Mammalia æquatorialis, 7(1): 83–89, 2025 ISSN 2697-3286

Mammalia æquatorialis
The Ecuadorian Journal of Mammalogy

Submitted: November 13, 2024 Accepted: January 04, 2025 Published: January 10, 2025
DOI: https://doi.org/10.59763/mam.aeq.v7i1.115

SHORT ARTICLE

First record of a second lower molar in *Leopardus pardalis* (Linnaeus, 1758) (Carnivora, Felidae)

Primer registro de un segundo molar inferior en *Leopardus pardalis* (Linnaeus, 1758) (Carnivora, Felidae)

Aldo Manzuetti[1, *] and Enrique M. González[2]

[1] Universidad de la República, Facultad de Ciencias, Iguá 4225, CP 11400, Montevideo, Uruguay.
[2] Museo Nacional de Historia Natural, 25 de Mayo 582, CP 11000, Montevideo, Uruguay.

Corresponding author: aldomanzuetti@adinet.com.uy

Abstract

Supernumerary teeth are an uncommon feature in wild mammalian carnivores. We report a *Leopardus pardalis* specimen with a well-developed second lower molar in both mandibular rami. This is the first record of this tooth in this taxon, for both living and fossil specimens. The biological and evolutionary implications are discussed in addition to comparisons with other Felidae.

Key words: biological implications, dental anomaly, neotropical wild cat, supernumerary teeth.

Resumen

Los dientes supernumerarios son poco comunes en mamíferos carnívoros silvestres. Reportamos un ejemplar de *Leopardus pardalis* con un segundo molar inferior bien desarrollado en ambas ramas mandibulares. Este es el primer registro de este diente en este taxón,

Citation:
Manzuetti, A., & González, E. M. (2025). First record of a second lower molar in *Leopardus pardalis* (Linnaeus, 1758) (Carnivora, Felidae). *Mammalia aequatorialis*, *7*(1), 83–89.

Journal homepage: https://mammalia-aequatorialis.org
Asociación Ecuatoriana de Mastozoología

tanto para especímenes vivientes como fósiles. Discutimos las implicancias biológicas y evolutivas y las comparamos con otros Felidae.

Palabras clave: anomalías dentarias, dientes supernumerarios, felino salvaje neotropical, implicancias biológicas.

Dental abnormalities in mammals can take several forms, including changes resulting from traumas, infections, or soft tissue damage, or alterations in the shape, structure, and/or number of teeth (Castejón-Gonzalez et al., 2016; Graipel et al., 1997; Vásquez et al., 2006; Verstraete & Terpak, 1997). Among the latter, supernumerary teeth (or hyperdontia) stand out, representing an increase in the number of teeth compared to the regular dental formula of the species. It can be observed in both deciduous and permanent dentition and is most frequently been recorded in the incisors and premolars; its main causes include hereditary factors and alterations during dental development (Castejón-Gonzalez et al., 2016; Kapadia et al., 2007).

Given that extra teeth are rare in wild mammalian carnivores (order Carnivora), instances are poorly documented in the scientific literature (Carniatto et al., 2021; Graipel et al., 1997; Peters et al., 2013). A large sample of museum specimens, in some cases exceeding hundreds of individuals, often yields only a few cases of extra teeth (Aghashani et al., 2017; Clark et al., 2017; Collados et al., 2018; Geddes et al., 2020; Janssens et al., 2016; Miles & Grigson, 2003; Slabá et al., 2018; Steenkamp et al., 2018; Winer et al., 2016; Ximénez, 1973).

In this report, we describe an ocelot specimen, *Leopardus pardalis* (Linnaeus, 1758), housed in the mammal collection of the Museo Nacional de Historia Natural de Montevideo, Uruguay (MNHNM 6802), with supernumerary teeth. The material consists of a skull and both complete hemimandibles, collected in the municipality of Manaus (state of Amazonas, northwestern Brazil) and corresponding to an adult female specimen. Unfortunately, no additional information is included in the catalog, but other materials in the MNHNM are recorded as purchased in the Manaus market in the middle of the 20th century; we can speculate that this material has the same origin.

Both the skull and mandible match the typical osteological characteristics reported for the species (Figure 1; De Lima et al., 2021; Murray & Gardner, 1997). The specimen lacks the right upper canine, the left upper P2, both upper M1, and the right auditory bulla. The respective alveoli are well-preserved, which suggests that these missing teeth were lost during preparation or manipulation of the skull rather than because of pathological or natural causes. The mandibular premolars present very slight periodontal disease (bone loss; Figure 1B, see Janssens et al., 2016). The teeth show almost no wear, indicating that they belong to a young adult specimen.

We observed hyperdontia posterior to the m1 in both mandibular rami due to the presence of a second lower molar (m2; Figure 1). This tooth is around half of the length of the m1 (Table 1), and has a peculiar morphology, since it does not resemble a molar or premolar. It has three well-defined cusps, with the middle cusp the most pronounced. The cusps are distinctly left-oriented and slanted with respect to the rest of the dentition; they somewhat overlap their respective m1. Moreover, these teeth appear to have single roots, although an x-ray study is needed to confirm this statement.

Dental formula is a key feature for taxonomy since it sheds light at biological and evolutionary levels on the development of a certain species. *Leopardus pardalis*, as well as other Felidae, presents a marked reduction in the number of cheek teeth compared with other members of the order Carnivora (Miles & Grigson, 2003). This reduction is due to their specialized ability to shear meat rather than grinding or crushing it, thus representing an extreme case of hypercarnivorous ecomorph (Goswami & Friscia, 2010; Prevosti & Forasiepi, 2018; Savage, 1977; Van Valkenburgh, 2007).

The regular dental formula for an adult ocelot is I 3/3, C 1/1, P 2–3/2, M 1/1, for a total

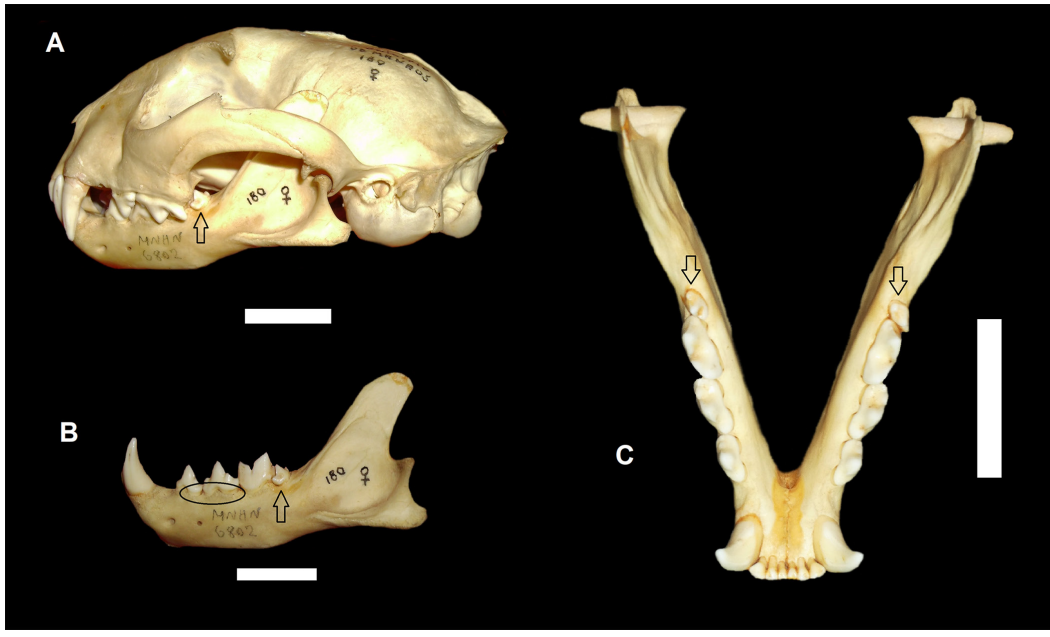

Figure 1. MNHNM 6802, *Leopardus pardalis* specimen in A) skull and mandible in left side, B) mandible in left side, C) mandible in occlusal view. The arrows indicate the m2, the oval indicates the periodontal disease. Scale bars 3 cm. Photographs A and B: Aldo Manzuetti; photograph C: Enrique M. González. Image montage: Aldo Manzuetti.

of 28–30 teeth with no m2 presence (Murray & Gardner, 1997). Seymour (1999) and Miles and Grigson (2003) studied large samples of approximately 750 and 65 *L. pardalis* specimens, respectively, and did not report the presence of any m2. The fossil record of *L. pardalis* is scarce and fragmented across the Americas, but the presence of an m2 is not reported in these specimens either (Manzuetti et al., 2023; Murray & Gardner, 1997; Prevosti et al., 2021; Ray et al., 1963; Werdelin, 1985). Other supernumerary teeth are mentioned for *L. pardalis* (such as the case of the p2, see Miles & Grigson, 2003; Seymour, 1999), but this is the first time that an m2 is reported for the species, for both current and fossil specimens.

The presence of supernumerary teeth in Felidae is a rare condition, estimated at 3% occurrence according to some studies (Miles & Grigson, 2003). Specifically, the presence of m2 teeth is a common feature in small extinct cats from the European Miocene, such as *Proailurus lemanensis* Filhol, 1879 and *Magerifelis peignei* Salesa, Gamarra, Siliceo, Antón, & Morales, 2024), and it is variable in *Pseudaelurus* Gervais, 1850 (Rothwell, 2001; Salesa et al., 2024; Seymour, 1999). It is considered a primitive character in the evolution of felids, given that is not frequently found in recent fossil specimens or extant species (Manville, 1963; Turner & Antón, 1997; Werdelin, 1987).

Werdelin (1987) and Seymour (1999) each mention a case of m2 presence in the jaguarundi *Herpailurus yagouaroundi* (E. Geoffroy Saint-Hilaire, 1803). Christiansen (2008) notes the presence of this tooth in one specimen of the leopard *Panthera pardus* (Linnaeus, 1758). The presence of an m2 has been reported in several populations of the genus *Lynx* (Kerr, 1792) from Europe and North America (predominantly in the Boreal lynx *Lynx lynx* (Linnaeus, 1758)), showing a fairly high percentage of prevalence, up to 27% (Gomerčić et al., 2009; Kvam, 1985; Manville, 1963; Werdelin, 1987). In these species (at least in the extant lynx and the leopard, and also in Miocene feli-

Table 1. Mandible and dental measurements (in mm) for the *Leopardus pardalis* specimen, following von den Driesch (1976). Measurements describing m2 are highlighted in **bold**. All measurements correspond to the left side.

Measurements	MNHNM 6802
Total length of mandible	82.7
Tooth row length i-m1	46.8
Tooth row length i-m2	**51.3**
Diastema c-p3	5.9
Total length canine	9.0
Maximum width canine	5.5
Total length p3	8.7
Maximum width p3	4.1
Total length p4	10.2
Maximum width p4	4.6
Total length m1	12.0
Maximum width m1	5.5
Total length m2	**5.7**
Maximum width m2	**3.3**

nes), the reported m2 seems to be vestigial (the crown is small and low and lacks prominent cuspids) compared to the well-developed m2 that we report here.

In the case of the *Lynx*, which is the species that most commonly displays the presence of an m2, there are various possible interpretations about what this characteristic represents. Werdelin (1987, following Kurtén, 1963; see also Manville, 1963) posits that the enlargement of the m1 might not be enough in some cases to expand the molar region, which may lead to the phenotypic expression of m2 (a characteristic that had never been genetically lost) due to new or altered environmental conditions (see also Miles & Grigson, 2003). Kvam (1985) states that if molar area needs to be increased, selection pressure would act to enlarge the existing m1 instead of triggering the reappearance of the m2 (which he considers a rudiment of a formerly extended dental formula that could be manifested in discontinuous patterns). Given that the ocelot case we record is isolated to date, it does not indicate a clear pattern and should be considered as an unusual condition rather than a reversion to an ancestral state. More study specimens and further analyses could shed light on this issue to understand better how the presence or absence of this feature could have influenced or conditioned the trophic ecology and lifestyle of this Neotropical wild cat, with an evolutionary focus.

The main problems related to an increase in the number of teeth are linked to dental crowding, malocclusion, complications in eruption and/or delayed eruption, and deviation of adjacent teeth, among others, so exodontia is the recommended treatment in clinical cases (Carniatto et al., 2021; Castejón-Gonzalez et al., 2016). However, in this report, we describe an adult animal with an apparently functional tooth located in the dental row such that no complications are caused for the adjacent m1 or the remaining cheek teeth (Figure 1). In this sense, there is nothing to suggest that this condition caused difficulties that affected the normal development of the life of this animal (for example, during prey hunting or food processing); therefore, the viability of this specimen does not appear to have been compromised in any obvious way.

Finally, we emphasize the value of studying materials housed in museums and scientific collections as a source of new information for previously-known taxa.

Acknowledgements: To A. Rojas (Colección de Paleontología-Facultad de Ciencias/UdelaR) for *L. pardalis* fossil specimens for comparison. To D. Tirira and one anonymous reviewer for comments and suggestions that improved the original draft. To Joy Collins for language improvement. Written as a contribution to the CSIC Grupos I+D 002011 Program (C302-347) "Paleontología de Vertebrados" and Posdoc. Project PEDECIBA Biología (A. Manzuetti).

Conflict of interest: The authors declare no conflict of interest.

Research funding: Not applicable.

Author contribution: AM, conception and data compilation, writing of first draft of the manuscript; AM and EMG, analysis and interpretation of data; writing of revised draft of the manuscript; approval of the final text.

Orcid:
AM: https://orcid.org/0000-0001-8794-8539
EMG: https://orcid.org/0000-0002-9051-1861

REFERENCES

Aghashani, A., Kim, A. S., Kass, P. H., & Verstraete, F. (2017). Dental and temporomandibular joint pathology of the California Mountain Lion (*Puma concolor couguar*). *Journal of Comparative Pathology*, *156*, 251–263. https://doi.org/10.1016/j.jcpa.2016.11.269

Carniatto, C., Prado, C., Lunardelli, F., & Vidotti, A. (2021). Permanência de dente canino decíduo em gato-do-mato-pequeno (*Leopardus guttulus*). *Medicina Veterinária*, *15*(1), 1–6. https://doi.org/10.26605/medvet-v15n1-2374

Castejón-Gonzalez, A., de la Morena-Cabanillas, M., San Román-Llorens, F., Fernández-Sánchez, J., Trobo-Muñiz, I., & San Román-Ascaso, F. (2016). Odontopediatría canina y felina. *Clínica Veterinaria de Pequeños Animales*, *36*(2), 79–89.

Christiansen, P. (2008). Evolutionary changes in craniomandibular shape in the great cats (*Neofelis* Griffith and *Panthera* Oken). *Biological Journal of the Linnean Society*, *95*, 766–778. https://doi.org/10.1111/j.1095-8312.2008.01080.x

Clark, E., Chesnutt, S., Winer, J., Kass, P., & Verstraete, F. (2017). Dental and temporomandibular joint pathology of the American Black Bear (*Ursus americanus*). *Journal of Comparative Pathology*, *156*, 240–250. https://doi.org/10.1016/j.jcpa.2016.11.267

Collados, J., García, C., & Rice, C. A. (2018). Dental pathology of the Iberian Lynx (*Lynx pardinus*), Part I: Congenital, developmental, and traumatic abnormalities. *Journal of Veterinary Dentistry*, *35*(3), 195–208. https://doi.org/10.1177/0898756418793578

De Lima, L. A., de Lima, T. G., de Lucca, D. S. Q., & Lopes, E. Q. (2021). Descrição anatômica esquelética, osteotécnica e osteomontagem de uma onça jaquitirica (*Leopardus pardalis*) atropelado na Serra do Mar-Bertioga-São Paulo-SP. *Brazilian Journal of Animal and Environmental Research*, *4*(4), 5373–5386. https://doi.org/10.34188/bjaerv4n4-040

Geddes, A., Kryštufek, B., Zadravec, M., Račnik, J., & Nemec, A. (2020). Oral and dental examination findings in European polecats (*Mustela putorius*). *Journal of Comparative Pathology*, *176*, 39–49. https://doi.org/10.1016/j.jcpa.2020.02.004

Gomerčić, T., Gužvica, G., Đuras Gomerčić, M., Frković, A., Pavlović, D., Kusak, J., Sindičić, M., & Huber, Đ. (2009). Variation in teeth number, teeth and skull disorders in Eurasian lynx, *Lynx lynx* from Croatia. *Folia Zoologica*, *58*(1), 57–65.

Goswami, A., & Friscia, A. (Eds.). (2010). *Carnivoran evolution: New views on phylogeny, form and function*. Cambridge University Press. https://doi.org/10.1017/CBO9781139193436

Graipel, M., Cherem, J., & Tames, D. (1997). Anomalia dentária em *Puma concolor* (Linnaeus, 1771) (Mammalia, Felidae). *Estudos de Biologia*, *42*, 21–24.

Janssens, L., Verhaert, L., Berkowic, D., & Adriaens, D. (2016). A standardized framework for examination of oral lesions in wolf skulls (Carnivora: Canidae: *Canis lupus*). *Journal of Mammalogy*, *97*(4), 1111–1124. https://doi.org/10.1093/jmammal/gyw058

Kapadia, H., Mues, G., & D'Souza, R. N. (2007). Genes affecting tooth morphogenesis. *Orthodontics and Craniofacial Research*, *10*, 237–244. https://doi.org/10.1111/j.1601-6343.2007.00395.x

Kurtén, B. (1963). Return of a lost structure in the evolution of the felid dentition. *Societas Scientiarum Fennica Commentationes Biologicae*, *26*, 1–12.

Kvam, T. (1985). Supernumerary teeth in the European lynx (*Lynx lynx lynx*) and their evolutionary significance. *Journal of Zoology*, *206*(1), 17–22. https://doi.org/10.1111/j.1469-7998.1985.tb05632.x

Manville, R. H. (1963). Dental anomalies in North American lynx. *Zeitschrift Saeugetierkunde*, *28*, 166–169.

Manzuetti, A., Ubilla, M., Jones, W., Perea, D., & Prevosti, F. (2023). The ocelot *Leopardus pardalis* (Linnaeus, 1758) (Carnivora, Felidae) in the late Pleistocene of Uruguay. *Historical Biology*, *35*(1), 108–115. https://doi.org/10.1080/08912963.2021.2023140

Miles, A. E. W., & Grigson, C. (2003). *Colyer's variations and diseases of the teeth of animals*. Cambridge University Press.

Murray, J., & Gardner, G. (1997). *Leopardus pardalis*. *Mammalian Species*, *548*, 1–10. https://doi.org/10.2307/3504082

Peters, F., Coelho, E., Vasconcelos, B., Roth, P., & Christoff, A. (2013). Dental anomalies in *Lontra longicaudis* (Carnivora: Mustelidae) collected in southern Brazil. *IUCN Otter Specialist Group Bulletin*, *30*(1), 31–36.

Prevosti, F. J., & Forasiepi, A. (2018). Evolution and biological context of South American mammalian carnivores during the Cenozoic and the biological context. In *Evolution of South American Mammalian predators during the Cenozoic: Paleobiogeographic and Paleoenvironmental Contingencies* (pp. 155–196). Springer Geology. https://doi.org/10.1007/978-3-319-03701-1_6

Prevosti, F. J., Méndez, C., Schiaffini, M., Cirignoli, S., Contreras, S., Zurita, A., & Luna, C. (2021). The fossil record of the ocelot *Leopardus pardalis* (Carnivora, Felidae): a new record from the southern range of its distribution and its paleoenvironmental context. *Journal of Vertebrate Paleontology*, *41*(1), e1922867. https://doi.org/10.1080/02724634.2021.1922867

Ray, C., Olsen, S., & Gut, H. (1963). Three mammals new to the Pleistocene fauna of Florida, and a reconsideration of five earlier records. *Journal of Mammalogy*, *44*(3), 373–395. https://doi.org/10.2307/1377207

Rothwell, T. (2001). A partial skeleton of *Pseudaelurus* (Carnivora: Felidae) from the Nambé Member of the Tesuque Formation, Española Basin, New Mexico. *American Museum Novitates*, *3342*, 1–31. https://doi.org/10.1206/00030082(2001)342<0001:APSOPC>2.0.CO;2

Salesa, M., Gamarra, J., Siliceo, G., Antón, M., & Morales, J. (2024). Unraveling the diversity of early felines: a new genus of Felinae (Carnivora, Felidae) from the Middle Miocene of Madrid (Spain). *Journal of Vertebrate Paleontology*, *43*(3), e2288924. https://doi.org/10.1080/02724634.2023.2288924

Savage, R. (1977). Evolution in carnivorous mammals. *Palaeontology*, *20*, 237–271.

Seymour, K. (1999). *Taxonomy, morphology, paleontology and phylogeny of the South American small cats (Mammalia: Felidae)* [PhD thesis, University of Toronto]. https://hdl.handle.net/1807/13251

Slabá, K., Kryštufek, B., & Nemec, A. (2018). Oral and dental examination findings in Beech Martens (*Martes foina*). *Journal of Comparative Pathology*, *163*, 10–17. https://doi.org/10.1016/j.jcpa.2018.06.004

Steenkamp, G., Boy, S., van Staden, P., & Bester, M. (2018). Oral, maxillofacial and dental diseases in captive cheetahs (*Acinonyx jubatus*). *Journal of Comparative Pathology*, *158*, 77–89. https://doi.org/10.1016/j.jcpa.2017.12.004

Turner, A., & Antón, M. (1997). *The big cats and their fossil relatives: An illustrated guide to their evolution and natural history*. Columbia University Press.

Van Valkenburgh, B. (2007). The evolution of feeding morphologies in the Carnivora. *Integrative and Comparative Biology*, *47*(1), 147–163. https://doi.org/10.1093/icb/icm016

Vásquez, V., Lara, E., Arias, L., & Díaz, C. (2006). Diagnóstico de las enfermedades periodontales en un grupo de carnívoros nativos en cautiverio en el Zoológico Jaime Duque. *Revista de Medicina Veterinaria*, *11*, 43–61.

Verstraete, F., & Terpak, C. (1997). Anatomical variations in the dentition of the domestic cat. *Journal of Veterinary Dentistry*, *14*(4), 137–140. https://doi.org/10.1177/089875649701400403

Von den Driesch, A. (1976). A *guide to the measurement of animal bones from archaeological sites*. Harvard University Press.

Werdelin, L. (1985). Small Pleistocene felines of North America. *Journal of Vertebrate Paleontology*, *5*(3), 194–210. https://doi.org/10.1080/02724634.1985.10011858

Werdelin, L. (1987). Supernumerary teeth in *Lynx lynx* and the irreversibility of evolution. *Journal of Zoology*, *211*, 259–266. https://doi.org/10.1111/j.1469-7998.1987.tb01532.x

Winer, J., Arzi, B., Leale, D., Kass, P., & Verstraete, F. (2016). Dental and temporomandibular joint pathology of the polar bear (*Ursus maritimus*). *Journal of Comparative Pathology*, *155*, 231–241. https://doi.org/10.1016/j.jcpa.2016.07.004

Ximénez, A. (1973). Anomalía dentaria en *Felis geoffroyi paraguae* (Pocock, 1940). *Trabajos del V Congreso Latinoamericano de Zoología* (pp. 278–280). Museo Nacional de Historia Natural, Montevideo.