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cause as studying pups where historical information is not known. The drawbacks of this method are that it requires considerably more effort per animal examined, and it will not produce large numbers of samples because usually fewer than 10% of pups die within the first 2 mo of life. The optimal study on mortality would include both study methods.

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Fatal Trauma Caused by a Deterrent Device for Bears

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Human/bear interactions have resulted in extensive property damage and/or serious injury or death to man (Herrero, 1970, *Science* 170: 593-598). In the last decade there has been an increase in the number of nuisance bears shot in defense of life or property in the Northwest Territories (NWT), Canada. When reviewed in conjunction with legal harvest rates and the low reproductive potential of bears, it is possible that these additional removals could adversely affect resident bear populations.

In 1981 the Department of Renewable Resources, Government of the NWT, in conjunction with industry and other government agencies, initiated a Bear Detection and Deterrent Research Program, the goals of which were to: 1) increase safety for people living and working in bear habitat; and 2) reduce the escalating number of nuisance-killed bears by developing and testing detection and deterrent systems.

The majority of tests have been conducted on polar bears (*Ursus maritimus* Phipps). The deterrent system involves the

firing of a rubber baton from a 38 mm multi-purpose riot gun at the bear (Stenhouse, 1983, NWT Wildlife Service File Report No. 31, 58 pp.). The baton weighs 135 g, has a diameter of 37 mm, and a length of 101 mm. The muzzle velocity of the projectile is 70 m/sec. When used for crowd control the baton is usually fired from a distance of about 35 m and is designed for ricochet firing. For bear work it is fired directly at the flank of the bear. However, the riot gun was not designed for precision shooting and a considerable amount of practice is needed before an individual can hit a bear in the desired location.

Tests with this deterrent over a 3-yr period have shown that all three species of North American bears can be deterred when struck with the baton. Approximately 400 bears have been struck during this period with no observed mortality or serious injury. From a practical standpoint, it is also important to note that none of these bears charged the gun handlers after being struck.

During tests in October 1983, a sub-adult (2-yr-old) male polar bear was struck in the thorax from a range of 30 m. The

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response resembled that of other bears. He snarled, hissed, turned and ran off. After running 30 m the bear fell on its side, convulsed and stopped breathing.

Due to transportation problems involving an airlift the bear was not examined until 24 hr after death. The carcass of the bear was in dorsal recumbency. There was no apparent damage to the skin or pelage, but palpation revealed an area of approximately 15×20 cm over the right ventral thorax which had subcutaneous fluid and crepitation. In the center of this area, just dorsal to the costochondral junction over the sixth rib there was a 3 cm palpable defect in the thoracic wall.

There was less than 1 cm of subcutaneous fat present. All lesions were confined to the thoracic region. There was a large (10×4 cm) subcutaneous hemorrhage over the ventral portion of the right sixth rib and extensive intramuscular hemorrhage in this area. The sixth rib was fractured approximately 3 cm dorsal to the costochondral junction.

A few free blood clots plus 250 ml of dark red fluid were present in the pleural cavity. There was a 4 cm tear in the ventral portion of the anterior lobe of the right lung. The pericardial sac, which had no lacerations, was enlarged and turgid and

contained a large volume of partially clotted dark red blood. The heart was fully contracted and over the right coronary groove was a hemorrhage (approximately 4×2 cm) in the center of which was a 1 cm tear. This tear communicated with the right ventricle. There was hemorrhage in the myocardium around the tear, to a distance of 3–4 cm from the tear.

The cause of death of this bear was cardiac tamponade. The pericardium was not damaged. It is, therefore, likely that the damage to the ventricle arose from a shock wave rather than a direct physical injury by either the projectile or rib. Had an end of the broken rib caused damage to the ventricle, the pericardium would probably have been damaged also.

There has been a recognized risk potential when using the rubber baton on bears. The possibility of severe injury exists. Currently there is no more efficient deterrent available and the alternative of not deterring bears would inevitably lead to a continued increase in the number of bears being shot as man continues to encroach upon bear range. Persons now using this system have been instructed to aim for the hind quarters of the bear and to avoid shooting at distances under 40 m.

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Electrocardiograms of American River Otters (*Lutra canadensis*) during Immobilization

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The Oklahoma Department of Wildlife Conservation conducted a pilot study in 1984 to assess the feasibility of reintroduction of American river otters into Okla-

homa waterways as a part of the Non-game Wildlife Program. Ten otters (five males and five females) wild-caught in Louisiana were used in the study. Surgical implantation of intra-abdominal radiotelemetry devices to monitor otter movements and locations post-release was per-

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