The Use of an Electronic Control Device in Wildlife Management: A Case Series

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Abstract: The Alaska Department of Fish and Game's (ADF&G) Division of Wildlife Conservation personnel routinely respond to situations in which they must safely and effectively modify an animal's undesirable behavior or restrain an animal to allow for a rapid disentanglement, injury assessment, or other short-term intervention. In hazing or aversive conditioning situations, traditional methods and tools may fail to correct the undesirable behavior and lethal force may be the only option left. Incapacitating drugs are routinely deployed for restraint and have a good safety record, but can be time consuming and carry inherent risks to the animal both from the delivery systems (e.g., puncture of vital structures) or the drugs themselves (e.g., overdose or other adverse drug reaction and, in some cases, a prolonged recovery period possibly leaving the animal more susceptible to environmental hazards and predators). There is also the risk of accidental human exposure to the drug through the handling and delivery process and in bounced and/or unrecovered darts in residential and other high public-use areas.

The use of electricity for wildlife mitigation is not a novel concept. Electric fences for animal exclusion and captivity are widely accepted and in common use. Hand-held electric jab-sticks have also been routinely used in both domestic animal and captive wildlife facilities since the 1950s for staff protection. However, the use of portable, targetable, distance-delivered electronic systems designed to incapacitate and cause noxious stimuli for hazing or aversive conditioning is a new concept in wildlife management, and is based on the modern TASER® Electronic Control Devices (ECD). Law enforcement officers have used these devices for over a decade to safely gain control of non-compliant, combative, and suicidal persons. We present 11 cases of the use of an ECD in the management of common wildlife-related calls for service to ADF&G. This case series demonstrates that ECDs may have a role in wildlife management for 1) temporary restraint and control, 2) hazing and/or aversive conditioning, and 3) personnel safety.

Key Words: aversive conditioning, Electronic Control Device (ECD), hazing, incapacitation, mitigation, personnel safety, TASER

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INTRODUCTION

Where wildlife habitat and human population centers intersect, there is always the potential for conflict, usually to the detriment of the wildlife involved. Inappropriate human behavior, including negligent management of anthropogenic food sources, may lead to food- and human-habituated wildlife, further exacerbating the potential for conflict. These conflicts can result in human or wildlife injury and death, property damage, and possibly to a lower public tolerance for co-existence. Wildlife death outside of natural death and regulated harvest can impact the long-term sustainability of a wildlife population. Proactive strategies to minimize the potential for conflict, and to reduce the need for lethal force destruction of animals in order to resolve conflict, are of great importance to the long-term viability and management of public trust wildlife resources. Wildlife professionals and law enforcement agents entrusted with the conservation of these resources routinely intervene in negative human-wildlife interactions and use a variety of strategies, tools and adaptive techniques to directly mitigate a wide range of situations. The tools they use within a force continuum may include Electronic Control Devices (ECD).

The Alaska Department of Fish and Game's (ADF&G) Division of Wildlife Conservation (DWC) personnel, either during field research, management projects, or calls for service from citizens or local law enforcement, are often tasked with confronting nuisance, injured, entangled or entrapped, defensive, and aggressive wild animals. In the course of these duties, responding personnel must attempt to control each situation for the safety and well being of themselves, the public, their property, and the animal while safely and effectively incapacitating the animal for direct physical intervention, or while modifying or controlling its behavior. Unfortunately, when traditional intervention methods fail to achieve a desired outcome, lethal force may be the only option left at the disposal of the respondent. Modern electronic control devices (ECD) have been used in human law enforcement for the control of non-compliant and aggressive persons for over a decade. There have also been some limited studies of electricity use for wildlife restraint. Joanen and Perry (1971) investigated the use of electrical current to "stun" alligators in the early 1970s. Modern ECDs may provide wildlife management personnel with another tool to use within a force continuum to help minimize the use of lethal force.

Handheld ECDs discharge a pulsed electrical current, either directly through two conductive metal contacts on the front of the device (providing a function similar to the

electrical jab stick), or remotely (up to 35 feet for the handheld devices) through two barbed probes that are connected to the device by insulated wire and are fired from the device by compressed nitrogen. When both probes make contact with the intended target, a pulsing electrical circuit is created. This high-voltage, low-amperage electrical circuit causes the firing of peripheral motor nerves that traverse the region between the two probes, causing them to be held in a contracted state and overriding voluntary control of the muscles. Sensory nerves are also stimulated leading to an aversive (painful) effect. The effects on the nerves only last as long as the device is delivering electricity. Because the function and quantity of motor nerves involved is dependent on the location of the probes and the spread between them, targeting is important. A wide spread including the front shoulder and hindquarter is usually sufficient to cause complete incapacitation of an animal.

The wildlife-specific X3W (Taser International Inc., Scottsdale, AZ) delivers an extremely low-amperage current (.0036 amps) pulsed at a rate of 19-29 pulses per second, depending on the user-controlled settings. For small animals, weighing in the range of 18 to 68 kg (40 to 150 lbs), the standard setting is recommended. For animals greater than 45 kg (100 lbs), the large animal setting should be used (there is some overlap in these settings, as these are meant as guidelines). The X3W has the advantage of having three separate modular cartridges allowing for three separate shots. If any positive (top) probe and any negative (bottom) probe connect, a current will be established. As demonstrated in the case series, it is possible for the wire resistance to break down and for current to be established through the wire itself when a probe does not make contact. It is also possible for the device to be activated by use of an arc switch without actually firing a cartridge. When this is done, electrical current arcs between the two metal contacts on the front of the device, causing a distinctly loud crackling sound to emanate from the device. This noise has been found effective as a noxious acoustic response stimulus in some situations, as is mentioned below.

TASER International, Inc. also manufactures a self-contained, 12-gauge shotgun-platform-delivered device named the TASER XREP (eXtended Range Electronic Projectile) ECD. When the XREP ECD makes contact with the target, the impact energy causes the nose assembly and tail assembly to separate. Upon separation, a 14-inch conductive lead tethers the two ends of the device together providing two points of contact, similar to the two probes in the handheld devices. The device has been field tested on both Alaskan moose (*Alces alces gigas*) and brown bears (*Ursus arctos*) and has proven itself to be a very effective hazing munition with a localized pain effect, but has proven ineffective at inducing full incapacitation in large mammals. This is likely due to the lower operating voltage (around 500 volts) produced by the device and the fixed spread.

Law enforcement field experience with ECDs has also indicated a very good safety profile. Field studies reported in human medical literature have shown no to mild injuries from the use of these devices (McManus et al. 2004, Eastman et al. 2008, Strote et al. 2010, Bozeman et al. 2009). In the largest of these studies, which looked at 1,201 consecutive uses of an ECD on human subjects, 78% had no injury, and 22% had mild injuries (Bozeman et al. 2009). Another study that included 1,101 uses concluded: "significant injuries related to six years of law enforcement [ECD] use in one city were rare" (Strote et al. 2010). In a letter to the editor, Dr. Bozeman reports no deaths in 4,058 consecutively monitored uses giving an upper limit on the fatal event probability of 0.09% (Bozeman 2009).

We present a sampling of 11 cases of the use of an ECD in the management of routine wildlife-related calls for service to ADF&G, DWC. In the first case, the use was conducted by an Alaska State Trooper during a staff safety emergency. This use led to an Institutional Animal Care and Use Committee (IACUC) approval for ADF&G wildlife-specific research and field trials, which further led to authorized wildlife restraint and control use by trained ADF&G personnel under Standard Operating Procedures (SOP), field use recommendations, and state regulation.

While traditional methods and tools for personnel safety and the control and restraint of wildlife are at times very effective, our goal is to suggest additional, non-traditional methods and tools for use in the incapacitation, control, and modification of animal behavior to further a responding agency's mission for the protection of human life and property and the conservation of wildlife resources.

Case 1: Personnel Safety Use

***Soldotna, AK, 6/1/2005*:** ADF&G personnel responded to an Alaska State Trooper agency request for assistance regarding two young Alaskan moose calves that were trapped in a 1-meter-deep, concrete-walled open basement at a new home project within an occupied neighborhood subdivision. The nearby adult female moose (cow) was at the ground level and highly agitated. In an effort to free the calves, a DWC technician used traditional hazing methods (human presence, noxious noise makers, and several 17-mm rubber ball shotgun-delivered impact rounds) to attempt to force the cow to leave the area. The DWC technician tried to push a wooden ramp further into the basement so that the calves might escape on their own, but the cow leapt into and through the basement, charged, and chased the personnel and the state trooper around the patrol car several times. The state trooper shot the highly agitated cow across the front of his car with his TASER X26 ECD, striking her in the shoulder. The cow immediately stumbled and began falling to the ground. As the cow fell, the wires from the device were pulled across the patrol car causing them to break. The cow immediately recovered and fled from the immediate area. The DWC technician was then able to approach and lift the calves from the basement. The cow cautiously returned to the calves once personnel were away from the calves and near their vehicles. The cow and calves were subsequently observed by DWC personnel to be safe and exhibiting normal behavior.

Case 2: Hazing Use

***Soldotna, AK, 5/29/2008*:** An adult female moose (cow) was separated from her two young calves by a 5-foot-tall chain-link fence. DWC personnel disconnected the fence at one corner of the yard and, using traditional methods

(e.g., noise, human presence, etc.), attempted to move the cow away from the area to allow the herding of the calves through the opening. The cow became agitated and jumped the fence, becoming a threat to DWC personnel and preventing the herding of the calves through the fence. A DWC technician discharged a TASER MX ECD with the cartridge removed, using only the electrical arcing noise to frighten the cow. The cow retreated to a neighboring backyard, allowing DWC personnel to safely herd the calves through the opening, and the cow and calves were successfully reunited.

Case 3: Hazing and Personnel Safety Use
***Kenai, AK, 6/9/2008*:** An adult female moose (cow) was attempting to leave the fenced confines of a cemetery, but her two calves were unable to jump the 4-foot-high fence. The cow had apparently killed one of the calves, and was very agitated and acting aggressively towards the second calf. The cow repeatedly jumped the fence back and forth and intermittently charged DWC personnel, local police, and the remaining calf. DWC personnel attempted to haze the cow, using traditional methods, to force her to temporarily vacate the area, but this effort proved unsuccessful, if not counterproductive. A DWC technician approached the animal in a motor vehicle and discharged a TASER MX ECD, with the cartridge removed. The cow temporarily fled by jumping the fence, but immediately returned when her calf was unable to follow. The cow then aggressively charged the DWC technician when he exited the vehicle and attempted to approach the calf. The DWC technician discharged his TASER MX ECD toward the rapidly-approaching animal with a cartridge in place. Because of the rushed shot and a limited-profile target, only one probe made direct contact with the animal and the other probe went over the animal's back. The device caused a partial muscular incapacitation effect as the conductive electrical wire was draped across the animal's back. This caused the cow to experience some noxious pain effect from the device, which caused her to turn from her attack and flee the area. The DWC technician was then able to safely lift the calf over the fence and hold it, while simulating calf vocalizations, until the cow cautiously returned to the area to reunite with her calf.

Case 4: Hazing / Staff Safety Use
***Near Soldotna, AK, 6/17/2008*:** A moose calf was incapacitated due to a severe compound fracture to a hind leg, possibly inflicted by the maternal cow, which was still present. DWC personnel approached and used a TASER MX ECD with the cartridge removed to produce a noxious, electrical arcing noise, which served to haze the adult moose away from the calf. DWC personnel were able to safely approach and humanely kill the badly-injured calf with the use of a firearm.

Case 5: Hazing Use
***Cooper Landing, AK, 6/26/2008*:** Two yearling Alaskan brown bears were observed repeatedly approaching cars and people at a Kenai Peninsula Borough-maintained waste transfer site and in the nearby surrounding neighborhoods. Multiple attempts by various agencies at using traditional hazing techniques, including human presence, noxious noise, and less-lethal shotgun-delivered rubber and shell cracker ammunition, had failed to drive the animals from the area for any desirable length of time. DWC personnel locked the facility down to public access for safety purposes and then exposed one of the juvenile bears to an exposure from his TASER X26. Both probes made contact with the bear, and the bear was fully incapacitated (all four limbs locked in extension) for the 5 seconds of the discharge in concert with loud human vocalizations. At the end of the discharge, the bear immediately recovered and fled the area, with the non-exposed cohort bear following. Neither bear was observed at the waste transfer site or surrounding neighborhood for several weeks thereafter, although they eventually did return and were subsequently destroyed.

Case 6: Incapacitation Use
***Sterling, AK, 2/16/2010*:** A yearling male moose was found with a round, galvanized chicken feed container firmly covering its head from the nose and over the eyes, making it impossible for the animal to eat, drink, or see. DWC personnel initially intended to chemically immobilize the animal, but found it could be approached closely enough to allow for the use of an electronic control device. A TASER MX ECD was deployed by one staff member and the moose experienced complete incapacitation (all four limbs were locked in extension). During the incapacitation and under lethal cover by the ECD operator, the Area Wildlife Biologist approached the animal, removed the feeder, examined the animal for obvious injury, and then retreated to a position of safety. After the discharge was terminated, the animal immediately fled the area.

Case 7: Hazing Use
***Kenai, AK, 1/13/2012*:** ADF&G received a complaint from a citizen who felt she was unable to leave her home due to an aggressive adult female moose. DWC personnel responded and encountered a cow near the home that approached personnel soon after they arrived. It was highly suspected by the agency respondents that the animal had been negligently or intentionally and illegally fed by someone within the residential neighborhood. As the animal continued in its approach towards the respondents, one DWC personnel deployed a Taser brand eXtended Range Electronic Projectile (XREP) self-contained ECD shotgun-delivered round, from a distance of approximately 40 feet, to the animal's right front shoulder while concurrently using loud verbal (human voice) stimuli. The animal quickly fled the area and was not reported to have returned.

Case 8: Incapacitation Use
***Kenai AK, 1/13/2012*:** Alaska State Trooper requested assistance for a young male moose with orange plastic snow fencing wrapped around its head and antlers. Upon arrival, DWC personnel found the moose to be bedded down and unable to see to the left side of its body due to the entanglement. DWC personnel approached the animal and deployed the X3W ECD3 causing full incapacitation. DWC personnel handed the device off to the assisting State Trooper, approached the incapacitated moose and removed the entanglement (leaving a very small piece in

the antler for identification purposes), and then retreated to safety and shut the device's current off. The animal immediately recovered and fled the area. The animal was reported to be in the same area two days later, feeding and exhibiting normal behavior.

Case 9: Incapacitation and Human Safety Use
***Palmer AK, 2/15/2012*:** The Palmer office of ADF&G DWC received a report of a female calf moose with its neck entangled in coaxial antenna cable within a residential neighborhood. DWC personnel approached the calf but were not immediately able to get into a good position for a shot with the X3W. Backing away from the animal caused it to turn broadside, as the cable was tight on its neck. DWC personnel got close enough to get both lasers positioned on the animal's front and hindquarters. As the trigger was pulled to deploy the device, the animal suddenly turned towards the shooter. The right probe hit her firmly in the front shoulder making good contact, but the left probe parted hair on her rump and kept moving beyond the moose. The deployment proved effective, as the animal fell to the ground incapacitated, likely due to the charge received from both the probe and the draped wire. The DWC staff member approached the animal, cut the cable off its neck, retreated, and discontinued the exposure. Upon cessation of the electrical charge, the animal instantly regained its footing and charged the DWC personnel, who fled to safety.

Case 10: Incapacitation
***Kenai AK, 2/21/2012*:** A Soldotna ADF&G DWC staff member received a call regarding an adult female moose that had two stackable, metal patio chairs over its head and entangled around its neck. A DWC technician responded and found the moose lying in a resident's front yard within a residential neighborhood. Approaching and firing one cartridge of the X3W, the staff member hit the animal, as it attempted to stand up, with one probe that made good contact, while the other probe missed the animal and went over its back. Another shot with another cartridge was immediately taken, which connected and led to the animal's full incapacitation. The technician quickly and safely approached the animal but was unable to quickly disentangle the chairs, as they were very solidly wedged over the animal's head and around its neck. He backed off to a safe distance and observed that the animal was unable to gain its footing, as it had fallen into a snow depression under a small spruce tree during the incapacitation (all four legs were horizontal to the ground and unable to make contact with the ground, preventing the animal from rolling upright). As the animal was unable to stand up, the technician approached the animal and within one minute was able to disengage the two chairs and safely retreat to his vehicle. The animal was still unable to regain its footing, so the technician again approached and, using a tow strap that he positioned loosely around the animal's neck, was able to assist the animal in its efforts to regain its footing. The animal did regain footing, but it did not leave the immediate area, possibly due to a winter-stressed physical condition. The tow strap was eventually pulled free, from the safety of a small wooden storage shed, by use of a long plastic pipe, and the staff member left the area after advising nearby neighbors on the condition of the animal. He also asked them to observe it and call if it appeared to have any complications from the intervention. The next morning the DWC staff member visited the site and observed that the same animal was up walking around the back yard of the home, browsing on nearby vegetation.

Case 11: Incapacitation
***Tustumena Lake, Kenai National Wildlife Refuge, Kenai Peninsula, AK, 3/2/12*:** ADF&G received a call from a fur trapper to inform them that he had caught a moose in a legally set #9 leg-hold wolf trap. ADF&G respondents and the trapper traveled by snowmachine across 30 miles of wilderness area on a glacier-fed frozen lake to the trap site and found a short-yearling (approx. 9-mo-old) male calf held firmly by a large leg-hold trap attached to its front left hoof. ADF&G personnel through close visual observation ascertained that there were no serious injuries involved, as it was obviously being held by the hard hoof material and not the fleshy portion of the leg, so approached to within 30 feet on a snowmachine and fired a TASER X3W at the moose, hitting it with at least two probes, causing full incapacitation. The ADF&G technician firing the device controlled the animal and provided lethal cover for the trapper and another ADF&G staff person, as they quickly intervened to remove the trap. After removing the trap, the two then retreated to their snowmachines and moved off to a safe distance while the ADF&G technician controlling the device simply drove away on his machine, thus breaking the wires as he put additional distance between himself and the moose. The moose instantly stood up and ran away from the people present and up the lake shoreline. The moose was last seen several minutes later, still moving further away along the shoreline. Darting equipment and drugs were brought along for use in this intervention but were not used.

DISCUSSION AND MANAGEMENT IMPLICATIONS

Further field experience and research with ECDs in wildlife management is needed. After the first case in this series, a research effort was undertaken under an IACUC approval by the DWC at the Moose Research Center outside of Sterling, AK. While these data are currently unpublished, the research indicated a reasonable safety profile in this larger wildlife species, and approval was given for further field use of the devices. An additional 3-year behavioral response observation study using Alaskan brown bear as indicator species was also recently completed, and it has shown promise for hazing and aversive conditioning in human-habituated, food-conditioned bears within developed areas and facilities, with a good safety profile. Trained ADF&G DWC personnel are now authorized to carry and deploy Taser X3W and XREP devices by approved ADF&G Standard Operating Procedures (SOP), written field use recommendations and State regulations.

This case series shows that ECDs have a role for: 1) temporary restraint/control, 2) hazing or aversive conditioning, and 3) personnel defense. While this is a limited and selective case series for brevity's sake, no animal in any other known ECD interventions have been directly killed or obviously injured by the use of these devices.

The ideal circumstances for use of the devices may be for temporary control for brief interventions or procedures. Examples for suggested use include quickly freeing an animal, placing a tag or collar on the animal, or doing a quick evaluation to check an injury for seriousness prior to making a decision on the appropriate action (e.g., chemical immobilization and treatment or immediate humane kill). In these circumstances, chemical sedation may be unnecessary and may put the animal and/or personnel, or even the public (e.g., lost chemical darting equipment) at greater risk. In addition, once a mortally wounded animal is chemically immobilized, the meat is rendered unsuitable for human consumption for a length of time, depending on the particular drug used, and the carcass may have to be buried to prevent introduction of chemical residues to scavengers. Furthermore, DWC experience has also shown ECDs to be very useful for hazing and aversive conditioning purposes, even when other traditional methods have failed, and have also proven to be useful for personnel self-defense. While an ECD should never take the place of lethal force when necessary, it may be used in more borderline cases, as in Case 1, where the personnel had a vehicle between them and the animal. No one device is considered a panacea, and ECDs do have some limitations.

LIMITATIONS

Since two probes must make contact (or contact with an insulation break in a wire) for the incapacitation effect to be induced by the handheld devices, skilled operation and targeting is far more critical than in a device that requires only one point of contact (e.g., impact rounds or the XREP, the shotgun-fired ECD). The probe spread is also crucial to the full effectiveness for incapacitation, so this requires a higher level of skilled operation. In addition, other Taser ECDs currently commercially available have all been optimized and tested for human use and so are not recommended for use on animals. Also, due to thicknesses of fur, hide, and differences in levels of subcutaneous fat, body mass, etc., it is possible that an ECD may not work for incapacitation in all circumstances. These devices will not fully replace traditional techniques of restraint and control and hazing or aversive conditioning, but they may add to the tools available for wildlife conservation officers and biologists for these uses.

CONCLUSION

Though the use of ECDs on wildlife to date has been limited, successful deployments have occurred. The case series presented demonstrates both the safety and efficacy of the device for use on wildlife and the potential use for wildlife-related personnel protection, temporary restraint and control, hazing and aversive conditioning of wildlife, and in some circumstances, ECDs may be a reasonable alternative to traditional restraint and behavioral modification techniques.

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