A REVIEW OF THE GEOMYDOECUS TEXANUS COMPLEX
(MALLOPHAGA: TRICHODECTIDAE) FROM GEOMYS
AND PAPPOGEOMYS (RODENTIA: GEOMYIDAE)\(^1\)

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Abstract: Geomydocus texanus is redescribed and illustrated, with the nominate subspecies restricted to material from Geomys personatus. Five new species and subspecies of Geomydocus are described: G. texanus tropicalis from Geomys tropicalis; G. ustulati ustulati from 5 subspecies of Pappogeomyms castanops (type-host: P. c. ustulatus); G. u. clarkei from 2 subspecies of P. castanops (type-host: P. c. clarkei); G. tamaulipensis from P. c. tamaulipensis; G. subnubilus from 9 subspecies of P. castanops (type-host: P. c. subnubilus). Distinctions between these taxa are shown using qualitative and quantitative characters, and principal components analysis of quantitative characters. A key is given for identifying these 6 taxa.

Price & Emerson (1971) reported Geomydocus texanus Ewing from Geomys tropicalis Goldman and 3 subspecies of Geomys personatus True. They added 2 questionable records for 3 specimens of lice from Pappogeomyms castanops jucundus (Russell & Baker) and P. c. rubellus (Nelson & Goldman). The uncertainty of these last records was based on the paucity of material and the occurrence of these lice on a different host genus. However, since then, extensive collecting of lice from all subspecies of P. castanops recognized by Russell (1968) has shown members of the texanus-complex to occur widely among them and to be largely sympatric with the expansus-complex discussed by Price & Hellenthal (1975). The abundance of the texanus-complex material, taken from 17 P. castanops subspecies, allowed a thorough reexamination of the entire group and has resulted in the recognition of 5 new species and subspecies. It is our purpose here to describe these taxa.

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 measurements are in millimeters. In evaluating character usefulness for specific and subspecific discrimination, critical values for each character were calculated at the point where the likelihood of single character misidentification of the 2 most similar taxa was equal, given normality and equal variance, and ignoring probability of collection. For characters offering moderately good discriminating ability, these critical values and the corre-
FIG. 1–9. *Geomydones texanus texanus*: (1) ♀ marginal temple; (2) ♂ marginal temple; (3) ♀; (4) ♂; (5) ♀ genital chamber particles; (6) ♀ genital sac; (7) ♀ genital sac; (8) ♂ head and scape; (9) ♂ genitalia.
As in FIG. 4. Temple width (TW; FIG. 8) 0.435–0.490 (21: 0.455 ± 0.0144); head length (HL) 0.310–0.385 (21: 0.337 ± 0.0201); submarginal and marginal temple setae (STS; MTS; FIG. 2) 0.025–0.040 (15: 0.035 ± 0.0042) and 0.020–0.025 long, respectively, with STS variably slightly more laterad to mediad of blunt spiniform inner MTS. Antenna with scape length (SL; FIG. 8) 0.160–0.195 (19: 0.173 ± 0.0083), scape medial width (SMW) 0.105–0.120 (19: 0.111 ± 0.0043), scape distal width (SDW) 0.110–0.125 (19: 0.117 ± 0.0043). Prothorax width 0.315–0.370 (23: 0.339 ± 0.0156). Tergal setae: I, 2; II, 13–18 (25: 16.1 ± 1.36); III, 19–27 (24: 23.5 ± 1.61); IV, 23–28 (24: 25.6 ± 1.50); V, 19–23 (24: 22.2 ± 1.64); VI, 15–20 (24: 17.4 ± 1.24); tergum and pleural setae on VII, 19–27 (24: 22.7 ± 1.97). Pleural seta x on IV usually more than 1.4 × longer than tergal seta y (FIG. 4). Sternal setae: II, 8–12 (25: 9.7 ± 1.10); III, 10–15 (23: 11.9 ± 1.56); IV, 12–17 (22: 14.5 ± 1.50); V, 9–13 (24: 11.5 ± 0.98); VI, 8–12 (25: 10.0 ± 0.96); VII, 6–10 (25: 8.0 ± 0.98); VIII, 4–7 (25: 5.6 ± 0.82). Total length 1.195–1.505 (21: 1.360 ± 0.0819).

Genitalia as in FIG. 9, with sac having large spines; parameral arch (PA) width 0.160–0.190 (25: 0.178 ± 0.0085); endomeral plate (EP) width 0.085–0.100 (25: 0.094 ± 0.0041), length 0.080–0.110 (25: 0.096 ± 0.0064), shaped as in FIG. 10, triangular, apically tapered without distinct division.

*Geomydœcus texanus texanus* Ewing FIG. 1

1–10, 16

♀. Temple width 0.465–0.510 (14: 0.486 ± 0.0174); head length 0.325–0.360 (14: 0.339 ± 0.0101); submarginal temple seta length 0.020–0.040 (9: 0.030 ± 0.0062); prothorax width 0.345–0.380 (14: 0.359 ± 0.0103); sternal setae on III, 10–13 (12: 11.4 ± 0.90).

♂. Temple width 0.450–0.490 (9: 0.465 ± 0.0144); head length 0.325–0.385 (9: 0.345 ± 0.0181); submarginal temple seta length 0.025–0.035 (6: 0.031 ± 0.0038); scape length 0.175–0.195 (7: 0.181 ± 0.0074); scape medial width 0.110–0.120 (7: 0.115 ± 0.0034); prothorax length 0.335–0.370 (11: 0.351 ± 0.0104). Sternal setae: II, 8–11 (13: 9.3 ± 0.94); III, 10–12 (12: 10.9 ± 0.79). Total length 1.355–1.505 (9: 1.429 ± 0.0474); parameral arch width 0.175–0.190 (13: 0.184 ± 0.0057).


*Geomydœcus texanus tropicalis* Price & Hellenthal, n. sp. FIG. 11

Type-host: *Papagoemys castanospermus usulatius* (Russell & Baker).

♀. Much as for *G. texanus*, except as follows. Temple width 0.430–0.520 (87: 0.484 ± 0.0243); head length 0.280–0.350 (87: 0.318 ± 0.0154); prothorax width 0.310–0.380 (88: 0.347 ± 0.0168). Tergal setae: II, 10–18 (88: 14.0 ± 1.61); III, 17–25 (88: 21.0 ± 1.96); IV, 17–28 (87: 22.7 ± 2.36); V, 16–27 (89: 21.3 ± 2.20); VI, 17–28 (89: 21.1 ± 2.04); tergal and pleural setae on VII, 23–34 (90: 28.1 ± 1.99). Longest seta of medial 10 on tergite VI, 0.055–0.095 (86: 0.074 ± 0.0080); on tergite VII, 0.095–0.145 (87: 0.115 ± 0.0097), with 0–8 (84: 4.6 ± 2.81) of these longer than 0.100. Length of 3 lateral setae on each side of last tergite 0.070–0.125. Sternal setae: II, 7–12 (90: 9.1 ± 1.04); III, 6–12 (88: 9.0 ± 1.06); IV, 10–15 (89: 12.8 ± 1.11). Subgenital plate with 19–31 (90: 22.9 ± 2.25) setae, with distribution and lengths much as in FIG. 17. Total length 1.010–1.465 (86: 1.288 ± 0.0993). Genital sac with 0–5 loops, with last complete loop extending back as far as 0.105 from anterior margin of sac.

♂. Much as for *G. texanus*, except as follows. Temple width 0.400–0.495 (73: 0.457 ± 0.0238); head length 0.285–0.360 (73: 0.329 ± 0.0182); scape length 0.145–0.190 (73: 0.175 ± 0.0115); prothorax width 0.300–0.365 (72: 0.337 ± 0.0155). Tergal setae: II, 10–17 (73: 12.8 ± 1.51); III, 16–26 (73: 20.5 ± 1.89); IV, 19–27 (72: 22.6 ± 1.76); V, 14–26 (73: 18.8 ± 1.96). Pleural seta x on IV as long as to somewhat longer than tergal seta y. Sternal setae on III, 7–12 (73: 9.4 ± 1.09). Total length 1.175–1.505 (72: 1.363 ± 0.0779). Parameral arch width 0.160–0.190 (73: 0.177 ± 0.0087); endomeral plate length 0.065–0.100 (72: 0.096 ± 0.0066), variably shaped as in FIG. 11 or 12.
FIG. 10–17. ♂ endomeral plate: (10) Geomydocerus texanus texanus; (11) G. ustulati ustulati; (12) G. tamaulipensis; (13) G. subnubili. (14) G. subnubili ♀ metanotum and abdomen. (15) G. tamaulipensis ♂ dorsolateral abdominal segment IV. ♂ terminalia: (16) G. texanus texanus; (17) G. tamaulipensis.
**Diagnosis**: The best features for separating *G. ustulati* from *G. texanus* are associated with the chaetotaxy of the ♀ subgenital plate and the shape of the ♂ endosomal plate. With ♀ *G. ustulati*, the lateralmost setae of each subgenital plate cluster have their line of alveoli nearer the most anterior of the other setae and these setae overlap considerably the short setae lining the inner margin of the gonapophyses (Fig. 16 vs Fig. 17). The endosomal plate of the ♂ *G. ustulati* is somewhat shorter, variably shaped, but more broadly rounded apically (Fig. 11 or 12 vs Fig. 10). The ♀ *G. ustulati* also tends to have fewer tergal, sternal, and subgenital plate setae, and the ♂ fewer tergal setae. For ♀ critical values for separation and probabilities of misidentification for the best discriminating quantitative characters were setae on sternite III 10.208 (0.14), setae on sternite IV 14.023 (0.16), and setae on the subgenital plate 25.847 (0.17). For ♂, the best character was setae on tergite II 14.472 (0.17).

**Geomydectus ustulati ustulati** Price & Hellenthal

♀. Temple width 0.470–0.520 (57: 0.498 ± 0.0118); head length 0.300–0.350 (57: 0.325 ± 0.0112); prothorax width 0.335–0.380 (58: 0.357 ± 0.0099); total length 1.155–1.465 (57: 1.333 ± 0.0748).

♂. Temple width 0.450–0.495 (50: 0.470 ± 0.0134); head length 0.315–0.360 (50: 0.337 ± 0.0124); scape length 0.165–0.190 (50: 0.181 ± 0.0063); prothorax width 0.330–0.365 (49: 0.346 ± 0.0091); total length 1.260–1.505 (49: 1.401 ± 0.0555).


**Geomydectus ustulati clarkii** Price & Hellenthal, *n. subsp.*

Type-host: *Pappogeomys castanops clarkii* (Baird).

♀. Temple width 0.430–0.490 (30: 0.456 ± 0.0166); head length 0.280–0.330 (30: 0.303 ± 0.0118); prothorax width 0.310–0.350 (30: 0.328 ± 0.0101); total length 1.010–1.345 (29: 1.200 ± 0.0808).
Temple width 0.400-0.450 (23: 0.429 ± 0.0151); head length 0.285-0.330 (23: 0.309 ± 0.0130); scape length 0.145-0.175 (23: 0.162 ± 0.0087); prothorax width 0.300-0.335 (23: 0.319 ± 0.0101); total length 1.175-1.385 (23: 1.283 ± 0.0552).

Diagnosis: Both sexes of G. u. clarkii tend to be smaller than G. u. ustulati in most dimensions. For ♀♀, critical values for separation and probabilities of misidentification for the best discriminating characters were temple width 0.477 (0.06), prothorax width 0.343 (0.08), and head length 0.314 (0.17). For ♂♂, the best characters were temple width 0.449 (0.07), prothorax width 0.333 (0.08), scape length 0.171 (0.09), head length 0.323 (0.14), and total length 1.342 (0.14).


Geomyodescus tamaulipensis Price & Hellenthal, n. sp. FIG. 12, 15, 17

Type-host: Pappogeomyces castanosps tamaulipensis (Nelson & Goldman).

♀ Much as for G. ustulati, except as follows. Tergal setae: II, 13-20 (21: 17.1 ± 1.95); III, 23-27 (21: 24.9 ± 3.11); IV, 25-30 (21: 27.1 ± 1.70); V, 23-28 (21: 25.7 ± 1.38); VI, 24-28 (21: 26.5 ± 1.21); tergal and pleural setae on VII, 29-37 (20: 34.3 ± 2.12). Longest seta of medial 10 on tergite VI, 0.085-0.110 (21: 0.098 ± 0.0074); on tergite VII, 0.130-0.180 (21: 0.151 ± 0.0154), with all 8 longer than 0.100 (FIG. 17). Length of 3 lateral setae on each side of last tergite, 0.090-0.135.

♂ Much as for G. ustulati, except as follows. Tergal setae: II, 18-20 (2: 19.0 ± 1.41); III-IV, 25-27 (2: 26.0 ± 1.41). Pleural setae x on IV equal to or shorter than tergal setae y (FIG. 15). Parameral arch width 0.165; endomeral plate as in FIG. 12.

Diagnosis: The larger number of tergal setae in both sexes, in combination with longer setae in various positions on the ♀♀, enables G. tamaulipensis to be separated from both G. texanus and G. ustulati. For ♀♀, critical values for separation and probabilities of misidentification for the best discriminating characters were longest seta on tergite VII 0.134 (0.13), setae on tergite VII 32.125 (0.14), and setae on tergite VI 24.989 (0.16). For ♂♂, the very small sample size allowed for too great an error in estimation of the sample means to warrant calculation of character use criteria; however, the number of setae on tergite II appears to show the most promise.

Material examined: Holotype ♀, P. c. tamaulipensi-
G. subnubilis has a distinctively different endomeral plate, as well as a tendency for shorter and fewer abdominal setae. For ♀♀, critical values for separation and probabilities of misidentification for the best discriminating characters were setae on tergite II 12.029 (0.05), setae on sternite III 7.407 (0.07), longest seta on tergite VII 0.097 (0.09), longest seta on tergite VI 0.065 (0.09), and setae longer than 0.100 on tergite VII 1.445 (0.10). For ♂♂, the best values were setae on sternite III 7.754 (0.09), setae on tergite II 11.046 (0.13), and setae on sternite VI 8.551 (0.15).

Material examined: Holotype ♀, P. c. subnubilus, 15 mi. (24.0 km) S of Concepcion del Oro, Zacatecas, Mexico, 24.I.1954, R. W. Dickerman, KU-58130; in collection of the University of Kansas. Paratypes (all from type-host): 4 ♀♀, 5 ♂♂, same as holotype; 15 ♀♀, 9 ♂♂, same, except KU-58128, 58129; 8 ♀♀, 3 mi. (4.8 km) N of Lulu, Zacatecas, Mexico, 27-28.V.1940, E. V. Miller, UC-91270, 91271; 17 ♀♀, 10 ♂♂, 22 mi. (35.2 km) SW of Concepcion del Oro, Zacatecas, Mexico, 5.I.1964, G. W. Jones, CAS-12994, 12996; 11 ♀♀, 10 ♂♂, 8 mi. (12.8 km) N of La Ventura, Coahuila, Mexico, 22.VII. and 17.XI.1949, W. K. Clark, KU-33135, 34590, 34933; 1 ♀, 2 ♂♂, Sierra Guadalupe, 11 mi. (17.6 km) S, 4 mi. (6.4 km) W of General Cepeda, Coahuila, Mexico, 18.IV.1953, G. H. Heinrich, KU-55587; 14 ♀♀, 5 ♂♂, 1 mi. (1.6 km) N of Agua Nueva, Coahuila, Mexico, 18.VII.1949, W. K. Clark, KU-33127; 7 ♀♀, 4 ♂♂, Laguna, Nuevo Leon, Mexico, 25-26.II.1954, R. W. Dickerman, KU-58095, 58096, 58097, 58099; 19 ♀♀, 20 ♂♂, 5 mi. (8.0 km) W of Ascension, Nuevo Leon, Mexico, 23-24.II.1954, R. W. Dickerman, KU-58101, 58102, 58104, 58106, 58108, 58109, 58155; 22 ♀♀, 19 ♂♂, 1 mi. (1.6 km) W of Dr. Arroyo, Nuevo Leon, Mexico, 17-18.II.1954, R. W. Dickerman, KU-58114, 58115, 58116, 58117; 8 ♀♀, 4 ♂♂, 7 mi. (11.2 km) NW of Providencia, Nuevo Leon, Mexico, 23.IV.1965, P. L. Clifton, KU-100450, 100451, 100453. Other material: 89 ♀♀, 82 ♂♂, P. c. elibatus Russell, Mexico, Coahuila, 7 mi. (11.2 km) S, 4 mi. (6.4 km) E of Bella Unión (4), 12 mi. (19.2 km) S, 2 mi. (3.2 km) E of Arteaga (5), 4 mi. (6.4 km) S, 6 mi. (9.6 km) E of Saltillo (4), 3 mi. (4.8 km) NE (1) and 12 mi. (19.2 km) W (4) of San Antonio de las Alazanas. 40 ♀♀, 36 ♂♂, P. c. goldmani (Merriam), Mexico, Coahuila, 1 mi. (1.6 km) S of Jimulco (4), “Pico de Jimulco” (1); Zacatecas, Canitas (1); Durango, Hacienda de Atotonilco (1). 22 ♀♀, 34 ♂♂, P. c. perexiguis Russell, Mexico, Coahuila, 21 mi. (33.6 km) S, 11 mi. (17.6 km) E of Australia (4). 17 ♀♀, 21 ♂♂, P. c. peridonous (Nelson & Goldman), Mexico, San Luis Potosí, 29 mi. (46.4 km) W, 14 mi. (22.4 km) N of Ciudad del Maiz (4). 41 ♀♀, 29 ♂♂, P. c. planifrons (Nelson & Goldman), Mexico, Tamaulipas, Miquihuana (4), 4 mi. (6.4 km) N of Juamave (1), 8 mi. (12.8 km) N (1) and 9 mi. (14.4 km) SW (1) of Tula. 73 ♀♀, 83 ♂♂, P. c. rubellus, Mexico, Zacatecas, Ville de Cos (7); San Luis Potosi, 4.5 mi. (7.2 km) SW of Herradura (5); Tamaulipas, Nicolas, 56 km NW of Tula (7). 25 ♀♀, 27 ♂♂, P. c. subsimilis (Nelson & Goldman), Mexico, Coahuila, 2 mi. (3.2 km) N of Santa Cruz (2), 3 mi. (4.8 km) S, 3 mi. (4.8 km) E of Muralla (2), San Antonio de Jaral (3), N foot Sierra Guadalupe, 9 mi. (14.4 km) S, 5 mi. (8.0 km) W of General Cepeda (1). 19 ♀♀, 19 ♂♂, P. c. succuluses Russell, Mexico, Zacatecas, Concepcion del Oro (4), 8 mi. (12.8 km) S of Majoma (4).

The taxa comprising the texanus-complex generally showed considerable variation and some overlap for even the best quantitative characters. However, such overlap is not unexpected given the individual variability and moderate sample sizes. Qualitative characters, though subtle, also supported our separations.

Because of the subtle nature of the characters required for distinguishing taxa, we felt it desirable to find further supporting evidence. Principal components analysis of the pooled quantitative data offered added support for our separations. Using the centered R-technique as described by Orloci (1967) for 28 ♀ characters and for 23 ♂ characters, the first 3 components were found to account for 65% of the ♀ variation and for 73% of the ♂ variation.

Scattergrams with coordinates representing the 1st, 2nd, and 3rd principal axes in reduced character space for each sex all generally supported our separation of taxa. The best separations were achieved by graphing the 1st and 2nd axes for ♀♀ and the 1st and 3rd axes for ♂♂ (FIG. 18).

Members of all 6 taxa encompassed within the texanus-complex key to couplet 30 as G. texanus in both the ♀ and ♂ keys of Price & Emerson (1971). The following modifications of these keys will enable the identification of most specimens included therein. As would be anticipated when one is dealing with such a large number of specimens that in most cases do not demonstrate profound qualitative differences between taxa, character ranges tend to overlap to a degree and certain individuals will cause difficulty in proper identification. Overall character evaluation has convinced us of the validity of our taxa, but we wanted to caution the users of
our keys to verify their identifications with the host records.

Anyone identifying Geomydiosus taken from P. castanops should be aware that 2 other species, G. expansus (Duges) and G. martini Price & Hellenthal, also occur commonly on these gophers. A study of these lice, which are grossly separable from those in the texanus-complex, has been reported by Price & Hellenthal (1975).

**KEY TO OF THE texanus-COMPLEX**

30. Temple setae close to FIG. 2, with submarginal temple setae occasionally extending to or slightly beyond apex of marginal temple seta; temple width greater than 0.41; genitalia width 0.16 or more, grossly shaped as in FIG. 9 (texanus-complex)...........30a

Temple setae with submarginal temple seta extending well beyond apex of marginal temple seta; head width 0.41 or less; genitalia width 0.15 or less, grossly shaped otherwise........ewingi

30b. Pleural seta x on both sides of IV more than 1.4 length of tergal seta y (FIG. 4); endomeral plate usually apically narrowed, as in FIG. 10; on Geomys..........................texanus........30c

Pleural seta x on both sides of IV less than 1.4 length of tergal seta y; endomeral plate usually apically broader (FIG. 11, 12); on Pappogeomys........30d

30c. Prothorax width 0.34 or greater; total length 1.37 or more; on G. personatus..........................texanus texanus

Prothorax width under 0.34; total length under 1.37; on G. tropicalis..........................texanus tropicalis

30d. Tergite II with 18 or more setae; tergite III with more than 24 setae.....................................tamaulipensis

Tergite II with up to 17 setae; tergite III with 24 or fewer setae.....................................usutalati

30e. Head width 0.45 or more; prothorax width 0.33 or more; scape length over 0.17........usutalati

Head width under 0.45; prothorax width 0.33; scape length 0.17 or less.............................usutalati clarkii

30a. Genital chamber sac varying from that shown in FIG. 6 to that in FIG. 7, with prominent lines converging medially (texanus-complex)..................30a

Genital chamber sac often faintly lined, without lines so obviously converging medially..................31

30b. Metanotum usually with only 1 + 1 medial very long setae, rarely with 2 + 1; generally shorter abdominal setae (FIG. 14), with 1 or fewer of medial 10 on tergite VII over 0.10 long; tergite II with up to 12 setae, sternite III with fewer than 8 setae........subnubli

Metanotum often with 2 + 2 medial very long setae, less often 2 + 1; generally longer abdominal setae (FIG. 3), usually 2 or more of medial 10 on tergite VII over 0.10 long; tergite II with more than 12 setae, sternite III with 8 or more..................30b

30b. Most lateral setae of each subgenital plate cluster not extending greatly beyond bases of short setae on inner margin of gonapophyses (FIG. 16) and usually with 25 or more total setae on sternites III–IV; on Geomys..........................texanus........30c

Most lateral setae of each subgenital plate cluster extending at least to tips of short setae on inner margin of gonapophyses (FIG. 14, 17), or, if doubtfull, usually 24 or fewer total setae on sternites III–IV; on Pappogeomys........30d

30d. Over 100 total setae on tergites III–VI; longest seta of medial 10 on tergite VII usually 0.15 or more; over 31 tergal and pleural setae on VII..........................tamaulipensis

Under 100 total setae on tergites III–VI; longest seta of medial 10 on tergite VII usually under 0.15; only up to 31 tergal and pleural setae on VII.....................................usutalati

30e. Head width 0.48 or more; prothorax width over 0.34........usutalati

Head width under 0.48; prothorax width 0.34 or less..................usutalati clarkii

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**LITERATURE CITED**


