Immobilization and Tagging of Polar Bears in Maternity Dens

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SUMMARY

In the spring of 1969 and 1970, 12 female bears were immobilized in maternity dens (Wrangel Island) with the help of powder syringe guns and the drug Sernylan. The procedure was as follows. On finding a den we covered the exit with snow and dug a 'well' 20-30 cm in diameter over the place where the entrance branches from the room of the den. Through this well the female bear was shot by the syringe into the muscles of the head or neck. The best dosage of Sernylan was 1.2-1.8 mg per 1 kg of body weight; the total dosage for a female of usual size was 250 mg. A mixture of 2.5 cc of a 10% water solution of Sernylan with 2.5 cc of ethyl alcohol is most convenient for low temperatures. Duration of a latent period is usually 8-10 min.; immobilization lasts 5-8 hours. The reaction of an animal to the drug is described. Female bears were tagged with ear tags (metal and coloured plastic), and red figures were painted on their flanks or backs. All the experiments on immobilizing by Sernylan were a success. Having recovered, female bears left their dens at once or stayed near the den for about a day. An attempt to immobilize a female bear with myorelaxin was unsuccessful.

INTRODUCTION

The problem of polar bear migrations and the rate of the differentiation of the species is very important for establishing rational management and conservation, but the problem is far from being resolved. Craniometric (Chernyavski 1969) and some other studies have not so far helped to define the presence or absence of certain geographical races or populations of the polar bear. A direct answer may be obtained only through tagging of a considerable number of animals. In recent years, countries with Arctic regions have begun tagging of polar bears with the help of immobilizing techniques. Bears have been immobilized by a 'syringe-gun' and drugs of different types—myorelaxants, narcotics and other chemicals affecting the central nervous system, among them the most successful being phencyclidine hydrochloride (Sernylan). Investigators in Canada, USA and Norway have worked with non-breeding bears that were found on the move on sea-ice or on land (Flyger *et al.* 1967; Jonkel 1967; Larsen 1967, 1968, 1969; Lentfer 1968, 1969, etc.).

In the course of field studies on Wrangel Island in March—April, 1969 and 1970, the authors managed to immobilize and tag female polar bears in their maternity dens. As on this island female bears breed in great numbers, it is the best place to master the method.

TECHNIQUES

For immobilization we used a 'Cap-Chur' powder syringe-gun and analogous equipment made in the USSR, with the drugs Sernylan (USA) and Myorelaxin (DDR).

The technique for immobilizing female polar bears in dens was the following. On some occasions after approaching an open den by vehicle we managed to make the female bear put her head out of the entrance, by teasing her, so that it was possible to fire the syringe from the door of the vehicle or standing beside it. Rarely, we found dens with broken ceilings[1], which also makes the animal easy to shoot.

But, as a rule, the female bear keeps hidden with her cubs in the den, and it is impossible to lure her out while one stays in the vehicle. In such cases, having found an inhabited den, we determined (by the direction of the entrance, under-snow sounds etc.) the probable location of the maternity room; we then covered the exit of den with snow and dug a 'well' 20-30 cm in diameter, aiming for the point where the exit corridor branches from the chamber. The female could not get out through the 'well', provided the snow roof of the den was thicker than 30-40 cm, but she would protrude her head through it. (Fig. 1). Choosing the right moment we then fired the syringe into the masseter or neck muscles, taking care not to hit the thick skull bones or make a sliding impact, which would only result in a ricochet and wastage of the drug.

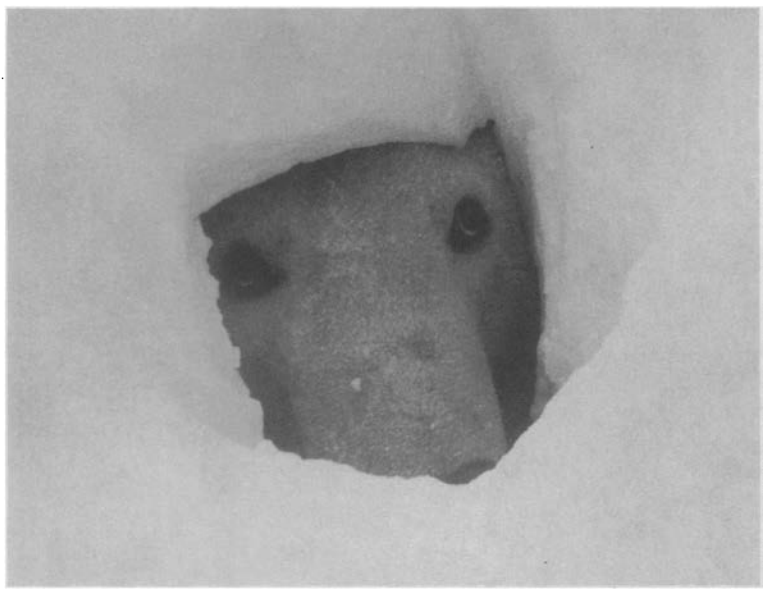


Fig. 1 Female bear looking out of the vertical hole dug down to the den chamber, just before the syringe is injected.

[1] Details of den structure and the ecology and the behavior of bears in dens are given by the authors in the next paper.

After firing we kept watch over the female through the hole until she ceased to move and then dug out the den (Fig. 2) to carry out the tagging. The whole cycle from finding of den up to the complete immobilization usually did not take more than an hour. During this time, one person usually stood on guard with a rifle. However, in our experiments bears never got aggressive and as long as the thickness of the roof over a den is more than 30-40 cm, the execution of the immobilization procedure on foot is quite safe.

The only other method used, on a single occasion, was when a female bear and cubs left their den, were overtaken by a light track vehicle, and the mother was immobilized by a shot at a distance of 20 m.

The immobilized animals were tagged (Figs. 3 and 4) in one or both ears with stainless steel ear tags and round plastic colour tags. A cub captured in 1969 and kept in the Moscow Zoo, has not lost these tags up to now. In 1969, we also sometimes applied small (13 × 3 cm) 'flags' of red polyvinyl chloride, but it turned out that the flags did not hold well in the ear, so their use was given up. Figures 30-50 cm high corresponding to the ear tag numbers were painted with a red nitro-enamel dye on the sides or on the back of the animals. According to observations, these figures are well noticeable at a distance of 1 km and more. In 1969, one female was tagged with a round polyfluoroethylene tag 20 cm in diameter, attached to her back by 'straps' of steel wire fastened under the forelegs. Each female bear was approximately aged by teeth examination and the weight estimated by comparing body length and fatness with those of the specimens studied earlier. The total body length was also measured. The frequency of breathing and rectal temperature of some females were recorded as well.

Fig. 2 Female bear lying immobilized in a den which has been half dug out.

Fig. 3 Female bear marked with ear tags and dye.

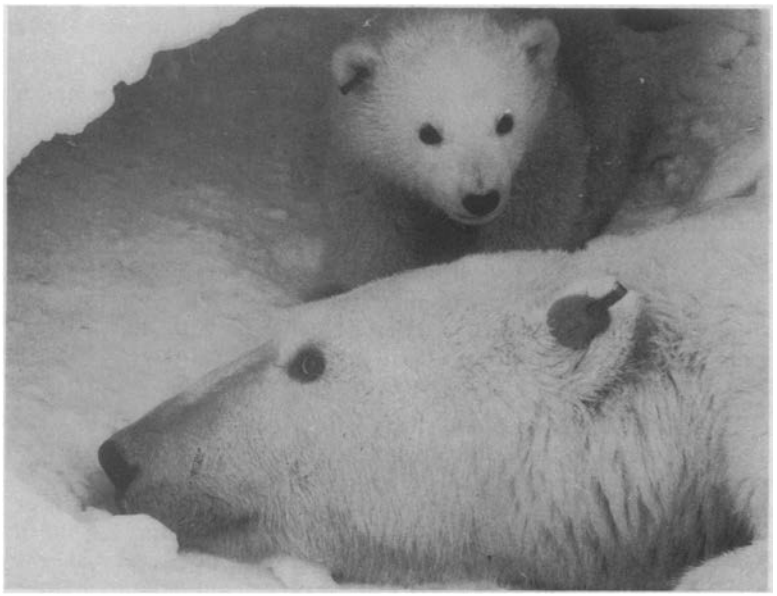


Fig. 4 Close-up of the female bear's ear tag and showing also the metal only ear tag used for the 10 Kg cub.

RESULTS

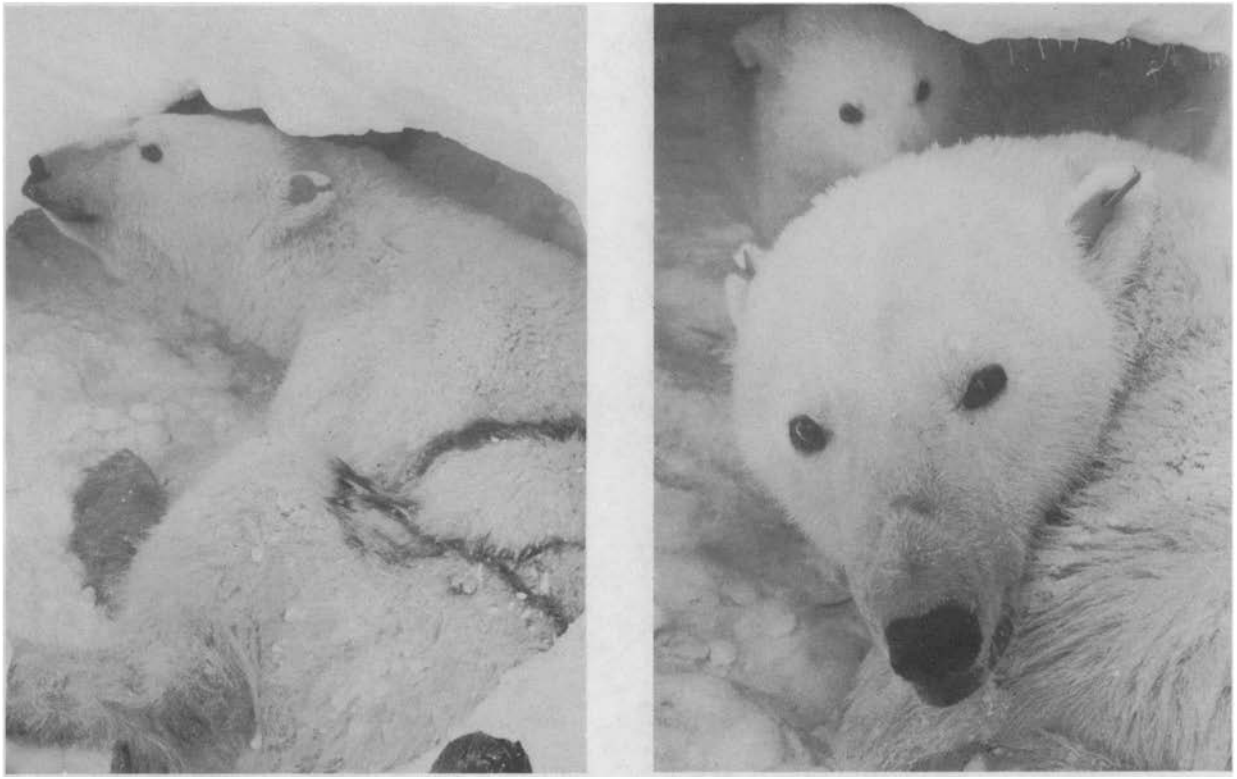
Results of the experiments on immobilization by Sernylan are set out in Table 1. A standard 10% solution of the drug was used. The same or a little smaller quantity of ethyl alcohol was added to the drug to prevent freezing. All the animals were successfully immobilized; there was no mortality. Dosages of Sernylan were 250-600 mg, or 0.8-3.0 mg per kg of body weight; in 1970, smaller dosages were used than in 1969. The period from injection to immobilization was usually 8-10 min. The completeness of immobilization varied: after dosages of 2.0-3.0 mg/kg females were utterly immobile; when smaller dosages were used, sometimes a bear could slightly move its head but could still be easily handled. One young female would not be completely immobilized, and even 66 min. after the injection moved her head and neck, and raised herself upon the forelegs. Young bears seemed to be, in general, more resistant towards Sernylan than the old ones. The animals usually recovered (Figs. 5 and 6) in 5-8 hours after being immobilized. The duration of the adynamic state in our experiments was larger than described in Canada, USA and Norway, with the same or even smaller dosages of Sernylan.

It is quite possible that such differences can be explained by still unknown pecularities in the physiology of lactating, non-feeding females as compared with migrating non-breeding animals. The breathing of the immobilized female bears was unstable; alternation of several deep inhalations and expirations, short cessation of breathing for up to 10-12 sec., and frequent superficial breaths were characteristic. The average frequency of breathing 1-2 hours after immobilization was usually 10-12 per minute; in one female it was 21-23 per minute. The minimum rectal temperature was 38.2°-39.2°C. There were side effects such as salivation (sometimes very intensive, followed by swallowing movements) and short (20-60 sec.) convulsions of the head and legs, repeated up to 4-5 times in the whole period of immobilization. In 1969, when dosages of 2.0-3.0 mg/kg were used, convulsions and salivation occurred in all the bears. In 1970, when dosages of 0.8-2.0 mg/kg were administered, varying degrees of side effects were seen, and in some animals no salivation or convulsions occurred at all.

On the whole the reaction of polar bears to Sernylan in our experiments was the same as in experiments carried out in the USA, Canada and Norway.

In the course of our work, we carried out an experimental catching of cubs for the Zoos, as well as training field personnel in the techniques of immobilization. In most cases, therefore, cubs were taken from their immobilized mothers. Five of the females whose cubs had been taken away, after recovering went towards the sea at once, while another three remained in their dens or near them for about a day but were no longer to be found after two days. On two occasions the cubs were left in half-dug out dens with immobilized mothers. In one case, the family was still there on the next day, in the other, it left the den the same night.

Sernylan has proved to be an excellent drug for immobilizing female bears in dens. We believe that the best dosages are 1.2-1.8 mg/kg, so that the dose for a female of an average weight (150-200 kg) would be about 250 mg. Sernylan dissolves well in a mixture of ethyl alcohol and water. In winter the best mixture is a 2.5 ml standard 10% solution of Sernylan plus 2.5 ml of alcohol loaded into a 5 ml syringe. Such a solution does not freeze at −20 to −30°C. In the period when there is a mass departure from dens by bear families (March 15-April 5), one team using our method can tag 2-3 females a day when the weather is good.



Figs. 5 and 6 Female bears recovering after immobilization. The head and neck can usually be moved within 2 to 3 hours.

TABLE 1. DETAILS OF FEMALE BEARS IMMOBILIZED BY SERNYLAN

No.	Date	Age, years (appr.)	Weight, kg (appr.)	Dosage		Latent time (min.)	Duration of immobilization; comments
				mg	mg/kg		
1.	31.3.1969	8-10	200	500[a]	2.50	8-9	7 hours
2.	31.3.1969	4-5	150	300	2.00	10	After 100 min. moved head and forepaws; after 6.5 h. had left the den
3.	6.4.1969,	4-5	150	300	2.00	9	After 2 h. moved head and forepaws
	7.4.1969,			400	2.67	10	After 9 h. moved head; after 20 h. had left the den
4	8.4.1969	10-13	200	300 + 300	3.00	2[b]	8 hours
5.	8.4.1969	8-10	200	300	1.50	10	more than 3 h.
6.	24.3.1970		170	300	1.76	8	more than 5 h.
7.	24.3.1970[c]		180	250+	1.39+	8	?

8.	25. 3. 1970	12-15	220	250	1. 14	13	more than 1 h.
9.	25. 3. 1970	5-6	150	250	1. 67	21[d]	after 66 min. raised herself on forelegs, moved head, neck, front part of the body
10.	26. 3. 1970		300	250	0. 83	8	?
11.	26. 3. 1970[c]	4-5	130	250 +	1. 92 +	5	?
12.	6. 4. 1970	7-9	150	250 + 50	2. 00	5[e]	After 2-3 hours slightly moved head and neck; after 7 h. freely moved head, neck, front part of the body; after 20 h. had left the den

Notes

[a] On the previous day this female received a small dosage (not exactly known) due to an unsuccessful shot.

[b] This female was shot not in a den but when being overtaken by a vehicle. After the first dosage she was weakened but continued to run for 20 min., after which a second dose was injected.

[c] In the course of testing new equipment, this bear received (before the dosage indicated) a very small, not exactly known previous dose which had failed to immobilize her.

[d] This bear was not completely immobilized.

[e] 30 min. after the first dosage the female was still not entirely immobilized and an additional dosage was injected.

One attempt was made to immobilize a female bear in a den using Myorelaxin (analogue of succinylcholine chloride). The experiment was a failure and the bear died of overdosage. Due to its physical properties Myorelaxin is inconvenient at low temperatures, and the conditions of work near or in a den do not allow the animal to be dealt with quickly enough. It is clear, therefore, that the drug is unsuitable for immobilizing bears in dens in winter.

The total number of bears tagged in 1969 and 1970 was 12.

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