



Chaetophractus vellerosus (Cingulata: Dasypodidae)

ALFREDO A. CARLINI, ESTEBAN SOIBELZON, AND DAMIÁN GLAZ

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División Paleontología de Vertebrados, Museo de La Plata, Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata, CONICET, Paseo del Bosque s/n, 1900 La Plata, Argentina; acarlini@fcnym.unlp.edu.ar (AAC); esoibelzon@fcnym.unlp.edu.ar (ES)

Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata, 122 y 60, 1900 La Plata, Argentina; dglaz@ciudad.com.ar (DG)

Abstract: *Chaetophractus vellerosus* (Gray, 1865) is commonly called Piche llorón or screaming hairy armadillo. *Chaetophractus* has 3 living species: *C. nationi*, *C. vellerosus*, and *C. villosus* of Neotropical distribution in the Bolivian, Paraguayan, and Argentinean Chaco and the southeastern portion of Buenos Aires Province. *C. vellerosus* prefers xeric areas, in high and low latitudes, with sandy soils, but is able to exist in areas that receive more than twice the annual rainfall found in the main part of its distribution. It is common in rangeland pasture and agricultural areas. *C. vellerosus* is currently listed as “Least Concern” by the International Union for Conservation of Nature and Natural Resources and is hunted for its meat and persecuted as an agricultural pest; however, the supposed damage to agricultural-farming lands could be less than the beneficial effects of its predation on certain species of damaging insects.

Key words: Argentina, armadillo, Bolivia, dasypodid, Paraguay, South America, Xenarthra

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Chaetophractus Fitzinger, 1871

Dasypus: Molina, 1782:305. Not *Dasypus* Linnaeus, 1758.

Loricatus Desmarest, 1804:28. Part.

Dasypus: Illiger, 1811:70. Part, not *Dasypus* Linnaeus, 1758.

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

Tatusia Lesson, 1827:309. Part.

Euphractus: Burmeister, 1861:427. Part, not *Euphractus* Wagler, 1830.

Chaetophractus Fitzinger, 1871:268. Type species *Dasypus villosus* (= *Loricatus villosus* Desmarest, 1804:28), by subsequent designation (Yepes 1928:494).

Dasyphractus Fitzinger, 1871:264. Type species *Dasyphractus brevirostris* Fitzinger, 1871, by monotypy.

Choetophractus Trouessart, 1898:1146. Incorrect subsequent spelling of *Chaetophractus* Fitzinger, 1871.

CONTEXT AND CONTENT. Order Cingulata, family Dasypodidae, subfamily Euphractinae, tribe Euphractini. Xenarthra is a monophyletic group (Gaudin 2004; Delsuc and Douzery 2009) that contains 31 living species grouped into 5 families and 14 genera (sensu



Fig. 1.—An adult of *Chaetophractus vellerosus* from Pipinas, Buenos Aires Province, Argentina. Photo by Esteban Soibelzon used with permission.

Gardner 2007; Wetzel et al. 2007). Xenarthra are distributed almost exclusively in the Neotropical Region (except the 9-banded armadillo, *Dasyypus novemcinctus*, McBee and Baker 1982; Gardner 2007; Wetzel et al. 2007). This superorder is divided into 2 orders: Cingulata and Pilosa (Wilson and Reeder 2005), all of them with living representatives. There are 3 proposed living species in the genus *Chaetophractus*: *C. nationi*, *C. vellerosus*, and *C. villosus*, all distributed within South America (but see Abba et al. 2016 concerning validity of *C. nationi*). The following key to the 3 species is adapted from Wetzel et al. (2007):

1. Size large, head-and-body length averaging 330 mm (range 261–344 mm); darkly colored and sparsely covered with long, black hair on carapace; head shield broad, and osteoderms on head shield patterned (not flat and smooth); width:length head shield ratio averaging 0.95; posterior margin of head shield not straight, but reflecting the outline of individual marginal osteoderms.....
.....*Chaetophractus villosus*
Size smaller, head-and-body length averaging < 280 mm; paler with color of hair on carapace tan or white; head shield narrower, and osteoderms flat and smooth; posterior margin of head shield straighter.....2
2. Size small, head-and-body length < 255 mm, condylonal length < 80 mm; hair tan and comparatively dense; pinnae long, extending back to the 1st fused row of osteoderms on scapular shield; head shield comparatively narrow (width:length ratio averaging 0.90) and posterior margin straight.....*Chaetophractus vellerosus*
Size intermediate, head-and-body length > 250 mm, condylonal length > 80 mm; hair pale tan, sometimes white; head shield proportionally broader than in most *C. villosus* and posterior margin with indentions between individual osteoderms; restricted to high Andean grasslands.....*Chaetophractus nationi*

Chaetophractus vellerosus (Gray, 1865)

Screaming Hairy Armadillo

- Cryptophractus brevirostris* Fitzinger, 1860:385, 395. Nomen nudum.
- Dasyypus vellerosus* Gray, 1865:376. Type locality “Santa Cruz de la Sierra,” Santa Cruz, Bolivia.
- Dasyphractus brevirostris* Fitzinger, 1871:264. Type locality “Chili.” Possibly from northwestern Argentina (Cerqueira and Tribe 2008:41).
- Chaetophractus vellerosus*: Gray, 1873:19. First use of current name combination.
- [*Dasyypus* (*Chaetophractus*)] *vellerosus*: Trouessart, 1898:1146. Name combination.
- Dasyypus vellerosus pannosus* Thomas, 1902:244. Type locality “Cruz del Eje,” Córdoba, Argentina.

[*Dasyypus* (*Chaetophractus*) *vellerosus*] *pannosus*: Trouessart, 1905:820. Name combination.

Dasyypus boliviensis Grandidier and Neveu-Lemaire, 1908:5. Type locality “environs d’Uyuni (Bolivie), à 3,600 mètres d’altitude,” Potosí, Bolivia; preoccupied by *Tatusia boliviensis* Gray, 1873, a synonym of *Dasyypus novemcinctus* Linnaeus, 1758.

Dasyypus vellerosus Grandidier and Neveu-Lemaire, 1908:6. Incorrect subsequent spelling of *Dasyypus vellerosus* Gray, 1865.

Dasyypus vellerosus pannosus O. Thomas, 1902:221. Incorrect subsequent spelling of *Dasyypus vellerosus* Gray, 1865.

Chaetophractus vellerosus pannosus: Yepes, 1928:500. Name combination.

Chaetophractus vellerosus vellerosus: Yepes, 1928:500. Name combination.

E[uphractus]. vellerosus: Krumbiegel, 1940:56. Name combination.

Euphractus villosus desertorum Krumbiegel, 1940:61. Type locality “San Carlos, Chaco,” Argentina.

CONTEXT AND CONTENT. Context as for genus. Commonly this species is cited as *Chaetophractus vellerosus* (Gray, 1865) Yepes 1928, crediting Yepes with the 1st use of the current name combination; however, Gray (1873:19) himself proposed the current combination. There are 2 subspecies recognized (Gardner 2005):

C. v. vellerosus (Gray, 1865). See above.

C. v. pannosus (O. Thomas, 1902). See above.

DIAGNOSIS

Chaetophractus vellerosus (Fig. 1) is the smallest of the Euphractini (head-and-body length < 255 mm—Wetzel et al. 1985b, 2007), though its size is close to that of the pichi, *Zaedyus pichiy* (Superina and Abba 2015); the dorsum of *C. vellerosus* is variegated brown and pale tan (Wetzel 1985a) and has the greatest hairiness (both ventral and dorsal) among the living Euphractini (Wetzel 1985b). Ears are proportionally much longer than those of the pichi (> 20 mm versus < 20 mm in the pichi—Superina and Abba 2015) and the big hairy armadillo, *C. villosus*, and similar to those of the Andean hairy armadillo, *C. nationi* (Anderson 1997).

The cephalic shield (Fig. 2) is more isodiametric (width:length = 0.919, based on measurements taken from 17 museum specimens of mixed sexes) than in the pichi (width:length = 0.77; Superina and Abba 2015) and not as wide as in *C. villosus* (Wetzel 1985b:29). The cephalic shield is formed by osteoderms that are not as smooth as those of the pichi, though scarcely sculpted (mainly at the postocular region), unlike *C. villosus*, which has the entire shield, ornamented. The posterior margin is flattened, not reflecting individual curves of each marginal

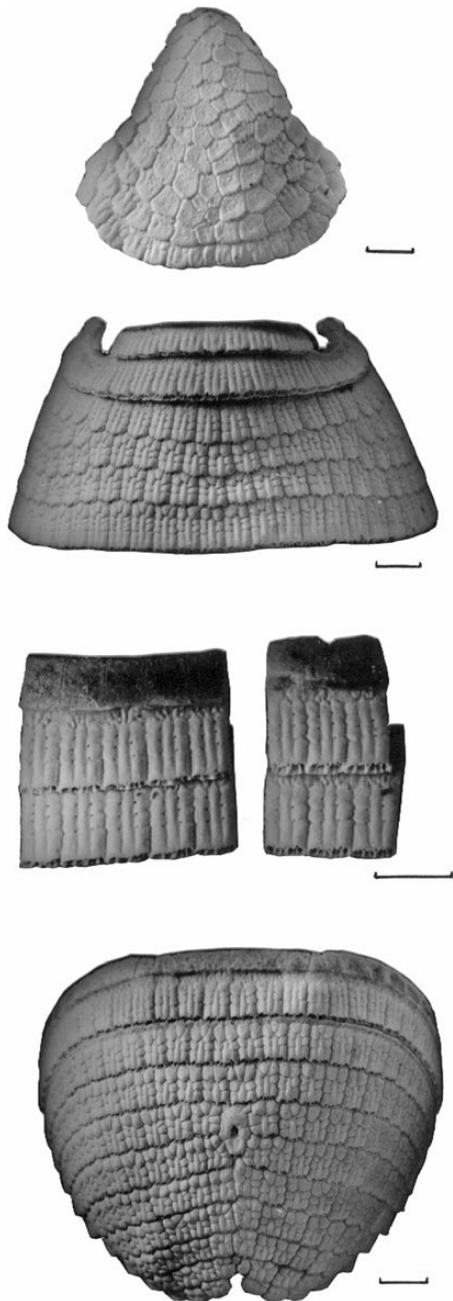


Fig. 2.—Dermic carapace of *Chaetophractus vellerosus*. From top to bottom: cephalic shield, nuchal strips, and scapular shield, movable bands (just detail of some osteoderms of them), and pelvic shield. Graphic scale = 1 cm. Greatest length of the cephalic shield is 58.1 mm.

osteoderm (Wetzel 1985b). There are 2 well-developed nuchal strips (Fig. 2), the posterior one with 25 to 31 osteoderms.

The scapular shield is relatively small, with no more than 4 rows of osteoderms in the middle plane (more numerous toward the margins), unlike *C. villosus* that has generally 5 or 6. Six to 9 mobile strips at sagittal line (usually 7 or 8; Fig. 2), sometimes the most posterior is attached to central part of pelvic shield; 4th mobile strip with 32 to 41 osteoderms (see Abba 2008). The osteoderms of the mobile strips present 3 distinct longitudinal zones (1

central zone and 2 lateral zones; see Fig. 2). The lateral zones are divided into small peripheral figures (4 or 5 in number), the most posterior of which is the largest; small foramina are present in the area where the posterior apex of each small figure intersects the separation line between lateral and central zones (see Krmpotic et al. 2009 for foramina interpretation). The posterior border of the osteoderms is rather straight and bears numerous piliferous foramina; there is a relatively short area shaped like a shallow transversal groove, which appears rough and longitudinally striated due to numerous canaliculi opening on its external surface. This groove separates the articulation zone from the posterior part of the osteoderm (see Soibelzon et al. 2006).

Pelvic shield (Fig. 2) is more extended than scapular shield, with 9–10 rows of osteoderms in middle plane, which is more than twice the length of scapular shield (Cabrera and Yepes 1940). Pelvic shield has 1 or 2 sagittal osteoderms with larger holes (compared with size of the normal foramina) corresponding to edoneous glands in the central area of pelvic carapace (the pichi has none). Marginal osteoderms of dorsal carapace are not as sharp as those of the pichi and *C. villosus*. Tail is longer than one-half the length of head and body and proportionally longer than that of *C. nationi*, *C. villosus*, and the pichi (Cabrera and Yepes 1940).

The skull of *C. vellerosus* (Fig. 3) is similar to that of the pichi. The rostrum of *C. vellerosus* is not as elongated and generally without the slight frontal depression of the pichi. Zygomatic arch is short, as in other Euphractini, and according to Wetzel (1985b), height of jugal is not uniform as in the pichi (though not all specimens of pichi clearly show this character). Teeth are always euhypsodont, and dental formula is 9/10 (some specimens have 9/9), with 1 tooth in the premaxillary, as in *C. villosus* but different from the pichi which has 8/9 and no premaxillary teeth (Superina and Abba 2015).

The 2 proposed subspecies (*C. v. vellerosus* and *C. v. pannosus*) are differentiated essentially by the amount and distribution of hair on the body (Yepes 1928). In *C. v. vellerosus*, hair is very abundant on the carapace and ventral parts, with numerous long hairs (> 36 mm). Conversely, in *C. v. pannosus*, hair covering the body is less dense and there are fewer long hairs (Yepes 1928). Based on limited observations, it has been suggested that at least part of the specimens referred to as *C. nationi* may correspond to a 3rd subspecies of *C. vellerosus* that occurs at high altitude (Wetzel 1985a, 1985b).

GENERAL CHARACTERS

Chaetophractus vellerosus is a small dasypodid. Average external and cranial measurements (mm, parenthetical range; taken by authors) for 12 males and 11 females, respectively, from Pipinas (35°34'S, 57°16'W; see Fig. 4) were: total length, 357.9 (310–399), 355.4 (322–401); length of head and body, 245.1 (210–284), 242.7 (214–271); tail length, 112.8 (100–128), 112.6 (99–133); hind foot length, 49.2 (40–53), 48.9 (45–55); and ear length, 30.4 (25–33), 29.8 (22–32). Mean body mass (g) of 53 adult males and 59 adult females, all from the same location (Magdalena,

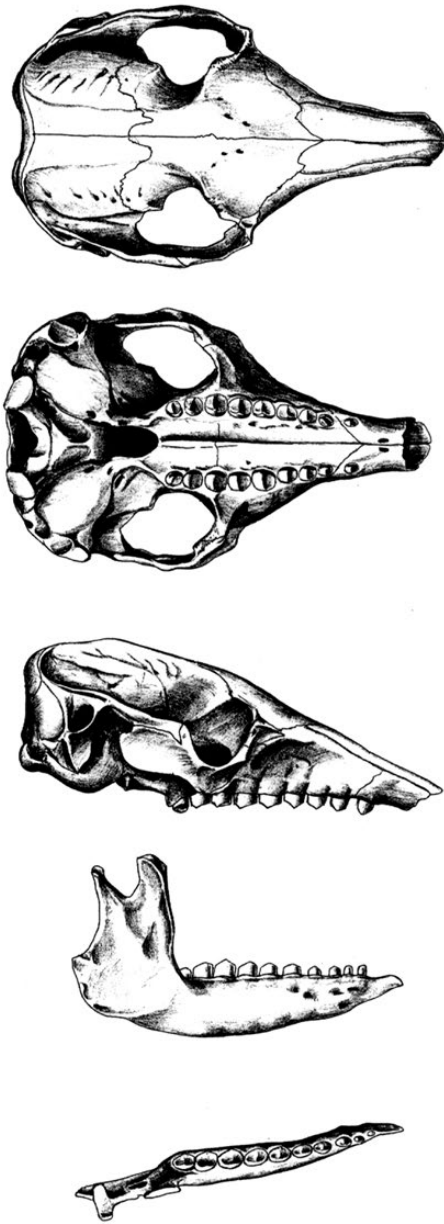


Fig. 3.—Dorsal, ventral, and lateral views of the skull, and lateral and dorsal view of the mandible of *Chaetophractus vellerosus*. Greatest length of skull is 65.6 mm.

Buenos Aires Province, Argentina), was 771.51 (± 134.155 SD) and 802.37 (± 122.564 SD—Abba et al. 2011), respectively. Mean measurements (mm, with parenthetical ranges) of 76 males and 71 females, respectively, from northwestern Argentina (Greggor 1974) were: total length, 376 (328–400), 368 (265–419); tail length, 114 (84–131), 112 (77–138); hind foot length, 49 (44–53), 48 (31–56); ear length, 28 (22–31), 27 (22–31); and body mass (g), 860 (543–1,329), 814 (257–1,126). Measurements (mm) of a single female from Roboré, Bolivia (18°20'S, 59°44'W—Anderson 1997) were: total length, 440; tail length, 152; hind foot length, 72; ear length, 30; and body mass (g), 950. Mean measurements (mm, with parenthetical ranges, *n*) for 15 specimens from Argentina,

1 from Bolivia (the holotype), and 4 from Paraguay (Wetzel 1985b) were: length of head and body, 230.1 (221.8–238.4, 19); tail length, 104.1 (95.1–113.1, 19); hind foot length, 47.0 (41.5–52.5, 16); ear length, 30.8 (29–32.6, 14); condylo-nasal length, 62.6 (60.8–64.4, 20); and width:length ratio of head shield, 0.9 (0.86–0.94, 17).

Hair is tan and comparatively dense all over the body; pin-nae long, extending back to the 1st fused row of osteoderms on scapular shield (Gardner 2007). The limbs and belly are covered with whitish or light brown hairs (Nowak 1999).

Farmers generally believe that *C. vellerosus* is easily captured because it is not a good runner, but based on our observations, capturing it is not easy on irregular ground where *C. vellerosus* is able to change direction suddenly, or when numerous burrows are present, and it is able to dart into inactive burrows; *C. vellerosus* is a quick and skillful digger. If pulled from the burrow by its tail, it will hold on with its claws and extend its carapace against the burrow wall, increasing resistance by using the serrated margin of the carapace against the wall. When caught, its screams loudly (like *C. nationi*) similar to a baby's crying. This protest call resulted in the common name "piche llorón" (screaming hairy armadillo) and permits its escape from predators (Wetzel 1982).

DISTRIBUTION

Chaetophractus vellerosus occurs from the Bolivian Chaco, southeastern Bolivia, near the locality of Santa Cruz de la Sierra (Anderson 1997; Gardner 2007), Puna Boliviana (Wetzel 1985b), and Paraguayan Chaco, western Paraguay (Crespo 1974), southwards in the Argentine provinces of Jujuy, Salta, most of Tucumán, Catamarca, north of La Rioja, Córdoba, San Luis, and east of Santa Fe (Yepes 1928, 1929; Cabrera 1958; Wetzel 1982, 1985b; Redford and Eisenberg 1992), reaching the provinces of Mendoza and La Pampa, and the southeastern portion of Buenos Aires Province (Crespo 1974; Wetzel 1982; Carlini and Vizcaíno 1987; Redford and Eisenberg 1992; Abba et al. 2011, 2016). *C. v. vellerosus* is distributed in Bolivia and the highlands of North Western Argentina, and *C. v. pannosus*, in lower areas of northwest Argentina, reaching the easternmost pampas (Yepes 1928, 1929; Cabrera 1958; Fig. 4). This disjunct distribution in Argentina has been explained as a relic of a more extensive paleo distribution that comprised the current territory of Buenos Aires Province during the late Pleistocene and part of the Holocene (Carlini and Vizcaíno 1987) and is in concordance with the recent phylogeographic studies which indicate that the ancestral haplotype of the species is in the Tucumán province and the derived haplotype in the Samborombón Bay (Poljak 2009). Recent discoveries in ensenadan sediments (Early to Middle Pleistocene) of southeastern Buenos Aires have allowed extension of also the temporal distribution of this species (see "Fossil Record"). The records in the Puna de Tarapacá, Chile, by Gardner (2005, 2007), probably correspond to *C. nationi* (Abba and Superina 2010a, 2010b).

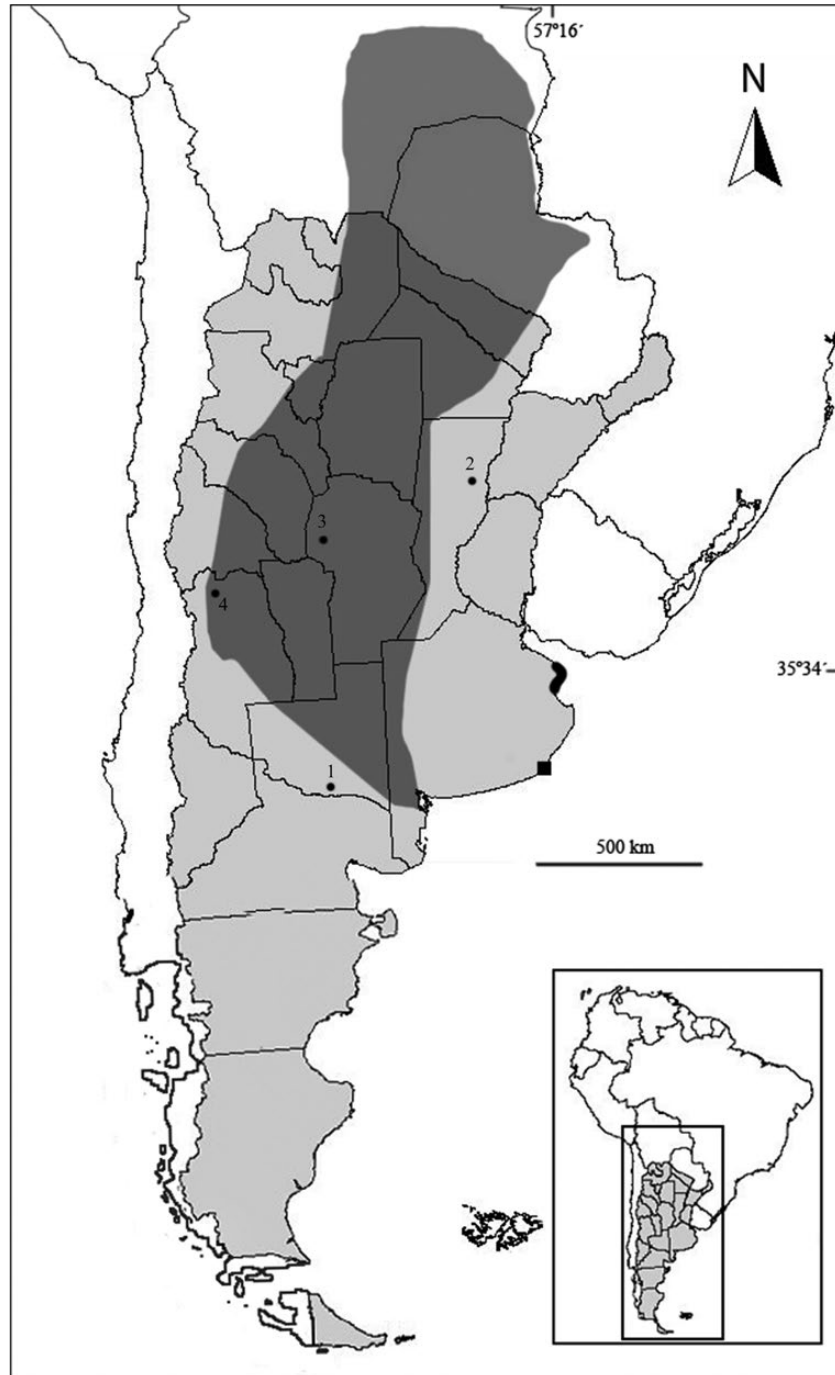


Fig. 4.—Geographic distribution of *Chaetophractus vellerosus*. Extended light gray shading indicates main distribution area; small black shading indicates relictual area in Buenos Aires Province (including Pipinas locality), Argentina. Black dots indicate archaeological sites: 1) “Tapera Moreira,” La Pampa Province; 2) “La Lechuza,” Santa Fe Province; 3) 4 Late Holocene sites in Córdoba Province; 4) “Agua de la Cueva,” Mendoza Province. Black square indicates fossil record at Punta Hermengo, Miramar, Buenos Aires.

In the province of Buenos Aires (Argentina), *C. vellerosus* has a fragmented distribution, as several specimens have been recorded in the coastal area from 34° to 36° of South latitude (ca. 170 km) in the Samborombón Bay and 70 km to the north (Crespo 1974; Carlini and Vizcaíno 1987; Soibelzon et al. 2007; Abba and Vizcaíno 2011; Abba et al. 2016). Soil conditions within all areas

of occurrence of *C. vellerosus* are similar, though mean annual precipitation across the distribution varies. In central and northwestern regions of Argentina, rainfall is between 200 and 600mm and in the eastern portion of Buenos Aires Province, between 1,000 and 1,200mm (Fig. 4). The elevational distribution is wide, from sea level up to 4,000 m (perhaps more, see Crespo 1944).

Wetzel (1985a, 1985b) recorded *C. vellerosus* in the Argentine provinces of Río Negro and Santa Cruz based only on 2 specimens from the collection of the Museo Argentino de Ciencias Naturales “Bernardino Rivadavia” (Museo Argentino de Ciencias Naturales [MACN] 31.2, a skull of Arroyo Pilcaniyeu 41°S, 70°W, MACN 29.899, a carapace of Santa Cruz Province 46°S, 52°S), collected in 1929 by Dr. A. Artayeta and L. Parodi, respectively. These records should be used with caution because there are irregularities in the catalog, and specimens and provenance may be confused with those of the pichi, which certainly inhabits those localities.

FOSSIL RECORD

Despite the fossil record of the genus *Chaetophractus* beginning in the Pliocene (Chapadmalalan Age/Stage), the species *C. vellerosus* is recorded in numerous provinces of Argentina: Buenos Aires during Ensenadan Age in “Punta Hermengo” (Lower to Middle Pleistocene—Soibelzon et al. 2006, 2010); La Pampa in the archaeological site “Tapera Moreira” (38°33′S, 65°33′W—Berón and Baffi 2003); Santa Fe in the archaeological site “La Lechuza” (29°54′19.9″S, 59°55′22.2″W—Comero et al. 2007); Córdoba in the archaeological sites “Las Chacras or C.Pun.39” (31°03′S, 64°31′W), Puesto La Esquina 1 (PE1, 31°09′S, 64°37′W), Arroyo Talainín 2 (31°18′S, 65°12′W), and TalaHuasi (31°27′S, 64°38′W, Department Punilla—Soibelzon et al. 2013); Mendoza in the archaeological site “Agua de la Cueva” (32°37′S, 69°04′W—Gil et al. 2011). Additionally, Vizcaíno et al. (1995) mentioned its presence in the Late Pleistocene of Catamarca, but without precise geographic location and collection number.

FORM AND FUNCTION

The head region of spermatozoa of *Chaetophractus vellerosus* is very large and similar to that of *C. villosus*, the pichi, and *Euphractus sexcinctus*, the 6-banded armadillo (Cetica et al. 1997, 1998; Cetica and Merani 2008). In frontal view it is long and wide ($14.47 \mu \pm 0.4 \text{ SD}$ and $12.68 \mu \pm 0.4 \text{ SD}$, respectively), in lateral view it is extremely thin, except at the base near the insertion point of the tail; consequently, the sperm head is transparent when observed through a contrast microscope. The sperm head is paddle-like in outline and posteriorly truncated. In lateral view, spermatozooids are spoon-like and commonly piled up. The acrosome covers about 70.2% of the head length and the postacrosomal region is relatively short. Staining with DAPI (4′6-diamidino-2-phenylindole, 0.2 $\mu\text{g/ml}$ in McIlvaine’s buffer pH 6.8) showed the nucleus (and its chromatin) extending homogeneously along the head of the spermatozoid (Cetica et al. 1997). The nuclear volume was estimated as $16.61 \mu^3$ and the mean nuclear thickness is $0.11 \pm 0.06 \mu \text{ SD}$. The acrosomal narrowing covers a large portion of the nucleus and is not significantly thicker than the spermatid maximum thickness (Cetica

et al. 1997). The tail length and the total sperm length are similar to those of spermatozooids of most Eutheria (Cetica et al. 1997).

With respect to kidney function, *C. vellerosus* has a relative medullary thickness (RMT) of $7.5 \pm 0.5 \text{ SD}$, a value that is above the normal range of values expected for desert mammals of its size (RMT = 7.1 for 850 g weight—Gregeor 1975). This indicates extreme ability to concentrate urine and consequently conserve water (McNab 1980; Gregeor 1985). Gregeor (1975) demonstrated the ability of *C. vellerosus* to extract and retain water from food in a comparison of it with a species of similar size, 9-banded armadillo (RMT = $4.9 \pm 0.4 \text{ SD}$). When both species were fed a diet with reduced water content (but given free access to water), *C. vellerosus* lost only 2% of its body weight; in contrast, the 9-banded armadillo lost 15% after 11 days on the diet. This outcome suggests that *C. vellerosus* is not dependent on succulent food, which is scarce several months out of the year in desert or semidesert zones where it is mainly distributed (Gregeor 1975).

Concerning body temperature, *C. vellerosus* has the typical pattern of armadillos, maintaining a low body temperature (34.4°C) independently of ambient temperature (McNab 1980), but lower body temperatures in cold seasons than in warm seasons have been reported (Abba et al. 2011). Gregeor (1985), in turn, reported that the body temperature of 2 specimens studied inside their own burrows dropped around 5.4°C and 6°C in 1 h, although the temperature of the burrows decreased less than these values. Basal metabolic rate is low (47% of the expected value for an animal of 1,100 g) and the minimal thermal conductance is high (117%). Consequently, the lower limit of thermoneutrality is relatively high (30°C). This kind of control of body temperature may explain why *C. vellerosus* avoids thermal extremes by concentrating its activity in the hottest hours of the day during the winter, and switching to diurnal activity in summer. Low metabolic rates are important in the setting of long gestation periods, low growth rates, long periods of parental care, and reduced number of offspring (McNab 1980, 1985). In winter, both females and males increase their body weight by more than 10%, developing a subcutaneous fat layer 1 to 2 cm thick, which may be even thicker in animals in captivity (Redford and Eisenberg 1992).

ONTOGENY AND REPRODUCTION

As most dasypodids (except members of the genus *Dasybus*), *Chaetophractus vellerosus* has 1 or 2 large young per litter, commonly once a year. As in *C. nationi*, *C. villosus*, and the pichi, females have a pair of pectoral mammae (Nowak 1999). A captive mother weighing 760 g in the Zoo of La Plata gave birth to a pair of young, 44.0 and 42.0 g each, born in November 1998. Mean body mass for 5 young females and males was 45.0 and 48.0 g, respectively (Abba et al. 2011). Young are born with eyes closed and eyes do not open until young are 7–10 days of age. The carapace is not ossified, and cornified scales are not developed, but young already display the definitive general structure;

claws are poorly keratinized and pilosity of the body is not developed yet (Krmptic et al. 2012).

The longevity of this species is unknown, but it is supposedly not much different from that of other euphractines. A specimen of *C. villosus* in captivity lived 15 years and 7 months (Flower 1931).

ChaetophRACTUS vellerosus has a seasonal reproductive pattern. This is supported by the results of Luaces et al. (2011) who found significant correlation between dry fecal and plasma progesterone concentrations. Toward the end of winter and beginning of spring, one of us (DG) commonly observed groups of 2–5 males tirelessly pursuing a female between midday and early afternoon (1200 to 1600h). During tracking studies, numerous attempts of copulation, in which a single male covered the female by holding himself to the female's back with his forelimbs, were observed.

ECOLOGY

ChaetophRACTUS vellerosus inhabits primarily extreme xeric areas, in high and low latitudes, but never areas with poorly drained soils, or in rocky places where construction of burrows is almost impossible, also it is common in range land pasture and agricultural areas (Abba et al. 2011; Pagnutti et al. 2014). *C. vellerosus* is able to exist in areas with more rainfall than is found in the main part of its distribution, and some populations are found in areas that receive twice the normal annual precipitation of the main area of its distribution (Carlini and Vizcaíno 1987; Glaz and Carlini 1999; Fig. 4). The local edaphic characteristics of the coastal area of Samborombón Bay determine more xeric conditions with respect to the soils around it because the soils are mainly sandy and very well drained (Murriello et al. 1993). Such conditions favored the development of xerophytic woodlands known as “Talaes” (*Celtis tala* forests). These “Talaes” develop on elevated shell-beds (“albardones”), which are covered by markedly sandy soils; this specific combination forms a system that is extremely permeable to water. The deposits, which originated during the Late Quaternary marine incursions, represent elevations of 1 to 2 m above the level of adjacent areas (Goya et al. 1992), and within the Samborombón Bay region, *C. vellerosus* is restricted specifically to these sectors (Glaz and Carlini 1999; Soibelzon et al. 2007).

ChaetophRACTUS vellerosus is mainly nocturnal in summer and diurnal in winter (Gregeor 1980, 1985). In winter, *C. vellerosus* spends the midday basking in sunlight and at night, when temperatures fall markedly it stays within its burrows. In summer, its activity begins in mid-afternoon and extends until dawn. Individuals are active at different hours of the day, for no more than 3 h continuously (Gregeor 1980a, 1980b, 1985). We have observed that the total time of activity on the surface is variable, being maximal during breeding season (early spring to middle summer) and minimal with extreme temperatures (both hot and cold). Larger individual displacements are observed in spring than in winter, when several males follow a female (Abba et al. 2011).

ChaetophRACTUS vellerosus typically digs burrows in areas of native woodlands and calcareous soils (Abba et al. 2007); in areas where soil lacks stability, burrows are found more commonly near vegetation (Crespo 1944; Gregeor 1985;). In dune zones, about 7% of the burrows were located at the sides of the dunes, whereas in low areas where the land is harder, the burrows were built around trees or shrubs, where the soil is loose (Gregeor 1985). Burrows have no predominant orientation and may be several meters in length, and the numerous entrances vary between 8 and 15 cm in diameter. Despite variation in entrance diameters, burrow temperatures are typically lower than the body temperature of the occupant, even on the hottest days of the year. The annual variation of temperature inside burrows is around 9°C, being near 18°C in winter, when surface temperature may be below 0°C, and 27°C in summer, when surface temperature reaches 65°C (Wetzel 1982, for Monte Desert).

An individual will enter and exit the burrow system through different holes and may not necessarily return to the same burrow (Gregeor 1980a, 1980b, 1985). When an individual is inside the burrow, the entrance is generally closed. We have observed in winter the accumulation of grass in the middle of a burrow system underground in the cavity where the animal rests at 0.70 m depth, covering a chamber 0.31 m diameter where at least 3 tunnels joined at that point, forming a system of up to more than 6 m in diameter. If an individual is not in its burrow, it is out foraging or, in winter, taking sun baths with its ventral surface exposed to the sun in a deep sleep, trembling repeatedly (Cabrera and Yepes 1940).

In the province of Buenos Aires, the home range sizes for 3 specimens of *C. vellerosus* (1 male and 2 females), estimated by plotting the localization points on a map, were 1.0564, 2.3131, and 1.5446 ha, respectively, and when moved several hundred meters away, an individual will quickly return to its home area (Glaz and Carlini 1999). The maximum activity area for these same 3 animals was calculated as 3.4153, 5.3191, and 3.7065 ha for the male and the females, respectively (Glaz and Carlini 1999). The home range for 12 females (6 in autumn–winter and 6 in spring–summer) and 18 males (14 in autumn–winter and 4 in spring–summer) in the Magdalena area (Buenos Aires) was 0.27 and 0.13 ha (respectively, for females); and 0.23 and 0.75 ha (respectively, for males—Pagnutti et al. 2014). These home range values are lower than those reported by Gregeor (1980b) for 7 specimens in the province of Catamarca (3.4 ha; recorded during May). The difference may be due to the greater food availability in humid areas such as the province of Buenos Aires (Glaz and Carlini 1999).

ChaetophRACTUS vellerosus can go for periods of time without drinking water, most likely a result of efficient kidneys that reduce water loss, and its ability to take water from food (Gregeor 1975, 1980a, 1985). A study of individuals in the Catamarca Province (Gregeor 1980b) illustrated that diet varied seasonally. In summer, insects were the item most represented (46% by volume [of identifiable material—here and subsequent values], $n = 48$ stomachs), although in winter plant material, mainly pods of *Prosopis*,

and roots and tubers of others plants became more predominate (50.7% by volume, $n = 36$ stomachs). In both seasons *C. vellerosus* fed also on vertebrates (27.7% by volume in summer, 13.9% by volume in winter), including anurans, lizards, different species of birds, and rodents of the genera *Eligmodontia* and *Phyllotis*. A study of *C. vellerosus* from Pipinas, Argentina (Soibelzon et al. 2007) indicated that invertebrates were a common prey item (44.2% weight, $n = 28$ stomachs) followed by plant material (17.9% weight), vertebrates (19.5% weight), and undetermined remains (18.4% weight). Among invertebrates, insects were the most abundant items (with 85.5% weight and a percentage of occurrences close to 100%). Similar results, based on fecal analysis, were reported by Abba et al. (2011). During winter, the Pipinas populations are reported as being more insectivorous than those from Catamarca. These individuals incorporated large amounts of sand when feeding, which is a significant component of the stomach content (Redford and Eisenberg 1992). Precipitation is practically absent in Catamarca during the winter months, a condition that favors the development of xerophytic plant species (e.g., *Prosopis*) and is detrimental to those animal species with higher humidity requirements (e.g., amphibians). Soibelzon et al. (2007) have estimated that this difference in diet is likely determined by climatic factors that influence the availability of different prey items. Consequently, *C. vellerosus* may be considered as an omnivorous opportunist (Greggor 1985).

GENETICS

Chaetophractus vellerosus has a diploid number ($2n$) of 62 chromosomes (Rahn et al. 1994; Lizarralde et al. 2005), there are 14 biarmed chromosomes, with a large submetacentric X chromosome, and an acrocentric (Rahn et al. 1994) or telocentric (Lizarralde et al. 2005) Y chromosome (one of the smallest in size among the complement). The largest pair of chromosomes is metacentric. The other pairs include: 3 metacentrics, 11 submetacentrics, and 16 acrocentrics. C-banding is positive in 1 arm of the largest pair, and in a centromeric position on the all other pairs (Rahn et al. 1994).

The karyotype is close in morphology and banding pattern to those of the pichi ($2n = 62$) and *C. villosus* ($2n = 60$). The position of the nucleolus organizer regions (sensu Howell and Black 1980) is located distally in the 3 and 9 submetacentric pairs on the long arms (Rahn et al. 1995). A recent study of the DNA content showed that *C. vellerosus* has a genome size of 4.46 pg DNA (Redi et al. 2005).

Gene diversity, mean nucleotide diversity (π), and mean n° of differences in base pairings were 0.7395 ± 0.0341 SD, 0.006460 ± 0.003750 SD, and 3.133 ± 1.641 SD, respectively, for *C. vellerosus* (S. Poljak, in litt.).

CONSERVATION

Chaetophractus vellerosus is listed as “Least Concern” on the 2016 International Union for Conservation of Nature and Natural

Resources Red List of Threatened Species (Abba et al. 2011, 2016; International Union for the Conservation of Nature and Natural Resources 2016). The supposed damage caused by *C. vellerosus* to agricultural-farming lands could be less than the beneficial effects of its predation upon some of damaging insect species (Soibelzon et al. 2007). Such studies are even more necessary when we consider that *C. vellerosus* has a relictual distribution in Buenos Aires Province and that hunting by humans, coupled with habitat fragmentation, could reduce the number of individuals to ecologically unsustainable levels, leading to the disappearance of the small populations of *C. vellerosus* at these latitudes.

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