TWO NEW MITES OF THE RARE FAMILIES BARBUTIIDAE AND LINOTETRANIDAE (ACARI), FROM THE NAMIB DESERT

BY Henri M. ANDRÉ *

ACARI
NAMIB DESERT
NAMIBIA
SOIL

SUMMARY : Two new actinedid mites are described from the gravel plain of the Namib desert : *Namibarbutia seelyae* n. gen., n. sp. (Barbutiidae) and *Linotetranus mirabebensis* n. sp. (Linotetranidae). The definitions of the genus *Barbutia* and the family Barbutiidae are modified accordingly. Identification keys are provided for both families. The high value of the ratio length-width of the new species is related to habitat.

ACARIENS
DÉSERT DU NAMIB
NAMIBIE
SOL

RÉSUMÉ : Deux nouveaux acariens Actinedida sont décrits de la plaine à gravier du désert du Namib : *Namibarbutia seelyae* n. gen., n. sp. (Barbutiidae) ainsi que *Linotetranus mirabebensis* n. sp. (Linotetranidae). Les définitions du genre *Barbutia* et de la famille des Barbutiidae sont modifiées en conséquence. Une clé d'identification des espèces de chaque famille est donnée. La valeur élevée du rapport longueur-largeur des nouvelles espèces est liée à l'habitat.

INTRODUCTION

Although the peculiarity of the soil fauna of the Namib desert was stressed as early as 1977 by COINEAU and MASSOUD, and again outlined by COINEAU and SEELY (1983), only a few mite species have been described from the Namib soils, *Microcaeculus namibensis* Piffl, 1965, *Namibacarus sabulosus* Fain *et al.* 1993, and *Neoteneriffiola coineaui* Judson, 1994. The two actinedid mites are surface-dwellers and only the acaridid *Namibacarus sabulosus* belongs to the interstitial fauna outlined by Y. COINEAU.

During a recent survey of the soil microfauna of the Namib desert (ANDRÉ, NOTI & JACOBSON, in prep.), two new mites belonging to the rare families Linotetranidae and Barbutiidae were collected. The family Linotetranidae, created by BAKER & PRITCHARD (1953), is monogeneric and comprises only three species, *Linotetranus cylindricus* Berlese, 1910, *L. achrous* Baker & Pritchard, 1953 and *L. protractulus* Athias-Henriot, 1961. The new species is therefore the fourth of the genus.

The family Barbutiidae is also monogeneric and was created by ROBAUX (1975). So far Barbutiidae have comprised only two species, *Barbutia anguineus* (Berlese, 1910) and *B. perretae* Robaux, 1975. As the chaetotaxy of the new species collected in the Namib desert differs greatly from that of *Barbutia*, a second genus is created and the family definition is modified to accommodate it.

The holotypes are deposited in the Musée royal de l'Afrique centrale, Tervuren.

BARBUTIIDAE

The genus *Barbutia* was proposed by OUDEMANS (1927) to accommodate *Stigmaeus anguineus* Berlese, 1910. It was later redefined by SUMMERS (1964)

* Musée royal de l'Afrique centrale, U.R. faune du sol, B-3080 Tervuren, Belgium.

Acarologia, t. XXXVII, fasc. 2, 1996.

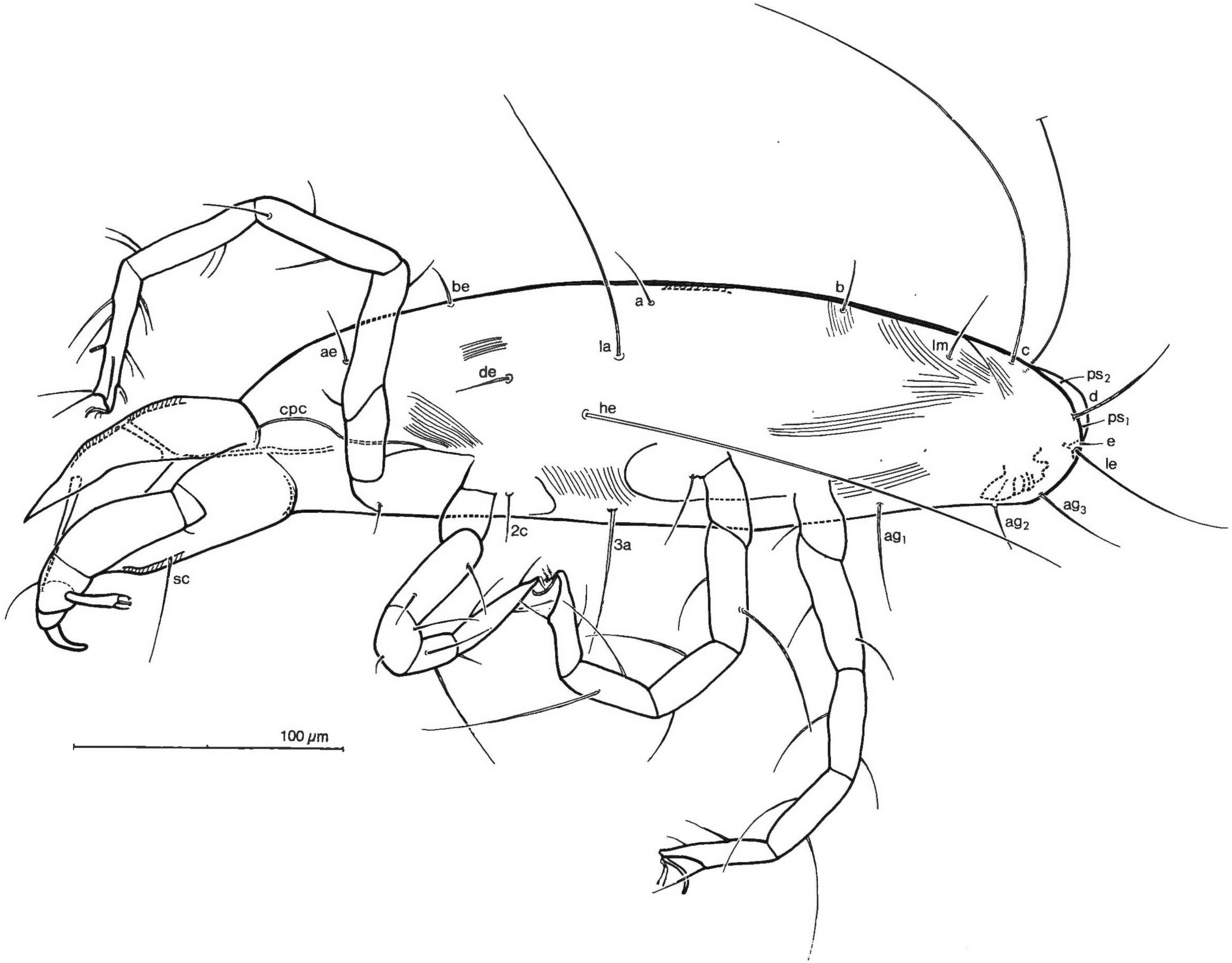

FIG. 1 : *Namibarbutia seelyae* n. sp.
Lateral view. Leg chaetotaxy incomplete. Setal nomenclature follows GRANDJEAN (1944). Equivalences with other authors are given in table 1 (p. 104).

and ROBAUX (1975). The latter described the second species of the genus, *Barbutia perretae* and created the new family Barbutiidae to accommodate these two species.

Using KETHLEY'S (1990) or KRANTZ'S (1978) keys to identify the new mite, I keyed out Barbutiidae in both cases. However, the new species does not conform to either the family description given by ROBAUX (1975), or the generic definition of the genus *Barbutia*. Consequently, I propose the creation of a new genus, *Namibarbutia*, and enlarge the family definition in such a way as to accommodate this genus.

Barbutiidae Robaux, 1975

Very small and elongate mites. Chelicerae fused together along basal halves. Dorsal neostigma on stylophore, with short peritremata. Palpal thumb-claw process present. Idiosoma without obvious plate. Three to four pairs of setae on prodorsum. Opisthosoma with nine pairs of dorsal setae. Anal aperture subterminal. Genital and anal apertures proximate but distinct. Coxae I and II well separated from coxae III and IV. Empodia with two pairs of capitate raylets.

Barbutia Oudemans, 1927

Four pairs of prodorsal setae. Two pairs of eyes. Anal aperture subterminal and ventral. Legs relatively short. Genua II, III and IV nude. Claws with two pairs of tenent hairs.

Namibarbutia n. gen.

Type species : *Namibarbutia seelyae* n. sp.

Derivatio nominis : The name results from the merging of Namib, the desert where the genus was first found, and *Barbutia*.

Three pairs of prodorsal setae. No eyes. Anal aperture subterminal and dorsal. Legs relatively long. Claws simple. Empodium with two pairs of two capitate raylets.

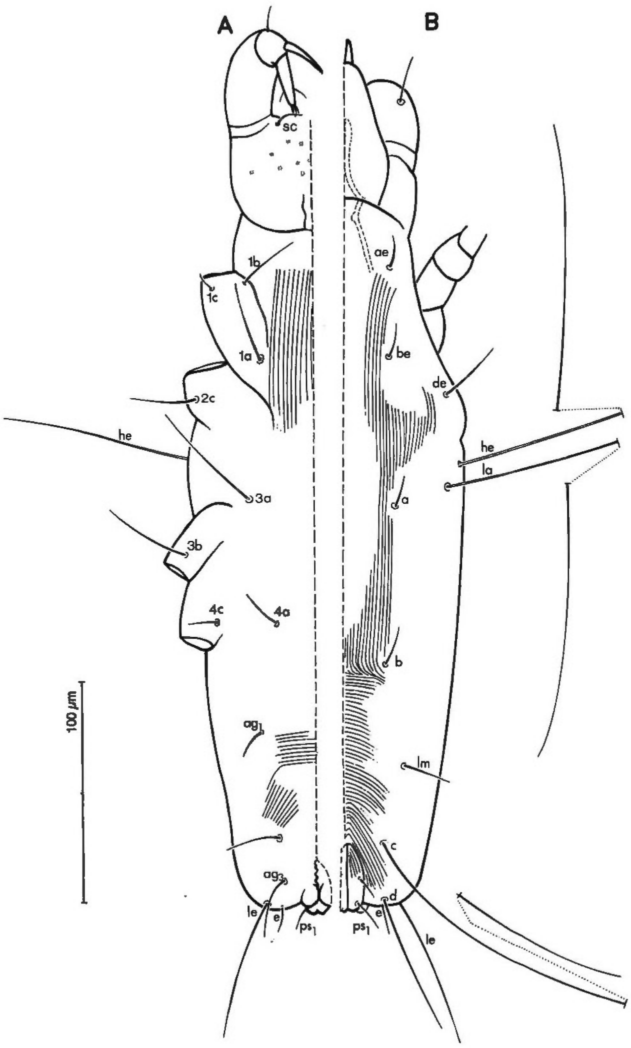

FIG. 2 : *Namibarbutia seelyae* n. sp.
A. — Ventral view ; B. — Dorsal view.

Namibarbutia seelyae n. sp.

Body length : 396 µm. Body rather elongate, with long legs in comparison to *Barbutia* (Fig. 1). Stylophore with dorsal, short, cross-chambered peritremata (Fig. 3G). Integument of dorsal face entirely striated longitudinally, except behind setae *b* where striae are transverse (Fig. 2B). Same striation pattern on the ventral face except under the gnathosoma where a granular ornamentation is observed, and at the base of legs where smooth plates are located (Fig. 2A). Some dorsal setae are extremely long : *he*, *la*, and *c*. Genital aperture

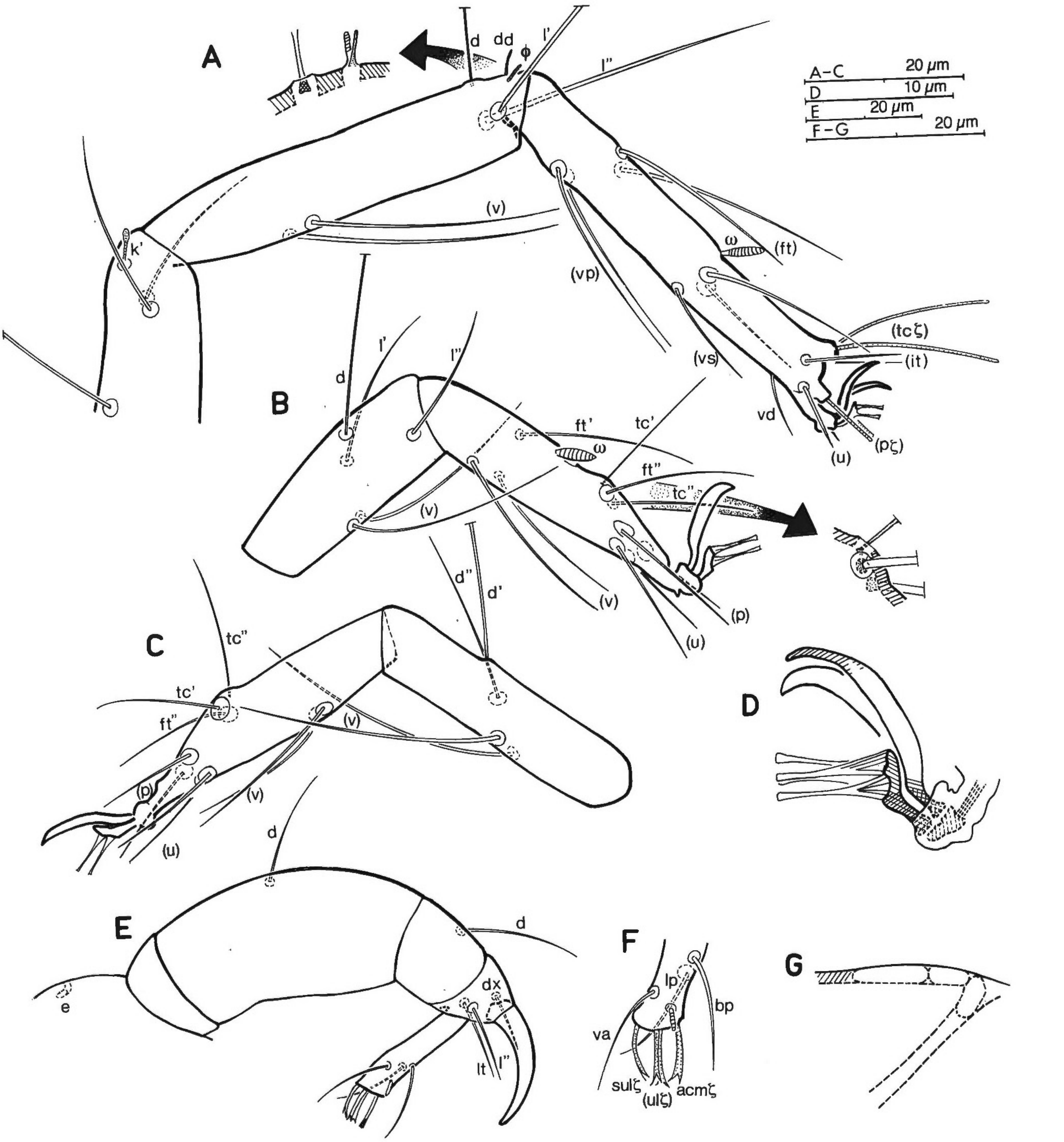

FIG. 3 : *Namibarbutia seelyae* n. sp.

A. — Distal part of leg I (paraxial view) with an insert of the duplex (*dd*-φ) (antiaxial view) ; B. — Tarsus and tibia II with an insert of the triplet (*tc'*-*tc"*-*ft"*) (antiaxial view) ; C. — Tarsus and tibia IV (antiaxial view) ; D. — Apotele IV ; E. — Palp (antiaxial view) ; F. — Tip of the palptarsus (antiaxial view) ; G. — Neostigma with cross-chambered peritremata (antiaxial view through the stylophore).

ventral. Two pairs of pseudanal setae and three pairs of aggenital setae. Leg chaetotaxy and solenidiotaxy (Fig. 3) : I 16(1)-6(1)-6-2-1 ; II 10(1)-5-5-2-0 ; III 9-4-2-2-1 ; IV 9-4-2-2-1. On tarsus I, setae (*tc*) and (*p*) are eupathidial and located on a tubercle (Fig. 3A). Tibia I with a duplex, (*dd*-φ) located distally, just in front of *d*, a thin seta with small root (eupathidial ?) (Fig. 3A). Famulus *k'* distal on genu I, as in Stigmaeidae. Tarsi II to IV with a triplet of dorsal setae, composed of a median thin seta with a small root (eupathidial ?) and two " normal " lateral setae (Fig. 3B). Palp chaetotaxy and solenidiotaxy : 0-1-1-4-7(1), *ba* apparently being absent. Supracoxal setae are recessed (Fig. 3E).

Derivatio nominis : The new species is named for Dr M. K. SEELY, Director of the Desert Ecological Research Unit in Gobabeb since many years.

Holotype : 1 female, Namib desert, gravel plain near Mirabeb (Plot no. 31), under *Stipagrostis ciliata* (perennial form), depth -5 cm, 14 June 1993, after watering.

Key to Barbutiidae

1. — Two pairs of eyes, anal aperture ventral, genua II to IV nude, claws with two pairs of short, capitate tenent hairs 2
   — No eyes, anal aperture dorsal, genua II to IV with at least one seta, claws simple.................. .... *Namibarbutia seelyae* n. sp.
2. — Seta *be* very long, much longer than the other prodorsal setae (230 µm, reaching base of leg IV), tarsus I with 10 setae.......................... .. *Barbutia anguineus* Berlese *sensu* Robaux (1975)
   — Seta *be* of same length as seta *de*, tarsus I with 7 or 8 setae......... *Barbutia perretae* Robaux, 1975

LINOTETRANIDAE

Linotetranus mirabebensis n. sp.

With a body length of 390 µm, the Namibian species is the smallest of all *Linotetranus* described. The habitus (Fig. 4) of the new species is close to that of *L. cylindricus*, redescribed by BAKER & PRITCHARD (1953) : the dorsal striation pattern is composed of three major areas separated by two furrows ; the relief of each area is made up of knobs, delimited by a network of fine, anastomosing, longitudinal lines. The ventral face is composed of four major areas made up of knobs, whose form varies (Fig. 4B). Prodorsum with four pairs of setae, the first pair slightly serrate, the second pair short and not reaching the bases of the third and fourth pairs. Opisthosoma with 18 pairs of setae, some of them very long. Two pairs of aggenital setae ; three pairs of genitals, located on two genital plates ; three pairs of pseudanal setae, located on the terminal anal lips (Fig. 5A, B). Ovipositor eversible as in Tetranychidae (Fig. 5A, C). Whip-like stylets (Fig. 5D). Palp chaetotaxy : 0-1-0-2-6, with a calcar on tibia and three terminal eupathidia (Fig. 5F), this species is unique among *Linotetranus* in the absence of a dorsal seta on the palp genu. Supracoxal setae normal (not recessed as *Namibarbutia*). Leg chaetotaxy : I 11(2)-5(1)-5-5-1 ; II 7(1)-4-2-3-1 ; III 4-4-1-2-1 ; IV 4-4-0-1-0. The new species differs from *protractulus* in having four setae on tibia III instead of three. Eupathidia on tarsus I : *tc"* and (*p*). Tectals, prorals and solenidia of tarsus I are located on tubercles (Fig. 5H). Ambulacrum composed of two claws and an empodium with tenent hairs (Fig. 5E).

Derivatio nominis : The name of the new species is derived from Mirabeb, a granite inselberg rising out of the gravel plain, near which it was found.

Holotype : 1 female, Namib desert, gravel plain near Mirabeb (Plot no. 31), under *Stipagrostis ciliata* (perennial form), depth -5 cm, 14 June 1993, after watering.

Key to Linotetranidae

1. — 17 pairs of dorsal setae on the opisthosoma (seta no. 15 absent) .... *Linotetranus achrous* Baker & Pritchard, 1953
   — 18 pairs of dorsal setae on the opisthosoma .. 2
2. — Prodorsal seta 1 distinctly pinnate, prodorsal seta 2 as long as setae 3 and 4, dorsal seta of genu I strongly serrate... *L. protractulus* Athias-Henriot, 1961

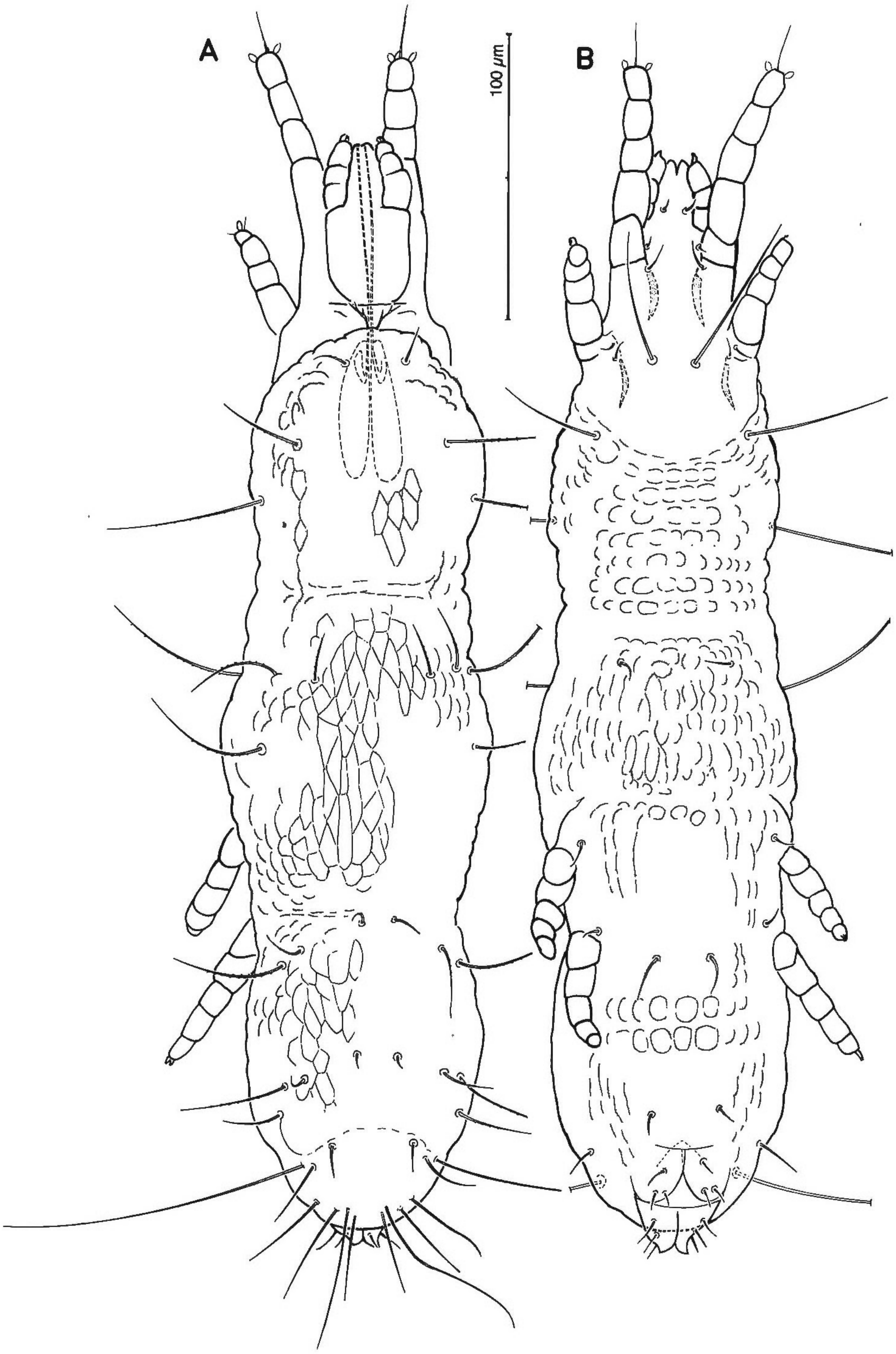

FIG. 4 : *Linotetranus mirabebensis* n. sp.
A. — Dorsal view ; B. — Ventral view. Leg chaetotaxy not drawn.

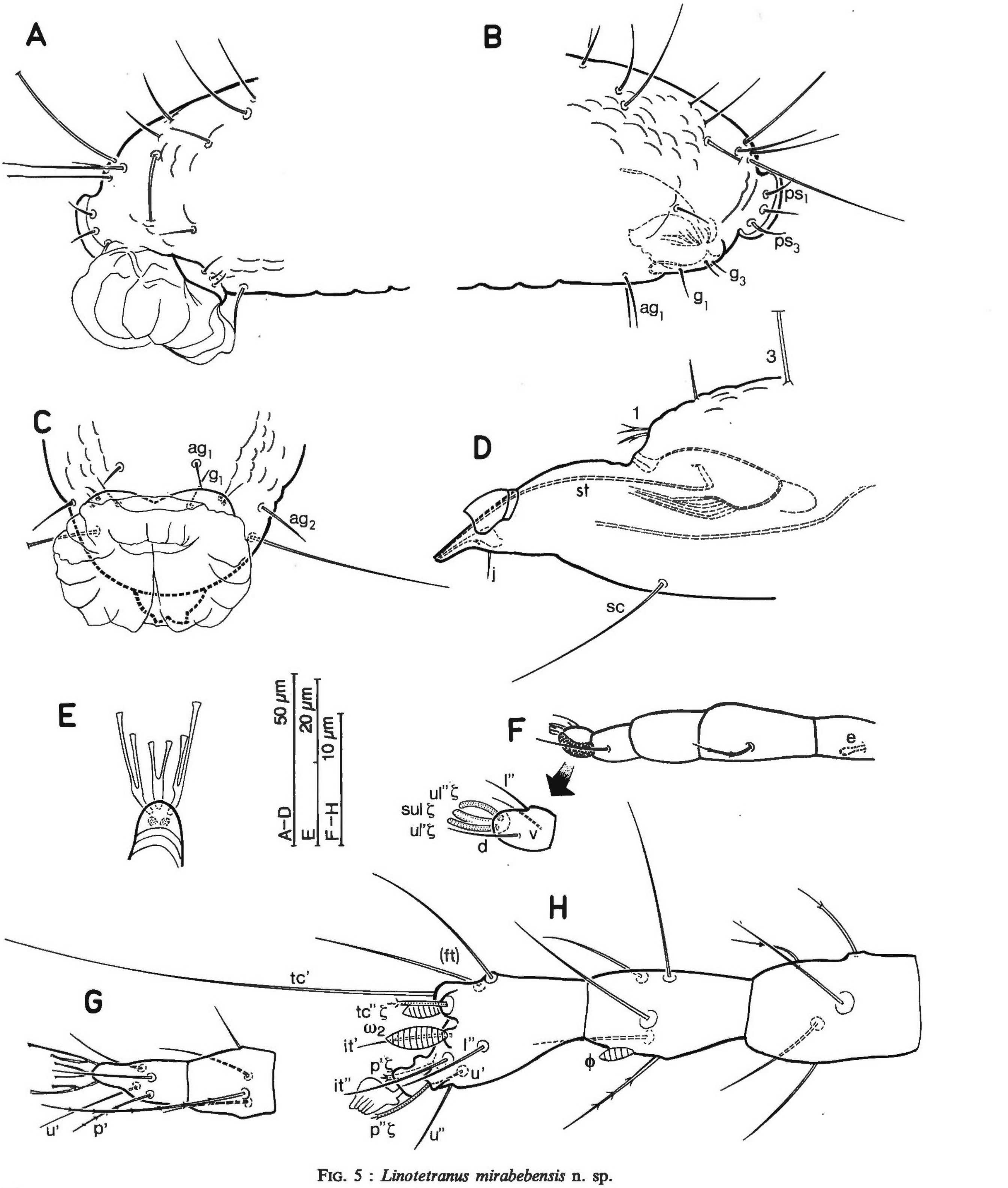

FIG. 5 : *Linotetranus mirabebensis* n. sp.

A. — Tip of opisthosoma, with ovipositor everted (lateral view) ; B. — Idem with the ovipositor inside ; C. — Ovipositor everted (ventral view) ; D. — Gnathosoma in lateral view ; E. — Apotele IV in dorsal view, F. — Palp in dorsal view (calcar stippled) ; G. — Tarsus and tibia IV in dorsal view ; H. — Distal part of leg I (antiaxial view).

— Prodorsal seta 1 slightly serrate, prodorsal seta 2 much shorter than setae 3 and 4 (Fig. 5D), dorsal seta of genu I nearly smooth 3

3 — No dorsal seta on palp genu, seta ag_1 short (not reaching the anal lips — Fig. 5B), small species (*ca* 400 µm)................. *L. mirabebensis* n. sp.

— Dorsal seta on palp genu, seta ag_1 long (reaching the anal lips), larger species (*ca* 500 µm) .... *L. cylindricus* Berlese *sensu* Baker & Pritchard, 1953

Discussion

Systematics

The status of the genus *Barbutia* and that of the family Barbutiidae were discussed in detail by Summers (1964) and Robaux (1975). The presence of tenent hairs on claws in *Barbutia* is unique among Raphignathoidea and both authors concluded that this character indicated that the genus should be accommodated somewhere between the Raphignathoidea and Tetranychidae. Obviously, the new species fills-in part the gap between *Barbutia* and other Raphignathoidea, especially Stigmaeidae. On the other hand, *Namibarbutia* also exhibits remarkable characters, such as the duplex (*dd*-φ) on tibia I and the recessed supracoxal setae. I do not propose any change at the familial level. I just note that the introductory remark of Summers (1966) still holds : " The recognition of families and genera of raphignathoids is difficult because no one since Oudemans (1927) has attempted to inventory and systematize this group of mites. "

Species identification in *Linotetranus* meets with some problems. Officially, there are only three species. However, I doubt that the species identified as *L. cylindricus* by Baker and Pritchard (1953) and collected from Utah is the same as that found by Berlese in Italy. As already suggested by these authors, it is possible that the genus *Linotetranus* contains a number of species that resemble each other very closely and that the Utah specimens are specifically distinct from the type from Italy. The problem will persist as long as Berlese's types will be prevented from a serious study and made unavailable to systematists.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ae	*ae*	*ae*	*ae*	*ae*	*ae*	*ae*	*ae*	*vi*	*ae*
be	*be*	*be*	*be*	*be*	*be*	*be*	*be*	*ve*	*be*
ce	*ce*	*pm*	–	–	*ce*	–	*ce*	*sci*	–
de	*de*	*ce*	*ce*	*ce*	*de*	*de*	*de*	*sce*	*de*
a	*a*	*a*	*a*	*a*	*a*	*a*	*a*	c_1	*a*
he	*he*	*he*	*he*	*he*	*he*	*he*	*he*	c_2	*he*
b	*b*	*b*	*b*	*b*	*b*	*b*	*b*	d_1	*b*
la	*la*	*la*	*la*	*la*	*la*	*la*	*la*	d_2	*la*
c	*c*	*c*	*c*	*c*	*c*	*c*	*c*	e_1	*c*
lm	*lm*	*lm*	*lm*	*lm*	*lm*	*lm*	*lm*	e_2	*lm*
d	*d*	*li*	*li*	*l*	*li*	*d*	*d*	f_1	*d*
lr	–	–	–	–	–	–	–	f_2	–
e_1	e_1	*e*	*e*	*e*	*e*	*e*	e_1	h_1	*e*
e_2	e_2	*le*	*le*	*le*	*le*	*le*	*lr*	h_2	*le*
ps_1	ps_1	?	g_2	g_2	g_2	ps_1	e_2	ps_1	ps_1
ps_2	ps_2	?	g_3	g_3	g_3	ps_2	*f*	ps_2	ps_2
ps_3	ps_3	?	g_4	g_4	g_4	ps_3	*w*	ps_3	–
t	*t*	?	pg_1	pg_1	pg_1	ag_1	*t*	ag_1	ag_1
u	*u*	?	pg_2	pg_2	pg_2	ag_2	*u*	ag_2	ag_2
v	*v*	?	pg_3	–	pg_3	ag_3	*v*	ag_3	ag_3
w	*w*	?	–	–	–	–	–	–	–
g_1	g_1	?	g_1	g_1	g_1	g_1	–	g_1	–
g_2	g_2	?	–	–	–	–	–	g_2	–
g_3	g_3	?	–	–	–	–	–	g_3	–

Table 1 : Chaetotaxic equivalences from different descriptions of Raphignathoidea.
(1) *Apostigmaeus* male (Grandjean, 1944). — (2) *Apostigmaeus* female (Grandjean, 1944). — (3) *Saniosulus* (Summers, 1960). — (4) *Eupalopsis* (Summers, 1960) completed with Gerson (1966) for the paraproctal and genital setae. — (5) *Zetzellia* (Gonzales-Rodriguez, 1965). — (6) *Stigmaeus* (Wood, 1967). — (7) *Mediolata* (André, 1977). — (8) *Barbutia* (Robaux, 1975). — (9) Raphignathoidea (Kethley, 1990). — (10) *Namibarbutia* (this paper). – : seta absent ; ? : seta not designated

Summers' (1960) designation of prodorsal setae is based on the same symbols as Grandjean (1944) but applied differently, hence confusions are possible particularly when the symbol *ce* is used. Gerson (1966) followed and completed Summers (1960), except that he inverted *he* and *e*. Robaux (1975 : 484) referred to the setal nomenclature proposed by Grandjean (1944) for *Apostigmaeus navicella*. Unfortunately, he made several mistakes. First, he used the chaetotaxy of the *navicella* female, where seta *lr* subsists, instead of that of the male, which has exactly the same number of setae as *Barbutia*. What Robaux designated as *lr* corresponds to Grandjean's e_2. Second, paraproctal setae were not correctly identified and were named, using an idiosyncratic system, e_2, *f* (a symbol coined by Robaux) and *w* (as if it were a fourth aggenital).

The ratio length-width

The two new species present a peculiarity already observed in true sand mites such as Nematalycidae : their elongate shape (Coineau *et al.*, 1978). Even

Species	L/W	habitat	
Gordialycus tuzetae	57.7	S	Eu
Nematalycus nematoides	13.0	S	Eu
Psammolycus delamarei	7.6	S	Eu
Linotetranus mirabebensis	4.2	G	Eu
Namibarbutia seelyae	3.5	G	Eu
Micropsammus littoralis	3.4	S	Eu
Microcaeculus sabulicola	1.9	S	Su
Neoteneriffiola coineaui	1.7	S	Su
Tetranychus urticae	1.7	F	Ep
Metalorryia armaghensis	1.6	B	Ep

TABLE 2 : Ratio body length/maximum width (L/W) in different Actinedida (adults only).

B : bark ; G : gravel ; F : foliage ; S : sand.

Eu : euedaphic species ; Su : surface dwellers ; Ep : epigeal species.

if the two species are not vermiform as *Gordialycus tuzetae*, the ratio length-width (L/W) is high (3.5 and 4.2). Compared to ratios observed in other actinedid mites (table 2), these values are remarkable. Of special interest is the contrast between sabulicolous species running at the surface and others crawling deep into the sand. For instance, *Microcaeculus sabulicola*, a sabulicolous caeculid, is fundamentally a surface-dweller even if it is able to sink into the sand ; the same probably applies to *Neoteneriffiola coineaui* which was found under marble stones in sandy soils. Both species have a L/W ratio closer to that of epigeal forms than that of euedaphic species. Even if an elongate shape is found in many other mites, such as Eriophyoidea for instance, the ecological meaning of such an adaptation in euedaphic sand mites needs more investigation.

ACKNOWLEDGEMENTS

I am grateful to the Desert Ecological Unit Station (DERU) for logistical support, and to many members of its staff for technical help and practical advice. I am indebted to Dr M. K. SEELY, director of DERU, for the opportunity to work in Gobabeb. I would also like to thank M. JUDSON for his suggestions when reading the first draft of the manuscript. The work was funded by the F.N.R.S.

REFERENCES

ANDRÉ (H. M.), 1977. — Note sur le genre *Mediolata* (Actinedida : Stigmaeidae) et description d'une nouvelle espèce corticicole. — Acarologia, **18** : 462-474.

ATHIAS-HENRIOT (C.), 1961. — Nouveaux acariens phytophages d'Algérie (Actinotrichida, Tetranychoidea : Tetranychidae, Linotetranidae). — Annls Ecole natn Agriculture Alger, **3** : 1-10.

BAKER (E. W.) & PRITCHARD (A. E.), 1953. — The family categories of tetranychoid mites, with a review of the new families Linotetranidae and Tuckerellidae. — Ann. ent. Soc. Amer., **46** : 243-258.

BERLESE (A.), 1910. — Acari nuovi. Manipulus V. — Redia, **6** : 199-234.

COINEAU (Y.), HAUPT (J.), DELAMARE DEBOUTEVILLE (Cl.) & THERON (P.), 1978. — Un remarquable exemple de convergence écologique : l'adaptation de *Gordialycus tuzetae* (Nematalycidae, Acariens) à la vie dans les interstices des sables fins. — C. R. Acad. Sci. Paris, **287D** : 883-886.

COINEAU (Y.) & MASSOUD (Z.), 1977. — Découverte d'un nouveau peuplement psammique : les microarthropodes du milieu interstitiel aérien des sables fins. — C. R. Acad. Sci. Paris, **285D** : 1073-1074

COINEAU (Y.) & SEELY (M. K.), 1983. — Mise en évidence d'un peuplement de microarthropods dans les sables fins des dunes du Namib central. — In : LEBRUN, Ph. *et al.* (eds). New Trends in Soil Biology. Dieu-Brichart, Louvain-la-Neuve : 652-654.

FAIN (A.), COINEAU (Y.) & ANDRÉ (H. M.), 1993. — Description de deux espèces nouvelles d'Astigmates sabulicoles (Acari). — Acarologia, **34** : 149-158.

GERSON (U.), 1966. — A redescription of *Eupalopsis maseriensisi* (Canestrini and Fanzago) (Acarina : Eupalopsellidae). — Israel J. Zool. **15** : 148-154.

GONZALES-RODRIGUEZ (R. H.), 1965. — A taxonomic study of the genera *Mediolata*, *Zetzellia* and *Agistemus* (Acarina : Stigmaeidae). — Univ. Calif. Publ. entomol. **41** : 1-47.

GRANDJEAN (F.), 1944. — Observations sur les acariens de la famille des Stigmaeidae. — Arch. Sci. Phys. nat., **26** : 103-131.

JUDSON (M.), 1994. — Studies on the morphology and systematics of the Teneriffiidae (Acari, Prostigmata). 1. A new species of *Neoteneriffiola* from Namibia. — Acarologia, **35** : 115-134.

KETHLEY (J.), 1990. — Acarina : Prostigmata (Actinedida). — In : DINDAL, D. L. (Ed.). Soil Biology Guide. John Wiley & Sons, New York : 667-756.

KRANTZ (G. W.), 1978. — A Manual of Acarology. — Oregon State university Book Store, Corvallis, USA.

OUDEMANS (A. C.), 1927. — Acarologischen Aanteekeningen LXXXVIII. — Ent. Berichten, **7** : 257-263.

PIFFL (E.), 1965. — *Microcaeculus namibensis* nov. sp. Ein Vertreter der Caeculiden (Arachnoidea, Acarina) aus der Namibwüste Sudwestafrikas. — Scientif. Pap. Namib Desert Res. Stn **28**(6) : 1-12.

ROBAUX (P.), 1975. — Observations sur quelques Actinedida (= Prostigmates) du sol d'Amérique du Nord. V. Barbutiidae, une nouvelle famille d'Acariens (Acari : Raphignathoidae) et description d'une nouvelle famille appartenant au genre *Barbutia*. — Acarologia, **17** : 480-488.

SUMMERS (F. M.), 1960. — *Eupalopsis* and eupalopsellid mites (Acarina : Stigmaeidae, Eupalopsellidae). — Fl. Entomol. **43** : 119-138.

SUMMERS (F. M.), 1964. — Three uncommon genera of the mite family Stigmaeidae (Acarina). — Acarologia, **8** : 226-229.

SUMMERS (F. M.), 1966. — Genera of the mite family Stigmaeidae (Acari, Prostigmata). — Acarologia, **8** : 230-250.

WOOD (T. G.), 1967. — New Zealand mites of the family Stigmaeidae (Acari, Prostigmata). — Trans. r. Soc. N. Z., Zool. **9** : 83-139.