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Liomys pictus

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

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***Liomys pictus* (Thomas, 1893)**

Painted Spiny Pocket Mouse

- Heteromys pictus* Thomas, 1893:233. Type locality Mineral San Sebastian, 4300 ft., Jalisco.
Heteromys hispidus J. A. Allen, 1897:56. Type locality Compostela, Nayarit.
Heteromys annectens Merriam, 1902:43. Type locality Pluma Hidalgo, Oaxaca.
Liomys plantinarenis Merriam, 1902:46. Type locality Platanar, Jalisco (spelled Plantinar on specimen label).
Liomys sonorana Merriam, 1902:47. Type locality Alamos, Sonora.
Liomys veraecrucis Merriam, 1902:47. Type locality San Andreas Tuxtla, Veracruz.
Liomys obscurus Merriam, 1902:48. Type locality Carrizal, Veracruz.
Liomys phaeura Merriam, 1902:48. Type locality Pinotepa, Oaxaca.
Liomys orbitalis Merriam, 1902:48. Type locality Catemaco, Veracruz.
Heteromys paralius Elliot, 1903:233. Type locality San Carlos, Veracruz.

- Liomys parviceps* Goldman, 1904:82. Type locality La Salada, 40 mi. S. Uruapan, Michoacán.
Liomys pinetorum 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. annectens* (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, *isthmus* Merriam, *veraecrucis* Merriam, *obscurus* Merriam, *phaeura* Merriam, *orbitalis* Merriam, *paralius* Elliot, and *pinetorum* Goodwin are synonyms).
L. p. plantinarenis Merriam (1902:46), see above (*parviceps* Goldman is synonym).

DIAGNOSIS. External and cranial measurements are medium to small for the genus, although some populations (*annectens*) 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 to terminal keel; glans penis is short when compared with baculum, tip of glans long, glans but slightly sculptured; urethral lappets are trilobed; $2n = 48$; $FN = 66$; 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, *Fahrenholzia microcephala*; most specimens have six plantar tubercles, although some individuals of *L. p. plantinarenis* have only five; upper incisors are asulcate.

GENERAL CHARACTERS. Pelage is hispid, 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

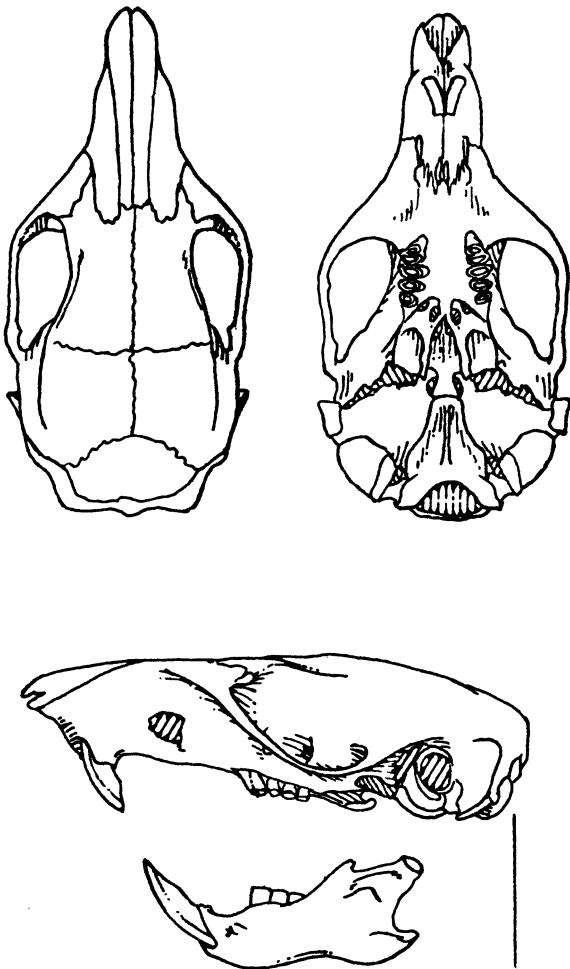


FIGURE 1. Dorsal, ventral, and lateral views of the cranium and a lateral view of the lower jaw of *Liomys pictus pictus* (KU 112276, male, San Sebastian, Jalisco). Scale at right is 10 mm.

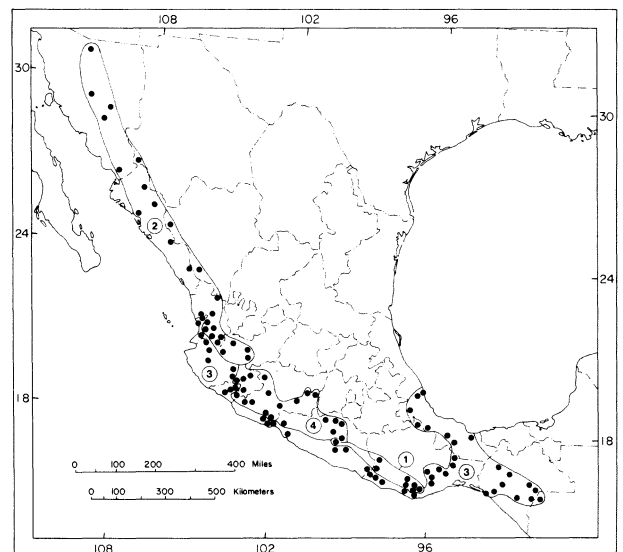


FIGURE 2. Geographic distribution of subspecies of *Liomys pictus*: 1, *L. p. annectens*; 2, *L. p. hispidus*; 3, *L. p. pictus*; 4, *L. p. plantinarenis*.

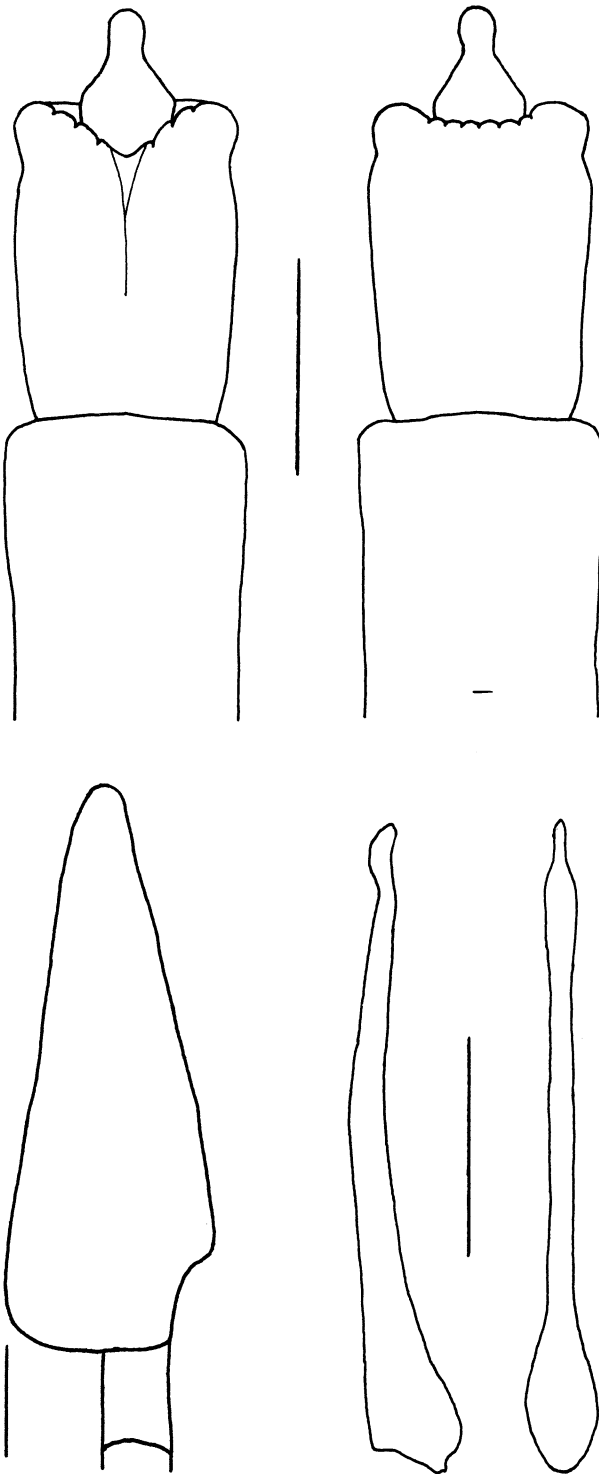


FIGURE 3. Glans penis of *Liomys pictus* (upper). Right is dorsal view and the left is the ventral view (KU 120590). The scale is 3 mm. Bacula of *Liomys pictus* (lower right). Right is dorsal view and the left is the lateral view (KU 96063). The scale is 3 mm. Head and neck region of spermatozoan (lower left) of *L. pictus* (KU 120592). The scale is 1 μ m. A small horizontal line marks the posterior end of the baculum in the glans.

upward conspicuously above spines. Juvenile pelage is grayish and consists primarily of soft slender hairs. Dental formula, as in all other heteromyids, is $i\ 1/1, c\ 0/0, p\ 1/1, m\ 3/3$, total 20.

Males were found to be significantly larger than females in seven (total length, length of tail, length of hind foot, greatest length of skull, interorbital constriction, mastoid breadth, and length of rostrum) of 13 external and cranial measurements. In four (zygomatic breadth, length of nasals, depth of braincase,

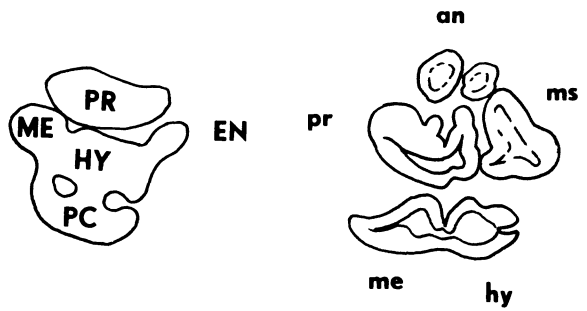


FIGURE 4. Crown patterns of the upper (at left) and lower (at right) right premolars of *Liomys pictus* (upper, KU 107667; lower, KU 99792). Anterior is to the top; for the upper premolar, lingual is to the right and for the lower premolar it is to the left. Abbreviations are: EN, entostyle; HY, hypocone; ME, metacone; PA, paracone; PC, posterior cingulum; PR, protocone; PS, protostyle; and (for the lower premolar) an, anteroconid; hy, hypoconid; me, metaconid; ms, mesoconid; pr, protoconid.

and interparietal width) of the remaining measurements, the means for males were larger than those for females; means for length of maxillary tooththrow 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 follows (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, 118.5 ± 2.21 (108.8 to 128.0) 27; length of hind foot, 28.9 ± 0.35 (26.0 to 31.0) 40, 28.5 ± 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; interorbital 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 14.3) 40, 12.7 ± 0.21 (11.1 to 13.9) 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 tooththrow, 4.9 ± 0.06 (4.6 to 5.4) 36, 4.9 ± 0.07 (4.4 to 5.2) 35; depth of braincase, 8.3 ± 0.07 (7.8 to 8.9) 39, 8.2 ± 0.08 (7.7 to 8.3) 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 México from Sonora to Jalisco, is a medium-sized subspecies characterized by a relatively short interparietal bone (length 3.7 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 México as far south as Chiapas and coastal southern Veracruz in eastern México 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 plantinarenensis* 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 annexens* 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 México 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 México from southern Veracruz northward to San Carlos in central Veracruz (Genoways, 1973).

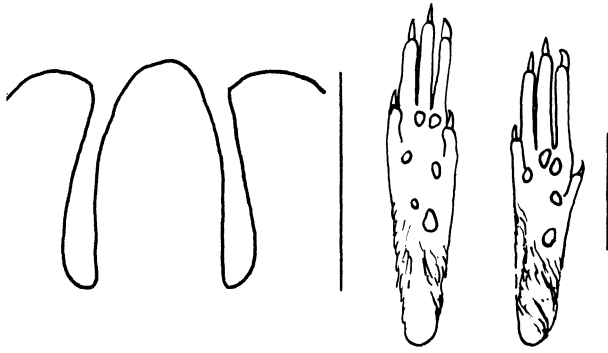


FIGURE 5. Semi-schematic drawings of the pterygoid structure and hind foot of *Liomys pictus*. Scale for the pterygoids is 3 mm and that for the hind foot 10 mm.

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 crenulated both dorsally and ventrally and 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 species 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 keel, the baculum is dorsoventrally flattened and in dorsal view the shaft appears laterally expanded in this region (Genoways, 1973; Burt, 1960).

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 (1935:198) stated in his description of the teeth of *Liomys* that the anterior loph of the upper premolar always was 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 metaloph 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 entostyle 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 entostyle 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 near the level of the lingual edge of the hypocone. A ridge extends posteriorly from the hypocone and connects with the cingulum, and the lingual end of the cingulum may be connected with the ridge extending from the entostyle to the hypocone or it may be free. However, even in the specimen that is figured (figure 4), slight wear will connect the cingulum with the ridge extending posteriorly from the entostyle. 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 hypocone. These two pits 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-entostyle-cingulum.

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

The metalophid of the lower premolar, which is separated from the protolophid by a deep median valley of enamel, is made up of two cusps, hypoconid and metaconid, that quickly become united into a single loph (figure 4). The lingual metaconid is smaller than the labial hypoconid. A labial re-entrant angle of enamel extends about one-half the distance across the hypoconid. 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 dorsum progresses posteriorly and laterally. Molt first reaches the lateral stripe just posterior to the level of the ears. The rump is the last area to complete molt. No molt was observed on the venter. Genoways (1973) found that *Liomys pictus* molted once annually, usually in the period April to June, although molting individuals were also recorded in February, March, and November.

In *Liomys pictus* the pterygoid bones extend ventrally and then turn laterally. The lateral expansion is minor and the bone is straight in appearance when viewed laterally. The pterygoids of *L. irroratus* are teardrop-shaped when viewed laterally. This has proven useful in separating cleaned crania from those of *L. pictus* in areas of potential sympatry. The shape of the inter-ptyergoid fossa is somewhat U-shaped anteriorly (figure 5).

The hind foot of *L. pictus* has six plantar tubercles, except for one small population of *L. p. plantinarenensis* from southern Jalisco that may have five tubercles (figure 5). The soles of the hind feet are haired.

Hatt (1932) compared the vertebral column of *Liomys pictus* with other ricochetal 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 284 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 embryos per female 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.

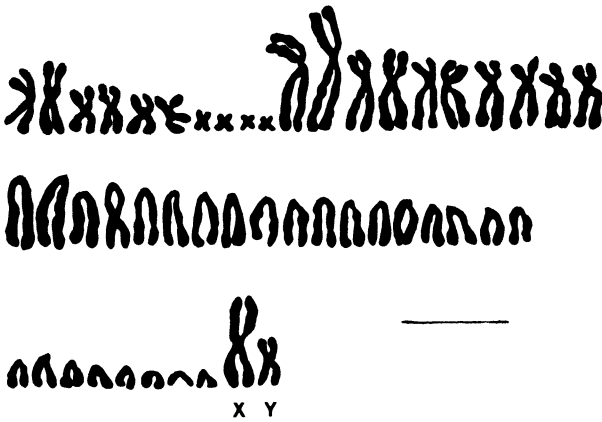


FIGURE 6. Karyotype of a male *Liomys pictus*. The scale is 10 μ m.

Some data on reproduction were recorded by Hooper (1955: 9) and Hall and Dalquest (1963:284). Wagner (1961:209) reported 17 females of *Liomys pictus* taken in the second half of March near Villa Flores, Chiapas, 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 (1963a:11) found that the mean of 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 Isaac, 1963:64; Eisenberg, 1963a:13). Immature individuals were found in each month for which Fleming (1969) had data (no specimens available for September, October, and December), excepting May. Immature specimens formed a larger proportion (43.6%) of the sample in March than in any other month.

ECOLOGY. Habitats occupied by *Liomys pictus* are extremely variable, ranging from Sonoran desert in northwestern México to arid lowland tropics along both west and east coasts of México 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 Omilteme, Guerrero, and Río Molino, Oaxaca. *Liomys pictus* appears to prefer moist habitats along rivers and streams in otherwise relatively xeric inland situations; this is especially evident in areas of sympatry with *Liomys 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 Cima, 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 Guerrero 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 along rivers and streams 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 *Liomys pictus* occurs. Species commonly found sympatrically with *L. pictus* are: *Oryzomys palustris*, *O. fulvescens*, *O. melanotis*, *Peromyscus banderanus*, *P. perfulvus*, *P. boylii*, *P. mexicanus*, *Baiomys musculus*, *Sigmodon hispidus*, *S. arizonae*, and *Neotoma mexicana*.

Liomys 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 *Liomys pictus*, 26 are trombiculids and three are laelapids, as follows: *Anahuacia* sp. (Genoways, 1973:356); *Ectony fuscicornis* (Genoways, 1973:356); *Euschoengastoides gagarini* (Genoways, 1973:356); *Euschoengastoides arizonae* (Loomis, 1971:699); *Euschoengastoides expansellus* (Loomis, 1971:700); *Euschoengastoides tumidus* (Loomis, 1971:703); *Eutrombicula alfreddugesi* (Genoways, 1973:356); *Eutrombicula* sp. (Genoways, 1973:356); *Fonsecia (Parasecia)* sp. (Genoways, 1973:356); *Hexidionis allredi* (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); *Otorhinophila intrasola* (Wrenn and Loomis, 1967:160); *Otorhinophila sinaloae* (Wrenn and Loomis, 1967:164); *Pseudoschoengastia aberrans* (Genoways,

1973:357); *Pseudoschoengastia audyi* (Brennan and Dalmat, 1960:191); *Pseudoschoengastia guatemalensis* (Brennan and Dalmat, 1960:191); *Pseudoschoengastia hoffmannae* (Brennan, 1960:486); *Pseudoschoengastia hungerfordi* (Genoways, 1973:357); *Pseudoschoengastia scitula* (Brennan and Jones, 1959:427); *Pseudoschoengastia* sp. "e" (Genoways, 1973:357); *Pseudoschoengastia* sp. "t" (Genoways, 1973:357); *Pseudoschoengastia* sp. (Genoways, 1973:357); *Sasacarus whartoni* (Genoways, 1973:357); *Androlaelaps leviculus* (Genoways, 1973:357); *Steptolaelaps heteromys* (Genoways, 1973:357); *Steptolaelaps liomydis* (Furman, 1955:525).

Only two species of ticks, *Ixodes sinaloae* (Kohls and Clifford, 1966:811, 813; Keiran and Jones, 1972:474) and *Ixodes* sp. (Genoways, 1973:357), are known from this species. One species of louse, *Fahrenholzia microcephala* (Ferris, 1922:161, Johnson, 1962:416), and six of fleas: Ceratophyllidae—*Jellisonia wisemani* (Genoways, 1973:357); Rhopalopsyllidae—*Polygenis guyni* (Genoways, 1973:357), *Polygenis martinezbaezi* (Genoways, 1973:357), *Polygenis vazquezi* (Hubbard, 1958:165), *Polygenis vulcanius* (Genoways, 1973:357), *Polygenis* sp. (Genoways, 1973:357).

Two endoparasite species of Coccidia, *Eimeria liomydis* and *Eimeria picti*, were described from *L. pictus* from Sinaloa and Nayarit (Levine *et al.*, 1958; Ivens *et al.*, 1959), recovered from fecal samples. No bacterial or viral diseases have been reported from *Liomys pictus*.

BEHAVIOR. *Liomys pictus* is a solitary, aggressive, nocturnal rodent joining others for breeding purposes only. It indulges in characteristic heteromyid activities such as sand-bathing, 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 naso-nasal. Other contacts are naso-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 fight, 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. Mate pairings usually do not last through parturition.

Females of *Liomys pictus* are prone to bolt from their nest when disturbed and return later to move nest and young. The female may 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 subtelocentric, and 13 pairs of telocentric (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 *pict* (painted). Of the subspecific names, *annectens* is from the Latin word *annect* (to bind together); *hispidus* is from a Latin word *hispid* (hairy or bristly); *plantinarenis* is based on the town Platanar, which was misspelled Plantinar on the specimen label.

REMARKS. Genoways (1973), in studying the phylogenetic relationships of *Liomys*, concluded that *Liomys pictus* and *Liomys 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 *Liomys* stocks along the lowlands of the Pacific coast of México.

LITERATURE CITED

- Allen, J. A. 1897. Further notes on mammals collected in Mexico by Dr. Audley C. Buller, with descriptions of new species. Bull. Amer. Mus. Nat. Hist. 9:47-58.
Baker, R. H., and J. K. Greer. 1962. Mammals of the Mexican state of Durango. Publ. Mus. Michigan State Univ., Biol. Ser. 2:25-154.

- Brennan, J. M. 1960. Eight new species of *Pseudoschoengastia* from Mexico and Panama with a revised key to the species (Acarina: Trombiculidae). *Acarologia* 2:480-492.
- Brennan, J. M., and H. T. Dalmat. 1960. Chiggers of Guatemala (Acarina: Trombiculidae). *Ann. Ent. Soc. America* 53: 183-191.
- Brennan, J. M., and E. K. Jones. 1959. *Pseudoschoengastia* and four new neotropical species of the genus (Acarina: Trombiculidae). *Jour. Parasitol.* 45:421-429.
- Burt, W. H. 1938. Faunal relationships and geographic distribution of mammals in Sonora, Mexico. *Misc. Publ. Mus. Zool. Univ. Michigan* 39:1-77.
- 1960. Bacula of North American mammals. *Misc. Publ. Mus. Zool. Univ. Michigan* 113:1-76.
- Eisenberg, J. F. 1963a. The behavior of heteromyid rodents. *Univ. California Publ. Zool.* 69:iv + 1-100.
- 1963b. A comparative study of sandbathing behavior in heteromyid rodents. *Behavior* 22:16-23.
- 1967. A comparative study on rodent ethology with emphasis on evolution of social behavior, I. *Proc. U. S. Nat. Mus.* 122:1-51.
- Eisenberg, J. F., and D. E. Isaac. 1963. The reproduction of heteromyid rodents in captivity. *Jour. Mammal.* 44:61-67.
- Elliot, D. G. 1903. Descriptions of apparently new species of mammals of the genera *Heteromys* and *Ursus* from Washington and Mexico. *Field Columbian Mus. Zool. Ser.* 3:233-237.
- Ferris, G. F. 1922. Contribution toward a monograph of the sucking lice, Part III. *Stanford Univ. Publ., Univ. Series, Biol. Sci.* 2:135-178.
- Fleming, T. H. 1969. Population ecology of three species of Neotropical rodents. Unpublished Ph.D. thesis, Univ. Michigan, Ann Arbor, 231 pp.
- Furman, D. P. 1955. *Steptolaelaps* (Acarina: Laelaptidae) a new genus of mites parasitic on neotropical rodents. *Jour. Parasitol.*, 41:519-525.
- Genoways, H. H. 1973. Systematics and evolutionary relationship of spiny pocket mice, genus *Liomys*. *Spec. Publ. Mus., Texas Tech Univ.* 5:1-368.
- Goldman, E. A. 1904. Descriptions of five new mammals from Mexico. *Proc. Biol. Soc. Washington* 17:79-82.
- Goodwin, G. G. 1956. Seven new mammals from Mexico. *Amer. Mus. Novit.* 1791:1-10.
- Hall, E. R., and W. W. Dalquest. 1963. The mammals of Veracruz. *Univ. Kansas Publ., Mus. Nat. Hist.* 14:165-362.
- Hooper, E. T. 1955. Notes on mammals of western Mexico. *Occas. Papers Mus. Zool., Univ. Michigan* 565:1-26.
- Hubbard, C. A. 1958. Mexican jungle and desert fleas with three new descriptions. *Entomol. News* 69:161-166.
- Ivens, F. G., F. J. Kruidenier, and N. D. Levine. 1959. Further studies of *Eimeria* (Protozoa; Eimeriidae) from Mexican rodents. *Trans. Illinois State Acad. Sci.* 51:53-57.
- Johnson, P. T. 1962. The species of *Fahrenholzia* Kellogg and Ferris from spiny pocket mice (Anoplura: Hoplopleuridae). *Ann. Entomol. Soc. Amer.* 55:415-428.
- Keirans, J. E., and E. K. Jones. 1972. Description of the immature stages of *Ixodes* (I.) *Sinaloa* Kohls and Clifford (Acarina: Ixodidae), from rodents in Mexico and Nicaragua. *Acarologia* 13:471-475.
- Kohls, G. M., and D. M. Clifford. 1966. Three new species of *Ixodes* from Mexico and description of the male of *I. auritulus auritulus* Neumann, *I. coneptati* Cooley and Kohls, and *I. lasallei* Mendez and Ortiz (Acarina: Ixodidae). *Jour. Parasitol.* 52:810-820.
- Levine, N. D., V. F. Ivens, and F. J. Kruidenier. 1958. New species of *Eimeria* (Protozoa: Eimeriidae) from Mexican rodents. *Trans. Illinois State Acad. Sci.* 50:291-298.
- Loomis, R. B. 1971. The genus *Euschoengastoides* (Acarina: Trombiculidae) from North America. *Jour. Parasitol.* 57: 689-707.
- Merriam, C. H. 1902. Twenty new pocket mice (*Heteromys* and *Liomys*) from Mexico. *Proc. Biol. Soc. Washington* 15: 41-50.
- Pinkham, C. F. A. 1973. The evolutionary significance of locomotor patterns in the Mexican spiny mouse, *Liomys irroratus*. *Jour. Mammal.* 54:742-746.
- Thomas, O. 1893. On two new members of the genus *Heteromys* and two of *Neotoma*. *Ann. Mag. Nat. Hist., ser. 6*, 12:233-235.
- Wagner, H. O. 1961. Die Nagetiere einer Gebirgsabdachung in Sudmexiko und ihre Beziehungen zur Umwelt. *Zool. Jb. Syst.* 89:177-242.
- Wood, A. E. 1935. Evolution and relationship of the heteromyid rodents with new forms from the Tertiary of western North America. *Ann. Carnegie Mus.* 24:73-262.
- Wrenn, W. J., and R. B. Loomis. 1967. *Otorhinophila*, a new genus of chiggers (Acarina: Trombiculidae) from western North America. *Acarologia* 9:152-178.

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