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NORTH AMERICAN RIVER OTTER (*LUTRA CANADENSIS*) TRANSLOCATION IN NORTH CAROLINA 1989-1996

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Abstract

North American river otters (*Lutra canadensis*) were live-trapped in eastern North Carolina between 1989-1996 and reintroduced to 11 watersheds in the western portion of the state. Among 333 captured otters, 80.2% (107 females, 160 males) were translocated and 6.3% (21) were returned to their home territory. Only 2.1% of all trapped otters (7/333) died or were euthanized due to trap-related injuries. Most otters sustained digit trauma, but all injuries resolved during the 10-16 day holding period. The following methods were developed to maximize the number of otters captured and to ensure their health during relocation: private trappers were encouraged to use modified foot hold traps and were trained in proper handling techniques, caging was specially designed to limit injury and escape, otters were allowed to acclimate for a minimum of 3 days before examination under anesthesia, safe anesthetic protocols were developed, and trap-related injuries were treated if necessary.

Zusammenfassung

Von 1989 bis 1996 wurden im östlichen Teil von North Carolina Nordamerikanische Fischottter (*Lutra canadensis*) lebend gefangen und in den Einzugsgebieten von 11 Flüssen im westlichen Teil dieses Staats wieder ausgewildert. Von 333 gefangenen Fischottern wurden 80.2% (107 Weibchen, 160 Männchen) für die Umsetzung verwendet und 6.3% (21) wieder in ihr ursprüngliches Territorium zurückgesetzt. Nur 2.1% von aller gefangenen Fischottern (7/333) starben an Fangbedingten Traumen oder wurden deswegen euthanasiert. Die meisten Fischotter erlitten Zehenverletzungen, aber alle Wunden heilten ab innerhalb der 10 - 16 Tagen langen Gefangenschaftsperiode ab. Die nachfolgenden Methoden wurden entwickelt um so viele Fischottern wie möglich zu fangen und ihre Gesundheit während des Transports zu gewährleisten: Private Fänger wurden dazu angeregt, modifizierte Fallen zu verwenden und sie wurden in geeigneten Handhabungsmethoden ausgebildet. Die Käfige wurden so konstruiert, dass die Gefahr von Verletzungen und des Ausbrechens gering war. Den Fischottern wurde eine Akklimatisationsperiode von minimal 3 Tagen geboten bevor sie unter Anästhesie untersucht wurden. Protokolle für die sichere Anästhesie wurden entwickelt, und Fangbedingte Verletzungen wurden, wenn nötig, behandelt.

Résumé

Des loutres de Canada (*Lutra canadensis*) étaient capturées en l'est North Carolina entre 1989-1996 et réintroduites dans 11 bassins en l'ouest de cette état. De 333 loutres capturées, 80.2% (107 femelles, 160 mâles) étaient transportées et 6.3% (21) retourné dans leur endroit d'origine. Pas plus que 2.1% de tous les loutres captées (7/333) moururent ou étaient euthanasées par suite de traumatisantes de capture. Le plus part des loutres Canadiennes on gagnées des droits traumatisée pendant leur période de captivité de 10 à 16 jours. Les méthodes suivantes sont développé pour réaliser une capture d'un nombre maximale des loutres Canadiennes et une santé optimale pendant leur transport:

des chasseurs privées étaient encouragé d'utiliser des trappes modifié et ils étaient traînées le maintenir d'une méthode optimale les animaux, les cages étaient adaptées pour limiter des traumatismes et l'échappement, les loutres étaient permettiez d'acclimatiser pendant 3 jours avant leur examination sous anesthésie, une protocole était développé pour une anesthésie sûre, et les traumatismes de capture étaient traité quant nécessaire.

Key words
River otter, *Lutra canadensis*, translocation, anesthesia, clinical pathology, trap injury

Introduction

By the early 1900's, wetland destruction, pollution, and overexploitation for fur resulted in widespread decline of the North American river otter (*Lutra canadensis*) throughout the United States and Canada. In North Carolina, otters survived in the eastern coastal areas but disappeared from western mountain steams. In 1986-1987, field surveys were conducted by the North Carolina Wildlife Resources Commission (WRC) to identify western watersheds with suitable otter habitat. The North Carolina River Otter Restoration Project began in 1989 and continued for 6 winter seasons (through 1996). Veterinary assistance was requested to evaluate the health of live-trapped otters (1), establish protocols for short term anesthesia, and treat any trap-related injuries.

Materials and Methods

Otters were captured by WRC personnel throughout the project, and by private trappers between 1992-1996 when funding became available to purchase the otters ($100 US per otter). Trappers were instructed to use a small foot hold trap (#11 double long spring or #1.5-1.75 coiled spring) modified with a chain and swivel. For transfer from the trap site, trappers were provided with a long-handled deep nylon net, a transfer cage, and detailed handling instructions (via hands-on or video demonstration). The transfer cage (44 x 42 x 37 cm), as well as the holding cages (92 x 64 x 43 cm), were specially built to limit the risk of escape or injury. Each cage had an aluminum sliding door with a wooden door frame which matched the steel rim of the net, and was constructed using 2.5-cm 12-gauge, plastic-coated, welded wire.

Otters were held outdoors in same sex groups of 2-4, and most adapted to their surroundings within a few days. The presence of other otters helped stimulate normal feeding and grooming behaviour. A plastic transport kennel was provided for shelter with a piece of burlap or cotton towel for bedding. Water was provided ad lib in a secured water container, and otters were fed whole fresh fish daily (or thawed-frozen fish, supplemented with 25 mg/day thiamin). Some otters refused whole fish initially, but were successfully encouraged to feed on small filets. During the 10-16 day holding period prior to relocation, most otters gained weight.

After a minimum of 3 days in holding, otters were anesthetized for physical examination, body size measurements, age and sex determination, tagging, blood sampling for haematology and serum chemistry analysis, and treatment (if necessary) of trap-related injuries. The anesthetic combinations evaluated during the project have been described in detail (5-8). Preferred combinations were 10 mg/kg ketamine with 0.25 mg/kg midazolam, or 0.025 mg/kg medetomidine with 2.5 mg/kg ketamine followed by 0.125 mg/kg atipamezole. For induction, each otter was placed in a transfer cage, weighed using a handheld metric spring scale, and then transferred to a net. Using a thick woven mat, the otter was manually restrained briefly for intramuscular injection in the cranial thigh muscles. Anesthetic monitoring included heart rate, respiratory rate, rectal temperature, indirect blood pressure, and relative oxyhemoglobin saturation.

Trap related injuries were classified according to the following categories: I – puncture wounds, lacerations, missing nails, or swelling only; II – closed luxation of the interphalangeal joints of one or more digits; III – open luxation of one or more digits; IV – as for III but with exposed or missing phalanges; V – distal limb fracture.

Results and Discussion

Among the 333 otters captured in eastern North Carolina, 80.2% (107 females, 160 males) were translocated to western streams, and 6.3% (21 males) were returned to their home territory. The large number of wild otters handled during this multi-year project provided an opportunity to optimize methods for their care while in captivity. Previous recommendations were based upon less than 100 relocated otters (2-4). During the North Carolina project, state biologists worked closely with private trappers to capture otters efficiently and with minimal injury. Overall trapping success was high (averaging 26 trap nights per otter) and trapping schedules were adjusted to maximize the number of female otters captured (early winter). The final sex distribution of relocated otters was 60% male and 40% female.

Overall mortality was 13.5% (Table 1). The death of 10 otters (3%) due to aggression while in holding was unexpected. Fighting occurred between males and females that were unintentionally housed together (prior to examination and sex confirmation), and between males if they were housed near an oestrus female. Trap-related mortality was acceptably low (2.1%) and occurred in 7 otters which died or were euthanized due to severe distal limb fractures (category V). Of these, 4 otters were captured with the recommended trap type but the swivels became entangled in vegetation, and 3 were caught above the foot by a large (inappropriate) trap.

Table 1.
Mortality among 333 wild-caught river otters (*Lutra canadensis*) during the North Carolina Otter Restoration Project 1989-1996.

Cause of death	Number of otters	% total
Found dead at trap site	14	4.2
Died in captivity	31	9.3
Acute death/capture stress	11	3.3
Aggression (male-female)	10	3.0
Pre-existing infections	3	0.9
Euthanized for trap injuries	7	2.1
Total	**45**	**13.5**

In most otters, trap-related injuries were limited to the digits regardless of trap type (Fig. 1). Injury categories were helpful in characterizing the degree of trauma produced by the trap, which ranged from minimal swelling to amputation of the distal phalanges on one or more digits. However, all injuries in these categories (I-IV) responded well to conservative treatment (cleansing, debridement, suturing). All digit wounds had resolved or were in advanced stages of healing upon release of the otters. Aside from digit trauma, the captured otters were in good physical condition. Only 3 otters were found to have pre-existing problems (facial abscess, pyometra, embedded fishing line) which resulted in death (Table 1). Tooth wear was prominent in otters originating from areas where their diets consisted largely of shellfish. Fractured teeth and gingival trauma occurred in 20 otters transported in improper caging (plain wire mesh greater than 2.5-cm gauge).

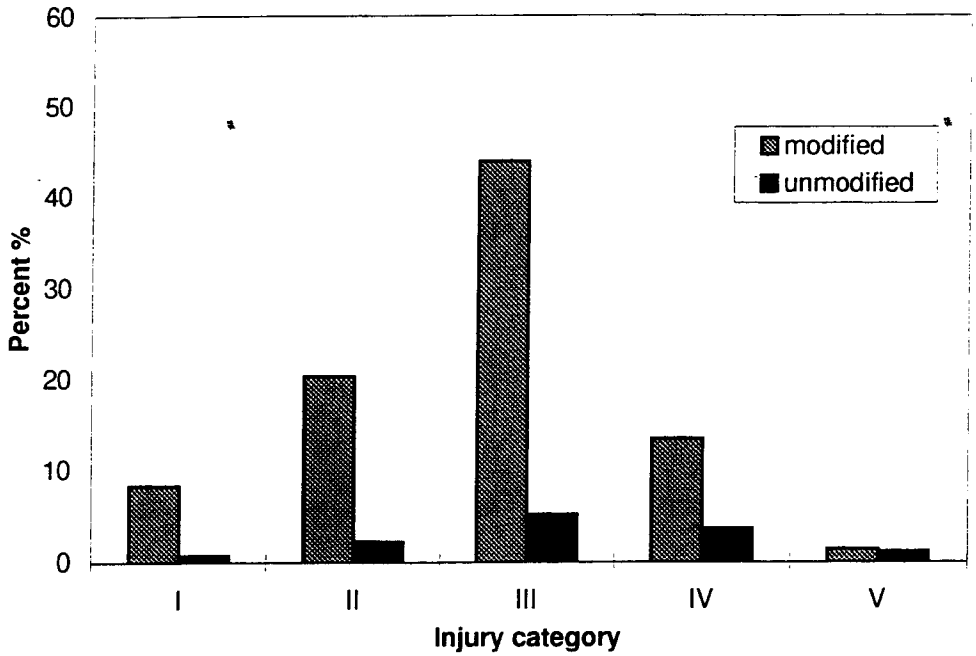

Fig. 1
Percentage of North American river otters (*Lutra canadensis*) captured using modified (=241) and unmodified (n=35) foot hold traps by injury category (I-puncture would, laceration, missing nails, or swelling only; I I-closed luxation of the interphalangeal joints of one or more digits; I I I-open luxation of one or more digits; IV-as for I I I but with exposed or missing phalanges; V-distal limb fracture).

A variety of protocols were established for short-term anesthesia (25-30 min) in otters (Table 2). Detailed descriptions of anesthetic induction, recovery, and the physiologic consequences of each combination have been reported elsewhere (5-8). For anesthetic administration, the combination of net and manual restraint worked well. Given the relatively large amount of subcutaneous space in otters, as well as their strength and agility, it was important to quickly immobilize the otter for hand injection. The cranial thigh muscles were used to ensure deep intramuscular delivery, which was essential for rapid anesthetic induction. Without a deep net, specially built transfer cage, and trained personnel, this method would not have been successful. Use of a modified squeeze cage for otter restraint has been reported by others (3,4,10).

Table 2
Recommended anesthetic dosages (including reversal agents where appropriate) for short term anesthesia (25-30 min) in North American river otters (*Lutra canadensis*).

Anesthetic combination (mg/kg)*	**Comments**
Ketamine (10), midazolam (0.25)	Highly recommended
Ketamine (2.5), medetomidine (0.025) (atipamezole 0.125)	May need higher dosages (Ket 3.5, Med 0.035) but respiratory depression more likely
Tiletamine-zolazepam (4) (flumazenil 0.08)	Recovery may be prolonged without flumazenil
Ketamine (10)	Expect muscle rigidity and variable duration
Ketamine (10), diazepam (0.5-1)	Prolonged recovery compared to ketamine, midazolam
Ketamine (5-10), xylazine (1-2) (yohimbine 0.125)	Variable effects from heavy sedation only to respiratory depression. Alternative dosages Ket (3-4), xyl (3-4)
Azaperone (0.1), fentanyl (0.1-0.2) (naloxone 0.04)	Not recommended

*Dosages given are based upon intramuscular administration

The most important anesthetic-related complication was respiratory depression. Within 5 min of induction, apnea frequently occurred regardless of the anesthetic combination. Respirations were more regular, and relative oxyhemoglobin saturation was higher (greater than 90% within 10 min post injection), in otters anesthetized with ketamine-midazolam or medetomidine-ketamine when compared to otters given tiletamine-zolazepam or ketamine. At the dosages evaluated, both azaperone-fentanyl and xylazine-ketamine produced unacceptable respiratory depression with relative oxyhemoglobin saturation remaining less than 80%. For all anesthetized otters, supplemental oxygen (via facemask or endotracheal tube) should be available.

Summary

The otter restoration project in North Carolina provided an opportunity to establish protocols for safely trapping, handling, and anesthetizing otters (5-8). Baseline information (body size, age, sex distribution, clinical pathology data) for over 300 wild otters was established. In a related study, thermal telemetry was used to evaluate the effect of simulated oil spill washing procedures on core body temperature in river otters(9). State biologists have continued their participation in otter relocation projects, most recently sending 107 otters to West Virginia.

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