

Nota



## RADIO MARKING THE FIRST GROUP OF ENDANGERED PATAGONIAN HUEMUL DEER IN ARGENTINA

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**ABSTRACT.** In Argentina, 350-500 endangered huemul remain. Huemul were radio-collared in Chubut during six winter days. Encountering huemul each day averaged 93 minutes (17 groups, 37 individuals). Spotting until darting an animal averaged 46 minutes; darting distance averaged 15.7 m; and darting until recovery averaged 45.5 minutes. Ten capture attempts were made, of which six were successful. Compared to the only huemul previously radio-collared in Argentina (2016), the present operation required 96.5% less man-days/animal. Of marked huemul, 86% presented clinical pathologies, best explained by restriction to marginal if not sink areas, or ecological traps. This operation allowed the first-ever marking of a huemul buck and a group of six huemul in Argentina.

**RESUMEN.** Marcando con radio collar un grupo del amenazado huemul patagónico por primera vez en Argentina. En Argentina quedan 350-500 huemules en peligro de extinción. Se marcaron huemules con radio-collares durante 6 días de invierno. El encuentro de un huemul cada día promedió 93 minutos (17 grupos, 37 individuos). El período de tiempo desde la detección hasta la inmovilización promedió 46 minutos; la distancia de tiro promedió 15.7 m; y desde la inmovilización hasta recuperación promedió 45.5 minutos. Se realizaron 10 intentos de captura, de los cuales seis fueron exitosos. Comparado con la única radio-marcación anterior en Argentina, esta operación requirió 96.5% menos días-hombre/animal. De los huemules marcados, 86% presentaban patologías clínicas, posiblemente por estar restringidos a áreas marginales o sumideros, es decir, trampas ecológicas. Esta operación permitió marcar por primera vez un macho y un grupo de seis huemules en Argentina.

**Key words:** clinical pathology, conservation strategy, *Hippocamelus bisulcus*, live capture, radio telemetry.

**Palabras clave:** captura viva, estrategia de conservación, *Hippocamelus bisulcus*, patología clínica, telemetría por radio.

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Patagonian huemul deer (*Hippocamelus bisulcus*) have been considered endangered for over a century (reviewed in Flueck & Smith-Flueck 2012); numbers continue declining, with possibly only 1500 individuals remaining (Jiménez et al. 2008). Numbers and occupied areas likely began to decline with pre-Columbian humans, and earliest accounts about huemul from interior Patagonia described landscapes already modified for several hundred years, and huemul exterminated in most of their historically occupied area (reviewed in Flueck & Smith-Flueck 2008, 2011a, 2012). Human presence had a strong impact on huemul, resulting in their disappearance from source habitat to survive only in refuges in high and remote mountains (Gowda et al. 2014). Only a mere 100 years ago huemul were still abundant in open plant communities like steppes, grasslands, and brushy areas with large concentrations of high quality forage (Kitzberger et al. 2014).

In Argentina, only 350-500 huemul remain, divided among approximately 50 subpopulations spread from Lanin National Park (Neuquén province) to southern Santa Cruz province (Flueck & Smith-Flueck 2006; Vila et al. 2006). Huemul were considered endangered already by 1936, when both the Buenos Aires Zoo and the zoological station at Isla Victoria in the Nahuel Huapi National Park were breeding huemul with the aim to repopulate areas that had lost this species (reviewed in Escobar Ruiz et al. 2017). Once again in 1971, several institutions (Dirección Nacional de Parques Nacionales, Dirección Nacional de Recursos Naturales Renovables, Sociedad Científica Argentina, Instituto del Hielo Continental Argentino, Zoológico de Buenos Aires, Gendarmería Nacional, Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Asociación Natura, and Federación Argentina de Montañismo) formed the "Operativo Nacional Huemul" with the objective to breed and reintroduce huemul to highly protected areas, as a means to prevent the total extinction of huemul (Federación Argentina de Montañismo 1971).

The remoteness of most huemul subpopulations plus the extremely low densities of animals have presented major hurdles for applying

sound scientific methodologies for tracking individuals. Knowledge on this species remains rudimentary (Flueck & Smith-Flueck 2006). In Argentina, tools such as telemetry have only recently been employed. Only indirect studies have been accomplished, including using fecal pellets to determine dietary behavior or patterns of animal signs to determine focal population trends. There have been no results from direct observations, and only one study has been published about statistics on remains of dead huemul (Flueck & Smith-Flueck 2008).

The lack of sound diagnoses of the major causes behind the decline and failure of recovery of huemul needs to be overcome in order to achieve a numeric and spatial recovery of this species. As data based on identified individuals is of essential importance, the use of radio telemetry is a primary tool. Hence, to allow studies of individual wild huemul, a capture operation was launched in the Protected Park Shoonem (of the village Alto Rio Senguer, province of Chubut, 44°51' S, 71°48' W), an area that includes two lakes of 167 km<sup>2</sup>, surrounded by the Andes mountains that locally reach peaks of 1900 m and higher. The habitat is characterized by old growth stands of dense forests, principally deciduous lenga trees (*Nothofagus pumilio*), which occur from lake level (930 m) up to about 1300 m. Mean winter temperature (June-August) is -4 to -2 °C with mean winter precipitation between 300-400 mm, principally as snow and annual precipitation averaging 1000 mm.

Huemul were located during six winter days of 2017, by searching the coastal area from a boat. The crew consisted of six to ten persons, including the capture team of three. The time between starting a search and encountering the first huemul averaged 93 min (SE = 21, range = 20-300 min). Once spotted, the huemul (single or in groups) were observed cautiously to determine if a capture was feasible. Any capture attempts were disregarded when steep terrain or cliffy coastline prevented a landing nearby, or because a member of that group already had been radio-collared. Once the decision was made to attempt a capture, the capture team went on land and the capturer with one assistant approached the targeted

huemul. Preparations (one radio, loaded dart, drugs, etc.) allowed only one anticipated capture attempt per day, although additional logistical support could double or triple the daily capture potential. During the six days, 17 groups of huemul (37 individuals) were seen: no capture attempts were made in seven cases; four attempts were unsuccessful as the animals retreated; and the remaining six attempts were successful. Deer were immobilized by darting, using medetomidine and ketamine reversed by atipamezole (**Fig. 1**). The time between spotting the animal and placing a capture dart averaged 46 min (SE=3.4, range=32-73 min), influenced by the type of terrain, the snow level of up to a meter, and the dense forest. The distance for shooting darts averaged 15.7 m (SE=2.1, range=10-23 m) (**Fig. 2, 3**). Lastly, the time between the dart impact and the animal back on its feet after reversal averaged 45.5 min (SE=1.97, range=29-56 min).

As circumstances of logistics were complex—remoteness, deep snow, animals accessing water at shoreline edge to move about (**Fig. 2c**)—which elevated capture stress, manipulations were minimized to reduce the down time. These included morphological measurements, brief gross examinations, photographic documentation, and radio collar installations. Irrespectively, the radio-marking of six huemul provided a major breakthrough to our understanding of the underlying factors preventing a recovery of this ultra-elusive and most endangered Patagonian deer.

Several attempts by different teams to capture and radio-collar huemul in Argentina over the

last three decades have been unsuccessful, until recently. Our previous efforts in Argentina included 5 operations (184 man-days), with three of these in the Protected Park Shoonem (97 man-days). In autumn of 2016, the first female huemul was captured and radio-collared in Argentina (“Seguirán a huemules con rastreadores satelitales” 2016). Over the course of the 14 days it took to capture this one female, a team of 17 persons, using six all-terrain vehicles and two boats, spotted only six huemul (“Seguirán a huemules con rastreadores satelitales” 2016). In contrast, the radio-collaring procedures reported here achieved captures with 96.5% less effort per animal (n=6) in terms of man-days, and that with the use of only one boat for all transport operations. Nonetheless, capture success will depend on many factors, notably deer density (as a function of seasonal weather and behavior), vegetation cover, topography, techniques employed, etc. It is worthwhile to take all this into account when designing a capture operation. The winter captures in the



**Fig. 1.** a) The first huemul buck captured and radio-collared in Argentina in August 2017, with capture team. b) Stalking a female in typical forest habitat of the Protected Park Shoonem, before immobilizing her.



**Fig. 2.** a) The distance for darting averaged 15.7 m; a mother with a yearling daughter. b) Once recumbent, the head of the buck is covered to reduce visual stimuli. c) Huemul walking along the water edge during deep snow pack.

huemul—can be taken into account to substantially increase success rate of attempts, while simultaneously reducing time and financial costs. The remoteness and low numbers of most current huemul subpopulations in Argentina have prevented the application of sound scientific methodologies, such as radio telemetry and making direct clinical evaluations of live animals. Unique opportunities should thus be utilized whenever possible, and thus a set of protocols needs to be outlined and on hand so that special opportunities, like a huemul that was recently captured by a farmer in El Manso valley (Black 2017), are not lost again.

The first three huemul bucks ever captured and marked in Argentina during the winter of 2017, together with the three females and a fresh carcass at the study site, have revealed some important new insights. From this Protected Park Shoonem population sample, 86% presented clinical pathologies in-

Protected Park Shoonem, when compared with our previous unsuccessful attempts at the same study area, demonstrated how climatic conditions—influencing use of the landscape by the



**Fig. 3.** The dart at impact (arrow). This buck was named “SinDte” (signifies toothless from “sin dientes” in Spanish) because he had lost prematurely 7 of the 8 incisive teeth.

cluding lameness, affected hooves, exfoliation of 2-7 incisors at young ages, other cranial osteopathologies, and muscle atrophy (Flueck & Smith-Flueck 2017). The best explanation for the observed absence of population recovery using the law of parsimony can be found not only in the high prevalence of osteopathology as evidenced earlier in carcasses throughout the Andean region (Flueck & Smith-Flueck 2008), but now furthermore is revealed through these clinical cases.

The herein described achievement of using radio telemetry on a group of wild huemul opens up new avenues of research. Importantly, this unique opportunity to clinically evaluate seven huemul points out the need to take huemul conservation to a higher level, taking it from diagnoses to actions. The existing absence of recovery of huemul populations must not remain an enigma. The nexus to nutritional ecology indicates that huemul populations are frequently restrained to marginal if not sink areas, or ecological traps (Flueck & Smith-Flueck 2011b). One feasible remedy would be to re-establish source populations using adaptive management strategies: huemul would be reintroduced to formerly occupied habitats whose conditions are considered sufficiently adequate to provide for successful source populations.

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