Liomyys pictus. By M. Elizabeth McGhee and Hugh H. Genoways

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Liomyys pictus (Thomas, 1893)
Painted Spiny Pocket Mouse

Heteromys hispidus J. A. Allen, 1897:56. Type locality Compostela, Nayarit.
Heteromys annecetns Merriam, 1902:43. Type locality Pluma Hidalgo, Oaxaca.
Liomyys plantinarensis Merriam, 1902:46. Type locality Platanar, Jalisco (spelled Plantinar on specimen label).
Liomyys sonorana Merriam, 1902:47. Type locality Alamos, Sonora.
Liomyys eraeaeucricus Merriam, 1902:47. Type locality San Andreas Tuxtlas, Veracruz.
Liomyys obscurus Merriam, 1902:48. Type locality Carrizal, Veracruz.
Liomyys pheae Merriam, 1902:48. Type locality Pinotepa, Oaxaca.
Liomyys oralis Merriam, 1902:48. Type locality Catezamaco, Veracruz.
Heteromys paraculis Elliot, 1903:233. Type locality San Carlos, Veracruz.

Liomyys parviceps Goldman, 1901:82. Type locality La Salada, 40 mi. S. Uruapan, Michoacan.
Liomyys pictonium Goodwin, 1956:2. Type locality San Miguel, about 4000 ft., 24 km NE Tonalá, Cerro Tres Picos, Chiapas.

CONTEXT AND CONTENT. Order Rodentia, Family Heteromyidae, Subfamily Heteromyinae. The species contains four subspecies (Genoways, 1973:174-197) as follows:
L. p. annecetns (Merriam, 1902:43), see above.
L. p. hispidus (J. A. Allen, 1897:56), see above (sonorana Merriam and escuinapae J. A. Allen are synonyms).
L. p. pictus (Thomas, 1893:233), see above (rostratus Merriam, ethinus Merriam, eraeaeucricus Merriam, obscurus Merriam, pheae Merriam, oralis Merriam, paraculis Elliot, and pictonium Goodwin are synonyms).
L. p. plantinarensis Merriam (1902:46), see above (parviceps Goldman is synonym).

DIAGNOSIS. External and cranial measurements are medium to small for the genus, although some populations (annecetns) are relatively large in size; cranium is relatively narrow in comparison with length (see figure 1); protoloph of upper premolar generally appears to be composed of a single cusp; three cusps of metaloph connect by loph so as not to form discrete cones; hypocone is largest cusp on metaloph; entostyle always connects to hypocone by loph; re-entrant angle on labial margin of lower premolar does not reach median valley; baculum is long and has a small rounded base, distal end of shaft has ventral keel that is laterally compressed and the shaft is dorsoventrally compressed; posterior terminal keel; glans penis is short when compared with baculum, tip of glans long, glans, but slightly sculptured; urethral lappets are trigloted; $2n = 48$; $F/V = 60$; head of spermatozoon is long and has pointed apex, and there is a distinct neck between head and midpiece of spermatozoon; wings of pterygoids are narrow; parasitized by the anopluran, Fahrendholzia microcephala; most specimens have six planter tubercles, although some individuals of L. p. plantinarensis have only five; upper incisors are sulciculate.

GENERAL CHARACTER. Pelage is hirsut, consisting of stiff spines mingled with slender soft hairs; upper parts are reddish brown; lateral strip is generally ochraceous but may be rather pale; underparts are white; hairs on back do not curl.

**FIGURE 1.** Dorsal, ventral, and lateral views of the cranium and a lateral view of the lower jaw of Liomyys pictus pictus (KU 112776, male, San Sebastian, Jalisco). Scale at right is 10 mm.

and interparietal width) of the remaining measurements, the means for males were larger than those for females; means for length of maxillary toothrow and interparietal length were the same for the two sexes (Genoways, 1973). External and cranial measurements for samples of males and females, respectively, of *Liomys pictus* from western Jalisco are as follow (mean, ± 2 SE, range, and number): total length, 241.0 ± 4.12 (218.0 to 264.0) 35, 229.7 ± 3.72 (212.0 to 248.0) 27; length of tail, 123.5 ± 2.80 (105.0 to 138.0) 35, 116.5 ± 2.21 (108.0 to 128.0) 27; length of hind foot, 28.9 ± 0.35 (26.0 to 31.0) 40, 29.5 ± 0.41 (26.0 to 31.0) 40, 28.5 ± 0.41 (26.0 to 31.0) 34, greatest length of skull, 32.3 ± 0.24 (30.8 to 34.1) 39, 31.6 ± 0.26 (30.1 to 33.0) 34; zygomatic breadth, 15.0 ± 0.14 (14.1 to 15.9) 30, 14.6 ± 0.12 (14.1 to 15.2) 31; interparietal constriction, 7.8 ± 0.11 (7.1 to 8.7) 40, 7.6 ± 0.11 (7.1 to 8.6) 35; mastoid breadth, 14.3 ± 0.12 (13.6 to 15.0) 39, 14.1 ± 0.11 (13.5 to 14.8) 35; length of nasals, 13.1 ± 0.18 (11.7 to 14.5) 40, 12.7 ± 0.21 (11.1 to 13.5) 34; length of rostrum, 14.2 ± 0.16 (13.1 to 15.5) 38, 13.8 ± 0.18 (13.0 to 14.8) 32; length of maxillary toothrow, 4.9 ± 0.06 (4.6 to 5.4) 36, 4.9 ± 0.07 (4.4 to 5.2) 35; depth of braincase, 6.3 ± 0.07 (6.0 to 6.9) 39, 6.2 ± 0.08 (6.1 to 6.3) 33; interparietal width, 8.9 ± 0.13 (7.9 to 9.7) 39, 8.9 ± 0.16 (7.9 to 9.5) 35; interparietal length, 4.5 ± 0.10 (3.8 to 5.2) 38, 4.5 ± 0.10 (4.0 to 5.1) 35.

*Liomys pictus hispidus*, which occurs in Northwestern Mexico from Sonora to Jalisco, is a medium-sized subspecies characterized by a relatively short interparietal bone (length 5.7 to 4.1), a high percentage of individuals with the interparietal bone divided (usually more than 50%) and heavily notched posteriorly, a high percentage of individuals with the premaxillary and nasal bones terminating at the same level, and a high percentage of individuals with the nasal bones emarginate posteriorly. Populations of *Liomys pictus pictus* occur throughout coastal regions of Western Mexico as far south as Chiapas and coastal southern Veracruz in Eastern Mexico and are characterized by medium to large size, relatively broad interparietal bone, undivided interparietal that is notched in less than 40% of northern populations, and premaxillary bones that terminate posterior to nasals. The smallest-sized subspecies, *Liomys pictus plantinarensis* of interior Jalisco, Michoacán, and Guerrero, resembles *L. p. pictus* in most cranial characteristics. In montane regions of Guerrero and Oaxaca, specimens of *Liomys pictus annectens* are characterized principally by larger external and cranial size and noticeably darker dorsal coloration (see Genoways, 1973, for additional details).

**DISTRIBUTION.** *Liomys pictus* occurs along the west coast of Mexico from a place 23 mi. S and 5 mi. E. Nogales, Sonora, southward through Sonora, Sinaloa, Durango, Nayarit, Jalisco, Colima, Michoacán, Guerrero, and Oaxaca (figure 2). In this area the species is generally restricted to the coastal lowlands and adjacent slopes of the Sierra Madre Occidental and Sierra Madre del Sur; however, in Jalisco, Michoacán, and Guerrero one subspecies is restricted to interior valleys and large river systems. Along the Pacific coast, *L. pictus* occurs as far south as the vicinity of Tonalá, Chiapas, but specimens are known from throughout the central valley of Chiapas and from one locality (Nenton) in Guatemala. The species also is known from several localities in the Isthmus of Tehuantepec and from along the coast of Mexico from southern Veracruz northward to San Carlos in central Veracruz (Genoways, 1973).
FORM AND FUNCTION. In Liomys pictus the glans penis is cylindrical in the basal two-thirds, but somewhat flared at the rim of the terminal crater, which is the broadest portion of the glans (figure 3). The flaring of the glans in this area may be partly due to swelling during preparation, however, some flaring was evident in all four of the specimens of this species studied. The glans of pictus is relatively short compared with the length of the baculum. The ratio of the diameter of the glans to the length of the glans is highly variable in this species, possibly indicating a swelling of the diameter of some specimens during preparation. The tip protruding from the terminal crater is actually longer in pictus than in other species of Liomys, except Liomys spectabilis, and than in Heteromys; the length of the tip in proportion to the overall length of the glans is similar in pictus and spectabilis. The rim of the terminal crater is slightly concave dorsally and deeply incised into a deep V ventrally. The rim is wrinkled both dorsally and ventrally. The incisions are slightly deeper than in Liomys irroratus (Genoways, 1973). The urethral lappets are located in the terminal crater ventral to the baculum and are trilobed. Of the four specimens with trilobed urethral lappets, pictus has the smallest lappets.

In comparison to body size, the bacula of Liomys pictus and L. spectabilis are the longest of any species of Liomys and longer than those of two species of Heteromys (figure 3). However, the base is proportionally narrower than in other species of Liomys. The base occupies about one-fourth of the total length of the bone. The shaft tapers rapidly from the base and usually is slightly bowed in lateral view. The shaft has a ventrally expanded and laterally compressed keel at its tip, which is from 0.85 to 1.25 mm long. Just posterior to the tip of the baculum is dorsoventrally flattened and in dorsal view the shaft appears laterally expanded in this region (Genoways, 1973; Burt, 1969).

In Liomys pictus the head of the sperm is long and has an acutely pointed apex (figure 3). Although the head of the sperm of pictus generally resembles that of irroratus, the apex of the head is more sharply pointed in pictus. The base of the sperm of pictus is flatter and less rounded than in irroratus, although the notch at one side of the base is present. The broadest portion of the head is just anterior to the notch. A neck is clearly present in this species (Genoways, 1973).

In Liomys pictus the protoloph of the upper premolar appears to consist of a single cusp, which is probably the protocone (figure 4). In some specimens, there is a slight development of lateral accessory cusps, but these are extremely weak and only occasionally present. Wood (1953:198) stated in his description of the teeth of Liomys that the anterior loph of the upper premolar was always composed of three cusps with the central cusp being the largest and the two lateral ones compressed almost beyond recognition. Certainly these lateral cusps are much more difficult to discern in the premolar of specimens of pictus than in L. irroratus.

The metatop of the premolar is crescent-shaped and consists of three cusps as in L. irroratus. However, the cusps of L. pictus are all connected by a loph so that they never form discrete cones as they do in irroratus. The hypocone is the largest of the three, but the metacone is almost as large. The smaller entoconid is placed anterior to the hypocone and almost completely lingual and it is never separated from the other cusps, always being connected by a loph to the hypocone. The median valley separating the protoloph and metaloph has a shape much as in irroratus. The re-entrant angle between the entoconid and hypocone does not reach the lingual edge of the tooth so that the median valley is Y-shaped, with one of the arms being shorter than the other.

A well-developed posterior cingulum extends from the middle of the metacone to nearly the level of the lingual edge of the hypocone. A ridge extends posteriorly from the hypocone and connects with the cingulum. The median edge of the cingulum may be connected with the ridge extending from the entoconid to the hypocone or it may be free. However, even in the specimens that is figured (figure 4), slight wear will connect the cingulum with the ridge extending posteriorly from the entoconid. There is a deep valley of enamel between the posterior cingulum and the hypocone, which is divided in half by the ridge extending posteriorly from the entoconid. The depth of enamel remain as islands surrounded by dentine as the tooth begins to wear. The valley between the hypocone-metacone-cingulum does not persist as long as the one between hypocone-entoconid-cingulum.

The protoloph of the lower premolar of pictus is composed of three cusps (figure 4). The protoloph is relatively large; it appears to be expanded labially and has nearly filled the space occupied by the re-entrant angle separating the protoloph and metaloph. In some specimens the re-entrant angle of enamel extending between the protoloph and metaloph has been completely blocked by the protoloph, but in other specimens a small valley of enamel temporarily separates the two cusps. The mesoloph is smaller than the protoloph. The anteroloph appears to be composed of two cusps, however, these quickly become united with wear. The angle of enamel separating the protoloph from the anteroloph is much deeper and persistent and is the angle between the mesoloph and the metaloph, therefore, these last two cusps unite as wear progresses before the anteroloph and protoloph unite. The mesoloph and protoloph unite early in the wear of the tooth at their posterosuperior margins and unite to enclose a deep pit of enamel. A posterior cingulum was not observed on any specimen of this species.

The metaloph of the lower premolar, which is separated from the protoloph by a deep median valley of enamel, is made up of two cusps, hypoloph and metaloph, that quickly become united into a single loph (figure 4). The lingual metaloph is smaller than the labial hypoloph. A labial re-entrant angle of enamel extends about one-third of the way to the hypoloph, with the distance as the hypoloph. The area posterior to this angle may represent the posterior cingulum. Unfortunately this re-entrant angle is not well developed in the specimen figured, but on other specimens it is as well developed as in the specimens of irroratus (see Genoways, 1973, for additional comments on dentition of Liomys).

Molt in Liomys pictus begins dorsally in two areas—firstly, about one-third of the way between the ears and the rump, and secondarily on top of the head. The molt on the dorsal fur progresses posteriadly and laterally. Molt of the fur extends from the rump to the sides of the body and, to some degree, on the head. The distance as the hypoloph. The area posterior to this angle may represent the posterior cingulum. Unfortunately this re-entrant angle is not well developed in the specimen figured, but on other specimens it is as well developed as in the specimens of irroratus (see Genoways, 1973, for additional comments on dentition of Liomys).

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Hatt (1932) compared the vertebral column of Liomys pictus with other riodont rodents. Quay (1965) found that L. pictus had medium-sized sebaceous glands in the oral lips and angle. No sudoriferous or mucous glands were found.

REPRODUCTION. In Liomys pictus, 49 of 264 females with reproductive data (Genoways, 1973) were pregnant and an additional 11 were lactating. Pregnancies were recorded in all months except January and October and a lactating female was recorded in the latter month. Most of the pregnant females were taken in April, August, September, and November. No pregnant females were recorded from 2 December to 5 February, although more than 70 females with reproductive data were available from that period. The mean number of pregnant females was 3.80 (mode, three) with a range of two to six. Males with enlarged testes were taken in most months, but males taken in November through February had testes that averaged much smaller than those of males taken between March and October.
Some data on reproduction were recorded by Hooper (1955:9) and Hall and Dalquest (1963:284). Wagner (1961:209) reported that Liomyms pictus take in the second half of March near Villa Flores, Chihuahua, that carried the following number of embryos: one female with three; 11 with four; four with five; and one with six, Eisenberg and Isaac (1963:65) and Eisenberg (1963:148) found that the mean of the six litters of L. pictus born in captivity was 3.5 and the range was two to five. One gestation period was 24 days and another was 26 days (Eisenberg and Holen, 1963:65; Eisenberg, 1963:138). Immature individuals were found in each month for which Fleming (1969) had data (no specimens available for September, October, and December), except May. Immature specimens formed a larger proportion of the sample in March than in any other month.

ECOLOGY. Habitats occupied by Liomyms pictus are extremely variable, ranging from Sonoran Desert in northwestern Mexico to arid lowland tropics along both west and east coasts of Mexico and to cloud forest in the mountains of Guerrero and Oaxaca. The known altitudinal range of the species is from sea level to approximately 7300 feet at Omitlerno, Guerrero, and Rio Molino, Oaxaca. Liomyms pictus appears to prefer moist habitats along rivers and streams in otherwise xeric inland situations; this is especially evident in areas of sympathy with Liomyms irroratus. In all such cases except one, pictus occurs in the moist lowlands and irroratus in the drier uplands. The one exception is near La Gima, Oaxaca, in a cloud forest situation, where the two species have been taken in what appears to be the same habitat. The other places where the two species have been taken together in Jalisco and Guerro are areas of close contact between upland and lowland habitats. Along the arid coasts, L. pictus appears to be more or less generally distributed, although it is, even there, more abundant in moist situations than in the dry thorn forest.

No comprehensive study has been undertaken on the ecology of this mouse but natural history information may be obtained from several sources (Baker and Greer, 1962:104; Burt, 1938:43; Hall and Dalquest, 1963:283–294; Hooper, 1955:9; and Wagner, 1961:207). Genoways (1973) reported on the local ecology of 11 areas where Liomyms pictus occurs. Species commonly found sympatrically with L. pictus are: Oryzomys palustris, O. fulvescens, O. melanotis, Peromyscus bairdii, P. perfoliatus, P. boylii, P. mexicanus, Baiomys masculus, Sigmodon hispidus, S. arizonae, and Neotoma mexicana. Liomyms pictus occurs most often in lowland dry forest, although some specimens are known from xerophytic montane vegetation. L. pictus is sympatric in part with L. irroratus, L. salvini, and L. spectabilis.

Of the 29 species of mites known to occur on Liomyms pictus, 26 are trombiculids and three are laelapids, as follows: Anahuecota sp. (Genoways, 1973:356); Eriozygus fuscicornis (Genoways, 1973:356); Euschoengastoides gagarini (Genoways, 1973:356); Euschoengastoides arizonae (Loomis, 1971:699); Euschoengastoides sp. (Genoways, 1973:356; Loomis, 1971:700); Euschoengastoides pictus-tumidus (Loomis, 1971:703); Eutrombicula alfrededglesi (Genoways, 1973:356); Eutrombicula sp. (Genoways, 1973:356); Fonescia paracacila) sp. (Genoways, 1973:356); Hexidionus allardi (Genoways, 1973:356); Leptotrombidium panamense potosinum (Genoways, 1973:356); Leptotrombidium n. sp. "c" (Genoways, 1973:356); Neotrombicula sp. (Genoways, 1973:356); Odontacarus sp. (Genoways, 1973:356); Ochthophilinae intrasola (Wrenn and Loomis, 1967:160); Ochthophilinae sinaloae (Wrenn and Loomis, 1967:164); Pseudochoengastia aberrans (Genoways, 1973:357); Pseudochoengastia audyi (Brennan and Dalmat, 1960:191); Pseudochoengastia guatemalensis (Brennan and Dalmat, 1960:191); Pseudochoengastia hoffmannae (Genoways, 1973:486); Pseudochoengastia hungerfordi (Genoways, 1973:357); Pseudochoengastia sculata (Brennan and Jones, 1959:427); Pseudochoengastia sp. "e" (Genoways, 1973:357); Pseudochoengastia sp. "t" (Genoways, 1973:357); Pseudochoengastia sp. (Genoways, 1973:357); Sacsacurus nehartoni (Genoways, 1973:357); Androlaelaps leucus (Genoways, 1973:357); Steptotarapla heteronomus (Genoways, 1973:357); Steptotarapla liomyms (Furman, 1955:325).

Only two species of ticks, Isodes sinaloa (Kohls and Clifford, 1966:811, 813; Keirn and Jones, 1972:474) and Isodes sp. (Genoways, 1973:357), are known from this species. One species of louse, Pheronemia microcephala (Ferris, 1922:161, Johnson, 1962:410), and six of fleas, Catopodinae-Articulata (Genoways, 1973:357); Rhopalopsyllidae-Polygenis gynni (Genoways, 1973:357), Polygenis martinezae (Genoways, 1973:357), Polygenis roquesii (Hubbard, 1968:165), Polygenis poliaris (Genoways, 1973:357), Polygenis sp. (Genoways, 1973:357).

Two endoparasites of Cocciidea, Eimeria liomyms and Eimeria pictus, were described from L. pictus from Sinaloa and Nayarat (Levine et al., 1958; Levine et al., 1959), recovered from fecal samples. No bacterial or viral diseases have been reported from Liomyms pictus.

BEHAVIOR. Liomyms pictus is a solitary, aggressive, nocturnal rodent joining others for breeding purposes only. It is secretive in characteristic heterodont molars, active in daytime, and nocturnal. It bathes, caching of seeds, and extensive washing and scratching (Eisenberg, 1963a, 1963b, 1967). Locomotion is mostly by diagonal limb coordination and quadrupedal richochets. There is little specialization toward bipedality. Pinkham (1973) felt that L. pictus displayed locomotion similar to that of Perognathus. Painted spiny pocket mice climb readily but clumsily.

Communication is both vocal and nonvocal. Noises produced include tooth-chattering as well as growling, squealing, grunting, and twittering. The most common contact promoting act in male-female encounters is nose-nose. Other contacts are nose-anal, head over head under, and crawling under. General neutral behavior includes perineal drag, pilo-erection, and general trembling especially of the tail. Agonistic postures include rushing, locked tight, and chasing. Opponents may assume a mutual upright posture, lock arms and struggle for as long as a minute on their hind legs. Driving, perineal investigation, grooming, patting, and mounting are displayed by males during preliminary sexual behavior. A typical lordosis is shown by the females. Male pairings usually do not last through parturition.

Females of Liomyms pictus are prone to bolt from their nest when disturbed and return later to move nest and young. The male place a pup in each pouch when retrieving. The development of young is prolonged. However, litters usually break up due to sibling aggression after one to two months (Eisenberg, 1963a, 1963b, 1967; Eisenberg and Isaac, 1963).

GENETICS. A diploid number of 48 chromosomes characterizes pictus and includes five pairs of metacentrics, five pairs of submetacentrics to subtelocentrics, and 13 pairs of telocentrics (Genoways, 1973). The X-chromosome is a large metacentric and the Y-chromosome is a medium-sized metacentric. The fundamental number is 66 (figure 6).

ETYMOLOGY. The name pictus is derived from the Latin word pictus (painted). Of the subspecific names, annectens is from the Latin word annect (to bind together); hispidus is from a Latin word hispid (hairy or bristles); plantatoris is based on the town Platanar, which was misspelled Plantinar on the specimen label.

REMARKS. Genoways (1973), in studying the phylogenetic relationships of Liomyms, concluded that Liomyms pictus and Liomyms spectabilis formed a natural group within the genus and that the two species had only recently diverged from each other. The ancestors of this group were probably isolated from other Liomyms stocks along the lowlands of the Pacific coast of Mexico.

LITERATURE CITED


Principal editor of this account was S. Anderson.