# BOCAGIANA

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## THE PROTURA (INSECTA) OF MADEIRA


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With 31 figures


SUMÁRIO. Dá se uma redescrição de **Maderentulus maderensis** (Condé, 1957) e descreve-se uma nova espécie, **Eosentomon noseki**, e uma nova sub-espécie, **Acerentulus confinis** subsp. **maderensis**. **Protentomon maderense** Condé & Nosek, 1970 é sinonimizado com **P. barandiarani** Condé, 1947. O número de espécies da ordem Protura conhecidas da Madeira eleva-se agora a nove, todas menos as duas espécies novas, oriundas da Europa.

SUMMARY. A redescription of **Maderentulus maderensis** (Condé, 1957) is given, and a new species, **Eosentomon noseki**, and a new subspecies, **Acerentulus confinis** subsp. **maderensis**, are described. **Protentomon maderense** Condé & Nosek, 1970 is synonymized with **P. barandiarani** Condé, 1947. Nine species of Protura are now known from Madeira, all originating from Europe, except for the two new ones.


### INTRODUCTION

This paper is occasioned by the wish to give a new description of the genus *Maderentulus*, endemic to Madeira and hitherto only described from a larva II. For this purpose I received material from Dr. Marie Hammer, Roland, Denmark, collected in 1963-64 and Dr. W. Hüther, Bochum, Germany, collected in 1972. Through the kindness of Dr. Bernd Hauser in Genève and Dr. J. Nosek, Bratislava, I also was able to reexamine the material collected by professors Per Brinck and Erik Dahl, Lund, Sweden, and worked up by Condé & Nosek, 1970. To all these colleagues I render my sincerest thanks. Besides the possibility of making the redescription I was able to add seven species to the


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known Madeiran Protura, one species and one subspecies of which are new to science. The descriptions are followed by a key.

The material collected by professors Brinck and Dahl is for the greater part kept in the Muséum d'Histoire Naturelle, Genève, and in Nosek's collection in Bratislava. The material collected by Dr. Hammer and Dr. Hüther is kept in the Zoological Museum of Copenhagen.

## I. A SURVEY OF THE PROTURA OF MADEIRA

### a. Acerentomidae.

#### 1. Maderentulus maderensis (Condé, 1957).

(Figs. 1-9, 25 A)

This species was described by Condé from a specimen of a larva II collected at Caldeirão Verde on Madeira in 1956. After examining the holotype and only known specimen, I erected the genus *Maderentulus* for this species in 1964 with the following characters: Abdominal legs II-III with two setae, the apical one more than half the length of the subapical. Canal of maxillary gland with long and slender calyx. On the foretarsus t 1 claviform, t 3 bacilliform. The latter expression was amplified in the species description as being «of a uniform breadth, not broadened into a leaf-like or lanceolate or bud-like shape». «Bacilliform» was the word used by Condé and I did not use it elsewhere in my book of 1964.

In 1970 Condé & Nosek reported many specimens of this species, one maturus junior and 27 ♀ from different localities on Madeira. In his book of 1973, however, Nosek gave a description and drawings of a specimen which he on the slide called «lectotype» of *Maderentulus maderensis,* and simultaneously he changed the diagnosis of *Maderentulus* to: «Acerentomids with 3 setae on abdominal legs II-III ... t 3 long willow-leaf shaped». Since it is without meaning to make a lectotype when the holotype is known and to essentially change the diagnosis, I borrowed, through the kindness of Dr. Hauser, Genève, the «lectotype» slide and other slides called *Maderentulus.*

The reexamination revealed that all these slides (as well as one presented earlier to me by Dr. Nosek) in fact belonged to *Maderentulus* with the exception of the «lectotype», which is a ♀ of *Acerentulus ladeiroi* da Cunha, 1950. The redescription by Nosek is thus based on a misidentification and another will be given below based on a neotype ♀ since the holotype larva II was destroyed by accident.

Length of body extended (Fig. 1) 450 μm, of foretarsus without claw 46 μm.

Mouthparts of the common shape; palps of maxillae with tuft and two sensillae, labial palp with tuft, three setae and a sausage-shaped sensilla (Figs. 3-4). Canal of maxillary gland with oval-heart-shaped

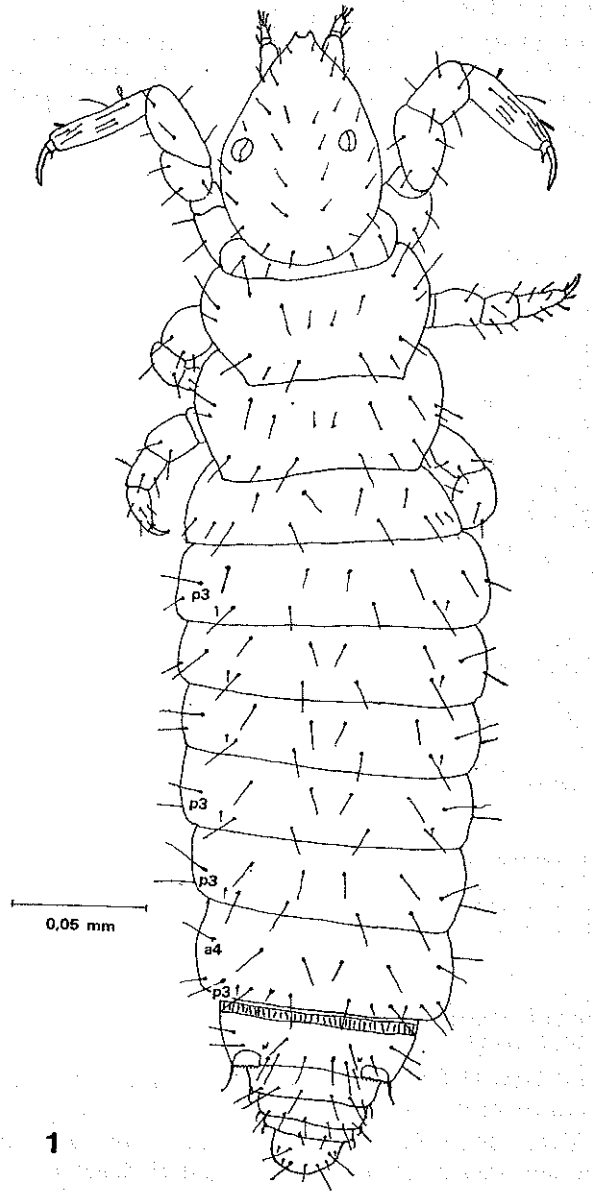



Fig. 1 **Maderentulus maderensis** (Cdé.), dorsal view

calyx and a dilatation distal to this; proximal part fairly short (Fig. 5). Pseudoculus circular, PR=12.5 (Fig. 6).

Foretarsus (Fig. 2) with all sensillae present, t 1 claviform, t 2 long, setiform, t 3 «bacilliform», i.e., long, with parallel sides and blunt apex. Sensilla a very long, b shorter than c, d very long, b-c-d in a row behind t 2. Sensilla f closer to e than to g, longer than both. On the in-

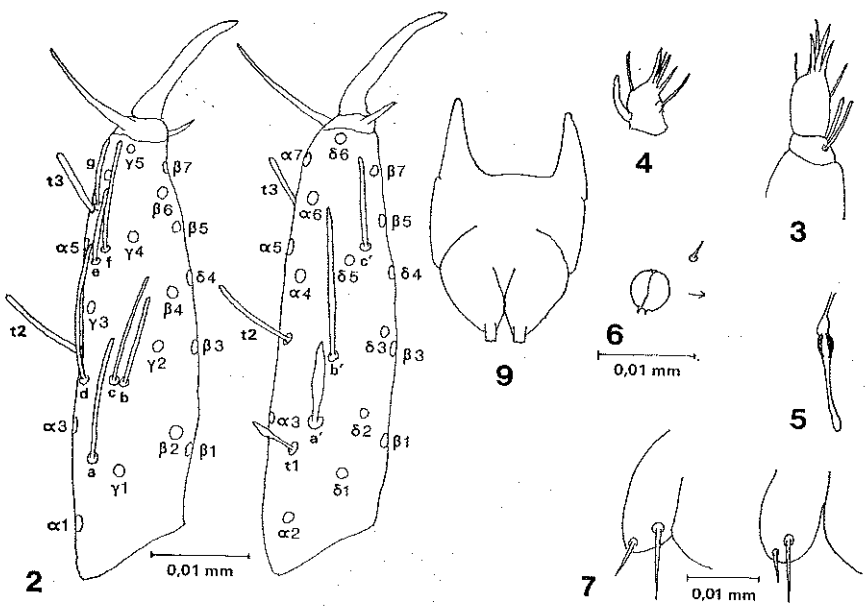



Fig. 2-7, 9: **Maderentulus maderensis** (Cdé.). Foretarsus in exterior (left) and interior views. — 3: Maxillary palp. — 4: Labial palp. — 5: Canal of maxillary gland. — 6: Pseudoculus. The arrow points laterad. — 7: Abdominal legs II (right) and III. — 9: Female squama genitalis.

terior side a' broad, sword-like, b' very long, c' almost reaching base of claw. BS=0.4. EU=0.15. TR=3.0.

Abdominal legs II-III (Fig. 7) with two setae, the apical one more than half the length of the subapical.

Tergite VIII (Fig. 8) with fully developed «striate band» and comb VIII with ten small teeth. In the original description of the holotype larva II it was given as «5 short and dispersed teeth»; whether this is right cannot now be checked on the holotype; it does not apply to the only specimen of a larva II I have before me.

Chaetotaxy: Metanotum with setae a 2, a 4 and M.

| | I | II-III | IV-VI | VII | VIII | IX-X | XI | Telson |
|---|---|---|---|---|---|---|---|---|
| terg. | 6/10 | 6/14 | 6/14 | 8/16 | 6/16 | 12 | 6 | 9 |
| stern. | 3/2 | 3/5 | 3/8 | 3/8 | 4/2 | 4 | 6 | 6 |

a 1, 2, 5 present on terg. I-VI (p 3 situated more or less in the anterior row), a 1, 2, 4, 5 on terg. VII. - p l' is missing on terg. I-VI, p 4' present on terg. II-VII. - Stern. VIII with four anterior and two posterior setae (Fig. 8); this was wrongly stated in Tuxen 1981: 137.

Female squama genitalis (Fig. 9) is very difficult to follow in all slides, but it seems that acrostylus is blunt and tripartite.

Holotype: A larva II from Caldeirão Verde near Queimadas, Aug. 1956 (see Tuxen 1964: 227). Now lost!

Neotype: ♀ from Portela 3 km south of Porto da Cruz, 600 m alt., moist soil under Ulex-bush, Oct. 6, 1972. Hüther leg. In the collection of prof. Condé, Naney.

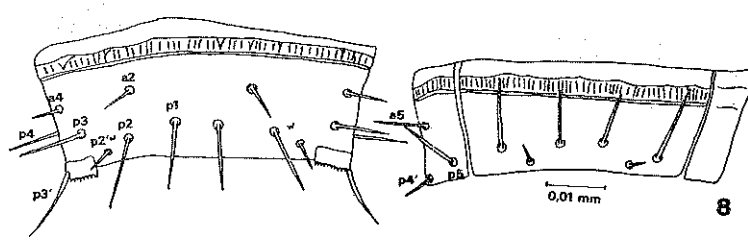



Fig. 8: **Maderentulus maderensis** (Cdé.). Abdominal segment VIII in dorsal and ventral views.

Occurrence on Madeira: Caldeirão Verde (the lost holotype). - Terreiro da Luta; Casa das Queimadas; Ribeira das Cales; Encumeada; all these localities are in a northern direction from Funchal, at altitudes from 800 to 1200 m. Material collected by Brinck and Dahl, April 20-28, 1957, and cited in Condé & Nosek, 1970. I have checked 15 of the 27 specimens recorded. - Passo do Poiso, 8 km north of Funchal, and Portela, south of Porto da Cruz, at 600 to 1415 m altitude. Collected by Hüther Oct. 4-6, 1972. - Caniço 6 km east of Funchal, 400 m, Hüther leg. Sept. 29, 1972. All specimens are immature or females.

The specimens were found under stones in ravines (Brinck and Dahl) or in samples from grassland or under bushes, 0-5 cm depth and humid (Hüther).

Distribution: Only known from Madeira.

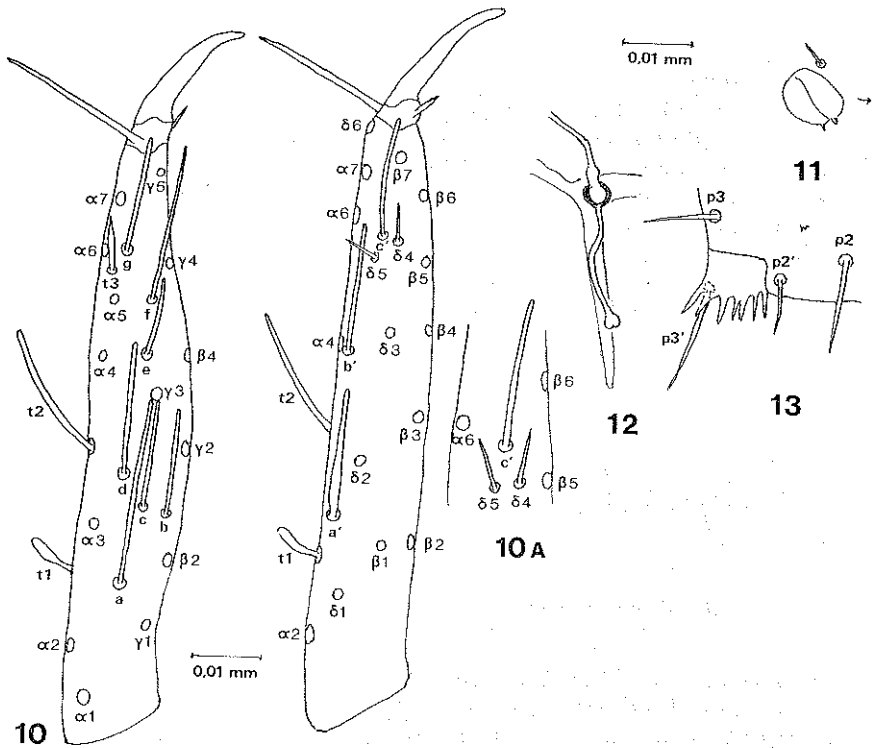
2. **Acerentulus confinis** Berl., 1908, subspecies **maderensis** n. subsp.

(Figs. 10-13, 25B)

Five specimens definitely belong to *Ac. confinis* Berl., but differ in some few points, so I shall describe them shortly.

Length of body 850 $\mu$m, of foretarsus without claw 98 $\mu$m.

Pseudoculus (Fig. 11) oval. PR = 13. Canal of maxillary gland with big, heart-shaped calyx; proximal part shorter than proximal branch of fulcrum, proximally broadly bipartite (Fig. 12).




Figs. 10-13: **Acerentulus confinis** Berl. subsp. **maderensis** n. subsp. Fig. 10: Foretarsus in exterior (left) and interior views. — 10 A: The position of $\delta$ 4, $\delta$ 5 and c' in a specimen of the main form from Yugoslavia. — 11: Pseudoculus. The arrow points laterad. — 12: Canal of maxillary gland. — 13: Comb of terg. VIII.

Foretarsus (Fig. 10) as in the main form, t 1 claviform, t 3 lanceolate resembling fig. 57 in Nosek 1973. Sensilla a reaching $\gamma$ 3; b as long as c; d surpassing e; f and g surpassing base of claw. Seta $\delta$ 4 and $\delta$ 5 very close to c' - contrary to the main form, see Fig. 10 A. BS = 0.4. TR = 4.0.

Comb VIII (Fig. 13) with about 10 fairly long teeth.
Chaetotaxy:

| | I | II-III | IV-V | VI | VII | VIII | IX-X | XI | Telson |
|---|---|---|---|---|---|---|---|---|---|
| terg. | 6/10 | 6/14 | 6/14 | 8/14 | 6/18 | 6/16 | 12 | 6 | 9 |
| stern. | 3/4 | 3/5 | 3/8 | 3/8 | 3/8 | 4/2 | 4 | 6 | 6 |

p 1' missing on terg. I-VI; p 3 present on terg. II-VII, situated far anteriorly on the first segments; p 3' present on terg. VII, p 4' on terg. II-VII. - Terg. II-V with a 1, 2, 5; terg. VI with a 1, 2, 4, 5; terg. VII with a 2, 4, 5.

The absence of a 1 on terg. VII is a difference from the main form; the seta is absent in all five specimens, and in his list of variability in this species Nosek (1973: 175) does not mention the absence of a 1 on terg. VII although he seems to have examined an enormous material from all of Europe and North Africa.

Holotype: ♀ from Funchal, Ponta da Cruz, below Opuntia, Oct. 3, 1972. Hüther leg. In Zoological Museum, Copenhagen.

Further material: 4 ♀ from the same locality and date, Hüther leg. All in one slide.

Remarks: The subspecies differs from the main form in the absence of a 1 on terg. VII and probably in the closely set position of δ 4, δ 5 and c'. These differences are too small, however, to justify a new species.

Distribution of the main form: All Europe and North Africa (Nosek 1973: 177-179) as well as Michigan (Bernard 1975: 176).

### 3. **Acerentulus cunhai** Condé, 1950.

(Figs. 14-16, 25C).

The species belongs to the *cunhai*-group of Nosek (1973: 174); I shall give a short description and some drawings of the Madeira specimens.

Length of body 1200 μm, of foretarsus without claw 98 μm.

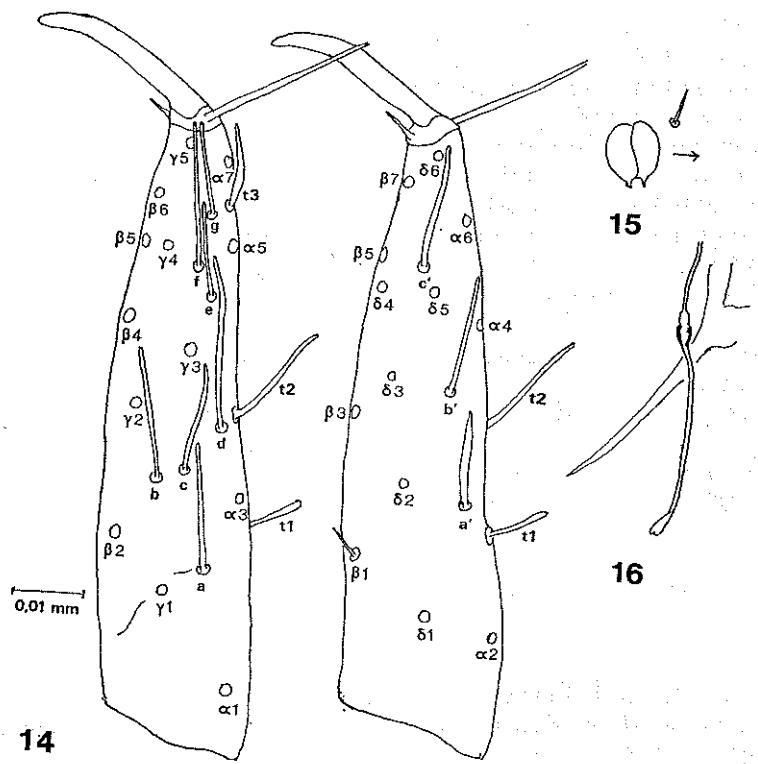
Pseudoculus oval, longer than broad (Fig. 15), PR=14. Canal of maxillary gland with narrow calyx and very long proximal part, surpassing even the proximal part of fulcrum (Fig. 16).

Foretarsus (Fig. 14). Sensillae as drawn by Nosek 1973; t 1 with very slender club. BS=0.5. TR=3.3.

Chaetotaxy:

| | I | II-III | IV-VI | VII | VIII | IX-X | XI | Telson |
|---|---|---|---|---|---|---|---|---|
| terg. | 6/10 | 6/14 | 6/14 | 8/18 | 6/16 | 12 | 6 | 9 |
| stern. | 3/4 | 3/5 | 3/8 | 3/8 | 4/2 | 4 | 6 | 6 |

p 1' missing on terg. I-VI; p 3 present on terg. II-VII, situated far anteriorly on the first segments; p 3' present on terg. VII, p 4' on terg. II-VII. - Terg. II-VI with a 1, 2, 5; terg. VII with a 1, 2, 4, 5.




Figs. 14-16: **Acerentulus cunhai** Cdé. Fig. 14: Foretarsus in exterior (left) and interior views. — 15: Pseudoculus. The arrow points laterad. — 16: Canal of maxillary gland.

Occurrence on Madeira: Monte north of Funchal, in moss and liverwort near a brook, Dec. 27, 1963, 6 ♀, Marie Hammer leg. - Caniço

east of Funchal, in dry grassland under stones, Sept. 29, 1972, 1 ♀, 1 mat. jun. and 4 larvae II, Hüther leg. - East of Caniçal, near eastern point of Madeira, under a stone on desert-like land, Sept. 30, 1972, 1 mat. jun. Hüther leg.

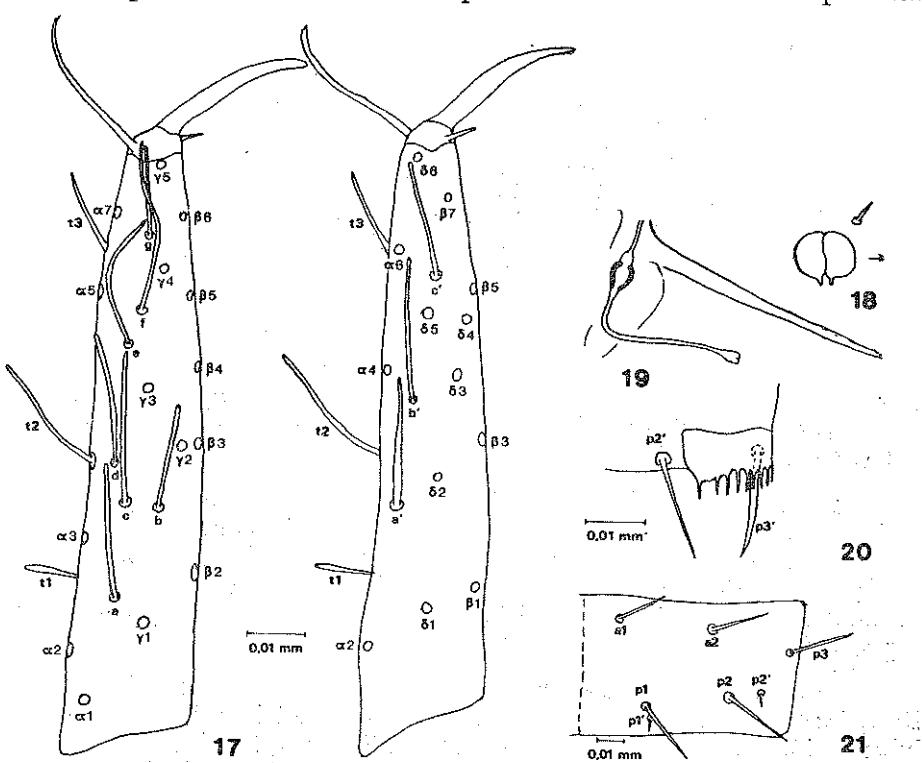
Distribution: Portugal, Mallorca, France, Ireland, Sweden (Nosek 1973: 203).

The species is easily recognizable among Madeiran acerentomids by the very long proximal part of the canal of maxillary gland.

## 4. **Acerentulus ladeiroi** da Cunha, 1950

(Figs. 17-21, 25D).

This species also belongs to the *cunhai*-group; I shall give a short description of the Madeiran specimens since it was a specimen




Figs. 17-21: **Acerentulus ladeiroi** da Cunha. Fig. 17: Foretarsus in exterior (left) and interior views. — 18: Pseudoculus. The arrow points laterad. — 19: Canal of maxillary gland. — 20: Comb of terg. VIII. — 21: Right half of terg. V.

of this species which Nosek mistook for *Maderentulus* (1973: 217, see also 212).

Length of body 800-900 μm, of foretarsus without claw 75-84 μm. Curiously enough the specimen drawn here proved to have an extremely long foretarsus, 116 μm, though the length of the body, contracted, was only 910 μm. This must be an individual variation; the relative length and position of the sensillae did not differ from that of the other specimens.

Pseudoculus as broad as long (Fig. 18), PR=13. Canal of maxillary gland with fairly big calyx and long proximal part though not exceeding proximal part of fulcrum (Fig. 19).

Foretarsus (Fig. 17) with sensillae as drawn by Nosek (1973: 213); t 1 with very slender club. BS=0.5 TR=3.8.

Comb of tergite VIII with about ten fairly long teeth (Fig. 20).

Chaetotaxy:

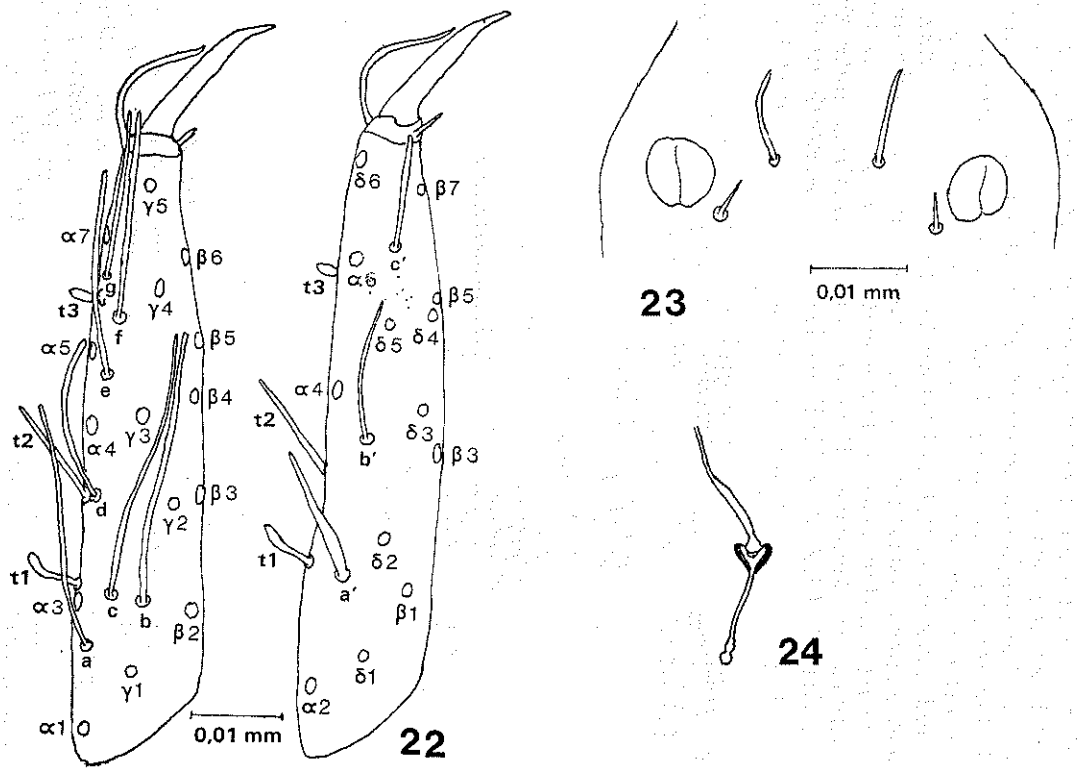
| | I | II-III | IV-V | VI | VII | VIII | IX-X | XI | Telson |
|---|---|---|---|---|---|---|---|---|---|
| terg. | 6/12 | 6/16 | 6/16 | 8/16 | 8/18 | 6/16 | 12 | 6 | 9 |
| stern. | 3/4 | 3/5 | 3/8 | 3/8 | 3/8 | 4/2 | 4 | 6 | 6 |

p 1' present on terg. I-VII (see below); p 3' present on terg. VII; p 4' on terg. II-VII. - p 3 is present on terg. II-VII, but situated far anteriorly on the first segments. - Terg. II-V with a 1, 2, 5; terg. VI-VII with a 1, 2, 4, 5.

The position of p 1' on terg. I-VI is interesting (Fig. 21), viz. quite close and a little distal to p 1. I have not realized this character before; an examination showed it to be present also in *Ac. gerezianus* da Cunha, in *tolosanus* Nosek even on terg. VII, and possibly also in *catalanus* Cdé., i.e. in all species of Nosek's «*cunhai*-group» where p 1' is present.

Occurrence on Madeira: Ribeira das Cales, 1200 m alt., April 26, 1957, Brinck and Dahl leg., the specimen called lectotype of *Maderentulus* by Nosek. - Passo do Poiso north of Funchal, 1415 m alt., grassland, wet soil, Oct. 4, 1972, 1 ♀. — Caniço east of Funchal, dry grassland, Sept. 29, 1972, 9 ♀. Hüther leg. in both localities.

Distribution: Portugal and Spain (Nosek 1973: 212).




Figs. 22-24: **Gracilentulus gracilis** (Berl.). Fig. 22: Foretarsus in exterior (left) and interior views. — 23: Pseudoculi with adjacent setae. — 24: Canal of Maxillary gland.

## 5. **Gracilentulus gracilis** (Berlese, 1908)

(Figs. 22-24, 25E)

I give drawings of the foretarsus and the canal of maxillary gland as well as the position of pseudoculi (Figs. 22-24) to facilitate identification. The specimens agree exactly with the description (Tuxen 1964: 296) but for the chaetotaxy of terg. VII: there is always a central seta in the anterior row and sometimes a 2 is missing. The central seta was reported also by Condé (1945-1955), myself (1964) and Nosek (1973) as a varying character; it is, however, characteristic of all 24 adult specimens (all females) of the species found on Madeira.

Ocurrence on Madeira: Funchal, Ponta da Cruz, near the sea, humid soil, Oct. 7, 1972, 9 ♀, Hüther leg. - Monte north of Funchal,

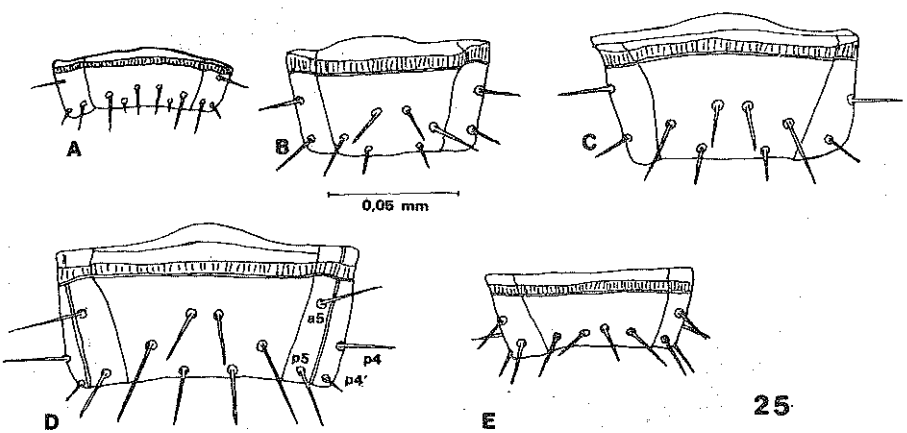



Fig. 25: Sternum VIII of A: **Maderentulus maderensis** (Cdé.). — B: **Acerentulus confinis** Berl. subsp. **maderensis** n. subsp. — C: **Acerentulus cunhai** Cdé. — D: **Acerentulus ladeiroi** da Cunha. — E: **Gracilentulus gracilis** (Berl.).

in Selaginella, moss and liverwort near a brook, Dec. 27, 1963, 1 ♀ and 1 mat. jun., Marie Hammer leg. - Terreiro da Luta, 5 km north of Funchal, 900 m alt., Dec. 27, 1963, Marie Hammer leg., and Sept. 28, 1972, Hüther leg., in all 5 ♀, 1 mat. jun. and 1 larva II. - Câmara de Lobos west of Funchal, on slope near the sea, Jan. 1, 1964, 1 larva II and 1 larva I, Marie Hammer leg. - Santo da Serra, 740 m alt., in a garden, Jan. 2, 1964, Marie Hammer leg., 7 ♀, 2 mat. jun.

Distribution: Europe and Mediterranean Africa (Nosek 1973: 220-223). Besides mentioned from South Africa, which is correct (Tuxen 1977: 177) and Australia (Tuxen 1967: 34) which, however, is due to a misidentification (Tuxen, unpublished).

The five species of Acerentomidae may also be distinguished by the chaetotaxy of sternite VIII, see Fig. 25 A-E.

## b. Protentomidae.

### 6. **Protentomon barandiarani** Condé, 1947

Syn. **Protentomon maderense** Condé & Nosek, 1970.

Only two specimens of this species have been found on Madeira; they were described as *maderensis* (should be *maderense* since *Protentomon* is neuter) n. sp. distinguished from *barandiarani* Cdé. « in the form of pseudoculus, PR, extremely broad sensilla a and in body size» (Condé & Nosek, 1970: 50). I have examined both the holotype and the paratype and cannot agree with the distinction for the following reasons:

1. In fig. 26 I give drawings of the pseudoculus of the holotype of *maderense* and of a specimen from the type material of *barandiarani;* the difference in shape is negligible.

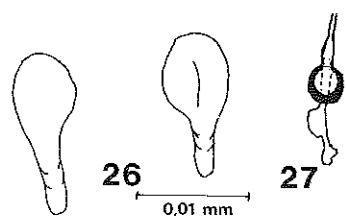



Fig. 26: Pseudoculus of **Protentomon barandiarani** Cdé. (left) and the holotype of **P. maderense** Cdé. & Nos. — 27: Canal of maxillary gland of the holotype of **P. maderense** Cdé. & Nos.

2. PR in the said specimen of *barandiarani* is 8.0 as in the holotype of *maderense:* it was stated as 10 in Tuxen 1964: 190, so it seems to be slightly variable.

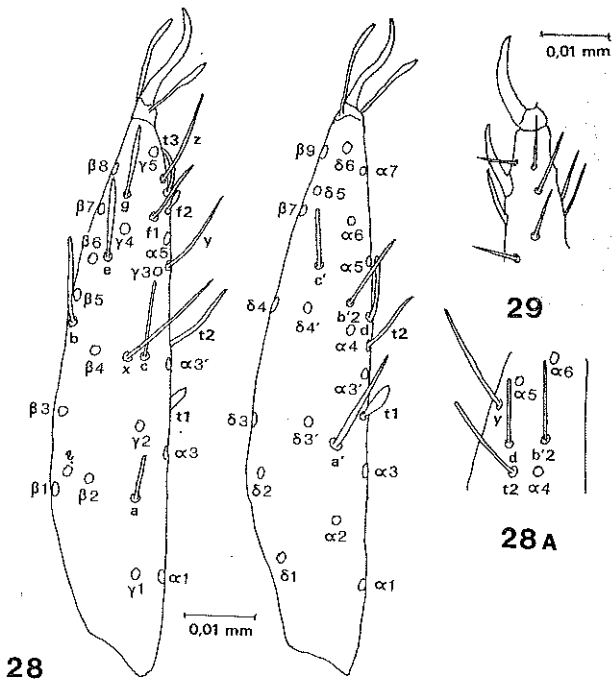
3. Sensilla a is slightly broader than the other sensillae in *barandiarani;* that it is «extremely broad» I cannot see on the drawings of *maderense* nor on the holotype.

4. Body length 500-560 μm in *maderense,* 660-700 μm in *barandiarani;* length of the foretarsus without claw is 28 μm in *maderense,* 32 μm in *barandiarani;* the difference is not outside the possibility of variation.

A difference not mentioned is that sensilla c is level with b in *maderense,* anterior to b in *barandiarani;* whether this difference is

important must be shown by future findings. - In Fig. 27 I give a drawing of the canal of maxillary gland of the holotype of *maderense* to show the structure typical of Protentominae and Condeellinae (see Tuxen & Yin 1982).

Ocurrence on Madeira (holotype and paratype of *maderense*): Casa das Queimadas, 880 m alt., July 24, 1957, Brinck and Dahl leg. In Muséum d'Hist. Nat. Genève.




Figs. 28-29: **Eosentomon noseki** n. sp. Holotype. Fig. 28: Foretarsus in exterior (left) and interior views. — 28 A: The position of sensillae t 2, d, and b' 2 on the other foretarsus. — 29: Hind tarsus.

Distribution: France (Pays Basque, type locality, and England (Nosek 1973: 164).

## c. Eosentomidae

Condé & Nosek, 1970 recorded the following specimens of Eosentomidae from Madeira: *E. forsslundi* Ion., one specimen, and *E.* sp., three specimens. Only one of these can now be found, it is indeterminable, the other specimens are lost. *E. forsslundi* Ion. is a synonym of *E.*

*germanicum* Prell, but this species is not present in the material I have seen and the identification cannot be checked.

## 7. **Eosentomon mixtum** Condé, 1945.

(Figs. 30, 31)

The specimens from Madeira agree exactly with the description in Tuxen 1964: 126-127, so only the important chaetotaxical characters of terg. VII and the female squama genitalis are figured in connection with the new species *noseki* (Figs. 30C, 31C).

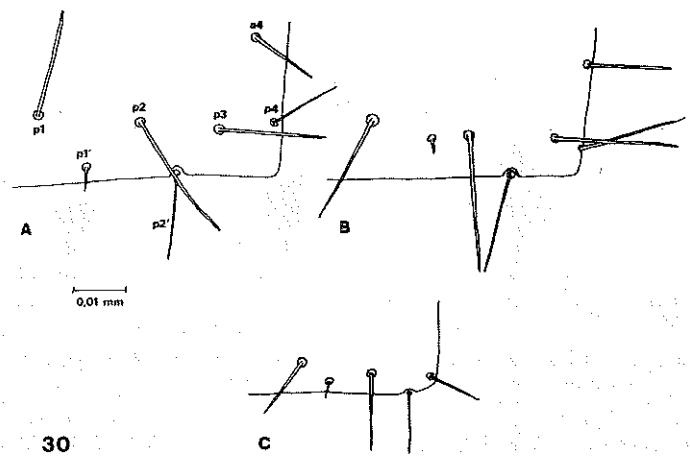



Fig. 30: Right hind part of tergite VII of **Eosentomon noseki** n. sp. (A), **delicatum** Gisin (B) and **mixtum** Cdé. (C).

Occurrence on Madeira: Between Terreiro da Luta and Passo do Poiso, north of Funchal, 970 m alt., very moist soil in forest of cypress and pine, 1 ♂, 2 ♀, Oct. 4, 1972. Hüther leg. Found together with *E. delicatum* Gisin.

Distribution: Central Europe from France to Austria (Nosek 1973: 114-115).

Remarks: Seta p 1' on terg. VII far behind p 1, near the posterior border of the tergite.

## 8. **Eosentomon delicatum** Gisin, 1945.

(Figs. 30, 31).

Also for this species the Madeiran specimens agree exactly with the description in Tuxen 1964: 130-132, so only the chaetotaxical character of terg. VII and the female squama genitalis are figured (Figs. 30B, 31B).

Occurrence on Madeira: Between Terreiro da Luta and Passo do Poiso, north of Funchal, 970 m alt., very moist soil in forest of cypress and pine, 11 ♂, 8 ♀, 2 mat. jun., 1 larva II, Oct. 4, 1972 together with E. *mixtum* Cdé. Hüther leg. - Passo do Poiso, 1415 m alt., moist soil in grassland, Oct. 4, 1972. 1 ♀. Hüther leg.

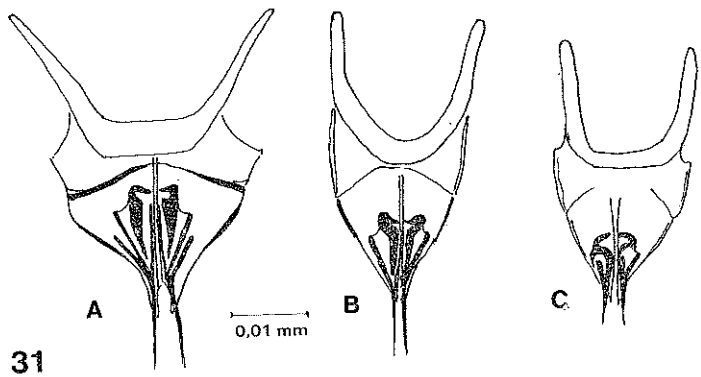



Fig. 31: Female squama genitalis of **Eosentomon noseki** n. sp. (A), **delicatum** Gisin (B) and **mixtum** Cdé. (C).

Distribution. All Europe north to southern Norway, southern Sweden and Iceland (Lindroth et al., 1973: 103), east to Yugoslavia and Greece, south to the Mediterranean incl. North Africa, and west to Spain (Nosek 1973: 122-124). The new species *noseki* described here may be present in this material.

Remarks: Seta p 1' on terg. VII close to p 2 and in a row with p 1-2.

## 9. **Eosentomon noseki** n. sp.

(Figs. 28-31).

Length of body 750 µm, of foretarsus without claw 94 µm.

Mouthparts as in *delicatum* Gisin. Labral setae present. Clypeal apodeme distinct. Pseudoculus fairly big, PR = 7.5.

Foretarsus (Fig. 28) like that of *delicatum* in which the most important character is the position of a fairly long sensilla c' behind both δ 5 and α 6. All sensillae present, c reaching γ 3, slightly longer than d; e and g spatulate, but slender, f 1 long. t 1 between α 3 and α 3': BS=1.0. Sensilla s and empodium with broadened apex, EU=0.9. TR=5.5.

Tarsus of middle and hind leg with a very small empodium, about one fifth of the claw (Fig. 29).

Praecosta indistinct.

Chaetotaxy: On metanotum p 1' very long, behind the line p 1-2. On abdomen exactly as in *delicatum,* but for the posterior row of terg. VII.

| | I | II-III | IV-V | VI | VII | VIII | IX-X | XI | Telson |
|---|---|---|---|---|---|---|---|---|---|
| terg. | 4/10 | 10/14 | 10/16 | 8/16 | 4/16 | 6/9 | 8 | 8 | 9 |
| stern. | 4/4 | 6/4 | 6/10 | 6/10 | 6/10 | 7 | 4 | 8 | 12 |

a 3 missing on terg. VI, a 1-3 on terg. VII. - p 1' surpassing p 1 on terg. I-VI; p 4' missing on terg. II-III, present on IV-VII.

The position of p 1, 1', 2, 2' on terg. VII is important (Fig. 30 A); p 1' is about one third the length of p 2' and in line with this, though not in a special cavity on the hind margin of the tergite; p 1 and p 2 are on a line far anterior to p 1' and 2'.

The female squama genitalis (Fig. 31 A) differs from that of *delicatum* in that the caput processus sternalis is longer and more slender, its proximal part not so elegantly bent. Distinct median sclerotizations of stylus; filum very long.

Holotype: ♀ from Terreiro da Luta, 3.5 - 5 km north of Funchal, 700 m alt., Oct. 4, 1972. W. Hüther leg. In Zoological Museum, Copenhagen.

Further material: 1 ♂, 3 ♀ same locality and date, moist soil, in Robinia forest. - Between Terreiro da Luta and Passo do Poiso, 970 m, Oct. 4, 1972, in open forest of pine and cypress, moist soil, 2 ♂, 1 ♀, Hüther leg.

Remarks: This species is closely related to *E. delicatum* Gisin; within the *transitorium*-group, at least, they are the only species with long sensilla c' placed behind δ 5. It is smaller than *delicatum* (though the body length of this species stated in Tuxen 1964 is too high), the pseudoculus is bigger (PR=7.5 against 12-13 in *delicatum),* the female squama genitalis is different, with longer caput processus bent more squarely inwards (Fig. 31 B), and p 1' on terg. VII is placed close to

the posterior border of the tergite as opposed to quite near to p 2 in *delicatum* (Fig. 30 B).

The last character has not been noticed earlier, so the new species may have been confused with *delicatum* in earlier papers. At least Nosek (1973: 121) gives a picture of «*delicatum*» from Vienna, Austria, in which the chaetotaxy of terg. VII is drawn as here for *noseki;* he does not mention the problem in the text. It may be, however, that the character is variable.

## II. KEY TO THE PROTURAN SPECIES OF MADEIRA

1. With spiracles on meso- and metathorax and three abdominal legs with terminal vesicle (Eosentomoidea) ... ... ... ... 2
— Without spiracles and at least abdominal leg III without terminal vesicle (Acerentomoidea) ... ... ... ... ... ... ... ... ... 4
2. Stern. IX and X with six setae; c' level with $\alpha$ 6 and $\delta$ 5 ... ... ... ... ... ... ... ... ... ... ... *Eosentomon mixtum*
— Stern. IX and X with four setae; c' far behind $\alpha$ 6 and $\delta$ 5 ... 3
3. p 1' on terg. VII level with p 1 - 2; caput processus sternalis curved against the middle line ... ... *Eosentomon delicatum*
— p 1' on terg. VII far behind p 1 - 2, close to hind border of tergite; caput processus sternalis bent sharply against middle line ... ... ... ... ... ... ... *Eosentomon noseki* n. sp.
4. Abd. legs I-II with terminal vesicle (Protentomidae) ... ... ... ... ... ... ... ... ... ... ... *Protentomon barandiarani*
— Only abd. leg I with terminal vesicle (Acerentomidae) ... ... 5
5. Abd. legs II-III with three setae; labial palp with tuft ... ... 6
— Abd. legs II-III with only two setae ... ... ... ... ... ... 8
6. Sensilla a on foretarsus long, reaching to $\gamma$ 3; canal of maxillary gland only half the length of proximal branch of fulcrum; p 1' missing on terg. I-VI ... ... ... ... ... ... ... ... ... ... ... ... ... ... *Acerentulus confinis* subsp. *maderensis* n. subsp.
— Sensilla a on foretarsus short, only reaching to d; canal of maxillary gland very long, reaching or surpassing tip of proximal branch of fulcrum ... ... ... ... ... ... ... ... ... 7
7. p 1' present on terg. I-VI, extremely close to p 1 ... ... ... ... ... ... ... ... ... ... ... ... ... *Acerentulus ladeiroi*
— p 1' missing on terg. I-VI ... ... ... ... *Acerentulus cunhai*

8. Labial palp with tuft; abd. legs II-III with a long subapical and a shorter lateral apical seta; stern. VIII with two posterior setae ... ... ... ... ... ... ... *Maderentulus maderensis*

— Labial palp reduced; abd. legs II-III with a long subapical and a short median apical seta; stern. VIII without posterior setae ... ... ... ... ... ... ... ... ... ... ... *Gracilentulus gracilis*

## III. CONCLUDING REMARKS

Madeira is a volcanic island in the Atlantic and has never been part of a continent. Its fauna of Protura thus must have been introduced somehow, and its origin is decidedly European. Two species and a subspecies are endemic, viz. the following:

*Maderentulus maderensis* (Cdé.), closely related to the genus *Acerentulus* which is mainly European, but with species also in the Pacific, Australia, Japan, Thailand and U. S. A. (Michigan).

*Acerentulus confinis* Berl. subsp. *maderensis* n. subsp., differing only in one or two small characters from the main form which is European and Mediterranean.

*Eosentomon noseki* n. sp., being closely related to *delicatum* Gisin, known from almost the whole of Europe and the Mediterranean.

Of the six remaining species *Acerentulus cunhai* Cdé. and *laderoi* da Cunha are known from Portugal and Spain; *Gracilentulus gracilis* (Berl.) from Portugal, but also from the rest of Europe, the Mediterranean and even South Africa; *Eosentomon delicatum* Gisin from the whole of Europe and the Mediterranean, but not from Portugal; *E. mixtum* Cdé. only from France and Central Europe; and *Protentomon barandiarani* Cdé. from France and England.

It may thus be concluded that the Madeiran fauna of Protura has come from Europe, probably mostly from Portugal, and probably in fairly recent time (maybe brought with soil by man). The endemic species and subspecies differ very little from European forms, and even the endemic genus *Maderentulus* has not developed very important characters compared with the European fauna.

The distribution within Madeira. All the localities on Madeira where Protura have been found (and probably sought for) lie on the eastern part of the island, from Câmara de Lobos west of Funchal to the easternmost cape, and from Funchal in the South to Casa das Queimadas in the North. Protura have been found from a slope quite near the sea (Câmara de Lobos) to an altitude of 1415 m, and under stones or in the uppermost 5 cm of the soil. Mostly in wet or humid soil, but also in quite desert soil (Caniçal). Apart from the last mentioned one, the biotopes offer no peculiarities.

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