GAYANA Gayana (2024) vol. 88, No. 2, 351-356

SHORT COMMUNICATION

Navigating pitfalls and misinterpretations in the use of historical sources for Huemul (*Hippocamelus bisulcus*) conservation: A critique to Flueck *et al.* (2023)

Sorteando obstáculos e interpretaciones erróneas en el uso de fuentes históricas para la conservación del huemul (*Hippocamelus bisulcus*): Una crítica a Flueck *et al.* (2023)

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ABSTRACT

In a recent article, Flueck *et al.* (2023) argue that the huemul (*Hippocamelus bisulcus*), an endemic South American deer species, historically occupied open habitats and islands, such as Tierra del Fuego, and that its decline was primarily due to indigenous hunting, commercial export of hides to Europe, habitat alteration by settlers, and the introduction of exotic species. We critically examine their use and interpretation of historical sources and highlight numerous methodological concerns that are similar to those we identified in a reply to a previous paper by the same authors (see Corti & Díaz 2023). We again emphasize the importance of rigorous quality control when using historical sources to inform current management of endangered species. This is crucial to prevent both, potential negative consequences resulting from proposed conservation efforts, and misguided future research efforts.

Keywords: conservation, historical records, huemul, misinterpretation.

RESUMEN

En un reciente artículo, Flueck *et al.* (2023) argumentan que el huemul (*Hippocamelus bisulcus*), una especie de ciervo endémica de Sudamérica, ocupó históricamente hábitats no boscosos e islas como Tierra del Fuego, y que su declive se debió principalmente a la caza indígena, la exportación comercial de pieles a Europa, la alteración del hábitat por los colonos y la introducción de especies exóticas. Nuestro artículo examina críticamente el uso e interpretación de las fuentes históricas, y destacamos numerosos problemas metodológicos similares a los identificados en un artículo anterior de los mismos autores (ver Corti & Díaz 2023). Insistimos en la importancia de un control de calidad riguroso en el uso de fuentes históricas para informar sobre la gestión actual de especies amenazadas. Esto es crucial para evitar tanto las posibles consecuencias negativas derivadas de los esfuerzos de conservación propuestos como los esfuerzos de investigación futuros equivocados.

Palabras clave: conservación, huemul, interpretación errónea, registros históricos.

Historical sources can provide valuable insights into changes in the distribution and abundance of wildlife over time. Their value, however, depends on objectively recognizing weaknesses and limitations inherent to historical sources (*e.g.*, Clavero *et al.* 2022; Schullery & Whittlesey 2006). Additionally, interpreting historical sources is susceptible to selective use to support specific arguments. We posit that this applies to a recent article by Flueck *et al.* (2023). In their article,

the authors argue, based on historical records, that South American huemul deer (*Hippocamelus bisulcus*) once inhabited open habitats, including the Atlantic coast of Patagonia, as well as various offshore islands such as Tierra del Fuego, where they likely coexisted with substantial populations of guanaco (*Lama guanicoe*). The authors further imply that huemul were primarily impacted by human activities that ultimately forced them to retreat from settled areas at lower elevations to isolated mountain regions where they now persist in "population sinks" year-round.

In a previous article, Flueck *et al.* (2022) also imposed their personal views over facts. Indeed, Corti and Díaz (2023) criticized the selective use and misinterpretation of many historical sources to support their ideas. Similarly, in our current critique of Flueck *et al.* (2023), we argue that the same pattern continues, with citations often failing to support the arguments due to contradictions, irrelevance, or lack of pertinent information. For instance, sources appear occasionally "modified" to fit specific arguments, such as broadly applying the historical use of the term "deer" to huemul only. In this regard, Hudson (1893) was cited to attest for huemul hunting occurred in the Patagonian steppe, but his observations during a year-long stay in the Rio Negro valley of northern Argentinean Patagonia actually refer to the pampas deer (*Ozotoceros bezoarticus*). Similarly, the US National Research Council (1991) was cited to support claims about the huemul's use of grasslands in southern Chile and Argentina, but the original text mentions forests, thickets, and grasslands in the Andes Mountains of both countries. Furthermore, Flueck *et al.* (2023) cited Schmieder (1946) and Sievers (1914) to support their claim of open areas being used by huemul but overlooked both authors' remarks that huemul rarely leave the forests. These examples highlight reoccurring problems with the interpretation of historic sources in Flueck *et al.* (2023) and warrant a more detailed response.

Flueck *et al.* (2023) continue their selective use of historic sources including the citation of Martin (1909) on huemul hunting, disregarding his statement that, while guanaco thrive in the open Patagonian steppe, the huemul remains confined to woodlands. Similarly, Kölliker *et al.* (1917) mention of numerous huemul in the valleys of the southern Patagonian cordillera is overlooked in the same set of quotations. Furthermore, the original source of Fitz Roy's (1839) does not refer to "many large herds", but rather "many deer", nor does it mention "luxuriant grass" or "several inlets" - additions made by Flueck *et al.* (2023). Notably, this observation references Ultima Esperanza Sound (51°35'28" S, 72°43'28" W, Chile), where deciduous forests and peat bogs form a mosaic, interspersed with vegetation-free areas (Cortés 1997; Pisano 1981). Another example of misinterpretation is the citation of Steffen (1929), who described the Patagonian pampa as having abundant meat reserves due to the presence of guanacos, rheas (*Rhea pennata*), large hairy armadillos (*Chaetophractus villosus*), dwarf armadillos (*Zaedyus pichiy*), and occasionally huemul. Although Steffen (1929) mentions that huemul may venture into the steppe, he categorizes only guanacos, rheas, and armadillos as true steppe species.

Further concerns arise regarding the interpretation of indigenous people use of huemul. Flueck *et al.* (2023) argued that the huemul extinction was driven by the ease of hunting for subsistence and the economic incentive of trading their hides. To support this, various authors are cited to suggest a recurrent use of huemul pelts. However, merely identifying an object as being made from mammal skin does not inherently imply overexploitation. Instead, this observation highlights the need for additional evidence or context to draw valid conclusions. For instance, Cunningham (1871) is referenced regarding sleeveless garments such as mantles made from deer skins as observed by Captain John Wood during his visit to Port San Julian (49°18'25" S, 67°43'47" W; Argentina) in 1670. However, Captain Wood did not differentiate between guanaco and deer, which is evident from his description: "Upon the land there are many deer, or sheep, which the Spaniards call *wyanaques* [guanacos], being a large animal approximately twelve hands high" (Dampier 1729). Additionally, Simmonds (1883) is cited to claim the huemul was a commercially important species traded internationally, but he only mentioned its abundance in the cordillera near the Chilean coast.

Another key point is the claim that huemul skins were regularly traded by indigenous peoples and exported to Europe through Argentina and Chile. Lydekker (1898) and Cabrera & Yepes (1960) mentioned that indigenous people traded huemul skins in Carmen de Patagones (40°47' S, 62°58' W) and Bahía Blanca (38°43' S, 62°16' W) on Argentina's Atlantic coast. Some researchers (*e.g.*, Mayorga 2019, 2020; Cirigliano 2016; Prates 2009) have studied the use of indigenous resources based on explorers' accounts and ethnographic investigations. When examining these records, contrasting contexts emerge regarding the extent of huemul skin trade. Archaeological and ethnographic evidence consistently highlight the guanacos' significance in the subsistence and economies of local indigenous communities (*e.g.*, Fernández & Stecher 2022, Rindel 2017; Marchione & Bellelli 2013; Cordero 2012; De Nigris 2004; Mengoni Goñalons 1999; Miotti 1998; Borrero & Franco 1997; Mena & Jackson 1991). Additionally, the use of skins from other species, including foxes (*Lycalopex* spp.), puma (*Puma concolor*), otters (*Lontra* spp.), rodents, rheas (*Rhea* spp.), cattle, and horses, has also been documented (*e.g.*, Caviglia 2002; Gómez Otero 1996-

1997; Latcham 1915; Hatcher 1903; Bertrand 1886; Musters 1871; Lacroix 1841).

Another challenge is the uncertainty about the huemul's early presence in Tierra del Fuego Island. In Flueck *et al.* (2023), six authors are cited under the category "type of direct observations" concerning its presence on that large island. However, by the criteria that direct observations involve visual identification, only Darwin (1839) and Lista (1887) can be considered relevant to this discussion. The contributions of Lacroix (1841) and Hershkovitz (1987) do not fit into this category, and Vietri and Godino (2019) made no reference to deer at all. Additionally, there is an instance of misrepresented content. Christensen (2016) referred to Gusinde (1951) regarding the presence of awls made from huemul antlers, speculating that these might have been obtained through trade, either from the Selk'nam of Tierra del Fuego or the Kawésqar of the Ultima Esperanza area. Notably, Christensen (2016) leaned toward a Kawésqar origin of those awls due to the absence of huemul on Tierra del Fuego Island. Another example is the citation of Bridges (1987) to support the idea of huemul's past presence on that large island. In Bridge's dictionary of the Yamana language, the term "*wiig-ata*" means "to come out from or cast as crabs and snakes their shell and skin or as deer antlers, to shed in this way". In other words, Bridges refers to the process of shedding or discarding, similar to the natural processes observed in crabs, snakes, and deer antlers. Clearly, the cited article fails to provide any concrete evidence supporting the claim of huemul presence on Tierra del Fuego Island.

Although Flueck *et al.* (2023) claimed to present additional relevant historical data, they continued to exhibit an uncritical approach to sources and disregarded evidence that contradicts their conclusions. Despite the vast expanse of extra-Andean Patagonia in Argentina, covering 557,335 km² (Matteucci 2012), there are insufficient historical records to assert that the huemul consistently inhabited this biome. In the late 19th and early 20th centuries, explorers such as Burmeister (1901), Hatcher (1903), and Onelli (1905) conducted extensive expeditions and documented the presence of huemul in the steppe. However, they identified its primary habitat as forests and Andean clearings. Likewise, other prominent scholars of that period, including Moreno (1899), de Agostini (2010), Osgood (1943), Sclater (1875), Lista (1880), Krieg (1951), Yepes (1929), Lydekker (1898), Gay (1847), and Prichard (1902), also regarded the huemul's habitat as predominantly within the Andean region's forests and clearings, not the steppe.

Early explorations and expeditions in Argentine Patagonia have significant limitations that must be considered to evaluate past species ranges (Corti & Díaz 2023). Still, Flueck *et al.* (2023) assert that the huemul historically inhabited unforested areas reaching all the way to the Atlantic coast. In addition to concerns regarding the quality and potential bias of the raw distributional data, the omission of a clear methodology for both their literature review itself and for determining the huemul's area of occupancy further complicates attempts to reconstruct its historical range. As such, the article's map showing historical huemul records (fig. 1 in Flueck *et al.* 2023), which represents the outcome based on this assumption, is incomplete as the authors fail to reference the source of each data point and do not distinguish them from archaeological sites. As Rocchini *et al.* (2011) highlight, spatial uncertainty quantification is essential for interpreting species distribution maps, and isolated past presence points, far from the primary area, may still offer valuable insights for hypothesis development.

The misuse of historical sources has serious consequences for understanding trends of specific species. An example of this issue is the study by Zuliani *et al.* (2023), which analyzed climatic indicators, topographic and vegetational proxies, and anthropogenic pressures to evaluate the influence of the climatic envelope on the huemul's current range. In their article, the historical range of the huemul - encompassing the Argentine Patagonian steppe and the Andean region - is based on the assertions made by Flueck *et al.* (2022). Their model suggests that while Patagonia's terrain is climatically suitable for the huemul, its restricted distribution is mainly a result of behavioral responses to human activity. Although, many anthropogenic factors have contributed to the decline in huemul abundance (*e.g.*, Corti *et al.* 2010), the species' specific responses to climate change affecting habitat quality, availability, and connectivity remain poorly understood (Riquelme *et al.* 2018, 2020).

Understanding historical distributions and population trends is critical for establishing conservation baselines and assessing potential threats and protection status, as reflected in frameworks such as the IUCN Red List and CITES. These frameworks, while lacking legal mandates, emphasize the importance of historic ranges. But towards this, it is essential to recognize that we often lack complete datasets to accurately quantify past population distributions. Species distributions are influenced by a variety of factors, including evolutionary history, dispersal capacity, and the history of land use and climate change (Hortal *et al.* 2012). Misuse, misinterpretation, or subjective overinterpretation of historical sources can exacerbate this issue, particularly when the limitations of these datasets are not fully acknowledged. Such flaws can lead to misguided management decisions, ultimately harming the wildlife they seek to protect. The shortcomings evidenced in Flueck *et al.* (2023, 2022) become

even more problematic when subsequent studies, like Zuliani *et al.*'s (2023), build upon such flawed results, leading to potentially misguided recommendations for policymakers. The huemul, one of the most endangered Neotropical deer (Corti *et al.* 2013; Vila *et al.* 2009), exemplifies the dangers of such research practices. Our article ultimately seeks to improve understanding and promote responsible research practices in the use of historical data.

ACKNOWLEDGEMENTS

We appreciate comments and suggestions from two reviewer that have improved our work.

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Received: 28.09.2024
Accepted: 21.10.2024

Editor: Fulgencio Lisón