Received: 21 April 2021 | Revised: 22 June 2021 | Accepted: 26 June 2021

DOI: 10.1002/oa.3021

RESEARCH ARTICLE

The dog of Los Chonos: First pre-Hispanic record in western Patagonia (~43° to 47°S, Chile)

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Funding information
Call for Strengthening Development of Regional Centers 2020, Grant/Award Number: R20F0002; ANID-FONDECYT, Grant/Award Numbers: 1130151, 1210045

Abstract

In recent years, numerous archaeological remains of dogs (*Canis familiaris*) have been found in the Southern Cone of South America. In Patagonia, the pre-Hispanic record was limited to the northeast. This article presents dog specimens recovered at archaeological site GUA-010 Conchal located in the western Patagonian channels of Chile. Their presence is related to hunter-gatherers showing marked marine adaptations. This study defines their chronology, characterizes them morphologically and morphometrically, estimates their body mass and age, and investigates their possible social roles. Our analyses indicates that the remains correspond to a pre-Hispanic dog dated at 870 ± 20 years ^{14}C BP (769–684 cal BP), thereby expanding the known geographic range of the species prior to European colonization. The dog was an adult animal, and its body size was approximately 3–4 kg, which represents the smallest individual recorded in the Southern Cone. Body size is consistent with the reports in ethnohistorical record, which indicated the use of dog fur as clothing and possibly its help in fishing. Archaeological evidence suggests that its function as a food source is unlikely.

KEYWORDS
Chonos Archipelago, late Holocene, maritime hunter-gatherers, pre-Hispanic *Canis familiaris*, western Patagonian channels

1 | INTRODUCTION

Our knowledge about the pre-Hispanic distribution of dogs (*Canis familiaris*), their morphological characteristics, and their uses, functions, and social status in the Southern Cone of South America have been enriched in recent years with newly dated records from northwestern Argentina (González Venanzi et al., in press) and, especially, from the lowlands of southern Brazil (Guedes Milheira et al., 2017), northeastern Argentina (Castro et al., 2020; Loponte & Acosta, 2016), and Uruguay (López Mazz et al., 2018; Loponte et al., 2021). Patagonia has been excluded from these advances, and the current information on dogs remains limited. This limited knowledge primarily derives from the lack of finds in this region.

Archaeological dogs were first identified in Patagonia at the Cueva del Milodon site (Roth, 1902) (Figure 1), but the specimens are lost, precluding any further taxonomic determination. Casamiquela (1975) reported the discovery of a skeleton in a mortuary context in Sierra Apas; these materials are being studied to determine their chronology. In Cueva Fell, Saxon (1976) and Clutton-Brock (1988) reported dental remains assigned to the taxon, and Cardich et al. (1977) and Tonni and Politis (1981) proposed their existence from the specimens found in Cueva 3 de Los Toldos. These determinations were rejected when these materials were restudied and reassigned to a species of fox, which was extinct during the late Holocene, *Dusicyon avus* (Amorosi & Prevosti, 2008; Caviglia, 1985–1986). The presence of *C. familiaris* in pre-Hispanic times in northeast

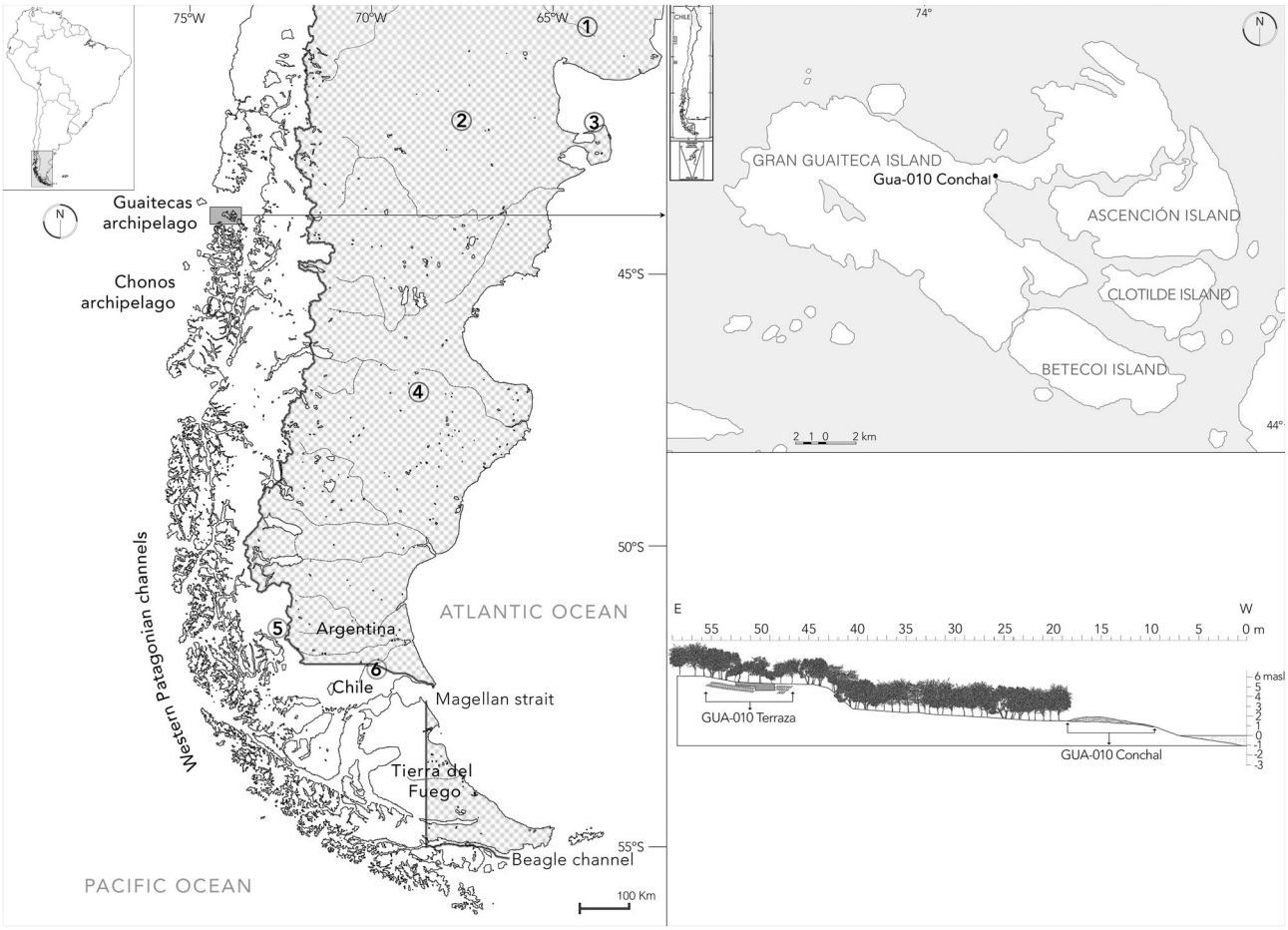

FIGURE 1 Left. General location and coastal layout of the GUA-010 Conchal site. Right. Location of the sites mentioned in the text. (1) Angostura 1, (2) Sierra Apas, (3) Médano de Playa Colombo; (4) Cueva 3 de Los Toldos, (5) Cueva del Milodon, and (6) Cueva Fell

Patagonia was confirmed upon its identification at the Angostura 1 site (Prates, Prevosti, & Berón, 2010), with an associated date of 938 ± 45 years ^{14}C BP (AA2551; 2σ: 971–730 cal BP). Recently, dog remains were discovered at the Médano de Playa Colombo site, whose context suggests a post-Hispanic age (Udrizar Sauthier & D'Agostino, 2017).

Dogs' presence in the Chilean Patagonia has not been confirmed. Its archaeological identification has numerous implications. They were part of the social, economic, and religious sphere of past societies (Anthony & Brown, 2017; Guagnin et al., 2018; Hill, 2018; Losey et al., 2011, 2018; Martin et al., 2014; Morey, 2010; Perri, 2016; Russell, 2012; Schwartz, 1997; Welker & Byers, 2019; among others) and also acted as taphonomic agents that modified and destroyed faunal assemblages (Kent, 1981; Lyon, 1970; Payne & Munson, 1985; Russell & Twiss, 2017). This study presents specimens from the GUA-010 Conchal site supporting the existence of *C. familiaris* in the Chilean western Patagonia and their interaction with marine hunter-gatherer groups that inhabited the Chonos Archipelago. The main objectives are to describe their context of discovery, to submit a radiocarbon date, and to present morphological, morphometric, and age data. Estimations of the body mass were made and compared with other pre-Hispanic *C. familiaris* records of the Southern Cone of South America. Finally, we evaluate general hypotheses about the role of dogs in marine hunter-gatherer groups.

1.1 | GUA-010 Conchal archeological site

The Chonos Archipelago (~43° to 47°S) was occupied since middle Holocene by marine hunter-gatherer (canoe groups) with high residential pericostal mobility (Reyes, 2020; Reyes et al., 2016). Subsistence relied on marine and littoral resources (mainly marine fishes, and to a lesser proportion seabirds, mollusks, and mammals like *Myocastor coypus*), although animals of the adjacent continental border, such as small- and medium-sized deer (e.g., *Pudu puda* and *Hippocamelus bisulcus*), were also hunted (Reyes, 2020; Reyes et al., 2016, 2019; San Román et al., 2016). The GUA-010 Conchal site is located in the south-central coast of Gran Guaiteca Island, at the northern end of the Chonos Archipelago (Figure 1). The site is a shell midden located 10 m from the current coastline (Figure 2), spanning 30 m from east to west and 20 m from north to south with a maximum height of 1 m of deposits. The archaeological materials recovered on the surface are exclusively lithics and include net weights, lithic cores, projectile points, choppers, perforators, and

FIGURE 2 Top. Panoramic view of the GUA-010 Conchal site and Gran Guaiteca Island. Bottom. Site view. The red arrow indicates the excavation unit of origin of the canid remains [Colour figure can be viewed at wileyonlinelibrary.com]

hammerstones, among others (Porter, 1993; Reyes, 2020; Reyes et al., 2016). Several materials were recovered from the excavations, such as charcoal remains and abundant malacological specimens of numerous taxa, as well as, to a lesser extent, human, fish, seabird, and mammal remains, including indeterminate canids (Reyes et al., 2019; San Román et al., 2016). The human remains were retrieved from the subsurface grave of an adult individual, altered by out-of-place anthropic activity (Reyes, 2020). Following these findings, the GUA-010 Conchal site was interpreted as a campsite of marine hunter-gatherer (canoe groups) where multiple activities were developed in successive reoccupations, since 2170 ± 30 years ^{14}C BP (1840–1554 cal BP) (Reyes, 2020). However, the adjacent area has been occupied since ~6200 years cal BP (GUA-010 Terraza site, Figure 1) (Reyes et al., 2016).

2 | MATERIALS AND METHODS

Five specimens were analyzed, which likely belonged to the same individual, judging by the identical stratigraphic provenance and similar tooth wear. These remains included a left upper canine, a left lower canine, a right upper fourth premolar, a cervical vertebral body (possible No. 6), and a left calcaneus (Figure 3). They were found in the first artificial level (0–10 cm) of a borehole (1 × 1 m) located near the western edge of the shell midden, along with malacological fauna, charcoal, and the aforementioned human remains (Reyes, 2020).

Taxonomic and anatomical determination was performed by morphological comparison of the specimens with the collection at the Centro de Estudios del Hombre Austral (Instituto de la Patagonia, Universidad de Magallanes, Punta Arenas, Chile), with reference literature (Hildebrand, 1954; Prates, Prevosti, & Berón, 2010; Tedford et al., 1995) and with a morphometric database of wild canids from the Southern Cone of South America (Prevosti, 2006; Prevosti et al., 2015; the present study) (Figures 4 and 5). Morphometric measurements (Table 1) were performed according to Prevosti (2006). Body mass was estimated from the mesiodistal length and labiolingual width of the upper fourth premolar (Losey et al., 2015), and it was compared with other records of *C. familiaris* of Southern Cone of South America (Table 2). Age estimation was based on the degree of tooth wear (Gipson et al., 2000).

Radiocarbon analysis of the upper canine was performed at the Center for Applied Isotope Studies (CAIS), University of Georgia. The date was calibrated using the program Calib Rev 7.0.4 (Stuiver & Reimer, 1993) and the calibration curve for the southern hemisphere (SHCal13; Hogg et al., 2013).

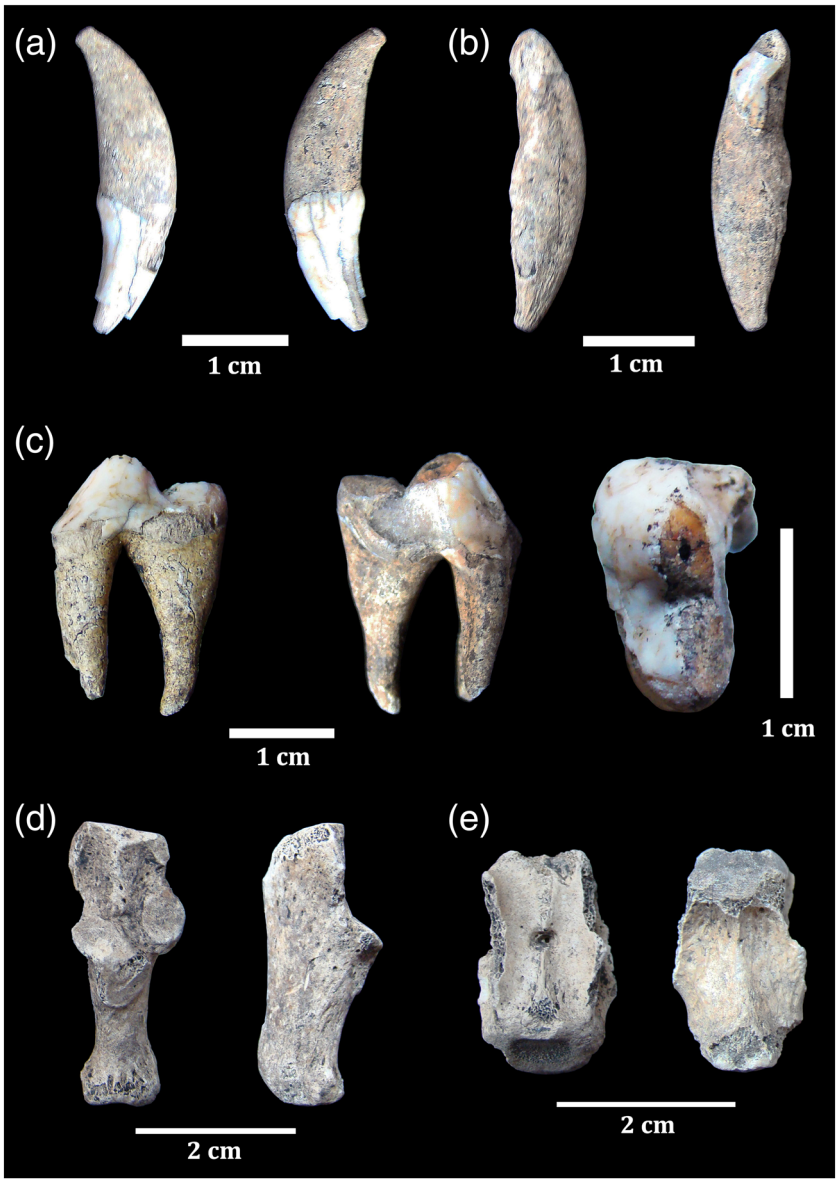

FIGURE 3 (a–d) *Canis familiaris* and (e) Canidae specimens from the archeological site GUA-010 Conchal. (a) Left upper canine, lingual (left) and labial (right) view. (b) Lower left canine, lingual (left) and labial (right) views. (c) Upper right fourth premolar, labial (left), lingual (center), and occlusal (right) views. (d) Left calcaneus, dorsal (left) and plantar (right) views. (e) Cervical vertebral body, dorsal (left) and ventral (right) views [Colour figure can be viewed at wileyonlinelibrary.com]

3 | RESULTS

The upper canine sampled for radiocarbon dating provided a pre-Hispanic age of 870 ± 20 years ^{14}C BP (UGAMS-51356, 2σ: 769–684 cal BP). The upper canine, upper fourth premolar, lower canine, and calcaneus were identified as *C. familiaris*, whereas the vertebral body could only be determined at the family level (Canidae). There was no evidence of human modification of the remains. The upper canine shows moderate wear. Its crown is robust and mesiodistally longer than that of *Lycalopex gymnocercus*, *Lycalopex griseus*, *Cerdocyon thous* (Figures 3a and 4), and likely *Lycalopex fulvipes* given the small body size of this species (approximately 3 kg) despite lacking metric data (Chebez et al., 2014). The crown is higher than all comparative samples of *L. griseus* and *C. thous* and is lower and mesiodistally shorter than those of *D. avus* and *Chrysocyon brachyurus*. In comparison with *Lycalopex culpaeus*, the upper canine is lower and within the dimensions of the mesiodistal length. In turn, the upper canine falls within the range of values of both variables for small modern dogs. The enamel shows a more complex pattern of bands (folded and in a "zig-zag" shape) than those observed in wild species (see Prates, Prevosti, & Berón, 2010). The lower canine crown shows signs of robustness, but this cannot be confirmed because the crown is fractured (Figure 3b). Its overall size seems larger than that of small foxes such as *L. griseus*.

The upper fourth premolar is robust (relation in occlusal view between the width of the tooth behind the protocone and its mesiodistal length), longer than those of *L. fulvipes* and *L. griseus* and narrower than those of *L. gymnocercus* and *C. thous* (Figures 3c and 5). It is shorter and narrower than the upper fourth premolars of *L. culpaeus* (only one specimen of the 140 is shorter), *D. avus*, and *Ch. brachyurus*. In comparison with comparative specimens of smaller dogs, this sample is longer and has a similar width. This specimen has a short metastyle and a strong paracrista, and the protocone is small and directed mesially; its mesial border is straight. The specimen also

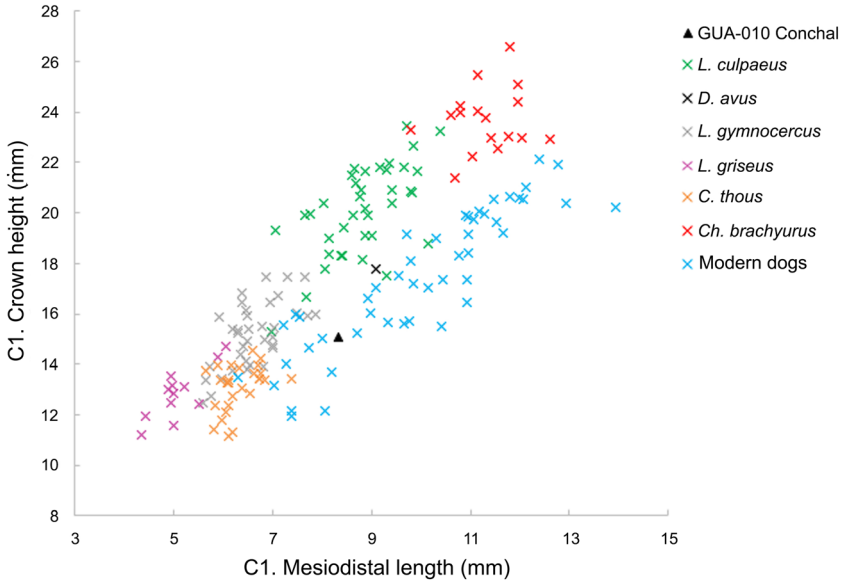

FIGURE 4 Relationship between the mesiodistal length and the height of the crown of the upper canine from the GUA-010 Conchal site and of Southern Cone canids. *Lycalopex culpaeus* ($n = 38$; Prevosti, 2006; the present study); *Dusicyon avus* ($n = 1$; the present study); *Lycalopex gymnocercus* ($n = 36$; Prevosti, 2006; the present study); *Lycalopex griseus* ($n = 12$; Prevosti, 2006); *Cerdocyon thous* ($n = 27$; Prevosti, 2006; the present study); *Chrysocyon brachyurus* ($n = 17$; Prevosti, 2006; the present study); and modern *Canis familiaris* ($n = 48$; the present study) [Colour figure can be viewed at wileyonlinelibrary.com]

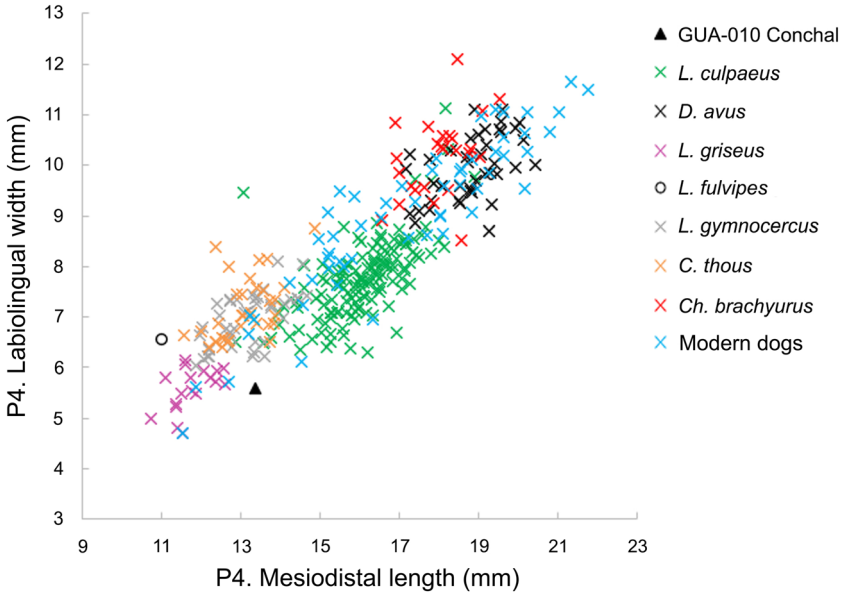

FIGURE 5 Relationship between mesiodistal length and labiolingual width of the upper fourth premolar from the GUA-010 Conchal site and of Southern Cone canids. *Lycalopex culpaeus* ($n = 140$; Prevosti, 2006; Prevosti et al., 2015; the present study); *Dusicyon avus* ($n = 41$; Prevosti et al., 2015; the present study); *Lycalopex griseus* ($n = 18$; Prevosti, 2006; Prevosti et al., 2015); *Lycalopex fulvipes* ($n = 1$; Prevosti, 2006); *Lycalopex gymnocercus* ($n = 40$; Prevosti, 2006; the present study); *Cerdocyon thous* ($n = 33$; Prevosti, 2006; the present study); *Chrysocyon brachyurus* ($n = 25$; Prevosti, 2006; the present study); and modern *Canis familiaris* ($n = 57$; the present study) [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 1 Morphometric values (mm) of the specimens from the GUA-010 Conchal archaeological site

Measure	GUA-010 Conchal (mm)
Mesiodistal length of upper canine	8.32
Labiolingual width of upper canine	4.82
Crown height of upper canine	15.07
Mesiodistal length upper fourth premolar	13.35
Width of upper fourth premolar	5.59
Maximum calcaneus length	33.66
Length of the calcaneal tubercle	23.51

shows advanced wear on the paracone and metastyle, with a little less wear on their junction.

The calcaneus has a round sustentacular facet and an articular facet with a wide and proportionally low cuboid and a low crest on the dorsal face of its distal half (Figure 3d). The plantar tubercle is oblique with a lower medial part. A comparative *L. culpaeus* has a narrower and higher cuboid facet, matching a more developed crest of the dorsal face of its distal half, and the sustentacular facet is elongated; the plantar tubercle is more homogeneous (proportionally less short on the medial side). Morphometrically, the specimen from the GUA-010 Conchal site is similar to *L. culpaeus* and *D. avus*, larger than *L. griseus* and *L. fulvipes*, and smaller than a modern large *C. familiaris*. Judging by the level of correspondence of the findings to specimens identified with certainty as *C. familiaris*, together with the absence of wild canids on Gran Guaiteca Island, both currently and in zooarcheological records (Reyes, 2020; San Román et al., 2016), this specimen was determined as the calcaneus of *C. familiaris*.

TABLE 2 Body mass estimates for archaeological dog remains from the Southern Cone of South America

Region	Site	Specimen	Body mass (kg)	Formula	Reference
Western Patagonia Chile	GUA-010 Conchal	-	3.42 ± 1.07	Losey et al. (2015)	This work
Northwestern Argentina	La Isla de Tilcara	2624	5.95 ± 2.01	Legendre and Roth (1988); Losey et al. (2015)	Belotti López de Medina (2017)
Northwestern Argentina	Til 1	Individual 1	11.23 ± 2.52	Legendre and Roth (1988); Losey et al. (2015); Losey et al. (2017)	González Venanzi et al. (in press)
Northwestern Argentina	Til 1	Individual 2	12.4 ± 2.45	Losey et al. (2017)	González Venanzi et al. (in press)
Northwestern Argentina	Til 1	Til 1_n1	9.05 ± 3.8	Losey et al. (2015)	González Venanzi et al. (in press)
Northwestern Argentina	Til 1	Til 1_n2	12.8 ± 2.59	Losey et al. (2015)	González Venanzi et al. (in press)
Northwestern Argentina	Til 1	Til 1_n3	13.74 ± 2.45	Losey et al. (2015)	González Venanzi et al. (in press)
Northwestern Argentina	Til 1	Til 1_n4	10.21 ± 2.69	Losey et al. (2015)	González Venanzi et al. (in press)
Northwestern Argentina	Til 1	Til 1_n5	5.58 ± 1.61	Losey et al. (2015)	González Venanzi et al. (in press)
Northwestern Argentina	Til 1	Til 1_n8	13.2	Legendre and Roth (1988)	González Venanzi et al. (in press)
Northwestern Argentina	Til 1	Til 1_n9	8.25 ± 0.98	Losey et al. (2017)	González Venanzi et al. (in press)
Northwestern Argentina	Til 1	Til 1_n10	8.53 ± 1.18	Losey et al. (2017)	González Venanzi et al. (in press)
Northwestern Argentina	Til 1	Til 1_n12	7.63	Losey et al. (2017)	González Venanzi et al. (in press)
Northwestern Argentina	Til 1	Til 1_n13	10.5 ± 3.53	Losey et al. (2017)	González Venanzi et al. (in press)
Northwestern Argentina	Til 1	Til 1_n14	7.21	Losey et al. (2017)	González Venanzi et al. (in press)
Northwestern Argentina	Til 1	Til 1_n15	10.21 ± 1.53	Losey et al. (2017)	González Venanzi et al. (in press)
Northwestern Argentina	Til 1	Til 1_n18	11.47 ± 2.77	Losey et al. (2017)	González Venanzi et al. (in press)
Northwestern Argentina	Til 1	Til 1_n21	11.32 ± 0.7	Losey et al. (2017)	González Venanzi et al. (in press)
Northwestern Argentina	Til 1	Til 1_n22	5.58 ± 1.59	Losey et al. (2017)	González Venanzi et al. (in press)
Northwestern Argentina	Tilcara	Individual α	9.41 ± 2.03	Losey et al. (2015)	Cabrera (1934)
Northwestern Argentina	Tilcara	Individual β	6.85 ± 1.74	Losey et al. (2015)	Cabrera (1934)
Northwestern Argentina	Casabindo	-	26.96 ± 6.7	Losey et al. (2015)	Cabrera (1934)
Northwestern Argentina	Amaicha	MLP-AM-1290	24.59 ± 3.11	Losey et al. (2015)	Cabrera (1934)
Northwestern Argentina	Tastil	Individual 1	12.41 ± 6.24	Losey et al. (2015)	González Venanzi et al. (in press)
Northwestern Argentina	Tastil	Individual 2	10.06 ± 3.81	Losey et al. (2015)	Zetti (1973)

TABLE 2 (Continued)

Region	Site	Specimen	Body mass (kg)	Formula	Reference
Northwestern Argentina	Tastil	Individual 3	13.28 ± 4.83	Losey et al. (2015)	Zetti (1973)
Northwestern Argentina	Tastil	Individual 4	10.36 ± 5.59	Losey et al. (2015)	Zetti (1973)
Northwestern Argentina	Hualfín	-	17.42 ± 5.22	Losey et al. (2015)	von Ihering (1913), Cabrera (1934)
Southern Brazil	PSG-07	115-04 PSG-07	17.59 ± 1.89	Losey et al. (2015)	Guedes Milheira et al. (2017)
Southeastern Uruguay	CH2D01/II	-	15.83 ± 2.7	Losey et al. (2015); Losey et al. (2017)	López Mazz et al. (2018); Loponte et al. (2021)
Southeastern Uruguay	CH2D01/B	-	13.11 ± 3.51	Losey et al. (2015); Losey et al. (2017)	López Mazz et al. (2018); Loponte et al. (2021)
Southeastern Uruguay	Potrerillo de Santa Teresa	-	14.85 ± 5.05	Losey et al. (2015); Losey et al. (2017)	López Mazz et al. (2018); Loponte et al. (2021)
Southwestern Uruguay	Cañada Saldaña	CS 49136	16.47 ± 1.17	Losey et al. (2015)	Loponte et al. (2021)
Southwestern Uruguay	Cañada Saldaña	CS 38342	15.53 ± 2	Losey et al. (2015)	Loponte et al. (2021)
Southwestern Uruguay	Cañada Saldaña	CS 49019	17.35 ± 4.31	Losey et al. (2015)	Loponte et al. (2021)
Southwestern Uruguay	Cañada Saldaña	-	15.3	Losey et al. (2017)	Loponte et al. (2021)
Southwestern Uruguay	Cañada Saldaña	Piece n/d box 17/118/2	12.55 ± 0.07	Losey et al. (2017)	Loponte et al. (2021)
Northeastern Argentina	Cerro Mayor	INAPL/CM-112	10.66	Losey et al. (2017)	Loponte and Acosta (2016)
Northeastern Argentina	La Lechuza	MRA-LZA-D7-130	20.06 ± 4.66	Legendre and Roth (1988); Losey et al. (2015)	Castro et al. (2020)
Northeastern Argentina	Arroyo Las Mulas 1	MAS-LM1-SO1-D11	23.15	Legendre and Roth (1988)	Castro et al. (2020)
Northeastern Argentina	La Palmera V	MAS-LPV-C1-5	14.32 ± 0.94	Losey et al. (2015)	Castro et al. (2020)
Northeastern Argentina	Sambaquí de Puerto Landa	MAMA-SPL-A and MAMA-SPL-B	14.16 ± 1.99	Legendre and Roth (1988); Losey et al. (2015); Losey et al. (2017)	Castro et al. (2020)
Northeastern Argentina	Cerros de los Pampas	MAMA-CP-244	18.54 ± 2.41	Legendre and Roth (1988); Losey et al. (2015)	Castro et al. (2020)
Northeastern Argentina	Cerro Mayor	INAPL CM-111	19.05 ± 3.75	Losey et al. (2015)	Loponte et al. (2021)
Northeastern Argentina	Cerro Lutz	INAPL CL1-UE-3	15.76 ± 2.36	Losey et al. (2015); Losey et al. (2017)	Loponte et al. (2021)
Northeastern Argentina	Cerro Lutz	INAPL CL1-UE20	14.98 ± 2.96	Losey et al. (2015); Losey et al. (2017)	Loponte et al. (2021)
Northeastern Argentina	La Bellaca 2	INAPL LB2-CF-1	17.45 ± 4.74	Losey et al. (2015)	Loponte et al. (2021)
Pampas Argentina	Chenque 1	ME E 41-2	16.07 ± 4.07	Losey et al. (2015); Losey et al. (2017)	Prates, Berón, and Prevosti (2010); Belotti López de Medina (2017)
Northeastern Patagonia Argentina	Angostura 1	MLP A1.4a.30.gr	13.6	Legendre and Roth (1988)	Prates, Berón, and Prevosti (2010); Belotti López de Medina (2017)

The body mass was estimated at 3.42 ± 1.07 kg. This is the smallest pre-Hispanic dog found in the Southern Cone of South America (Table 2). The presence of moderate-to-advanced dental wear suggests that it was an adult dog of at least 4–6 years old.

4 | DISCUSSION AND FINAL CONSIDERATIONS

The *C. familiaris* from the GUA-010 Conchal site, with a radiocarbon date of 870 ± 20 years ^{14}C BP (769–684 cal BP), is the first pre-Hispanic record in western Chilean Patagonia. This finding indicates that dogs were present not only among hunter-gatherers who occupied the inner of the continental territory (at least east of the Andes Mountains; Prates, Prevosti, & Berón, 2010) but also in shell-midden campsites of marine hunter-gatherers (canoe groups) that inhabited the northern Patagonian archipelago. Thus, it represents a confirmed southernmost pre-Columbian record of *C. familiaris* in the Southern Cone.

The presence of the specimen recovered on the Gran Guaiteca Island necessarily required human intervention for its transportation, as its location is about 40 km from the adjacent continental edge and was never connected. Thanks to their small size, dogs would have been easily carried in boats. This small morphotype is consistent with sightings and descriptions made by the first Europeans who sailed in this archipelago in the 16th century (e.g., De Cortés Hojea, 1879, p. 518). They described the use of fur of these types of dogs for fashioning clothes (De Cortés Hojea, 1879, p. 518; see also Juan Bautista Ferrufino in Urbina Carrasco, 2014, p. 88 for larger dogs). Although the morphotype was not indicated, one chronicler informed the function of dogs in helping fishing efforts: "Upon inquiry, we found that there had been six canoes of them (marine hunter-gatherers), who, among other methods of taking fish, had taught their dogs to drive the fish into a corner of some pond, or lake, from whence they were easily taken out, by the skills and address of these savages." (Byron, 1768, p. 56).

The archeological context of the *C. familiaris* specimens was deeply disturbed, precluding any attempt to establish a direct association with the skeletal human remains recovered beyond their intentional anthropic introduction on the island and their deposit within the campsite. Given that these remains belong to an adult dog of at least 4–6 years old, it would not be compatible with a breeding scenario for its consumption. Dogs bred for this purpose would have likely been slaughtered as soon as they reached their final body size, approximately at 1 year of life (Clutton-Brock & Hammond, 1994). Context of this discovery does not suggest either the existence of a ceremonial cynophagy.

The archeological record and taxonomic identification of *C. familiaris* at the GUA-010 Conchal site contribute to our knowledge of the history of the species in the extreme south of the South American continent. This finding confirms ethnohistorical data on the existence of dogs in canoeing groups in the northern Patagonian archipelago and extends its pre-Hispanic temporal range to 769–684 cal years BP and its geographic distribution to island environments in western Chilean Patagonia. This is the smallest *C. familiaris* recorded in the Southern Cone and matches with ethnohistorical sources that described the use of its fur for fashioning clothes.

ACKNOWLEDGMENTS

This research was carried out thanks to the financial support of ANID-FONDECYT (Grants 1130151 and 1210045) and Call for Strengthening Development of Regional Centers 2020 (Grant R20F0002). We are grateful to the three reviewers for their valuable comments that helped us to improve the manuscript and to María Pinal Villanueva for her help in English.

CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

DATA AVAILABILITY STATEMENT

Data available on request from the authors

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How to cite this article: Venanzi, L. G., Prevosti, F. J., San Román, M., & Reyes, O. (2021). The dog of Los Chonos: First pre-Hispanic record in western Patagonia (∼43° to 47°S, Chile). *International Journal of Osteoarchaeology*, 1–10. https://doi.org/10.1002/oa.3021