

A NEW MEXICAN ARBOREAL *MYCOBATES* (ORIBATEI : MYCOBATIDAE)

BY José G. PALACIOS-VARGAS and Ignacio M. VÁZQUEZ *

MYCOBATIDAE
ORIBATID MITES
EPIPHYTIC FAUNA
POPOCATÉPETL

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ABSTRACT : The adults and ontogenetic series of *Mycobates royi* n. sp. are described. This species inhabits epiphytic mosses and lichens on *Cupressus benthamii* and *Pinus hartwegii* from Popocatépetl volcano, México.

RÉSUMÉ : Dans ce travail, on décrit l'adulte d'une nouvelle espèce de *Mycobates* ainsi que son développement ontogénétique. La nouvelle espèce est associée aux mousses et lichens épiphytes de *Cupressus benthamii* et *Pinus hartwegii* du volcan Popocatépetl, au Mexique.

This article is a contribution to general research on the microarthropods of epiphytic environments from Eje Neovolcanico México, carried out in the Laboratorio de Acarología, Universidad Nacional Autónoma de México, México (PALACIOS-VARGAS, 1981). Several oribatid mites have been described from this micro-habitat (NORTON and PALACIOS-VARGAS, 1982; PALACIOS-VARGAS and NORTON, 1984). The association of mites with lichens appears to vary in specificity. Several species and subspecies are known to be exclusive to this microhabitat, they belong mainly to the families Cymbaeremaeidae, Oribatulidae, Oripodidae and Scheloribatidae. Other species, even those which prefer the lichens and feed on them, can live on other plants, but their immatures may be restricted to lichens (Groups B of SEYD and SEWARD, 1984); in this group, we found a new species of the family Mycobatidae; which is described below.

To date 18 species of *Mycobates* are known to inhabit litter, soil, mosses and lichens. The new

species inhabits the mosses, *Neckera chlorocaulis* and *Leucodon cryoptotheca*, collected from branches of *Cupressus benthamii* at 3,000 m elev., and the lichens *Pseudevernia intensa* and *Usnea subfloridana*, from branches of *Pinus hartwegii* at 3,600 and 3,900 m elev. Some ecological notes on this species are given by NORTON and PALACIOS-VARGAS (1987). All the measurements are given in micrometers.

Mycobates royi n. sp.

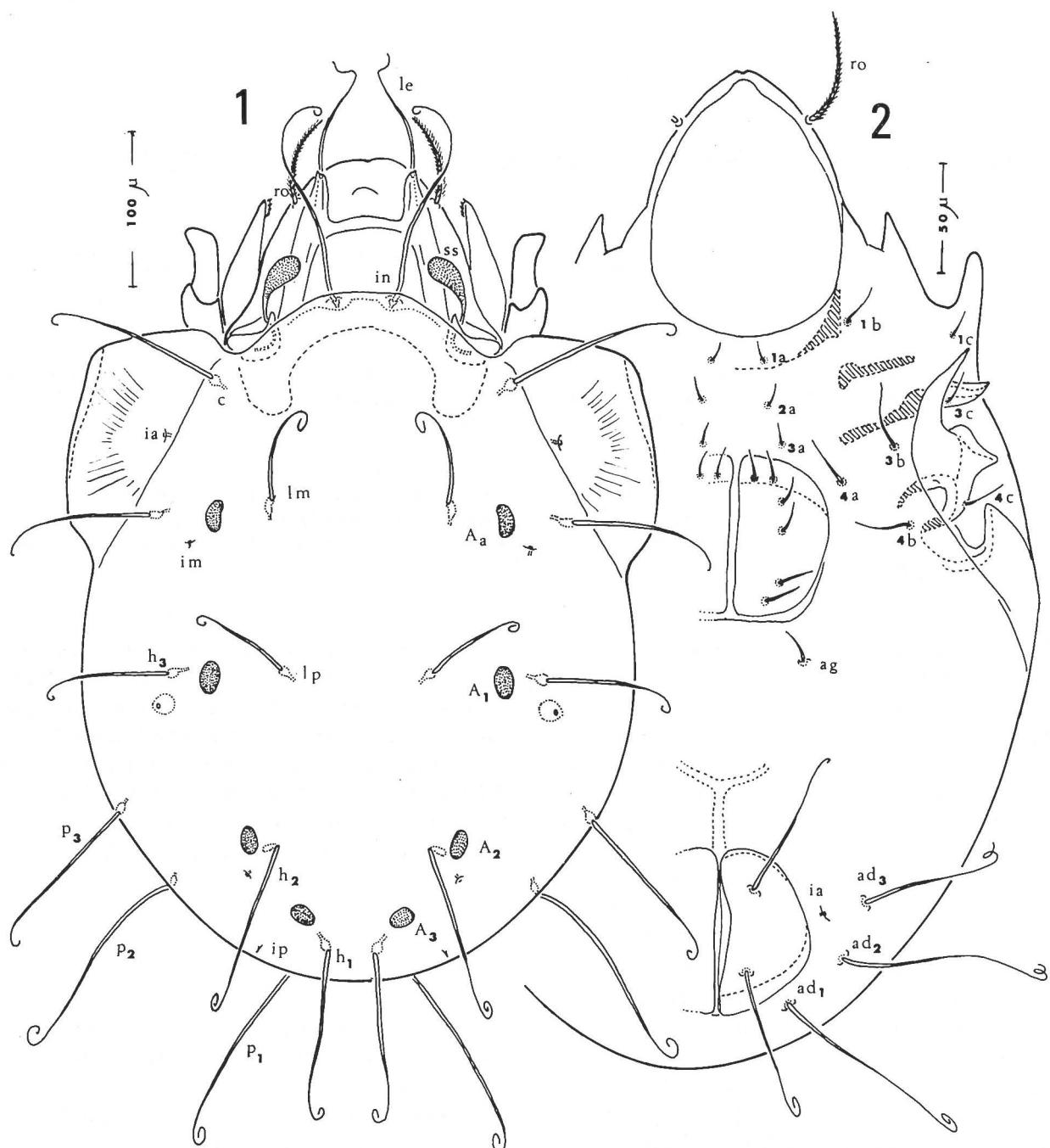
ADULT

Dimensions. Average total length of ten specimens 514 (range 468-662); mean maximum notogastral width 326 (307-355).

Cerotegument. Restricted to lateral podosoma, composed of uniform granules.

Integument. Dark brown with micropunctations, visible at higher magnification; fine striations on pteromorphs.

* Laboratorio de Acarología, Depto. Biología, Facultad de Ciencias, U.N.A.M. 04510 México, D.F.



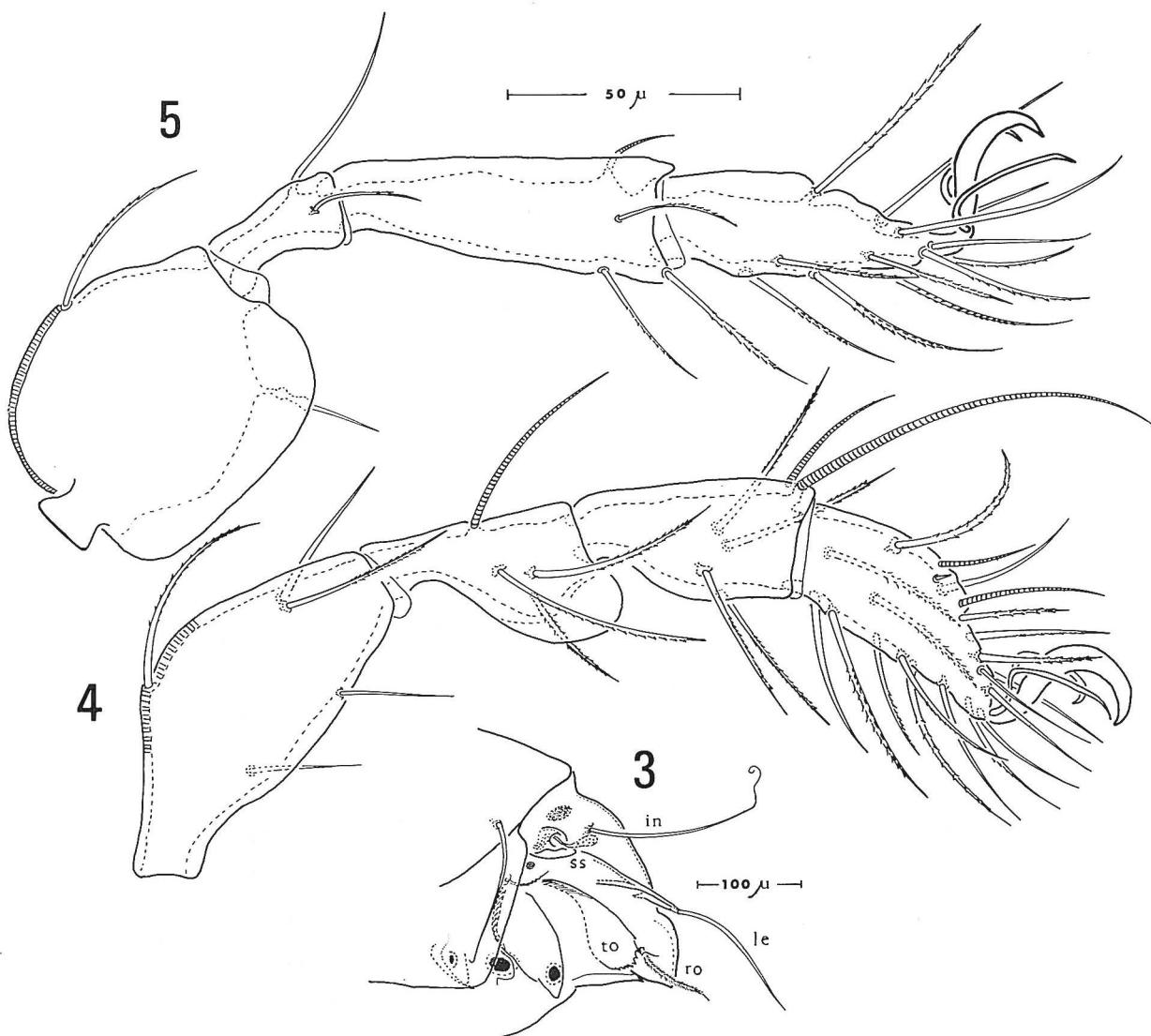
Figs. 1-2 : *Mycobates royi*, n. sp.
Dorsal aspect of the adult (1). Ventral aspect of adult (2).

Prodorsum (Fig. 1). Rostrum wide with notch on anterior margin. Lamella long, narrow, with cusp almost reaching tip of rostrum : area between lamella broad, 72. Translamella narrow, long. Lamellar cusp edentate. Lamellar seta (*le*) smooth, sinuose, 103; interlamellar seta (*in*) very long, smooth, with curled tip, 190. Rostral seta (*ro*) barbulate, 84. Exobothridial setae (*ex*) short, finely barbulate, 31. Sensillus short, 48, clavate, elbowed, head denticulate, pedicel smooth, narrow. Bothridium not completely concealed under anterior margin of notogaster.

Lateral Aspect of Podosoma (Fig. 2). Tutorium wide, reaching insertions of setae *ro*, with 7-8 teeth, longitudinal striae only at base. Genal tooth very thick. Discidium and custodium well developed.

Notogaster. With 10 pairs of notogastral setae, *c*, *c*₃ and *d* series absent, each with very curled tip, 108-120. Pteromorph large. Four pairs subequal irregular circular porose areas ; Aa, 24.

Ventral Region (Fig. 3). One pair of smooth aggenital setae, 28, two pairs anal, 84-112, and three smooth pairs of adanal setae, very long, 96-120, and with curled and tapered tip. Genital plate



FIGS. 3-5 : *Mycobates royi*, n. sp.

Lateral aspect of prodorsum and podosoma (3). Leg. I of adult (4). Leg IV of adult (5).

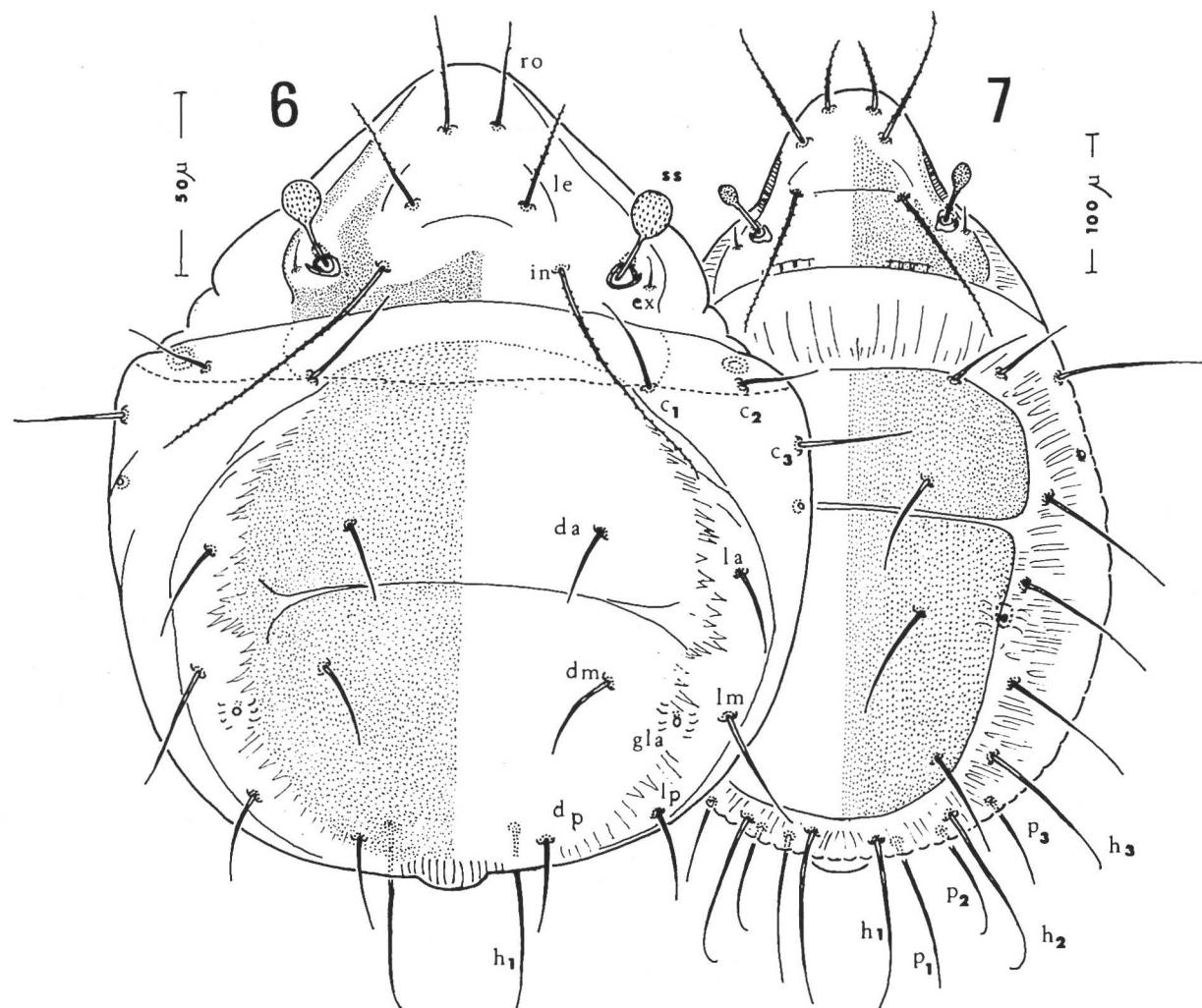
with six pairs of smooth, short setae, 14; g_1, g_2 on anterior margin of plate. Coxisternal setation 3-1-3-3; seta 1b, 36, other setae short, 12.

Legs (Fig. 4, 5). Heterotridactylous. Leg setation from trochanter to tarsus, including famulus (solenidia in parentheses): I : 1-5-3(1)-4(2)-19(2); II : 1-5-3(1)-15(2); III : 2-2-1(1)-3(1)-15(0); IV : 1-2-2(0)-3(1)-12(0). Genua I, II, femur IV with ventral carina. Solenidion of tibia IV extremely short, 12.4.

ONTOGENY

LARVA (Fig. 6). Length of one distended specimen 250.

Dorsal Aspect. Longest seta of aspis in, about 74; ro, 33; le, 28, all with few barbulations. Sensillus 24, clublike, head with some denticles; pedicel thin. Central part of aspis granulate. Dorsum of opisthosoma with 10 pairs setae: $c_1, c_2, c_3, da, la, dm, lm, lp, dp$, and h_1 (h_1 , 52, others 24-28); venter with setae h_2 , 28; h_3 , 9. Dorsum with a large granulate plate, with an incomplete suture between setae da, dm . Opisthosomal gland opening between setae dm, lm and lp . Coxisternal formula: 2-1-2; seta 1b, 41; other setae, about 20. Humeral organ present. Leg chaetotaxy as in table 1. All tarsi monodactylous.



FIGS. 6-7 : *Mycobates royi*, n. sp.
Dorsal aspect of larva (6). Dorsal aspect of tritonymph (7).

PROTONYMPH. Average length of 5 specimens 335 (range 297-384). Body shape similar to that of larva. Aspis with well defined area of granulation between and behind setae *in*. Setae *ro*, 24; *le*, 45; *in*, about 86; sensillus (*ss*) clublike, 28; *ex*, 19. Opisthosoma with 12 pairs of setae; *c₁* smallest, 38; *c₂*, 39; *c₃*, 46; *da*, *la*, *dm*, *lm*, *dp*, *lp*, *h₁₋₃*; *h₁*, longest, 59. Venter with setae *p₁*, *p₂* adanals. Genital region with one pair of setae. Coxisternal formula : 3-1-2-1. Tarsi monodactylous.

DEUTONYMPH. Average length of 4 distended specimens 453 (range 393-480). Aspis setae : *in*, about 115; *ro*, 52; *le*, 67; *ss* clublike, 32. Opisthosomal seta, *c₁* shortest, 52; *h₁* longest, 76. Coxisternal

formula : 3-1-2-2; *1b* longest, 38; *4a*, *4b*, 20; others about 9. Three pairs genital setae, one pair aggenitals. Three adanals present; *ad₁*, long, 38. Tarsi monodactylous, chaetotaxy as in table 1.

TRITONYMPH (Fig. 7). Average length of 4 undistended specimens 542 (range 441-566). Setae *in*, 144; *ro*, 60; *le*, 96; *ss* clublike, 32. Opisthosomal setae attenuate, somewhat curled at tips; *c₁* shortest, 62; *h₁* longest, about 132. Coxisternal formula : 3-1-3-3; setae *1b* about 48. five pairs of genital setae. Genital, aggenital setae subequal, 19; 2 pairs of anal setae, 26; 3 pairs of adanals with *ad₁* longest, 76, with curled tip. Tarsi monodactylous, chaetotaxy in Table 1.

TABLE I

	Troch.	Femur	Genu	Tibia	Tarsus
LEG I	LA	—	d, bv"	(I), σ	(I), v', φ1
	PN	—	—	—	ω2
	DN	—	I'	—	15
	TN	v'	I''	v'	19
	AD	—	v''	—	I'', v''
LEG II	LA	—	d, bv"	(I), σ	I', v', φ
	PN	—	—	—	—
	DN	—	I'	—	ω2
	TN	v'	I''	v'	—
	AD	—	v''	—	v''
LEG III	LA	—	d, ev'	I', σ	v', φ
	PN	—	—	—	—
	DN	I'	—	—	—
	TN	v'	—	v''	it
	AD	—	—	I'	—
LEG IV	PN	—	—	—	ft' (pv) (u) (p)
	DN	—	d, ev'	d	v', φ
	TN	v'	—	I'	v''
	AD	—	—	I'	—

TABLE I : Ontogeny of leg setae in *Mycobates royi* n. sp. Parentheses indicate that both setae of a pair appear in the same instar.

DIAGNOSIS.

Adults differ from other species of *Mycobates* in having the following combination of attributes : 10 pairs of notogastral setae (108-120 long) with very curled tips; lamellar cusps without teeth; narrow

translamella; rostrum with notch on anterior margin; lamellar setae smooth (103); interlamellar setae smooth (190); tutorium with 7-8 teeth; and heterotridactylous legs.

MATERIAL.

Holotype female, two adult paratypes, one tritonymph deposited in the Laboratorio de Acarología, Facultad de Ciencias, UNAM; two adults paratypes, one tritonymph to be deposited in the following institutions: Museo de Historia Natural de la Ciudad de México, México, D.F.; Canadian National Collection, Ottawa, Ontario, Canada; The Collection of Roy A. NORTON, College of Environmental Science and Forestry, SUNY, Syracuse, N.Y., USA; and Laboratorio de Acarología, Escuela Nacional de Ciencias Biológicas, IPN, México, D.F. About 50 paratypes in alcohol are maintained in the collection of the senior author.

Type data. MEXICO : State of Mexico ; Popocatépetl volcano. Specimens of type series were collected on epiphytic mosses and lichens, ex *Pinus hartwegii*, 3,600 m elev., 3-XII-1982, J. G. PALACIOS-VARGAS.

ETYMOLOGY. The authors dedicate this new species to Dr. Roy A. Norton for his contributions to the study of oribatid mites.

DISCUSSION

The genus *Mycobates* has been recorded from the Holarctic Region and South America. The new species is similar to those of Holarctic Region. *Mycobates royi* n. sp. is similar to *M. tridentatus* Weigmann (1976), mainly in the body setation and the shape of these setae. *M. royi* n. sp. is larger (514) than *M. tridentatus* (400). The most conspicuous difference between these species is that the new species is heterotridactylous, whereas *M. tridentatus* is monodactylous. *M. royi* n. sp. has a narrow translamella, the lamellar cusps lack teeth, the median process on rostral region is very small, and the anterior margin of rostrum has a small notch. *M. tridentatus* in contrast has a wide translamella, lamellar cusp with teeth, anterior margin of rostrum with a large notch, and a large median process in the rostral region (WEIGMANN, 1976).

Leg setation of adults of *M. royi* n. sp. was compared with that of *M. ezoensis* (FUJIKAWA, 1982). The difference found, following the original

description (FUJIKAWA, *op. cit.*), is the lack of one seta on tarsus I, femur III and tarsus III in the new species.

ECOLOGICAL NOTES

Specimens were collected mainly from epiphytic mosses and/or lichens (samples about 5 × 5 × 5 cm), sampled by triplicate monthly from February 1982 to March 1983 (except for September) in forest of Popocatépetl volcano. Sixteen species of mosses were collected from 3,000 to 4,000 m elev. on this mountain. *Mycobates royi* n. sp. was found in *Neckera chlorocaulis* and *Leptodontium viticulosoides* only, and never at 4,000 m elev. We have observed that these mosses shelter a high diversity of other microarthropods also. The lichens where the new species was found are *Pseudevernia intensa*, *Usnea subfloridana* and occasionally *Usnea rubicunda*. Other oribatid mites are much more abundant on these lichens, e.g. *Trichoribates ocotlicus* (cf. PALACIOS-VARGAS and NORTON, 1984). For comparison purposes we include here the information about *M. royi* n. sp. from soil and litter samples from the same collecting sites.

The percent of permanence (PP, *sensu* RAPORT and NAJT, 1966) at 3,000 m. was : soil (0), litter (0), mosses (23); at 3,600, soil (7), litter (0), lichens (76); at 3,900, soil (0), litter (30), lichens (69). The coefficient of frequency (CF, *sensu* CHRISTIANSEN, 1964) found for this species at 3,000, was : soil (0), litter (0), mosses (10.2); at 3,600, soil (2.5), litter (0), lichens (51.2); at 3,900, soil (0), litter (10.2), lichens (35.5).

The abundance was generally low, 5-10 individuals per sample each month, except in December at 3,000 m (50 individuals) and at 3,900 (100 individuals).

According to the frequency criteria of KARPINEN (1972 and 1977) and MORAZA et al. (1980), *Mycobates royi* n. sp. is a fundamental species at 3,600 m elev., but accessory at 3,900 m. This species was found once in patches of *Arenaria bryoides* at 4,000 m elev., sometimes in soil and litter, but it is accidental here.

TRAVÉ (1963) found in La Massane, France, that the population of most arboricolous species are

reduced in summer because of heat and dryness. We have found in Popocatépetl that during winter and spring the litter is very poor but the low temperatures and snow do not affect the population density of arboricolous mites. The immatures and adults of *Mycobates royi* n. sp. were found during all seasons; immatures are most abundant during winter.

Despite the low abundance of this species, it is the only oribatid mite that we have found with its highest PP and CF at 3,600 m, others such as *Trichoribates ocoiticus*, *Belba clavasensilla* and *Cryptozetes usnea*, are better represented at 3,900 m (NORTON and PALACIOS-VARGAS, 1987).

Some species of *Mycobates* are thought to be so close associated to lichens that the immatures are restricted to this habitat, even though adults can be found in other, mainly epiphytic micro-habitats. However, we have occasionally found immatures of *M. royi* n. sp. are in leaf litter.

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Paru en Mars 1988.