

## The Species of the Genus *Xenillus* Robineau-Desvoidy, 1839 in the Neogaea (Acari: Oribatei)

By

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**Abstract.** This paper underlines the presence of the genus *Xenillus* ROBINEAU-DESVOIDY, 1839 in the Neotropical Region. The genus is emended, and a key to the species found in the Neogaea is added.

The species of the oribatid genus *Xenillus* ROBINEAU-DESVOIDY, 1839 until recent times have been known only from the Holarctic Region. Since neither in the rich collection of HAMMER from South America and New Zealand nor in materials collected by AOKI in the Oriental Region a single *Xenillus* species was discovered, it seemed that the genus is Laurasian in origin, restricted to the Holarctic Region. However, after elaborating the material of the Hungarian Soil Zoological Expeditions several *Xenillus* species came forward from the Neotropical Region. What is more, the heretofore known data indicate even a richer fauna of this group in South America than in the Holarctic. Today 28 Neotropical species are known, but since the closing of the manuscript further new species have been discovered. The study of these latter forms is now under course.

The goal of the present contribution is to summarize briefly the differential diagnosis of the so far described species. A similar critical revision and summary would be very useful in Europe too, especially the highly interesting *Xenillus* species of Europe. Again the same applies for the southern areas of the United States of America. The oribatid mites can be divided similarly to other Arthropoda groups into two groups of distribution. There are species which have very wide area of distribution, and within this they are so unified that species found in far removed areas or in different continents, or zoogeographical regions show no significant morphological differences. Such a species is e. g. *Malacoangelia remigera* BERLESE, 1913 and also the most ancient types of primitive oribatids: the monotypical species. In some genera having many species, the species is spread over a small area only, they can well be characterized by simple combination of features. Such a group is the *Xenillus*. The transitional forms between

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the two types represent such taxa whose species are highly variable, and what is more, even with a good set of features cannot be sufficiently described. Such is the *Eremulus* BERLESE, 1908, or the genus *Tectocephus* BERLESE, 1913, or that complex that is referred to as *Berlesezetes auxiliaris* (GRANDJEAN, 1936), or the *Oppiella nova* (OUDEMANS, 1902), or the *Quadroppia quadricarinata* (MICHAEL 1885). Only the future examinations may reveal whether these species are real or not, since most of them are based on quantitative differences generally. On the other hand, the *Xenillus* species found in the Neotropical Region may well be characterized both by quantitative and qualitative features alike, and what is more, they can well be separated even on zoogeographical basis.

While describing the species and compiling the keys I used the following features:

1. The type of sensillus: *a*) clavate with short stalk and capitate head, *b*) with long, thin stalk and abruptly dilated, disciform or paddle-like end, *c*) with long, thin stalk and very slightly dilated, sparsely ciliated or aciculated, pointed end, *d*) long, either setiform or in the distal third very slightly fusiform, completely smooth, *e*) lanceolate, densely aciculated or spinulated; 2. intercuspidal triangle (present or absent); 3. length of interlamellar setae; 4. form and truncature of cuspides; 5. sculpture of interlamellar area; 6. notogastral homotrichy or heterotrichy; 7. length and ratio of sensillus, setae  $c_1$  and  $c_2$ ; 8. type of notogastral sculpture: *a*) smooth, *b*) punctulate, *c*) circular foveolate, *d*) oval foveolate, *e*) longitudinal slits.

A short diagnosis of the genus *Xenillus* ROBINEAU – DESVOIDY, 1839 is as follows: 5 pairs of genital setae; 11 pairs of notogastral setae; setae  $c_1$  and  $c_2$  present; tutorium present; 2 incisions on rostrum; intercuspidal triangle mostly present; experimental setal formula: 3 – 1 – 3 – 3; 1 pair of aggenital, 2 pairs of anal, 3 pairs of adanal setae present (aggenital setae may be absent?); nymphs apheroderm, quadridéficient (?).

Type-species: *Xenillus clypeator* ROBINEAU – DESVOIDY, 1839.

If we accept this definition of the genus *Xenillus* then we should consider the genus *Dinoxenillus* PÉREZ – INIGO & BAGGIO, 1980 a synonym. However, it seems quite probable that after a thorough study of the European and North American xenillids the genus should be split into several subgroups. It would be especially important to redescribe and revise the status of the genera *Leuroxenillus* WOOLLEY & HIGGINS, 1966, *Stenoxenillus* WOOLLEY & HIGGINS, 1966 and *Stonyxenillus* WOOLLEY & HIGGINS, 1966. According to GRANDJEAN (1954: 435) and BALOGH (1972: 66, footnote) several characteristics of the genera *Xenillus* and *Liacarus* (s. lato) are identical, consequently, the family of Xenillidae cannot be maintained. The South American *Liacarus* species differ from those of *Xenillus* only in one essential feature: the number of genital setae ( $G = 6$ ). However, my present investigations are sufficient only to draw the attention of specialists to these problems.

#### *Identification key to the species of Xenillus found in the Neogaea*

- 1 (10) Sensillus short, clavate with short stalk and fusiform or capitate head.
- 2 (3) Sensillus with smooth head: interlamellar setae and all notogastral setae smooth, setiform; lamellar cuspides in the basal half coalescent; intercuspidal triangle absent. — Length: 959 – 1160  $\mu\text{m}$ , width: 652 –

— 816  $\mu\text{m}$ . Locus typicus. Argentina, Córdoba, Sierra del Córdoba.  
Habitat: dry litter under shrubs:

**argentinensis** J. BALOGH & P. BALOGH, 1985

- 3 (2) Sensillus with aciculate or granulate head; interlamellar setae and all notogastral setae ciliate; lamellar cuspides in the basal half not coalescent.
- 4 (7) Lamellar cuspides long, as long as interlamellar area; inner margin of cuspides slightly concave; intercuspidal triangle absent.
- 5 (6) Interlamellar area with a longitudinal, bacilliform appendage; the end of cuspis with an arched, shallow incision; sensillus twice longer than setae  $c_1$ ;  $c_1$  longer than  $c_2$ . — Length 582–606  $\mu\text{m}$ . Locus typicus: Paraguay, Puerto Presidente Stroessner, Acaray waterfall. Habitat: wet litter about 50 m above waterfall:

**variabilis** BALOGH & MAHUNKA, 1981

- 6 (5) Interlamellar area without longitudinal, bacilliform appendage; the end of cuspis with semicircular, deep incision; setae  $c_2$  thrice longer than sensillus;  $c_1$  shorter than  $c_2$ . Length: 960–984  $\mu\text{m}$ ; width: 623–656  $\mu\text{m}$ . Locus typicus: Brasilia, São Paulo, near Santos. Habitat: very wet and thick leaf litter in a secondary forest:

**forceps** J. BALOGH & P. BALOGH, 1985

- 7 (4) Lamellar cuspides short: much shorter than interlamellar area; inner margin of cuspides slightly convex or parallel; intercuspidal triangle present.
- 8 (9) Lamellar setae originate on the surface of cuspis, near to anterior margin of lamellae; notogastral setae fusiform and densely spathulate; ciliate: setae  $c_1$  and  $c_2$  shorter than sensillus; notogaster with larger and smaller circular foveolae. — Length: 730  $\mu\text{m}$ ; width: 476  $\mu\text{m}$ . Locus typicus: Brasilia, Maranhao, Fazenda Agua Azul, Serra do Gurupi, NW from Imperatriz. Habitat: tropical rain forest, leaf litter:

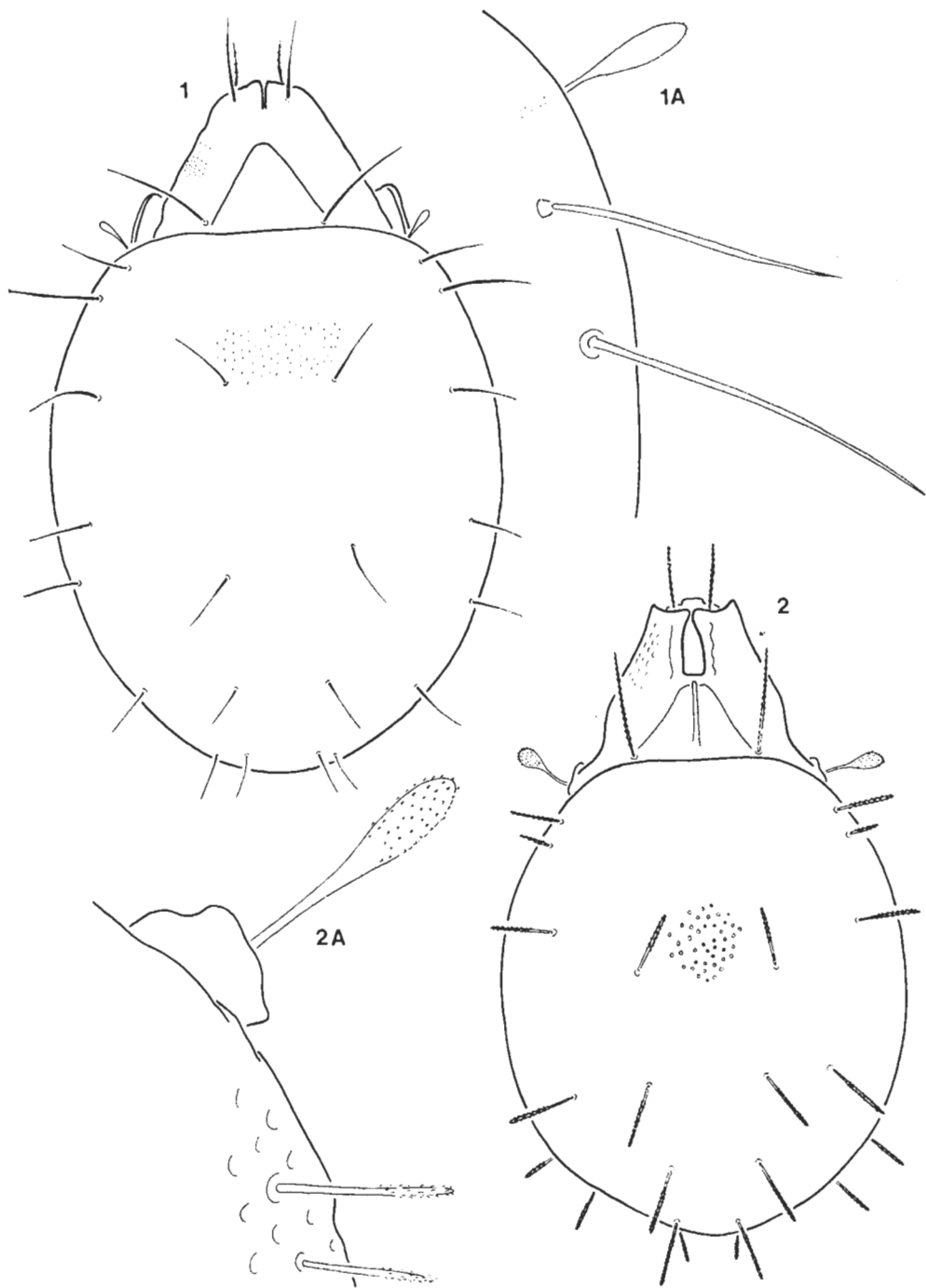
**fazendae** J. BALOGH & P. BALOGH, 1985

- 9 (8) Lamellar setae originate on the apical truncature of cuspis: prodorsal and notogastral setae densely ciliate but not fusiform; setae  $c_1$  longer than sensillus; notogaster with somewhat elongate, scattered foveolae. — Length: 451–576  $\mu\text{m}$ ; width 287–397  $\mu\text{m}$ . Locus typicus: Brasilia, Estado São Paulo, Cabreuva. Habitat: secondary forest, humus:

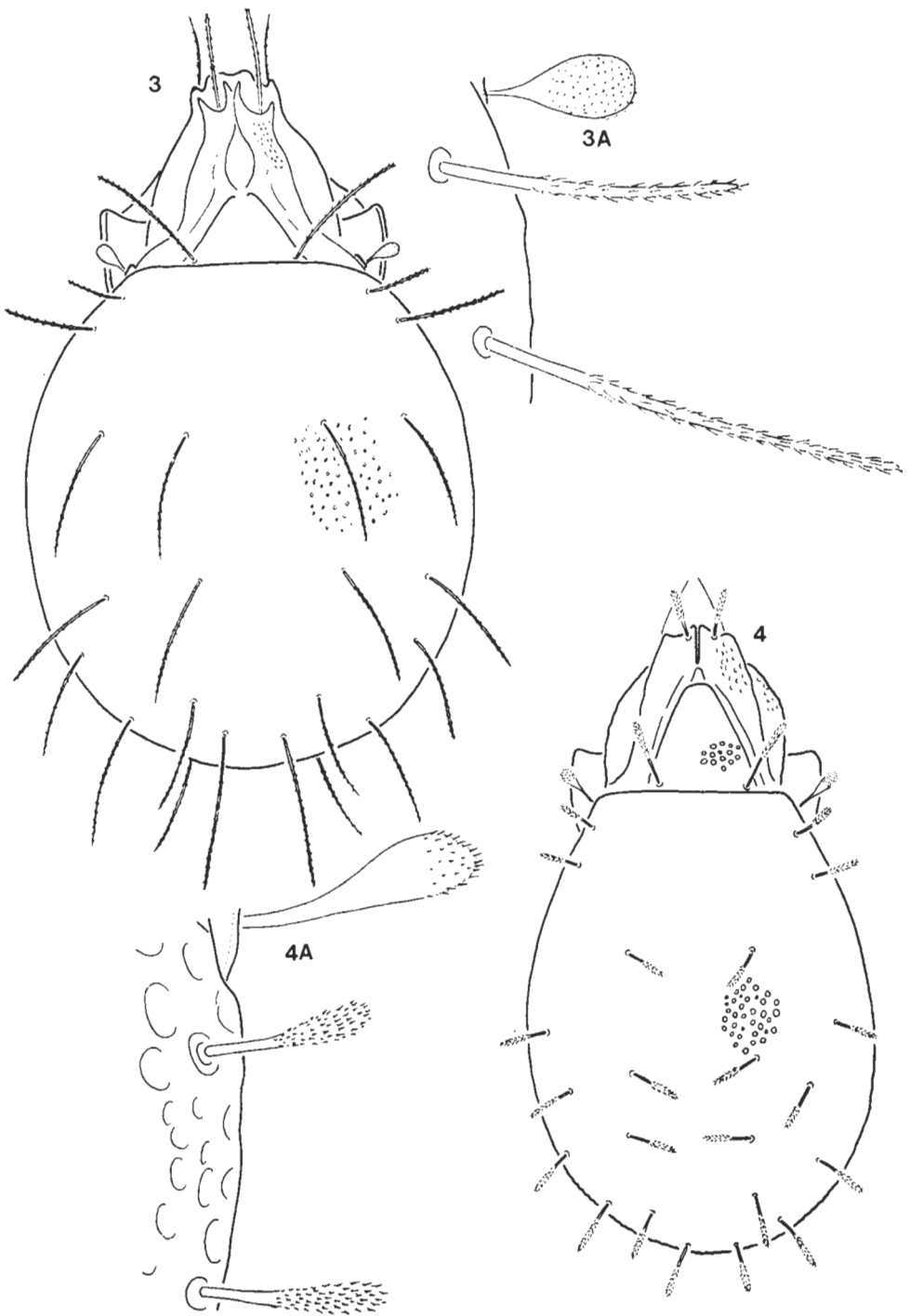
**capitatus** BALOGH & MAHUNKA, 1977

- 10 (1) Sensillus never short, with short stalk and fusiform or capitate head.
- 11 (26) Sensillus with long, thin stalk and mostly abruptly dilatated, with a disciform or paddle-shaped end.
- 12 (13) Notogastral setae extremely short and fine, discernible only in marginal position; especially setae  $c_1$ ,  $c_2$ ,  $p_1$ ,  $p_2$ ,  $p_3$ . Notogaster and ventral side foveolate. — Length: 545–599  $\mu\text{m}$ ; width: 381–410  $\mu\text{m}$ . Locus typicus: Brasilia, Rio de Janeiro, Botanical Garden. Habitat: primary rain forest on sandy soil, litter:

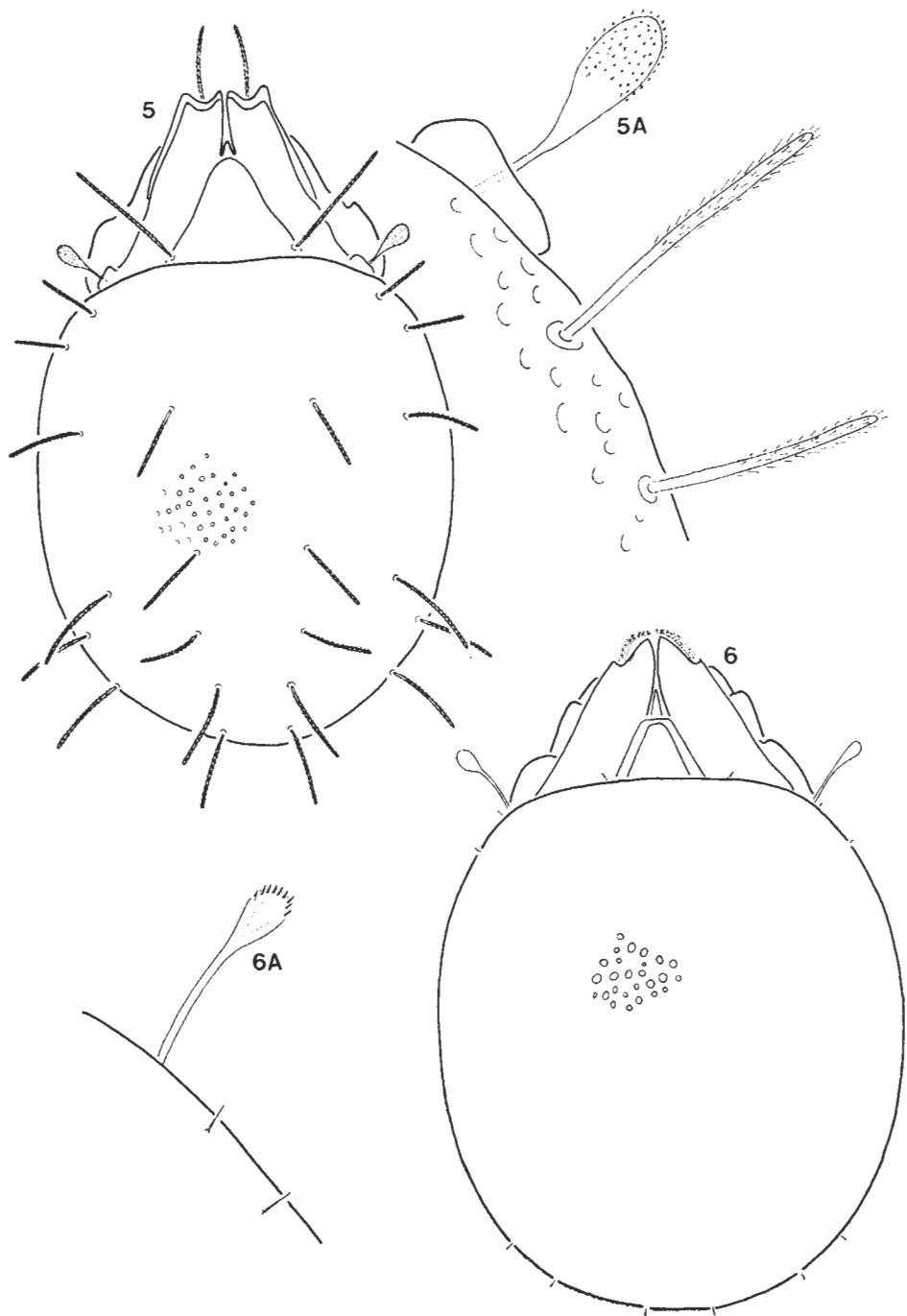
**subnudus** J. BALOGH & P. BALOGH, 1985



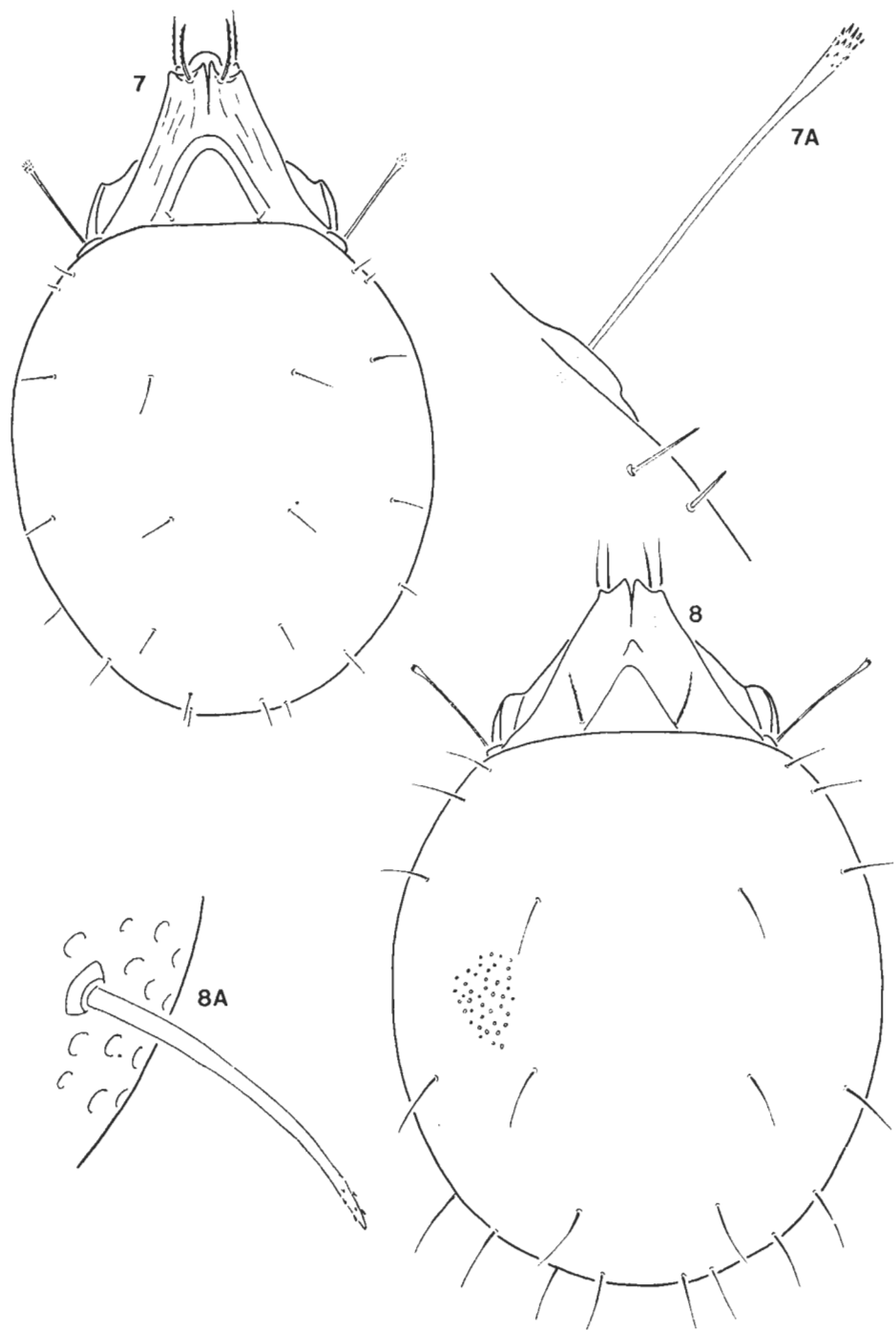
Figs. 1-2. 1: *Xenillus argentinensis* J. BAL. & P. BAL., 1985 - 2: *X. variabilis* J. BAL. & MAH., 1981



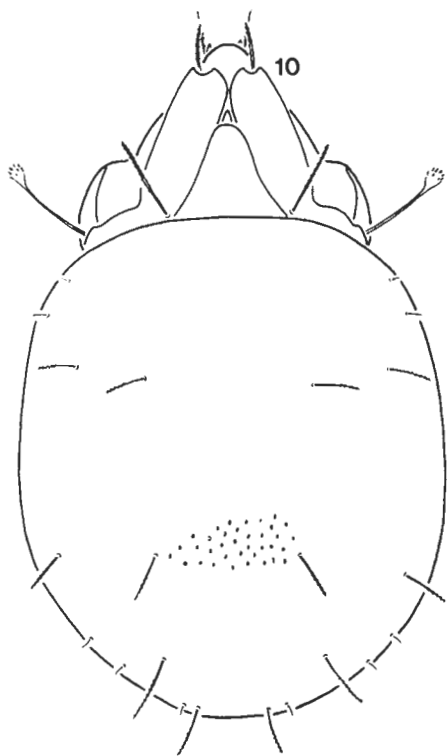
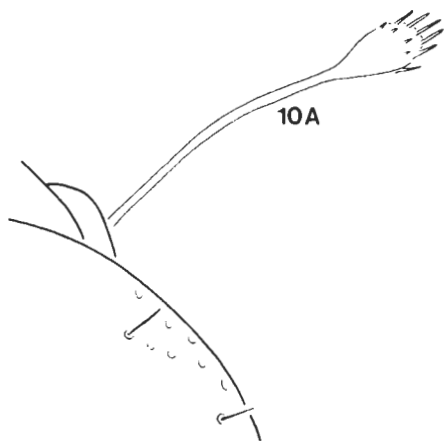
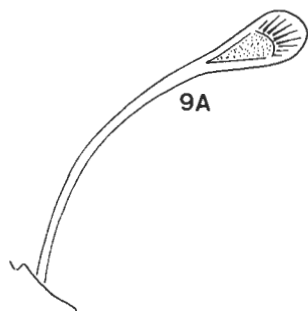
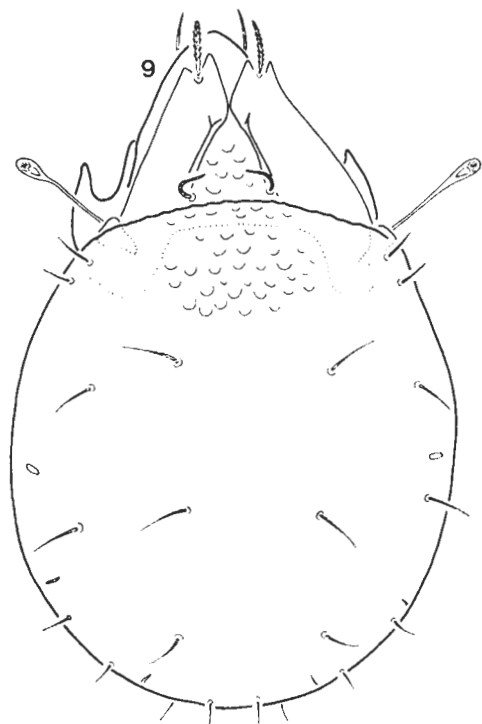
Figs. 3-4. 3: *Xenillus forceps* J. BAL. & P. BAL., 1984 - 4: *X. fazendae* J. BAL. & P. BAL., 1985



Figs. 5--6.5: *Xenillus capitatus* J. BAL. & MAH., 1977 - 6: *X. subnudus* J. BAL. & P. BAL., 1985

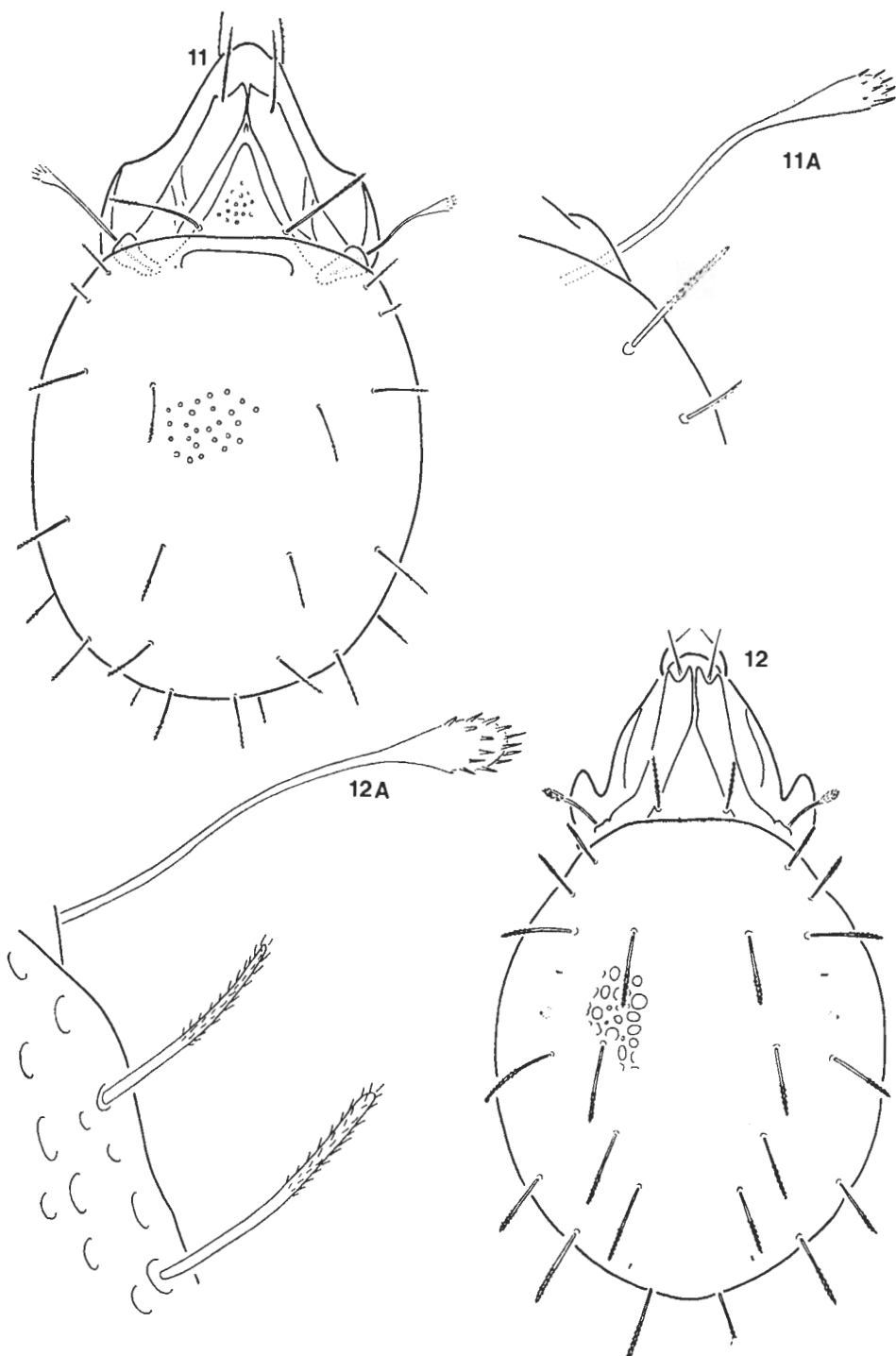


Figs. 7-8. 7: *Xenillus peruensis* J. BAL. & P. BAL., 1985 - S: *X. columbianus* P. BAL., 1985

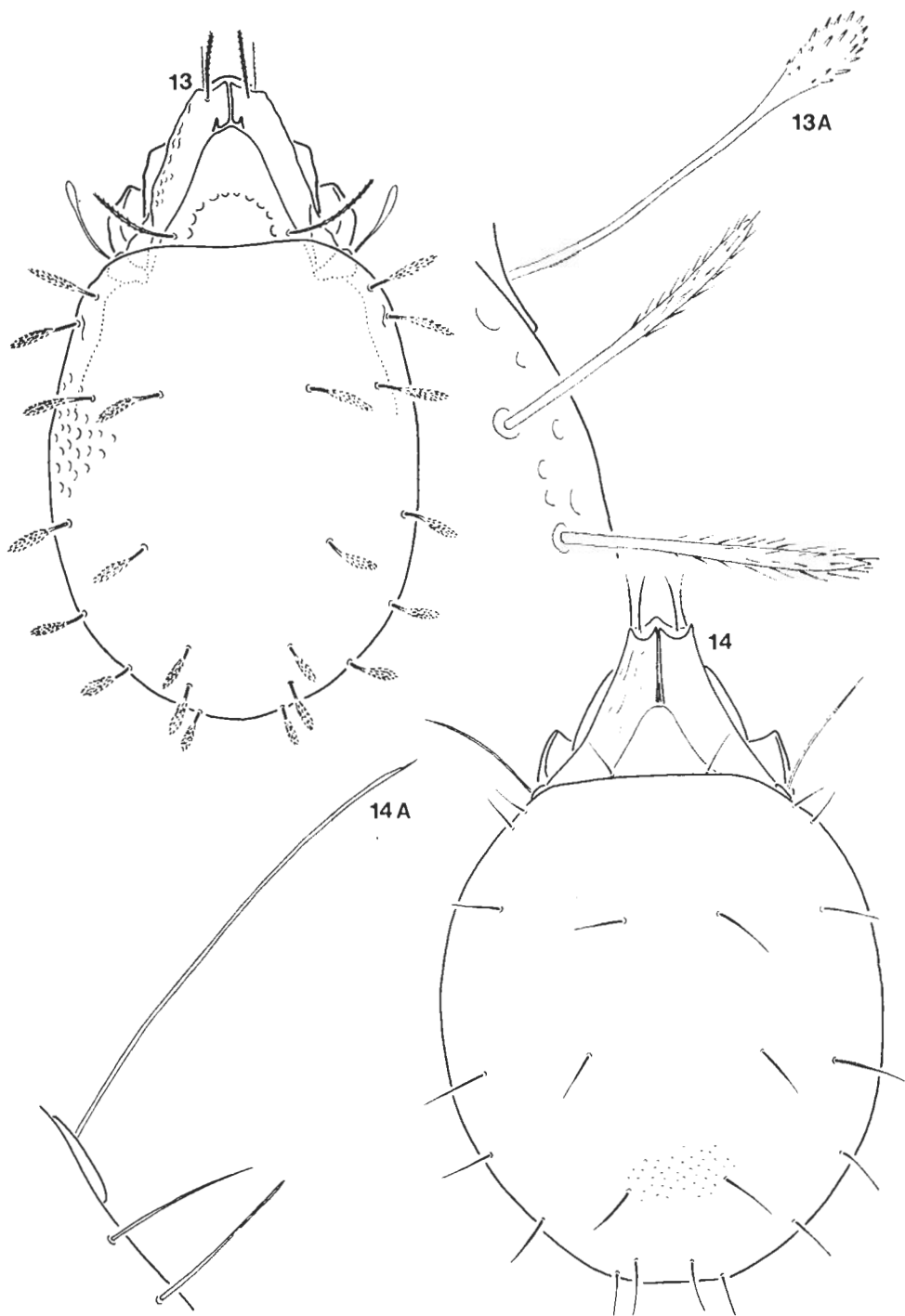


Figs. 9–10. 9: *Xenillus butantanensis* PÉR.—INIGO & BAGG., 1980—10: *X. hammerae* J. BAL. & P. BAL., 1985

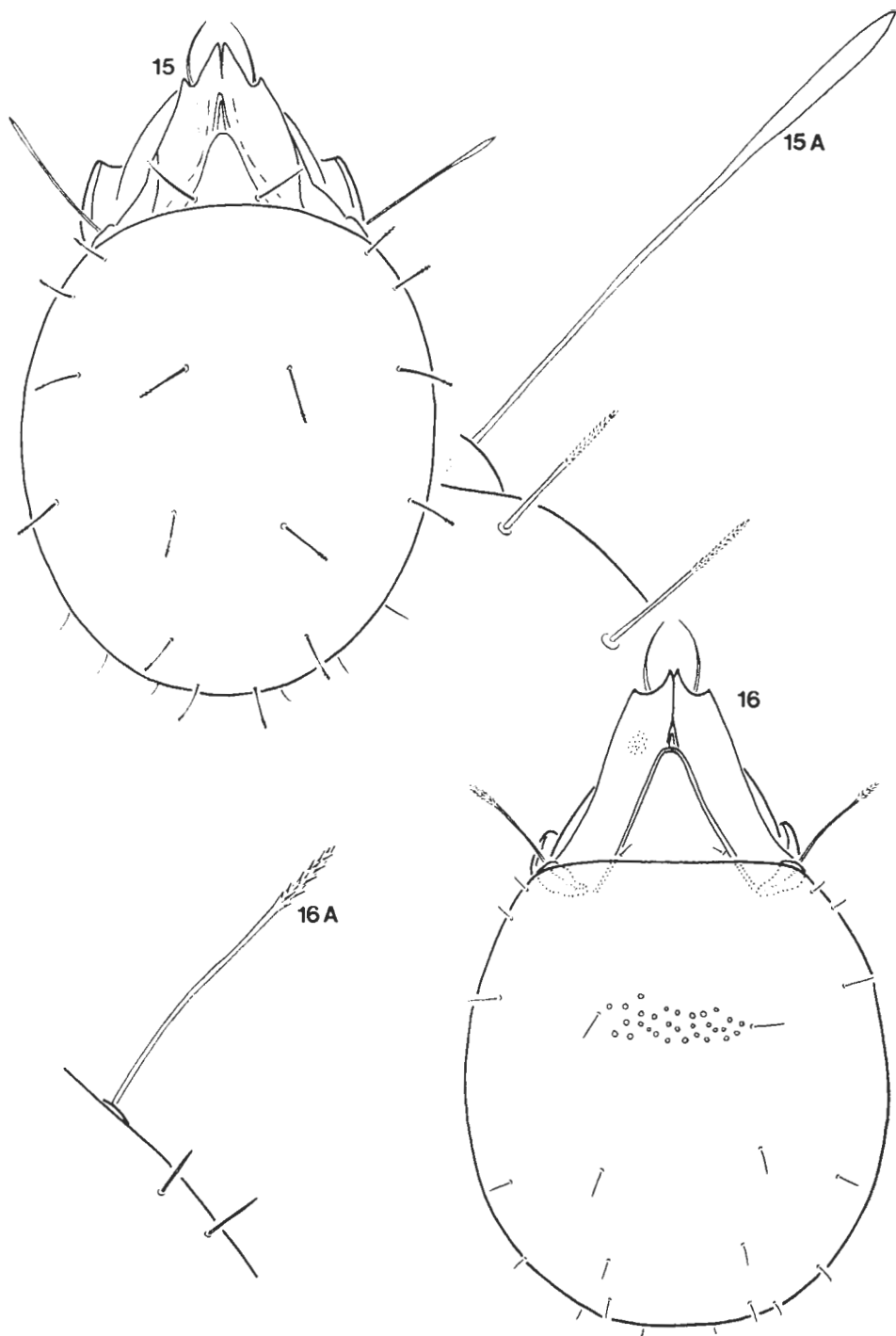




Figs. 11–12. 11: *Xenillus rohri* J. BAL. & P. BAL., 1985 – 12: *X. brasiliensis* J. BAL. & MAH., 1969



Figs. 13–14. 13: *Xenillus lawrencei* J. BAL. & MAH., 1968 – 14: *X. setiger* J. BAL. & P. BAL., 1985



Figs. 15 – 16. 15: *Xenillus bolivianus* J. BAL.&P. BAL., 1985 – 16: *X. amazonicus* J. BAL.&P. BAL. 1985

- 13 (12) Notogastral setae at least partly well discernible, of medium length or long.
- 14 (19) All notogastral setae smooth, setiform, without cilia.
- 15 (16) Interlamellar setae extremely short; basal half of cuspides coalesced. Notogaster not foveolated, smooth. — Length: 599–738  $\mu\text{m}$ ; width: 390–435  $\mu\text{m}$ . Locus typicus: Peru, transect between Lima and Pucallpa, near Tingo Maria, 353 km from Pucallpa. Habitat: moss forest, steep slope, soil moss:  
**peruensis** J. BALOGH & P. BALOGH, 1985
- 16 (15) Interlamellar setae medium long; basal half of cuspides either with an intercruspidal triangle connected, or separated; notogaster foveolated.
- 17 (18) The paddle-shaped end of sensillus apically with some spines; intercruspidal triangle present; interlamellar area without foveolae; notogaster with scattered, smaller and larger foveolae. — Length: 631  $\mu\text{m}$ ; width: 426  $\mu\text{m}$ . Locus typicus: Columbia.  
**columbianus** P. BALOGH, 1985
- 18 (17) The paddle-shaped sensillus apically without spines; intercruspidal triangle absent; interlamellar area with foveolae; notogaster with relatively dense, larger foveolae. — Length: 432–480  $\mu\text{m}$ . Locus typicus: São Paulo, Cidade Universitária „Aramando de Salles Oliveira”, Bosque da Biologia. Habitat: tropical rain forest, humus and litter:  
**butantanensis** PÉREZ–INIGO & BAGGIO, 1980
- 19 (14) All or most of notogastral setae ciliate.
- 20 (21) Notogastral heterotrichy: 5 pairs of notogastral setae ( $c_1$ ,  $c_2$ ,  $p_1$ ,  $p_2$ ,  $p_3$ ) extremely short and smooth; 6 pairs ( $te$ ,  $ti$ ,  $ms$ ,  $r_1$ ,  $r_2$ ,  $r_3$ ) much longer and on the apical half ciliate; notogastral foveolae scattered, longitudinally somewhat oblong. — Length: 554–656  $\mu\text{m}$ ; width: 3030–353  $\mu\text{m}$ . Locus typicus: Brasilia, São Paulo, near Santos. Habitat: secondary rain forest: thick, luxuriant moss on the soil:  
**hammerae** J. BALOGH & P. BALOGH, 1985
- 21 (20) Notogastral heterotrichy absent: all notogastral setae at least on the apical half ciliate (setae  $c_1$ ,  $c_2$ , and  $p_1$  exceptionally shorter, but apically always ciliate!).
- 22 (23) Setae  $c_1$  and  $c_2$  much shorter than remaining notogastral setae: sensillus more than twice longer than  $c_1$ ; notogastral setae sparsely ciliate. — Length: 439–570  $\mu\text{m}$ ; width: 258–336  $\mu\text{m}$ . Locus typicus: Brasilia, Rio de Janeiro, Botanical Garden. Habitat: primary rain forest on sandy soil, litter:  
**rohri** J. BALOGH & P. BALOGH, 1985
- 23 (22) Setae  $c_1$  and  $c_2$  only a little shorter than remaining notogastral setae: sensillus only twice or less than twice longer than  $c_1$ ; notogastral setae densely ciliate.
- 24 (25) Setae  $c_1$  as long as half length of sensillus; anterior margin of cuspides with a deep, arcuated incision; inner and outer tip of cuspis acuminate. — Length: 663–877  $\mu\text{m}$ ; width: 408–632  $\mu\text{m}$ . Locus typicus: Brasilia, Manaus. Habitat: primary rain forest, litter:  
**brasilianus** BALOGH & MAHUNKA, 1969

25 (24) Setae  $c_1$  longer than half length of sensillus; anterior margin of cuspides with shallow incision; outer tip of cuspis with low, obtuse tip. — Length: 625–666  $\mu\text{m}$ ; width: 285–377  $\mu\text{m}$ . Locus typicus: Argentina, Córdoba, Sierra de Córdoba, Fanti. Habitat: shrubby area, litter:

**lawrencei** BALOGH & MAHUNKA, 1968

26 (11) Sensillus never with long, setiform stalk and abruptly dilated, with a disciform or paddle-shaped end.

27 (30) Sensillus long, completely smooth; either setiform or in distal third very slightly fusiform; intercuspidal triangle extremely long, spiniform.

28 (29) Sensillus quite setiform, cuspides apically with a semicircular incision: inner tip as long as outer tip; all notogastral setae medium long, smooth, rigid; setae  $c_1$  and  $c_2$  about twice longer than distance between their alveoli, convergent; notogaster punctulate. — Length: 935  $\mu\text{m}$ ; width: 615  $\mu\text{m}$ . Locus typicus: Peru, transect between Lima and Pucallpa, near Tingo Maria, 353 km from Pucallpa. Habitat: moss forest, humus and roots of a farn-tree:

**setiger** J. BALOGH & P. BALOGH, 1985

29 (28) Sensillus in apical third very slightly dilated; cuspides obliquely truncate: inner tip much longer than outer tip; setae  $c_1$ ,  $c_2$ ,  $p_1$ ,  $p_2$ ,  $p_3$  little shorter than remaining notogastral setae; apically sparsely ciliate; setae  $c_1$  and  $c_2$  about as long as distance between their alveoli, parallel; notogaster smooth. — Length: 625  $\mu\text{m}$ ; width: 336  $\mu\text{m}$ . Locus typicus: Bolivia, Alto Beni, 580 m. Habitat: tropical rain forest, litter:

**bolivianus** J. BALOGH & P. BALOGH, 1985

30 (27) Sensillus never completely smooth. setiform or in distal third with a slightly fusiform end; intercuspidal triangle never extremely long, spiniform.

31 (50) Sensillus with long, thin stalk and very slightly dilated, sparsely ciliated or aciculated, pointed end.

32 (35) All notogastral setae smooth, setiform, without cilia.

33 (34) Setae  $c_1$  as long as setae  $c_2$ ; interlamellar setae short; lamellae finely punctulate; notogaster foveolate. — Length: 574–771  $\mu\text{m}$ ; width: 381–500  $\mu\text{m}$ . Locus typicus: Brasilia, Marnhao, Fazenda Agua Azul, Serra do Gurupi, NW from Imperatriz. Habitat: tropical rain forest, litter:

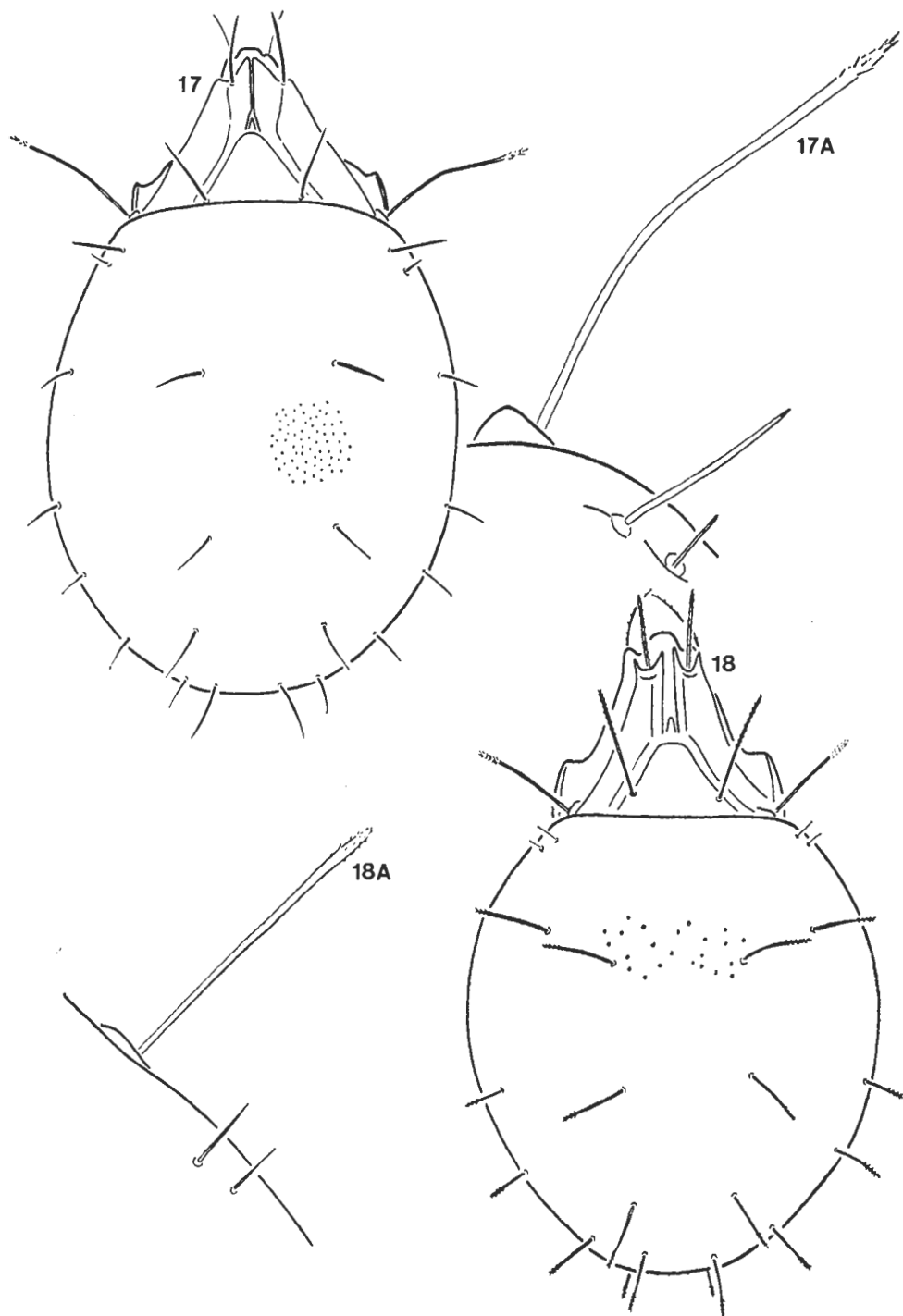
**amazonicus** J. BALOGH & P. BALOGH, 1985

34 (33) Setae  $c_1$  about thrice longer than setae  $c_2$ ; interlamellar setae long; lamellae not punctulate. Notogaster with scattered punctulation. — Length: 750  $\mu\text{m}$ ; width: 492  $\mu\text{m}$ . Locus typicus: Bolivia, near Coroico, cca 3200 m. Habitat: *Sphagnum* on a bluff rocky wall:

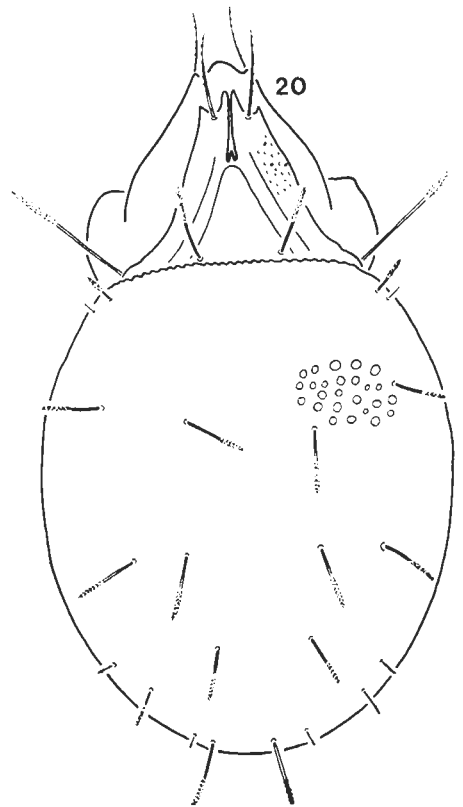
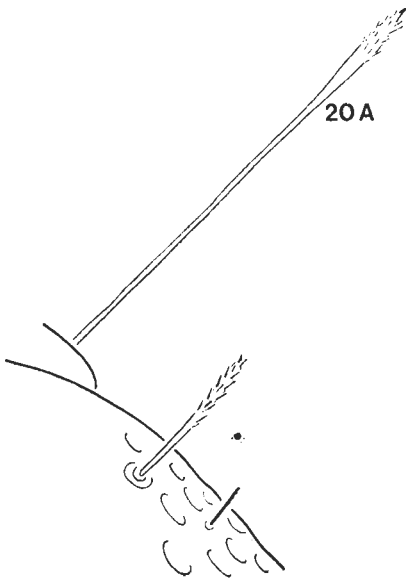
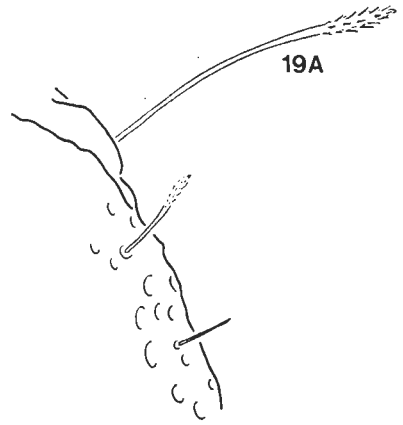
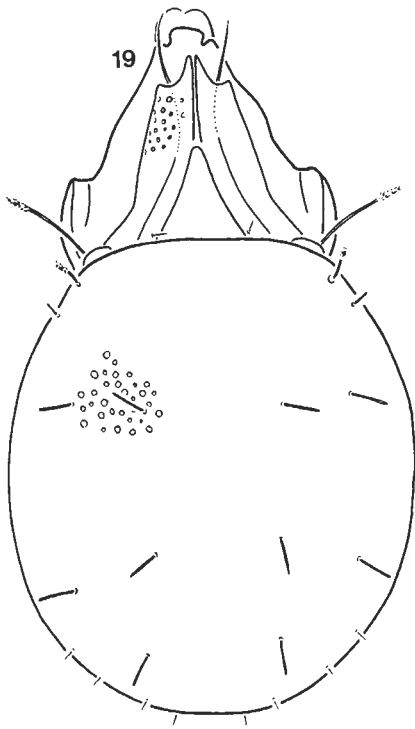
**punctulatus** J. BALOGH & P. BALOGH, 1985

35 (32) At least setae  $te$ ,  $ti$ ,  $ms$ ,  $r_2$  and  $r_1$  always ciliate.

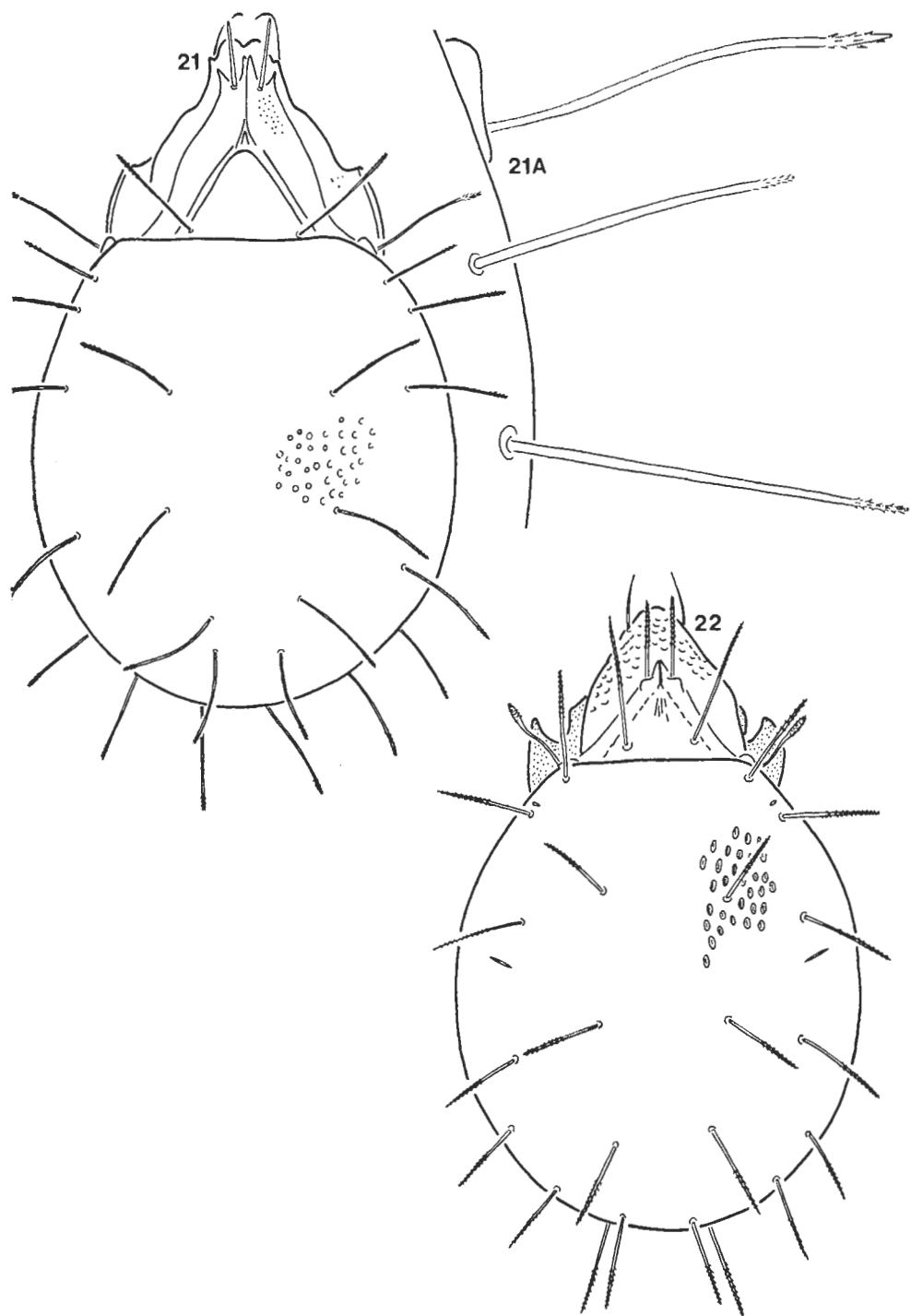
36 (39) Either setae  $c_1$  and  $c_2$  or setae  $c_2$ ,  $r_1$ ,  $p_1$ ,  $p_2$  and  $p_3$  smooth and much shorter than remaining notogastral setae.



Figs. 17-18. 17: *Xenillus punctulatus* J. BAL. & P. BAL., 1985 - 18. *X. ecuadorensis* J. BAL. & P. BAL., 1985

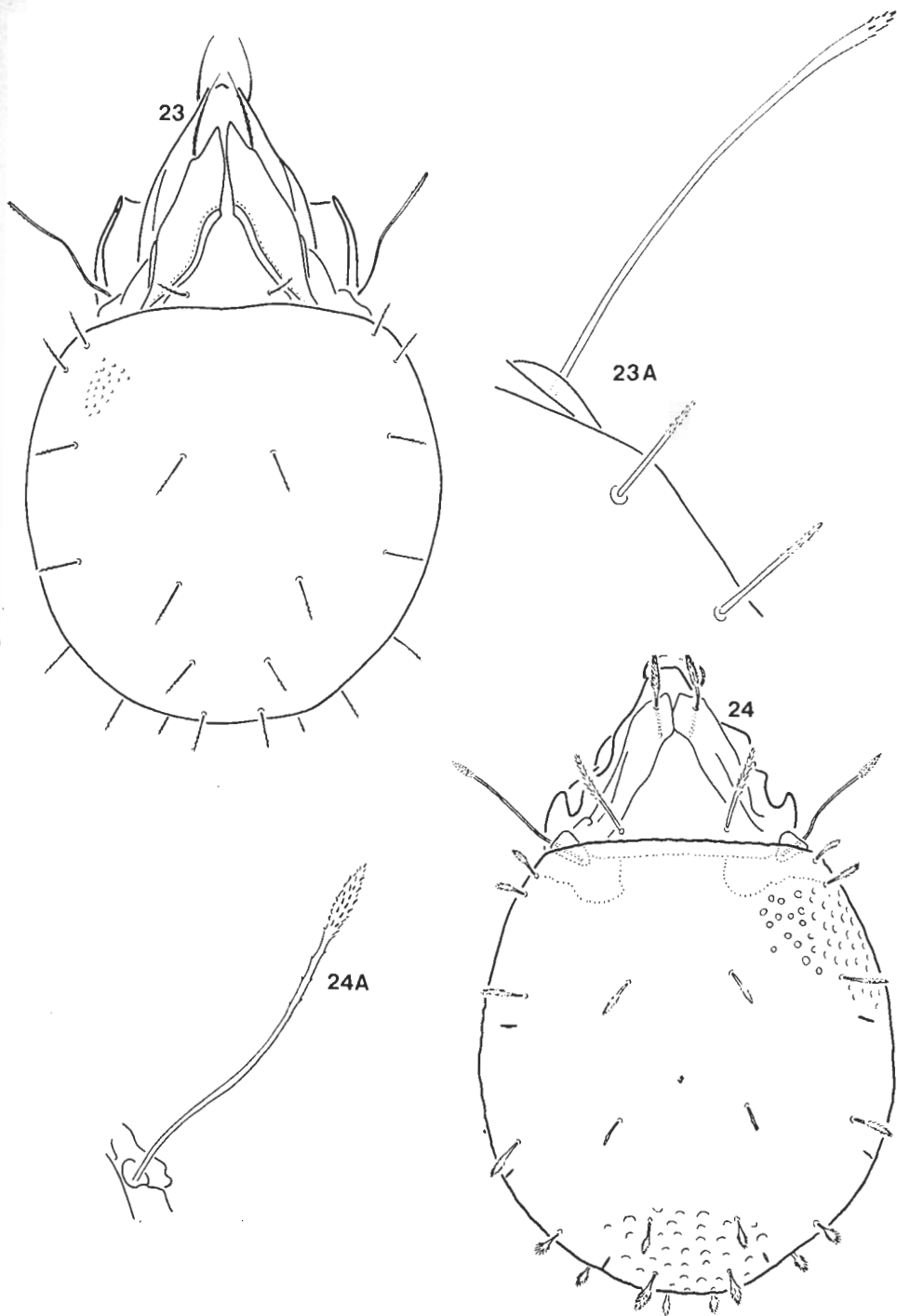


Figs. 19-20. 19: *Xenillus davisorum* J. BAL. & P. BAL., 1985 - 20: *X. heterotrichus* J. BAL. & P. BAL., 1985

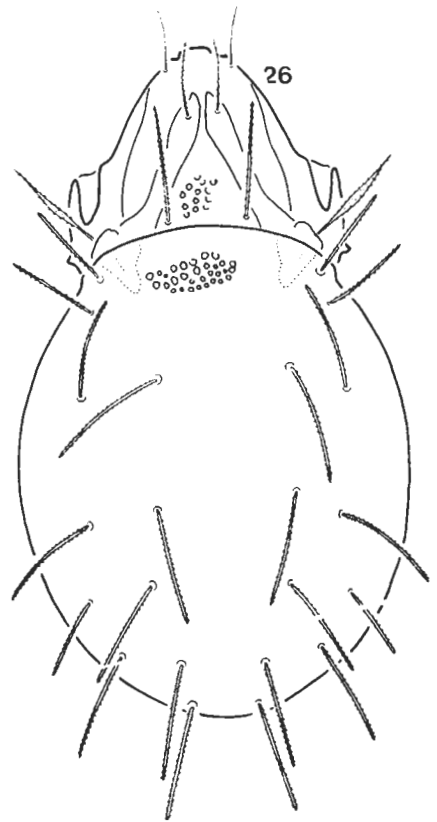
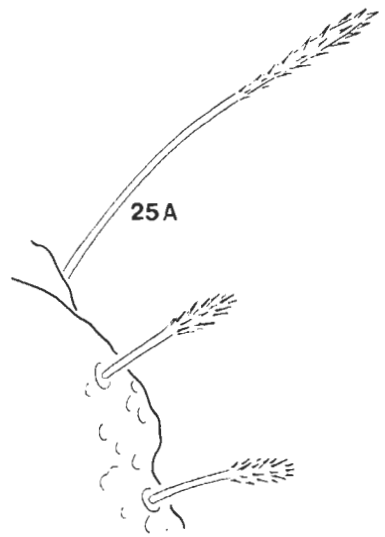
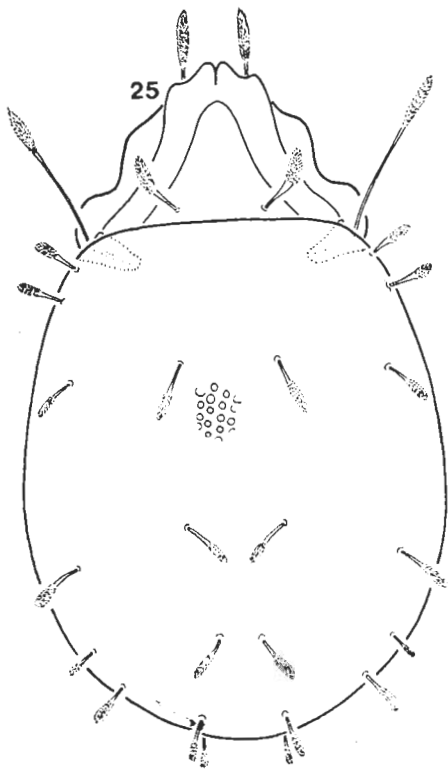


Figs. 21-22. 21: *Xenillus venezuelanus* J. BAL. & P. BAL., 1984 - 22: *X. superbus* (PÉR.-INIGO & BAGG., 1980)

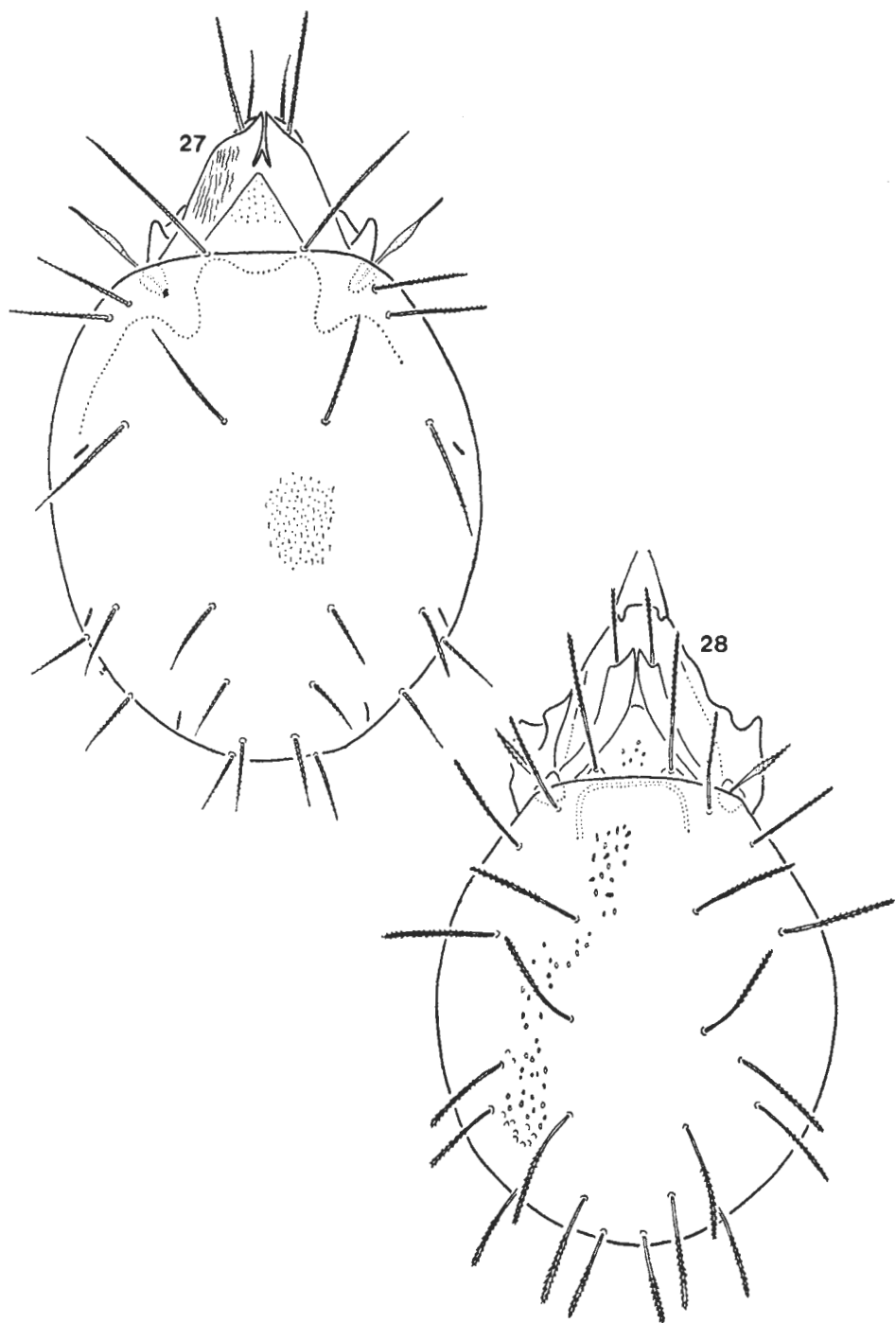




Figs. 23–24. 23: *Xenillus longisetosus* J. BAL. & MAH., 1969–24: *X. sanctipauli* PÉR. – INIGO & BAGG., 1980



Figs. 25–26: 25: *Xenillus fusifer* J. BAL. & MAH., 1977–26: *X. disjunctus* J. BAL. & MAH., 1977



Figs. 27 - 28. 27: *Xenillus ornatus* (COVARRUBIAS, 1967) - 28: *X. longipes* MAH., 1985

- 37 (38) Setae  $c_1$  and  $c_2$  short and smooth, remaining notogastral setae much longer and apically ciliate; notogaster with irregularly scattered small foveolae. — Length: 763–1005  $\mu\text{m}$ ; width: 484–656  $\mu\text{m}$ . Locus typicus: Ecuador, Cotopaxi, cca 3500–4000 m. Habitat: paramo-region, wet soil moss and debris of grasses:  
**ecuadorensis** J. BALOGH & P. BALOGH, 1985
- 38 (37) Setae  $c_2$ ,  $r_1$ ,  $p_1$ ,  $p_2$  and  $p_3$  short and smooth, remaining notogastral setae much longer and spatulate or apically very finely ciliate; notogaster with larger and smaller foveolae. — Length: 689  $\mu\text{m}$ ; width: 410  $\mu\text{m}$ . Locus typicus: Brasilia, Maranhao, Fazenda Agua Azul, Sierra do Gurupi. NW from Imperatriz. Habitat: tropical rain forest, litter:  
**davisorum** J. BALOGH & P. BALOGH, 1985
- 39 (36) All notogastral setae at least apically ciliate.
- 40 (41) Setae  $p_1$  and  $p_3$  very short and thin: setae  $r_1$ ,  $r_2$ , and  $r_3$  about thrice longer than  $p_1$  and  $p_3$ ; setae  $c_1$  about thrice longer than setae  $c_2$ ; lamellae sparsely foveolate; notogaster with large, circular foveolae. — Length: 656–681  $\mu\text{m}$ ; width: 402–410  $\mu\text{m}$ . Locus typicus: Brasilia, Maranhao, Fazenda Agua Azul, Serra do Gurupi, NW from Imperatriz. Habitat: rain forest, litter:  
**heterotrichus** J. BALOGH & P. BALOGH, 1984
- 41 (40) Setae  $p_1$  and  $p_2$  the same length as setae  $r_1$ ,  $r_2$  and  $r_3$  or only a little shorter.
- 42 (45) Setae  $c_1$  and  $c_2$  almost as long or longer than sensillus.
- 43 (44) Lamellar cuspides long: as long as interlamellar area; almost reaching to tip of rostrum; setae  $c_1$  slightly shorter than  $c_2$  and sensillus; notogaster with circular foveolae. — Length: 877–964  $\mu\text{m}$ ; width: 595–709  $\mu\text{m}$ . Locus typicus: Venezuela, Caracas, Mt. Avila National Park, 2200 m. Habitat: tropical montane forest, wet litter and humus:  
**venezuelanus** J. BALOGH & P. BALOGH, 1985
- 44 (43) Lamellar cuspides short: much shorter than interlamellar area, not reaching to tip of rostrum; setae  $c_1$  and  $c_2$  longer than sensillus; notogaster with oblong, longitudinally divided foveolae. — Length: 1020–1224  $\mu\text{m}$ . Locus typicus: São Paulo, Cidade Universitária „Armando de Salles Oliveira”, Bosque da Biologia. Habitat: tropical rain forest, humus and litter:  
**superbus** (PÉREZ—INIGO & BAGGIO, 1985)
- 45 (42) Setae  $c_1$  and  $c_2$  much shorter than sensillus.
- 46 (47) Notogastral setae setiform, apically with very short cilia; notogaster with small, scattered foveolae. — Length: 538–633  $\mu\text{m}$ ; width: 364–443  $\mu\text{m}$ . Locus typicus: Bolivia, Puerto Linares. Habitat: tropical rain forest, litter:  
**longisetosus** BALOGH & MAHUNKA, 1969
- 47 (46) Notogastral setae fusiform, apically dilated and densely ciliated; notogaster with large, circular foveolae.

48 (49) Lamellar setae originating on the surface of cuspis; interlamellar setae setiform, long, apically not dilated, much longer than notogastral setae. — Legth: 494–630  $\mu\text{m}$ . Locus typicus: São Paulo, Cidade Universitaria „Armando de Salles Oliveira”, Bosque da Biologia. Habitat: tropical rain forest, humus and litter:

**sanctipauli** PÉREZ — INIGO & BAGGIO, 1980

49 (48) Lamellar setae originating on the apical margin of cuspis; interlamellar setae fusiform, apically dilated, same type as notogastral setae. — Length: 571–816  $\mu\text{m}$ ; width: 393–520  $\mu\text{m}$ . Locus typicus: Brasilia, Estate São Paulo, Cabareuva. Habitat: secondary forest, humus:

**fusifera** BALOGH & MAHUNKA, 1977

50 (31) Sensillus lanceolate; densely aciculated or spinulated.

51 (52) Lamellar cuspides separated: neither with intercuspidal triangle, nor with connected translamella; notogaster with circular foveolae; notogastral setae at least partly with thick, bacilliform spines. — Length: 861  $\mu\text{m}$  width: 502  $\mu\text{m}$ . Locus typicus: Chile, Maipu, 25 km SW from Santiago. Habitat: moss scraped from walls and rocky gorge:

**disjunctus** BALOGH & MAHUNKA, 1977

52 (51) Lamellar cuspides either with interlamellar triangle or with short connected translamella; notogaster either with longitudinally elongated or with slitlike fissures; notogastral setae ciliated.

53 (54) Interlamellar area granulated. Lamellae and interlamellar triangle fused. Setae  $c_1$  and  $c_2$  near to each other: distance  $c_2$  — te thrice longer than distance  $c_1 - c_2$ . — Length: 1020  $\mu\text{m}$ ; width: 673  $\mu\text{m}$ . Locus typicus: Chile, Province O'Higgins, Palms of cocolán. Habitat: palm forest, litter:

**ornatus** (COVARRUBIAS, 1967)

54 (53) Interlamellar area foveolated. Lamellae separated; interlamellar triangle not fused with lamellae. Setae  $c_1$  and  $c_2$  far from each other: distance  $c_2$  — te less than twice longer than distance  $c_1 - c_2$ . — Length: 834–1009  $\mu\text{m}$ ; width: 514–592  $\mu\text{m}$ . Locus typicus: Paraguay, Provincia Concepción, Estancia Estrellas. Habitat: forest, litter:

**longipes** MAHUNKA, 1985

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