: 5 ind., 1989-02-09; Half Moon Cay, Light House Reef: dense tree and bush vegetation in the interior of the island, 5 m a.s.l.; moist, well-decayed leaf litter; BEL 89-17, 1989-02-14: 2 ind.; Maya Mountains, at Blue Hole, tropical rainforest, ca. 100 m; moist, partly-decayed leaf litter; BEL 90-31, 1990-02-12: 1 ind.; Maya Mountains, Cockscomb Basin Reserve, hardwood rainforest, ca. 200 m; moist, decayed leaf litter with roots and humus.

Guatemala: (fig. 200) GUA 86-8, 1986-02-14: 1 ind., GUA 86-10, 1986-02-15: 1 ind., GUA 86-13: 1 ind., and GUA 86-14: 1 ind.; Peten, Tikal, rainforest, 200 m a.s.l.; moist, leaf litter and humus; GUA 86-25, 1986-02-23: 1 ind.; Rio Dulce - Golfete, in Manatee Biotope Chocon Machacas, at Laguna Calix, 5 m, under *Inga micheliana*; dry to moist, decayed leaf litter.

General distribution:

Gondwanan: S and SE Asia, Papua New Guinea, Australia, Central and W Africa; Central America: Greater and Lesser Antilles, Panamá: Barro Colorado Island; South America: Brasil, Venezuela: Isla Margarita, Peruvian Andes (NIEDBALA 1992), Belize, Guatemala, Cocos Island, Galapagos Islands.

Atropacarus (Hoplophorella) cucullatus (EWING, 1909)

Record from Galapagos: (fig. 199)

Isla Santiago: GAL 91-S.4, 1991-06-09: 1 ind.; moist highland at Los Aguacates, 550 m a.s.l.; leaf litter under *Croton scouleri* and *Tournefortia rufo-serica* (leg. S. ABEDRABBO).

Records from Central America:

Belize: (fig. 200) BEL 90-37, 1990-02-26: 1 ind.; Maya Mountains, Mountain Pine Ridge at Augustine, 470 m a.s.l., near Rio Frio Cave, Hardwood tropical forest; moist, well-decayed leaf litter.

Guatemala: (fig. 200) GUA 86-8, 1986-02-14: 1 ind.; Peten, Tikal, rainforest, near temple V, 200 m a.s.l.; moist, well-decayed leaf litter under rock; GUA 86-26: 1 ind., and GUA 86-27: 4 ind., 1986-02-25; at River Los Altares near Livingston, 20 m resp. 30 m, hardwood tropical rainforest; moist, decayed leaf litter and humus.

General distribution:

Semicosmopolitan: S and E Asia, Papua New Guinea, Nearctic; Central America: Panamá (NIEDBALA 1992). Belize, Guatemala, Galapagos Islands.

Atropacarus (Hoplophorella) glaucus (HAMMER, 1972)

Records from Galapagos: (fig. 199)

Isla Santa Cruz: GAL G038, 1985-04-16: 1 ind.; near Los Gemelos, *Scalesia* forest, 590 m, under *Scalesia pedunculata*, *Chiococca alba*, and *Zanthoxylum fagara*; moist, decayed leaf litter; GAL G 072, 1987-03-08: 2 ind.; *ibid.*, *idem*; GAL #1203, 1982-04-21: 1 ind.; *ibid.*, *idem* (leg. Y. LUBIN).

Isla Floreana: GAL 527, 1987-01-17: 2 ind.; cultivated area in moist highland between Cerro Pajas and Asilo de la Paz, 320 m; moist leaf litter and moss under *Zanthoxylum fagara* and *Psidium guajava*; GAL 528: 1 ind.; *ibid.*, 340 m; dry to moist leaf litter and pieces of wood under *Furcraea cubensis* and *Lantana camara*; GAL G052: 3 ind.; *ibid.*, 340 m; moist, well-decayed leaf litter and humus in *Commelina diffusa* under *Scalesia pedunculata*.

Isla Fernandina: GAL 260, 1985-03-15: 3 ind.; W part of the crater rim, under ferns *Telypteris* sp. and *Pityrogramma calomelanus* in fumarole, 1290 m; moist to wet, decayed fern litter (soil temperature >40° C).

A total of 13 specimens were found in 7 samples from three islands in different sites, among them in fern litter in a hot fumarole on Fernandina. In Galapagos, the species occurs mainly in moist leaf litter at medium elevations.

Records from Cocos Island:

COC 85-3, 1985-06-19: 3 ind; Chatham Bay, 25 m behind beach, 5 m a.s.l., at base of hill; moist leaf litter and humus; COC 85-7: 1 ind.; *ibid.*, 75 m, area next to

a stream, always above water level; moist moss, rotten limb; COC 85-8: 1 ind.; *ibid.*, 80 m behind beach, 4 m; moist leaves and humus, partly covered by a large rock; COC 85-25: 1 ind.; *ibid.*, 90 m, sunny fairly open undergrowth, at base of tree fern; dry leaf litter (leg. M. ASPINALL).

Records from Central America:

Belize: (fig. 200) BEL 89-12: 2 ind., BEL 89-13: 5 ind., and BEL 89-14: 1 ind., 1989-02-09; Half Moon Cay, Light House Reef: dense tree and bush vegetation in the interior of the island; well-decayed, moist leaf litter; BEL 89-15, 1989-02-14: 1 ind.; between Belize City and Belmopan, in *Pinus caribbea* forest, 30 m a.s.l.; coniferous and leaf litter; BEL 89-21: 2 ind.; *ibid.*, E of Belmopan; dry to moist leaf litter and humus; BEL 89-18, 1989-02-14: 2 ind.; Maya Mountains, at Blue Hole, ca. 100 m a.s.l., in tropical primeval rainforest; moist, decayed leaf litter; BEL 89-19: 10 ind. and BEL 89-20: 3 ind.; *ibid.*, E of Blue Hole, under palm trees and *Artiocarpus*; moist leaf litter; BEL 89-31, 1990-02-12: 1 ind.; Maya Mountains, Cockscomb Basin Reserve, hardwood rainforest, ca. 200 m; moist, decayed leaf litter with roots and humus.

Guatemala: (fig. 200) GUA 86-24, 1986-02-23: 2 ind.; Rio Dulce - Golfete, in Manatee Biotope Chocon Machacas, 5 m, hardwood tropical forest at Rancho, under *Swietenia macrophylla*; dry to moist, decayed leaf litter under uppermost layer.

Costa Rica: COR VII-3, 1992-02-08: 1 ind., COR X-5, 1991-01-09: 1 ind., and COR XIII-7, 1991-02-02: 1 ind.; Biological Station La Selva near Puerto Viejo de Sarapiquí, 50 m a.s.l., lowland rainforest; in phytotelms of bromelias on trees (leg. E. STUR).

General distribution:

Gondwanan: Polynesia (HAMMER 1972, NIEDBALA 1992); Belize, Guatemala, Costa Rica, Cocos Island, Galapagos Islands.

Atropacarus (Hoplophorella) schauenbergi (MAHUNKA, 1978)

Records from Galapagos: (fig. 199)

Isla Santa Cruz: GAL 819, 1988-03-10: 1 ind.; littoral zone in Bahía Academy, Puerto Ayora, under *Conocarpus erecta* and *Avicennia germinans*; dry to moist mangrove leaves; GAL G013, 1985-02-27: 1 ind.; transition zone around Caseta, forest of *Psidium galapageium*, 190 m a.s.l.; dry moss, leaf litter and humus; GAL G006, 1985-02-08: 1 ind.; *Scalesia* forest near Cerro Crocker, 700 m; dry to moist leaf litter, moss, and humus under *Scalesia pedunculata*.

Isla Plaza Sur: GAL 669, 1987-02-20: 1 ind.; near landing dock, 5 m; dry to moist, decayed litter under *Opuntia echios* and *Grabowskia boerhaaviaefolia*.

Isla San Cristóbal: GAL G030, 1985-03-31: 1 ind.; cultivated area near El Progreso, 350 m; dry to moist, well-decayed leaf litter under *Psidium guajava*, *Persea americana*, and *Eugenia jambos*.

Isla Floreana: GAL 529, 1987-01-17: 2 ind.; cultivated area near caves under Asilo de la Paz, 340 m; moist, well-decayed leaf litter with roots and humus, in crevice under *Lantana camara*.

Isla Pinta: GAL 922, 1988-04-01: 5 ind.; summit of the main crater, fern-sedge zone with *Polypodium* sp., and *Pteridium aquilinum*, 600 m; moist, decayed fern litter and humus, under uppermost layer; GAL 924: 15 ind.; *ibid.*; moist moss under *Cyperus*, with roots of fern, and humus (soil temperature of both samples >40°C due to volcanic activity).

Isla Isabela, Volcán Wolf: GAL 952, 1988-03-23: 1 ind.; upper dry zone, forest of *Zanthoxylum fagara*, *Cordia lutea*, *Macraea laricifolia*, *Tournefortia* sp., and *Psidium galapageium*, 1000 m; moist, decayed leaf litter and humus in thick litter layer (leg. L. BAERT, K. DESENDER, J.P. MAELFAIT, loc. 72). Volcán Alcedo: GAL 910, 1988-03-25: 2 ind.; NE slope, upper arid zone with open woodland of *Scalesia microcephala*, *Tournefortia rufo-serica*, and *Heliotropium angiospermum*, 780 m; dry to moist leaf litter; GAL 876: 2 ind., and GAL G077: 2 ind.; 1988-03-21, upper edge of inner S crater rim, fern-sedge zone, 1030 m; moist fern litter under *Pteridium aquilinum* and *Ipomoea* sp.; GAL G079, 1988-03-22: 1 ind.; inside small crater NW of fumarole, elfin forest of *Psychotria rufipes* and *Scalesia microcephala*, 890 m; moist, decayed leaf litter and humus. Volcán Cerro Azul: GAL-91-S.16, 1991-05-19: 1 ind.; arid zone with open herb vegetation, 5 m (leg. L. BAERT, K. DESENDER, J.P. MAELFAIT).

Isla Fernandina: GAL G023, 1985-03-15: 21 ind.; W part of the crater rim, under ferns *Telypteris* sp. and *Pityrogramma calomelanus* in fumarole, 1290 m; moist to wet, decayed fern litter (soil temperature >40°C); GAL 91-S.25, 1991-05-09: 1 ind.; forest in humid (*Psychotria*) zone, 450 m (leg. S. ABEDRABBO, loc. #5).

A total of 58 specimens were found in 16 samples from nine islands or volcanoes. In Galapagos, this species occurs mainly in moist fern and leaf litter and humus in almost all vegetation zones. Some specimens were found in or near agricultural areas, others in remote places on Pinta, Isabela and Fernandina, where introduction by humans is unlikely. Several specimens were found in soils heated by volcanic activity.

Record from Cocos Island:

COC 85-21, 1985-06-24: 1 ind.; Chatham Bay, 80 m a.s.l., in forest; moist moss from base of tree (leg. M. ASPINALL).

General distribution:

Gondwanan: India, Mauritius; Greater and Lesser Antilles (NIEDBALA 1992); Galapagos Islands, Cocos Island.

***Atropacarus (Hoplophorella) singularis* (SELLNICK, 1959)**

Record from Galapagos: (fig. 199)

Isla Isabela, Volcán Sierra Negra: GAL 516: 1987-01-15: 1 ind.; W of Puerto Villamil near cemetery, littoral zone, under *Conocarpus erecta* and *Rhizophora mangle* between lagoons and lava flow; moist mangrove leaf litter and black humus.

General distribution:

Gondwanan: Australia, Polynesia; Central America: Greater and Lesser Antilles (NIEDBALA 1992); Galapagos Islands.

***Atropacarus (Hoplophorella) stilifer* (HAMMER, 1961)**

Records from Galapagos: (fig. 199)

Isla Santa Cruz: Littoral zone in Puerto Ayora, in algae; arid zone around P. Ayora, and on N part of the island, 250 m; transition zone on N part, 520 m; fern-sedge zone on Cerro Crocker, 860 m. Isla San Cristóbal: *Miconia* zone in Encañada with small river SE of lake El Junco, 500 m, and cultivated areas near El Progreso, 460 m. Isla Gardner near Española: arid zone. Isla Floreana: moist highland and cultivated areas between Cerro Pajas and Asilo de la Paz, between 340 and 555 m. Isla Pinzón: arid zone, SE slope and Central Valley between 30 m and 300 m, and under *Scalesia incisa* at 310 m. Isla Santiago: dry forest on W side, at 300 m. Isla Bartolomé: littoral zone, under mangroves. Isla Pinta: summit of the main crater, fern-sedge zone, 600 m (soil temperature >40°C). Isla Isabela Volcán Alcedo: upper arid zone at 780 m. Volcán Sierra Negra: littoral zone near Puerto Villamil; arid zone between P. Villamil (muro de las lagrimas) and Quinta Playa, under *Scalesia cordata*, *Pisonia floribunda*, and *Heliotropium angiospermum*; transition zone, between 200 and 230 m, under *Scalesia cordata* and *Sapindus saponaria*. Isla Fernandina: Punta Espinoza, littoral zone, mangrove litter; W slope from 450 to 1290 m, in dry and humid zones and in fern-sedge zone.

A total of 182 specimens were found in 46 samples from 11 islands or volcanoes. In Galapagos, this species occurs in all vegetation zones from the littoral zone to the top of the islands, mostly at lower and medium elevations, in a wide variety of habitats: in grass, cactus, leaf and fern litter, in rotten wood and humus, as well as in soils heated by volcanic activity.

Records from Central America:

Guatemala: 86-16, 1986-02-19: 1 ind.; Baja Verapaz, Quetzal Biotope S of Purlha, cloud forest, 1600 m a.s.l.; moist moss from tree trunk; GUA 86-23, 1986-02-22: 12 ind., Rio Dulce - Golfete, in Manatee Biotope Chocon Machacas, 5 m; dry to moist, decayed leaf litter in mangrove belt; GUA 86-25, 1986-02-23: 6 ind., *ibid.*,

at Laguna Calix, 5 m, under *Inga micheliana*; dry to moist, decayed leaf litter; GUA 90-30, 1990-02-02: 3 ind.; *ibid.*, hardwood tropical forest at Rancho; moist, decayed leaf litter.

General distribution:

Gondwanan: India; Peru; Panamá (NIEDBAŁA 1992); Guatemala, Galapagos Islands.

Atropacarus (Hoplophorella) tuberosus sp. nov.

(figs 181-195)

DESCRIPTION

Measurements of holotype: prodorsum: length 288, width 195, height 151, sensillus 106, setae: rostral 26.6, exobothridial 13.3; notogaster: length 611, width 407, height 412, setae: c_1 35.4, h_1 , ps_1 24.9; genitoaggenital plate 137x 79.7, anoanal plate 177x 97.5.

Relatively large species; brown in colour, integument covered with irregular, wavy microsculpture, with fine puncturation; distinct cerotegument present.

Prodorsum with strong dorsal carina, two long lateral carinae present on each side. Dorsal region long with incision posterior to rostral setae. Lateral carinae short, rounded anteriorly. Sensilli long, narrow, sickle-shaped, rough; setae short, spiniform, rough; comparative lengths: $ro > in = le > ex$.

Notogaster with 15 pairs of setae, short ($c_1/c_1-d_1 = 0.15$), swollen, phylliform, rough (gastronotal setae of specimens from locality GUA 86-8 much narrower). All setae inserted on round protuberances, those of setae h_1 , h_2 , ps_1 , and ps_2 are especially prominent. Setae $c_{1,3}$ slightly remote from anterior margin, c_2 somewhat more than c_1 and c_3 .

Ventral region: Setae h of mentum shorter than the distance between them. Genitoaggenital plates with 9 setae each, formula: 4+1:4. Anoanal plates with 5 rough setae each, formula 3:2, ad_2 and ad_3 short, spiniform, ad_1 and an longer, ad_1 slightly shorter than an .

Legs: Formulae of setae and solenidia of "complete type", seta d on femur I inserted distally; setae a'' on tarsus I, a'' and ft'' on tarsus II straight distally.

Holotype and 9 paratypes: GUA 14.

Comparison: The new species differs from other members of *Hoplophorella* in the shape of its gastronotal setae.

Etymology: The name of this species "*tuberosus*" meaning "with protuberance" refers to the protuberances or apophyses on which the notogastral setae are inserted.

Record from Central America:

Guatemala: (fig. 200) GUA 86-8, 1986-02-14: 1 ind.; Peten, Tikal, near temple V, rainforest, 200 m a.s.l.; moist, well-decayed leaf litter under rock; GUA 86-14, 1986-02-15: 10 ind; *ibid.*, near S Acropolis; moist, undecayed to well-decayed leaf litter.

General distribution:

Hitherto known only from the type locality in E Guatemala. Probably endemic.

ECOLOGICAL NOTES

In Galapagos, the euptyctimous mites occur in all vegetation zones from the littoral zone (mangrove leaf litter) to the top of the islands. The records from the littoral zone are mostly single individuals. Most species prefer moist habitats at medium to higher elevations of the islands and were found in leaf and fern litter, moss and humus, but some occur also in grass or cactus litter. Some species inhabit even such extreme habitats as fern litter in fumaroles or hot volcanic soils (*Rhysotritia clavata*, *Rh. comteae*, *Arphthycarus inelegans*, *Atropacarus andrei*, *A. glaucus*, *A. schauenbergi*, and *A. stilifer*). Other species were mainly found in or near agricultural areas, suggesting introduction by man (*Oribotritia didyma*, *Indotritia bellingeri*, *Phthiracarus anomymus*).

The Euptyctima colonize a similar range of microhabitats on the Cocos Island, which offers only tropical rainforest. Most species were found in dry to moist leaf, fern and grass litter, moss and humus, as well as in rotten wood. Although some species occur in leaf litter close to the beach, most species prefer medium elevations of the island (in the higher part of the island no samples have been collected yet).

In Central America, Euptyctima were mostly found in moist, decayed leaf and fern litter, rotten wood, and moss in tropical rainforest of lower elevations between 5 and 460 m a.s.l., but also in cloud forest between 1550 and 2100 m. Several species inhabit the decayed coniferous and fern litter of *Pinus caribbea* forest between 30 and 680 m (*Rhysotritia clavata*, *Rh. comteae*, *Rh. dinota*, *Plonaphacarus kugohi*, *Arphthycarus inelegans*, *Protophthiracarus varius*, *Atropacarus glaucus*). Some species occur in mangrove leaf litter (*Rhysotritia dixia*, *Plonaphacarus kugohi*, *Atropacarus stilifer*), some were found in leaf litter on the coralline island Half Moon Cay of the Light House Reef Atoll, 75 km off the Belizean coast (*Mesotritia breviseta*, *Indotritia krakatauensis*, *Atropacarus andrei*, *A. glaucus*). *Atropacarus glaucus* was also found in phytotelms of bromelias on trees, a rarely investigated habitat in which more species can be expected.

Table 1 shows the distribution of the Euptyctima on various islands of the Galapagos Archipelago and on the Cocos Island. Euptyctima were found on 14 islands in Galapagos and 4 volcanoes of Isla Isabela. The highest number of species was found on Isla Santa Cruz (13 species), followed by San Cristóbal and Isabela (11 species each), Floreana (10) and Fernandina (9 species). The other islands show lower numbers of species, which is partly explained by their small size and fewer habitats available, but also by the smaller number of samples taken there. No Euptyctima could be found on some islands where samples were taken: the tiny islands Baltra, Daphne, and Sombrero Chino, but also the larger but flat islands Genovesa and Marchena, and the dry slopes of Volcán Darwin on Isla Isabela. On

the Cocos Island 11 species were found. The diversity of each island is dependent of the island area, larger islands generally supporting more species than smaller ones (MAC ARTHUR and WILSON 1967). The increase of the species number with the area of each island follows the regression $y = 0.307 x + 0.080$ (fig. 201).

Area itself is probably not the primary factor affecting species richness, but it presumably operates indirectly through increasing the variety of available habitats (MAC ARTHUR and WILSON 1967, PIANKA 1988). The larger islands are generally higher in altitude and offer more vegetation zones and more habitats. This is also true of the Euptyctima (the correlation coefficient of the dependence island size - species number is $r = 0.87$). Apart from some islands that harbour only one species, most islands of the Galapagos Archipelago are close to the regression line (fig. 201), showing similar habitat patterns. Isla Santiago is an exception which can be explained by the low number of samples taken there. More species can be expected on that island. The number of species increases considerably on the Cocos Island, which is covered with tropical rainforest. That island harbours more species than any Galapagos island of comparable size.

The similarity of species composition between the islands (fig. 202) was calculated using the similarity index of BARONI-URBANI and BUSER (1976). Compared to other similarity indices, this index includes also the negative matches, or the common absence of species in two samples. The cluster analysis was carried out using the method of average linkage between the merged clusters (ANDERBERG 1973). Islands with only one or two species of euptyctimous mite are omitted; the volcanoes of Isabela Island were treated separately.

The Cocos Island lies apart and has a similarity of 56% with the islands of Galapagos; 6 species are common to both. The Galapagos islands or volcanoes show a great degree of similarity of euptyctimous mite species. The highest similarities can be found between Volcán Alcedo and Isla Fernandina, as well as between the volcanoes Wolf and Sierra Negra, and of the latter volcanoes with Isla Santiago. Santa Cruz and Floreana show 87% similarity with 10 species in common, and both islands together 75% with San Cristóbal. The remaining islands and volcanoes decrease gradually in similarity with the mentioned groups and islands. This might be explained in part by lower species numbers. The species similarity corresponds with the similarity of the habitats or vegetation zones. Higher islands offer more habitats and have more species in common. On the other hand, the Cocos Island with its different type of vegetation has a different species composition (cf. table 1).

ZOOGEOGRAPHIC REMARKS

During our investigations of the euptyctimous oribatid fauna on the Galapagos Islands, Cocos Island and in Central America, we found 18 species of *Euphthiracaroida* and 19 species of *Phthiracaroida*. Seventeen species are new to the science.

Sixteen species of *Euphthiracaroidea* and 49 species of *Phthiracaroidea* were previously known from the literature from the northern Neotropical Region (Central America, Antilles, and northern South America including Peru) (BALOGH & BALOGH 1988 and pers. com.). Only one species of *Steganacaridae* was known from the Galapagos Islands, which was collected in the course of this project (NIEDBALA 1989, SCHATZ 1991a), and not a single species from the Cocos Island.

At present, a total of 19 species of euptyctimous oribatid mites are known from the Galapagos Islands (Tab. 1), among them 5 new to the science, and 3 known only from the Archipelago. Eleven species were found on the Cocos Island (Tab. 1), among them 4 new to the science, and 3 known only from this island. Out of the 25 species recorded from Central America during this study, 11 are new to the science, and 10 are known only from one or two localities. The lack of data on the Neotropical Region precludes inferences on endemism for most species.

Among the 11 species of *Phthiracaroidea* from the Galapagos Islands 3 were found in great abundance, all of them showing a wide geographic distribution. Of the 8 species of *Euphthiracaroidea*, there are 5 frequent, 4 of them with a rather wide distribution, and one, *Indotritia retusa*, may be endemic to the archipelago.

The *Phthiracaroidea* recorded in this study are characterized by a high percentage of widely distributed species. Species restricted to Central or South America are approximately as numerous as those with a wider distribution (Gondwanan or semicosmopolitan). Only one species of *Steganacaridae*, *Notophthiracarus schatzii* NIEDBALA, 1989, might be endemic to the Galapagos Islands.

The *Euphthiracaroidea*, on the other hand, are characterized by the presence of only 4 species with a wide distribution (South America, Gondwanan or semicosmopolitan). Most species seem to have their origin in Central America. Also the number of endemic species is higher than in the preceding group; two might be endemic to the Galapagos Islands; three to the Cocos Island.

The *Euptyctima* of the Galapagos Islands and Cocos Island are of a clearly Central American and in part South American origin. The arrival of the euptyctimous mites in such isolated oceanic islands can be explained mainly in two ways: dispersal of these minute organisms by rafting, depending on currents, and transport by other organisms, mostly accidentally by man with agricultural products and soil, but perhaps also by birds (HAMMER 1982, SCHATZ 1991b).

DISCUSSION

The Galapagos Islands are geologically young, the Cocos Island is even younger, and both Galapagos and Cocos are relatively close to the mainland. They may represent earlier stages in evolution of insular biota. The best example is the majority of the euptyctimous mite fauna which on both island groups is very similar to the Central American fauna. The fauna of the Galapagos Islands is well known for its uniqueness. The peculiarities of oceanic island ecology, like arrival by chance, and a wide spectrum of unoccupied niches, favour a rapid evolution of endemic

forms in geographical isolation (CARLQUIST 1974, SCHATZ 1991b). The Galapagos Islands constitute a mosaic of dry and wet habitats, subject to unpredictable changes due to volcanic activity and climatic variation. Moreover, the archipelago effect provides opportunities for adaptive radiation and allopatric speciation (PORTER 1984). The percentage of endemic taxa is a measure of degree of isolation in space and time (CARLQUIST 1966). The presence of 5 apparently endemic species of *Euphthiracaroides* and *Phthiracaroides* might indicate the fast process of speciation on this archipelago.

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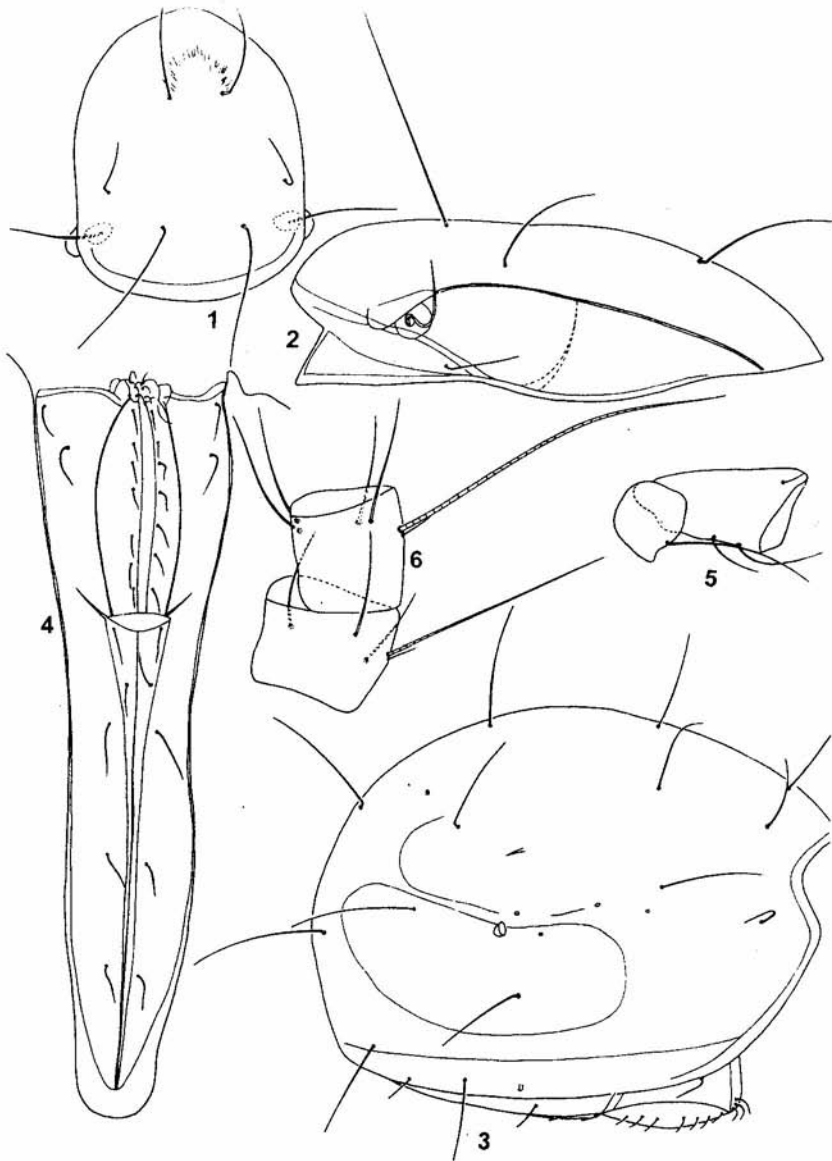
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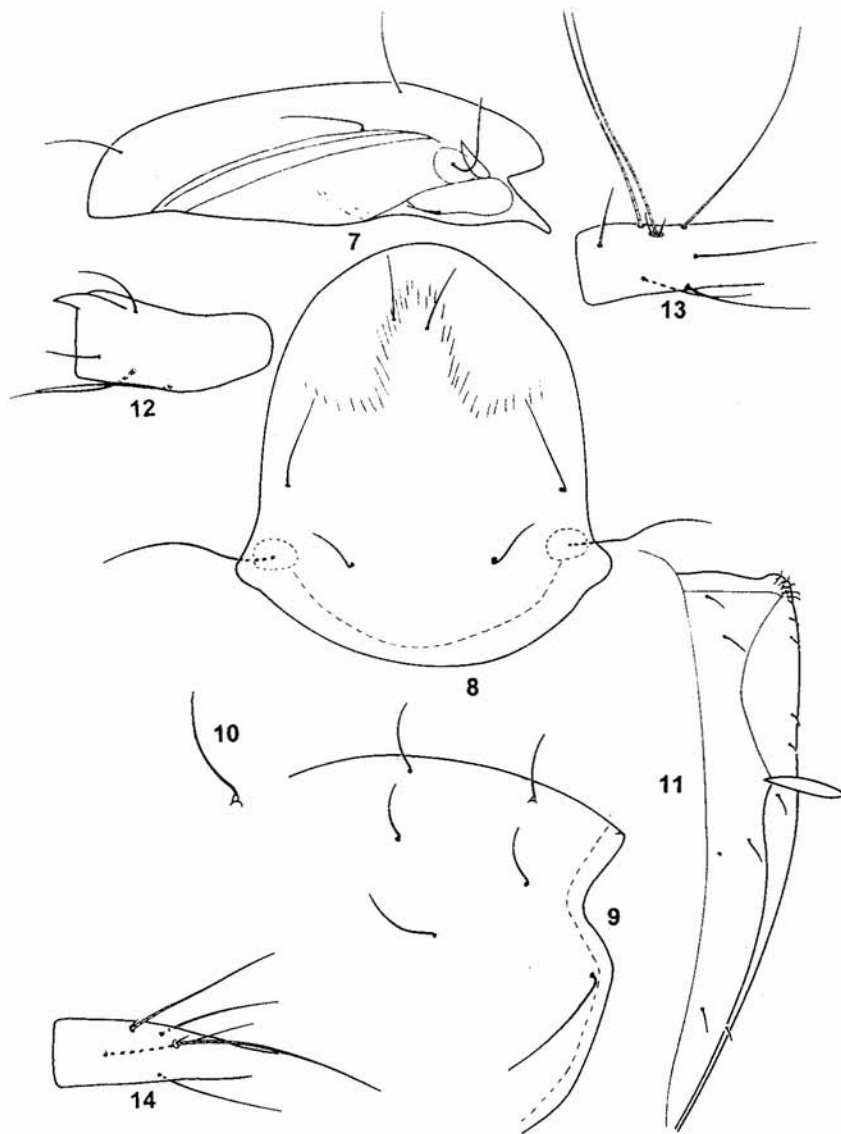
Table 1: Euptyctimous mites (*Acari, Oribatida*) from the Galapagos Islands and Cocos Island: number of specimens / number of localities.

Species:	Island:	GALAPA-GOS	Santa Cruz	Seymour Norte	Plaza Sur	San Cristóbal	Santa Fe	Gardner / Española	Isabela
	Size (Km ²):	7882	904	1,8	0,2	552	24	0,6	171
	Altitude (m):	1710	864	30	30	715	259	49	640
<i>Oribotritia attenuata</i> sp. nov.									
<i>Oribotritia didyma</i> sp. nov.		22/6	10/5				1/1		5/5
<i>Oribotritia serrula</i> sp. nov.									
<i>Oribotritia trisetosa</i> sp. nov.									
<i>Indotritia bellingeri</i> sp. nov.		92/5	89/3						1/1
<i>Indotritia retusa</i> sp. nov.		166/53	55/8			13/9			37/14
<i>Euphthiracarus fusticulus</i> sp. nov.									
<i>Rhysotritia ardua</i> (C.L. KOCH, 1841)		63/10	6/2			18/4			39/4
<i>Rhysotritia clavata</i> MÄRKEL, 1964		223/55	57/19			13/7			3/2
<i>Rhysotritia comteae</i> MAHUNKA, 1983		684/104	140/25			198/15	2/1		82/14
<i>Rhysotritia dinota</i> sp. nov.		7/5	6/4			1/1			
<i>Rhysotritia ejuncida</i> sp. nov.		1/1							
<i>Microtritia tropica</i> MÄRKEL, 1964									
<i>Phthiracarus anonymus</i> GRANDJEAN, 1934		15/7	3/2			12/5			
<i>Phthiracarus pygmaeus</i> BALOGH, 1958		1/1		1/1					
<i>Plonaphacarus kugohi</i> (AOKI, 1959)		2/2				1/1			
<i>Arphthacarus melegans</i> (NIEDBALA, 1985)		51/30	25/18			15/7			
<i>Notophthiracarus schatzii</i> NIEDBALA, 1989		3/1							
<i>Atropacarus</i> (II.) <i>andrei</i> (BALOGH, 1958)		106/53	27/15			10/3			8/7
<i>Atropacarus</i> (II.) <i>cucullatus</i> (EWING, 1909)		1/1							
<i>Atropacarus</i> (II.) <i>glauca</i> (HAMMER, 1972)		13/7	4/3						6/3
<i>Atropacarus</i> (II.) <i>schauenbergi</i> (MAHUNKA, 1978)		58/16	3/3		11/1	1/1			2/1
<i>Atropacarus</i> (II.) <i>singularis</i> (SELLNICK, 1959)		1/1							
<i>Atropacarus</i> (II.) <i>stilifer</i> (HAMMER, 1961)		182/46	22/12			2/2		3/2	19/5
	Number of species:	19	13	1	1	11	2	1	10
	Number of specimens:	1691	447	1	11	284	3	3	202

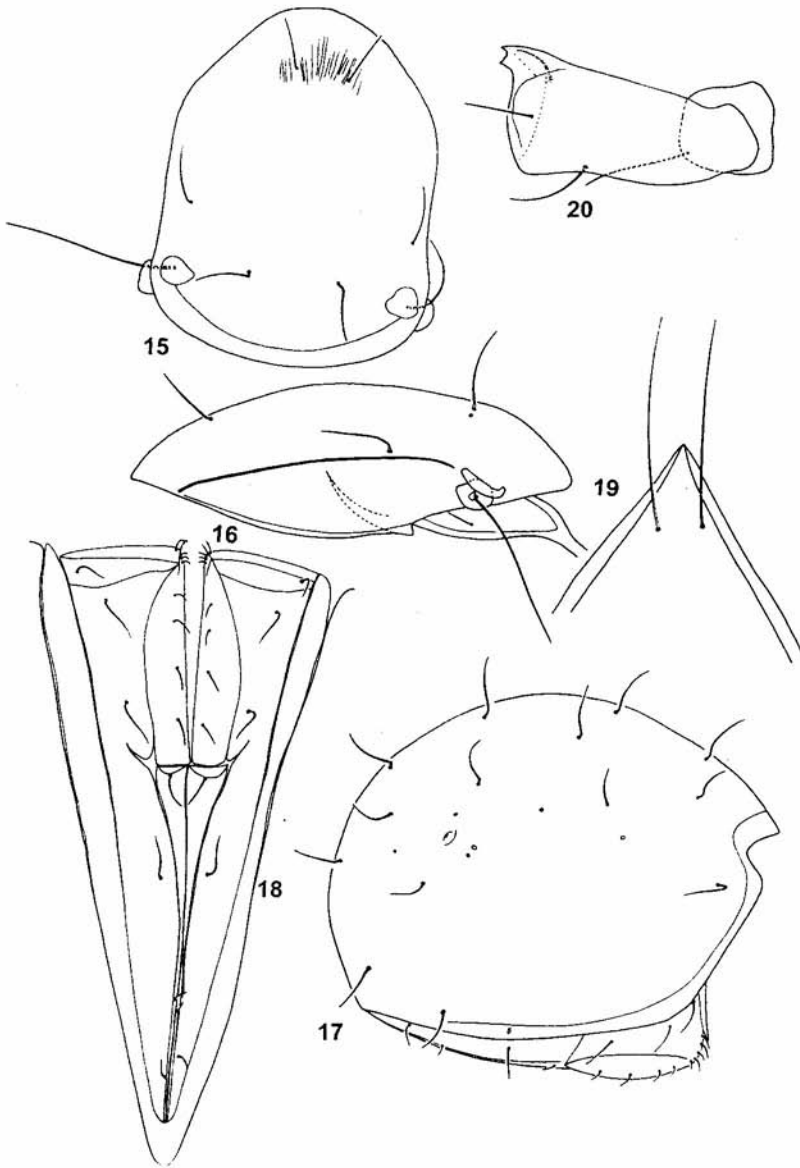
Punta	Santiago	Huato- lané	Rábida	Punta	Pemón- dina	ISABE- LA	V. Wolf	V. Alcedo	V. Sierra Negra	V. Cerro Azul	COCOS ISLAND	General distribution:
18	572	1,2	4,9	60	635	4670					25	
458	905	109	367	777	1494	1710	1710	1128	1100	1689	684	
											2/2	Cocos I., end?
						6/5			6/5			Central America
											2/1	Cocos I., end?
											11/5	Central America
						2/1			2/1			Central America
16/5				8/6	3/2	34/9		22/6	12/3			Galapagos I., end?
											8/2	Cocos I., end?
												semicosmopolitan
11/1					88/5	51/21	6/2	33/9	12/10		7/5	neotropical
1/1	18/5		8/1		28/6	207/36	19/4	166/22	21/9	1/1		Central America
												Central America
						1/1			1/1			Galapagos I., end?
											1/1	Gondwanan (?)
												semicosmopolitan
											11/3	Gondwanan
					1/1						66/6	semicosmopolitan
						11/5	1/1	9/3	1/1			Central America
					3/1							Galapagos I., end?
	4/3			4/2	8/4	45/19		38/13	6/5	1/1	1/1	Gondwanan
	1/1											semicosmopolitan?
					3/1						6/4	Gondwanan?
				10/2	22/2	9/6	1/1	7/4		1/1	1/1	Gondwanan
						1/1			1/1			Gondwanan
28/6	5/2	1/1		55/1	20/3	27/12		1/1	26/11			Gondwanan
4	4	1	1	4	9	11	4	7	10	3	11	
56	28	1	8	77	176	392	27	276	88	3	116	



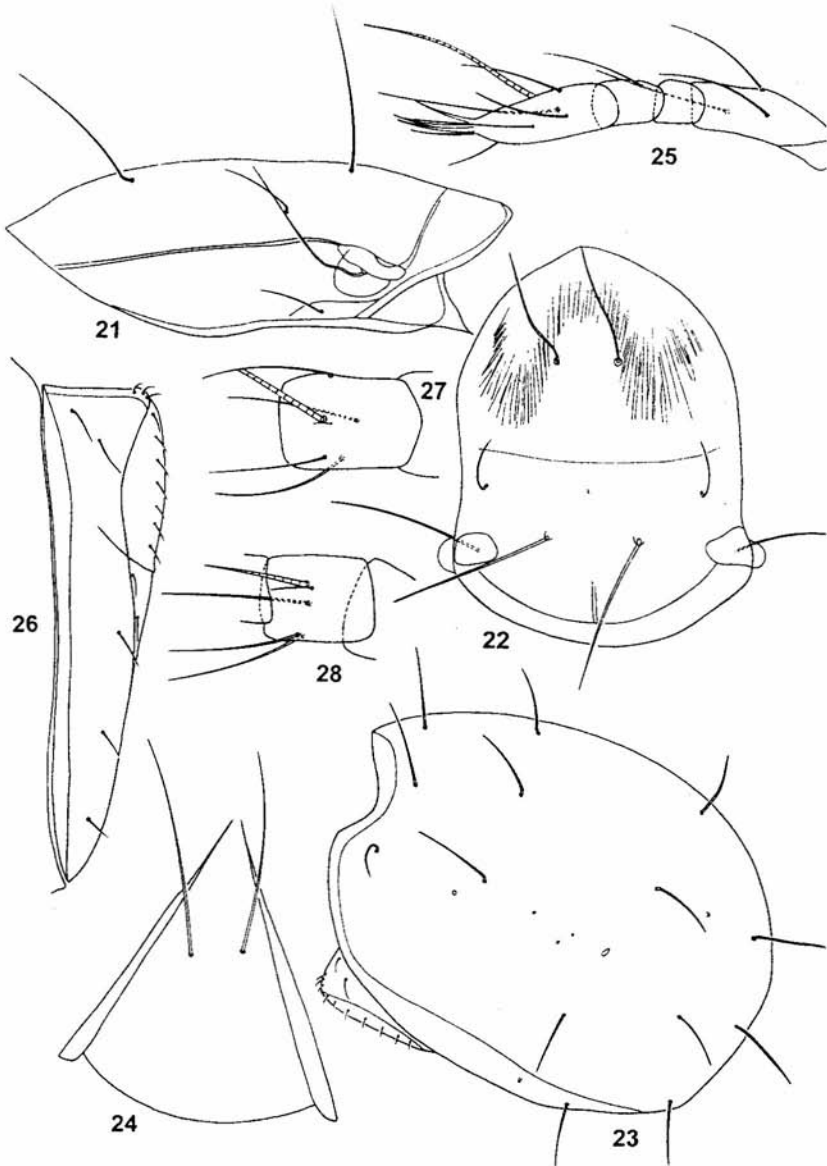
1-6. *Oribotritia attenuata* sp. nov.: 1 - prodorsum, lateral view, 2- prodorsum, dorsal view, 3 - notogaster, 4 - genital, aggenital, anal, and adanal plates, 5 - trochanter and femur I, 6 - genu and tibia II



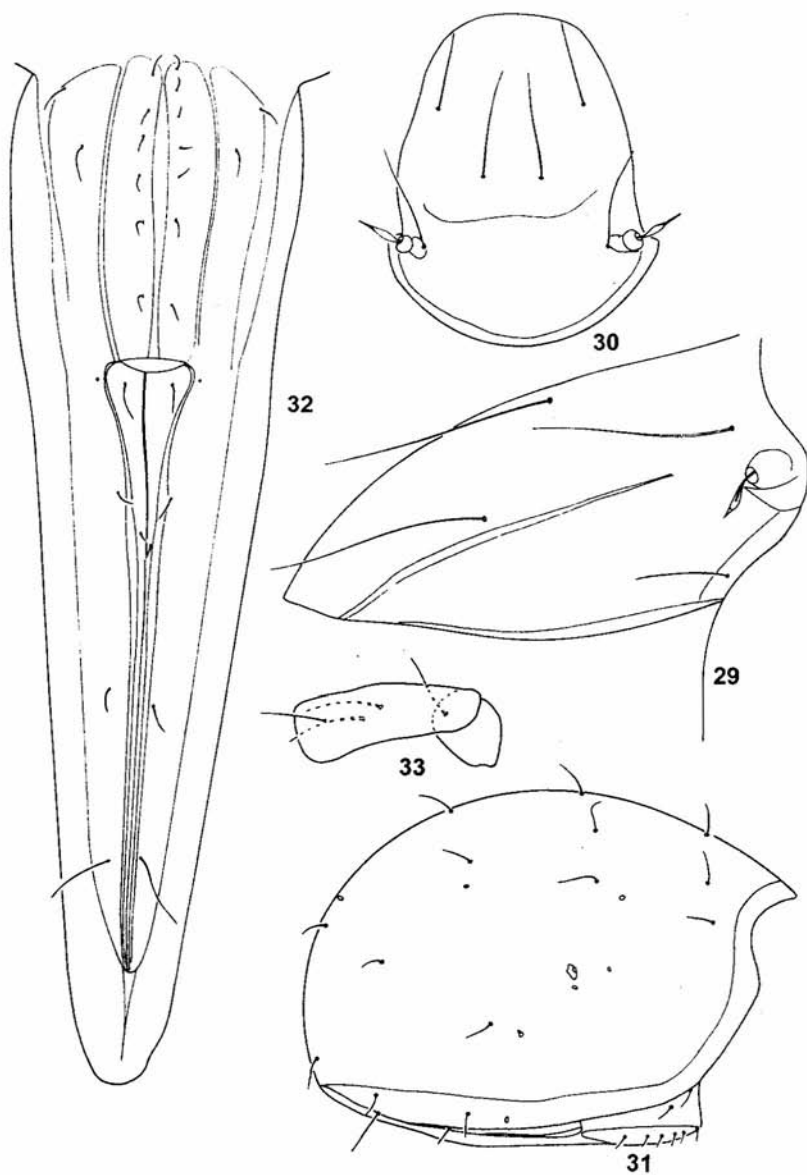
7-14. *Oribotritia didyma* sp. nov.: 7 - prodorsum, lateral view, 8 - prodorsum, dorsal view, 9 - anterior part of notogaster, 10 - seta c, 11 - genital, aggenital, anal and adanal plates, 12 - femur I, 13 - fragment of tarsus I, 14 - fragment of tarsus II



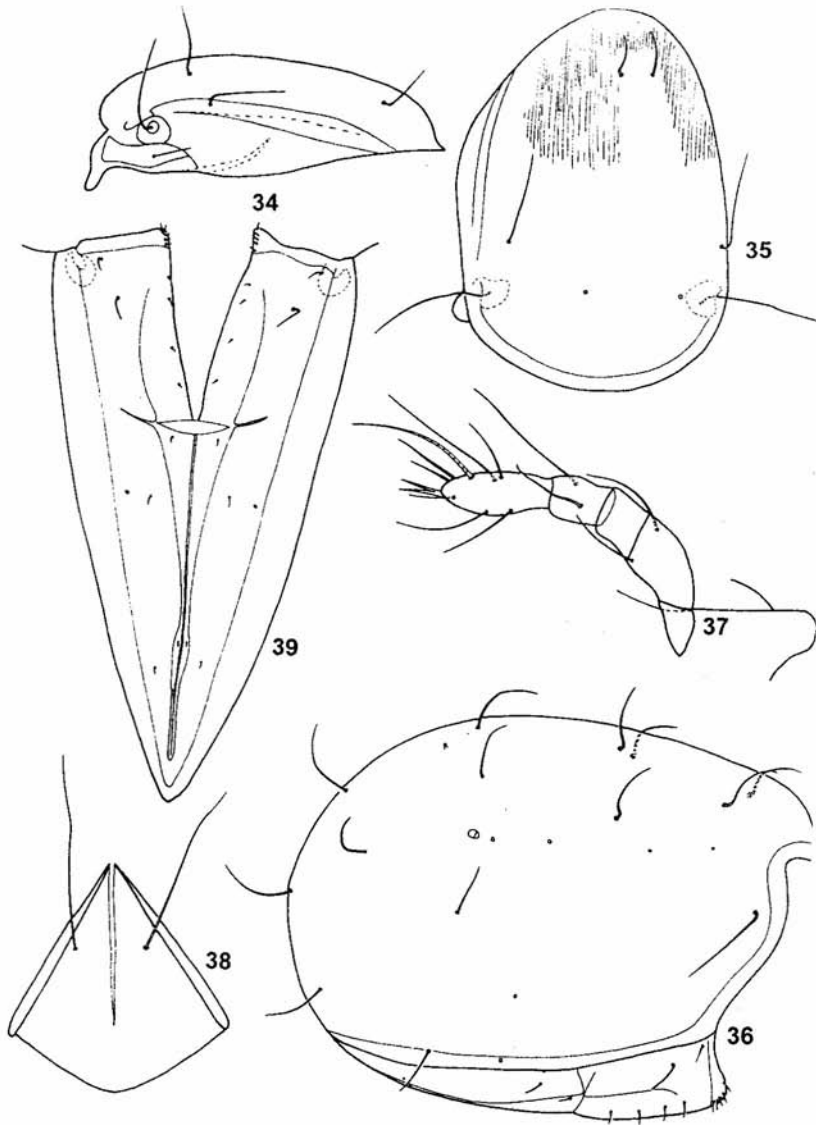
15-20. *Oribotritia serrula* sp. nov.: 15 - prodorsum, dorsal view, 16 - prodorsum, lateral view, 17 - notogaster, 18 - ventral view of body, 19 - fragment of mentum, 20 - trochanter and femur I



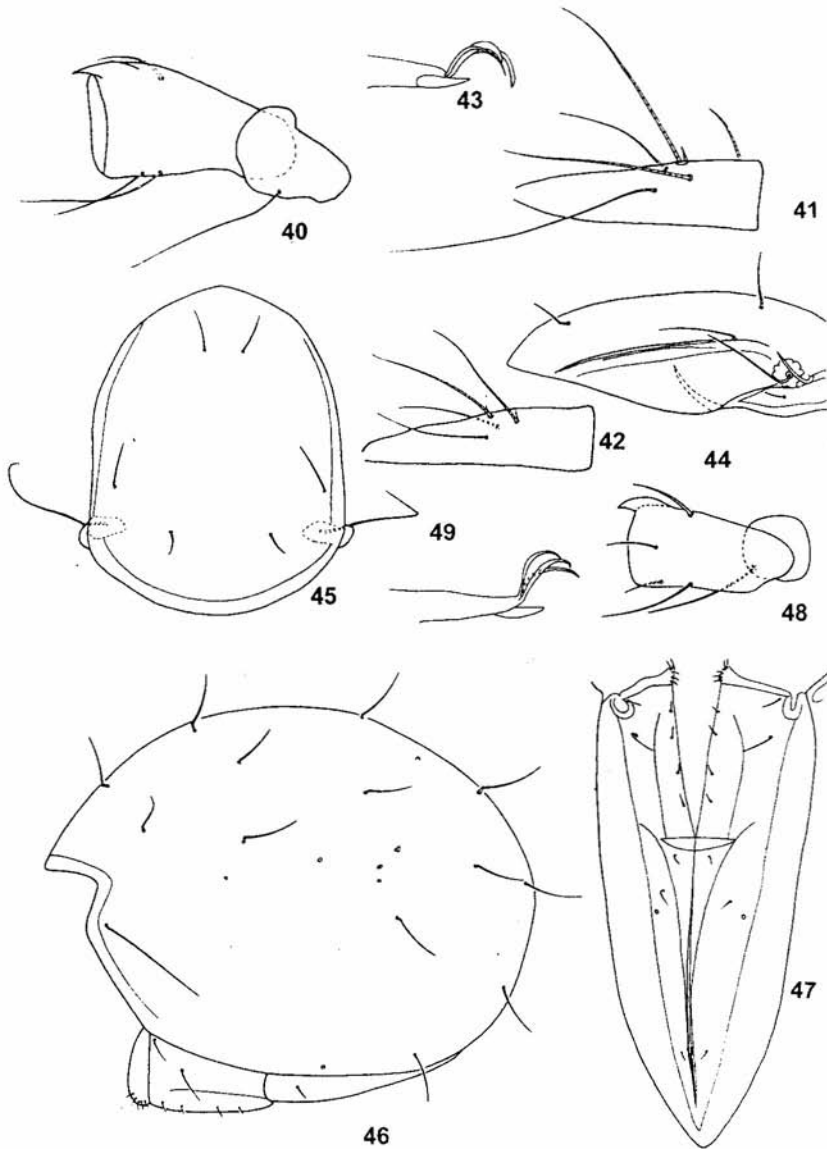
21-28. *Oribitritia trisetosa* sp. nov.: 21 - prodorsum, lateral view, 22- prodorsum, dorsal view, 23 - notogaster, 24 - fragment of mentum, 25 - palp, 26 - genital, aggenital, anal and adanal plates, 27 - tibia II, 28 - tibia III



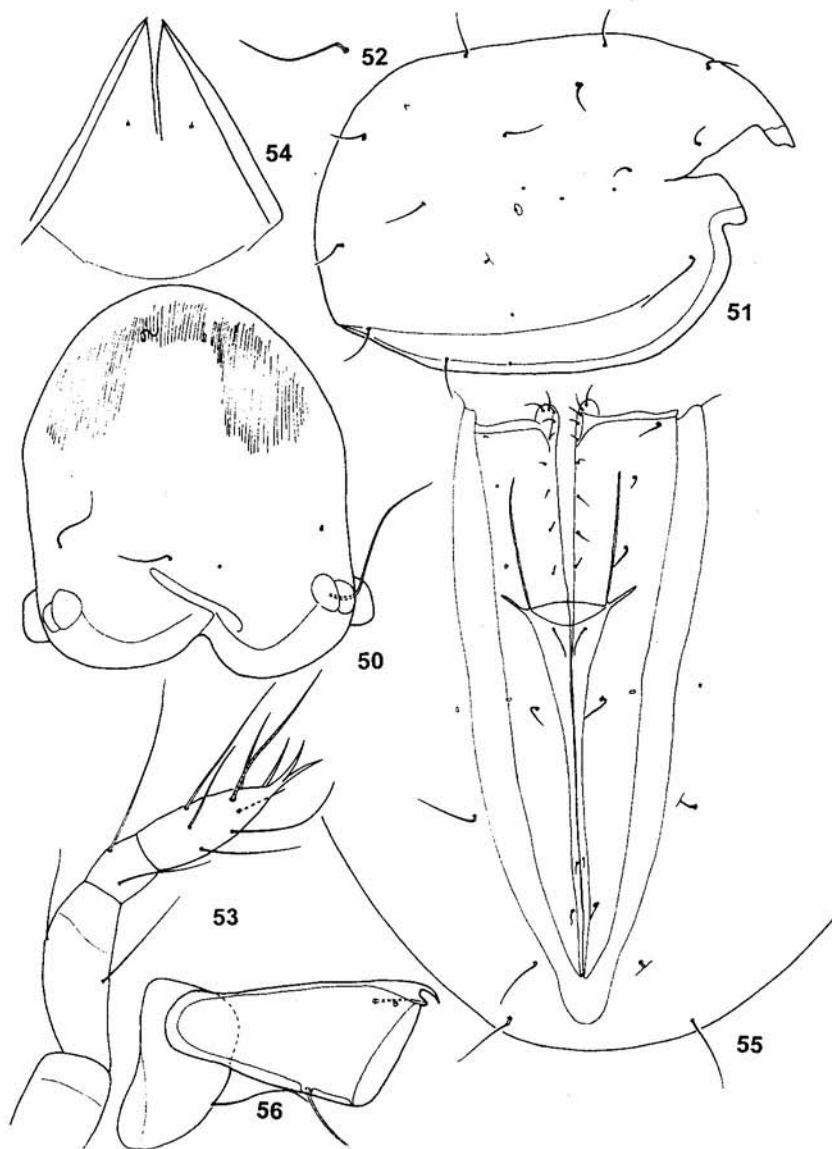
29-33. *Mesotritia breviseta* sp. nov.: 29 - prodorsum, lateral view, 30 - prodorsum, dorsal view, 31 - notogaster, 32 - genital, aggenital, anal and adanal plates, 33 - trochanter and femur I



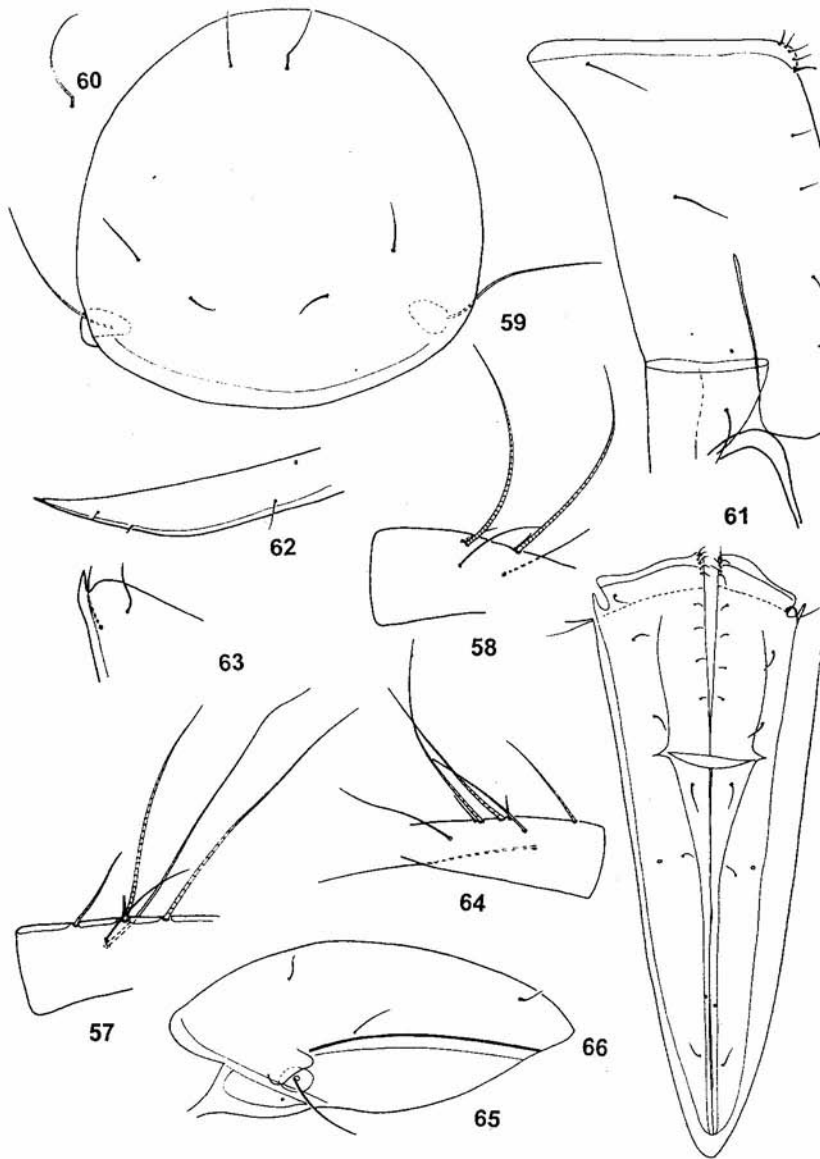
34-39. *Indotritia bellingeri* sp. nov., specimen of Ramsay from Cuba: 34 - prodorsum, lateral view, 35 - prodorsum, dorsal view, 36 - notogaster, 37 - palp, 38 - mentum, 39 - genital, anal and adanal plates



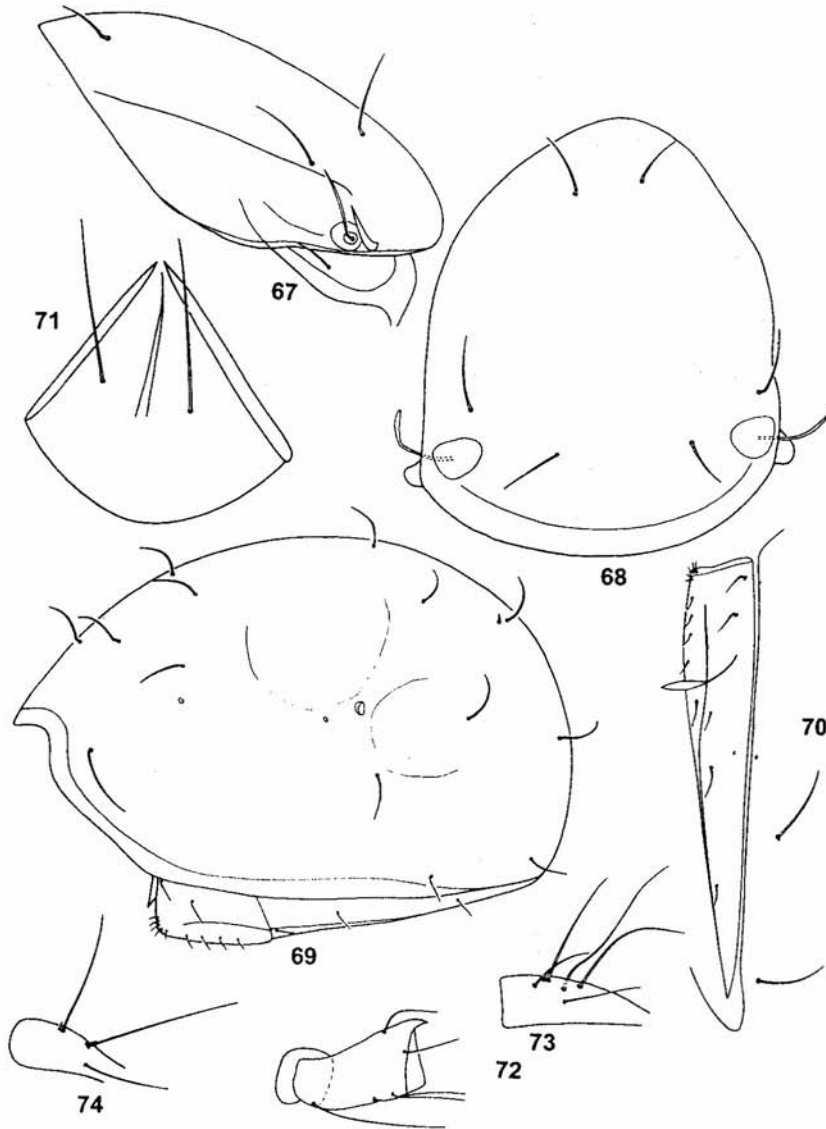
40-49. *Indotritia bellingeri* sp. nov., specimen of Ramsay from Cuba: 40 - trochanter and femur I, 41 - fragment of tarsus I, 42 - fragment of tarsus II, 43 - fragment of tarsus IV; specimen from Venezuela: 44 - prodorsum, lateral view, 45 - prodorsum, dorsal view, 46 - notogaster, 47 - ventral view of body, 48 - trochanter and femur I, 49 - fragment of tarsus IV



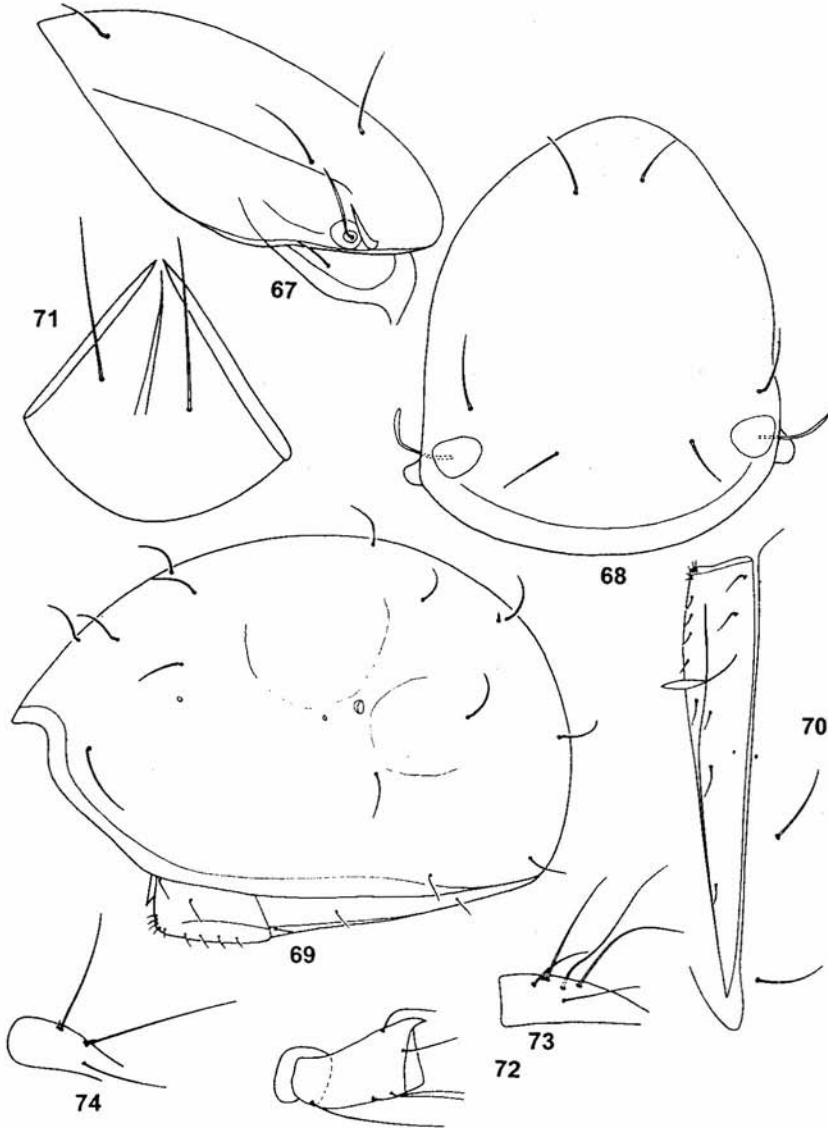
50-56. *Indotritia acanthophora* MARKEL, 1964, synonym of *Indotritia krakatauensis* (SELLNICK, 1923); 50 - prodorsum, dorsal view, 51 - notogaster, 52 - seta h, 53 - palp, 54 - mentum, 55 - ventral view of body, 56 - trochanter and femur I



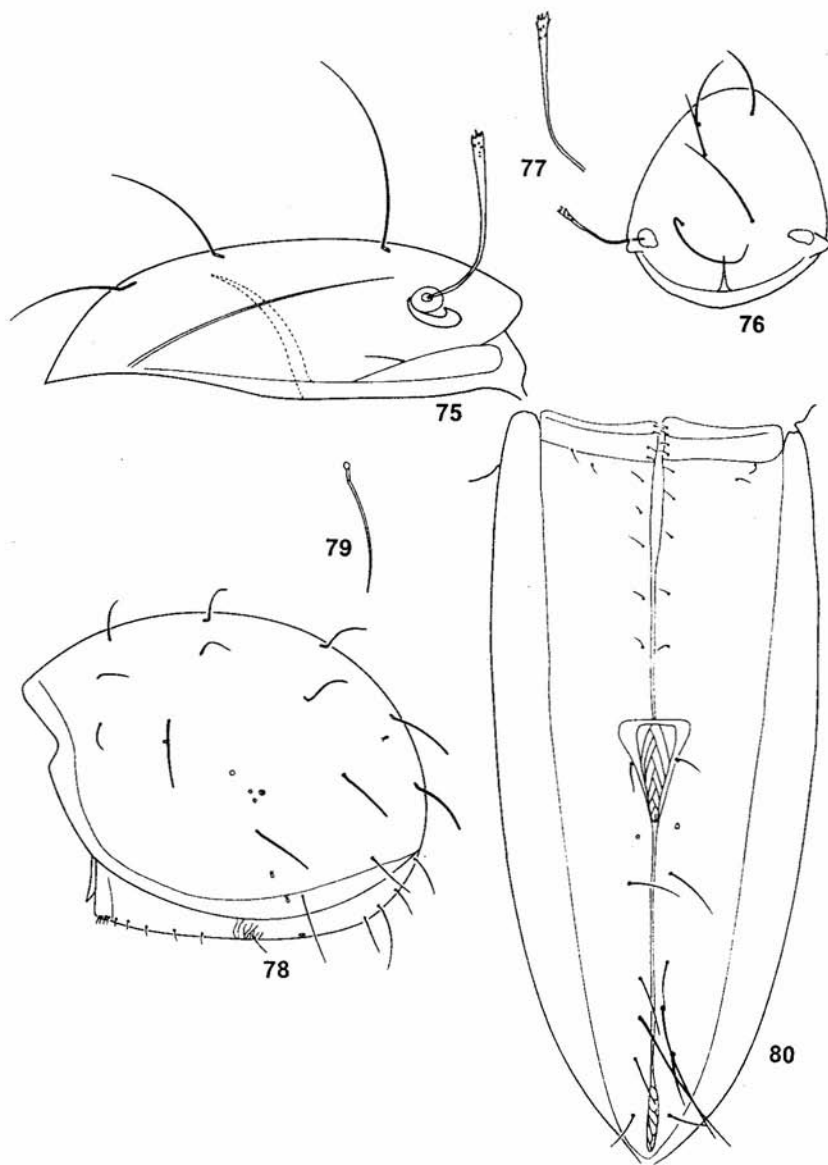
57-58. *Indotritia acanthophora* MÄRKEL, 1964, synonym of *Indotritia krakatauensis* (SELLNICK, 1923): 57 - fragment of tarsus I, 58 - fragment of tarsus II; 59-64. *Indotritia sellnicki* AOKI, 1965, synonym of *Indotritia krakatauensis* (SELLNICK, 1923): 59 - prodorsum, dorsal view, 60 - seta c_1 of notogaster, 61 - genitoaggenital plate, 62 - anal and adanal plate, 63 - fragment of femur I with d and l setae, 64 - fragment of tarsus I; 65-66. *Indotritia krakatauensis* (SELLNICK, 1923), specimen from sample BEL 89-13: 65 - prodorsum, lateral view, 66 - genitoaggenital, anal and adanal plates



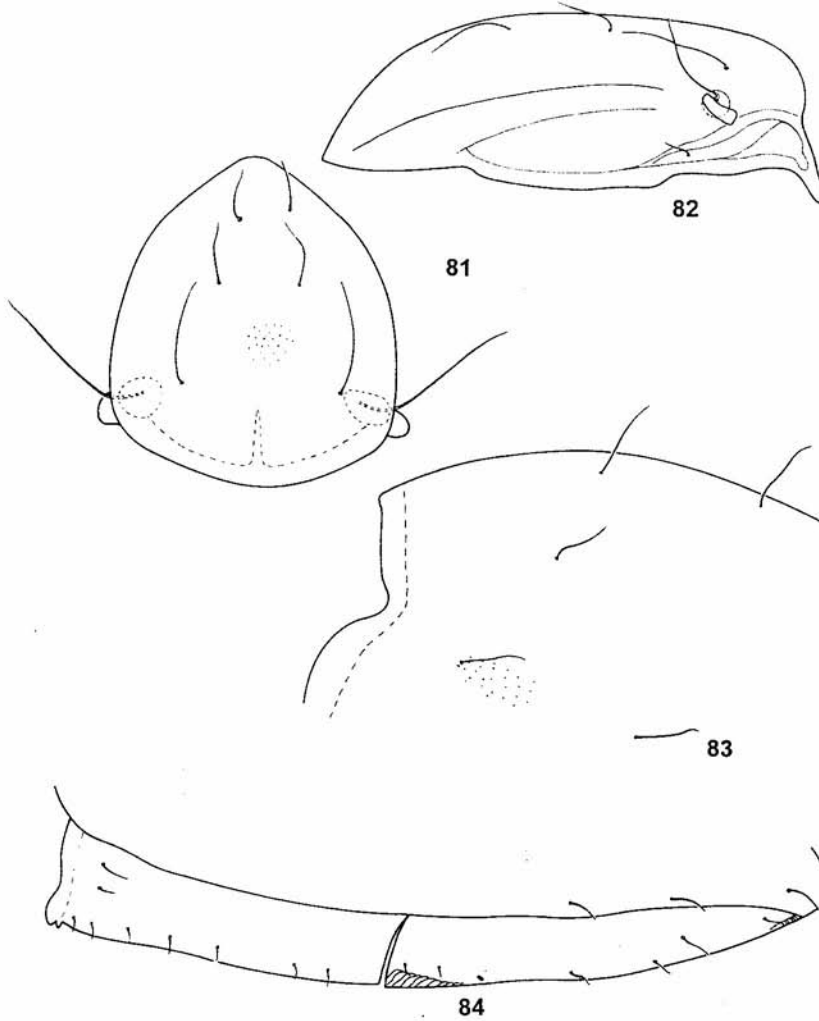
67-74. *Indotritia retusa* sp. nov.: 67 - prodorsum, lateral view, 68 - prodorsum, dorsal view, 69 - notogaster, 70 - genitoaggenital, anal, and adanal plates, 71 - mentum of infracapitulum, 72 - trochanter and femur I, 73 - fragment of tarsus I, 74 - fragment of tarsus II



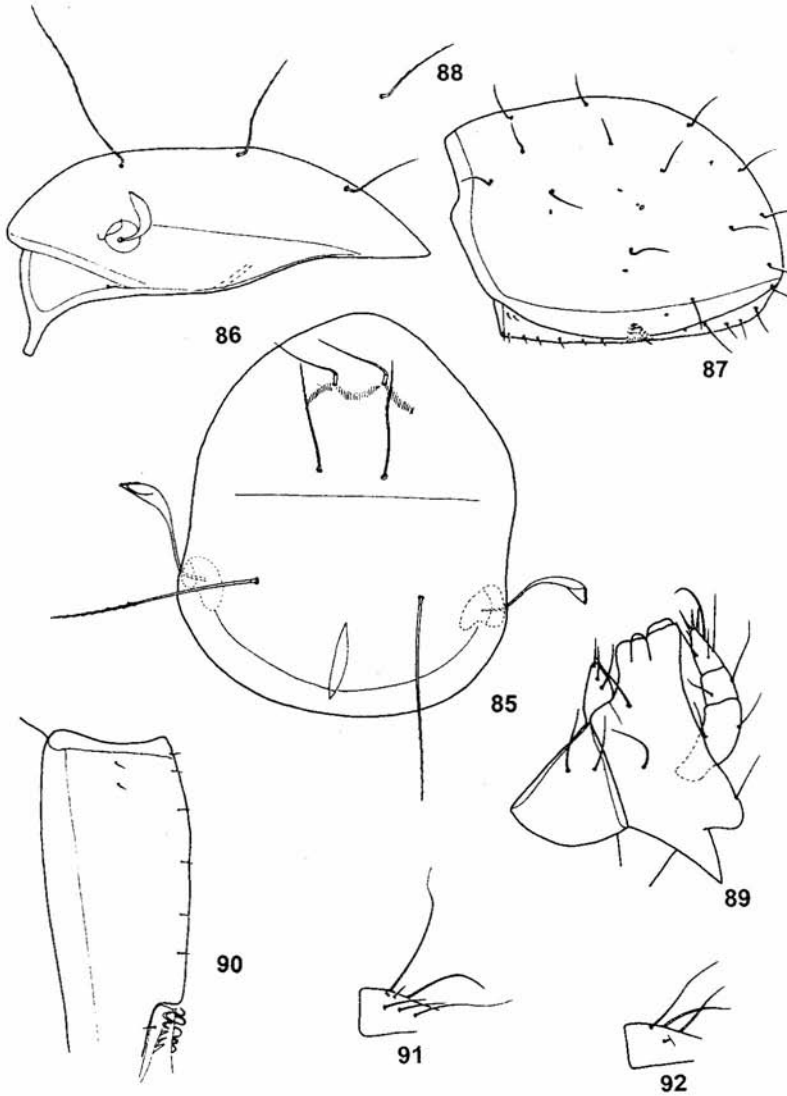
67-74. *Indotritia retusa* sp. nov.: 67 - prodorsum, lateral view, 68 - prodorsum, dorsal view, 69 - notogaster, 70 - genitoaggenital, anal, and adanal plates, 71 - mentum of infracapitulum, 72 - trochanter and femur I, 73 - fragment of tarsus I, 74 - fragment of tarsus II



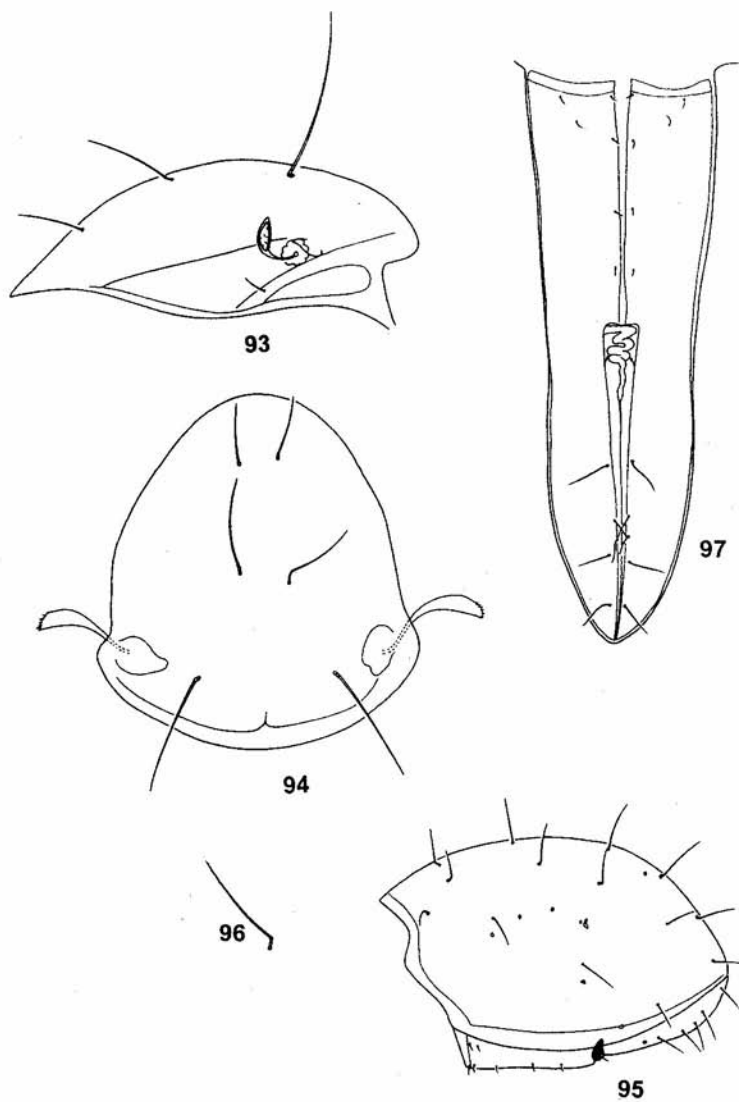
75-80. *Euphthiracarus fusticulus* sp. nov.: 75 - prodorsum, lateral view, 76 - prodorsum, dorsal view, 77 - sensillus, 78 - notogaster, 79 - seta h, 80 - ventral view of body



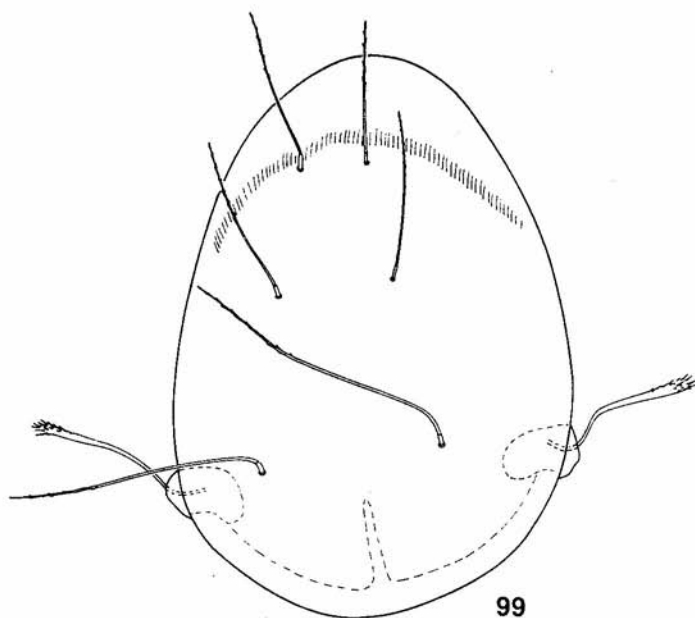
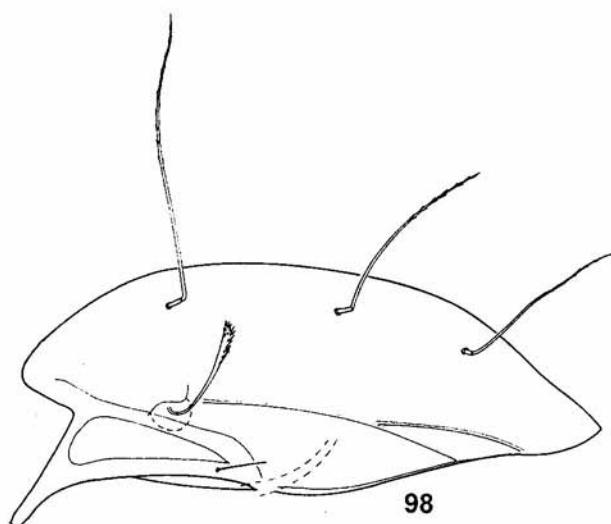
81-84. *Pocsia (?) dubia* sp. nov.: 81 - prodorsum, dorsal view, 82 - prodorsum, lateral view, 83 - anterior part of notogaster, 84 - genitoaggenital and ano-adanal plates



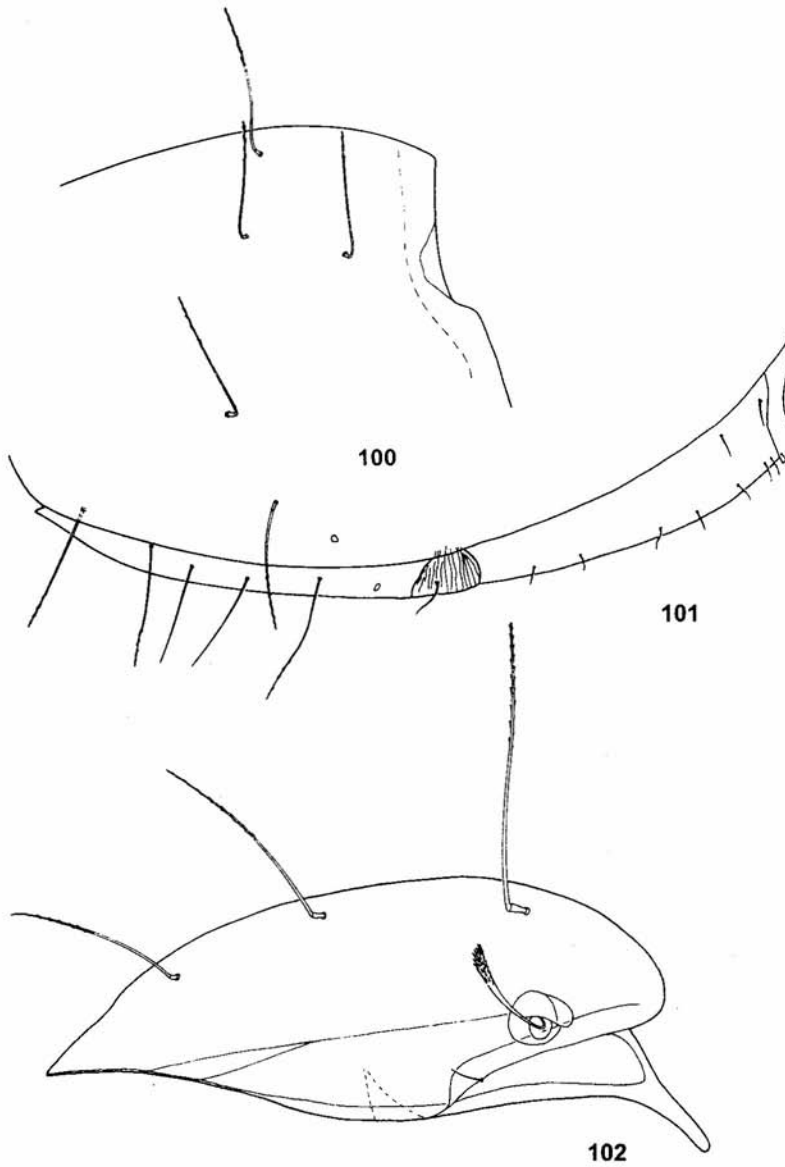
85-92. *Rhysotrititia clavata* MÄRKEL, 1964, "typus": 85 - prodorsum, dorsal view, 86 - prodorsum, lateral view, 87 - notogaster, 88 - seta h_1 , 89 - infracapitulum, 90 - genitoaggenital plate, 91 - fragment of tarsus I, 92 - fragment of tarsus II



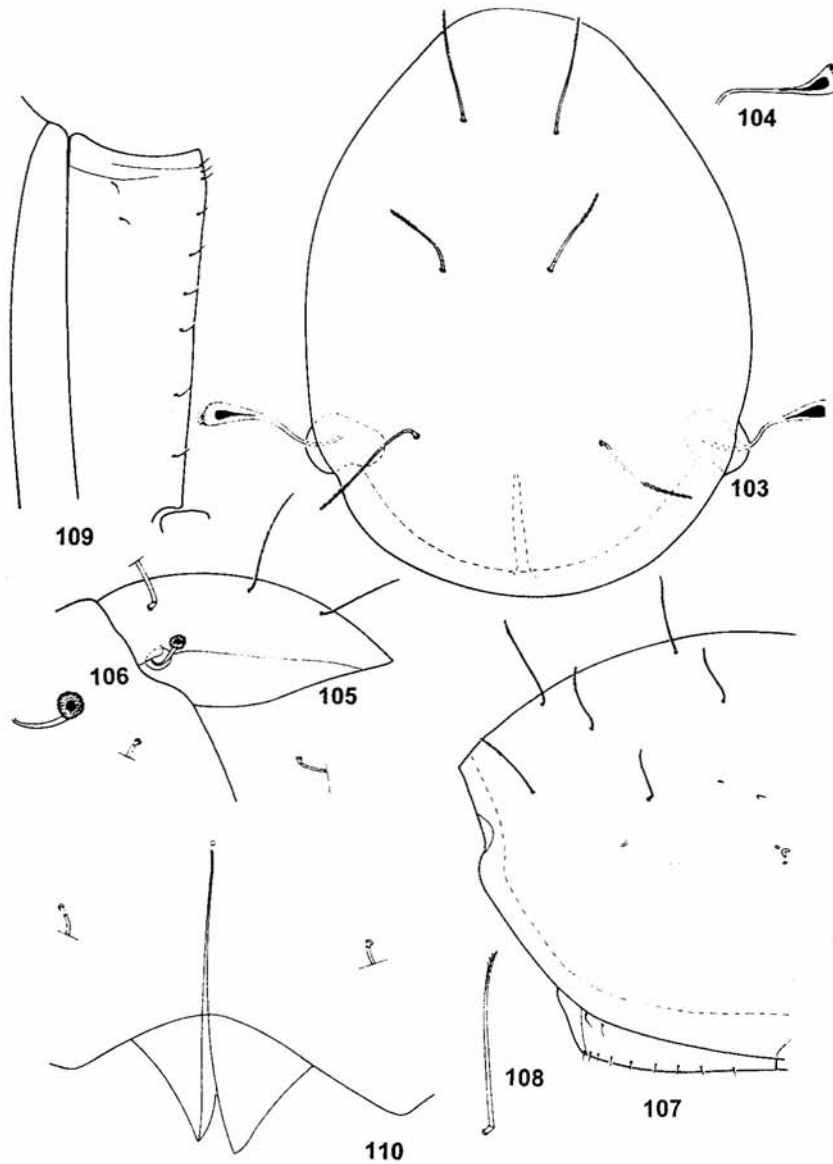
93-97. *Rhysotrititia clavata* MÄRKEL, 1964, specimen from sample COC 85-6: 93 - prodorsum, lateral view, 94 - prodorsum, dorsal view, 95 - notogaster, 96 - seta h, 97 - genitoaggenital and anoanal plates



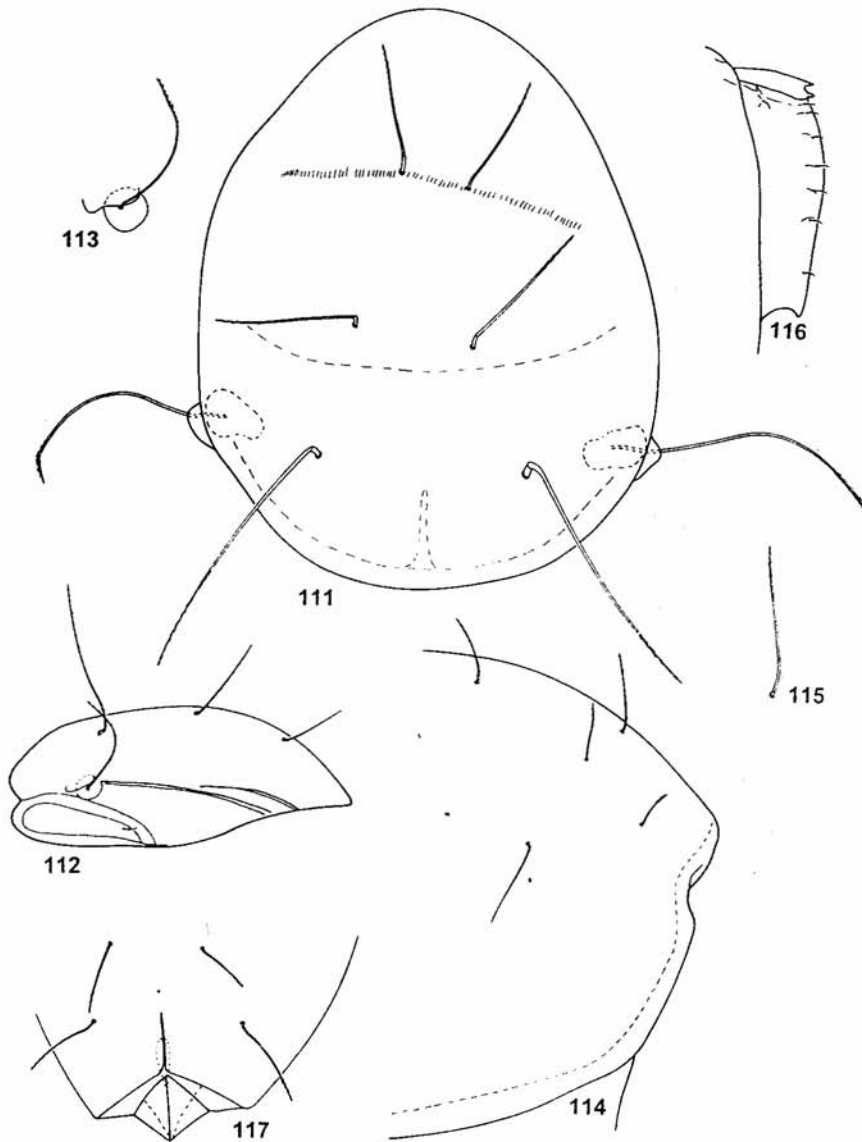
98-99. *Rhyssotritia comteae* MAHUNKA, 1983, specimen from Galapagos Islands: 98 - prodorsum, lateral view, 99 - prodorsum, dorsal view



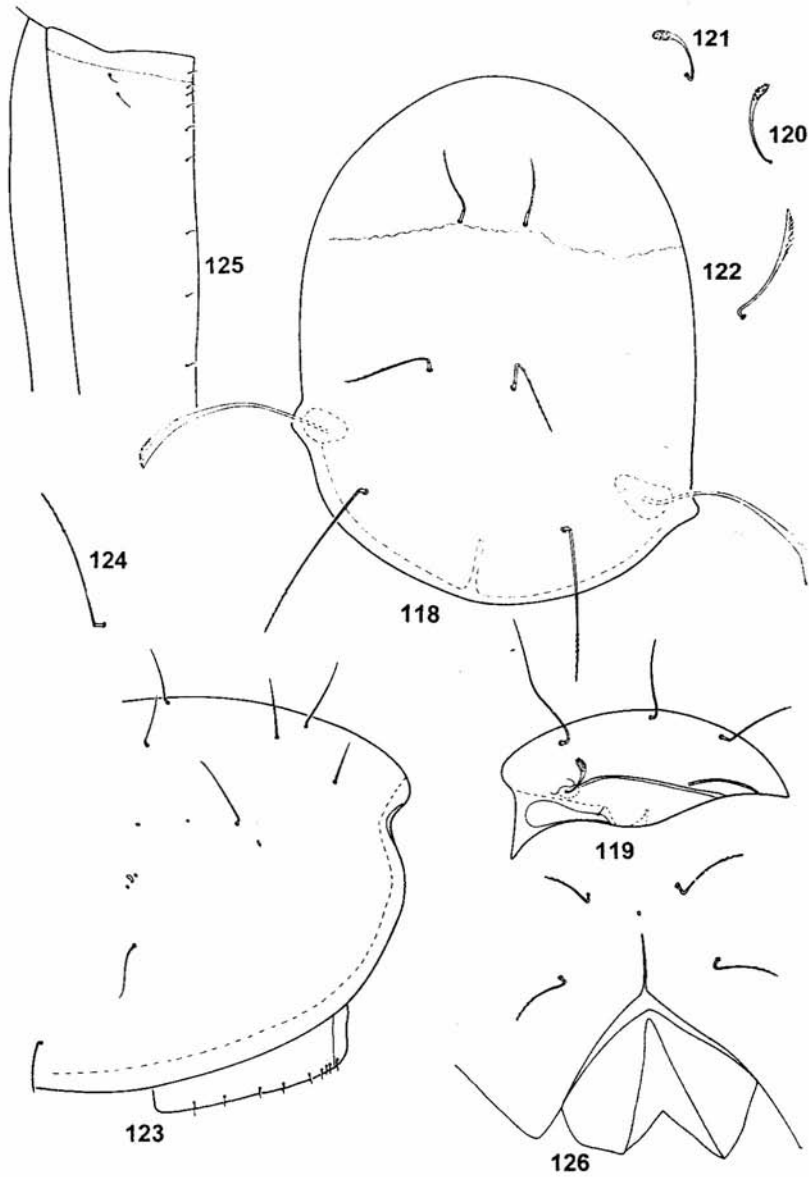
100-102. *Rhysotritia comteae* МАЛУНКА, 1983, specimen from Galapagos Islands: 100 - anterior part of notogaster, 101 - genitoaggenital and ano-adanal plates, lateral view, 102 - prodorsum, lateral view, another specimen



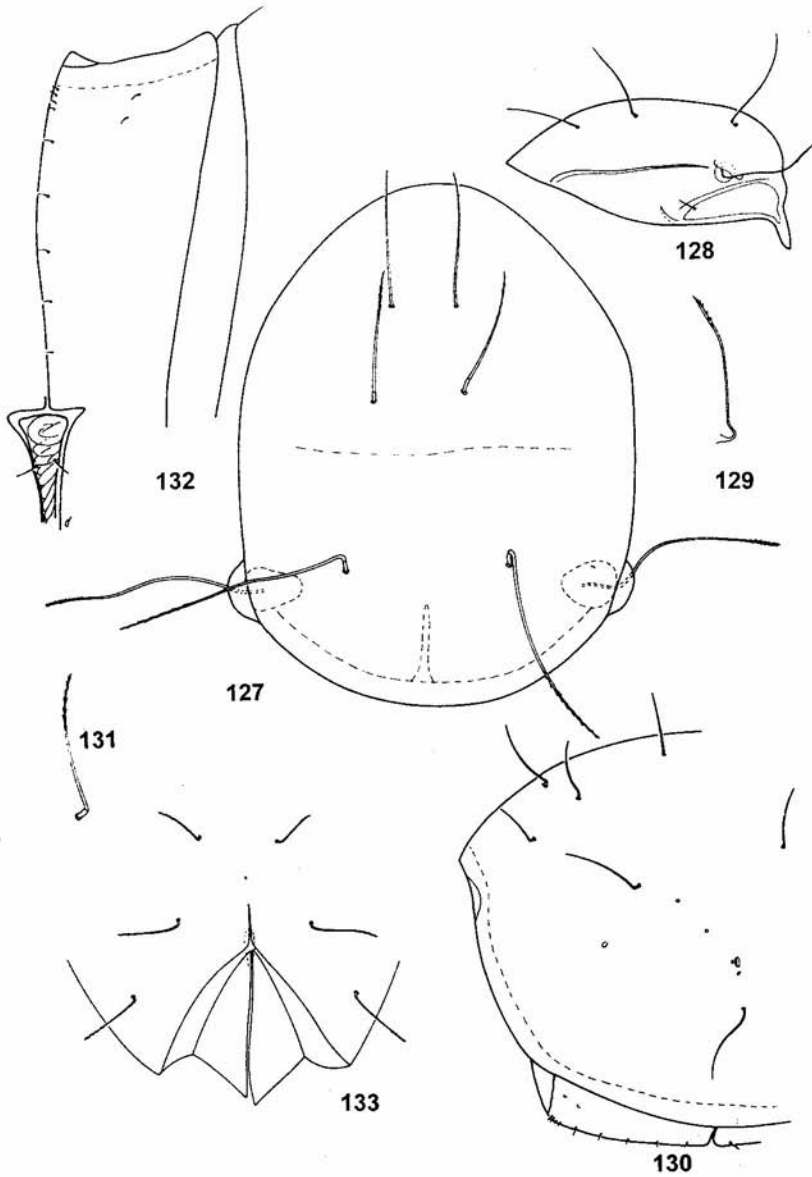
103-110. *Rhyssotritia dinota* sp. nov.: 103 - prodorsum, dorsal view, 104 - sensillus, 105 - prodorsum, lateral view, 106 - sensillus, 107 - anterior part of notogaster, 108 - seta c_1 , 109 - genitoaggenital plate, 110 - posterior view of notogaster



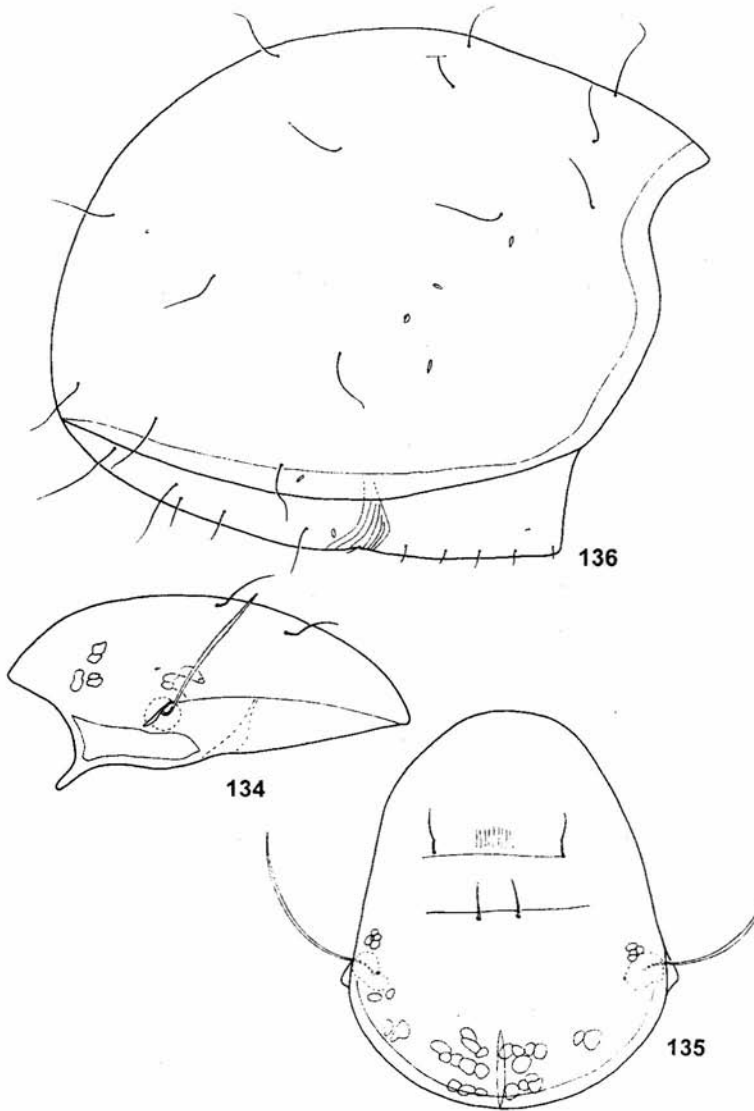
111-117. *Rhysotritia dikra* sp. nov.: 111 - prodorsum, dorsal view, 112 - prodorsum, lateral view, 113 - sensillus, 114 - anterior part of notogaster, 115 - seta c_1 , 116 - genitoaggenital plate, 117 - posterior view of notogaster



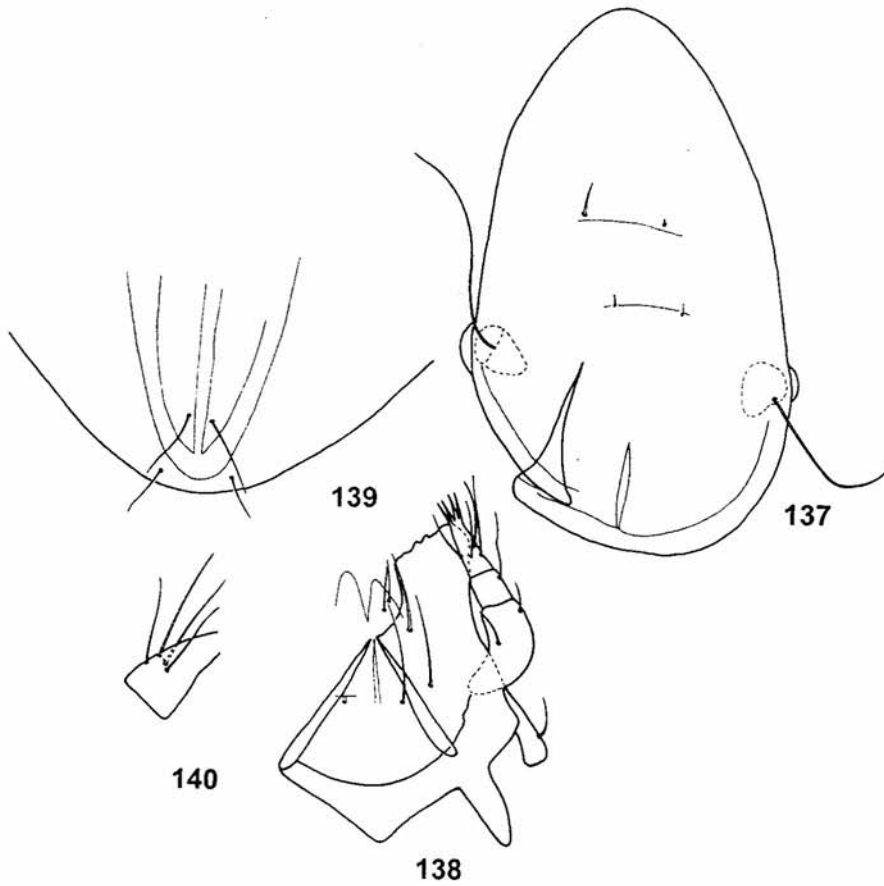
118-126. *Rhysoiritia dixia* sp. nov.: 118 - prodorsum, dorsal view, 119 - prodorsum, lateral view, 120-122 - different views of sensilli, 123 - anterior part of notogaster, 124 - seta c_1 , 125 - genitoaggenital plate, 126 - posterior view of notogaster



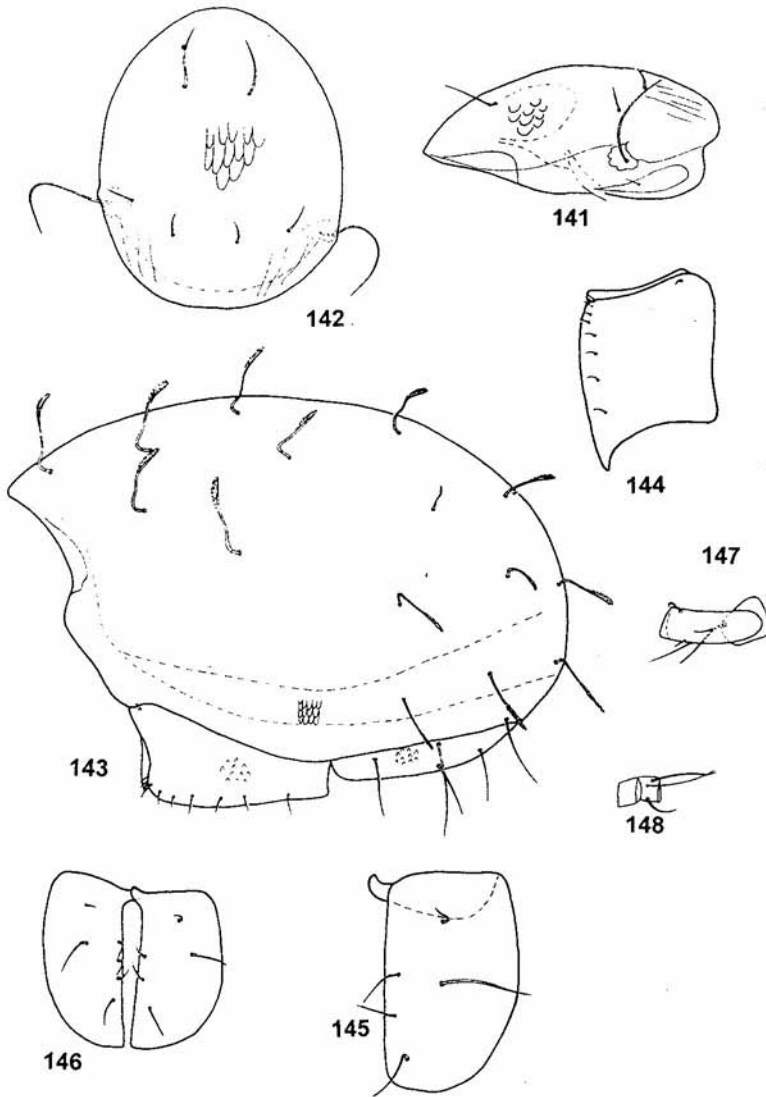
127-133. *Rhysotritia ejuncida* sp. nov.: 127 - prodorsum, dorsal view, 128 - prodorsum, lateral view, 129 - sensillus, 130 - anterior part of notogaster, 131 - seta c, 132 - genitoaggenital plate, 133 - posterior view of notogaster



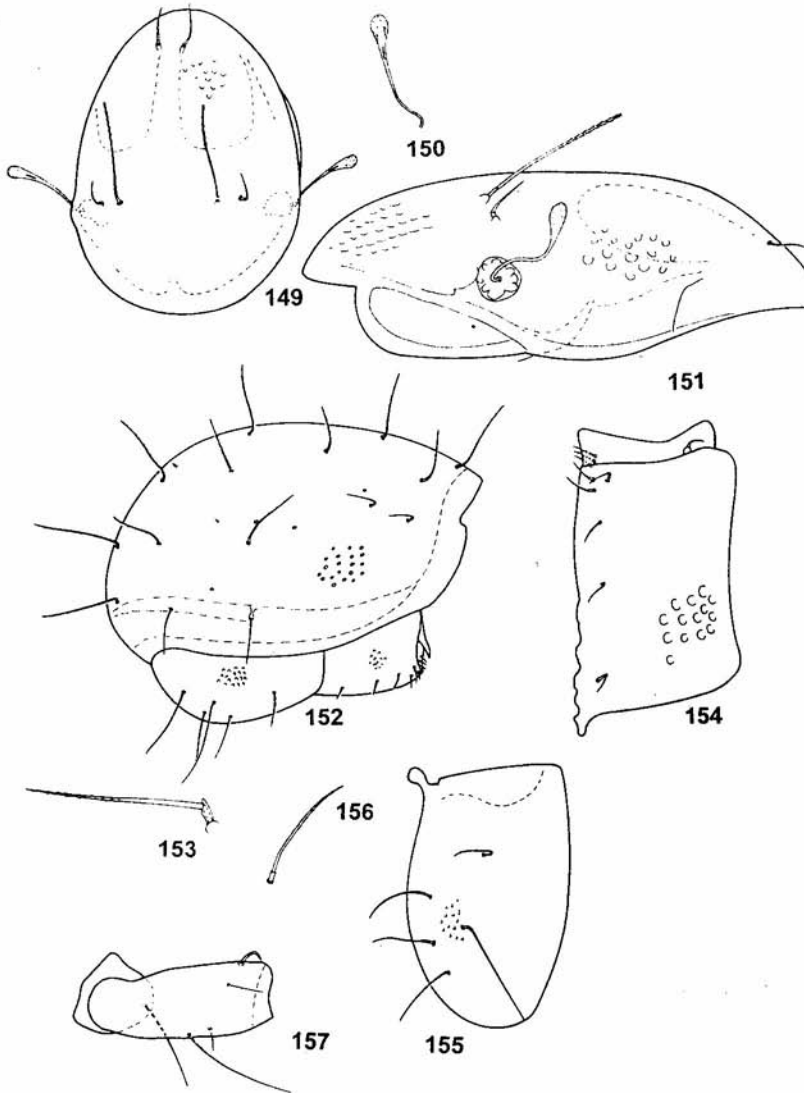
134-136. *Microtrititia tropica* MÄRKEL, 1964, "typus": 134 - prodorsum, lateral view, 135 - prodorsum, dorsal view, 136 - notogaster



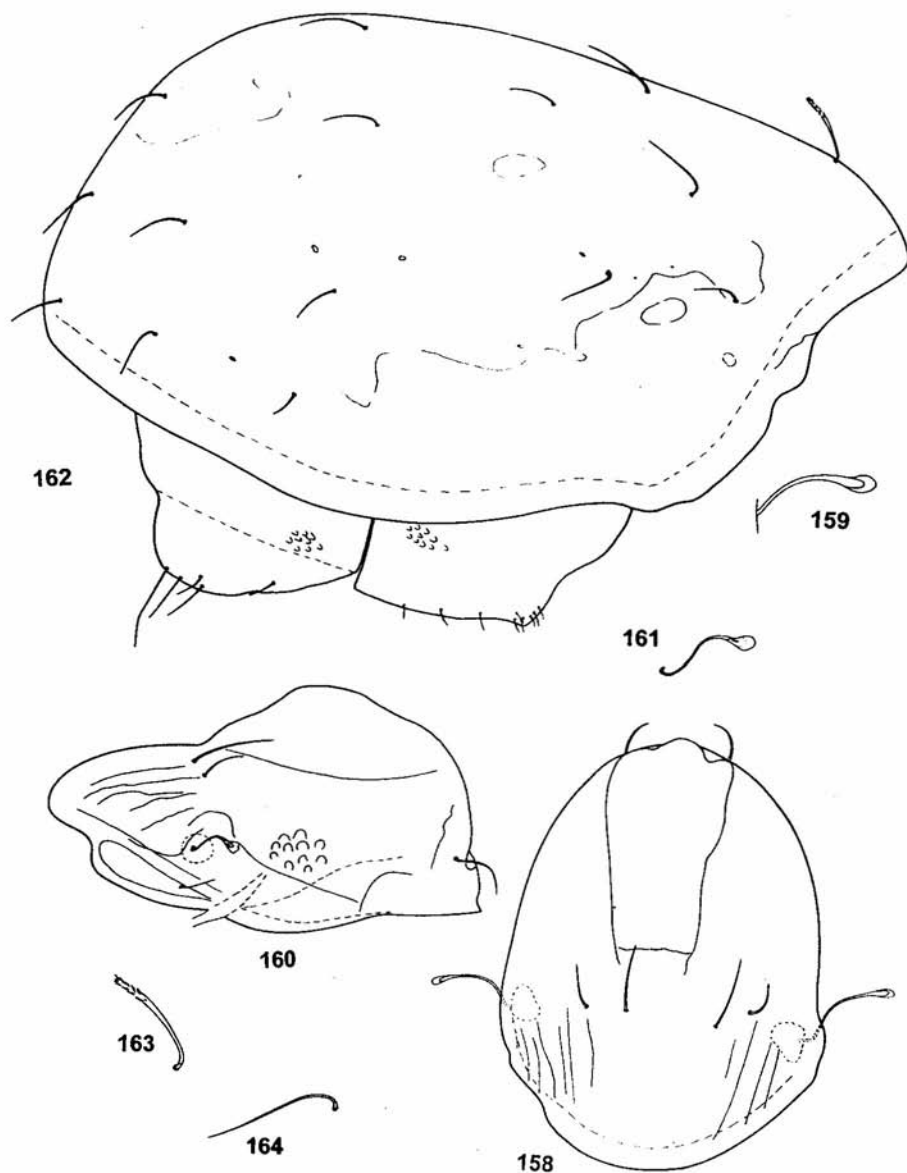
137-140. *Microtritia tropica* MÄRKEL, 1964, "paratypus": 137 - prodorsum, dorsal view, 138 - infracapitulum with palp, 139 - posterior part of ventral plate, 140 - fragment of tarsus II



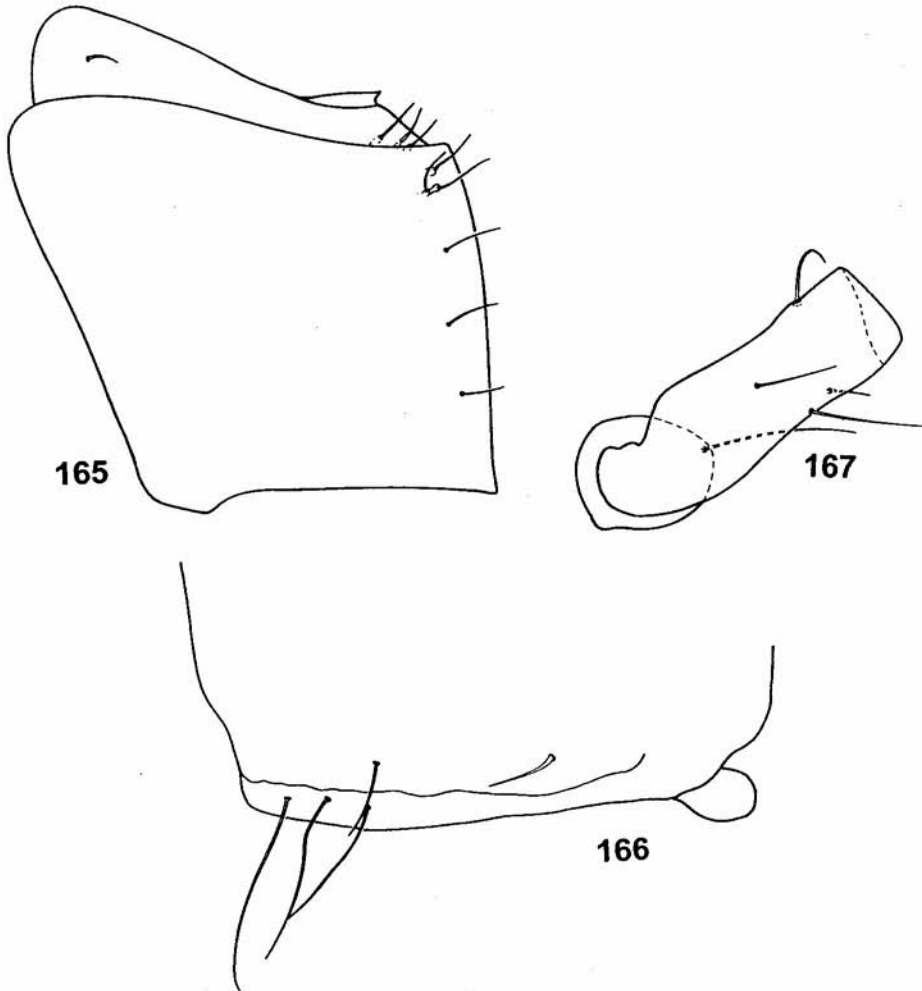
141-148. *Hoplophthiracarus mutabilis* sp. nov.: 141 - prodorsum, lateral view, 142 - prodorsum, dorsal view, 143 - notogaster, 144 - genitoaggenital plate, 145 - anoadanal plate, 146 - anoadanal plates (paratype), 147 - trochanter and femur I, 148 - genu and tibia IV



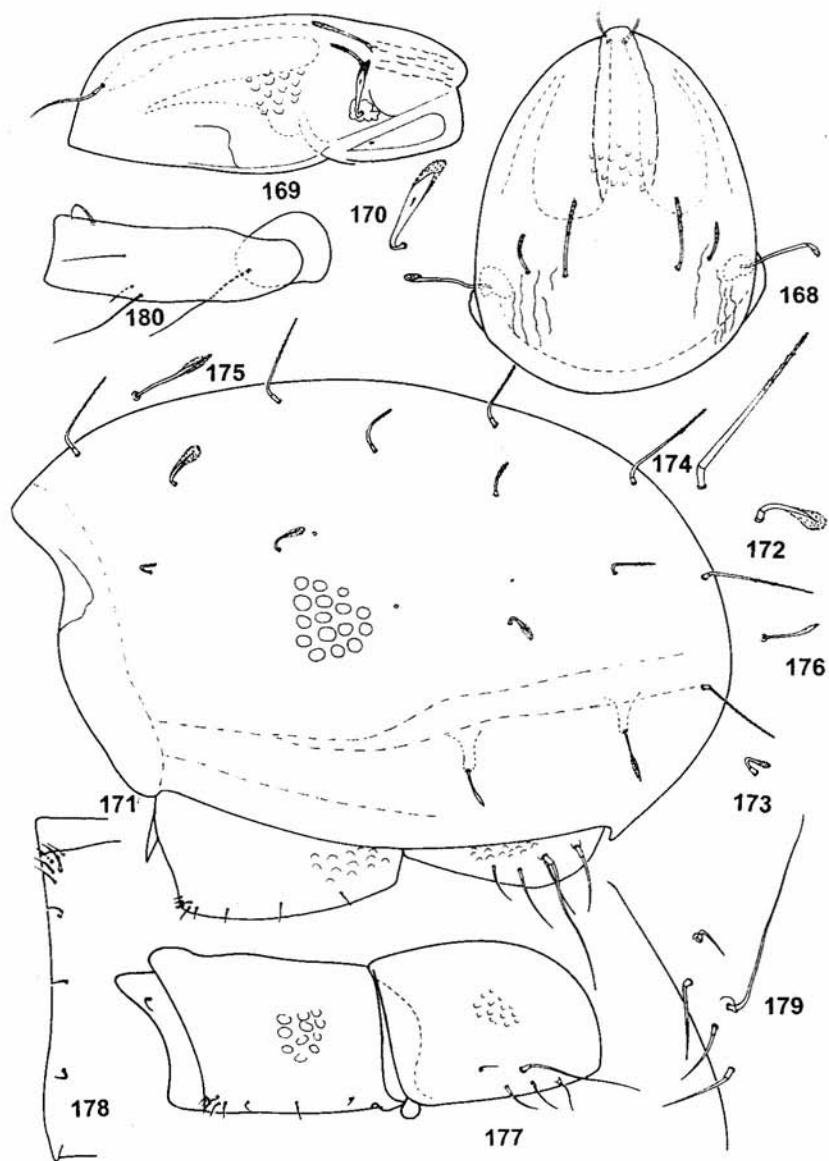
149-157. *Arphthycarus inelegans* (NIEDBALA, 1986), specimen from GAL 87-459: 149 - prodorsum, dorsal view, 150 - sensillus, 151 - prodorsum, lateral view, 152 - notogaster, 153 - seta h, 154 - genital-aggenital plate, 155 - anoadanal plate, 156 - seta ad, 157 - trochanter and femur I



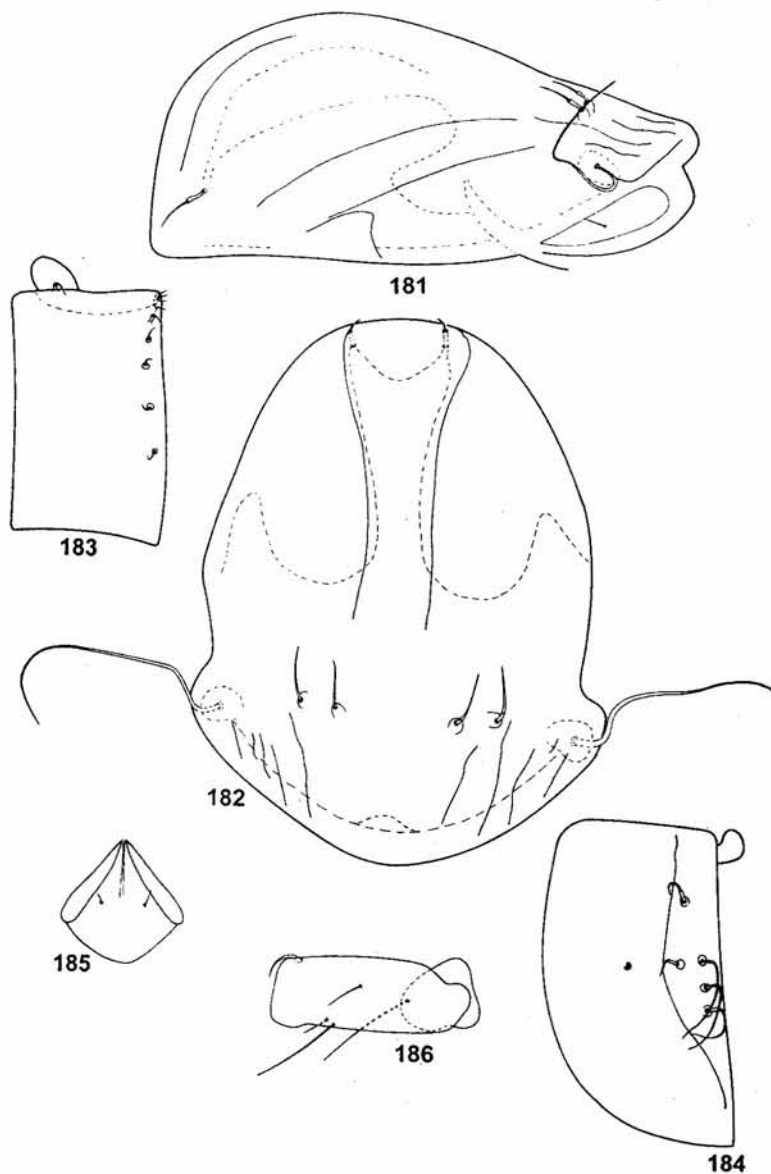
158-164. *Protophthiracarus tripartitus* sp. nov.: 158 - prodorsum, dorsal view, 159 - sensillus, dorsal view, 160 - prodorsum, lateral view, 161 - sensillus, lateral view, 162 - notogaster, 163 - seta c, 164 - seta ps₁



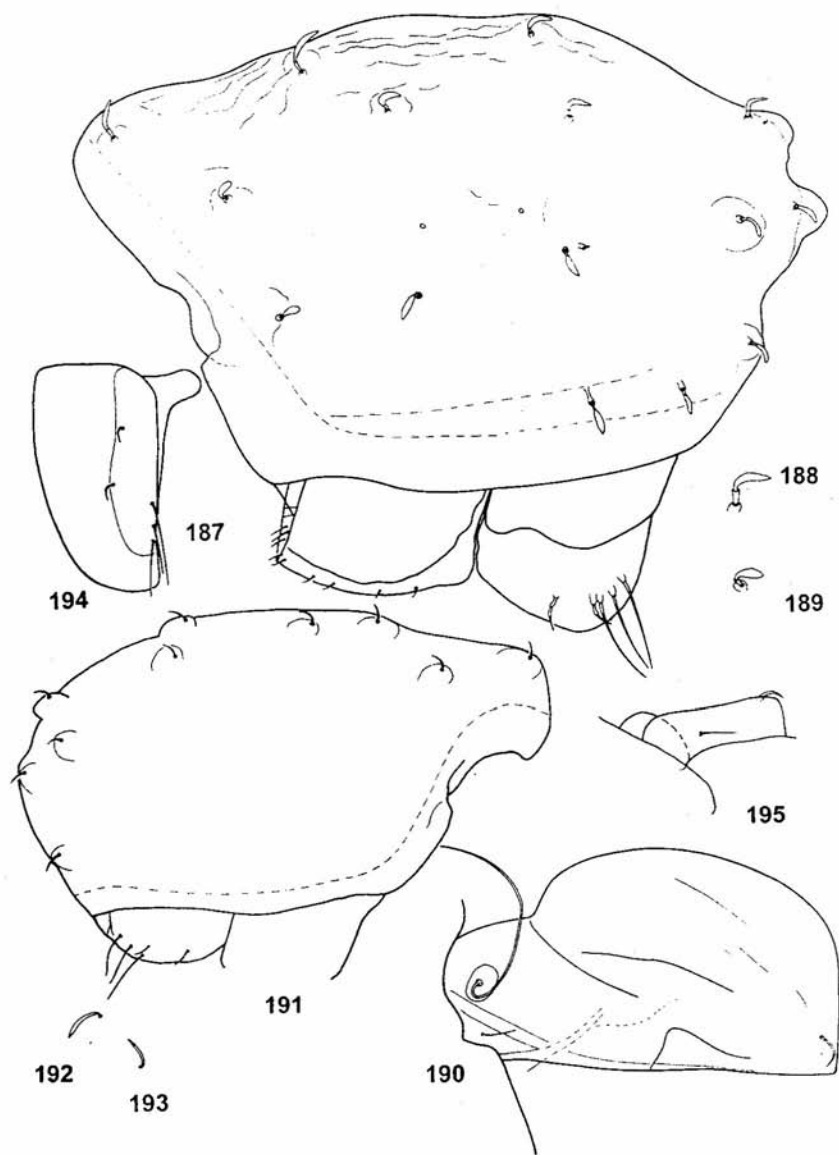
165-167. *Protophthiracarus tripartitus* sp. nov.: 165 - genitoaggenital plate, 166 - anadanal plate, 167 - trochanter and femur I



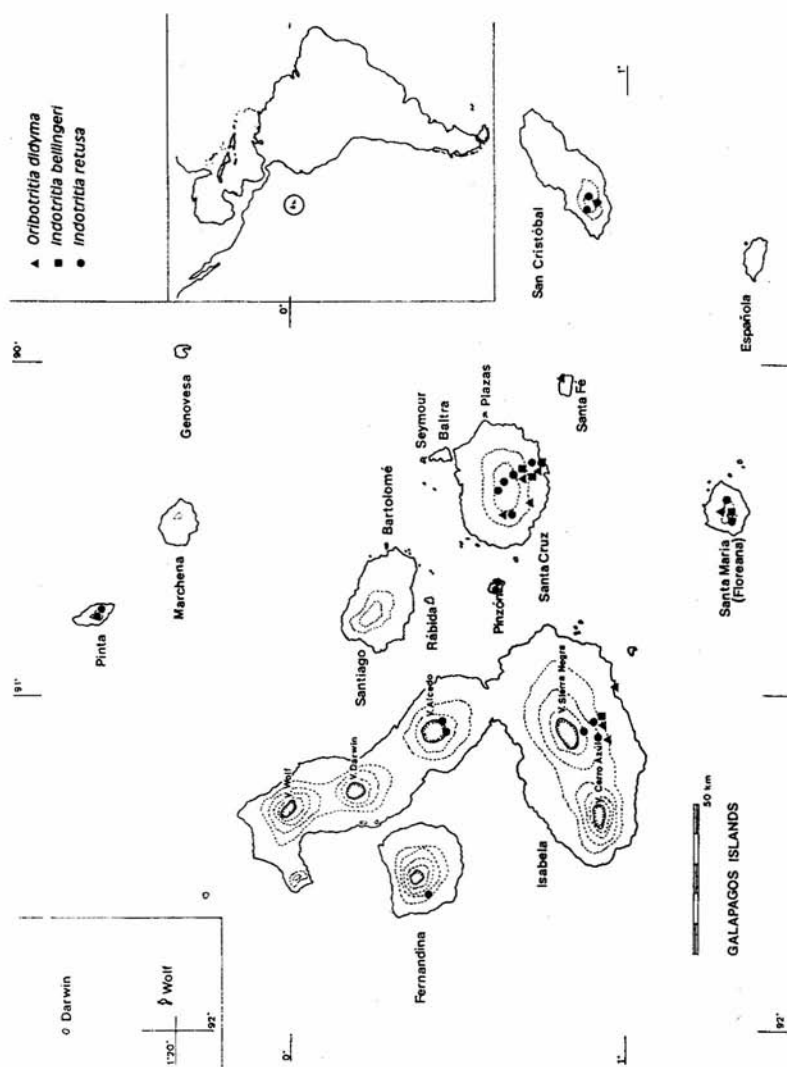
168-180. *Protophthiracarus varius* sp. nov.: 168 - prodorsum, dorsal view, 169 - prodorsum, lateral view, 170 - sensillus, lateral view, 171 - notogaster, 172 - seta c_2 , 173 - seta c_3 , 174 - seta h , 175 - seta ps_3 , 176 - seta ps_4 , 177 - genitoaggenital and ano-adanal plates, 178 - fragment of genitoaggenital plates, 179 - anal and adanal setae, 180 - trochanter and femur I



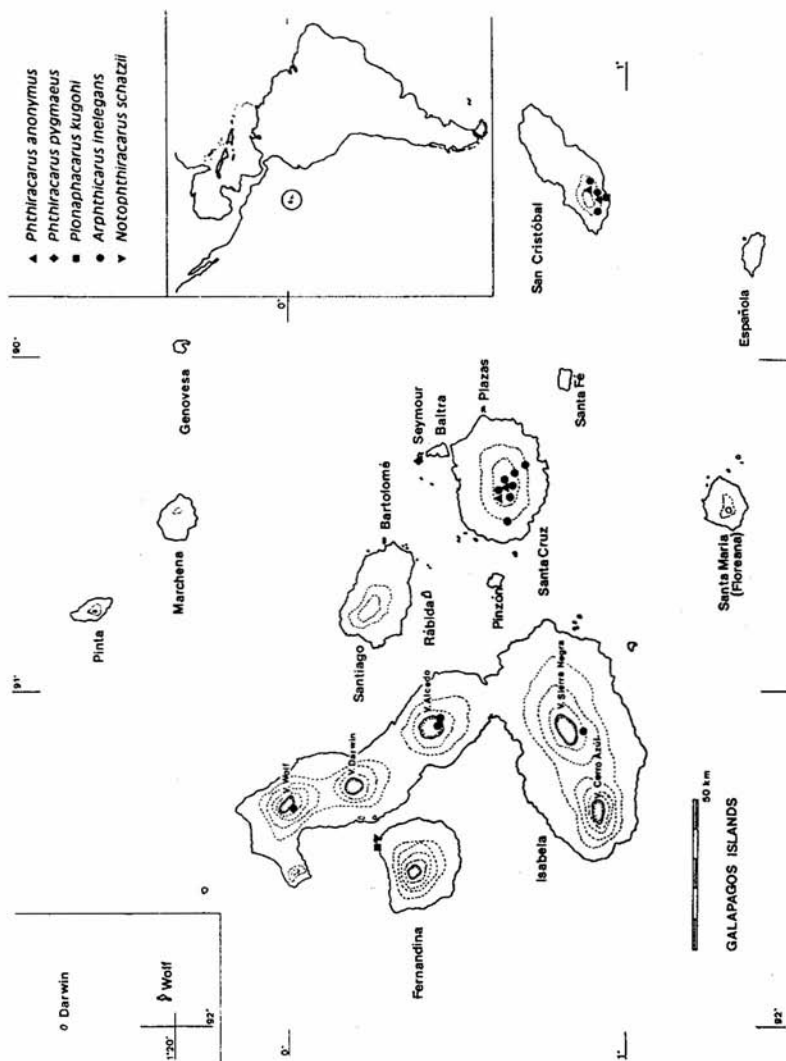
181-186. *Atropacarus (Hoplophorella) tuberosus* sp. nov., holotype: 181 - prodorsum, lateral view, 182 - prodorsum, dorsal view, 183 - genitaloaggenital plate, 184 - anoadanal plate, 185 - mentum of infracapitulum, 186 - trochanter and femur I



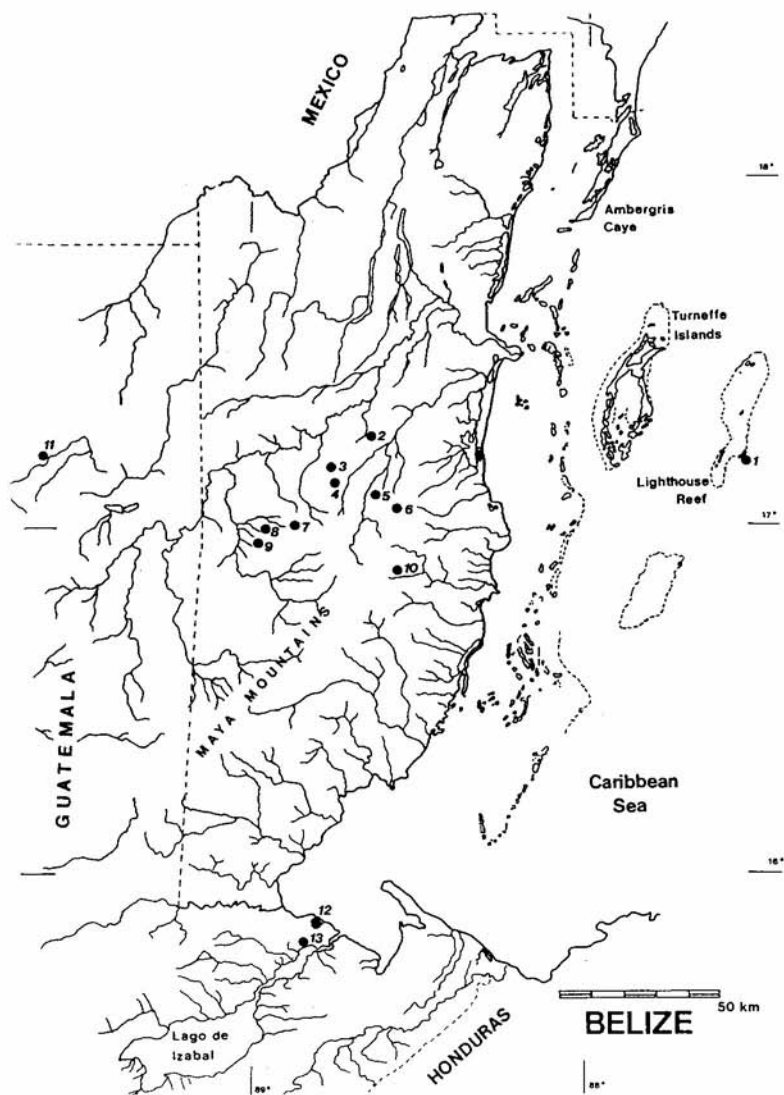
187-195. *Atropacarus (Hoplophorella) tuberosus* sp. nov., holotype: 187 - notogaster, 188 - seta c_1 , 189 - seta c_2 ; paratype: 190 - prodorsum, lateral view, 191 - notogaster, 192 - seta ps_2 , 193 - seta d_1 , 194 - anoadanal plate, 195 - fragment of trochanter and femur I



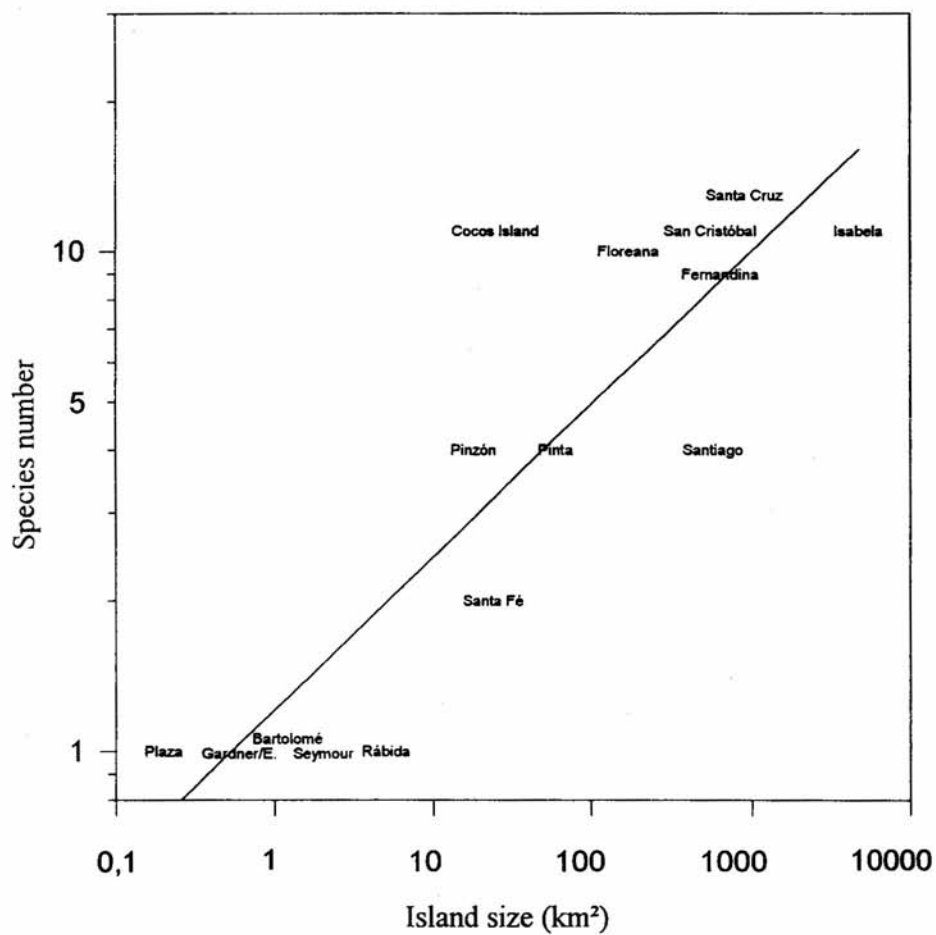
196. Records of species of Euptyctimous oribatid mites from the Galapagos Islands: Fam. *Oribotritiidae*



198. Records of species of Euptyctimous oribatid mites from the Galapagos Islands: Fam. *Phtthiracaridae* and *Steganacaridae*



200. Sites with records of Euptyctimous oribatid mites in Belize and Eastern Guatemala: 1 - Light House Reef (BEL 89-12,13,14), 2 - between Belize City and Belmopan (BEL 89-15), 3 - South of Belmopan (BEL 89-21), 4 - South of Belmopan near Hummingbird Highway (BEL 89-16), 5 - Blue Hole (BEL 89-17, 18), 6 - East of Blue Hole (BEL 89-19,20), 7 - Maya Mountains, Hidden Fall (BEL 90-34), 8 - Maya Mountains, Rio On (BEL 90-35), 9 - Maya Mountains, Augustine, Rio Frio Cave (BEL 90-36,37), 10 - Cockscomb Basin (BEL 90-31), 11 - Tikal (GUA 86-8,9,10,13,14), 12 - Siete Altares near Livingston (GUA 86-26,27), 13 - Manatee Biotope Chocon Machacas, Golfete (GUA 86-23,24,25, GUA 90-30), Not mapped: 14 - Quetzal Biotope near Purulha (GUA 86-16,18,19,20,21: 15°11'N, 90°13'W), 15 - Chichicastenango (GUA 86-7: 14°57'N, 91°07'W)



201. Euptyctimous mites (*Acari, Oribatida*) from the Galapagos Islands and Cocos Island: species number plotted against island size

