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NECROPHILOUS SCARABAEIDAE AND TROGIDAE BEETLES OF TROPICAL DECIDUOUS FOREST IN TEPEXCO, PUEBLA, MEXICO

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ABSTRACT

The necrophilous Scarabaeidae and Trogidae beetles from the tropical deciduous forest of Tepexco, Puebla, Mexico were studied. Using NTP-80 traps, 12 samples were obtained between 1989 and 1990, resulting in the collection of 12 genera, represented by 21 species. The biomass was principally made up of individuals of the species *Ateuchus rodriguezi* (DeBorre 1886), *A. halffteri* Kohlmann 1984, *Canthon cyanellus* LeConte 1859, *Coprophanaeus pluto* Harold 1869, *Canthidium puncticolle* Harold 1868 and *Omorgus rubricans* Robinson 1946, representing 182.02 g per year.

A comparison of the copro-necrophagous fauna of Scarabaeidae and Trogidae of the tropical deciduous forest in the forest studied showed a specific similarity of 53%. In Tepexco the highest diversity was recorded during the spring and summer, but in Jojutla during summer and autumn.
KEY WORDS: Coleoptera, Scarabaeidae, Trogidae, Necrophagous, Tropical Deciduous forest, Mexico.

RESUMEN

Se presenta un estudio sobre la fauna de escarabajos Scarabaeidae y Trogidae necrófagos del bosque tropical caducifolio de Tepexco, Puebla, México. Durante 1989 y 1990, usando la necrotrampa permanente del tipo NTP-80, se obtuvieron 12 muestras que capturaron 12 géneros con 21 especies. La principal biomasa corresponde a las especies *Ateuchus rodriguezi* (DeBorre 1886), *A. halffteri* Kohlmann 1984, *Canthon cyanellus* LeConte 1859, *Coprophanaeus pluto* Harold 1869, *Canthidium puncticolle* Harold 1868 y *Omorgus rubricans* Robinson 1946, que representan 182.02 g por año.

Comparando la fauna copro-necrófaga de Scarabaeidae y Trogidae del bosque tropical caducifolio estudiado, Tepexco muestra una similitud específica del 53% con su equivalente de Jojutla, Morelos, con una mayor diversidad durante la primavera y verano y menor en otoño e invierno, en cambio en Jojutla esta relación se invierte.

PALABRAS CLAVE: Coleoptera, Scarabaeidae, Trogidae, Necrófagos, Bosque tropical caducifolio, México.

INTRODUCTION

As the fifth contribution to the project "Copro-necrophagous Decomposer Entomofauna of the Mexican Transition Zone", whose objectives were set out by Morón & Terrón (1984), this study was carried out in Tepexco, in the state of Puebla, Mexico.

Site description. The study area is located in the southeast region of the state of Puebla, near its border with the state of Morelos on the lower slopes of Tlayehualco mountain. The area has rendzine-calcareous soil and tropical deciduous forest (Rzedowski, 1978) between 1,200 and 1,400 m altitude. The climate of the region is warm, subhumid $Aw_o(w)(i')$ gw" (García, 1988) with annual precipitation of 856 mm and a mean annual temperature of 22 °C.

MATERIAL AND METHODS

Sampling was carried out between May, 1989 and June, 1990 using permanent NTP-80 carrion-bait traps (Morón & Terrón, 1984). Each month the squid carrion was changed and the collector liquid was removed with all captured insect fauna. The latter was then washed with water and alcohol and separated and identified before being preserved in 70% alcohol.

All specimens collected were deposited in the collection of the Instituto de Ecología as well as in the author's collection.

RESULTS

Over the year of sampling, 574 specimens of Scarabaeidae and Trogidae were captured, these represent 12 genera and 21 species (Table 1) which are listed below:

I. Trogidae

Trox spinulosus dentibius Robinson 1940
Omorgus suberosus Fabricius 1775
Omorgus rubricans Robinson 1946
Omorgus fuliginosus Robinson 1941

II. Scarabaeidae

1. Scarabaeinae
   A) Onitini
      Coprophanaeus pluto (Harold 1863)
      Phanaeus daphnis Harold 1863

Table 1

Phenology of Scarabaeidae and Trogidae species captured in NTP-80 traps in the tropical deciduous forest of Tepexco, Puebla, Mexico.

Species	F	M	A	M	J	J	A	S	O	N
Canthon cyanellus				5	47	7	14	1	4	
C. v. corporali						1	1			
C. v. leechi					5		7		4	1
C. h. inciseus							2			
Phanaeus daphnis					1					
Ateuchus rodriguezi		2	26		120	7	24			
A. halffteri	1		24	12	27	14	26	3	9	2
C. puncticolle			9	3	9	11	35	1		
D. gibbosum					3					
Coproph. pluto					11	1	4			
D. centralis					3					
O. igusiensis					6	1	8			
O. s.p. aff.championi							1			
Onthophagus sp. 1						5	14	2		
Onthophague sp. 2							1			
Pleurophorus mioros				1						
Ataenius platensis			1				1			
O. suberosus				3			2			
Trox s. dentibius				1			1			
O. rubricans			10		20	1	4		1	
O. fuliginosus					1					
Total species/month	1	1	5	6	12	9	16	4	4	2

B) Coprini
Dichotomius centralis (Harold 1869)
Ateuchus rodriguezi (DeBorre 1886)
A. halffteri Kohlmann 1984
Canthidium puncticolle Harold 1868

C) Scarabaeini
Canthon cyanellus cyanellus LeConte 1859
C. humectus incisus Robinson 1948
C. (G.) viridis leechi Martínez et al, 1964
C. (G.) viridis corporali (Balthazar 1939)
Deltochilum gibbosum sublaeve Bates 1887

D) Onthophagini
Onthophagus igualensis Bates 1887
Onthophagus sp. aff. *championi* Bates 1887
Onthophagus sp. 1
Onthophagus sp. 2

2. Aphodiinae
A) Eupariini
Ataenius platensis (Blanchard 1843)

B) Psamodiini
Pleurophorus micros (Bates 1887)

DISCUSSION

The phenology of necrophagous Scarabaeidae and Trogidae in the tropical deciduous forest of Tepexco, Puebla is closely tied to annual changes in temperature and precipitation. When the temperature began to rise in february (20.5 °C) and march (22.7 °C) the first species, *A. halffteri* and *A. rodriguezi*, appeared. In june when the temperature rose to 24.7 °C and the monthly precipitation was 167.6 mm, 12 species were

captured. However, in july during the canícula, or little dry season, the diversity decreased to nine species, after which it increased to 16 species in august. In september the diversity decreased to four species, even though precipitation and temperature were the same as for the previous month. This level of diversity persisted through the month of october and decreased to two species in november (Fig. 1, Table 1)

Of the seven Scarabaeidae and Trogidae tribes present we observed the following: the Onitini were only active during the summer; the Coprini were active from the end of winter until autumn; the Scarabaeini appeared at the beginning of spring and continued to be active during summer and autumn; the Onthophagini, however, were only captured during the summer and at the beginning of autumn; the Trogini appeared in mid-spring and were captured until mid-autumn (Table 2).

Table 2.

Phenology of Scarabaeidae and Trogidae species captured in NTP-80 traps in the tropical deciduous forest of Tepexco, Puebla, Mexico.

Tribe	F	M	A	M	J	J	A	S	O	N	D
Coprini	X	X	X	X	X	X	X	X	X	X	
Onthophagini					X	X	X	X			
Onitini					X	X	X				
Scarabaeini		X			X	X	X	X	X	X	
Eupariini			X				X				
Psamodiini				X							
Trogini			X	X	X	X	X		X		
Total	1	2	3	3	5	5	6	3	3	2	0

Table 3.

Scarabaeidae and Trogidae species captured with NTP-80 traps at two sites in Mexico with tropical deciduous forest vegetation (data are number of individuals).

Species	Tepexco Puebla	Jojutla Morelos
Deltochilum gibbosum sublaeve	3	18
Canthon c. cyanellus	5	221
C. (G.) viridis corporali	2	116
C. (G.) viridis leechi	17	0
C. humectus incisus	2	0
Phanaeus daphnis	1	0
Coprophanaeus pluto	16	26
Ateuchus rodriguezi	179	21
A. halffteri	120	0
Dichotomius centralis	3	1
Canthidium puncticolle	68	0
Onthophagus sp. aff. *championi*	1	1
Onthophagus igualensis	15	42
Onthophagus sp. 1	21	0
Onthophagus sp. 2	1	0
Pleurophorus moros	1	0
Ataenius platensis	2	0
Omorgus suberosus	5	75
Trox spinulosus dentibius	2	0
Omorgus rubricans	36	0
Omorgus fuliginosus	1	0
Canthon indigaceus chevrolati	0	20
Pseudocanthon perplexus	0	5
Onthophagus rostratus	0	1
Onthophagus hoëpfneri	0	5
Total species	21	13
Number of individuals/Number of samples	48	52
Similarity index (QS, Sorensen 1948)	53%	

With respect to seasonal phenology, nine species coexist in the spring, 20 in the summer, six during autumn and only one species was captured during the bwinter (Fig. 2). The most important species with respect to total biomass were *A. rodriguezi* (50.12 g), *C. cyanellus* cyanellus (44.46 g), A. halffteri (33.60 g), *Coprophanaeus pluto* (20.80 g), *Canthidium puncticolle* (19.04 g) and *Omorgus rubricans* (18.00 g). These species represent 186.02 g per year and 88.77% of the annual biomass of Scarabaeidae and Trogidae at the site.

Table 4.

Percent abundance and biomass of Scarabaeidae captured in NTP-80 traps in Tepexco, Puebla and Jojutla, Morelos according to nidification patterns proposed by Halffter & Edmonds (1982).

Nidification Pattern	Jojutla, Morelos Abundance	Biomass	Tepexco, Puebla Abundance	Biomass
I	12.90	6.35	77.41	59.42
II	4.72	15.20	3.22	11.43
IV	28.90	27.06	4.55	5.38
V	53.4	51.37	14.80	23.65
I, II: subterrean paracoprid;	IV, V: roller telecoprid.			

Comparing the copro-necrophagous Scarabaeidae and Trogidae fauna we found that the fauna of the tropical deciduous forest of Tepexco has species similarity index of 53% with a similar forest in Jojutla, Morelos (Deloya *et al.* 1987; Table 3), on the other hand, the fauna of a tropical semi-evergreen forest in Sian Ka'an in Quintana Roo only has a similarity index of 28% (Morón *et al.* 1986), however seasonal diversity is greater during spring and summer in Tepexco and less in autumn and winter.

With respect to the copro-necrophagous Scarabaeinae species, Tepexco has a species similarity index of 59% when compared with the tropical deciduous forest of Jojutla and although they share six genera (*Deltochilum* Eschscholtz 1822, *Canthon* Hoffmannsegg 1817, *Coprophanaeus* Olsouf. 1824, *Canthidium* Erichson 1847, *Dichotomius* Hope 1838 and *Onthophagus* Latreille 1807) species abundance and diversity are different. In Jojutla 82% of the species abundance is represented by species with a roller telecoprid habit (nidification patterns IV and V, sensu Halffter & Edmonds, 1982) and 18% of the abundance by subterranean paracoprid species (nidification patterns I and II) (Deloya *et al.* 1987). In Tepexco however, the relation is reversed and roller telecoprids (patterns IV and V) only represent 19% of the total abundance and subterranean paracoprids (patterns I and II) represent 81% of the abundance. These differences are also directly related to the biomass at the site. Paracoprids respresent 22% of the biomass in Jojutla and 71% in Tepexco (Table 4). Finally, the annual biomass of Scarabaeidae and Trogidae in Tepexco was 209.53 g, 25.88% less than that obtained in the region of Jojutla, owing to the smaller size of species with a paracoprid habit.

CONCLUSION

The phenology of necrophagous Scarabaeidae and Trogidae in the tropical deciduous forest of Tepexco, Puebla is closely related to annual changes in temperature and precipitation. *A. rodriguezi*, *C. cyanellus*, *A. halffteri*, *C. pluto*, *C. puncticolle* and *O. rubricans* represent the most important biomass of the beetles obtained with the permanet NTP-80 carrion-bait traps, with the 88.77 % per year. In Tepexco the Scarabaeidae-Scarabaeinae species with subterranean paracoprid habit (nidifications patterns I and II) predominate.

The copro-necrophagous fauna of Scarabaeidae and Trogidae of Tepexco, Puebla, has a specific similarity of the 53 % with the Jojutla Morelos fauna and even though both necrophagous communities share

the same type of vegetation, the same latitude, experience similar annual precipitation and temperature regimes and are only separated by 46.25 km, the tropical deciduous forest at Tepexco, Puebla has a greater species diversity (21 species) than the forest in Jojutla, Morelos. Beetle species abundance and biomass in Tepexco are, however less relative to those of Jojutla. This can be attributed to the sites' different origins, since Tepexco is found in the subprovince of the Morelos plains along the neovolcanic axis at the limit of the area's transition with the high part of the Balsas Basin.

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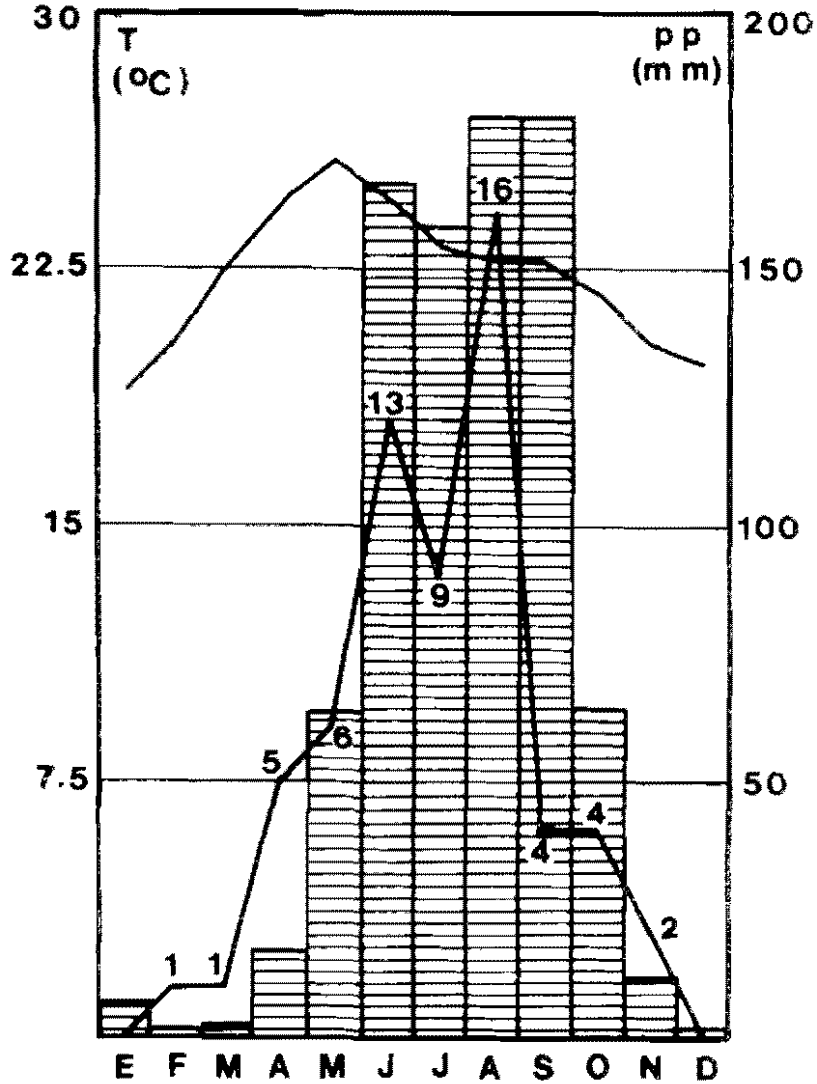

Figura 1

Phenology of necrophilous Scarabaeidae and Trogidae species of Tepexco, Puebla in relation to monthly precipitation and temperature changes over a year.

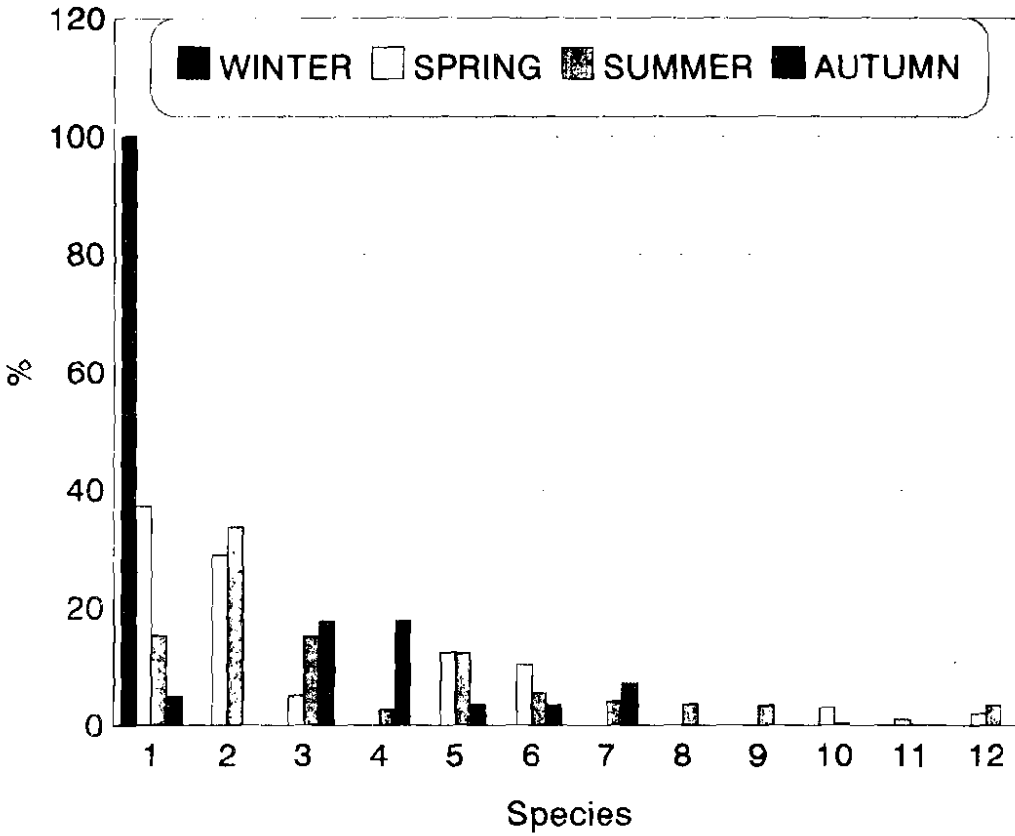

Figura 2

Seasonal distribution of necrophagous Scarabaeidae and Trogidae species in Tepexco, Puebla. 1) *A. halffteri*, 2) *A. rodriguezi*, 3) *C. cyanellus*, 4) *C. viridis leechi*, 5) *C. puncticolle*,6) *O. rubricans*, 7) *Onthophagus* sp., 8) *C. pluto*,9) *O. igualensis*, 10) *O. suberosus*, 11) *T. spinulosus dentibius* 12) Other species.