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Changes in the range distribution of *Hippocamelus bisulcus* in Patagonia

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Abstract

The past geographical distribution of *Hippocamelus bisulcus* followed through early travel accounts, missionaries' reports and historical literature from 1592 to 1960, as well as archaeological information, provides evidence of the presence of this species in open vegetation zones such as the steppe. The data thus far available indicate that the ideas about the huemul being only restricted to forested habitats in the past must be revised.

Introduction

The huemul, *Hippocamelus bisulcus* (Molina, 1782) was formerly found in the southern Andean region in Argentina and Chile, between 33° and 54° south latitude. In Chile, it is now found in the Nevados de Chillán area (approximately 37°S), and in the Provinces of Aysen and Magallanes (POVILITIS 1978). In Argentina, it is recorded from Los Glaciares and Perito Moreno National Parks, Santa Cruz Province, and also from some areas of Los Alerces National Park in Chubut Province (I.U.C.N. 1982).

Given the huemul's vulnerability to human predation, it has been a relatively easy target for hunters with dogs. Livestock diseases, habitat degradation and competition with domestic animals are also important causes of the species' decline (DROUILLY 1983; POVILITIS 1979, 1982, 1983; PRICHARD 1902; RAU 1980; TEXERA 1974). The only population of huemul in the Chilean region of Nevados de Chillán that still occurs is critically endangered, and several small groups, first studied in the early 1970s, now appear extinct (TONY POVILITIS, pers. com).

On the evidence of historical and archaeological data, the huemul seems to have also occupied open vegetation zones such as the steppe. Travelers, missionaries, explorers and ethnographers provide us with the first observations and descriptions of this mammal. Perhaps because of the large amount of material involved and the scattered nature of references, such a study has not been previously attempted.

Material and methods

The past geographical distribution of this species was studied through the use of early travel accounts, missionaries' reports and historical literature. A rigorous evaluation of these sources was required. The references were considered with utmost caution since the huemul was a new species to European travelers, and an uncritical use of the records would have easily led to unwarranted results. The observer's ability in identifying wildlife has been evaluated through a thorough analysis of the texts. References to "stag" or "deer" have been disregarded in zones where the *Ozotoceros bezoarticus* could have been mistaken for a *Hippocamelus bisulcus*.

Information has been catalogued from over 102 reports covering the period 1592–1960. Although early travelers provided the basic source material, many bibliographies from various sources also led to significant accounts.

Results and discussion

Bibliographical records are more abundant for the Andean region and the Magallanic channels due to the interest of European expeditions and the preference to settle in the latter region. Early travelers found only two natural ports in the Atlantic coast of Patagonia:

Deseado and San Julián. This resulted in a concentration of data in both areas, while vast regions of the territory remained unexplored for a long time. This led to the assumption that the huemul was a deer of the mountains and that it had always inhabited areas in proximity to rugged topography. However, SCLATER (1873) stated: "It may be objected that the name *chilensis* is inappropriate as the animal is more particularly Patagonian than Chilean."

As early as the voyages of CAVENDISH (LA HARPE 1801) and BYRON (HAWKESWORTH 1774) in 1591 and 1765 to the South Seas, deer were observed in Puerto Deseado (47° 44' S, 65° 54' W), and the same remark was made at the end of the last century by FRANCISCO P. MORENO (in: PRICHARD 1902; WOLFFSOHN 1910; OSGOOD 1943). Also a manuscript kept in the British Museum labeled "Add. M. 17603", possibly from the 18th century, describes the Atlantic coast of Patagonia and refers to the presence of deer in the same geographical area.

The question that remains is why the deer were not observed by most travelers in Puerto Deseado in historical times. This can be due to different factors: 1. It must be considered that these trips rarely had a naturalistic objective and that the final destination was the Strait of Magellan. 2. There is evidence of changes in the volume of the Deseado River producing substantial influence on the environment and consequently on the flora and fauna (BURMEISTER 1901). Studies on the Deseado formation attest to a deposit of temporary and intermittent stream typical of arid or semiarid regions (LOOMIS 1914).

During hydrographical works carried out in 1900, BURMEISTER (1901) found two small groups of huemuls (6 and 12 individuals each) in the plains of Santa Cruz Province (approx. 47° S, 69°–70° W). He described the zone as a series of grades and the predominant vegetation was represented by calafate (*Berberis* sp.), molle (*Schinus o'donelli*) and mata negra (*Verbena tridens*). A few years earlier, when explorers traveled to Río Negro Province, the species was observed near Victorica and Irigoyen mountains (approx. 47° S, 69° W), far from the forested region (ROA 1884). Coastal observations of importance were made in Bahía Camarones (44° S, 41° W), Chubut Province (VIEDMA 1972) and in the area between Santa Cruz River and the Strait of Magellan (VIEDMA 1837).

In the Chilean steppe of Magallanes Province, deer were found in Segunda Angostura (HERNÁNDEZ DE OVIEDO 1852), Laguna Blanca (BERTRAND 1886), in the eastern coast of the Strait of Magellan (GUERRERO VERGARA 1880), San Gregorio and in the zone between Punta Dungeness and Chabunco (PASTELLS 1920).

Archaeological information also reveals important evidence of a broader geographical distribution. Remains of cervids examined by ROSENDO PASCUAL (GONZÁLEZ 1960; MENGHIN and GONZÁLEZ 1954) from sites at Intihuasi, San Luis Province (32° 10' S, 66° 21' W) and Ongamira, Córdoba Province (30° 51' S, 64° 31' W) yielded bones of the genus *Hippocamelus*. Even though the species was not identified, it indicates a much broader distribution for any *Hippocamelus* species (*bisulcus* or *antisensis*) than previously known.

Further remains of cervids show the presence of this mammal at the site Cueva Grande del Arroyo Feo, Santa Cruz Province (46° 56' S, 70° 30' W) located quite far away from the woody Andean region (SILVEIRA 1979). Furthermore, works carried out at Piedra Museo, south of El Jaramillo, Santa Cruz Province (47° 11' S, 67° 08' W) yielded as yet unidentified cervid remains which still have no radiocarbon date (LAURA MIOTTI, pers. com.). The presence of huemul is also confirmed at archaeological sites located in ecotonal areas such

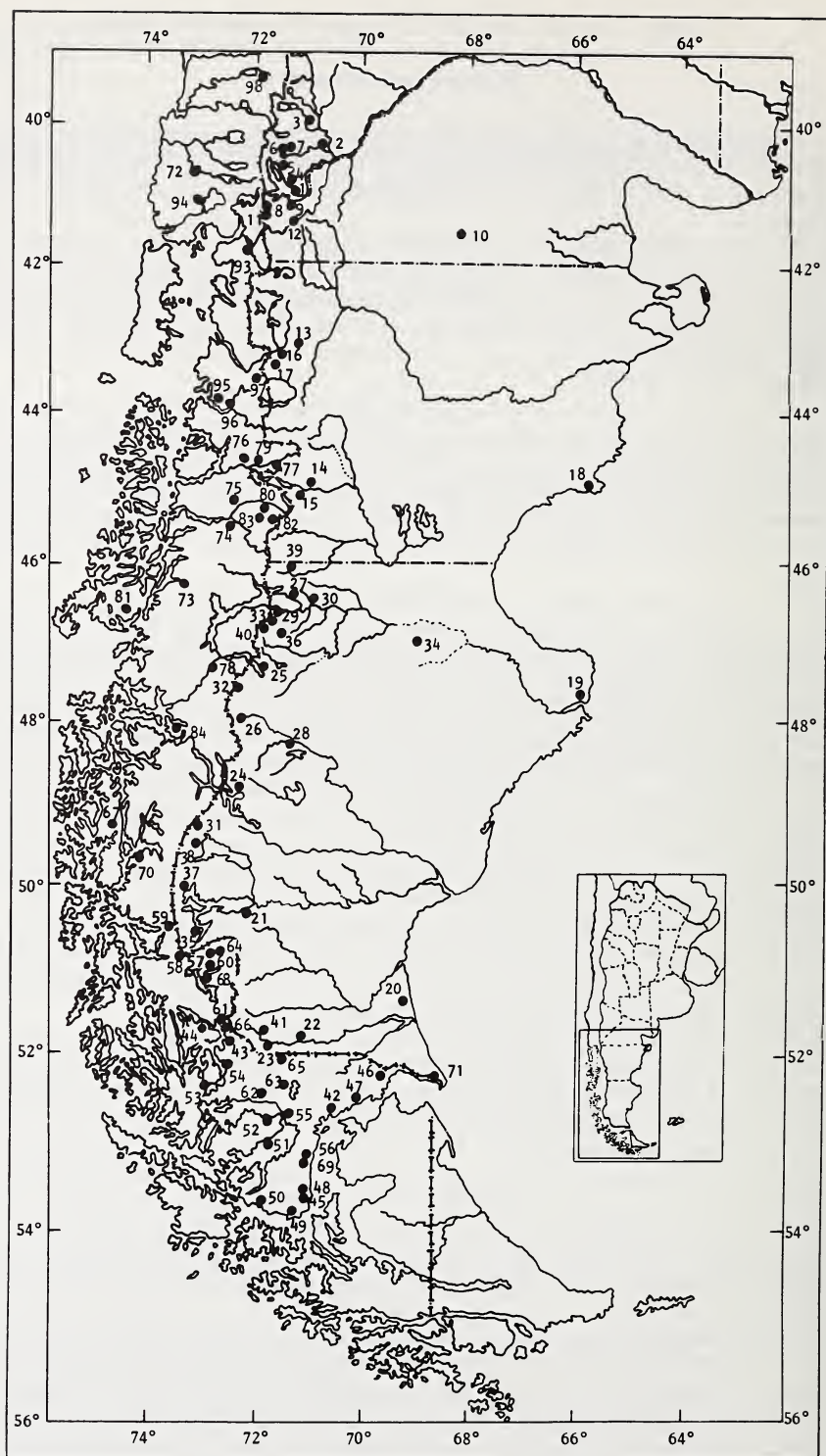


Fig. 1. Historical observations of huemul from 1592 to 1960. For location see opposite page

Argentina.

Neuquén: 1 = Puerto del Venado (41°01'S, 71°24'W), 2 = Confluence Calefú River with Collón Curá (40°23'S, 70°45'W), 3 = Junín de los Andes (39°56'S, 71°05'W), 4 = Cuyín Manzano (40°47'S, 71°17'W), 5 = Northern Lake Traful (40°41'S, 71°13'W), 6 = Lake Falkner (40°28'S, 71°31'W), 7 = Lake Villarino (40°26'S, 71°35'W).

Río Negro: 8 = Boquete Pérez Rosales and Paso Barros Arana (41°05'S, 71°49'W), 9 = Surroundings Nahuel Huapi (41°00'S, 71°30'W), 10 = Victoria and Irigoyen Mountains (41°41'S, 68°08'W), 11 = Western coast Lake Frías (41°04'S, 71°48'W), 12 = Nirihuau River (41°06'S, 71°08'W).

Chubut: 13 = Northern Thomas Peak (43°05'S, 71°10'W), 14 = Northern Guía Peak (45°05'S, 71°03'W), 15 = Senguerr River (45°02'S, 70°49'W), 16 = Futa-Leufú River (43°10'S, 71°45'W), 17 = 16 de Octubre (43°19'S, 71°18'W), 18 = Bahía Camarones (44°49'S, 65°41'W).

Santa Cruz: 19 = Puerto Deseado (47°44'S, 65°54'W), 20 = From Santa Cruz River to Strait of Magellan (approx. between 50°–52°S, 69°15'W), 21 = Lake Argentino (50°16'S, 72°28'W), 22 = Morro Philippi (51°44'S, 71°37'W), 23 = Gallegos River (51°52'S, 71°15'W), 24 = Northern coast Lake San Martín (49°11'S, 71°59'W), 25 = Lake Pueyredón (47°19'S, 72°00'W), 26 = Lake Belgrano (47°51'S, 72°06'W), 27 = Lake Buenos Aires (46°27'S, 71°28'W), 28 = Chico River (48°16'S, 71°22'W), 29 = Los Antiguos River (46°33'S, 71°37'W), 30 = Northern and eastern coast Lake Buenos Aires (46°33'S, 71°07'W), 31 = Fitz Roy (49°13'S, 73°05'W), 32 = Pirámide Peak (47°46'S, 72°26'W), 33 = Plateau between Los Antiguos and Jeinemeni Rivers (46°49'S, 71°40'W), 34 = Surroundings Deseado River (approx. 47°S, 69°W), 35 = Glacier Moreno (50°31'S, 73°20'W), 36 = Southern Los Antiguos River (46°54'S, 71°32'W), 37 = Glacier Upsala (50°00'S, 73°24'W), 38 = Glacier Viedma (49°30'S, 73°20'W), 39 = Cholila (42°31'S, 71°27'W), 40 = Eastern coast Jeinemeni River (46°40'S, 71°40'W), 41 = SW of Santa Cruz province (51°21'S, 70°19'W).

Chile.

Magallanes: 42 = Segunda Angostura (52°35'S, 70°30'W), 43 = Punta de los Venados (52°20'S, 72°34'W), 44 = Bahía Worsley (51°40'S, 73°11'W), 45 = Punta Santa Ana (53°38'S, 71°00'W), 46 = Zone between Punta Dungeness and Chabunco (52°18'S, 68°32'W), 47 = San Gregorio (52°35'S, 70°09'W), 48 = Puerto Hambre (53°30'S, 71°00'W), 49 = Zone between Cerro Negro and Cabo Froward (53°54'S, 71°20'W), 50 = Puerto Gallant (53°40'S, 72°06'W), 51 = Englefield (53°05'S, 71°55'W), 52 = Riesco (53°00'S, 73°37'W), 53 = Sonda Obstrucción (52°14'S, 72°31'W), 54 = Bahía Pascua (52°28'S, 72°34'W), 55 = Hoyas Otway and Skyring (52°42'S, 71°33'W), 56 = Punta Arenas (53°08'S, 70°55'W), 57 = Payne (50°53'S, 73°00'W), 58 = SW Lake Argentino (50°40'S, 72°47'W), 59 = Glacier Francisco Vidal (50°42'S, 73°38'W), 60 = Cañadón de los Mosquitos (50°51'S, 72°35'W), 61 = Última Esperanza (51°32'S, 73°00'W), 62 = Carpa de Benavides (52°30'S, 72°00'W), 63 = Laguna Blanca (52°25'S, 71°09'W), 64 = Los Baguesales (50°37'S, 72°28'W), 65 = Southern Gallegos River (52°08'S, 71°32'W), 66 = Tres Pasos (51°45'S, 72°21'W), 67 = Wellington (49°37'S, 74°40'W), 68 = Lake Sarmiento (51°04'S, 72°42'W), 69 = Río de los Ciervos (45°30'S, 71°00'W), 70 = Surroundings Saumares Island (49°37'S, 74°00'W), 71 = Eastern coast Estrecho de Magallanes (52°0'S, 68°27'W).

Osorno: 72 = Osorno (40°33'S, 73°07'W).

Aysen: 73 = Huemules River (45°49'S, 73°34'W), 74 = Aysen River (45°24'S, 72°42'W), 75 = Southern Tabular Peak (45°08'S, 72°06'W), 76 = Cordón Huemules (44°40'S, 72°11'W), 77 = Southern Cáceres Peak (44°33'S, 71°26'W), 78 = Baker River (47°30'S, 73°37'W), 79 = Frías River (44°40'S, 72°00'W), 80 = Richards Peak (44°37'S, 71°30'W), 81 = Península Taitao (46°27'S, 74°00'W), 82 = Coyhaique (45°33'S, 72°03'W), 83 = Estero Mano Negra (45°24'S, 71°52'W), 84 = Glacier Jorge Montt (48°17'S, 73°30'W).

Santiago: 85* = Santiago (33°00'S, 34°12'W), 86* = San Bernardo (33°36'S, 70°44'W).

Colchagua: 87* = Cachapoal River (34°15'S, 69°55'W).

Maule: 88* = Baños de Cauquenes (35°58'S, 72°21'W).

Concepción: 89* = Concepción (36°50'S, 73°03'W).

Bío, Bío: 90* = Bío Bío River (38°45'S, 71°27'W), 91* = Cuenca del Duqueco (38°46'S, 71°28'W), 92* = Antuco (37°20'S, 71°41'W).

Llanquihue: 93 = Southern Lake Taguatagua (41°42'S, 72°09'W), 94 = Surroundings Frutillar (41°15'S, 73°01'W).

Chiloé: 95 = Palena River (43°58'S, 72°50'W), 96 = Confluence Palena and Frío Rivers (43°42'S, 72°19'W), 97 = Carrenleufú and Hielo Rivers (43°29'S, 71°46'W).

Valdivia: 98 = Pucón (39°16'S, 71°59'W).

Note: * Not indicated on the map due to a northern location.

as Alero Dirección Obligatoria (RAFAEL GOÑI, pers. com.) and Cerro Casa de Piedra (ASCHERO 1981–82) Santa Cruz Province, Argentina.

The only site with archaeological evidence of huemul in the Chilean steppe is Alero Entrada Baker located at the origin of the Chacabuco River, Aysen, in layers corresponding probably to the beginning of the Christian era (FRANCISCO MENA LARRAÍN, pers. com.).

Nevertheless, it is the intention of the author not to suggest the existence of this species in the above areas based on assumptions but rather to await further fossil evidence and archaeological studies. As of the present state of knowledge, important points remain unanswered:

- a. What kind of ecological events do the archaeological sites represent?
- b. What dietary regimes were available?
- c. How might environmental dynamics have influenced population densities and adaptations for reproduction?

Based on the records obtained, the figure shows 98 geographical sites from Argentina and Chile where the species was observed in the time span under study.

If the huemul once inhabited the Argentine plains (CARETTE 1922), reaching Uruguay in the Quaternary era (KRAGLIEVICH 1932), they could have reached Chile through accessible passes in a relatively recent time. When referring to the zone comprised between lakes Buenos Aires and Argentino, T. HUNGERFORD HOLDICH (1904) stated that the presence of the huemul in the Chilean forest was an evidence that it had found its way through Andean passes.

Historical accounts for Argentina provide evidence that the population of huemul was extensive in four areas: Lake Tromen (PEREA 1989), Lake Buenos Aires (PRICHARD 1910), Lake San Martín (S. RADBOONE in La Chacra 1936) and Lake Argentino (PRICHARD 1902; KÖLLIKER et al. 1917). The number of animals observed in these zones contrasts greatly with the other areas, where generally only two or four individuals were found. On the other hand, it is surprising that the deer have only been recorded from Chile's coastal range in 1871 by the Corbeta Chacabuco in the surroundings of the Huemules River (approximately 46°S) (SIMPSON 1875).

In 1871 ENRIQUE M. SIMPSON (1875) started an expedition 6.5 km south of Estuario Quitrulco, Chile, with the intention of finding a pass across the cordillera, as the many deer observed in a valley made him suspect that they had come from Argentina where they were abundant. The importance of its presence in the zone was confirmed recently at archaeological sites in the river Ibañez valley (approx. 46°S), northern coast of Lake General Carrera–Buenos Aires (FRANCISCO MENA LARRAÍN, pers. com.).

Field information gathered in studies carried out recently in Aysen (44–49°S), Chile, show that the geographical distribution is in most cases intimately correlated to the eastern springs of the cordillera (ALDRIDGE 1988).

LYDEKKER (1910) and SCLATER (1873) considered the Argentine plains as the habitat of the huemul. If we take into account the zones where huemul abounded in the past, we find that in Santa Cruz two of the largest lakes (Buenos Aires and Argentino) are connected to important rivers that flow to the Atlantic Ocean, and that Lake San Martín lies close to the River Chico basin. Based on a review of the historical and archaeological information, it can be assumed that originally huemul inhabited the plains and that, considering their vulnerability, ecological changes, predators, human settlements or all of these together, the animals were compelled to migrate towards the mountains following the courses of the rivers or lakes. Something very similar could have happened in northern Patagonia where the higher human density could have prevented a more fluid dispersal of the species to Chile across the cordillera. In the surroundings of the Limay River, Neuquén Province, bone remains at excavations revealed the importance of this species as a faunal resource (MARIO SILVEIRA, pers. com.).

We may suppose that the huemul still occupy the niche to which they are best adapted. Modern studies are focussed on ecology, biology and conservation problems (ALDRIDGE 1988; DROUILLY 1983; POVILITIS 1979, 1983, 1985; RAU 1980; TEXERA 1974), but the survival of the species is still pending. The data presented in this study, on the other hand, are intended to show that all the ideas in the past about the huemul being only restricted to forested habitats will have to be revised.

This work supports the hypothesis that in the past the huemul lived in Patagonia gradually migrating eastwards to the Atlantic coast. The opposite alternative to the present hypothesis holds the misidentification of the species as probable. This argument is weakened because the southern border of distribution of *Ozotoceros bezoarticus* is in the north of Río Negro Province (CASAMIQUELA 1975) and a misidentification with *Pudu puda* is highly improbable.

Consequently, two alternatives must be considered:

1. Originally, the huemul lived in Patagonia and then retreated to the remote, undisturbed Andean areas. It is important to emphasize that the last registration of the huemul in the Atlantic coast date from the end of the 19th century when a strong anthropic influence took place. Analysis of a 10,000-year accumulation of owl pellets in Cueva Traful in southern Neuquén Province in Argentina enabled PEARSON (1987) to show that an important faunal change occurred during the last century. VEBLEN and LORENZ (1983) also reported prominent changes in vegetation during this period in the forest-steppe boundary in northern Patagonia.
2. The huemul lived in the Andean forested habitats and it occasionally reached the Atlantic coast. Environmental changes in the habitat may have initiated a migration of individual animals through corridors across inhospitable land (FORMAN and GODRON 1989). Pollen profiles covering the late and post-glacial era in Patagonia contain major vegetation changes that coincide with climatic fluctuations (MARKGRAF 1983).

Available information to date do not favour either of the alternatives, although neither of them can be dismissed until more controlled data and systematic studies are performed.

Zusammenfassung

Änderung des Verbreitungsgebietes von Hippocamelus bisulcus in Patagonien

Der Süd-Andenhirsch (*Hippocamelus bisulcus*) ist von 33°–54° südl. Br. in den patagonischen Anden Chiles und Argentiniens bis zur Magellanstraße beheimatet. Obwohl seine Verbreitungsgrenze nur ungenau bekannt war, vermutete man, daß sich diese Art nur auf das Andengebiet beschränkte.

Die frühere geographische Verbreitung dieser Hirschart wurde durch Berichte von Forschungsreisenden, Missionaren und Ethnographen belegt. Literatur wurde von 1592 bis 1960 in 102 Berichten berücksichtigt. Besonders hervorzuheben sind auch archäologische Knochenfunde dieses Hirsches in Patagonien.

Die vorliegende Arbeit erbringt den Nachweis dafür, daß der Süd-Andenhirsch früher auch die patagonische Steppe bewohnte.

References

- I.U.C.N. (1982) South Andean Huemul. In: I.U.C.N. Mammal Red Data Book. Part 1. Ed. by J. THORNBACK and M. JENKINS. I.U.C.N. Publ., Gland. Pp. 477–481.
- ALDRIDGE, D. K. (1988): Proyecto conservación del huemul (*Hippocamelus bisulcus*) en Chile. Medio Ambiente 9, 109–116.
- ASCHERO, C. A. (1981/1982): Nuevos datos sobre la arqueología del Cerro Casa de Piedra, sitio CCP5. Relaciones Soc. Arg. Antrop., Nueva Serie 14, 267–284.
- BERTRAND, A. (1886): Memoria sobre la región central de las tierras magallánicas. Anuario Hidrográfico de la Marina de Chile, Vol. 11.
- BURMEISTER, C. (1901): Memoria sobre el territorio de Santa Cruz. Ministerio Agricultura República Argentina.
- CARETTE, E. (1922): Cérvidos actuales y fósiles de Sudamérica. Revisión de las formas extinguidas pampeanas. Rev. Mus. La Plata 26, 393–475.

- CASAMIQUELA, R. M. (1975): Nota sobre la dispersión, en época histórica, de algunos mamíferos en el ámbito pampeano-patagónico. *Relaciones Soc. Arg. Antrop.*, Nueva Serie 9, 111-117.
- DROUILLY, P. (1983): Recopilación de antecedentes biológicos y ecológicos del huemul chileno y consideraciones sobre su manejo. *Boletín Técnico* 5. Santiago: Corporación Nacional Forestal.
- FORMAN, R. T.; GODRON, M. (1989): *Landscape Ecology*. New York: J. Wiley and Sons.
- GONZÁLEZ, A. R. (1960): La estratigrafía de la gruta de Intihuari (prov. San Luis) y su relación con otros sitios precerámicos de Sudamérica. *Rev. Instituto Antropología* 1, Apéndice II.
- GUERRERO VERGARA, R. (1880): Los descubridores del Estrecho de Magallanes i sus primeros exploradores. Santiago de Chile.
- HAWKESWORTH, J. (1774): *Voyages autour du monde, entrepris par ordre de Sa Majesté Britanique, actuellement regnante, pour faire des découvertes dans l'Hémisphère austral. Exécuté successivement par le Chef d'escadre Byron, les capitaines Wallis, Carteret et Cook, dans les vaisseaux le Dauphin, l'Hirondelle et l'Endeavour. Rédigés par ... sur les journaux tenus par les divers commandans et d'après les papiers de M. Joseph Banks. Traduit de l'Anglois. Amsterdam.*
- HERNÁNDEZ DE OVIEDO Y VALDES, G. (1852): *Historia General y natural de las Indias, islas y tierra firme del mar Océano ... Publicala la R. Academia de la Historia, cotejada con el código original, enriquecida con las enmiendas y adiciones del autor e ilustrada en la vida y el juicio de las obras del mismo, por D. José Amador de los Ríos. Madrid.*
- HOLDICH, T. H. (1904): *The countries of the King's Award*. London: Hurst and Blackett.
- KÖLLIKER, A.; KÜHN, F.; REICHTER, F.; TOMSEN, A.; WITTE, L. (1917): *Patagonia: resultados de las expediciones realizadas de 1910 a 1916*. Buenos Aires: Sociedad Científica Alemana.
- KRAGLIEVICH, L. (1932): Contribución al conocimiento de los cérvidos fósiles del Uruguay. *An. Mus. Hist. Nat.* 3, 355-438.
- LA HARPE, J. F. DE, comp. (1801): *Abrégé de l'Histoire générale des voyages de M. L'Abbé Prévot, contenant ce qu'il y a de plus remarquable, de plus utile et de mieux avéré dans les pays où les voyageurs ont pénétré; les mœurs des habitants, la religion, les usages, arts et sciences, commerce, manufactures ... Paris: Hotel de Thou. 1780-IX.*
- LOOMIS, F. B. (1914): *The Deseado Formation of Patagonia. Eight Amherst Expedition*. Mass.: Amherst College.
- LYDEKKER, R. (1910): *General sketch of the hoofed mammals*. Harmsworth Natural History. London: Carmelite House.
- MARKGRAF, V. (1983): Late and post-glacial vegetational and paleoclimatic changes in subantarctic, temperate, and arid environments in Argentina. *Palynology* 7, 43-70.
- MENGHIN, O.; GONZÁLEZ, A. R. (1954): Excavaciones arqueológicas en el yacimiento de Ongamira, Córdoba (Rep. Arg.), con apéndice por Rosendo Pascual. *Not. Mus. La Plata, Antrop.* 67, 213-274.
- OSGOOD, W. H. (1943): *The mammals of Chile*. *Field Mus. Nat. Hist., Zool. Ser.* 30, 1-268.
- PASTELLS, P. (1920): El descubrimiento del Estrecho de Magallanes. En conmemoración del IV Centenario, por ... con la colaboración del Rvdo. P. Constantino Bayle. Madrid: Sucesores de Rivadeneyra.
- PEARSON, O. P. (1987): Mice and the post-glacial history of the Trafal Valley of Argentina. *J. Mammalogy* 68, 469-478.
- PEREA, E. (1989): ... y Félix Manquel dijo ... *Textos Ameghinianos*. Fundación Ameghino. República Argentina.
- POVILITIS, T. (1978): The Chilean Huemul Project - a case history (1975-76). In: *Threatened Deer, Proceedings of a Working Meeting of the SSC Deer Specialist Group*, Longview, Washington, U. S. A., 26 Sept.-1 Oct., 1977. I.U.C.N., Switzerland. Pp. 109-129.
- (1979): *The Chilean huemul project (1975-1976): Huemul ecology and conservation*. Ph. D. diss., Colorado State Univ., Fort Collins.
- (1982): The huemul in Chile: National symbol in jeopardy? *Oryx* 17, 34-40.
- (1983): Social organization and mating strategy of the huemul (*Hippocamelus bisulcus*). *J. Mammalogy* 64, 156-158.
- (1985): Social behavior of the Huemul (*Hippocamelus bisulcus*) during breeding season. *Z. Tierpsychol.* 68, 261-286.
- PRICHARD, H. H. (1902): Field notes upon some of the larger mammals of Patagonia, made between September 1900 and June 1901. *Proc. Zool. Soc. Lond.* Pp. 272-277.
- (1910): *Hunting camps in woods and wilderness*. London.
- RAU, J. (1980): Movimiento, hábitat y velocidad del huemul del sur (*Hippocamelus bisulcus*) (Artiodactyla, Cervidae). *Not. Mens. Mus. Nac. Hist. Nat. (Santiago)* 24, 7-9.
- ROA, L. O. DE (1884): *Exploraciones de la Patagonia*. Bol. Inst. Geog. Arg. 5.
- SCLATER, P. L. (1873): Remarks on *Cervus chilensis* and *Cervus antisensis*. *Ann. and Mag. Nat. Hist.* 11.
- SILVEIRA, M. J. (1979): Análisis e interpretación de los restos faunísticos de la Cueva Grande del Arroyo Feo (Pcia. de Santa Cruz). *Relaciones Soc. Arg. Antrop.* 13, 229-247.

- SIMPSON, E. M. (1875): Exploraciones hechas por la corbeta Chacabuco. Anuario Hidrográfico de la Marina de Chile. Vol. 1.
- TEXERA, W. D. (1974): Algunos aspectos de la biología del huemul (*Hippocamelus bisulcus*) (Mammalia: Artiodactyla, Cervidae) en cautividad. Anal. Inst. Patagonia, Punta Arenas (Chile) 5, 155–188.
- VEBLEN, T.; LORENZ, D. (1988): Recent vegetation changes along the forest/steppe ecotone of Northern Patagonia. Ann. Assoc. Am. Geog. 78, 93–111.
- VIDEIRA, A. DE (1837): Descripción de la costa meridional del sur, llamada vulgarmente patagónica . . ., Colección de Angelis, Vol. 6.
- (1972): Diario de un viaje a la costa de Patagonia. Colección de Angelis, Edit. Plus Ultra. Vol. 8.
- WOLFFSOHN, J. W. (1910): Notas sobre el huemul. Rev. Chil. Hist. Nat. 14, 227–234.

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Zoologisch-Botanische Datenbank/Zoological-Botanical Database

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