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Mites associated with *Dendroctonus frontalis* Zimmerman (Scolytidae: Coleoptera) in Central America and Mexico*—

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COMPENDIO

Se sabe que 57 ácaros coexisten con el escarabajo sureño del pino, Dendroctonus frontalis Zimmerman en América Central y México. Algunos parecen ser agentes potenciales de control biológico. — Los autores.

Introduction

THE pine forests of Central and North America continually suffer economic damage from the southern pine beetle, *Dendroctonus frontalis* Zimmerman 1868***, and associated bark beetles. The most severe epidemic in the history of this insect occurred in Honduras from 1962 to 1965 (1, 2). Then and subsequently, studies aimed at determining the biology and ecology of the beetle and reducing losses were conducted in Honduras, Guatemala, and Mexico (2, 6). As part of these investigations boring dust, infested bark, and preserved bark beetles were sent to the U. S. Forest Service Laboratory at Pineville, Louisiana, for the isolation and identification of associated mites.

Fifty-seven species were found in this material and are here presented in an annotated list. While the compilation can at best be regarded as partial, we hope it will serve as a reference point for other acarologists. A comprehensive survey has recently been completed in Louisiana, and we have drawn on it to speculate about the value of some Central American species as biological controls.

Source of materials

Thirteen mite species were collected in 1962-1964 near Puebla, Mexico, by W. E. Rose and C. G. Martell. Rose (6) listed the species and indicated the roles of some. The mites were associated with *Dendroctonus frontalis*, *D. valens* Leconte 1860, *Ips mexicanus* (Hopkins 1906), and *I. lecontei* Swaine 1924. They were found in *Pinus leiophylla* Scheide and Deppe 1831 and *Pinus montezumae* Lambert 1832, the primary pine species in the area.

J. F. Coyne forwarded 18 species collected near Cedros, Honduras, in January and February 1965. All were from galleries of *D. frontalis* infesting *Pinus oocarpa* Schiede 1838.

R. C. Wilkinson collected 37 species near Tegucigalpa, Honduras, during February and March 1966. Again, all occurred in galleries of *D. frontalis* infesting *Pinus oocarpa*.

E. W. Clark, working in central Guatemala, collected 26 species between October 1971 and June 1972. All were in galleries of *D. frontalis* infesting *Pinus montezumae*, *P. bartwegii* Lindley 1839 (= *P. rudis* Endlicher 1847) and *P. maximinoi* H. E. Moore 1966 (= *P. tenuifolia* Benthams 1842, a later homonym of *P. tenuifolia* Salisbury (1796)).

Results and conclusions

On the basis of the 57 species listed in Table 1, pine bark beetle mites from Central America are notably diverse in species. Not only do the southern and Rocky

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*** Recent studies suggest that the *D. frontalis* complex in Central America and Mexico represents more than one species (8).

Table 1.—Mites associated with *Dendroctonus frontalis* from Central America and Mexico.

Mite	Distribution ^{a/}	Mite	Distribution ^{a/}
Order PARASITIFORMES		Order ACARIFORMES	
Suborder MESOSTIGMATA		Suborder ACARIDEI	
Cohort Liroaspinga		Tyroglyphidae	
Uropodellidae		** <i>Histiogaster arborsignus</i> Woodring 1963	G, H, L, M
<i>Uropodella laciniata</i> Berlese 1888	H, 1	<i>rotundus</i> Woodring 1966	G, H, L, M
Cohort Gamisina		<i>Schwiebia falticus</i> Woodring 1966	H, W
Ascidae		<i>Tyrophagus putrescentiae</i> (Schrank, 1781)	H, L
* <i>Lasioseius saftoi</i> (Ewing 1920)	G, H, W	Anoetidae	
** <i>Proctolaelaps bickleyi</i> (Bram 1956)	G, 1	<i>Anoetus conjuncta</i> Woodring and Moser 1970	G, H, L
** <i>dendroctoni</i> Lindquist & Hunter 1965	G, H, L, M	<i>sordida</i> Woodring and Moser 1970	H, L
** <i>hystricoides</i> Lindquist & Hunter 1965	G, H, L, M	<i>varia</i> Woodring and Moser 1970	G, H, L
** <i>hystrix</i> (Vitzthum 1923)	1, M	Suborder TARSONEMINI	
* <i>subcorticalis</i> Lindquist 1971	G, H, M, W	Fyemotidae	
* sp. (♂ 3763) ^{b/} d/	H	* <i>Acarophaenax</i> sp. d/	H
Digamasellidae		** <i>Pyemotes</i> prob. <i>parviscolyti</i> (Cross and Moser 1971)	H, 1
** <i>Digamasellus neocornutus</i> Hurlbutt 1967	G, H, L	* sp. (<i>ventricosus</i> group) d/	M
** <i>neodisetus</i> Hurlbutt 1967	G, H, L	* <i>Pygmephorus bennetti</i> Cross and Moser 1971)	G, L
* <i>quadrissetus</i> (Berlese 1921)	C, G	Tarsonemidae	
* <i>quadritorus</i> Robillard 1971	H, 1	<i>Heterotarsonemus lindquisti</i> Smiley 1969	G, H, L, M
* sp. "p" ^{c/}	G, H	* <i>Iponemus nabua</i> Lindquist 1969	H
Laelapidae		<i>Tarsonemus endophloeus</i> Lindquist 1969	G, M, W
* Laelapidae sp. (♂ 9926) ^{b/} d/	H	<i>ips</i> Lindquist 1969	H, L, M
Macrochelidae		<i>krantzi</i> Smiley and Moser (7)	G, L
** <i>Macrocheles boudreauxi</i> Krantz 1965	G, L	<i>subcorticalis</i> Lindquist 1969	G, H, 1
Parasitidae		<i>triarcus</i> Lindquist 1969	G, W
** <i>Eugamasus lyriformis</i> McGraw & Farrier 1969	G, H, L, M	Suborder ELEUTHERENGONA	
Cohort Cercomegistina		Bdellidae	
Cercomegistidae		* <i>Spinibdella depressa</i> (Ewing 1909)	H, 1
** <i>Cercoleiopus coelonotus</i> Kinn 1970	H, L	Cheyletidae	
Cohort Antennophorina		* <i>Acarocheyla</i> nr. <i>virginiensis</i> (Baker 1949)	H, 1
Celaenopsidae		Ereynetidae	
** <i>Pleuronectocelaeno drymoecetes</i> Kinn 1968	H, L	<i>Ereynetoides scutulii</i> Hunter 1964	H, L, M
Cohort Uropodina		Tetranychidae	
Uropodidae		Tetranychidae sp. ^{d/}	H
<i>Nentaria moseri</i> Hirschmann 1972	G	Tydeidae	
<i>Trichouropoda australis</i> Hirschmann 1972	H, L, M	Tydeidae spp. ^{d/}	H
<i>guatemalensis</i> Hirschmann 1972	G	Trombididae	
(<i>ovalis</i> group) ^{e/}	H	Trombididae sp. ^{d/}	H
<i>lamellosa</i> Hirschmann 1972	H, L	Suborder ORIBATEI	
<i>polytrichasimilis</i>	G, E	Cymbaeremaeidae	
Hirschmann 1972	H	<i>Scapheremaeus palustris</i> (Sellnick 1928)	H, 1
sp. "s" ^{e/}	H	Oribatellidae	
sp. (♀ 15,711) ^{b/} d/	G	nr. <i>Cultrobates</i> ^{d/}	H
<i>Uroobovella moseri</i> Hirschmann 1972	H	Oribatulidae - Scheloribatidae	
sp. ^{d/}	G	<i>Eporibatula</i> sp. ^{d/}	H
		<i>Paraleius</i> n.sp.	H, 1
		<i>Schelorbates</i> sp. ^{d/}	H

a/ C — Cosmopolitan
 E — Europe
 G — Guatemala
 H — Honduras
 L — Common in Louisiana
 1 — Recorded for Louisiana
 M — Mexico
 W — Western U.S.

** — Known natural enemy
 * — Possible natural enemy.
 b/ In U.S. Forest Service collection, Pineville, La. Number refers to Forest Service Slide.
 c/ In Canadian National Collection. To be described by J. Robillard, Canada Department of Agriculture, Ottawa.
 d/ Unclassifiable - see text for explanation.
 e/ To be described by W. Hirschmann in his *Parasitological Zoologie*.

Mountain faunas meet and mix there, but other species occur which appear to be endemic to the area.

Thirty-one of the species are also associated with *D. frontalis* in Louisiana, 20 being common there (5).

Of the 26 not recorded for Louisiana, 12 were unclassifiable. That is, until more diagnostic stages can be collected they cannot be identified to genus or species, and hence cannot be compared with the North American material. Five of the 26 are associated with bark beetles in the western United States. One species, *Trichouropoda polytrichasimilis*, is recorded for Europe (3) and, if cosmopolitan, may be found in Louisiana. Another species, *Digamasellus quadrisetus*, is cosmopolitan (4) and may eventually be collected in Louisiana. Nineteen have so far been found only in Central America but may have more extensive ranges.

The impact of these mites on Central American bark beetles has not been evaluated. Eleven of the species are known to attack the southern pine beetle in Louisiana (Moser, unpublished), and at least 13 others appear to be natural enemies. Since 9 of the latter 13 do not occur in Louisiana, they may be candidates for importation as biological control agents. Conversely, some of the southern and western mites not occurring in Central America may be worth introducing there.

Some of the fungus feeders may also exert an impact. *Tarsonemus krantzi* and *T. ips* are known to feed on or transmit *Ceratocystis minor*, the blue-stain fungus commonly associated with bark beetle attacks in the United States (5, and Moser, unpublished). *T. subcorticalis* and *T. triarcus* very likely feed on *C. minor* or other species of *Ceratocystis*. *Pygmephorus bennetti* feeds on a *Sebacina*-like basidiomycete in pupal chambers of *Ips* (5).

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