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## New Data on Armadillos (Xenarthra: Dasypodidae) for Central Patagonia, Argentina

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### Abstract

Armadillos represent the most diverse family of xenarthrans. Although many studies have been done on these mammals, several topics, such as their local distribution, natural history, behavioral ecology and conservation, remain poorly known. *ChaetophRACTUS villosus* and *Zaedyus pichiy* are the most common armadillos in extra-Andean Patagonia, a vast area in southern Argentina and Chile that encompasses different ecosystems and has been modified by human activities, mainly by sheep grazing. In this work we present new data on the distribution, natural history, conservation, and ecology of *C. villosus* and *Z. pichiy* from central Patagonia (Chubut and Río Negro provinces, Argentina). We registered 60 localities for *C. villosus* and 35 for *Z. pichiy* that confirm their presence in wide sectors of central Patagonia. Furthermore, we confirmed that these two armadillo species suffer high rates of mortality due to their use as a protein source, hunting by dogs, road traffic, and poisoning, among others. We conclude that their populations are at risk of overexploitation and local extinction. The basic knowledge provided here will be a first step towards the conservation of these characteristic Patagonian mammals.

**Keywords:** *ChaetophRACTUS villosus*, *Zaedyus pichiy*, new records, distribution.

### Introduction

Armadillos (Mammalia: Dasypodidae) represent the most diverse family of recent xenarthrans (Wetzel, 1985a, b). Although many scientific publications exist on these species (see Superina, 2010), several topics, such as the natural history, local distribution, behavioral ecology, and conservation, remain poorly studied (McDonough and Loughry, 2008).

Extra-Andean Patagonia occupies an area of 750,000 km<sup>2</sup> and encompasses different ecosystems, from grasslands to shrub-steppes and semi-desert. Phytogeographically, the area includes the Patagonian steppe, the Monte shrub-steppes, and scrublands (Cabrera, 1976). Human activities have modified most of the Patagonian region, most notably by sheep

grazing on the natural vegetation. There is evidence that grazing by domestic herbivores has been modifying the vegetation and accelerating soil degradation processes since the beginning of the twentieth century (e.g., Beeskow *et al.*, 1987; Rostagno and Del Valle, 1988; Bisigato and Bertiller, 1997).

Most of Patagonia is dominated by strong and constant west winds. Precipitation levels decrease from west to east; most of the region receives less than 200 mm per year. Mean annual temperature varies between 12°C in the northeastern part and 3°C toward the south (Paruelo *et al.*, 1998). However, minimum temperatures in the Somuncurá plateau are among the coldest recorded for Argentina (-35°C in Maquinchao, Río Negro province).

Today, four species of armadillos are known to inhabit Patagonia (including Argentina and Chile): *ChaetophRACTUS vellerosus* (Gray, 1865), *C. villosus* (Desmarest, 1804), *Chlamyphorus truncatus* (Harlan, 1825), and *Zaedyus pichiy* (Desmarest, 1804). *Ch. truncatus* and *C. vellerosus* occur only rarely (Abba and Vizcaíno, 2008), but *C. villosus* and, especially, *Z. pichiy* are two typical medium-sized mammals from Patagonia (Cabrera and Yepes, 1940; Daciuk, 1974). According to bibliographic records and voucher material from Argentinean mammal collections, only 51 localities have been reported for these two species in Patagonia (Abba and Vizcaíno, 2008; Abba, unpublished data).

In this work, we present data on new localities, natural history, conservation, and ecology of *C. villosus* and *Z. pichiy* from central Patagonia (Chubut and Río Negro provinces, Argentina).

### Materials and Methods

Fieldwork was carried out during the summers of 2005 to 2007 as part of the dissertation research of two of the authors (MJN and DEUS) and in conjunction with the project "Postglacial Patagonia: evolutionary responses of small mammals to climate change" (National Geographic Society, grant number 7813-05). Data were collected opportunistically and through observation of individuals of *Z. pichiy* and *C. villosus* in different areas of central Patagonia, mainly the Chubut river basin, Somuncurá plateau, and Península Valdés. Additionally, we used information from interviews with rural settlers to obtain information on the behavior, habits, diet, abundance, and hunting of armadillos; the detailed results of these interviews are being analyzed and will be published elsewhere.

Collected material, such as skeletal remains, are in preparation and will be added to the Mammal Collection of Centro Nacional Patagónico, Chubut, Argentina. Additional evidence is registered in the field catalogue of Marcelo Carrera and Marcela J. Nabte.

## Results

### *Chaetophractus villosus* Desmarest, 1804

*Common name:* large hairy armadillo, peludo, quirquincho grande.

*Global and local conservation status:* Least Concern (LC). Listed as LC because of its (1) wide distribution and thus, presumed large population; (2) occurrence in a number of protected areas; and (3) tolerance of a large degree of habitat modification. Also, it is unlikely to be declining fast enough to qualify for listing in a more threatened category (Fonseca and Aguiar, 2004).

*Reported uses:* hunting for food. Traffic accidents and poisoning with substances used to kill foxes were reported as other causes of non-natural mortality.

*New records:* 60 (see Table 1 and Fig. 1). Most records were observations of live individuals or collected carcasses. Only five animals could be captured and sexed; three were males and two were females. None of the latter was pregnant at the moment of capture in fall.

*Habitat:* this species was observed, captured, and reported in all habitat types (steppes, monte shrub-steppes, and scrublands), but was more common in the monte shrub-steppes.

*Observations:* local people list many negative impacts of *C. villosus* and frequently persecute it as a pest. One important complaint is related to its burrows, especially to the risk of livestock (sheep) and horses stepping into them and breaking their legs. Other common concerns include disease transmission and possible attacks on young sheep. In addition, *C. villosus* was found to negatively affect bird populations, both domestic (chicken) and wild (e.g., penguins in the northern part of Península Valdés at San Lorenzo ranch) because of their consumption of eggs and chicks.

Although local people view “peludos” as unclean because they eat carrion, garbage and pichis, many still use this armadillo as an important protein source. In many tourist areas (e.g., Punta Norte, Península Valdés) “peludos” are a favorite because they are neither aggressive nor shy, and will eat from the hand of people.

### *Zaedyus pichiy* Desmarest, 1804

*Common name:* pichi, piche, piche de oreja corta, piche patagónico.

*Local conservation status:* Least Concern (LC). Species widespread and abundant (Díaz and Ojeda, 2000).

*Global conservation status:* Near Threatened (NT). This species is relatively widespread and is present in a great number of protected areas (Heinonen Fortabat and Chébez, 1997). However, it is hunted extensively, especially in the northern and eastern portion of its range, and local extinctions have been recorded in some areas (Fonseca and Aguiar, 2004; Superina, 2008; Superina and Members of the IUCN/SSC Edentate Specialist Group, 2008). Less information is available about declines in southern areas. Overall, this species is estimated to have declined significantly, primarily due to intense hunting (Fonseca and Aguiar, 2004).

*Reported uses:* hunting for food. Traffic accidents and hunting by domestic dogs were reported as other causes of non-natural mortality.

*New records:* 35 (see Table 1 and Fig. 1). Similar to *C. villosus*, most observations were of wild individuals that could not be captured. The gender of five animals was determined, four of them being males. One female captured during winter was not pregnant.

*Habitat:* *Z. pichiy* was observed, captured, and reported in all habitat types (steppes, monte shrub-steppes, and scrublands) but seemed to be more common in steppes.

*Observations:* in contrast to *C. villosus*, rural settlers eagerly hunt this species because it is “clean” (i.e., it does not ingest carrion) and its meat is more palatable. Many rural families will spend the afternoon hunting pichis and may catch four or five animals per day. They eat the meat and use the fat for frying.

In Península Valdés, pichis are more abundant in sandy areas. They are mainly found in the southern part of Península Valdés and become scarcer toward its northern portion. In central Patagonia, pichis are rarely seen aboveground during cold periods (fall and winter). Pichis are frequently observed eating plants, mainly *Condalia microphylla* and *Arjona tuberosa*, and insect larvae (Tenebrionidae, *Nyctelia* spp.). Remains of several juvenile pichis were found below nests of Black-chested Buzzard-Eagles (*Geranoetus melanoleucus*), as observed by Saggese and De Lucca (1994).

## Discussion

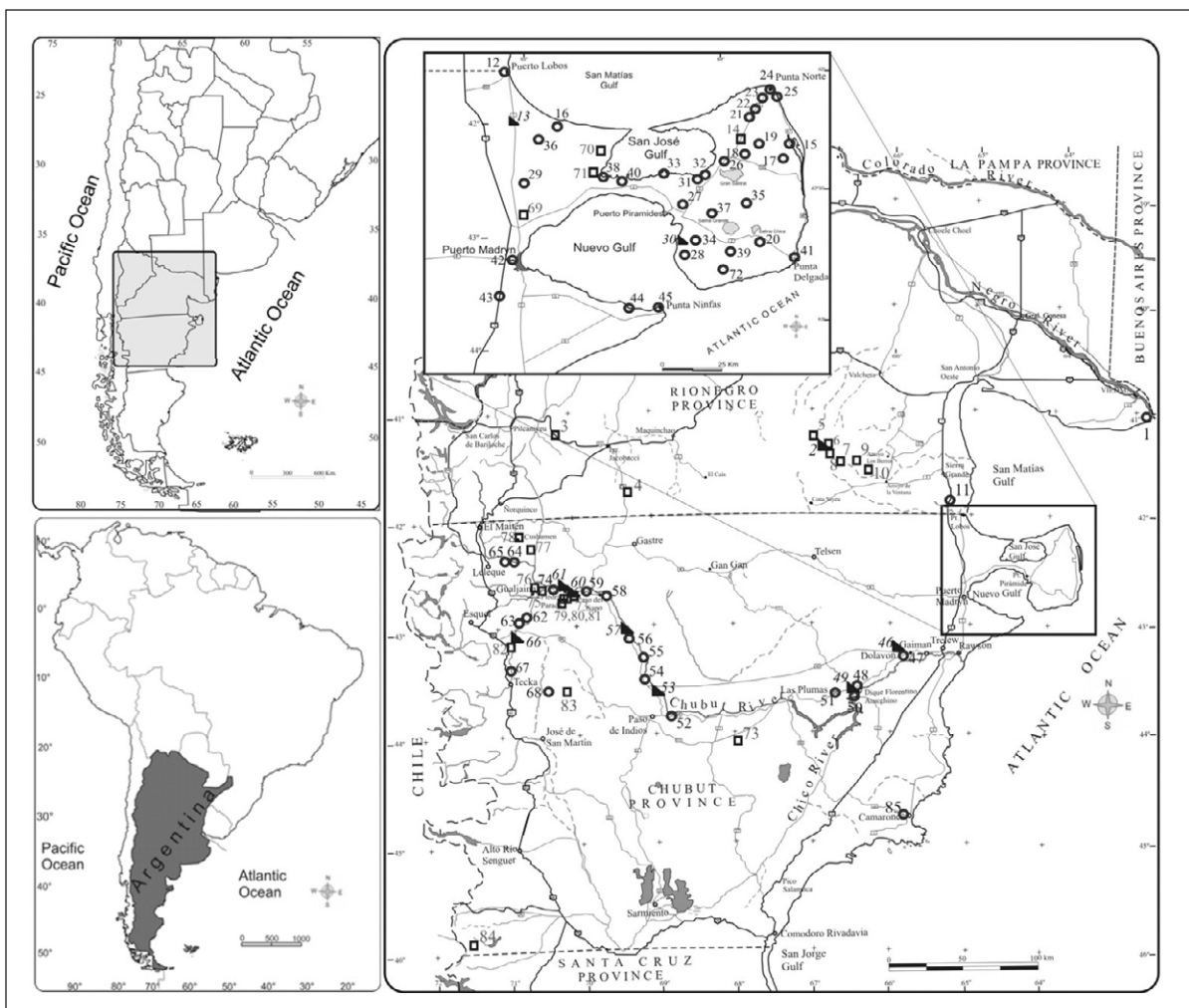
Like all armadillos, *C. villosus* and *Z. pichiy* have low body temperatures, low basal metabolic rates, and high thermal conductances (McNab, 1985). Given the low ambient temperatures in Patagonia, these characteristics represent a major constraint on the behavior and ecology of large hairy armadillos and pichis. Perhaps related to this, interviews with locals indicate that both species are observed more often during the day and suggest that *Z. pichiy* enters hibernation during the cold season (cf. Superina and Boily, 2007).

The collected data suggest that in Patagonia, *C. villosus* is more common than *Z. pichiy*. The former is probably a new component of the Patagonian fauna that naturally immigrated into this area ca. 150 years ago (Poljak *et al.*, 2010; Abba *et al.*, in preparation).

Perhaps, its higher abundance is a consequence of its successful invasion of Patagonia (Williamson and Fitter, 1996).

On the other hand, *Z. pichiy*, the typical Patagonian armadillo, is registered in low frequencies and is intensely hunted. We therefore believe that the global conservation status (NT) is more realistic and/or better reflects the current situation than the local status (LC; Diaz and Ojeda, 2000).

*C. villosus* has been described as a carnivore-omnivore (Redford, 1985; Casanave *et al.*, 2003; Abba, 2008) that ingests, among others, meat and carrion. The observations presented here agree with the general type of food habits, but includes reports of consumption of lambs and birds (both domestic and wild), a behavior that has not been reported before for this species and is not easy to observe.



**Figure 1.** Map showing new records of *Chaetophractus villosus* and *Zedus pichiy* in central Patagonia (see Table 1). ○ = *Chaetophractus villosus*, □ = *Zedus pichiy*, ▲ = *Zedus pichiy* + *Chaetophractus villosus*.

**TABLE 1.** List of new records for *Chaetophractus villosus* and *Zaedyus pichiy* (see also Figure 1). **NR**=national route; **PR**=provincial route; **Ea.**=Estancia (farm, ranch).

Number	Localities	Province	Lat. (S)	Long. (W)
1	Mouth of Río Negro river	Río Negro	41°04'14"	62°52'02"
2	Corona hill – Somuncurá plateau	Río Negro	41°27'21"	66°54'52"
3	20 km East of Clemente Onelli	Río Negro	41°14'48"	70°16'57"
4	Ea. Calcatreo	Río Negro	41°44'00"	69°22'00"
5	Paraguay Lagoon – Somuncurá plateau	Río Negro	41°21'04"	66°57'44"
6	Top of Somuncurá plateau I	Río Negro	41°27'19"	66°53'31"
7	La Querencia – Somuncurá plateau	Río Negro	41°29'26"	66°53'05"
8	Top of Somuncurá plateau II	Río Negro	41°31'41"	66°49'14"
9	Top of Somuncurá plateau III	Río Negro	41°31'00"	66°38'15"
10	Campana Mahuida	Río Negro	41°35'36"	66°27'37"
11	NR 3, 8 km North of Arroyo Verde	Río Negro	41°55'47"	65°18'27"
12	Puerto Lobos	Chubut	42°00'00"	65°04'18"
13	Ea. La Colmena	Chubut	42°12'59"	65°02'57"
14	Ea. La Adela (La Escondida)	Chubut	42°20'12"	63°57'07"
15	Caleta Valdés	Chubut	42°17'00"	63°39'00"
16	Ea. 16 de Agosto	Chubut	42°13'00"	64°52'00"
17	Ea. La Adela (El Piquillín)	Chubut	42°20'00"	63°42'00"
18	Ea. La Adela (La Escondida)	Chubut	42°21'00"	63°59'00"
19	Ea. La Adela (La Media Luna)	Chubut	42°18'00"	63°52'00"
20	Ea. La Corona	Chubut	42°41'00"	63°38'00"
21	Ea. La Ernestina - NR 3	Chubut	42°08'00"	63°49'00"
22	Ea. La Ernestina - NR 3	Chubut	42°06'00"	63°47'00"
23	Ea. La Ernestina - NR 3	Chubut	42°04'00"	63°45'00"
24	Ea. La Ernestina - Punta Norte	Chubut	42°04'47"	63°45'33"
25	Ea. La Ernestina - PR 47	Chubut	42°05'00"	63°45'00"
26	Ea. La Adela (La Escondida)	Chubut	42°21'00"	63°59'00"
27	Ea. Loreto	Chubut	42°32'00"	64°11'00"
28	Ea. San Pablo	Chubut	42°38'00"	64°10'00"
29	Ea. Estrella del Sud	Chubut	42°27'00"	65°02'00"
30	Ea. San Pablo	Chubut	42°38'16"	64°12'36"
31	Facasso Beach I	Chubut	42°25'00"	64°07'00"
32	Facasso Beach II	Chubut	42°25'00"	64°06'00"
33	Larralde Beach North	Chubut	42°24'17"	64°18'09"
34	Ea. San Pablo	Chubut	42°41'00"	64°13'00"
35	Ea. Bajo Gualicho	Chubut	42°33'00"	63°53'00"
36	Ea. El Golfo	Chubut	42°15'00"	64°56'00"
37	Ea. Las Margaritas	Chubut	42°35'00"	64°04'00"
38	Ea. El Pampero	Chubut	42°25'00"	64°36'00"
39	Ea. Bajo Bartolo	Chubut	42°42'00"	63°56'00"
40	Ea. La Isla - PR 2	Chubut	42°28'00"	64°32'00"
41	Punta Delgada	Chubut	42°45'00"	63°38'00"
42	Puerto Madryn	Chubut	42°46'45"	65°02'15"
43	Laguna Blanca	Chubut	42°49'16"	65°07'57"
44	Bahía Cracker	Chubut	42°57'05"	64°27'48"
45	Punta Ninfas	Chubut	42°58'29"	64°18'32"
46	Ea. La Elvira	Chubut	43°13'58"	65°55'53"
47	10 km West of Dolavon	Chubut	43°18'20"	65°48'42"
48	NR 25, 6 km East of Las Chapas	Chubut	43°35'06"	66°27'03"
49	Las Chapas	Chubut	43°35'14"	66°27'30"
50	Ameghino Seawall	Chubut	43°38'14"	66°30'53"



Number	Localities	Province	Lat. (S)	Long. (W)
51	Between Las Chapas and Las Plumas	Chubut	43°38'43"	66°42'37"
52	36 km West of Los Altares	Chubut	43°51'41"	68°49'31"
53	Ea. La Madrugada	Chubut	43°37'40"	68°57'08"
54	Pichiñan's farm	Chubut	43°33'19"	69°04'05"
55	Ea. El Torito	Chubut	43°18'26"	69°07'44"
56	Gorro Frigio I	Chubut	43°07'30"	69°18'07"
57	Gorro Frigio II	Chubut	43°05'15"	69°19'31"
58	Paso del Sapo	Chubut	42°43'51"	69°35'25"
59	Ea. San Ramón	Chubut	42°38'19"	69°50'33"
60	Cretón's farm	Chubut	42°41'25"	70°04'29"
61	Mario Moncada's farm	Chubut	42°38'26"	70°07'48"
62	PR 14 Gualjaina I	Chubut	42°54'40"	70°37'03"
63	PR 14 Gualjaina II	Chubut	42°57'18"	70°42'33"
64	Ea. Leleque I	Chubut	42°24'04"	70°45'52"
65	Ea. Leleque II	Chubut	42°22'09"	70°50'31"
66	Arroyo Pescado Cabin	Chubut	43°03'14"	70°47'55"
67	NR 40, 10 km North of Tecka	Chubut	43°24'38"	70°52'51"
68	8 km East of Ea. Quichaura	Chubut	43°34'19"	70°21'46"
69	Ea. El Doradillo (El Chalet)	Chubut	42°32'00"	65°01'00"
70	Ea. La Entrada I	Chubut	42°22'00"	64°43'00"
71	Ea. La Entrada II	Chubut	42°26'00"	64°42'00"
72	Ea. Los Dos Hermanos	Chubut	42°46'00"	63° 57'00"
73	Ea. Bajada del Guanaco	Chubut	44°06'09"	67°58'50"
74	Piedra Parada	Chubut	42°41'46"	70°03'15"
75	PR 12 and Gualjaina river	Chubut	42°39'51"	70°22'52"
76	PR 12 near Gualjaina	Chubut	42°38'48"	70°26'31"
77	Netchovitch's farm - Fofo Cahuel	Chubut	42°19'55"	70°33'14"
78	Cushamen	Chubut	42°09'21"	70°40'51"
79	Colan Conhue I	Chubut	42°41'25"	70°04'29"
80	Colan Conhue II	Chubut	42°41'45"	70°07'18"
81	Colan Conhue III	Chubut	42°41'47"	70°07'46"
82	43 km North of Tecka	Chubut	43°09'40"	70°50'19"
83	3 km East of Pocitos de Quichaura	Chubut	43°34'29"	70°12'52"
84	Valley Huemules – Lago Blanco	Chubut	45°56'45"	71°33'31"
85	Camaronés	Chubut	44°46'07"	65°43'00"

The food habits reported for *Z. pichiy* in central Patagonia agree with the information presented by Superina *et al.* (2009) for Mendoza, who described this species as an opportunistic omnivore that ingests high proportions of insects, but also plant material.

The geographic distribution of neither species seemed to be restricted by altitude or vegetation type. This contrasts sharply with other inhabitants of the region, such as the Patagonian hare (*Dolichotis patagonum*), another medium-sized mammal that is not found above 1000 m, and the many small mammals of the central basaltic plateaus (such as Somuncurá;

Andrade, 2007) whose distributions are strongly affected by plant composition.

To summarize, we confirmed the presence of *C. villosus* and *Z. pichiy* in wide sectors of central Patagonia. Both species suffer high mortality for many reasons: they are hunted for food, killed very frequently by dogs, hit by cars, poisoned with substances used to kill foxes, and must cope with the compaction of the soil by millions of sheep. These populations are therefore at risk of overexploitation and local extinction. Additional knowledge of localities, as well as of their ecology and natural history, will contribute

to the conservation of these characteristic mammals of Patagonia.

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