Empirical Research Regarding Trauma to Wildlife as a Result of Trapping

Updating the AIHTS Trapping Standards to Improve Animal Welfare and Capture Efficiency and Selectivity (Proulx et al., 2020)

- TRAUMA/LONG-TERM IMPACTS OF TRAPPING: "The assessment of restraining traps should not be limited to injuries incurred in a trap but should also include the long-term effects of trapping on animals that have been released by the trapper or researcher. For example, the No. 3 Victor Softcatch™ padded foothold trap appeared to cause little or no injuries to Ruppell's foxes (*Vulpes rueppellii*) when individual animal injury rates were considered [85]. However, subsequent cage trapping showed that foothold trapping could lower the survival rate of these foxes for a period of 6 months following their release [85]. Similarly, significant capture-related effects in ursids may go undetected at the time of capture, thus providing a false sense of the welfare of released animals [86]. Cattet et al. [87] reported on the incidental diagnosis of exertional (capture) myopathy in a grizzly bear (*Ursus arctos*) that died approximately 10 d after capture by leghold snare. The same researchers found that serum concentrations of aspartate aminotransferase (AST) and creatine kinase (CK), biochemical indicators of muscle injury, were above normal levels in a higher proportion of apparently uninjured grizzly bears and black bears (*U. americanus*) captured in leghold snares than those captured by helicopter darting or by barrel trap [86]. In addition, the rate of movements made by bears decreased below mean normal rate immediately after capture and then returned to normal only 3–6 weeks after release [86]. Researchers determined that grey wolves (*Canis lupus*) captured in foothold traps and cable restraint devices (modified neck snares with a stop to avoid asphyxiation) restricted their activity and movement patterns for 8–10 d following capture [88]. Such behavioural changes could have significant impacts on the reproduction performance and survival (e.g., by not securing their minimum daily food intake or maintaining the integrity of their territory) of animals that were recently captured...

  …Signs of distress may include vocalization, carnivores feeding on plant material because they are dehydrated or hungry, the posture of the animals from the beginning to the end of the capture period, and changes in the alertness of animals at sunrise or sunset or when other animals pass by, etc... [2].

  …Whereas a long-term effect of live trapping on released animals might be expected, the impact of killing devices on animals which escape must also be taken into consideration when assessing traps. For example, killing neck snares do not quickly render canids unconscious [12], and when neck-snared canids escape, they usually die from infection and/or starvation hours or days after escaping [2]. The probability of animals escaping from killing traps needs to be assessed as part of any approval process." (see Hypothesis 3)

- TRAUMA: "However, too many trapper forums and pest control websites still suggest methods to kill trapped animals that are inappropriate, such as stunning with a stick and kneeling/stomping on the animal's chest, strangulating with a loop at the end of a pole [104], or drowning [105]. Trappers also use small firearms, but they may shoot wolverines, wolves, and lynx in the chest to minimize damage to the pelt (and facilitate skinning) and protect the valuable skull [106]. Such methods diverge from methods that are recognized to minimize pain and distress." (see 8.1)

- SUPPORT FOR SHORTER TRAP CHECK INTERVALS: “The AIHTS specify that, in field tests, traps should be checked daily.” (see 8.2)
- SUPPORT FOR SHORTER TRAP CHECK INTERVALS: “The American Society of Mammalogists recommends that restraining traps for nocturnal species should be set before dusk and checked as soon as possible after dawn, while restraining traps for diurnal species should be set at dawn or early morning and checked every few hours in warm weather [**56**]. However, since some animals may injure themselves soon after capture [**29**], restraining traps should be visited at short time intervals and, ideally, as soon as possible following capture. This is particularly true for restraining snares, which are highly promoted in the USA, even though comprehensive field research on breakaway devices to protect non-target species is lacking [**110**].” (see 8.2)
- SUPPORT FOR SHORTER TRAP CHECK INTERVALS: “However, from an animal welfare point of view, the end result of long trap visit intervals by researchers or fur trappers is the same, i.e., animals suffer. Therefore, the expectations of standards for trappers should aim to match those for scientific researchers.” (see 8.2)
- **“Over the last 20 years, countless datasets have been collected on the impact of trapping on animal welfare [10],** trap selectivity and the impact of trapping on the persistence of animal populations [13,15], and the ethics of wildlife professionals and managers with respect to mammal trapping [2,9,10,72,97].” (see Discussion)

Humaneness and Selectivity of Killing Neck Snares Used to Capture Canids is Canada: A Review (Prouxl et al., 2015)

- TRAUMA: “Captured animals may remain conscious but physically inactive due to distress, shock, injury or pain.” (p. 58)

Mammal Trapping: A Review of Animal Welfare Standards of Killing and Restraining Traps (Iossa et al., 2007)

- TRAUMA: See “Table 2: Trauma scales developed by various authors; numbers represent scores given to each injury” (p. 338) which includes 22 measured traumas such as fractures, amputations, and lacerations.
- TRAUMA: “Submersion or drowning traps are mainly used to kill semiaquatic species, mostly muskrat and American mink (Mustela vison) in Europe and North American beaver (Castor canadensis) and river otter (Lontra canadensis), amongst others, in North America. Some of these species show physiological adaptations to aquatic life such as slower heart rates (bradycardia), and therefore can dive for prolonged periods. For instance, the Eurasian otter (Lutra lutra) dives for up to 22 minutes (Conroy & Jenkins 1986), the muskrat for 12-17 minutes (Inglis et al 2001) and the North American beaver for 15 minutes (Irving & Orr 1935). Death by drowning-induced hypoxia is a slow process for these species and even after struggling, which consumes oxygen more quickly, electroencephalogram loss occurs after an average of 4 minutes for the muskrat, and 9 minutes for the beaver (Gilbert & Gofton 1982). The animals show an indicator of distress because they struggle to get to the surface (Gilbert & Gofton 1982).” (p. 338).
- TRAUMA: See “Table 3: Trauma scale developed by ISO Technical Committee 191” for a list of possible traumas. (p. 339)
- TRAUMA/LONG-TERM IMPACTS OF TRAPPING: “As has already been shown in Rüppel’s fox (Vulpes rueppellii), the majority of individuals received low injury scores when caught in padded

leg-hold traps, yet subsequent survivorship was significantly reduced, possibly due to predation caused by temporary limping (Seddon et al 1999). Damage caused by the pressure of neck snares on tissue may take days to appear, often after individuals are released; such tissue necrosis can lead to death of the individual (Stocker 2005). For carnivores broken teeth have been linked to the inability to catch wild prey and increased livestock predation (Patterson et al 2003). Even such factors as claw loss may impact on subsequent ability to catch prey" (p.344)

- TRAUMA/IMACTS OF BEING IN TRAP LONGER: "**Anxiety caused by confinement and physical exertion related to struggling will also affect the welfare of the animal (Marks et al 2004). When prolonged, this distress can have a deleterious effect on an animal's health and subsequent survival** (Moberg 1999)." (p. 344)
- TRAUMA: "**Stress and pain of capture cause significant changes in hormones, enzymes and electrolytes, as well as muscle pH. Trapped animals have increased levels of serum cortisol** (Hamilton & Weeks 1985; Kreeger et al 1990; White et al 1991; Cross et al 1999; Warburton et al 1999; Inglis et al 2001), indicating a stress response to being trapped." (p. 344)
- TRAUMA/IMPACTS OF BEING IN TRAP LONGER: "**Increased activity causes a physiological response and may even cause long-term muscle damage (Duncan et al 1994);"** (p.344)
- TRAUMA: "Pressure from the wire ligature can damage cellular structures, which can in turn lead to necrosis of tissues (pressure necrosis) and ultimately death in the days following release (Stocker 2005)." (p. 344)
- TRAUMA/SUPPORT FOR SHORTER TRAP CHECK INTERVALS: **"Longer periods of time spent in the trap are often associated with greater exertion and more serious injuries (Powell & Proulx 2003)."** (p.346)
- SUPPORT FOR SHORTER TRAP CHECK INTERVALS: "Most European countries and some North American states require traps (both killing and restraining) to be checked daily (although this may mean circa 36 hours, if traps are checked at dawn and then at dusk the following day [FACE 1998; Fox & Papouchis 2004a]). This is a minimum standard; reducing the time in traps by either checking more frequently (Proulx et al 1993) or monitoring traps with electronic devices can reduce the number of serious injuries (Kaczensky et al 2002; Potočnik et al 2002; Larkin et al 2003)." (p.346)

An Evaluation of Long-Term Capture Effects in Ursids: Implications for Wildlife Welfare and Research (Cattet et al., 2008)

- TRAUMA: "We measured blood serum levels of aspartate aminotransferase (AST), creatine kinase (CK), and myoglobin to assess muscle injury in association with different methods of capture. Serum concentrations of AST and CK were above normal in a higher proportion of captures by leghold snare (64% of 119 grizzly bear captures and 66% of 165 black bear captures) than capture by helicopter darting (18% of 87 grizzly bear captures) or by barrel trap (14% of 7 grizzly bear captures and 29% of 7 black bear captures). Extreme AST values (.5 times upper reference limit) in 7 (6%) grizzly bears and 29 (18%) black bears captured by leghold snare were consistent with the occurrence of exertional (capture) myopathy." (p. 973)
- LONG-TERM IMPACTS OF TRAPPING: "We calculated daily movement rates for 91 radiocollared grizzly bears and 128 radiocollared black bears to determine if our activities affected their mobility during a 100-day period after capture. In both species, movement rates decreased below mean normal rate immediately after capture (grizzly bears: X ¼ 57% of normal, 95% confidence interval ¼ 45–74%; black bears: 77%, 64–88%) and then returned to normal in 3–6 weeks (grizzly bears: 28 days, 20–37 days; black bears: 36 days, 19–53 days)." (p.973)

- LONG-TERM IMPACTS OF TRAPPING: “We examined the effect of repeated captures on age-related changes in body condition of 127 grizzly bears and 207 black bears and found in both species that age-specific body condition of bears captured 2 times (42 grizzly bears and 98 black bears) tended to be poorer than that of bears captured once only (85 grizzly bears and 109 black bears), with the magnitude of effect directly proportional to number of times captured and the effect more evident with age. Importantly, the condition of bears did not affect their probability of capture or recapture.” (p.973)
- “Significant capture-related effects may go undetected, providing a false sense of the welfare of released animals. Further, failure to recognize and account for long-term effects of capture and handling on research results can potentially lead to erroneous interpretations.” (p.973)

Conserving Wildlife in a Changing World: Understanding Capture Myopathy – a Malignant Outcome of Stress During Capture and Translocation

- TRAUMA: “Capture myopathy is a condition with marked morbidity and mortality that occur predominantly in wild animals around the globe. It arises from inflicted stress and physical exertion that would typically occur with prolonged or short intense pursuit, capture, restraint or transportation of wild animals. The condition carries a grave prognosis, and despite intensive extended and largely non-specific supportive treatment, the success rate is poor.” (p. 1)
- TRAUMA: “Clinically, the animal usually presents with a combination of any of the following signs: lethargy, muscular stiffness, weakness, incoordination, recumbence, partial paralyses (paresis), metabolic acidosis, myoglobinuria and death (Chalmers and Barrett, 1977; Spraker, 1993). Macropathology typically reveals muscle necrosis, dark red-stained renal medullae and dark-coloured urine (Harthoorn and Van der Walt, 1974).” (p.2)
- TRAUMA: “There is no specific duration before death sets in, but death can occur within a few minutes, hours, days or even weeks after the precipitating event (Harthoorn, 1976; Spreaker 1993).” (p. 3)
- TRAUMA: “The condition of capture myopathy is an often fatal, exertionor stress-induced muscle degenerative condition affecting captured wild animals. The myopathy referred to relates to the muscle damage and weakness observed after a strenuous event. Muscle damage (rhabdomyolysis) is central to the pathogenesis of capture myopathy (Harthoorn, 1976; Spraker, 1993).” (p. 3)
- TRAUMA: “Classically, the initial clinical signs observed in animals suffering from capture myopathy are anxiety, shivering, rapid breathing, bent neck (torticollis), dark red urine and hyperthermia. In more protracted cases, animals may also present with lame or stiff limbs, appetite loss and constipation and can appear weak or lethargic. Once the animal presents with these signs, the probability of recovery is very poor (Wallace et al., 1987; Spraker, 1993; La Grange et al., 2010).” (p. 4)
- TRAUMA: “The stress experienced by wild animals appears to be one of the key precipitating factors of capture myopathy (La Grange et al., 2010).” (p. 12)

Killing Traps and Snares in North America: The Need for Stricter Checking Time Periods (Proulx et al., 2019)

- SUPPORT FOR SHOTER TRAP CHECK INTRVALS: “Because trappers use a variety of trigger configurations and trap sets, all killing devices, even those certified by trapper organizations or governments, should be monitored at least once every 24 h on traplines, but preferably every 12 h, because one cannot know a priori whether traps will strike animals in appropriate

locations for a quick kill. However, when using trapping devices such as killing neck snares that are legal and allowed by government agencies despite being inhumane, trappers should check them every 12 h. When traplines are situated near urban areas, e.g., within 10 km, checks should be done every 12 h to release pets and non-target animals." (p. 1)

- SUPPORT FOR SHORTER TRAP CHECK INTERVALS: "Work on traplines also showed that killing traps and snares were not always performing as expected, and ≥30% of animals captured in legal traps in Canada and the USA were struck in non-lethal regions and lost consciousness many minutes past the acceptable time limit, or were still alive for hours after capture [9,10]." (p. 2)
- TRAUMA/IMPACTS OF BEING IN TRAP LONGER: "When animals are captured by the abdomen or legs, they do not die quickly, and killing Conibear 120 traps then become restraining traps. **Animals stay alive and commonly die from exposure many hours after capture**." (p. 4)
- TRAUMA: "Because the two-prong trigger fails to ensure strikes in vital regions, and the Conibear 120 trap does not have the striking and clamping forces to produce a humane kill, many mink captured in this trap stay alive for many hours, and sometimes until the following day (Rodtka, unpublished data)." (p. 5)
- SUPPORT FOR SHORTER TRAP CHECK INTERVALS: "However, all killing traps, even those that have been certified as being humane [12], should be monitored frequently because environmental conditions and trappers' modifications can impact on their killing performance, and one cannot guarantee that all animals will be struck in appropriate locations for a quick kill [2]." (p. 6)
- SUPPORT FOR SHORTER TRAP CHECK INTERVALS: "When traplines are too long for frequent trap visits, they should be subdivided into smaller sections. Trappers would then be able to check their traps every 24 h, e.g., at sunrise, or even more often." (p. 6)
- SUPPORT FOR SHORTER TRAP CHECK INTERVALS: **"Checking traps within a 24-h period on traplines, and within 12 h in urban and sub-urban areas or when using legal but inhumane trapping devices, would minimize pain and discomfort of animals kept alive in killing devices. It would also be advantageous to trappers as it allows them to retrieve captured animals before they are scavenged upon by animals, maintain trap sets that may have been disturbed by animals that avoided capture or by weather conditions, release non-target animals that have not suffered serious injuries during capture, or humanely kill those that are too badly injured to be released." (p. 7)**

American Veterinary Medical Association

- SUPPORT FOR SHOTER TRAP CHECK INTERVALS: "The AVMA recommends that trappers should be trained to use traps and techniques correctly and traps should be checked at least once every 24 hours."

Association of Fish and Wildlife Agencies Trapper Education Manual

- SUPPORT FOR SHOTER TRAP CHECK INTERVALS: "Make a commitment to check your traps at least once every day. When you set out a trapline, you assume responsibilities. Animal welfare is a top priority. Most furbearers are nocturnal so it is best to check your live-restraining traps at first light each morning. If you cannot check them at daylight, check them as early in the day as possible. One important difference between trapping and hunting is your commitment to work your trapline every day until you remove your traps. Hunters can choose the days they want to hunt, but trappers must check their sets every day. **Bad weather or other problems should not change your plans.** If you cannot personally fulfill your responsibility to wildlife and fellow

trappers because of illness have another licensed trapper check your line. If a licensed friend or family member knows where your sets are located they can check or remove your traps for you. Keep notes and sketches showing where to find your traps." (p. 97)

Hunter-Ed

- SUPPORT FOR SHORTER TRAP CHECK INTERVALS: "Never make more sets than you can handle…Check traps at least once a day. Early morning is the best time to run your trapline. Many furbearing animals are more active at night and likeliest to be trapped at that time. Prompt collection of any trapped furbearers is humane and ethical."