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Field Immobilization of American Martens (*Martes americana*) and Short-tailed Weasels (*Mustela erminea*)

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ABSTRACT: Ketamine hydrochloride (KH) and a 5:1 combination of KH and xylazine hydrochloride (XH) were used successfully to immobilize short-tailed weasels (*Mustela erminea*) and American martens (*Martes americana*), respectively. Four adult male martens were intramuscularly injected with 30 to 82 mg/kg KH and 8.0 to 16.4 mg/kg XH. Three adult male short-tailed weasels were intramuscularly injected with 20.8 to 42.1 mg/kg KH. Mean (±SE) induction times for martens and short-tailed weasels were 1.8 ± 0.2 min and 46 ± 4.1 sec, respectively; recovery times were 100.4 ± 19.3 min and 97.9 ± 6.3 min, respectively. Heart rate was relatively constant among martens; however, respiration varied widely (21 to 122 breaths per minute). Marten body temperature decreased between 0 and 20 min post-recumbency. Short-tailed weasel heart rate and respiration decreased in response to sedation until slightly before arousal. Body temperature stabilized by 20 min post-recumbency. Two short-tailed weasels tremored slightly within 10 min of arousal. I conclude that KH and KH/XH are safe immobilizing agents for martens and short-tailed weasels, respectively.

Key words: American marten, *Martes americana*, short-tailed weasel, *Mustela erminea*, ketamine hydrochloride, xylazine hydrochloride, chemical immobilization, field study.

American martens (*Martes americana*) have been successfully immobilized with phencyclidine and promazine (Seal and Erickson, 1969; Seal et al., 1970; Mech, 1974; Clark et al., 1989), ether (Davis, 1983), halothane (Herman et al., 1982), sodium pentobarbital (More, 1977), ketamine hydrochloride (KH) (Steventon and Major, 1982; Brown, 1986; Snyder and Bissonette, 1987), and KH and acepromazine (Martin and Barrett, 1983; Zielinski et al., 1983). Archibald and Jessup (1984) and Slough (1989) used KH and xylazine hydrochloride (XH) in combination to immobilize martens but did not provide details of immobilization. Seal and Kreeger (1987) recommended immobilizing American martens using KH in combination with promazine or diazepam.

Little information is available regarding immobilization of short-tailed weasels (*Mustela erminea*). Phencyclidine hydrochloride (Gamble, 1980), phencyclidine with promazine (Seal and Erickson, 1969; Seal et al., 1970) and ether (Lockie and Day, 1963; King and Edgar, 1977; Nams, 1981) have been used successfully. Seal and Kreeger (1987) recommended that short-tailed weasels be immobilized using KH in combination with promazine, diazepam, or possibly xylazine.

Ketamine hydrochloride is a cyclohexane-based drug that creates dissociative anesthesia (Aronson, 1984; Seal and Kreeger, 1987). Xylazine hydrochloride is an alpha$_2$-adrenergic agonist that induces transitory hypertension prior to prolonged hypotension (Kreeger et al., 1986; Seal and Kreeger, 1987). Ketamine hydrochloride and XH in combination generally results in smooth induction and recovery (Harthoorn, 1976). Ketamine hydrochloride alone, or KH and XH in combination have been used to anesthetize a variety of mammalian carnivores; however, their use has not been previously reported for short-tailed weasels or described well for American martens. I report on the use of KH and KH/XH for field immobilization of short-tailed weasels and American martens, respectively.

American martens and short-tailed weasels were captured in live traps. American martens were captured in Tomahawk live traps (Models 102, 207, and 209.5; Tomahawk Live Trap Co., Tomahawk, Wisconsin, USA). Short-tailed weasels were captured in National (12.7 × 12.7 × 40.6

TABLE 1. Dosages and physiological responses of adult male American martens ($n = 5$) immobilized with ketamine hydrochloride (KH) and xylazine hydrochloride in combination and short-tailed weasels ($n = 5$) immobilized with KH alone.

	American marten			Short-tailed weasel		
	Mean	SE[a]	Range	Mean	SE[a]	Range
Ketamine hydrochloride (mg/kg)	61.4	6.5[b]	30.0–82.0	31.2	7.1[b]	20.8–42.1
Xylazine hydrochloride (mg/kg)	12.2	1.3[b]	8.0–16.4	—	—	—
Induction time (min)	1.8	0.2	1.2–2.5	0.8	0.07	0.6–1.0
Arousal time (min)	44.3	15.5	13.5–112.0	32.6	6.5	12.0–48.0
Standing time (min)	84.2	19.4	46.0–159.0	73.5	5.6	62.0–96.0
Recovery time (min)	100.4	19.3	62.0–175.0	97.9	6.3	76.0–112.0
Heart rate at 0 min (beats per minute)	125	7.5	99–148	189	14.4	140–220
Respiration at 0 min (breaths per minute)	65	15.1	21–122	107	22.2	40–180
Rectal temperature at 0 min (C)	38.9	0.08	37.1–39.0	37.8	0.5	36.8–39.8

[a] Standard error.
[b] Standard deviation for ketamine hydrochloride and xylazine hydrochloride, SE for all other values.

cm; National Live Trap Co., Tomahawk, Wisconsin, USA), Havahart (12.5 × 12.5 × 45.5 cm; Model 1, Woodstream Corp., Lititz, Pennsylvania, USA), and wooden (9.0 × 9.5 × 25.5 cm) live traps (Patric, 1958). Meat scraps were used for bait. All martens were intramuscularly injected in a rear hip via hand-syringe with a 5:1 (50 mg : 10 mg) combination of KH (Ketaset®, Bristol Laboratories, Syracuse, New York, USA) and XH (Rompun®, Mobay Corporation, Shawnee, Kansas, USA). Short-tailed weasels were driven into a handling bag before being similarly injected with 2.5 to 4.0 mg KH.

Procedures used to document marten and short-tailed weasel responses to immobilization followed Belant (1991). Induction time was the interval between injection and lateral or sternal recumbency. Arousal time was recorded as the interval between recumbency and head mobility. Standing time was the interval between recumbency and upright posturing. Recovery time was the interval between recumbency and the animal's ability to maintain an upright posture while I moved the live trap to different positions. I recorded rectal temperature, respiration rate, and resting heart rate as soon as practical after immobilization. Additional rectal temperatures were taken at 10-min intervals until handling procedures were completed. Weights and morphological measurements also were recorded. All animals were released at the capture site upon full recovery from anesthesia.

Four adult male martens were captured a total of 10 times from 9 May to 16 June 1990 and 2 May to 18 May 1991. Each marten was immobilized once during the study with the exception of one marten that was immobilized 10 days later to attach a radio transmitter. Martens were intramuscularly injected with 30 to 82 mg/kg KH and 8.0 to 16.4 mg/kg XH (Table 1). Mean (±SE) induction time ($n = 5$) was 1.8 ± 0.2 min. Respiration was highly variable, from moderately depressed to slightly hyperventilated. Heart rate was relatively constant among martens. Mean rectal temperatures decreased 3.2 C through 20 min post-recumbency.

Mean induction and recovery times (Table 1) were similar to those reported by Archibald and Jessup (1984; 1.9 min and approximately 90 min, respectively), who used a standard dose of 20 mg KH and 4 mg XH.

Three adult male short-tailed weasels were captured a total of 13 times between 1 May and 23 May 1991. One short-tailed weasel was immobilized once and two were immobilized twice ≥7 days apart. Short-tailed weasels were intramuscularly injected with 20.8 to 42.1 mg/kg KH (Table

1). Mean (±SE) induction time ($n = 5$) was 46 ± 4.1 sec. Body temperature decreased after induction, then stabilized by approximately 20 min post-recumbency. Both heart rate and respiration increased within 10 min of arousal. In two instances, slight body tremoring occurred simultaneously to increased metabolic activity.

Ketamine hydrochloride dosages used on short-tailed weasels in this study were approximately three times higher than dosages of KH used in combination with phenothiazine tranquilizers recommended for short-tailed weasels by Seal and Kreeger (1987). Phenothiazine tranquilizers can be used in conjunction with cyclohexanes to reduce total drug dose in addition to smoothing induction and recovery (Haigh, 1982).

With the exception of slight tremoring in two short-tailed weasels after KH administration, and the possible exception of variable respiration in martens, no adverse responses were observed. I conclude that KH alone, and KH and XH in combination, are safe immobilizing agents for short-tailed weasels and martens, respectively. In the future, I recommend that those using KH also should incorporate muscle relaxing agents such as diazepam (Randall et al., 1961). Although recovery times reported in this study were not unusually long, additional experimentation should be conducted with varying dosages and combinations of KH and XH in conjunction with antagonists such as yohimbine hydrochloride (YH). Yohimbine hydrochloride reverses the sedation effects of XH (Hsu and Lu, 1984) and may partially antagonize the effects of KH (Kreeger and Seal, 1986; Deresienski and Rupprecht, 1989). Although YH has not been reported for martens or short-tailed weasels, Seal and Kreeger (1987) recommended its use for several mustelid species.

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