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Cover: Leaves and fruits of *Terminalia arjuna* in water colour artwork on cold pressed water colour paper by Bhama Sridharan.

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SHORT COMMUNICATION

Chemical immobilisation of free ranging Tibetan Wolf *Canis lupus chanco* (Gray, 1863) (Mammalia: Carnivora: Canidae) with Ketamine-Xylazine combination in Ladakh, India

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Abstract: The Tibetan Wolf *Canis lupus chanco* is one of the two Critically Endangered species of Ladakh, India. Six free-ranging Tibetan wolves were immobilized using ketamine and xylazine mixture as part of the rescue operations. Dose rates of 4.92 ± 0.52 mg/kg body weight and 2.08 ± 0.29 mg/kg body weight for ketamine and xylazine respectively provided good level of anesthesia for carrying out effective capture. Drug induction was recorded at 4.4 ± 1.1 minutes with animal coming into sternal recumbency by 5.6 ± 1.5 minutes and animals were approached at 6.2 ± 1.7 minutes. Duration of anesthesia was 35.25 ± 6.07 minutes. Yohimbine administered for reversal at the dosage of 0.125 mg/kg body weight provided reversal effect with animal standing by 15.5 ± 4.2 minutes. The current information suggests that xylazine and ketamine mixture is effective and safe for capturing the free-ranging Tibetan Wolves for wildlife management interventions.

Keywords: Chemical capture, immobilization, induction, rescue, reversal, revival.

The Tibetan Wolf *Canis lupus chanco* is the largest canid species in India with high conservation priority (Shawl et al. 2008). In India, it is recorded from parts of Kashmir, Changthang plateau of Ladakh and Spiti valley of Himachal Pradesh at elevation range of 3,200–5,600 m (Khan et al. 2023). In Ladakh region, Tibetan Wolf is found in both Leh and Kargil districts and is listed as 'Critically Endangered' species as per the IUCN Red List. Tibetan wolf is protected and included in the Schedule I of India's Wildlife (Protection) Act, 1972 (Shawl et al. 2008). The ambient temperature in the area ranges from -5 to -10°C.

Wild animal rescues involving animal capture is an important wildlife management technique for managing wild animals in distress with conservation implications as it supports management of conflict situations (Nyhus 2016). Chemical immobilization is a safe and effective strategy for capturing wildlife as it causes minimal stress to wild animals (Neilsen 1999). Limited reports are available on anesthetic doses for most of the wild species in India for effective immobilization (Belsare & Vanak 2013).

Ketamine-xylazine drug mixture has been effectively used for immobilization of wild canids (Muliya et al. 2016). We report successful chemical immobilisation of free-ranging Tibetan Wolf *Canis lupus chanco* with ketamine-xylazine combination.

Methods

Ladakh is located between Longitudes of 32.25° to 34.63° N and latitudes of 75.6° to 78.36 ^{0}E at the western

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part of India and falls under Trans-Himalayan region. The altitudinal range of 2,700–7,500 m and total area of Ladakh is 78,000 km^2. It has two districts — Leh and Kargil. Six Tibetan Wolves (one female and five males) were captured from different parts of Leh district of Ladakh as part of the field rescue operations carried by the Wildlife Protection Department, Leh, Union territory of Ladakh. All the animals in this study were captured either due to displacement or distress.

All the animals were chemically immobilised using a combination of xylazine hydrochloride (2 mg/kg) (XYLAMED, 100 mg/ml, Bimeda, Cambridge, Ontario) and ketamine hydrochloride (5 mg/kg) (KETAMINA, 100 mg/ml, Biowet Pulawy, Poland or VETALAR, 100 mg/ml, Parke Davis & Co., P O Box qq8 GPO, Detroit, Michigan 48232, USA). The drug mixture was administered remotely using air pressurised syringe projector (Dan Inject model-JM Syringe projector). Following completion of necessary procedures, yohimbine (0.125 mg/kg) (20 mg/ml; YOHIMBE, 20 ml, Equimed USA) was administered intramuscularly for drug reversal.

Results

All the animals were weighed for accurate body weights after induction and drug dosages were calculated retrospectively. Actual body weight, drug dosage, induction (first sign of induction), time of complete loss of consciousness and total duration required for carrying out field procedures was recorded. Initial signs of drug effect included decreased mentation and progressive ataxia followed by recumbency. Drug induction was rapid and smooth in all the animals. The mean ± standard deviation for actual body weight, actual dose rate of ketamine, actual dose rate of xylazine, induction, approach time, total time for carrying out field procedures were 29.22 ± 5.31 kg, 4.92 ± 0.52 mg/kg, 2.08 ± 0.29 mg/kg, 4.1±1.1 minutes, 5.6 ± 1.5 minutes, and 35.25 ± 6.07 minutes, respectively. All the physiological parameters remained well within the normal range for other canid species during the entire procedure (Malmsten 2007) with no adverse effect observed from any of the animal captured (Table 1).

Following completion of field procedures, the animals were administered yohimbine (0.125 mg/kg) and the sequence of recovery events were recorded. Different parameters recorded for signs of recovery were ear and eye movement time, head raising time and standing time after reversal. The mean ± standard deviation for ear and eye movement time, head raising time and standing time after reversal were 11.75 ± 2.6 minutes, 13.25 ± 2.87 minutes and 15.5 ± 4.2 minutes, respectively.

None of the cases showed any signs of extrapyramidal signs and all the recoveries were smooth.

Discussion

Since there are limited studies on immobilisation of Tibetan Wolf, its immobilisation is a challenge when there is requirement for such intervention. The combination of ketamine hydrochloride and xylazine hydrochloride (4.92 ± 0.52 mg/kg body weight and 2.08 ± 0.29 mg/kg body weight, respectively) was found to be effective for chemical capture of Tibetan wolf in field emergencies. However, Chakraborty & Das (1994) documented use of 10 mg/kg of ketamine and 1.33 mg/kg of xylazine mixture to be effective for immobilisation of Tibetan Wolf in captivity. The dose rate of xylazine and ketamine in the present study are like those documented by Miller & Fowler (2014) for Gray Wolves.

Since there is a lack of existing information on the physiological parameters of Tibetan Wolves, we were unable to make direct comparisons with our results.

Table 1. Mean ±SD and range for physiological parameters observed in Tibetan Wolf *Canis lupus chanco* chemically immobilized with ketamine and xylazine drug combination.

Parameters	Unit	Mean ± SD	Range
Rectal temperature on approach	^{0}F	102.28 ± 0.82	101–103
Rectal temperature after 10 minutes of approach	^{0}F	102 ± 0.4	101.5–102.5
Rectal temperature after 20 minutes of approach	^{0}F	102 ± 0.5	101.5–102.5
Respiration rate on approach	/Minute	19.6 ± 7.3	12–19
Respiration rate after 10 minutes of approach	/Minute	20.2 ± 5.76	12–30
Respiration rate after 20 minutes of approach	/Minute	17.25 ± 4.99	14–26
Heart rate on approach	/Minute	66.25 ± 10.9	58–82
Heart rate after 10 minutes of approach	/Minute	76 ± 16.57	62–100
Heart rate after 20 minutes of approach	/Minute	73 ± 10.39	64–82

Nevertheless, the recorded rectal temperatures throughout the entire procedure were found to be within the normal range observed (Malmsten 2007) though the respiratory rate (12–19 per minute) and heart rate (69–98 per minute) was higher compared to values of Indian Gray Wolf as reported by Muliya et al. (2016).

Conclusion

We conclude that the ketamine and xylazine anesthesia @ 4.92 ± 0.52 mg/kg, 2.08 ± 0.29 mg/kg, respectively was effective for immobilization of Tibetan Wolves and yohimbine @ 0.125 mg/kg act as excellent reversal drug against xylazine. The drug combinations used in the study has been referenced for free ranging Tibetan Wolves and their physiological parameters, which can help in managing emergency rescue situations for free ranging Tibetan Wolves. The study was based on smaller sample size. A larger sample size would be advantageous to make the results more rigorous and insightful.

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