Journal of Threatened Taxa

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www.threatenedtaxa.org

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

SMALL WILD CATS SPECIAL ISSUE

COMMUNICATION

ANAESTHETIC, CLINICAL, MORPHOMETRIC, HAEMATOLOGICAL, AND SERUM CHEMISTRY EVALUATIONS OF AN ANDEAN CAT *LEOPARDUS JACOBITA* (CORNALIA, 1865) (MAMMALIA: CARNIVORA: FELIDAE) BEFORE RELEASE IN BOLIVIA

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14 December 2020 | Vol. 12 | No. 16 | Pages: 17235–17244
DOI: 10.11609/jott.5676.12.16.17235-17244

Journal of Threatened Taxa | www.threatenedtaxa.org | 14 December 2020 | 12(16): 17235–17244
ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)
DOI: https://doi.org/10.11609/jott.5676.12.16.17235-17244
#5676 | Received 02 January 2020 | Final received 20 July 2020 | Finally accepted 09 August 2020
PLATINUM OPEN ACCESS

COMMUNICATION

Anaesthetic, clinical, morphometric, haematological, and serum chemistry evaluations of an Andean Cat *Leopardus jacobita* (Cornalia, 1865) (Mammalia: Carnivora: Felidae) before release in Bolivia

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Abstract: The Andean Cat *Leopardus jacobita*, one of the most rare and endangered feline species in the world, is distributed from central Peru to central Argentina. The aim of this study was to evaluate the health and morphometry of a subadult male Andean Cat that was rescued from wildlife trade in Bolivia and held captive for 165 days before being released back into its natural habitat. Physical immobilizations followed by anaesthesia using ketamine hydrochloride (KH) and xylazine hydrochloride (XH) were performed to obtain clinical, morphometric, haematological and serum chemical parameters. Physical immobilizations were efficient using capture nets. The combination of KH + XH had an average initial sedation effect within 12min with a range of 10–16 min after intramuscular application. Anaesthetic average plane lasted 41.7min with a range of 40–45 min and was extended to 64.5min (63–66 min range) with an addition of KH. The individual was underweight on arrival and gradually reached an ideal condition and was overweight before its release. Morphometry parameters showed that it grew during the captive period. It was released back into the wild when it was considered healthy. This is the first report of a protocol of physical and chemical immobilization, physiological values, and biometric variation of an Andean Cat under captive conditions.

Keywords: Anaesthesia, biometry, immobilization, health evaluation, physiology, small wild cat, South America.

Editor: Angie Appel, Wild Cat Network, Bad Marienberg, Germany. **Date of publication:** 14 December 2020 (online & print)

Citation: Beltrán-Saavedra, L.F., R.L. Quiñajo, G. Ledezma, D. Morales-Moreno & M.L. Villalba (2020). Anaesthetic, clinical, morphometric, haematological, and serum chemistry evaluations of an Andean Cat *Leopardus jacobita* (Cornalia, 1865) (Mammalia: Carnivora: Felidae) before release in Bolivia. *Journal of Threatened Taxa* 12(16): 17235–17244. https://doi.org/10.11609/jott.5957.12.16.17235-17244

Funding: The Vesty Pakos Zoo supported cat maintenance and clinical laboratory and drug costs. The Andean cat Alliance supported with camera traps to observe the individual into the enclosure.

Competing interests: The authors declare no competing interests.

For **Author details, Author contribution** and **Spanish abstract** see end of this article.

Acknowledgements: We thank Andrea Morales for valuable comments on the first version of this manuscript. Daniela Ticona Nacho kindly created the schematic drawing of biometrics in Figure 1. Omar Torrico provided the photograph of the Andean Cat in Image 1 and 2. We are grateful for the logistic support provided by Alvaro Quispe, Daniel Flores, Fortunato Choque, Francisco Quispe, Emerson Alanoca, Herminia Flores, Johel Rocha, Johnny Nina, Johny Sirpa, Jorge Poma, Mario Mamani, Milton Quispe, Rufina Callisaya, and Santiago Mamani. We are grateful to Angie Appel and to the anonymous reviewers for the improvement of this manuscript. This study was carried out according to the administrative Resolution VMABCC # 34/15 given to Vesty Pakos Zoo by the General Directorate of Biodiversity and Protected Areas of the Bolivian Ministry of the Environment and Water.

INTRODUCTION

The Andean Cat *Leopardus jacobita* is one of the rarest feline species in the world and the most threatened in America (Andean Cat Alliance 2011). The species is classified as Endangered and is threatened by loss and degradation of habitat, opportunistic or palliative hunting and extremely low genetic diversity (Cossíos et al. 2012; Villalba et al. 2016). In Bolivia's Red List Species Book, it is listed as Critically Endangered, as it is threatened by hunting, fragmentation and alteration of habitat and by declining prey populations (Villalba et al. 2009).

The species is distributed from central Peru to central Argentina (Sorli et al. 2006; Cossíos et al. 2007; Novaro et al. 2010). In Bolivia, its presence was confirmed in the high Andean region of the departments of Potosí in southwestern Bolivia, of Oruro and Cochabamba in the central Andes of Bolivia and of La Paz in western Bolivia (Villalba et al. 2012; Huaranca et al. 2013).

To our knowledge, there is no published information on haematology, serum chemistry and clinical values of the Andean Cat. According to phylogenetic studies, the closest related species to the Andean Cat is the Pampas Cat *Leopardus colocola* (Johnson et al. 2006), for which only isolated data on chemical immobilization, clinical parameters and haematology in one free-ranging individual are available (Beltrán-Saavedra et al. 2009). To date, morphometric information on Andean Cats is scarce, because most of the data correspond to measurements of museum skins, and just a few live individuals were measured (Pine et al. 1979; Yensen & Seymour 2000; García-Perea 2002; Noss et al. 2010; Tellaeche et al. 2018).

The aim of this study was to evaluate an anaesthetic protocol and determine clinical, morphometric, haematological and serum chemistry parameters, and their variations in an Andean Cat rescued from wildlife trade. The animal was kept in captivity at the Vesty Pakos Zoo in La Paz, Bolivia, prior to being relocated to its natural habitat.

STUDY AREA

The Vesty Pakos Zoo in the Municipal Autonomous Government of La Paz is a wildlife custody centre legally established and recognized by the National Environmental Authority, through administrative Resolution VMABCC # 34/15. It is located in La Paz city (-16.572°S & -68.083°W) at an elevation of 3,265m, with an extension of 201,522.15m^2. On 15 March 2016, a subadult male Andean Cat was handed over by the La Paz Department Authority to the Vesty Pakos Zoo, which maintained the feline in temporary quarantine for 165 days. The animal was visually isolated from humans, and environmental enrichment was applied until it was considered healthy for release. This study was carried out on the basis of five evaluations, the details and dates of each are presented in Table 2.

MATERIAL AND METHODS

On arrival of the individual, Ixodidae ticks were removed from the edges of the ears, and through the coproparasitological enrichment technique faeces analyses were performed, finding eggs of nematodes of the order Strongylida (parasitic load 2 eggs/g faeces). The Andean Cat was dewormed with a broad-spectrum anthelmintic (Oralmec Gold, ivermectin 1mg/g, pyrantel pamoate 80mg/g, praziquantel 35mg/g, Biomont S.A. Peru; ivermectin 0.2 mg/kg, pyrantel pamoate 16mg/kg, praziquantel 7mg/kg oral route). Subsequent coproparasitological faeces analyses remained negative for endoparasites. Every day, the animal was observed using a remote camera (GoPro Hero 4, GoPro Inc., USA) and a digital camera (Nikon D5200, 300 mm lens, Nikon Corp. Japan). Various postures adopted by the animal were photographed to evaluate its attitude, bilateral symmetry, appearance, conformation, body condition, tail movements, motor activity, breathing, among others, that indicate possible abnormalities compatible with pathological signs. Inspections of fluids, urine or secretions were carried out during cleaning and environmental enrichment events.

During the captive period, the Andean Cat was fed every day for the first four weeks with a diet composed of live Guinea Pigs *Cavia porcellus* (595g average; diet proportion: 95.1%) and mice (30.7g average; diet proportion 4.9%), providing the mice once a week. Thereafter, to simulate natural conditions of feeding and because of its low activity inside the enclosure, the cat was fed every other day with a diet of red meat (600g average; diet proportion: 25.5%), heart (550g average; diet proportion: 23.4%) and live Guinea Pigs (800g average; diet proportion: 51.1%); this last item was provided once a week.

Physical and chemical immobilization

The Andean Cat was captured on two occasions with a 106.7 x 38.1 x 50.8 cm folding cage trap (Tomahawk Live Trap Co., USA) following free-ranging capture

methodologies (Beltrán-Saavedra et al. 2009). On the following three occasions, the individual was captured with a capture net and immediately covered with cloth to minimize stress.

Chemical immobilization was performed with a combination of dissociative anaesthesia ketamine hydrochloride (KH) (Ketamine 10%, 100mg/ml, Alfasan International B.V., The Netherlands; 10mg/kg intra-muscular [i/m] route) and the muscle sedative-relaxant xylazine hydrochloride (XH) (Xilazine 2%, 20mg/ml, Alfasan International B.V., The Netherlands; 1–2 mg/kg i/m). This combination was administered with a hand syringe in the posterior extremity musculature, with the animal covered with cloth until the pharmacological effect was achieved. The veterinary staff remained silent during this time. If drug supplementation was necessary, only KH was used. We did not use any antagonist, as the individual was kept in all occasions in a Kennel cage of 55.9 x 35.6 x 35.6 cm covered with cloth during the recovery phase. After it woke up and was able to stand, its pupillary response to light and motor coordination was evaluated before it was released into the enclosure and after the last evaluation, into the wild.

Clinical and morphometric evaluations

Clinical evaluations of the Andean Cat's body condition and physical state were performed using the 9 points-Body Condition Score, according to which 1–3 points are considered "underweight", 4–5 "ideal", 6–7 "overweight" and 8–9 "obese" (Laflamme 1997 in Santarossa et al. 2017). Temperature, heart and respiratory rates were also determined (MedArks register: ISIS, 12101 Johnny Cake Rd., Apple Valley, MN 55124, USA).

Morphometric parameters were obtained according to previous publications (Emmons 1999; García-Perea 2002; Yensen & Seymour 2000; Noss et al. 2010; Tellaeche et al. 2018) and our own elaborated guide (Table 1; Figure 1). On the first four evaluations, measurements and body weight were recorded, and on the fifth evaluation only body weight was obtained as the individual was on the way to being released.

The individual was weighed with a digital scale (Inmobiliaria y Constructora TOR S.A. de C.V., San Nicolas MR 66480 México) to the nearest 0,001kg. Body measurements were obtained using a digital vernier caliper (Truper S.A. de C.V., Jilotepec MX 54240 México) to the nearest 0.1mm; and a measure tape and a ruler to the nearest 0.1cm. The increase in body size was calculated from the difference of the last measurement made for each parameter in relation to the first one; and considering that the tail is one of the most relevant characteristics for the identification of the species (Cossíos et al. 2007), the proportion of tail length in relation to body length was calculated.

Following García-Perea (2002) criteria regarding age, the parameters of head and body length (HBL) and tail length (TL), were also used to verify the initial determination of the individual's age as a subadult, which was based on its size and overall appearance.

Biometric data were compared to all available bibliographic data on the species (Table 1).

Blood collection, haematological and serum chemistry evaluations

Before haematological and serum chemistry evaluations, the individual had a 12-hour fasting period. On the first three chemical immobilizations, blood samples of the cephalic vein were collected, keeping 4ml in tubes with ethylenediaminetetraacetic acid (EDTA) for haematology studies, and 3ml in tubes without additives for serum chemistry. Haematological and serum chemistry parameters were determined in a commercial laboratory (Laboratorio Clínico Científico, La Paz, Bolivia) two hours after blood sampling.

RESULTS

Protocol of physical and chemical immobilization

The first two physical immobilizations with folding cage traps allowed the capture of the Andean Cat individual. On the third occasion, it avoided entering the cage, so that a capture net was used, allowing to reduce the time between the capture and the application of the anaesthetic drug.

The combination of KH + XH had an average effect within 12min (range of 10–16 min), after intramuscular (i/m) application to the start of sedation; the average duration of the anaesthetic plane was 41.7 min (range of 40–45 min); and when HK had to be added, it lasted on average 64.5min (range of 63–66 min) (Table 2; Images 1 and 2).

Clinical and morphometric evaluations

Clinical evaluations showed that the individual arrived with underweight (first weight= 4.100kg). Between the evaluation II and IV, it was judged to have an ideal body weight, reaching 5.946kg at the evaluation V, when it was considered overweight. The Andean Cat increased 1.846kg during the captive period before it was released back into the wild (Table 2).

Table 1. Morphometry guidelines and tools used to measure a subadult male Andean Cat *Leopardus jacobita* in captivity at Vesty Pakos Zoo, La Paz, Bolivia.

Parameter	Description	Tool
Total body length (TBL)	Distance from the tip of the snout to the tip of the tail (excluding the fur at the tip) along the spine	Measure tape
Head length (HL)	Distance from the tip of the nose to the junction of the skull with the spine, along the middle part of the head	Measure tape
Tail length (TL)	Distance from the anus to the tip of the tail (excluding the fur at the tip), measured by the ventral side of the tail	Measure tape
Head and body length (HBL)	Difference between TBL and TL	
Neck circumference (NC)	Neck contour perimeter	Measure tape
Front foot length (FFL)	Distance from the elbow to the tip of the longest finger. Measurement taken from the front right foot	Ruler
Back foot length (BFL)	Distance from the heel to the tip of the longest toe, measured on the back-right foot	Ruler
Front pad length (FPL)	Distance from the base of the palm to the tip of the longest finger, measured on the right front leg	Ruler
Front pad width (FPW)	Widest part of the pad, measured on the right front leg	Ruler
Back pad length (BPL)	Distance from the base of the palm to the tip of the longest finger, measured on the right back leg	Ruler
Back pad width (BPW)	Widest part of the pad, measured on the right back leg	Ruler
Ear length (EL)	Distance from the base of the notch to the tip of the ear, excluding the hairs, on the inner side of the ear	Ruler
Testicles length (T)	Distance from the tip to the base of one of the testicles, measured on the right testicle	Digital caliper
Upper canine height (UCH)	Canine tooth height from the tip to the gum, measured on the upper and lower right canine throughout the center of each	Digital caliper
Lower canine height (LCH)		
Dental formula (DF)	Number of incisors, canines, premolars and molars of the upper and lower jaw counted from the center of the dentition in the right jaw	Visual
Weight	Total body weight in kg after a 12-hour fasting period	Digital scale

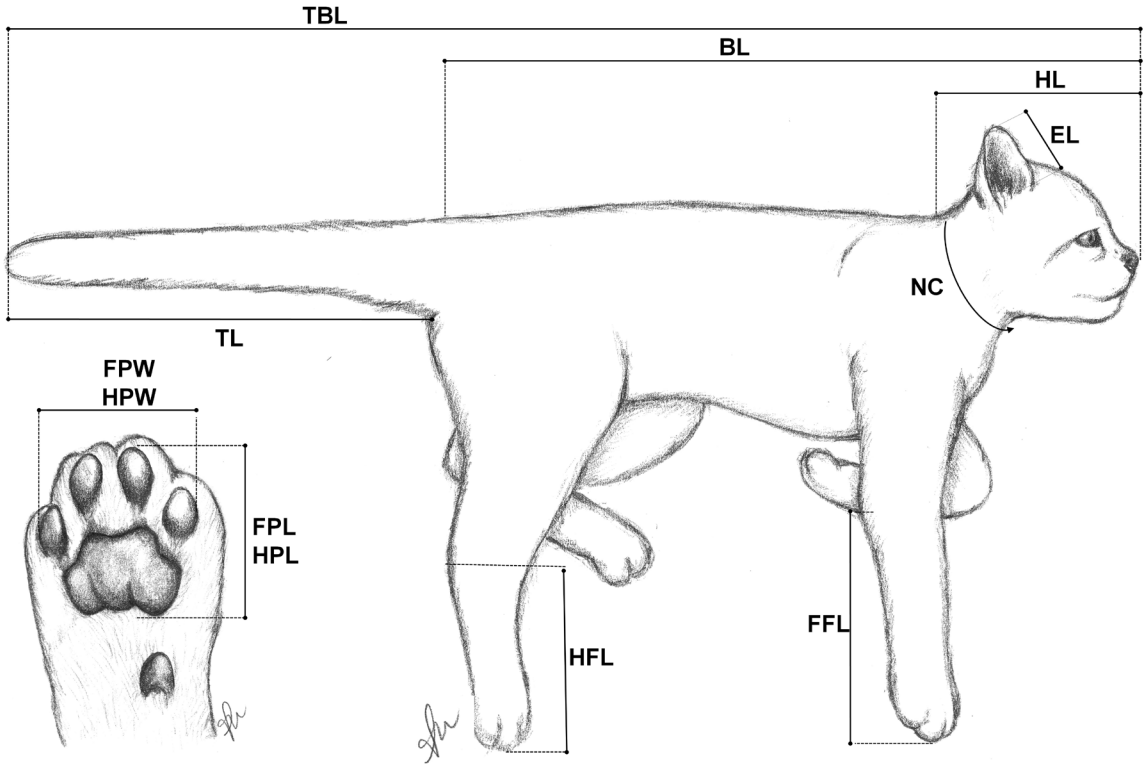

Figure 1. Schematic drawing of biometrics obtained from a male subadult Andean Cat *Leopardus jacobita* at the Vesty Pakos Zoo, La Paz, Bolivia. © Daniela Ticona Nacho

Table 2. Protocol of chemical immobilization used in a male subadult Andean Cat *Leopardus jacobita* in captivity, Vesty Pakos Zoo, La Paz, Bolivia. The evaluations I to IV were done for health studies and the last one prior to its release. Doses of KH and XH are listed in mg/kg of body weight.

Date	Evaluations	Intended dose HK:HX	Weight	KH initial dose	KH additional dose*	KH total dose	No. of additional doses	XH initial dose	Application-sedation effect (min)	Duration of sedation (min)
17.iii.2016	I	10:1	4.100	10	0	10	0	1	16	45
04.iv.2016	II	10:2	4.720	8.68	0	8.68	0	1.74	11	40
12.v.2016	III	10:2	5.328	8.91	1.00	9.91	1	1.79	10	66
14.vi.2016	IV	10:2	5.602	8.50	1.68	10.18	1	1.69	13	63
27.viii.2016	V	10:2	5.946	9.40	0	9.40	0	1.88	10	40

*Additional doses of ketamine were used after ~40–45 min to extend the duration of sedation, when more handling had to be done with the individual.
The data recorded for body temperature (˚C), heart rate (min) and respiratory rate (min) are presented in the Table 3.

Table 3. Body condition and physiological parameters of a subadult male Andean Cat *Leopardus jacobita* in captivity at Vesty Pakos Zoo, La Paz, Bolivia.

Evaluations	Body condition**	Temperature (˚C)*		Heart rate (min)*		Respiratory rate (min)*	
		Mean	Ranges	Mean	Ranges	Mean	Ranges
I	Underweight	38.4	38.0–38.8	169	132–220	44	-
II	Ideal	37.6	37.2–38.4	104	88–112	24	-
III	Ideal	36.9	-	111.5	110–113	29	22–35
IV	Ideal	38.7	-	116	-	56	-
V	Overweight	36.4	-	121.2	108–135	28	20–36

*For averages not accompanied by ranges, the values recorded were unique | ** Body condition and fitness according to 9 points-Body Condition Score (Laflamme 1997 in Santarossa et al. 2017).

Image 1. The male subadult Andean Cat *Leopardus jacobita* in Vesty Pakos Zoo, La Paz, Bolivia. © Omar Torrico

Table 4. Morphometric measurements and body size increase of a subadult male Andean Cat *Leopardus jacobita* in captivity at Vesty Pakos Zoo, La Paz, Bolivia. Biometric values are expressed in millimeters (mm) and are compared with values obtained in other studies.

Parameter	Evaluations of this study					Other studies	References
	I	II	III	IV	Increase		
TBL	1015	-	1017	1020	5	-	-
HBL	645	-	644	645	0	577–850	Yensen & Seymour (2000)
						640–660** 740–850	García-Perea (2002)
						570–920	Noss et al. (2010)
						620–750	Tellaeche et al. (2018)
HL	130	135	139	140	10	120–150	Tellaeche et al. (2018)
TL	370	373	373	375	5	480	Pine et al. (1979)
						410–480	Yensen & Seymour (2000)
						330–420**	García-Perea (2002)
						350–480	Noss et al. (2010)
						420–460	Tellaeche et al. (2018)
NC	202	206	219	219	17	190–230	Tellaeche et al. (2018)
FFL	209	209	216	216	7	-	-
BFL	120	125	129	129	9	110	Pine et al. (1979)
						133	Yensen & Seymour (2000)
						110–133**	García-Perea (2002)
						110–130	Noss et al. (2010)
FPL	44	46	46	46	2	42–48	Tellaeche et al. (2018)
FPW	-	39	39	42	3*	34–40	Tellaeche et al. (2018)
BPL	45	46	47	47	2	45–48	Tellaeche et al. (2018)
BPW	-	29	31	31	2*	38–40	Tellaeche et al. (2018)
EL	60	60	61	61	1	53**	Pine et al. (1979)
						63**	Yensen & Seymour (2000)
						53–63**	García-Perea (2002)
						30–70	Noss et al. (2010)
						47–56	Tellaeche et al. (2018)
T	18,4	18,4	22	24	5,6	-	-
UCH	11.8	-	-	11	-0.8	5.6–7.58	Tellaeche et al. (2018)
LCH	10	-	-	10.1	0.1	5.32–7.82	Tellaeche et al. (2018)

*Data taken from the evaluation II | **Measurement of subadult individuals

The individual had the following dental formula: incisors= 3/3; canines= 1/1; pre-molars= 2/2; and molars= 1/1. Also, between the evaluations I and IV, a small dental wear was observed in the UCL.

Morphometric parameters obtained from the individual in the first four evaluations are presented in Table 4, establishing changes in some parameters; these are compared with those reported by other authors. In the measurement of HBL and TL, the tail represented 57.4% of the total body length upon arrival and gradually increased to 58.1%.

The measurements of HBL and TL taken in the evaluations I to IV were within the range of measurements taken for subadults (Table 4). Therefore, when the Andean Cat was released into the wild, it was still considered to have been in this age category.

Table 5. Haematological and serum chemistry parameters in a male subadult Andean Cat *Leopardus jacobita* kept in captivity at Vesty Pakos Zoo, La Paz, Bolivia. Values of free-ranging Ocelot *L. pardalis* (Widmer et al. 2016) and captive Ocelot (International Species Information System 2002), and reference ranges of Domestic Cats *Felis catus* (Aiello & Moses 2015) are included for comparison.

Parameters	Units	Evaluation of Andean Cat			Free-ranging Ocelot	Captive Ocelot	Domestic Cat
		I	II	III	Range	Range	Range
Haematology							
Red blood cells	10^9 /L	5.2	4.6	5.2	5.5–7.1	5.10–10.8	5.0–10.0
Haemoglobin	g/L	155	129	154	95–131	94–171	100–150
Haematocrit	L/L	0.46	0.39	0.46	0.30–0.40	0.27–0.53	0.30–0.45
MCV*	fl	89.6	85.2	88.6	42.25–60.0	42.9–62.8	39–55
MCH*	pg/cell	29.8	28.0	29.6	13.4–22.4	12.7–21.8	13–17
MCHC*	g/L	332.0	330.0	334	311.8–363.9	238.0–396.0	300–360
Platelet count	10^9 /L	180	190	260	280–694	88.0–581.0	300–800
Eritrosedimentation	mm/h	1	4	1	-	-	-
White blood cells	10^9 /L	10.0	9.9	10.0	12.1–19.8	4.62–23.30	5.5–19.5
Bands	10^9 /L	0.20	0.0	0.20	0.18–0.57	0.0–0.50	0.0–0.30
Neutrophils	10^9 /L	7.2	6.6	5.2	7.4–15.9	0.105–20.7	2.5–12.5
Eosinophils	10^9 /L	0.1	0.1	0.3	0–0.9	0.0–3.63	0.0–0.8
Basophils	10^9 u/L	0.0	0.0	0.0	0.0	0.0–0.37	0.0–0.2
Lymphocytes	10^9 /L	2.3	2.9	4.2	1.5–8.7	0.46–7.61	1.5–7.0
Monocytes	10^9 /L	0.2	0.3	0.1	0.5–1.6	0.05–2.62	0.0–0.9
Serum chemistry							
Creatinine	umol/L	100	120	120	61.9–114.9	71.0–283.0	80–194
Blood urea nitrogen	mmol/L	13.6	17.6	16.6	-	-	6.8–12.1
Potassium	mmol/L	3.2	-	-	4.5–5.2	2.8–5.8	3.7–6.1
Total protein	g/L	68.0	64.0	62.0	74.0–113.0	56.0–100.0	60.0–79.0
Albumin	g/L	36.0	36.0	-	22.1–28.2	22.0–46.0	28.0–39.0
Globulin	g/L	31.0	-	-	50.0–90.9	24.0–67.0	26.0–51.0
Albumin/globulin proportion		1.16	-	-	0.24–0.48	-	-
AST*	IU/L	47.7	53.8	28.9	38.0–193.0	9.0–111.0	7.0–38.0
ALT*	IU/L	49.0	52.7	39.8	33.0–117.0	19.0–269.0	25.0–97.0
ALP*	IU/L	11.3	20.0	6.83	13.0–35.0	4.0–243.0	0.0–45.0

*MCV—Mean cell volume | MCH—Mean cell haemoglobin | MCHC—Mean cell haemoglobin concentration | AST—Aspartate aminotransferase | ALT—Alanine aminotransferase | ALP—Alkaline phosphatase.

Haematological and serum chemical evaluations

Haematological and serum chemistry parameters obtained from the first three immobilizations are reported in Table 5.

DISCUSSION

The present work reports for the first time a protocol of chemical immobilization, haematological and serum chemistry parameters of a healthy Andean Cat individual; and contributes to the morphometry of the species.

Protocol of physical and chemical immobilization

In this study, the individual "learned" not to enter the cage trap, and the use of capture nets proved to be a more appropriate method of physical immobilization in a closed environment.

Chemical immobilization of other feline species such as Bobcat *Lynx rufus*, Guigna *Leopardus guigna*, Ocelot *L. pardalis*, and Pampas Cat suggest the use of ketamine and xylazine on doses ranging from 7.65–14.7 mg/kg KH and 0.74–1.4 mg/kg XH (Beltrán & Tewes 1995; Acosta et al. 2007; Tellaeche et al. 2020). For this individual Andean Cat under captive conditions, however, we had

Image 2. Obtaining blood and biometrics samples in an anesthetized male subadult Andean Cat *Leopardus jacobita* at the Vesty Pakos Zoo, La Paz, Bolivia. © Omar Torrico

a good and safe 40 minutes sedation period using a dose of 8.68mg/kg KH and 1.74mg/kg XH.

Clinical and morphometric evaluations

The Andean Cat was considered underweight on the evaluation I of its body condition, which may be related to its natural condition of being a wild subadult individual (García-Perea 2002), and a presumable four-day fasting period prior to its arrival at the Vesty Pakos Zoo. Subsequently, its body condition was judged ideal and within ranges of 4.0–5.8 kg recorded for the species by García-Perea (2002), Villalba et al. (2004), and Tellaeche et al. (2018). At the evaluation V, it was judged overweight, which was probably the effect of a low energy expenditure, and also by medical and nutritional care given during captive conditions.

Although hypothermia and hyperthermia are considered common adverse effects of chemical immobilizations of wild felids (e.g., Tellaeche et al. 2020), the Andean Cat showed none, probably because it was not too stressed prior to anaesthetic injection and because it was kept warm using hot-water bottles wrapped in cloth during procedures.

During sedation, heart and respiratory rates higher than the averages were initially recorded (129.7/min y 36.2/min respectively), possibly due to capture stress, which stabilized during the course of the sedations. Similar records were observed in a free-ranging wild Pampas Cat (Beltrán-Saavedra et al. 2009).

The cat's tail length ratio to the body length (58.1%) was slightly lower (60–75%) than those obtained of free-ranging adult Andean Cats (Yensen & Seymour 2000; García-Perea 2002), and from skins (66–75%) of this species (Cossíos et al. 2007). Its body measurements, however, were similar or within the ranges reported for the species (Yensen & Seymour 2000; García-Perea 2002; Tellaeche et al. 2018). We report measurements of testis length of an Andean Cat for the first time. For further morphological measurements, we suggest to evaluate both left and right size of canines and testicles to identify the existence of possible asymmetries.

Haematological and serum chemical evaluations

In the evaluation I, the haematological values of red blood cells, mean cell haemoglobin concentration (MCHC), eosinophils, basophils and lymphocytes obtained were all within the reference ranges of Domestic Cats, free-ranging and captive Ocelots (International Species Information System 2002; Aiello & Moses 2016; Widmer et al. 2016), and similar to those reported in a free-ranging Pampas Cat (Beltran-Saavedra et al. 2009). On the other hand, haemoglobin values obtained by Beltran-Saavedra et al. (2009) presented slightly superior variations in relation to the reference ranges of Domestic Cats and free-ranging Ocelots, but they were within the ranges of those of captive Ocelots. In the evaluation II, the values obtained of MCHC, eosinophils, basophils and lymphocytes and haemoglobin were all within the reference ranges of Domestic Cats, free-ranging and captive Ocelots (International Species Information System 2002; Aiello & Moses 2016; Widmer et al. 2016), and similar to those reported in a free-ranging Pampas Cat (Beltran-Saavedra et al. 2009). The value of red blood cells, however, was lower than those reported in Domestic Cats, free-ranging and captive Ocelots and a free-ranging Pampas Cat (Beltran-Saavedra et al. 2009), but not related to physiological and morphological abnormalities of the red series. In the evaluation III, the values obtained of red blood cells, MCHC, eosinophils, basophils and lymphocytes were all within the reference ranges of Domestic Cats, free ranging and captive Ocelots (International Species Information System 2002; Aiello & Moses 2016; Widmer et al. 2016), and in a free-ranging Pampas Cat (Beltran-Saavedra et al. 2009). On the other hand, haemoglobin values showed slightly superior variations in relation to the reference ranges of Domestic Cats and free-ranging Ocelots, but they were within the ranges of captive Ocelots.

The values of white blood cells, bands, neutrophils and monocytes obtained in evaluations I to III were within the ranges of Domestic Cats and captive Ocelots (International Species Information System 2002; Aiello & Moses 2016). All these values were similar to those reported in a free-ranging Pampas Cat and in free-ranging Ocelots (Beltrán-Saavedra et al. 2009; Widmer

et al. 2016). In contrast, haematocrit values in all three evaluations were within the reference ranges of Domestic Cats, but showed little variations with respect to those of free-ranging and captive Ocelots, and those of a free-ranging Pampas Cat.

On the other hand, the values of mean cell volume (MCV) (89.6, 85.2 y 88.6 fl) and mean cell haemoglobin (MCH) (29.8, 28.0 y 29.6 pg/cell) obtained in the evaluations I to III were superior to the reference ranges of Domestic Cats and, to those of free-ranging and captive Ocelots (International Species Information System 2002; Aiello & Moses 2016; Widmer et al. 2016). These differences, however, were not associated with pathological signs and abnormal haematological morphologies such as reticulocytosis, anisocytosis or polychromasia, which are compatible with anaemia or haemolysis (Aguiló 2001; Cowell 2004).

Also, in the evaluations I to III, the platelet counts (180, 190, and 260 10^9/L) were lower than the reference ranges of Domestic Cats, free-ranging and captive Ocelots (International Species Information System 2002; Aiello & Moses 2016; Widmer et al. 2016). Ectoparasite ticks on the ears and a low parasite load of one type of nematode that were detected at the individual's arrival could be the cause for initial lower platelet count, which increased after removal of ticks and the deworming treatment. The low platelet count, however, was not associated with pathological signs such as bleeding, haemorrhagic diathesis or petechiae described by Nuñez-Ochoa (2007).

All the values of serum chemistry obtained in the evaluations I to III were within the reference ranges of Domestic Cats and free-ranging and captive Ocelots (International Species Information System 2002; Aiello & Moses 2016; Widmer et al. 2016), with little variation of creatinine, globulin and total protein values in free-ranging Ocelots. In addition, total protein was similar to the values reported in a free-ranging Pampas Cat (Beltrán-Saavedra et al. 2009).

The only potassium value obtained in the evaluation I was a little lower than the reference ranges of Domestic Cats, whereas blood urea nitrogen and aspartate aminotransferase values were higher than the same reference ranges (Aiello & Moses 2016). There were, however, no clinical abnormalities, and these serum values are among those reported for free-ranging and captive Ocelots (International Species Information System 2002; Widmer et al. 2016).

The value of albumin/globulin proportion obtained in the evaluation I was higher than the ranges reported for free-ranging Ocelots (Widmer et al. 2016). The parameters of erythrosedimentation were not comparable, since previous authors did not report these data.

Using capture nets was more suitable than cage traps for the containment of this individual. The procedures using KH+XH with an intended dose of 10:2mg/kg proved to be safe and efficient for 40 minutes of procedure for this subadult male Andean Cat under captive conditions. Clinical parameters indicated that the individual remained in good body condition during captivity, showed a constant increase in size and weight, and was considered healthy following haematological and serum chemistry evaluations. This study contributed to the knowledge of physiological and morphological parameters of the Andean Cat, and together with other health and biological parameters allowed to determine the timing of release of this individual into its natural habitat. We strongly recommend to conduct more research on the Andean Cat to obtain additional data relevant for both in situ and ex situ conservation and management of this little-known cat.

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Resumen: El Gato Andino *Leopardus jacobita*, una de las especies de felinos más raras y amenazadas del mundo, se distribuye desde el centro de Perú hasta el centro de Argentina. El objetivo de este estudio fue evaluar la salud y la morfometría de un Gato Andino macho subadulto que fue rescatado del tráfico de fauna silvestre en Bolivia y mantenido en cautiverio durante 165 días antes de ser liberado de nuevo en su hábitat natural. Se realizaron inmovilizaciones físicas seguidas de anestesia utilizando clorhidrato de ketamina (HK) y clorhidrato de xilacina (HX) para obtener parámetros clínicos, morfométricos, hematológicos y químicos séricos. Las inmovilizaciones físicas fueron eficientes utilizando redes de captura. La combinación de HK + HX tuvo un efecto sedante inicial promedio dentro de 12min con un rango de 10–16 min después de la aplicación intramuscular. El promedio del plano anestésico duró 41.7 min con un rango de 40–45 min y se extendió a 64.5 min (rango de 63–66 min) con una adición de HK. El individuo llegó con una condición corporal de bajo peso, gradualmente alcanzó una condición ideal y sobrepeso antes de su liberación. Los parámetros de morfometría mostraron que creció durante el período de cautiverio. Se liberó de nuevo al medio silvestre cuando fue considerado saludable. Este es el primer informe de un protocolo de inmovilización física y química, valores fisiológicos y variación biométrica de un Gato Andino en condiciones de cautiverio.

Palabras clave: América del sur, anestesia, biometría, evaluación de salud, felinos silvestres pequeños, fisiología, inmovilización.

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Author contributions: LFBS performed study design and chemical immobilizations, analyzed clinical, physiological and chemical immobilization data, and prepared the manuscript. RLQ performed the study design, physical and chemical immobilizations, obtained samples and clinical data, supplemented the manuscript. GL performed the study design, obtained biometric data, supplemented the manuscript. DM obtained and analyzed biometric data, supplemented the manuscript. MLV analyzed biometric data, supplemented the manuscript

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PLATINUM OPEN ACCESS

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

December 2020 | Vol. 12 | No. 16 | Pages: 17171–17262
Date of Publication: 14 December 2020 (Online & Print)
DOI: 10.11609/jott.2020.12.16.17171-17262

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