Heteromys gaumeri. By Cheryl A. Schmidt, Mark D. Engstrom, and Hugh H. Genoways

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Heteromys Desmarest, 1817

Heteromys Desmarest, 1817:181. Type species Mus anomalus Thompson, 1815.

CONTEXT AND CONTENT. Order Rodentia, Suborder Sciuromorpha, Superfamily Geomyoidae, Family Heteromyidae, Subfamily Heteromyinae.

The genus Heteromys includes several to ten species, depending on authority consulted, arranged in two subgenera. The subgenus Heteromys includes H. anomalus, H. australis, H. desmarestianus, H. gaumeri, and H. goldmani; the subgenus Xydomys includes H. nelsoni and H. oreaster. A key to species follows (modified from Goldman, 1911; Hall, 1981):

1 Adult pelage composed of soft bristles, resembling juvenile pelage of other members of the subfamily. 
2 Adult pelage composed of stiff bristles or spines
3 (1) Ears edged with white, posterior ends of premaxillae extending beyond posterior margins of nasals, posterior molars narrower than premolars; H. oreaster
   (2) Ears without white edges, posterior ends of premaxillae flush with posterior margins of nasals, posterior molars equal to or broader than premolars; H. nelsoni
5 (4) Length of tail usually less than 145 mm in adults and about equal to length of head and body, underhairs on dorsum grayish; H. australis
   (5) Length of tail usually less than 145 mm in adults and greater than length of head and body, underhairs on dorsum dull orange-buff; H. anomalus
6 (4) Length of head and body usually greater than 140 mm and length of tail greater than 170 mm in adults, underhairs on dorsum grayish, lateral line absent; H. goldmani
5 (4) Length of head and body usually less than 140 mm and length of tail less than 170 mm in adults, underhairs on dorsum orange-buff, narrow lateral line present; H. desmarestianus

Heteromys gaumeri Allen and Chapman, 1897

Gaumer’s Spiny Pocket Mouse

Heteromys gaumeri Allen and Chapman, 1897:9. Type locality “Chichen-Itza, Yucatan, Mexico.”

CONTEXT AND CONTENT. Context as noted above for genus. Subgenus Heteromys, desmarestianus species group. H. gaumeri is monotypic (Engstrom et al., 1987; Goldman, 1911).

DIAGNOSIS. Heteromys gaumeri differs from other Heteromys by the presence of hair on the posterior portion of the sole of the hind foot, which is naked in all other species in the genus (Genoways, 1973; Goldman, 1911). H. gaumeri is geographically isolated from all other heteromyines except H. desmarestianus, with which it might overlap on the southern portion of the Yucatán Peninsula (Engstrom et al., 1987; Jones et al., 1974). Morphologically, H. gaumeri is distinguished from H. desmarestianus by averaging smaller in most external and cranial measurements; having relatively large auditory bullae; having a broad, bright ochraceous (orange buff) lateral line extending onto cheeks and ankles (a narrow pale-ochraceous lateral line often is present in H. desmarestianus, but seldom extends onto cheeks and ankles); having a relatively well-haired tail with a conspicuous terminal tuft (the tail in H. desmarestianus is sparsely haired, without a conspicuous terminal tuft); and in having a baculum with a relatively narrow shaft (Engstrom et al., 1987; Genoways, 1973; Goldman, 1911). H. gaumeri has a diploid number of 56 chromosomes whereas H. desmarestianus and all other members of the subgenus Heteromys have a diploid number of 60 (Engstrom et al., 1987; Rogers, 1989).

GENERAL CHARACTERS. Heteromys gaumeri (Fig. 1) is a medium-sized orange-buff to gray spiny pocket mouse. In general coloration, it resembles Lomys pictus and L. spectabilis more than other species of Heteromys. Engstrom et al. (1987:301) described H. gaumeri (Figs. 1, 2) as follows: “Dorsal coloration of adults ranges from dark to medium gray, with heavy admixture of orange buff hairs lending an overall ochraceous cast to the otherwise gray dorsum (adults in worn pelage appear more ochraceous and molting individuals often have a 'salt and pepper' appearance); rich orange buff lateral line, usually broad and conspicuous, extending from cheeks to base of tail, ochraceous hairs often extending onto dorsal and ventral surfaces of ankle; margins of forearm orange buff, interrupted on dorsal surface by white line; venters and feet white; tail well haired, grayish brown above, dull white below, with conspicuous terminal tuft of hairs; ears dusky, lightly edged with dull white; sole of hind foot haired, posteriorly. Subadults medium to dark gray above, dorsum without ochraceous hairs; ochraceous lateral line faint and narrow. Juvenile pelage similar to that of subadults, but spiny hairs on dorsum absent. Tail longer than head and body; soles of hind feet with six tubercles; body size medium for the genus. Skull size medium, with relatively large auditory bullae; lower permanent premolar with three lophs; upper and lower molars with three lophs, enamel island formed between metaloph (id) and cinclus disappearing nearly with wear.”

In Gaumer’s spiny pocket mouse, males average larger than females for most external and cranial characters, however, sex accounts for only a minor component (average 0.9%) of total variance within samples. Most external and cranial measurements vary significantly with age and age contributes the major component (average of 53.1%) of total within-sample variance. Although levels of age and sexual variation are comparable to other heteromyines, most mensural and pelage characters do not vary geographically. In contrast to other heteromyines, those characters that are significantly heterogeneous among localities appear to lack any spatial patterns (Engstrom et al., 1987).

Means and ranges (in parentheses) of selected external and cranial measurements (in mm) of adult males and females (Engstrom et al., 1987) are: total length, 261.2 (235 to 288); length of tail, 145.5 (137 to 159); length of hind foot, 34.2 (32 to 36); length of ear, 17.4 (17 to 19); greatest length of skull, 35.2 (33.9 to 37.5); zygomatic breadth, 16.1 (15.3 to 16.7); mastoid breadth, 15.3 (14.8

Fig. 1. Adult male Heteromys gaumeri from 27.5 km S Constitucion, Campeche, Mexico. Photograph by M. D. Engstrom.
to 15.9; length of nasals, 14.3 (13.2 to 15.6); length of maxillary toothrow, 4.9 (4.7 to 5.2); depth of braincase, 9.0 (8.5 to 9.5). Means and ranges (in parentheses) of weights (in g) for four adult males and six adult females (Birney et al., 1974) are, respectively, 70.7 (62.0 to 85.4) and 56.6 (43.2 to 65.3).

**DISTRIBUTION.** *Heteromys gaumeri* is endemic to the Yucatán Peninsula and has been taken there at elevations from sea level to 100 m. The geographic range of *H. gaumeri* (Fig. 3) includes: northern Belize; El Petén, Guatemala; eastern Tabasco, Mexico; and the Mexican states of Campeche, Quintana Roo, and Yucatán (Dowler and Engstrom, 1980; Engstrom et al., 1987; Izor and McCarthy, 1984; Jones et al., 1974; Ryan, 1960).

**FOSSIL RECORD.** Álvarez (1982) reported fossil remains (primarily postcranial material and mandibles) of *H. gaumeri* from Pleistocene and Holocene cave deposits in Loltún, Yucatán. Hatt et al. (1953) reported sub-Recent deposits from several other caves in the state of Yucatán.

**FORM.** The dental formula of *H. gaumeri* is i 1/1, c 0/0, p 1/1, m 3/3, total 20. The upper premolar consists of a protoloph, metoloph, and posterior cingulum. The protoloph and metoloph are each composed of three cusps and the two lophs are separated by a T-shaped median valley of enamel, the lingual portion of which persists in some specimens until they are old adults. The posterior cingulum is well-developed and is separated from the hypocone of the metoloph by a lingual re-entrant angle of enamel which, upon wear, forms an island of enamel surrounded by dentine. This island persists for some time with further wear, but does not persist as long as the enamel valley between the protoloph and metoloph (Genoways, 1973).

The lower premolar is composed of three lophs, an anterior cingulum, protolophid, and metolophid. The anterior cingulum is well-developed and composed of two or more cusps. The protolophid comprises three united cusps, anteroconid, protoconid, and mesoconid. With wear, the anteroconid is the first cusp to be united (along its lingual margin) to the anterior cingulum. The metolophid is composed of two united cusps and is separated from the protolophid by a deep, median valley of enamel. There is no posterior cingulum (Genoways, 1973).

The upper and lower molars are composed of three lophs(ids), a protoloph(id), metoloph(id), and posterior (upper) or anterior (lower) cingulum. The cingulum is well-developed in both the upper and lower molars; it is nearly as long as the metoloph and about half the length of the metolophid. The cingulum is connected to the metolophid along the lingual margin of the tooth, but separated from that loph(id) along the labial margin at early stages of wear. The two loph(ids) are united along their labial margins as wear progresses, isolating one or more islands of enamel between them. These islands disappear with further wear, and, in the upper molars, persist for a much shorter period of time in *H. gaumeri* than in *H. desmarestianus* (Genoways, 1973).

The baculum is similar to that of *H. desmarestianus* and has
a broad base comprising about one-third the total length of the bone. A narrow oval shaft (almost needle-like in some specimens) makes up the remaining two-thirds and ends in a slightly upturned tip. Selected bacular measurements (in mm) of two adult H. gaumeri are: length of baculum, 8.1, 8.8; height of base, 1.65, 1.75; and width of base, 1.25, 1.45 (Genoways, 1973).

Soles of the hind feet in H. gaumeri have six plantar tubercles and are haired posteriorly (Genoways, 1973; Goldman, 1911). Over-hairs taken from the dorsum of the body are widely and deeply troughed on the dorsal surface. The ventral hair surface is domed, but flattened near the ridges of the dorsal trough. Individual hairs consist of a narrow base that quickly flares to a broad shaft and then tapers gradually to the tip. Overhairs of H. gaumeri are longer and wider than other species of Heteromys; lengths and widths (in mm) of individual hairs range from 12.5 to 14.0 and 0.26 to 0.37, respectively (Homan and Genoways, 1978).

REPRODUCTION. Heteromys gaumeri appears to have a relatively distinct breeding season beginning near the end of the dry season, continuing through the wet season, and perhaps ending in January. Reproduction appears to be "asynchronous" with females in all stages of reproduction present in one population. Testes sized of subadult and adult H. gaumeri caught between 23 April and 10 May ranged (in mm) from 6 by 3 for a subadult to 21 by 13 for an adult. Four of 11 females collected during the same period were pregnant (Birney et al., 1974). A pregnant female taken on 26 December and males with enlarged testes in March, April, July, and August were reported by Genoways (1973). None of seven females collected in Tabasco in July was pregnant, although both scrotal and nonscrotal males were present in the same population (Dowler and Engstrom, 1988).

Gaumer (1917) stated that females of H. gaumeri gave birth to four young, although litter sizes ranging from two to four have subsequently been reported (Birney et al., 1974; Genoways, 1973).

ECOLOGY. Heteromys gaumeri occurs in a variety of habitats on the Yucatan Peninsula from tall to medium-height subdeciduous-saprennial tropical rainforest in the south and east, to short tropical deciduous forest and thorn forest in the north and northwest (Miranda and Hernandez X., 1963). This species often is common in cultivated areas. H. gaumeri has been reported from the following habitats: herbaceous vegetation along roadsides and bordering sugarcane fields in Yucatan and Quintana Roo (Hatt and Villa, 1950); dense thorn forest and cornfields surrounded by thorn forest in Yucatan (Birney et al., 1974); secondary deciduous forest and brushy areas near a river in eastern Tabasco (Dowler and Engstrom, 1988); along fallen logs and in dense vegetation at the base of trees within primary forest in Peten, Guatemala (Ryan, 1960); and in riparian deciduous seasonal forest in Belize (Izor and McCarthy, 1984). In Belize, H. gaumeri was collected in broadleaf forest characterized by the occurrence of the trees Achras zapota and Barsera simaruba, Guazuma sp., Acca sp., and Lonchocarpus sp.; palms (Sabal sp. and Cryptosiphia sp.) also were present, but less abundant (Izor and McCarthy, 1984). Other species of rodents taken in association with H. gaumeri include: Sciurus yucatanensis, S. degpei, Orthogomys hispidus, Sigmodon hispidus, Orzyomys leucopus, O. vucatanensis, Mus musculus, Rattus rattus, Dasyprocta punctata, Agouti paca, and Coendou mexicanus (Birney et al., 1974; Dowler and Engstrom, 1988; Izor and McCarthy, 1984; Jones et al., 1974).

Heteromys gaumeri is known to harbor the following ecto-parasites: mites, Trombiculidae (Cardiotes mexicanus, Ectonos fu- sticornis, Fonseca gunnelys, Leptotrombidium panamense, Odon- tacar acutangen, Pseudochengasia extrice, P. scutalis, Loomis, 1969), Laelapidae (Androlaelaps fahrenderholz, Eubrachy- laelaps jamaeisoni, Hysapalis lariciana, H. sp., Steptolaelaps heteromys: Genoways, 1973), and Glycophyglidae (Dermacentor ornatus, Neobdellaphus yucatanensis; Ponce and Genoways, 1973; ticks, Ixodidae (Amblyomyna sp., Ixodes sp., Genoways, 1973); and an-opluran lice, Hoplopleuridae (Fahrenholzella ferrisi; Emerson, 1971). No endoparasites have been reported from Gaumer's spiny pocket mouse.

GENETICS. The karyotype (Fig. 4) has a diploid number of 56 and a fundamental number of 76. The autosomal complement consists of a graded series of 11 pairs of large to small-sized meta-centric and submetacentric chromosomes and 16 pairs of large to small-sized acrocentrics or subacrocentrics (here scored as uniaxial in the calculation of the fundamental number). The sex chromosomes are of a large submetacentric Xe as medium-sized submetacentric Y. No chromosomal variation has been noted among individuals or populations (Engstrom, et al., 1987).

Levels of genetic variation within populations of H. gaumeri, as measured by protein electrophoresis, are comparable to values reported for most heteromyine rodents, but low when compared to rodents in general. In four populations of H. gaumeri, mean proportion of polymorphic loci per population was 0.025 and average proportion of loci heterozygous per individual was 0.002. Genetic distances among these populations (average Rogers D = 0.025) also were small (Patton and Rogers, in press a).

REMARKS. The number of species currently recognized within the genus Heteromys varies among authors. For example, Hall (1981) and Honacki et al. (1982) included 10 nominal species in the genus (although Hall, 1981, suggested that the genus was in need of revision), whereas Best (in press), Patton and Rogers (in press a, b), and Rogers (1989) recognized only seven described species. Additionally, Patton and Rogers (in press a) noted the presence of two undescribed species, one from Costa Rica and one from Panama. In this review, we followed the last group of authors and the seven described species are included in the key to species.

Subgeneric affinities within Heteromys are also unclear. Patton and Rogers (in press a, b) and Rogers (1989) questioned the monophyly of the subgenus Xylomyx and noted that chromo- somally, H. oresterus is more similar to members of the subgenus Heteromys than to H. nelsoni (the other member of the subgenus Xylomyx). Goldman (1911) included H. gaumeri within the desmarestianus species group in the subgenus Heteromys for conven- ience, but noted that it was not closely related to any living species of Heteromys. On the basis of morphological and karyotypic differ- ences, Engstrom et al. (1987) recommended that H. gaumeri be removed from the desmarestianus group and suggested that it might warrant recognition as a subgenus distinct from other Heteromys. The generic name, Heteromys, is from the Greek for different or other (Hetero) and mouse (mys) in reference to the original description of the type as Mus anomalous. The specific name, gau- meri, was named in honor of George F. Gaumer, naturalist and student of the flora and fauna of the Yucatan Peninsula. The Mayan vernacular name for H. gaumeri is "puten put."


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