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SPECIES	SEX	AGE (years)	WEIGHT (lb) (kg)		SERNYLAN (mg)	PROMAZINE (mg)	ONSET (mins)	IMMOBILISED (mins)	REMARKS
Giant anteater <i>Myrmecophaga t. tridactyla</i>	♂	2	75	34	60	45	15	28	Fully recovered; normal behaviour by 20 hours
3		88	40	75	75	3-5	10	Able to stand and walk but unsteady by 6 hours	
6		115	52	75	75	8	22	Able to stand and walk but with difficulty by 4 hours	
	♀	8	140	63	100	75	9	20	Fully recovered; normal behaviour by 26 hours
Two-toed sloth <i>Choloepus didactylus</i>	♀	6	31	14	15	3	12	22	Fully recovered; normal behaviour, able to climb about cage, by 12 hours

Table 1. Dosages and effects of combined dosages of Sernylan and Promazine on two species of edentates at Lincoln Park Zoo, Chicago.

the intention at this dose level. The anteaters were easily moved to new quarters under the influence of these drugs. Only the three-year-old male showed excessive salivation. This was noted 15 minutes after darting and continued for about four hours. In all cases the tongue protruded from the mouth for a distance of 7-10 cm (3-4 in) for several hours after immobilisation. This was of some concern to us because of the delicate nature of this organ. Care was taken to keep the tongue moist and away from sharp objects during this time. All anteaters accepted water and ate their solid diet (Meritt, 1970) within 30 hours after immobilisation.

The onset of drug effect in the Two-toed sloth was marked by uncoordinated foreleg motion, repeated opening and closing of the eyes and some erratic mouth movements. The tongue did not protrude at any time. Rectal temperatures taken 90 minutes after immobilisation at a room temperature of 25.6°C (78°F) was 34.4°C (94°F). During the recovery period additional heat was provided for the sloth using a 150 watt heat lamp situated approximately 30 inches away from the

animal's body. Recovery was uneventful and the sloth accepted both food and water within 36 hours after immobilisation.

In our limited experience of using this drug combination it has been found to be an effective, safe and useful aid in immobilising two species of edentates.

PRODUCTS MENTIONED IN TEXT

Cap-Chur pistol: manufactured by Palmer Chemical Company, Palmer Village, Box 867, Douglasville, Georgia 30134, USA

Promazine: Promazine Hydrochloride, manufactured by Fort Dodge Laboratories, 5853 West North Avenue, Chicago, Illinois 60639, USA

Sernylan: manufactured by Parke Davis Company, 7601 Skokie Boulevard, Skokie, Illinois, USA

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Immobilising pumas

Felis concolor

with phencyclidine hydrochloride¹

MAURICE G. HORNOCKER & WILBUR V. WILES

Idaho Cooperative Wildlife Research Unit, Moscow, Idaho, USA

A long-term ecological study of the puma *Felis concolor* in the Idaho Primitive Area was initiated in 1964 to study a puma population and to assess the impact of this population on its principal prey, the big-game animals. Hornocker (1969, 1970) has reported findings concerning territoriality within the puma population and has analysed the effect of predation on mule deer *Odocoileus hemionus* and elk *Cervus canadensis* populations. This paper reports on dosages of

phencyclidine hydrochloride which were administered to pumas captured during the study.

MATERIALS AND PROCEDURE

The study was conducted in central Idaho in an area of approximately 518 km² (200 square miles) during six winters, 1964-65 to 1969-70. Work began each year in late November and continued until late April or early May. All immobilisations occurred during these winter months.

¹ Contribution from the Idaho Cooperative Wildlife Research Unit, US Bureau of Sport Fisheries and Wildlife, University of Idaho, Idaho Fish and Game Department and the Wildlife Management Institute cooperating. The study was financed by the Idaho Fish and Game Department, the University of British Columbia, the Boone and Crockett Club, the New York Zoological Society, the Theodore Roosevelt Memorial Fund of the American Museum of Natural History, the National Wildlife Federation, the Carnegie Museum, and the National Science Foundation (Grant No. GB-8734).

Trained dogs were used to capture the pumas. The cats normally climbed trees to escape dogs, but, on some occasions, they sought refuge on steep bluffs or in caves. An average of 4.8 man-days of hunting and tracking was required for each capture. Fifty-one pumas were caught and marked over a six year period; 32 were recaptured 118 times, making a total of 169 captures during the study. Not all pumas were drugged because it was often only necessary to identify a marked, recaptured animal.

All pumas which were handled were given intramuscular injections of Sernylan,¹ (phencyclidine hydrochloride) in aqueous solution, 100 mg per ml concentration. Dosages were computed from an estimate of each puma's weight. The drug was administered by Cap-Chur syringes fired from a specially designed, powder-charge gun.

hours from camp. Recumbent pumas were left in a dry spot under an overhanging ledge, in a cave, or under a dense fir. Although not fully recovered some were able to walk by the time we were through checking them. We visited some drugged pumas the following day, but this was not always possible.

RESULTS

A total of 89 dosages was administered. This included 27 given to adult males, 27 to adult females, 16 to juvenile males, and 19 to juvenile females. The term 'juvenile' pumas was applied when the pumas were still with their mother and, in the case of marked known-age animals, those less than 24 months of age.

Dosages for adult males and females averaged 1 mg of drug per 907 g (2 lb) body weight with a range of 1 mg per 372 g-2 kg (0.8-4.3 lb) in

	NO. DOSAGES	AVERAGE DOSAGE (mg/lb)	DOSAGE RANGES (mg/lb)	AVERAGE TIME FIRST EFFECTS NOTED (mins)	AVERAGE TIME ANIMAL MANAGEABLE (mins)
Adult ♂♂	27	1/2.0	1/0.8-4.3	6.5	11.5
Adult ♀♀	27	1/2.0	1/1.0-5.0	6.4	11.4
Juvenile ♂♂	16	1/1.3	1/0.7-2.3	5.3	10.1
Juvenile ♀♀	19	1/1.2	1/0.7-1.8	5.0	9.5

Table 1. Results of administering phencyclidine to pumas *Felis concolor* in Idaho 1964-1970.

Phencyclidine, when injected into cats, depresses the central nervous system (Chen *et al.*, 1959). Dosages administered in this study initially calmed but normally did not immediately immobilise the animals. Subsequent prostration resulted however in about 75% of the drugged pumas which then usually remained in the tree and were lowered by rope to the ground. Some pumas jumped from the tree upon being injected and if not immediately treed again by the dogs, were easily approached on the ground, usually within 800 m (0.5 mile). Each drugged puma was suspended in a nylon net and weighed on a portable spring scale.

We did not record the time required for complete recovery because we were often several

males and 453 g-2.3 kg (1-5 lb) in females. Dosages for juveniles were heavier; they averaged 1 mg per 538 and 509 g (1.3 and 1.2 lb) for males and females, respectively, with a range of 1 mg per 198-991 g (0.7-2.3 lb) in males and 198-679 g (0.7-1.8 lb) in females. The extremes in the ranges for both adults and juveniles were few - only one dosage in 27 adult males was heavier than 1 mg per 453 g (1 lb) and only one was lighter than 1 mg per 1.5 kg (3.5 lb). In juveniles, only 2 of 16 males and 2 of 19 females received a dosage heavier than 1 mg per 453 g (1 lb).

Our data do not permit us to say that juveniles require heavier dosages of phencyclidine. It is possible they consistently received heavier dosages because their weight was misjudged.

¹ Use of brand names does not imply endorsement by the Federal government.

First effects were noted in 6.5 and 6.4 minutes in adult males and females, respectively, and in 5.3 and 5 minutes in juvenile males and females, respectively (Table 1). First effects normally followed a characteristic pattern: head-weaving, licking movements of the tongue, increased salivation, and partial loss of coordination. The average time elapsed from the injection until pumas could be approached and managed was 10.6 minutes. The average for adults was slightly more than a minute longer than for juveniles, probably because of the heavier dosages administered to the latter.

Eighteen pumas - six adult males, six adult females, and six juveniles - were drugged 51 times in successive years. One male was immobilised in five successive years, and three other adults (one male and two females) in four successive years.

DISCUSSION

Immobilisation of wild pumas poses some problems not inherent with other species. At the same time, problems common in drugging other species do not occur. Pumas must be captured with the aid of dogs and as a result, 'captured' pumas usually are in trees 20 ft or more above the ground. Thus, they are stationary, and there is no need for a fast-acting drug which is so essential to the capture of many free-ranging species, particularly those inhabiting densely vegetated or steep, rugged terrain. However, cats immobilised by drugs, such as succinylcholine chloride, may fall from the trees and be injured or killed (Hornocker *et al.*, 1965); phencyclidine hydrochloride presented no such problem. This drug provides for a wide margin of safety in cats; tranquillising dosages can be increased and the animal taken into complete surgical anaesthesia (Chen *et al.*, 1959; Harthoorn, 1965). With the heavier doses, however, undesirable side effects in a few animals were noted: pronounced clonic rigidity, depressed respiration, and mild to severe convulsions. The latter symptom was observed in five individuals which recovered without any apparent, lasting, ill effects. Seal and Erickson (1969) advise the use of promazine in conjunction with phencyclidine. In 126 trials with 83 animals of 19 species of Felidae in zoos, they experienced none of the above side effects.

No mortalities occurred because of an overdose of phencyclidine. Two pumas died in related accidents. Dosages, as stated, were intended to render pumas manageable and permit us to approach them in the tree, attach a rope, and lower them to the ground. No. 41, some 60 ft up in a dense fir, was administered a second dose after it was mistakenly believed to have been missed by the first shot. The puma, a 68 kg (150 lb) adult male became completely immobilised, fell from the tree and was killed. A 19 kg (42 lb) kitten died when the Cap-Chur syringe needle punctured its lung.

Phencyclidine was almost ideal for use in our study. Harthoorn (1965) stated that the margin of safety of Sernylan was high for Felidae, and he presented data which showed that domestic cats recovered from dosages as heavy as 6 mg per 453 g (1 lb). He cited the advantages of the drug: rapid absorption, rapid induction of narcosis, retention of fighting reflexes in low dosage rates, wide margin of safety, and rapid breakdown and excretion at therapeutic levels. The use of promazine in conjunction with phencyclidine, also advised by Harthoorn, should further improve its efficacy for most species of Felidae.

PRODUCTS MENTIONED IN TEXT

Cap-Chur Syringes: manufactured by Palmer Chemical & Equipment Co, Douglasville, Georgia, USA.

Sernylan: manufactured by Biocetics Laboratories Inc., St. Joseph, Missouri, USA.

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