A RECONSIDERATION OF GEOMYDOECUS EXPANSUS (Duges) (Mallophaga: Trichodectidae) FROM THE YELLOW-FACED POCKET GOPHER (Rodentia: Geomyidae)[1]

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Abstract

Geomydoecus expansus is redescribed, with its occurrence recorded from 22 subspecies of *Pappogeomys castanops*; a neotype designation establishes *P. c. excelsus* as the type-host. A closely related new species, *G.* **martini**, taken from 7 subspecies of *P. castanops*, is described; the type-host is *P. c. subnubilus*. Discriminant functions, given for 2 and 3 characters for each sex, are shown to offer enhanced differentiation over single characters.

When Price and Emerson (1971) revised the genus *Geomydoecus* Ewing, they applied the name *G. expansus* (Duges) to material available from 3 subspecies of *Pappogeomys castanops* (Baird), the yellow-faced pocket gopher. At that time it was believed that *G. expansus* was probably widely distributed among *P. castanops*, and that there was little likelihood of confusion that would necessitate a neotype designation. Subsequent study of numerous specimens from all 25 subspecies of *P. castanops* recognized by Russell (1968) has shown the problem more complex than anticipated. We have not only found *G. expansus* from 22 *P. castanops* subspecies, but have recognized a closely related new species from 7 *P. castanops* subspecies. It is our intent here to redescribe *G. expansus* and to designate a neotype for it, then to describe the new species.

In the following descriptions, measured or counted characters are followed by the minimum and maximum observed values, and, in parentheses, the sample size, mean, and standard deviation. All measurments are in millimeters. Host nomenclature is that of Russell (1968). Abbreviations used for host accession numbers in the "Type-material" section are KU (University of Kansas Museum of Natural History), USNM (United States National Museum of Natural History), and CAS (California Academy of Sciences). In the "Other Material" section, a number in parentheses following a locality represents the total gophers from which lice were taken.

The discriminant functions given in this paper were calculated using

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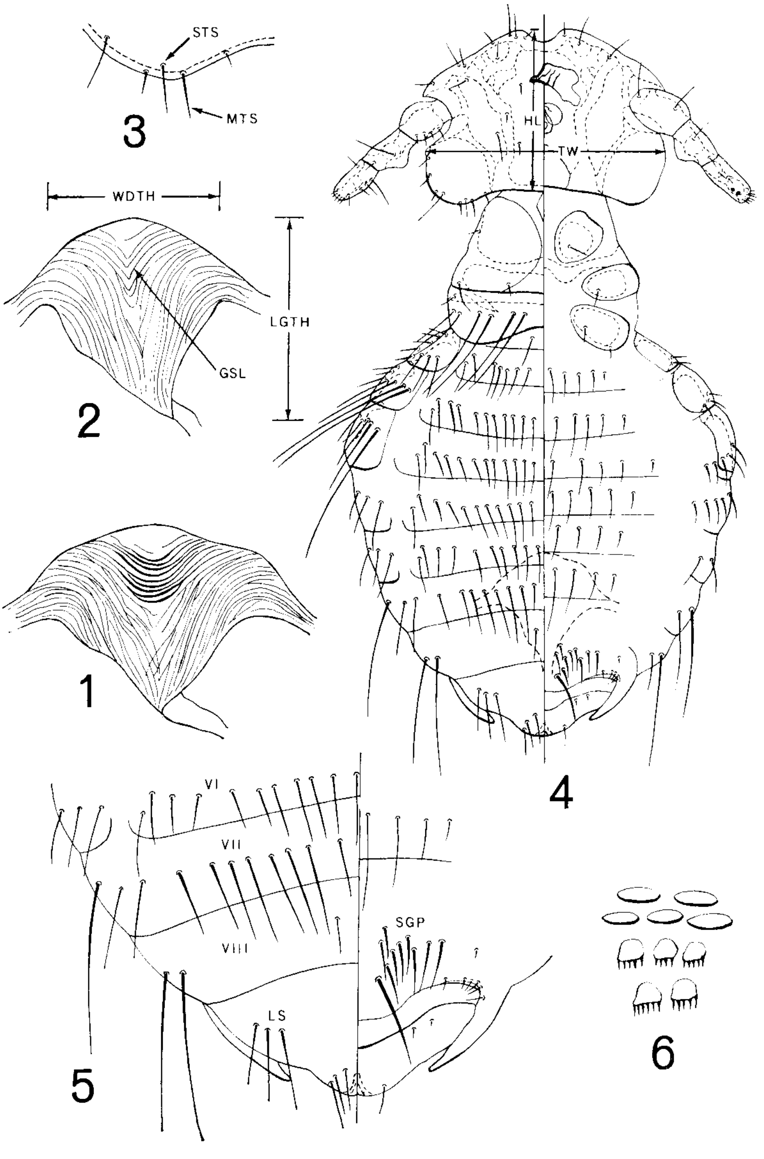
the U.C.L.A. BMD computer program BMD04M (Discriminant Analysis for Two Groups) as described in Dixon (1971). Most other calculations for this study were done using computer programs written by the junior author.

Geomydoecus expansus (Duges)
(Figs. 2–12)

Female: As in Fig. 4. Temple width (TW) 0.435–0.500 (95: 0.466 ± 0.0138); head length (HL) 0.280–0.335 (95: 0.309 ± 0.0115); submarginal and marginal temple setae (STS, MTS: Fig. 3) each 0.025–0.045 long, with STS (89: 0.037 ± 0.0048) lateroanterior to MTS. Prothorax width 0.295–0.355 (95: 0.326 ± 0.0120). Metanotum with from 2 + 2 very long setae each side, as in Fig. 4, to only 1 in each position. Tergal setae: I, 2; II, 11–16 (95: 13.6 ± 1.12); III, 16–26 (95: 21.6 ± 1.96); IV, 19–31 (94: 24.8 ± 2.65); V, 15–28 (94: 23.3 ± 2.28); VI, 16–27 (94: 21.3 ± 2.48); tergal and pleural setae on VII, 24–36 (95: 28.3 ± 2.44). Longest seta of medial 10 on tergite VI, 0.050–0.105 (95: 0.084 ± 0.0098) long; on tergite VII, 0.090–0.135 (95: 0.116 ± 0.0092), with 0–8 (95: 5.0 ± 2.59) of these longer than 0.100. Longest seta of medial pair on tergite VIII, 0.035–0.070 (95: 0.052 ± 0.0056). Last tergite with 3 lateral setae (LS: Fig. 5) close together on each side; outer seta generally shorter, 0.035–0.080 long, and middle 0.065–0.110 and inner 0.075–0.110 setae subequal in length. Sternal setae: II, 8–13 (95: 10.4 ± 1.11); III, 7–13 (94: 9.9 ± 1.19); IV, 8–13 (93: 9.8 ± 1.27); V, 6–13 (94: 9.5 ± 1.17); VI, 6–11 (95: 8.2 ± 1.06); VII, 6–10 (95: 7.8 ± 0.90). Subgenital plate (SGP: Fig. 5) with 16–25 (95: 20.2 ± 1.92) setae, with distribution and lengths as shown. Total length 1.070–1.405 (95: 1.247 ± 0.0621). Genital sac width 0.160–0.240, length 0.175–0.240, with 2–8 weak posteriorly directed angulate loops (GSL: Fig. 2), with last complete loop extending back 0.070–0.110 (93: 0.094 ± 0.0114) from anterior margin of sac; genital chamber particles lateroanteriorly as in top 2 rows of Fig. 6, medioposteriorly as in bottom 2 rows.

Male: As in Fig. 9. Temple width 0.380–0.450 (85: 0.418 ± 0.0146); head length 0.285–0.340 (85: 0.312 ± 0.0115); STS length 0.030–0.050 (82: 0.041 ± 0.0047), STS lateroanterior to blunt spiniform MTS with length 0.020–0.030 (Fig. 7). Antenna (Fig. 8) with scape length (SL) 0.150–0.200 (85: 0.180 ± 0.0091), scape medial width (SMW) 0.095–0.125 (85: 0.113 ± 0.0062), scape distal width (SDW) 0.100–0.130 (85: 0.118 ± 0.0069). Prothorax width 0.270–0.330 (85: 0.304 ± 0.0114). Tergal setae: I, 2; II, 9–13 (85: 10.8 ± 0.96); III, 12–22 (85: 17.2 ± 1.76); IV, 14–23 (83: 19.1 ± 1.81); V, 14–20 (83: 17.1 ± 1.62); VI, 9–15 (85: 11.5 ± 1.10); tergal and pleural setae on VII, 14–19 (84: 16.3 ± 0.99). Sternal setae: II, 8–13 (83: 10.0 ± 1.19); III, 7–12 (83: 10.0 ± 0.98); IV, 7–12 (85: 9.5 ± 1.10); V, 6–12 (85: 8.6 ± 1.15); VI, 5–9 (85: 6.9 ± 0.85); VII, 4–8 (84: 6.4 ± 0.76);



FIGS. 1–6. 1, *Geomydoecus martini* female: genital sac. 2–6, *G. expansus* female: 2, genital sac; 3, lateral temple setae; 4, dorsal-ventral view (without legs); 5, dorsal-ventral view of terminalia; 6, genital chamber particles.

VIII, 4–8 (85: 5.9 ± 0.57). Total length 1.110–1.370 (85: 1.262 ± 0.0495). Genitalia as in Fig. 12, with sac having 6 large spines; parameral arch (PA) width 0.125–0.150 (85: 0.143 ± 0.0062); endomeral plate (EP) width 0.060–0.075 (85: 0.072 ± 0.0037), length 0.060–0.095 (84: 0.076 ± 0.0055), shaped as in Figs. 10 and 11.

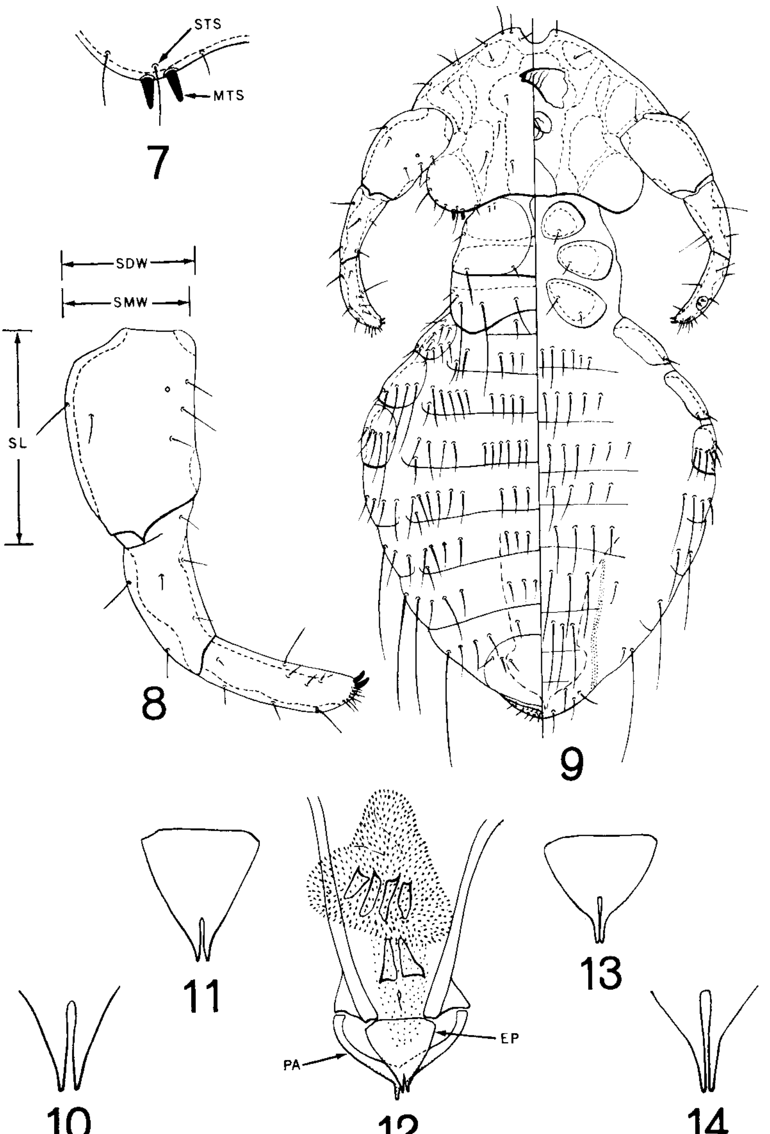
Remarks: *Geomydoecus expansus* was described by Duges (1902) based on specimens "... en abundancia en la tuza (*Geomys mexicanus*, Licht.; *Platygeomys gymnurus*, Merr.)." Hopkins and Clay (1952) interpreted both of these parenthetical host names as being probably only examples of species belonging to the group to which "tuza" belongs; moreover, *Geomys mexicanus* Lichtenstein is an unidentifiable composite which, according to Merriam (1895), represents at least 2 different genera collected from the "tableland of Mexico." Since there is no way of knowing what the type-host of *G. expansus* is, and since the type-materials are unknown, Price and Emerson (1971) applied this name to a series of lice they had from *P. castanops*. Even if type-materials should exist, the absence of known collection data would make it highly doubtful if they could be recognized.

Price and Emerson (1971) chose not to establish a neotype for *G. expansus* since it did not appear necessary for nomenclatorial stability. The discovery of a second closely related species of *Geomydoecus* on *P. castanops*, however, requires that we designate a neotype at this time. We have interpreted *G. expansus* as consistent with the description and materials used by Price and Emerson (1971) and have chosen the type-host as one occurring in Mexico in the southern portion of the *P. castanops* distribution.

Type-host: *Pappogeomys castanops excelsus* (Nelson & Goldman).

Type-material: Neotype ♀, from type-host, 2 mi E Torreon, Coahuila, 20 Jan. 1951, A. A. Alcorn (KU-40231); in collection of University of Kansas. Neoparatypes (all from type-host): 8 ♀♀, 4 ♂♂, same as neotype; 3 ♀♀, 3 ♂♂, same, except KU-40230; 32 ♀♀, 42 ♂♂, same, except 8 Jan. 1951, J. R. Alcorn (KU-40222, 40223, 40224) and 12 Jan. 1951 (KU-40226); 38 ♀♀, 57 ♂♂, 1 mi SW San Pedro de las Colonias, Coahuila, 8 Feb. 1951, J. R. Alcorn (KU-40219, 40220, 40221); 10 ♀♀, 26 ♂♂, 8 mi E 2 mi S Americanos, Coahuila, 19 May 1954, R. W. Dickerman (KU-58712, 58713, 58714); 18 ♀♀, 16 ♂♂, Tlahualilo, Coahuila, 17 Mar. 1926, E. A. Goldman (USNM-246530).

Other Material: 62 ♀♀, 56 ♂♂, *P. c. angusticeps* (Nelson & Goldman), Texas—Terrell Co., 1 mi (2), 2 mi (3), and 3 mi (4) W Dryden. 24 ♀♀, 33 ♂♂, *P. c. bullatus* (Russell & Baker), Coahuila—La Gacha (4), 12 mi SE Hacienda La Mariposa (1). 155 ♀♀, 147 ♂♂, *P. c. castanops*, Kansas—Ford Co., 4 mi E (2), 6.5 mi N 4 mi E (3), 5 mi N 2.5 mi E (3), 8.5 mi N 6 mi E (2), 7.5 mi N 6 mi E (2), and at (1) Dodge City; Hodgeman Co., 10.4 mi W Jetmore (2); Lane Co., 16 mi SSE Dighton (1); Finney Co., 3.4 mi W Kalvesta (1); Gray Co., 10 mi N 4.5 mi E Cimarron (1). 148 ♀♀, 158 ♂♂, *P. c. clarkii* (Baird), Texas—Presidio Co., Presidio (3); Coahuila—Villa Acuna (3), Rio



FIGS. 7–14. 7–12, *Geomydoecus expansus* male: 7, lateral temple setae; 8, dorsal antenna; 9, dorsal-ventral view (without legs); 10, apical portion of endomeral plate; 11, endomeral plate; 12, genitalia. 13–14, *G. martini* male: 13, endomeral plate; 14, apical portion of endodermal plate.

Grande 17 mi S Dryden (3), 26 mi NE Piedro Blanco (1), opposite Samuels, Texas (1); Chihuahua—Ojinaga (2). 47 ♀♀, 61 ♂♂, *P. c. consitus* (Nelson & Goldman), Chihuahua—1 mi S Ojinaga (4), 25 mi S Gallego (2), Station Arados (1). 109 ♀♀, 129 ♂♂, *P. c. goldmani* (Merriam), Coahuila—1 mi S Jimulco (4), Pico de Jimulco (1); Durango—Rio Nazas 6 mi NW Rodeo (5). 12 ♀♀, 8 ♂♂, *P. c. hirtus* (Nelson & Goldman), New Mexico—Bernanillo Co., Albuquerque (2); Texas—El Paso Co., El Paso (1). 42 ♀♀, 45 ♂♂, *P. c. jucundus* (Russell & Baker), Coahuila—2 mi N (1) and at (1) Monclova, 1 mi S (1) and at (1) Hermanas. 30 ♀♀, 48 ♂♂, *P. c. parviceps* Russell, New Mexico—Otero Co., 5 mi (1) and 18 mi (1) SW Alamogordo. 74 ♀♀, 85 ♂♂, *P. c. perexiguus* Russell, Coahuila—21 mi S 11 mi E Australia (5), 6 mi E Jaco (3), 18 mi S 14 mi E Tanque Alvarez (3), 3 mi N 9 mi E El Pino (1), 50 mi N 20 mi W Ocampo (1). 32 ♀♀, 42 ♂♂, *P. c. peridoneus* (Nelson & Goldman), San Luis Potosi—14 mi N 29 mi W Ciudad del Maiz (4). 216 ♀♀, 204 ♂♂, *P. c. perplanus* (Nelson & Goldman), New Mexico—Eddy Co. (1), 1 mi E (4) and 3.5 mi SE (1) Carlsbad, Carlsbad National Park (2); San Miguel Co., 2 mi W 1 mi S Conchas Dam (3); Chaves Co., Roswell (4), 7 mi N Maljamar (3); Lea Co., 3 mi N Hobbs (3); Oklahoma—Cimarron Co. (1), 7 mi N Kenton (3); Texas—Reeves Co., Pecos (1); Hansford Co., 6 mi S 3 mi W Gruver (1). 11 ♀♀, 26 ♂♂, *P. c. planifrons* (Nelson & Goldman), Tamaulipas—8 mi N (1) and 9 mi SW (1) Tula. 98 ♀♀, 128 ♂♂, *P. c. pratensis* Russell, Texas—Brewster Co., 8 mi W 3 mi S (3), 10 mi W 3 mi S (2), and at (2) Alpine; Pecos Co., Ft. Stockton (3); Terrell Co., 2 mi E Sanderson (2); Jeff Davis Co., 1 mi NE Ft. Davis (2). 19 ♀♀, 17 ♂♂, *P. c. rubellus* (Nelson & Goldman), Tamaulipas—Nicolas 56 km NW Tula (1). 27 ♀♀, 49 ♂♂, *P. c. simulans* Russell, Texas—Armstrong Co., 8 mi S 7 mi W Claude (1). 22 ♀♀, 21 ♂♂, *P. c. sordidulus* (Russell & Baker), Coahuila—1.5 mi NW Ocampo (3). 31 ♀♀, 38 ♂♂, *P. c. subnubilus* (Nelson & Goldman), Zacatecas—15 mi S Concepcion del Oro (4), 3 mi N Lulu (2); Coahuila—1 mi N Agua Nueva (1). 5 ♀♀, 2 ♂♂, *P. c. subsimus* (Nelson & Goldman), Coahuila—12 mi N 10 mi E Parras (1). 22 ♀♀, 25 ♂♂, *P. c. surculus* Russell, Durango—12 mi E (1) and at (1) La Zarca. 62 ♀♀, 75 ♂♂, *P. c. torridus* Russell, Texas—Brewster Co., 8 mi W (1), 8 mi N (2), 5 mi S (1), and 6 mi S (1) Terlinqua; Jeff Davis Co., Valentine (1), 10.5 mi NW (1) and 11 mi WSW (1) Jct. Hwy. 17 and 166.

Geomydoecus **martini** n. sp.
(Figs. 1, 13, 14)

Female: Much as for *G. expansus,* differing as follows. Temple width 0.425–0.480 (65: 0.454 ± 0.0012); submarginal temple seta length 0.035–0.060 (65: 0.051 ± 0.0053). Tergal and pleural setae on VII, 24–36 (64: 30.7 ± 2.53). Longest seta of medial 10 on tergite VII, 0.080–0.120 (65: 0.103 ± 0.0090) long, with 0–8 (63: 1.8 ± 2.25) of these longer than 0.100. Subgenital plate with 14–20 (65: 17.2 ± 1.49) setae. Genital sac length 0.160–0.225, with 6–11 (65: 8.5 ± 1.29) strong evenly rounded loops (Fig. 1), last complete loop extending back 0.060–0.120 (65: 0.083 ± 0.121) from anterior margin of sac.

Male: Likewise much as for *G. expansus*, except as follows. Submarginal temple seta length 0.045–0.065 (50: 0.052 ± 0.0047). Antenna with scape length 0.160–0.190 (50: 0.173 ± 0.0068), scape medial width 0.095–0.120 (50: 0.106 ± 0.0054), scape distal width 0.100–0.125 (50: 0.112 ± 0.0056). Tergal setae on II, 8–14 (50: 11.6 ± 1.18); V, 14–23 (50: 19.6 ± 1.76); VI, 11–18 (50: 14.3 ± 1.78). Genitalia with endomeral plate width 0.065–0.085 (50: 0.075 ± 0.0047), length 0.055–0.075 (50: 0.067 ± 0.0056), and shaped as in Figs. 13 and 14.

Discrimination: The best features for separating *G. martini* from *G. expansus* are the details of the female genital sac and the endomeral plate of the male genitalia. The genital sac of the female *G. expansus* has weak angulate loops (Fig. 2), whereas these loops for *G. martini* are more numerous, evenly rounded, and distinct across the medial portion (Fig. 1). The endomeral plate of the male *G. expansus* is almost triangular (Figs. 11, 12), with converging sides apically and almost always with pronounced separation of apical pieces (Fig. 10); that of *G. martini* has the narrowed apical portion nearly parallel-sided and usually with closely appressed apical pieces (Figs. 13, 14).

Comparison of character means using single classification analysis of variance showed that, for females, the submarginal temple seta length (STSL) and number of genital sac loops (NGSL) was greater in *G. martini* than in *G. expansus*, but that the number of subgenital plate setae (SGPS) for *G. expansus* was greater than for *G. martini*. With males, the submarginal temple seta length and number of setae on tergite VI (STG6) was greater in *G. martini*, but the endomeral plate length (EPL) was greater in *G. expansus*. In order to establish the relative reliability of these characters, a critical value for each was calculated at the point where, given normality, the probability of misidentification of either species was equal. The critical values and probabilities of misidentification were, for female characters, STSL 0.043 (0.085), NGSL 6.85 (0.100), and SGPS 18.69 (0.194), and for male characters, STSL 0.047 (0.121), STG6 12.91 (0.152), and EPL 0.071 (0.215). Because of the high probability of error using any one quantitative character, discriminant functions were calculated for the 3 characters for each sex, and for each combination of 2 of the characters for a sex, along with critical values and probabilities of misidentification as above. These functions (Table 1) substantially increased the discriminating power of the characters. To use a discriminant function to identify a specimen, sum the products of the counted or measured characters (in millimeters) and their coefficients and compare the result with the critical value given. Specimens with values greater than the critical value are identified as

TABLE 1. Discriminant functions for separating *Geomydoecus expansus* and *G. martini*.

Discriminant Function Coefficients			Discriminant Means and Standard Deviations		Critical Value for Discriminant	Probability of Misidentification
			G. expansus	*G. martini*		
Female Characters						
STSL	SGPS	NGSL				
-3.807	0.008	-0.013	-0.043 ± 0.0300	-0.164 ± 0.0259	-0.104	0.017
-3.875	0.008		0.016 ± 0.0224	-0.062 ± 0.0232	-0.023	0.044
-3.627		-0.013	-0.200 ± 0.0253	-0.292 ± 0.0240	-0.246	0.031
	0.007	-0.013	0.081 ± 0.0229	0.014 ± 0.0184	0.047	0.057
Male Characters						
STSL	EPL	STG6				
-3.318	2.391	-0.009	-0.064 ± 0.0254	-0.148 ± 0.0258	-0.106	0.050
-3.929	2.268		-0.008 ± 0.0225	-0.055 ± 0.0215	-0.023	0.076
-3.284		-0.009	-0.237 ± 0.0210	-0.299 ± 0.0232	-0.268	0.079
	2.358	-0.012	0.042 ± 0.0185	-0.012 ± 0.0233	0.015	0.093

G. expansus and those with values less than the critical value are identified as *G. martini*, with a probability for misidentification as indicated. The discriminant functions based on 3 characters were best, but lacking any one of these characters, functions based on the other 2 also represented substantial improvements over the individual characters. The theory and use of discriminant functions are discussed in Snedecor and Cochran (1967).

Remarks: The females of both *G. expansus* and *G. martini* identify most consistently as *G. expansus* in couplet 28 of the female key of Price and Emerson (1971); they are separable at this point by the differences of genital sac structure. The male of *G. expansus* identifies as such in couplet 40 of the male key of Price and Emerson (1971); that of *G. martini* comes out with *G. coronadoi* Barrera in couplet 36. At this time, pending a further study of *G. coronadoi*, we are unable to separate these males, but females of *G. coronadoi* and *G. martini* are grossly different in a number of features.

Even though 6 of the 7 *P. castanops* subspecies carrying *G. martini* are listed within the 22 from which *G. expansus* was taken, in no instance did both louse species occur on the same individual gopher and only once did they even occur in the same locality—that of *P. c. rubellus* at Nicolas 56 km NW Tula, where 6 gophers yielded *G. martini* and a seventh, *G. expansus*. Aside from this single exception, their occurrence seems to be mutually exclusive within a host subspecies. Since this study has been based on over 3,750 adult specimens of these lice taken from over 250 host animals of 23 *P. castanops* subspecies representing about 105 localities, these conclusions would appear to be fairly soundly based.

Type-host: *Pappogeomys castanops subnubilus* (Nelson & Goldman).

Type-material: Holotype ♀, from type-host, 5 mi W Ascension, Nuevo Leon, 24 Feb. 1954, R. W. Dickerman (KU-58108); in collection of University of Kansas. Paratypes (all from type-host): 8 ♀♀, 3 ♂♂, same as hototype; 2 ♀♀, 4 ♂♂, same, except KU-58109; 11 ♀♀, 16 ♂♂, same, except 23 Feb. 1954 (KU-58101, 58102, 58104, 58106, 58155); 9 ♀♀, 5 ♂♂, 1 mi W Dr. Arroyo, Nuevo Leon, 17 Feb. 1954, R. W. Dickerman (KU-58114, 58115); 4 ♀♀, 2 ♂♂, same, except 18 Feb. 1954 (KU-58116, 58117); 5 ♀♀, 13 ♂♂, Laguna, Nuevo Leon, 25 Feb. 1954, R. W. Dickerman (KU-58095, 58096, 58097); 5 ♂♂, same, except 26 Feb. 1954 (KU-58099); 17 ♀♀, 10 ♂♂, 7 mi NW Providencia, Nuevo Leon, 23 Apr. 1965, P. L. Clifton (KU-100450, 100451, 100453); 5 ♀♀, 17 ♂♂, Sierra Guadalupe 11 mi S 4 mi W General Cepeda, Coahuila, 18 Apr. 1953, G. H. Heinrich (KU-55587); 8 ♀♀, 7 ♂♂, 8 mi N La Ventura, Coahuila, 22 July 1949, W. K. Clark (KU-33135, 34590); 1 ♀, 1 ♂, same, except 17 Nov. 1949 (KU-34933); 10 ♀♀, 7 ♂♂, 22 mi SW Concepcion del Oro, Zacatecas, 5 Jan. 1964, G. W. Jones (CAS-12994, 12996).

Other Material: 168 ♀♀, 172 ♂♂, *P. c. elibatus* Russell, Coahuila—7 mi S 4 mi E Bella Union (4), 12 mi S 2 mi E Arteaga [= Artegia] (5), 4 mi S 6 mi E Saltillo (4), 2 mi E 2 mi N (2) and 12 mi W (4) San Antonio de las Alazanas. 4 ♀♀, 8 ♂♂, *P. c. goldmani*, Durango—Hacienda de Atotonilco (1); Zacatecas—Canitas (1). 23 ♀♀, 28 ♂♂, *P. c. planifrons*, Tamaulipas—Miquihuana (4), 4 mi N Jaumave (1). 85 ♀♀, 72 ♂♂, *P. c. rubellus*, Zacatecas—Villa de Cos (6); San Luis Potosi—4.5 mi SW Herradura (5); Tamaulipas—Nicolas 56 km NW Tula (6). 53 ♀♀, 67 ♂♂, *P. c. subsimus*, Coahuila—3 mi S 3 mi E Muralla (3), 2 mi N Santa Cruz (2), N Foot Sierra Guadalupe 9 mi S 5 mi W General Cepeda (1), San Antonio de Jacal (3). 46 ♀♀, 66 ♂♂, *P. c. surculus*, Zacatecas—Concepcion del Oro (4), 8 mi S Majoma (5).

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