

## *Zaedyus pichiy* (Cingulata: Dasypodidae)

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**Abstract:** *Zaedyus pichiy* (Desmarest, 1804) is a small armadillo commonly known as pichi. Like all armadillos, it bears a carapace of ossified dermal scutes covered by epidermal scales, but it is the only species that bears marginal scutes with sharply pointed apices. This diurnal, semifossorial species inhabits xeric shrublands and grasslands on sandy soils from central Argentina and Chile south to the Straits of Magellan. *Z. pichiy* has opportunistic omnivorous food habits and is the only xenarthran known to enter hibernation. It is listed as “Near Threatened” by the International Union for Conservation of Nature and Natural Resources; it is mainly threatened by humans who hunt it for food or sport.

**Key words:** armadillos, pichi, South America, Xenarthra

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### *Zaedyus Ameghino, 1889*

*Loricatus* Desmarest, 1804:28. Part.

*Dasypus*: G. Fischer, 1814:127. Part, not *Dasypus* Linnaeus, 1758.

*Tatus* Olfers, 1818:220. Part, incorrect subsequent spelling of *Tatu* Blumenbach, 1779.

*Tatusia* Lesson, 1827:309. Part.

*Euphractus* Wagler, 1830:36. Part.

*Chaetophractus* Fitzinger, 1871:268. Part.

*Zaedyus* Ameghino, 1889:867. Type species *Dasypus minutus* Desmarest, 1822, by original designation.

*Zaedyus* Lydekker, 1890:50. Incorrect subsequent spelling of *Zaedyus* Ameghino, 1889.

*Zaediis* Lydekker, 1894:34. Incorrect subsequent spelling of *Zaedyus* Ameghino, 1889.

*Zaëdius* Krumbiegel, 1940:63. Incorrect subsequent spelling of *Zaedyus* Ameghino, 1889.

CONTEXT AND CONTENT. Order Cingulata, family Dasypodidae, subfamily Euphractinae, genus *Zaedyus*. Synonymy is modified from Wetzel et al. (2008). *Zaedyus* is monotypic.

### *Zaedyus pichiy* (Desmarest, 1804) Pichi

*Dasypus quadricinctus* Molina, 1782:302. Type locality “Chili;” preoccupied by *Dasypus quadricinctus* Linnaeus, 1758, a synonym of *Tolypeutes tricinctus* Linnaeus, 1758.

*lor[icatus]. pichiy* Desmarest, 1804:28. Type localities (based on de Azara’s (1801:192) description of “*Le tatou pichiy de d’Azara*”) “les Pampas au Sud de Buenos-Ayres, depuis le parallèle de 36e. degré de latitude méridionale, jusqu’à la Terre des Patagons,” Argentina; restricted to Bahia Blanca, Buenos Aires, Argentina, by Cabrera (1957:218; not Lesson 1842:150).

[*Dasypus*] *ciliatus* G. Fischer, 1814:127. Type localities “ad meridiem *Boni Aeris*, (Buenos Ayres) inde a parallela gradus 36 latitudinis meridionalis usque ad terram *Patagonum*,” junior objective synonym of *Loricatus pichiy* Desmarest, 1804.



**Fig. 1.**—A female juvenile *Zaedyus pichiy* from Malargüe Department, Mendoza Province, Argentina. Photograph by Mariella Superina.

*T[atus]. fimbriatus* Olfers, 1818:220. Type locality “Paraguay, en den Pampas;” based on “*T. Pichiy*” of de Azara (1801:192), therefore a junior objective synonym of *Loricatus pichiy* Desmarest, 1804.

*Dasyypus patagonicus* Desmarest, 1819:491. Based on “*Le Tatou pichiy*, d’Azara” (1801); therefore, a junior objective synonym of *Loricatus pichiy* Desmarest, 1804.

*Dasyypus minutus* Desmarest, 1822:371. Type localities “au Sud de Buenos-Ayres, depuis le parallèle de 36e. degré de latitude méridionale jusqu’à la Terre des Patagons. ... [et] du port Désiré ...,” Argentina; restricted to Port Désiré (= Puerto Deseado, Santa Cruz) by Wetzel et al. (2008:147).

*Tatusia minuta*: Lesson, 1827:312. Name combination.

*Euphractus marginatus* Wagler, 1830:36. Type locality based on “*Tatou pichiy*” of de Azara (1801); therefore, the type localities are “les Pampas au Sud de Buenos-Ayres, depuis le parallèle de 36e. degré de latitude méridionale jusqu’à la terre des Patagons,” Argentina (de Azara 1801:192); a junior objective synonym of *Loricatus pichiy* Desmarest, 1804.

*Dasyypus [(Euphractus)] minutus*: Burmeister, 1861:427. Part, name combination.

*Euphractus minutus*: Gray, 1865:376. Name combination.

*Chaetophractus minutus*: Fitzinger, 1871:272. Name combination.

*Dasyypus minutus* Burmeister, 1879:440. Part, not *Dasyypus minutus* Desmarest, 1822.

*Zaedyus minutus*: Ameghino, 1889:868. Name combination and generic description.

*Zaedyus cilliatu*s: Allen, 1901:183. Name combination and incorrect subsequent spelling of *Dasyypus ciliatus* G. Fischer, 1814.

[*Zaedi*us] *ciliatus*: Trouessart, 1905:819. Name combination. *Zaedyus pichiy*: Osgood, 1919:33. First use of current name combination.

*D[asyypus]. Australis* Larrañaga, 1923:343. Type locality “australem plagam bonaerensem;” based on de Azara’s (1802:158) “*Pichiy*.”

*Zaedyus pichiy caurinus* Thomas, 1928:526. Type locality “Mendoza,” Mendoza, Argentina.

*Euphractus (Zaedyus) pichiy*: Moeller, 1968:514. Name combination.

CONTEXT AND CONTENT. Context as for genus. Synonymy is modified from Allen (1901), Cabrera (1957), Gardner (2005), and Wetzel et al. (2008). Two subspecies are recognized (Cabrera 1957; Wetzel et al. 2008):

*Z. pichiy caurinus* Thomas, 1928. See above.

*Z. pichiy pichiy* (Desmarest, 1804). See above.

NOMENCLATORIAL NOTES. The generic name, *Zaedyus*, is from Ameghino (1889) and means a very pleasant armadillo (za from *za*, Greek, an intensive particle meaning very + *edy*

from *edys*, Greek, meaning pleasant [see Braun and Mares 1995]). Desmarest (1804) based the species name, *pichiy*, on de Azara’s (1801) *tatou-pichiy*, which is derived from the word *pichi*, meaning small in the indigenous language Mapuche. Other common names in Spanish are blanquito, piche patagónico, pichi patagónico, quirquincho, piche de oreja corta, piche planiza, and piche planicero (Superina and Aguiar 2006; Abba and Vizcaíno 2011). It is sometimes called dwarf armadillo in English.

## DIAGNOSIS

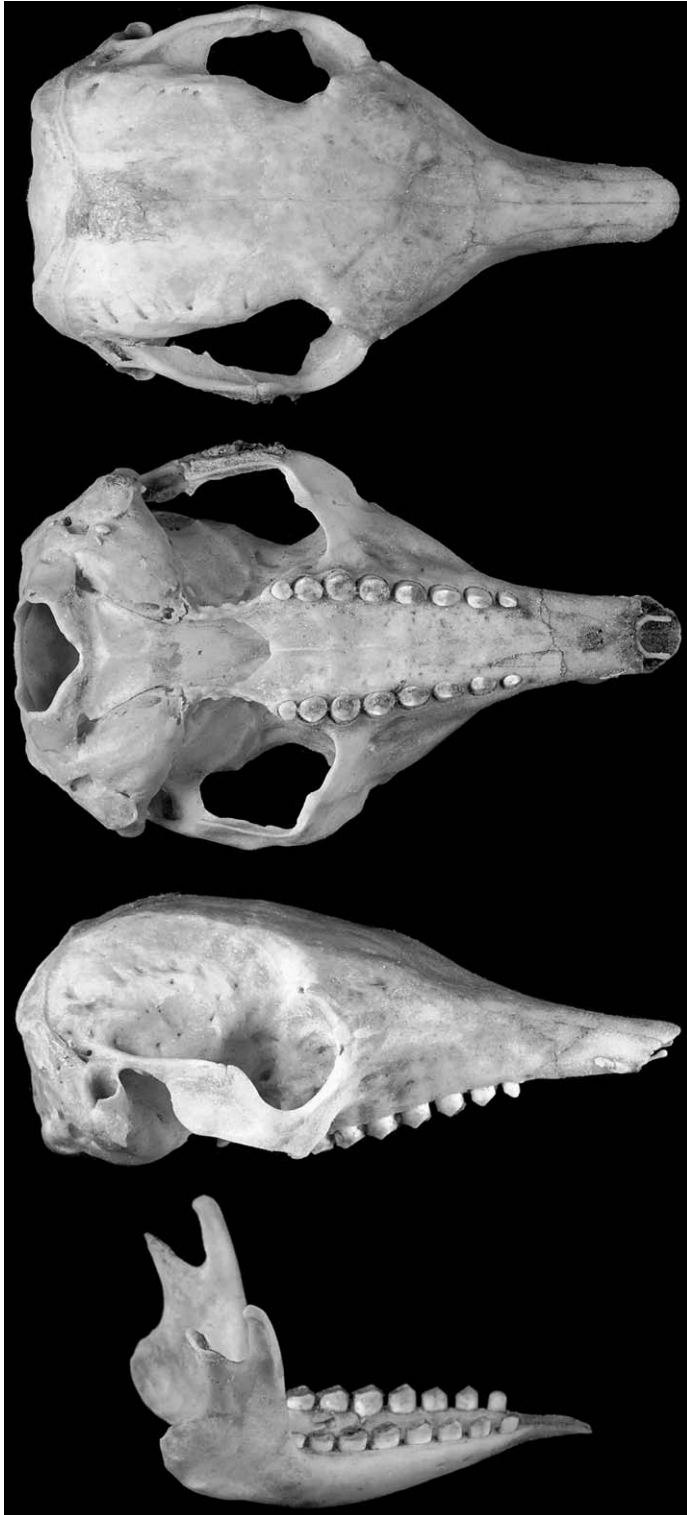
*Zaedyus pichiy* is a small, hairy armadillo that can be distinguished from other armadillo species by its marginal scutes with sharply pointed apices and a light longitudinal dorsal line extending from the posterior end of the scapular shield or the 1st band to the posterior end of the pelvic shield (Fig. 1; Wetzel 1985a; Superina 2008). Ear length is usually < 20 mm, compared to > 20 mm in the partially sympatric and similar-sized screaming hairy armadillo (*Chaetophractus vellerosus*), which also has a proportionally wider head shield than *Z. pichiy*. In contrast to the six-banded armadillo (*Euphractus sexcinctus*—Redford and Wetzel 1985), the big hairy armadillo (*Chaetophractus villosus*), and the screaming hairy armadillo, *Z. pichiy* lacks pelvic glands and does not have teeth on the premaxillary (Wetzel 1985a, 1985b). The carapace color of *Z. pichiy* is usually lighter than that of individuals belonging to *Chaetophractus*.

The height of the zygomatic arch is more or less uniform and lacks a distinct notch below the orbit (Fig. 2). When compared to the six-banded armadillo, *Z. pichiy* has a shorter zygomatic arch, and its jugal is more than twice as high at the symphysis as the overlying anterior end of the squamosal, although it is always less than twice as high in the six-banded armadillo (Wetzel 1985a).

## GENERAL CHARACTERS

Like all Cingulata, *Zaedyus pichiy* bears a carapace consisting of ossified dermal scutes (osteoderms) that are covered by epidermal scales. Usually 7 bands (range 6–8) separate the scapular and pelvic shields, and 1 complete movable band of nuchal scutes is present on the anterior edge of the scapular shield (Wetzel 1985a; Superina 2008). The tail and top of the head also are covered with scutes. The head shield is triangular. The carapace color varies from light yellow to almost black (Superina 2008).

The osteoderms of the movable bands are about 20 mm long and 6 mm wide. They bear 3 longitudinal figures, the 2 lateral ones being subdivided into poorly defined, smaller figures (Fig. 3A). There are small perforations in the intersection of the grooves that limit the central figure and



**Fig. 2.**—Dorsal, ventral, and lateral views of skull and lateral view of mandible of an adult male *Zaedyus pichiy* (MLP [Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata, Argentina, mammal collection] 7.V.10.2) from Cerro Nevado, Malargüe, Mendoza, Argentina. Field number of specimen is ZP 43 (MS). Greatest length of skull is 62 mm.

those that subdivide the lateral figures. The posterior border of the lateral figures is thin and has small piliferous foramina, the most conspicuous foramen being located on the central figure (Vizcaíno and Bargo 1993). The osteoderms of the scapular and pelvic shields are subquadratic to rectangular, with a proportionally higher number of the former than in members of *Chaetophractus*. The osteoderms are about 9.5 mm long and 7.5 mm wide and bear a central figure that reaches their posterior margin as well as peripheral, but no secondary figures (Fig. 3B). The central and peripheral figures are more convex than those in *Chaetophractus*. The osteoderms of the head shield vary in size and shape, and lack figures or perforations (Fig. 3C). The osteoderms form a pattern that is unique for each individual.

Ventral hairs are tan; their length and density increase in winter. Long hairs protrude through 2, rarely 3, small piliferous foramina located at the posterior border of individual scales of the bands, and through 1 or 2 foramina at the posterior border of scales of the scapular and pelvic shields (Ameghino 1889).

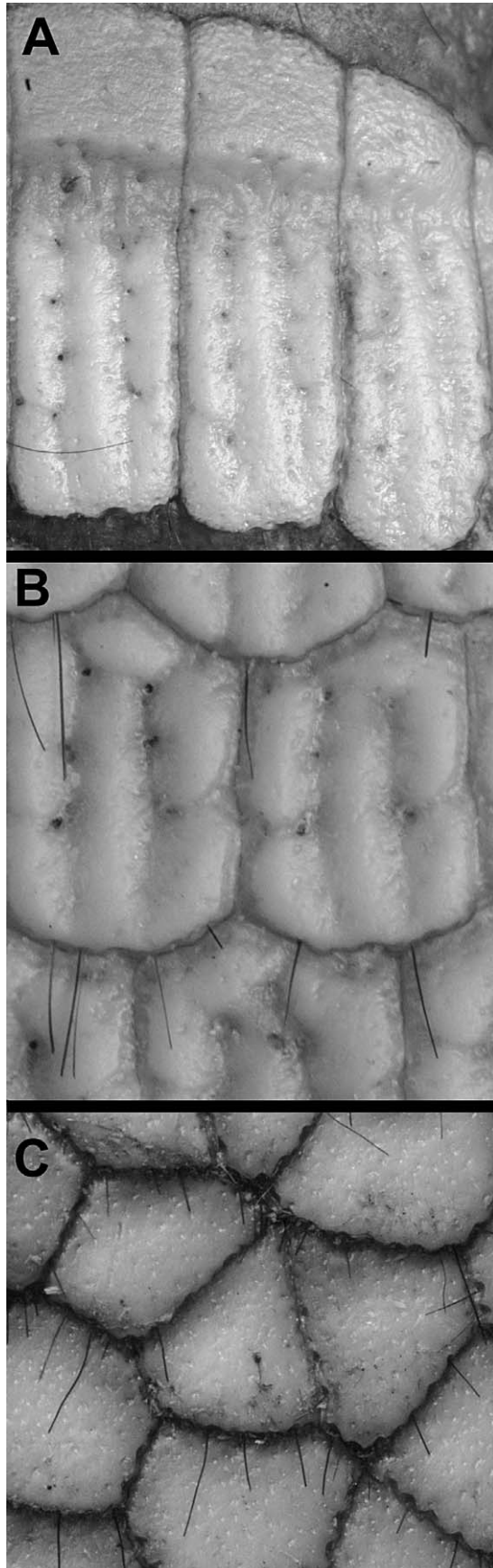
The ears are short and gray. Eyes are small, with black bristles on the upper eyelid and long sensitive bristles below the eye (Lönnerberg 1898). There are 5 toes, which are equipped with large claws, on the forefeet and hind feet.

Mean external measurements (mm; taken by MS), with parenthetical range and *n* were: carapace length, 193 (160–231, 240); carapace width at 4th band, 220 (189–249, 240); head length, 68.9 (60–80, 240); head width, 53.1 (45–63, 240); ratio of head shield width to length, 0.77 (0.64–1.00, 240); ear length, 15.9 (11–21, 195); tail length, 108 (85–132, 224); hind-foot length, 48.9 (42–59, 195). Mean ( $\pm$  *SD*) external measurements (mm) given by Wetzel (1985a) for 5 (except where otherwise stated) adult specimens were: head and body length, 273.0 (39.5); tail length, 109.2 (8.7); hind-foot length, 50.4 (3.2); ear length, 13.4 (1.5); ratio of head shield width to length, 0.88 (0.04, *n* = 13); nuchal scute length, 4.5 (3.8).

The head length : width ratio varies geographically, with animals from northern Mendoza Province, Argentina, having shorter and wider heads (ratio  $0.09 \pm 0.02$  *SD*, *n* = 14) than animals from southern Mendoza Province (ratio  $0.08 \pm 0.01$ , *n* = 92 [Superina 2008]).

Adult *Z. pichiy* have a mean body mass of 977 g (700–1,500 g, *n* = 100; measured by MS). There is some evidence of sexual dimorphism. Males tend to be heavier than females (mean  $\pm$  *SD*;  $983 \pm 177$  g versus  $906 \pm 127$  g; *n* = 53 and 28, respectively), but this difference is not statistically significant. A significant difference exists, however, in carapace width (males:  $220 \pm 11$  mm, *n* = 71; females:  $212 \pm 11$  mm, *n* = 41; *P* < 0.001 [Superina 2008]).

There are slight sex differences in skull measurements, with skulls of females being 2–3 mm shorter than those of males (Thomas 1928). Females have a larger pelvic cavity



than males. In the latter, the ventral joint tips of the pubis are located more interiorly than in the former and contact each other (V. Seitz, in litt.).

Skull size also differs between subspecies: skulls of *Z. pichiy pichiy* from Buenos Aires, Chubut, and Santa Cruz provinces measure “about 68 mm in length by 42 mm in breadth” and have a zygomatic breadth “upwards of 43 mm” (Thomas 1928:526). The largest male skull measured by Thomas (1928) was 70 mm long and 44 mm wide, “but all intermediate sizes are represented” (Thomas 1928:526); a female skull measured by the same author was 66 by 42 mm. Skulls of the subspecies *Z. pichiy caurinus* have a proportionally shorter muzzle. The type specimen has the following measurements: greatest length, 64 mm; condylobasal length, 63 mm; zygomatic breadth, 41 mm; tip of the muzzle to back of postorbital projection, 38 mm; palate length, 35 mm (Thomas 1928).

Skulls of *Z. p. caurinus* are smaller and have a proportionally shorter snout than those of *Z. p. pichiy* (Frechkop and Yepes 1949; Squarcia and Casanave 2000). Skull measurements (mm, mean  $\pm$  SD) given by Squarcia and Casanave (2000) for *Z. p. pichiy* ( $n = 15$ ) and *Z. p. caurinus* ( $n = 8$ ), respectively, were: total length,  $67.51 \pm 1.47$ ,  $63.50 \pm 2.17$ ; basal length,  $55.34 \pm 1.41$ ,  $52.44 \pm 1.85$ ; palatal length,  $37.51 \pm 1.02$ ,  $34.81 \pm 1.79$ ; nasal length,  $23.28 \pm 1.14$ ,  $20.55 \pm 1.47$ ; maximum width,  $41.03 \pm 0.88$ ,  $37.67 \pm 1.41$ ; rostral width,  $10.07 \pm 0.33$ ,  $8.51 \pm 0.54$ ; interorbital width,  $18.89 \pm 0.54$ ,  $18.00 \pm 0.29$ ; palatal width,  $8.55 \pm 0.19$ ,  $8.16 \pm 0.48$ ; extracondylar width,  $20.83 \pm 0.41$ ,  $19.80 \pm 0.58$ ; maximum height,  $23.69 \pm 0.56$ ,  $22.12 \pm 1.04$ ; extratympanic width,  $37.00 \pm 0.93$ ,  $33.02 \pm 1.16$ .

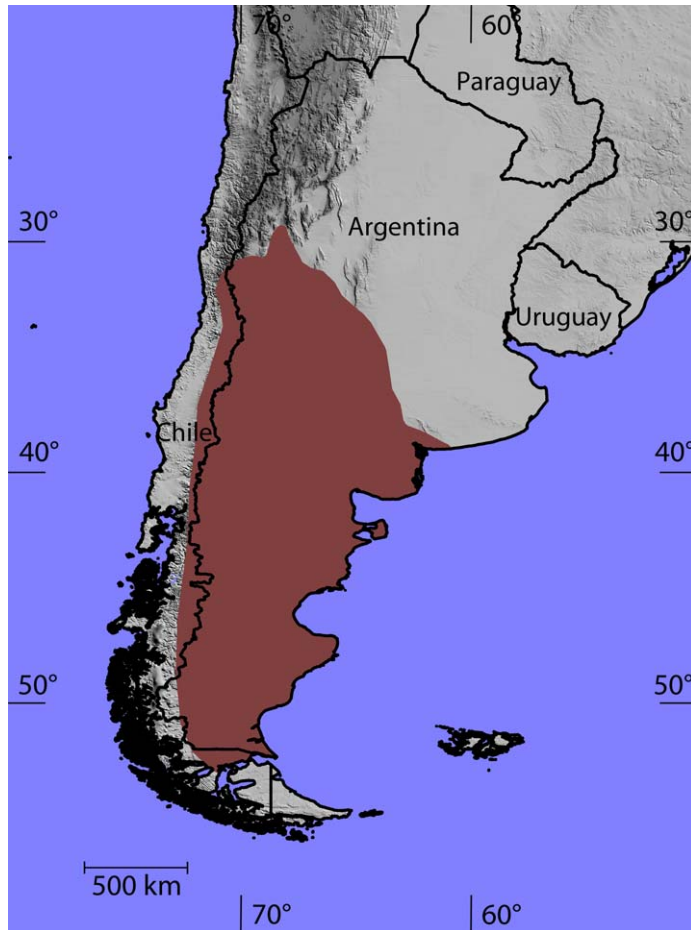
Wetzel (1985b) gives a mean ( $\pm$  SD) condylo-nasal length of  $66.7 \pm 2.7$  mm ( $n = 26$ ) without specifying the subspecies. Reinbach (1955) provides a detailed description of the skull of an embryo of *Z. pichiy*.

## DISTRIBUTION

*Zaedyus pichiy* was initially endemic to Argentina and spread into Chile in the 19th century (Fig. 4). It has been reported from the Argentine provinces of Buenos Aires, Chubut, Córdoba, La Pampa, La Rioja, Mendoza, Neuquén, Río Negro, San Juan, San Luis, and Santa Cruz (Vizcaíno et al. 2006; Abba et al. 2012). In Chile it is present in the following regions (Schneider 1866; Tamayo

←

**Fig. 3.**—Osteoderms of different parts of the carapace of *Zaedyus pichiy*. A) Movable bands, 20 mm length by 6 mm width; note that the lateral figures are subdivided into smaller, poorly defined figures. B) Scapular and pelvic shields, 9.5 mm length by 7.5 mm width; note that the peripheral figures are not subdivided. C) Head shield; note the lack of figures and perforations.



**Fig. 4.**—Geographic distribution (brown) of *Zaedyus pichiy*. Map redrawn from Abba and Superina (2010) with modifications.

1973; Texera 1973): Valparaíso (Río Colorado, Los Andes), Maule (Laguna de Maule), Biobío (Antuco, San Fabián de Alico), Aysén del General Carlos Ibáñez del Campo (Lago General Carrera), and Magallanes y Antártica Chilena (Fenton Farm and Route N°9, 33 km North).

### FOSSIL RECORD

The genus *Zaedyus* is known from the late Pliocene (Marshall et al. 1984; McKenna and Bell 1997). *Zaedyus pichiy* is known from the Pleistocene to Recent of South America (Cione and Tonni 1999). More specifically, it is known since the Ensenadan Stage/Age of the Pampean Region (Cione and Tonni 2005). The earliest record of this species is from Buenos Aires Province, where it was found in the local mammalian biozone *Mesotherium cristatum* (2.14–0.5 million years ago—Cione and Tonni 1999). In summary, the existence of *Z. pichiy* dates back for approximately a million years.

### FORM AND FUNCTION

**Form.**—*Zaedyus pichiy* has 8 maxillary and 9 mandibular pairs of simple crowned, elliptical, homodont teeth consisting of osteodentine and lacking enamel, whose anterior and posterior surfaces are worn into a bevel (Ameghino 1889; Wetzel 1985a; Vizcaíno 2009). The premaxillary is devoid of teeth (Wetzel 1985a). The palate bears 7 cross ridges corresponding to the 7 anterior teeth; the palate is smooth posterior to the last ridge (Lönnerberg 1898). The tongue has a sharp apex and bears filiform, fungiform, and vallate papillae. Foliate papillae are absent (Ciuccio et al. 2008).

The stomach is transversely extended; in the single individual studied by Lönnerberg (1898), its longest diameter was about 7 cm. “The cardiac portion has a smooth villous membrane, but the pyloric shows a good many, well marked, partly forked rugose, and the muscular coat is here much thicker. At the pylorus there are two thick semilunar ridges, or valves, situated at opposite sides, but not at the same height, the upper one, that is the one nearer the lumen of the stomach, being much thicker” (Lönnerberg 1898:300).

In the individual examined by Lönnerberg (1898), the length of the small intestine corresponded to about 8 times the carapace length. “There is no proper ileo-coecal valve, but the small intestine is narrowed where it enters the great gut, and shows on its inside about half a dozen longitudinal ridges. There are two lateral colic caeca. They are not quite 1 cm long and have nearly the same width” (Lönnerberg 1898:301). One of us (MS) has observed considerable size differences in the caeca of wild *Z. pichiy*, which may be related to dietary differences.

The spleen is trilobed. It adheres to the ventral left part of the stomach by a short gastrosplenic omentum (Lönnerberg 1898). Both red and white pulp are present. Its hemopoietic activity persists in adult individuals (Galíndez et al. 2003).

“The pancreas is very long, but thin. Its left restiform portion extends from the spleen along the margin of a prolongation of the Omentum gastrolienale in a curve across the abdominal cavity to the mesenterium duodenale in which it is greatly expanded. It opens into the duodenum, not quite 2 1/2 cm from the pylorus” (Lönnerberg 1898:302).

The liver consists of 6 greater lobes and 2 smaller lobules; the right posterior lobe partly covers the right kidney. The gall bladder is embedded in the posterior side of the central right lobe. The right kidney is larger and anterior to the left kidney. The left adrenal gland is larger than the right one. “The former has a rounded but flat shape and is free from the kidney, but attached to the spine. The right one lies between the right caudal lobe of the liver and the kidney, and is thus pressed against the latter organ” (Lönnerberg 1898:303). The urinary bladder is short and rounded.

Females have 2 pectoral mammary glands. The vulva is large, around 12 mm. A urogenital sinus of 18-mm length is present instead of a true vagina. The uterus is pyramid-shaped with a well-developed body and 2 small lateral horns (Cetica et al. 2005). The ovaries are 4 mm long, 33–36 mm<sup>3</sup> in volume, cylindrical with rounded extremities, and with a longitudinal polarization in cortex and medulla (Codón and Casanave 2000; Cetica et al. 2005; Superina et al. 2009a). Polyovular follicles are relatively common, but tertiary (preovular) follicles are not. Corpora lutea have only been observed on ovaries of pregnant females (Superina et al. 2009a).

The penis is long, reaching approximately 60% of body length (Superina and Loughry 2012). The intra-abdominal testes have a volume of 0.14–0.35 cm<sup>3</sup> in juveniles ( $n=4$ ) and 0.10–1.25 cm<sup>3</sup> in yearlings (off-season,  $n=14$ ). In adults, testis volume is 0.32–2.88 cm<sup>3</sup> outside the reproductive season ( $n=30$ ) and 4.14 cm<sup>3</sup> during the breeding season ( $n=1$ —Superina and Jahn 2009). The spermatozoa are long, with spoon-shaped heads (Cetica et al. 1998).

**Function.**—Outside the hibernation period, the rectal temperature of wild individuals varies from 32.2°C to 38.3°C, with a mean ( $\pm$  *SD*) of 35.2°C  $\pm$  1.2°C (Superina et al. 2009c). At a constant ambient temperature of 15°C, body temperature can vary between 22°C and 36°C over the course of a day (Roig 1971).

*Zaedyus pichiy* is the only extant xenarthran known to enter shallow daily torpor and prolonged deep hibernation, with minimal subcutaneous temperatures of 14.6°C  $\pm$  2.1°C (Superina and Boily 2007). In Mendoza Province, west-central Argentina, hibernation usually lasts from mid-May to mid-August. Considerable fat reserves are built up before hibernation (Superina and Boily 2007; Superina 2008). During daily torpor, body temperature typically drops to below 30°C, sometimes as low as 24.5°C, during a period of 4–6 h (Superina and Boily 2007). Environmental stress, such as reduced food quality, leads to prolonged and deeper torpor (Superina and Jahn 2013).

*Zaedyus pichiy* is highly susceptible to sudden changes in environmental temperature; rapidly elevating ambient temperature from 0°C to 15°C leads to an increase in body temperature of up to 16°C within an hour, and death within 8–10 h (Roig 1971). *Z. pichiy* has a basal metabolic rate (mean  $\pm$  *SE*) of 0.226  $\pm$  0.013 cm<sup>3</sup> O<sub>2</sub> g<sup>-1</sup>·h<sup>-1</sup>. Its minimal conductance is 0.027  $\pm$  0.0011 cm<sup>3</sup> O<sub>2</sub> g<sup>-1</sup>·h<sup>-1</sup> °C<sup>-1</sup> (McNab 1980).

## ONTOGENY AND REPRODUCTION

*Zaedyus pichiy* reaches sexual maturity at the age of 9–10 months, but some females do not reproduce until their 2nd year. *Z. pichiy* is a seasonal breeder, which, in males, is reflected in significant differences in fecal testosterone metabolite levels. Fecal testosterone levels (mean  $\pm$  *SEM*)

are 68.7  $\pm$  4.1 ng/g dry feces off-season and 199.6  $\pm$  23.1 ng/g dry feces during the reproductive season (Superina and Jahn 2009). The reproductive season lasts from spring to early summer, varies latitudinally between 3 and 5 months, and is regulated by photoperiod (Superina and Jahn 2009). No ovarian cyclic patterns were found in fecal hormone analyses of female *Z. pichiy*, and they may be induced ovulators (Superina et al. 2009a). There is no evidence of delayed implantation.

Gestation length is 58–60 days. Fecal progesterone metabolite levels remain basal during the 1st half of pregnancy, then increase 10-fold to peaks of 3,500 ng/g dry feces (Superina et al. 2009a). Postpartum fecal progesterone and glucocorticoid concentrations are greater in lactating than in nonlactating *Z. pichiy* (Superina et al. 2009a). In the wild, births occur between October and January. Parturition of 1 yearly litter of 1 or 2 (exceptionally 3) offspring of approximately 50 g (Superina and Loughry 2012) occurs inside the burrow. Newborns are covered with a pinkish, soft, flexible carapace lacking cornification and containing only small osteoderms. The carapace hardens and acquires a yellow color during the first 2 weeks of age (Superina et al. 2009a). The offspring do not leave the burrow until they are about 40 days old and partially weaned (Superina et al. 2009a). Linear growth rate during lactation is 9 g/day, and body mass at weaning is 40% of adult body mass (Superina and Loughry 2012).

## ECOLOGY

*Zaedyus pichiy* inhabits arid to semiarid habitats with firm, sandy soils (Superina 2008). It is a common inhabitant of the Patagonian steppe, which is composed of grasslands with isolated shrubs and areas with open bush communities. It also occurs in the southern portion of the Chacoan region, which consists of small trees, shrubs, and scarce pasture (Superina 2008). Abba and Vizcaíno (2011) list it for the Espinal, Monte, and Pampa ecoregions where it occurs on sandy soils, mainly in natural grasslands and shrublands, and to a lesser degree in farmland, in areas with agricultural activities. Based on a species distribution model (Abba et al. 2012), 40% of the population inhabits the Patagonian steppe; 26% the Monte of plains and plateaus; 13% Pampas grasslands; 11% the Espinal ecoregion; and 10% in rarely used habitats, such as the Patagonian forest, dry Chaco, and Monte of hills and valleys.

*Zaedyus pichiy* digs and uses burrows for shelter and thermoregulation. Burrow entrances are dome-shaped (about 15 cm wide by 8 cm high) and usually hidden under vegetation. The burrows are sealed while being excavated (Superina 2008). Most burrows have a single entrance, are unbranched, can reach several meters length, and end in a chamber that lacks nesting material. Burrow depth varies seasonally and latitudinally and can be as deep as 1.5 m

during winter (Superina and Boily 2007). Burrow depth reflects the level at which burrow temperature is buffered from daily fluctuations in aboveground temperature due to thermal inertia and insulation of soil (Superina and Boily 2007). Some captive *Z. pichiy* have been observed using the same burrow for several weeks (especially while nursing offspring), whereas others often dug new burrows almost every day. Abandoned burrows may be used by snakes, such as *Bothrops*.

*Zaedyus pichiy* has been described as a carnivore–omnivore with a preference for carrion that also ingests insects, especially ants and their larvae, other invertebrates, and plant material (Redford 1985). More recently, *Z. pichiy* has been classified as an opportunistic omnivore with a preference for insects that feeds on beetles and their larvae, several species and castes of ants, plant material, scorpions, spiders, Diptera larvae, vertebrates such as lizards and small mammals, phasmids, and fungi (Superina et al. 2009b). Darwin (1839) observed Coleoptera, various larvae and pupae, roots, and an *Amphisbaena* in stomach contents from *Z. pichiy*. *Z. pichiy* preys on soil-nesting bees (Sarzetti and Genise 2011). Wild *Z. pichiy* do not drink water. Darwin stated that “(It) can drink no fresh water for years together” (Keynes 2000:204).

*Zaedyus pichiy* is the main prey of crowned eagles (*Harpyhaliaetus coronatus*) where these species are sympatric (Sarasola et al. 2010). Other predators include South America gray fox (*Lycalopex* [formerly *Pseudalopex*] *griseus*—Zapata et al. 1998), cougar (*Puma concolor*—Pessino et al. 2001), and birds of prey such as black-chested buzzard-eagles (*Geranoaetus melanoleucus*—Saggese and de Lucca 2004).

**Diseases and parasites.**—Blood can be collected from the coccygeal vein (Superina and Mera y Sierra 2008). *Zaedyus pichiy* has a lower white blood cell count (mean  $\pm$  SD;  $4.7 \pm 2.9 \times 10^3/\mu\text{l}$ ,  $n = 66$ ) and a lower red blood cell count ( $4.30 \pm 1.05 \times 10^6/\mu\text{l}$ ,  $n = 25$ ), but higher mean cell volume ( $120.2 \pm 30.0$  fl,  $n = 25$ ) than most other mammals (Superina and Mera y Sierra 2008). Its lymphocytes lack receptors for the Fc-segments of immunoglobulins (Sasiain et al. 1977).

Trauma-related lesions and scars are frequent in wild individuals. Excessive ambient humidity can lead to infected skin lesions and, eventually, to death. This disease, locally known as “pichi plague,” has caused local extinctions (Superina et al. 2009c).

Ectoparasites include the fleas *Malacopsylla grossiventris* and *Phthiropsylla agenoris* and the tick *Amblyomma pseudoconcolor* (Superina et al. 2004, 2009c). Intestinal parasites are present in  $> 90\%$  of wild *Z. pichiy* (Superina et al. 2009c). Infestations with *Aspidodera* are common, but *Mathevotaenia*, *Trichuris*, *Eimeria*, *Trichostrongyloidea* (Ezquiaga et al. 2009), and *Cyclobulura superinae* (Navone et al. 2010) also have been identified in *Z. pichiy*. Cysts of

*Sarcocystis* and *Besnoitia* can be present in muscle and lung tissue, respectively (Superina et al. 2009c).

*Trypanosoma cruzi* has been isolated from blood of *Z. pichiy* (Mazza et al. 1935), and 2 of 25 tested wild individuals were seropositive for this hemoparasite (Superina et al. 2009c).

## BEHAVIOR

*Zaedyus pichiy* has predominantly solitary and diurnal habits, but can be nocturnal in captivity (Altmann and Scheel 1980; Superina 2008). When threatened, *Z. pichiy* runs to hide in an existing burrow or under shrubs, digs a new burrow, or lies flat on the ground to protect its soft ventral side (Krieg 1961). As stated by Darwin, “When surprised, it either buries itself very quickly, or lies close to the ground to escape observation. In loose dry earth it is necessary to get off your horse quickly in order to secure your prize, which when fat & roasted is most excellent eating” (Keynes 2000:204). Vocalization includes a purring sound that can change into a grunt or a scream similar to that of screaming hairy armadillos (Superina 2008). Several males may chase a female during breeding season and show aggressive behavior toward each other (Superina 2008).

## GENETICS

The diploid number ( $2n$ ) for *Zaedyus pichiy* is 62 chromosomes, consisting of 14 pairs of metacentric or submetacentric and 16 pairs of acrocentric autosomes. The X chromosome is submetacentric and the Y is a diminutive acrocentric. Some cells may be hypodiploid (Meritt and Benirschke 1973). Several genomic and mitochondrial sequences have been described in *Z. pichiy* (Delsuc et al. 2002, 2003, 2012; Möller-Krull et al. 2007).

## CONSERVATION

*Zaedyus pichiy* is listed as “Near Threatened” by the *International Union for Conservation of Nature and Natural Resources Red List of Threatened Species* (International Union for Conservation of Nature and Natural Resources 2011). It also is listed as “Near Threatened” in the *Libro Rojo de los Mamíferos de Argentina* (Superina et al. 2012). Populations of *Z. pichiy* are decreasing mainly due to intense (illegal) hunting for food and sports, but individuals also are killed by dogs, hit by cars, and affected by habitat modification and overgrazing. Local extinctions have occurred due to disease. A population reduction of 20% in the past 10 years has been estimated (Abba and Superina

2010). In Mendoza Province, Argentina, *Z. pichiy* is the main prey of poachers (Superina 2008).

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