



THE UNIVERSITY of EDINBURGH
The Royal (Dick) School
of Veterinary Studies

The Jeanne Marchig
International Centre for
Animal Welfare Education



COLLEGE OF VETERINARY MEDICINE

Veterinary clinical examination report

“Yupik”, Female Polar Bear (*Ursus maritimus*)

22nd March 2017



Clinical Examination report

“Yupik” Female entire Polar bear (*Ursus maritimus*)

Age approx. 23-25 Years

Weight 219kg (21st March 2017)

Morelia zoo, Mexico

Clinical history and observations

Yupik’s last health-check was in 2012 when she was anaesthetised with 2.2mg/kg tiletamine/zolezepam and 0.06mg/kg medetomidine. Despite using these drugs previously and significant evidence for their safety in the bear anaesthesia literature, the zoo staff remained concerned over the use of these drugs due to the death of an unmonitored anaesthetised gorilla in transport at a different zoo, indicating a lack of understanding of anaesthetic pharmacology across zoological species, and the paramount importance of anaesthetic monitoring during anaesthesia.

Yupik’s previous health check report concluded that she was suffering from cardiac pathology, despite a clear cardiac ultrasound examination not being performed. Additionally she was also noted as suffering from dental disease which is painful and can lead to secondary health problems, but despite this finding, the dental disease has remained untreated.

Health-check aims

- i. Establish current cardiac health status
- ii. Treat painful, chronic dental disease
- iii. Establish general health parameters and fitness to travel

Preparation for anaesthesia

Training programme for hand injection to facilitate a stress-free anaesthetic induction, important in a patient with possible cardiac disease was initiated in January 2017 with modifications to the bear den, essential for successful training agreed to be completed by the zoo by February 24th.

Den modifications were not completed until March 20th and so successful training for injection was not possible, meaning that a dart induction (more painful and stressful) was necessary. Additionally the zoo staff prioritised unnecessary maintenance to the den over training sessions to ensure that Yupik could be safely positioned for accurate darting.



Prior to anaesthesia it is essential that the patient is calm and kept in a normal routine to minimise cardiovascular stress and thus risks during anaesthesia, instead significant maintenance work occurred in Yupik's living area in the 3 days prior to her health-check (den modifications for training that it was now too late to perform, modification of her bed into a table and changing of light fixtures). None of these modifications were necessary at this late stage and the noise and disruption increased Yupik's stress levels prior to the health check. This increased stress was evident in her increased stereotypical pacing behaviour and increased respiratory rate (33bpm) and effort when people were present. The lack of preparation, and increased stress to Yupik during this time were completely avoidable and an unnecessary risks.

Despite two planning meetings with the zoo in the days prior to the anaesthesia, emphasising the points above, maintenance was still ongoing in Yupik's den on the morning of the anaesthesia and she demonstrated significant stereotypical pacing behaviour at the time of darting. Additionally water was withheld from Yupik overnight, contrary to previous recommendations.

Anaesthetic induction

Yupik was alert and stereotypical at the time of darting. The zoo vets were unwilling to aim the dart at her shoulder, an area with good drug absorption, and instead darted her in the back of the hindlimb, an area not recommended for anaesthetic darting, as the muscle in this area is limited and so drug absorption is poor as the drug sits in the subcutaneous tissues. Yupik was darted in this area with 440mg tiletamine/zolezepam and 11mg of medetomidine at 8.10am.

Predictably, Yupik was still ambulatory 23 minutes later, with her high stress levels and the poor dart placement resulting in a slow response to the anaesthetic drugs. It was agreed that additional anaesthesia was needed and an additional ½ dose of tiletamine/zolezepam (220mg) and medetomidine (5.5mg) was recommended by visiting veterinarian (HB) as the sedative and anxiolytic (anti-anxiety) effects of this drug combination result in better sedation than ketamine alone.

This advice was disregarded, and Yupik was darted with 220mg of Ketamine 8.46am after significant delay in preparing the dart.



By 8.53am Yupik was sedated but still responsive to stimuli and not safe to move or intubate, necessitating a second injection of tiletamine/zolezepam (220mg) and medetomidine (5.5mg) as previously recommended.

By 9.12am Yupik was fully anaesthetised, and she was repositioned and intubated for maintenance on isoflurane, an inhalational anaesthetic at 9.17am.

The anaesthetic induction process was extended due to Yupik's high stress levels, environmental noise and disturbance, poor dart placement, insistence on using ketamine in the second dart, and disorganisation in dart preparation and gun loading.

Anaesthetic maintenance

Yupik was maintained under anaesthesia for the duration of the procedure. During this time her vital signs including heart rate, respirator rate, peripheral pulse quality, SpO2 and ETCO2 were monitored. Her anaesthetic status was stable and unremarkable throughout the examination.



HOJA DE ANESTESIA

Nombre YUPIK Fecha 22 / MAR 2017

Número de caso / Raza Oso Polar Sexo M C T R Edad 25 Años Peso 220kg

FC FR Pulso tP MM TLLC Ht PPT Riesgo Anestésico 1 2 3 4 5 E

Anestesiólogo ALMA AGARCIA L Clínico Tipo de Anestesia Inhalador

Cirujano	Procedimiento	Recumbencia	Cirujano	Sonda E.T.
	<u>Extracción Cebillo</u>	<u>Lat. Izq.</u>		<u>18 mm</u>
	Instrumentos Especiales	Rad. T.O.	Tiempo estimado Procedim.	Problemas
	<u>Otorlogia</u>			<u>NO.</u>

Fármaco	Dosis	Ruta	Hora	Inicio Anestesia
Preanestésicos				<u>8:10 AM.</u>
				Inicio Proc. 1
				Inicio Proc. 2
Inducción				Fin Anestesia <u>15:23</u>
				Extubación <u>16:10</u>
Mantenimiento				De pie <u>17:05</u>
ISO <input checked="" type="checkbox"/> / SEVO <u> </u>		<u>SET.</u>		TTA <u>723 hrs</u>
				Firma Anestesiólogo <u>[Signature]</u>

Horas	15	30	45	0	15	30	45	0	15	30	45	0	15	30	45	0	Total
Agentes y Líquidos IV																	
Fármacos																	
O ₂ L/min. <u>8.5</u>																	
SPO ₂ <u>SpO₂</u>																	
ETCO ₂																	
F.C. <input checked="" type="radio"/>																	
F.R. <input type="radio"/>																	
T° <input type="radio"/>																	
Pres. Art. <input type="radio"/>																	
Sist. <input type="radio"/>																	
Media <input type="radio"/>																	
Diast <input type="radio"/>																	
I.RPV <input type="radio"/>																	

GS	pH	PaCO ₂	PaO ₂	HCO ₃	SBE	K ⁺	Na ⁺	Ca ⁺	Cl ⁻	Lactato	Comentarios / Complicaciones
1	<u>7.36</u>	<u>Fin Ax</u>									<u>11 Ax local. boca.</u>
2	<u>7.32</u>	<u>Recuperación Ventil. Manual O₂</u>									<u>Mepivacain 3% Cebillo</u>
3	<u>7.38</u>	<u>15:40 Ligero rta. palp. y mandib.</u>									<u>Sup. Izq.</u>
4	<u>7.31</u>	<u>15:51 Se quita O₂</u>									<u>12 Tracción Energía.</u>
5											<u>13 750 mg Tramadol. IV.</u>
6											<u>14 Extracción cebillo.</u>
											<u>15 Sutura oria.</u>

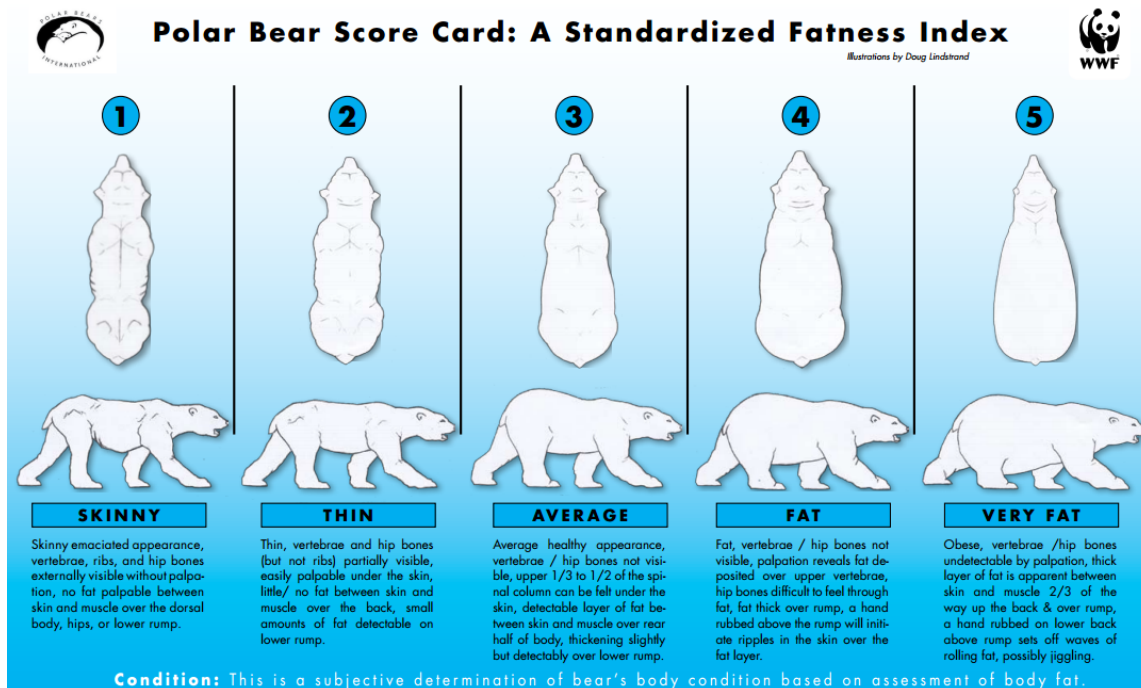
Clinical examination

All body systems were examined. Details given below

Physical examination:

Skin and haircoat: Generally healthy. Some minor areas of hairloss on the face.

Body condition score: 2/5, thin.

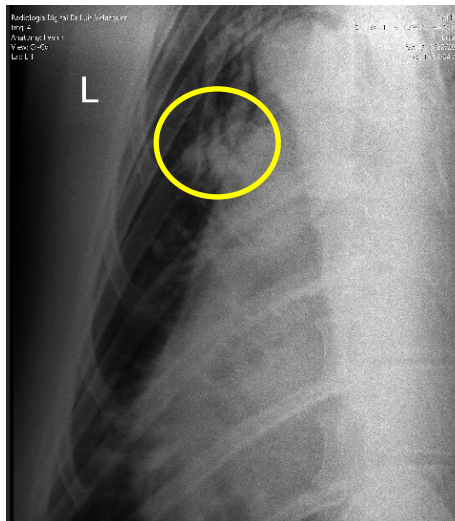


Yupik demonstrates considerable muscle loss and thus sagging of the overlying skin and subcutaneous tissue resulting in her low-hanging abdomen that was misinterpreted by the zoo as abdominal ascites (fluid).

Cardiovascular system: Both lung fields clear on auscultation and heart sounds normal.

Echocardiogram normal cardiac structure and function, with mild-moderate pulmonary hypertension. (see cardiac report for further details)

Small opacity detected by xray, in left cranial lung lobe.



Yupik showed signs of mild haemoconcentration (dehydration) with a PCV of 56 and TP of 8.4 – likely due to dehydration associated with water being withheld. Intravenous fluid therapy was delivered throughout the procedure

Ophthalmic examination: Both eyes normal including anterior chamber and fundic exam

Abdominal ultrasound: No abnormality detected on palpation. Ultrasound of liver, kidneys, bladder, spleen and abdominal viscera. Good visualization achieved. No abnormalities detected. No free fluid/ascites.

Musculoskeletal system: Missing P2, right forepaw. Right carpus and elbow mild crepitus, right shoulder restricted range of motion. Left elbow crepitus and restricted range of motion, left shoulder restricted range of motion. Right tarsus crepitus. Left tarsus and stifle crepitus. Spine laying nice and flat, hips loose and good range of motion. All other joints normal.

Radiography:

Right fore foot showing missing P1



Right carpus showing calcification of tendons:



Right elbow with calcification of tendon attachment



Right tarsus with 'kissing lesion' osteophytosis and tendon calcification



Right stifle with irregular patella and calcification of patellar tendon



Left carpus with calcification of tendons



Left elbow with calcification of tendon attachment



Left tarsus with 'kissing lesion' osteophytosis



Left stifle with irregular patella



Yupik shows a variety of mild skeletal pathology including arthritic changes in her elbows, stifles and tarsi and calcification of several tendons. In humans, calcification of the tendons leads to a build-up of pressure in the tendon, as well causing a chemical irritation and is very painful. The kissing lesions/osteophytosis of the tarsi are also likely to also cause pain.



Dental examination:

Significant dental pathology including three fractured canine teeth and erosion of the incisors. Apical radiographs demonstrated a lack of apical integrity in the fractured right maxillary canine tooth, necessitating extraction due to the presence of severe infection causing erosion of the bone and an oro-nasal fistula. The left lateral mandibular incisor was also extracted due to deep gingival pocketing. Both mandibular canine teeth were treated endodontically although the canals were incompletely filled by sealant. Antibiotic therapy (Amox LA 15mg/kg) and analgesia (Meloxicam 0.2mg/kg and Tramadol 3mg/kg) were administered. See images below.

Dental Examination Record

Date: 22.3.2017	S Number:	Name: YUPIK
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Maxillary dental chart

R L

110 109 108 107 106 105 104 103 102 101 201 202 203 204 205 206 207 208 209 210

T T Fx Fx W W

Comments: 204 Tip Fx 104 Fx, 105, 106, 206 missing

Mandibular dental chart

R L

411 410 409 408 407 406 405 404 403 402 401 301 302 303 304 305 306 307 308 309 310 311

W W W G W Fx L Fx G W W

Comments: Fx of 304 and 404, generalized gingivitis & wear.

X-Rays taken: Pre & Post operative maxillary & mandibular x-rays.

KEY:	Tip fracture	T#	Loose	L
	Slab fracture	S#	Pulp exposed	PE
	Bar biting wear	BB	Non pulp exposed	NP
	Missing	•	Gingivitis	G
	Worn	W	Tartar	T
	Extracted	X	Caries	C

Dental xrays showing pre- and post-treatment mandible:



Dental xrays showing pre- and post-treatment maxilla:



Previous discussions have indicated the possibility of developing crowns for Yupik's teeth. Leading dental experts recommend that composite build-ups or cast crowns are unnecessary and unethical in a carnivore's oral environment. They will inevitably fail and the animal will require further immobilisation with associated risks.

Endoscopy:

Vaginal endoscopy = normal



Upper gastrointestinal endoscopy = Mild gastritis, samples taken for histopathology

Discussion

Physical health

Overall Yupik is generally healthy. Previous concerns regarding her cardiovascular health have been demonstrated to be groundless. Her dental pathology has been treated but the long duration of infection necessitated the extraction of one canine tooth, but as this pathology is likely to be associated with her habit of bar-biting and therefore traumatically induced, further dental treatment may be required in future unless appropriate steps can be taken to reduce frustration and bar-biting behaviour.

Yupik shows mild-moderate signs of skeletal pathology, which is well documented in zoo bears housed in confined environments (Bourne and others 2010; Kitchener 2004). She also demonstrates significant loss of body condition associated with her limited environment and lack of appropriate exercise, plus a restricted diet due to the inability of the zoo staff to accurately evaluate normal Polar bear body condition, combined with the risk of hyperthermia of a well-conditioned bear in this tropical climate. Her current diet is non-seasonal and contains only 20-30% of fresh produce meat or fish. She does not receive cod liver oil or other supplements to replicate a natural Polar bear diet. She has signs of gastritis which may be related to chronic stress and/or diet.

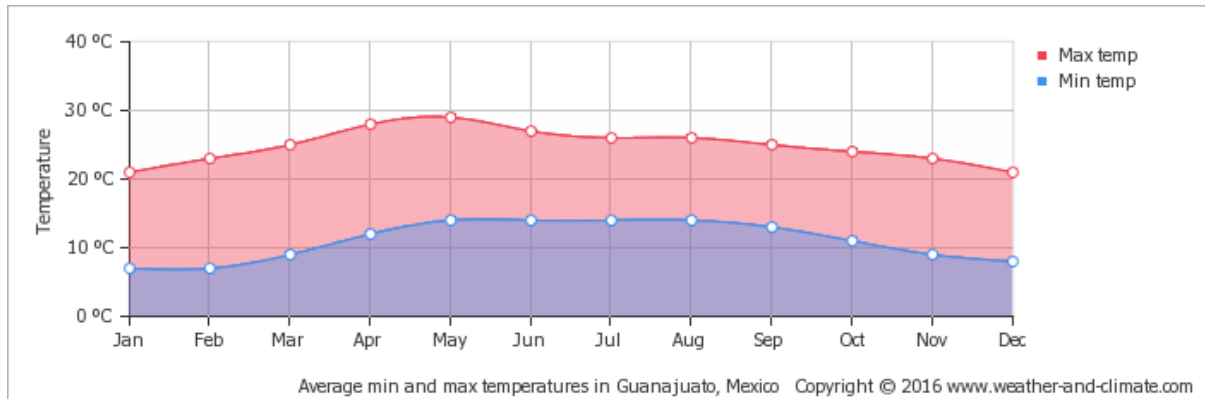
Yupik's activity and low body condition are a result of environment and husbandry, but also the climate in Morelia – it would be dangerous for her to be maintained at a natural and healthy seasonal weight due to the risks of hyperthermia in this climate. Additionally the warm and moist environment increases the risk of allergic or infectious diseases such as fungal disease or allergies, to which she is not naturally acclimatised – these are possible aetiologies for her pulmonary hypertension and the lesion in her left lung. Colder, drier, tundra climates would likely provide improved respiratory function.

Doncaster, UK, is located at 53°N and Churchill, Canada, is at 58°N and so both are on a similar latitude. By contrast Morelia sits only 19°N. Summer temperatures in Doncaster and Churchill are similar (less than 20°C) and so heat stress is not a problem in these locations. In winter the temperature is well below zero and snow is common. In Morelia, maximum average temperatures are above 20°C for most of the year. There is little seasonal variation

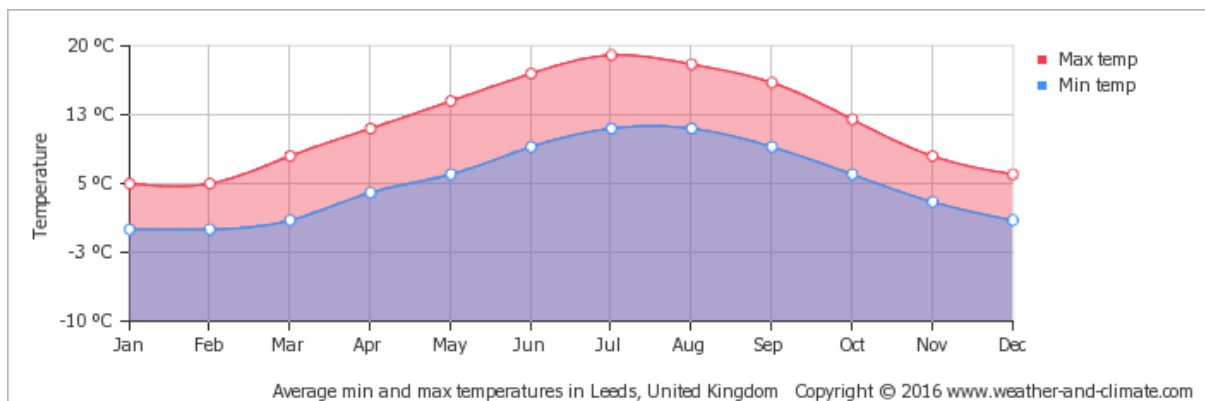


in temperature and even in the coldest months the temperature does not reach zero and snow does not occur.

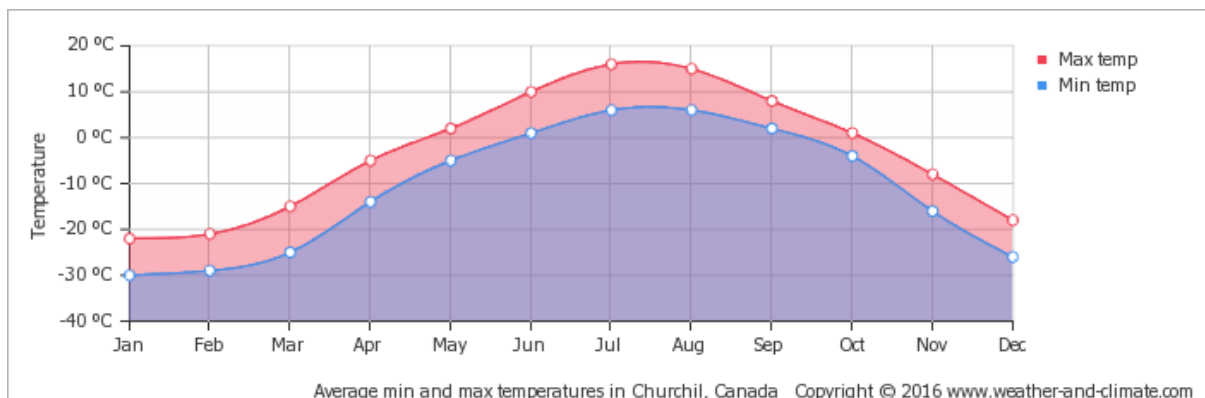
Morelia:



Doncaster



Churchill



Bears feed seasonally and are behaviourally adapted to respond to the changing seasons. Yupik's current tropical environment does not accommodate these biological needs.

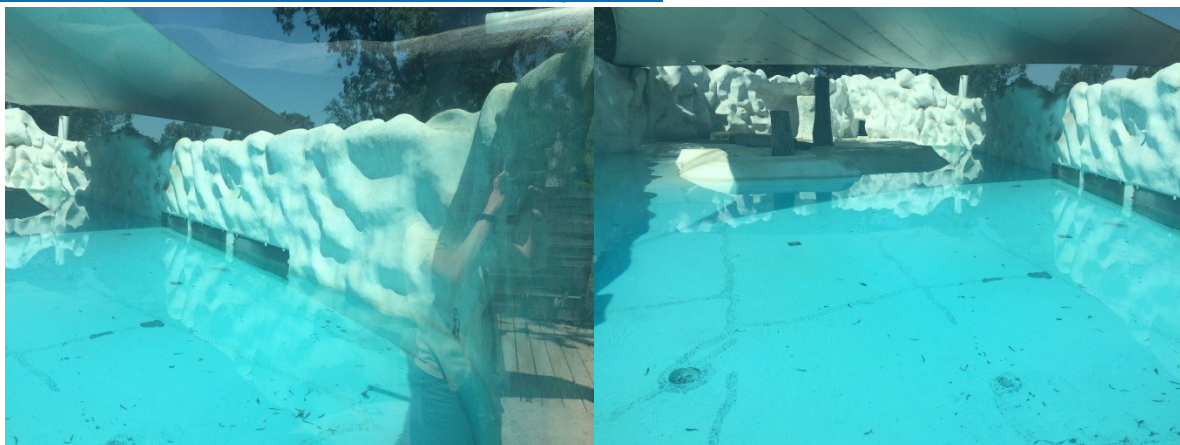


Psychological health

Behaviourally, Yupik demonstrates a repertoire of abnormal repetitive behaviours typical of psychopathology associated with maternal deprivation, and frustration of normal behavioural drives due to environmental restriction (Clubb and Mason 2004; Clubb and Mason 2007; Latham and Mason 2008; Mason 2010). Yupik demonstrates terrestrial pacing behaviour, swimming and head-tossing stereotypy and bar biting behaviours.

A recent study analysing data from 55 polar bears housed in 20 North American zoos demonstrated that factors associated with reduced stereotypy included enrichment, an increasing number of bears in the group, and bears having a view out of their exhibit with a strong suggestion that the existence of a positive reinforcement training program may also be important (Shepherdson and others 2013). Unfortunately Yupik does not have access to any of these resources – she has a limited enrichment programme, no bear social contact and an exhibit that eliminates any possible view. Additionally the Morelia zoo has not engaged in the proposed positive reinforcement training programme despite an expert animal trainer (MW) developing a programme for them, and so her current environment and husbandry programme is inadequate to address her mental health needs.

[The artificial polar bear enclosure at Morelia zoo is completely encircled by visual barriers and offers little terrestrial space or swimming depth:](#)





The polar bear enclosure at Yorkshire Wildlife park is a 10 acre linked multi-enclosure habitat offering bears a variety of terrains and extensive views over the countryside. The natural lake is over 4 metres deep and covers an area of 6,500 square metres of water



Yupik's poor relationship with her keeper and vets is a particular concern. She was repeatedly described as 'difficult' and 'aggressive', and a new keeper was brought in from a different part of the zoo to start some training as her relationship with her existing keeper is poor. Research evidence indicates that a poor zookeeper-animal relationship is detrimental to zoo animal welfare and positive zookeeper animal bonds facilitate husbandry and may improve welfare (Hosey 2008; Hosey and Melfi 2012; Melfi and Hosey 2011). As Yupik ages she may require ongoing physical and behavioural health management. Currently the Morelia zoo is not equipped to provide for her current or ongoing healthcare needs.

A polar bear keeper at Yorkshire Wildlife Park demonstrating positive reinforcement training – essential for developing positive keeper-animal relationships and monitoring physical and behavioural health in aging bears





Conclusions and Recommendations

Yupik is generally healthy and fit to be transported in 2017. Her existing health problems are likely a result of, or exacerbated by, her current environment and husbandry, and a move to a more natural enclosure in a colder climate would improve her body condition score, allow for natural feeding and foraging behaviours, build her muscle mass and support her joints and reduce her behavioural frustration.

The Morelia zoo has demonstrably not been able to meet Yupik's physical or behavioural needs. Her current care has resulted in a misdiagnosis of a cardiac condition, misdiagnosis of abdominal ascites, inappropriate medication, neglect of her long-term dental disease, and development of behavioural abnormalities indicative of fear and frustration. Despite the work that zoo staff have done to improve her enclosure and plan this health evaluation, it is clear that they do not have the resources or skills to manage Yupik as she ages, and her health condition deteriorates.

As Polar bears are recorded as living up to 42 years in appropriate captive environments, we would strongly recommend that Yupik is transported as soon as possible to a natural, large, temperate environment such as Yorkshire Wildlife Park, in order to limit the damage caused by her current environment, and to allow her an opportunity for rehabilitation to physical and psychological health.

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