Evaluation of Techniques for Capturing Common Ravens in Southwestern Idaho

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Introduction

Researchers studying Common Ravens (*Corvus corax*) have captured them using several techniques, including rocket nets (Mahringer 1970, Dorn 1972, Kerttu 1973, Stiehl 1978), drop-in traps (Coldwell 1967, Stiehl 1978, A. Magoun pers. comm.), padded leghold traps (J. Hughes pers. comm.), single-end Havahart traps (Schwan and Williams 1978), a handheld net gun (R. Ambrose pers. comm.), and a box trap fitted with a manually tripped, trap door (B. Heinrich pers. comm.; Table 1). From April 1985 to November 1986, we employed most of the above techniques and several new ones to capture Common Ravens in southwestern Idaho. In this paper, we evaluate the relative effectiveness of these capture techniques and interpret our results with respect to the ecology of Common Ravens in our study area.

Study Area and Methods

Our study focused on ravens roosting communally on a 124 km segment of 500 kV transmission line in southwestern Idaho. Heavily grazed shrubsteppe vegetation (West 1983) and agriculture dominate this area. Topographic relief increases from east to west as the transmission line crosses the Snake River Plain and enters the foothills of the Owyhee Mountains. Annual

Table 1. Success of techniques used to capture Common Ravens in this and other studies.

Study	Technique	Capture season(s)	Total trap time (days)	Ravens captured	Capture rate (days/raven)
Coldwell (1967)	Drop-in trap	Winter	≤180	750	<1
Mahringer (1970)	Rocket net	All seasons	38	148	<1
Dorn (1972)	Rocket net	Summer	≤60	26	<2
Kerttu (1973)	Rocket net	Winter-Spring	≤30	21	<1
Schwan and Williams (1978)	Havahart traps	Fall	≤60	11	<5
Stiehl (1978)	Drop-in trap	Winter-Spring	101	99	1
Stiehl (1978)	Rocket net	Spring & Fall	159	6	27
Young and Engel (1988)	Leghold traps	All Seasons	180	23	8
Young and Engel (1988)	Rocket net	Spring	18	1	18
Ambrose (pers. comm.)	Net gun	Winter	2	2	1
Heinrich (pers. comm.)	Box trap	Winter	4*	91	<1
Hughes (pers. comm.)	Leghold traps	Winter	30	36	<1
Magoun (pers. comm.)	Drop-in trap	Winter	40-50	43	<1

*This trap was pre-baited 7 to 42 days prior to each of the 4 capture days.

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precipitation averages 20 cm (U.S.D.I. 1979), most of which occurs from late autumn to early spring.

We attempted to trap and transmitter-equip ravens from communal roosts on the transmission line in order to describe their movements and habitat use. Traps were set near roost sites in areas where ravens had recently been observed foraging. Padded #1 single and #2 double flat-spring leghold traps (Woodstream Manufacturing Co., Lititz, Penn.), a drop-in trap (Kalmbach 1939), and rocket nets (Dill and Thornsberry 1950) were the most common techniques employed (Table 2). We also attempted to capture ravens using bal-chatri traps (Berger and Mueller 1959), noose carpets (Anderson and Hamerstrom 1967), a handheld net gun (Coda Enterprises, Inc., Mesa, Ariz.), and a net launcher (Coda Enterprises, Inc., Mesa, Ariz.).

Leghold traps appeared to be the most effective technique and, therefore, were employed most frequently (Table 2). Leghold traps (#2's only) were prepared by weakening the springs with vise grip pliers and spraying them with flat black paint. Strips of 9.5 mm foam rubber were cut to fit the leading edge of the jaws and secured with spirally wrapped, black vinyl, electrical tape. Traps were chained together in groups of two–four. Procedures for setting leghold traps were similar to those described by Harmata (1984). Traps were placed in shallow depressions excavated in the soil around a bait. Squares of fiberglass insulation (7 x 7 cm) were placed under trigger pans to prevent soil from collecting beneath them and to increase pan tension. Traps were then covered with finely sifted soil, usually collected on site to ensure that it closely matched the surrounding substrate. Two to 17 traps were used in a single set, depending on trap and bait sizes. A set was considered to be the group of traps associated with a single bait.

Table 2. Capture rates for techniques used to capture Common Ravens, April 1985-October 1986.

Technique	Trap-hours	Ravens captured*	Trap-hours/ raven
Leghold traps	1015 (71%)	23 (15A, 7S, 1Y)	44.1
Drop-in trap	234 (16%)	0	-
Rocket nets	141 (10%)	1 (1A)	141.0
Bal-chatri traps & noose carpets	22 (2%)	0	-
Net gun & net launcher	18 (1%)	0	-
Total/Mean	1430	24	59.6

*A = adult; S = subadult; Y = young of the year.

Sixteen food items, most of which were carrion, were used for bait (Table 3). Ring-necked Pheasant (*Phasianus colchicus*) and black-tailed jack rabbit (*Lepus californicus*) were the most common baits used, followed by whole or quartered calves (*Bos taurus*) and deer mice (*Peromyscus maniculatus*). Caged live domestic mice (*Mus musculus*), various cereal grains, and chicken (*Gallus gallus*) eggs were also occasionally used as bait.

We patterned our drop-in trap after that described by Stiehl (1978). The trap was baited with carrion, usually a whole or quartered calf. The drop-in trap was always pre-baited for several days before 1 or 2 live decoy ravens were placed inside. Two 9 x 18 m rocket nets and a net launcher equipped with a 12 x 12 m net were used in areas where terrain allowed. Rocket net locations were always pre-baited for several days before a net was installed. Once a net was installed, we usually waited at least 2 days before arming and manning it to allow ravens to adjust to its presence. Bal-chatri traps were either circular or Quonset shaped and baited with one–three live domestic mice. Noose carpets consisted of 10 cm squares of plastic hardware cloth equipped with numerous 3.6 kg-test, brown, monofilament nooses. Noose carpets were either set around baits or on frequently used perches. We also attempted to capture ravens using a net gun equipped with a 3.7 m square net.

Ages of captured ravens were determined by palate color according to criteria described by Kerttu (1973). To assess trapping effort, we considered traps set before dawn to be open 30 min before sunrise and traps set until dark to be closed at sunset. For leghold traps, 1 trap-hour refers to a set of traps open for 1 hour. Prebaiting days were not included in capture effort calculations.

Results

Trapping Success. During 1,430 trap-hours, 24 ravens were captured: 23 with leghold traps and 1 with a rocket net (Table 2). Sixteen of these were adults (≥2 years old), seven were subadults (≥1 and ≤2 years old), and one was a young of the year (≤1 year old).

Of the 16 items used to bait leghold traps, 8 were successful in luring at least 1 raven into capture: pheasant, rabbit, adult cattle, mice, and lamb carcasses, plus whole or quartered calves and live mice (Table 3). Success rates for leghold traps did not differ significantly among the eight baits with which at least one raven was caught (log-likelihood ratio, $G = 2.29$, $df = 7$, $P > 0.90$). Success rates for leghold traps differed significantly among seasons (log-likelihood ratio, $G = 9.17$, $df = 3$, $P < 0.05$; Table 4); success was highest during winter and spring, and lowest during summer.

Table 3. Capture rates for baits used with leghold traps to capture Common Ravens, April 1985 - October 1986.

Bait	Trap hours	Ravens captured	Trap hours/ raven
Pheasant	236 (23%)	4	59.0
Rabbit	229 (23%)	4	57.3
Calf	179 (18%)	4	44.8
Dead mice	107 (11%)	5	21.4
Live mice	88 (7%)	2	44.0
Chicken eggs	28 (3%)	0	-
Cow	22 (2%)	2	11.0
Lamb	16 (2%)	1	16.0
Grain	16 (2%)	0	-
Squirrel	15 (1%)	0	-
Badger	14 (1%)	0	-
Quail	14 (1%)	0	-
Chicken	7 (1%)	0	-
Horse	2 (<1%)	1	2.4
Elk	2 (<1%)	0	-
Dog	1 (<1%)	0	-
Total	1015	23	44.1

Raven Response to Trapping. Ravens appeared wary of changes we introduced into their environment. Visible capture devices were usually approached indirectly or not at all. The drop-in trap occasionally lured one to three ravens to the ground next to the trap, but none ever entered. Ravens only occasionally fed on baits associated with rocket nets or the net launcher, but even then, no more than two ravens were observed feeding simultaneously. Attempts to use the net gun failed, because we were unable to approach within firing range (10 m) of ravens. Ravens maneuvered around noose carpets and did not land on bal-chatri traps.

Table 4. Seasonal capture rates for leghold traps used to capture Common Ravens, April 1985 - October 1986.

Season	Trap hours	Ravens captured	Trap hours/ raven
Winter (Dec - Feb)	63 (6%)	3	21.0
Spring (Mar - May)	254 (25%)	11	23.1
Summer (Jun - Aug)	385 (38%)	4	96.3
Autumn (Sep - Nov)	312 (31%)	5	62.4
Total/Mean	1015	23	44.1

The response of ravens to baits was inconsistent and unpredictable. Ravens seemed less apt to approach larger bait items such as cattle, jack rabbits, and pheasants, and frequently observed other animals feed before they approached even pre-bait carcasses. Smaller baits, such as mice, seemed more readily approached if ravens located them.

Groups of nearby ravens were always disrupted by the capture of a conspecific. Ravens responded to such captures by flushing, vocalizing, and usually leaving the area promptly.

Discussion

Our overall trapping success was poor compared to other studies (Table 1). Drop-in traps and rocket nets were effective in most studies which employed either; however, the drop-in trap failed to capture ravens in our study, and success using a rocket net was extremely low. The net gun, which captured two ravens in two attempts in Alaska (R. Ambrose pers. comm.), was also unsuccessful in our study. Even padded leghold traps, our most effective technique, were considerably less effective than in the 1 other study which employed them (J. Hughes pers. comm.). Similar to this study, however, most other studies captured ravens primarily during winter and spring. Only three of ten studies captured ravens during other times of year (Table 1).

We believe our relatively low success with leghold traps was not due to inadequate concealment of traps. One would expect, if this was the case, that we would have captured primarily less-experienced, juvenile ravens. However, most of our captures were adults. We suspect our poor trapping success was due to a combination of four factors: interference by other species during leghold trapping, a history of raven persecution in the study area, prior experience with coyote (*Canis latrans*) control measures, and an abundant, year-round, food supply.

Leghold trapping was sometimes interfered with by non-target captures. Coyotes, and domestic dogs and cats were attracted to baits and sometimes either removed baits or were captured in traps. Ravens were also frequently accompanied by Black-billed Magpies (*Pica pica*) which fed more readily on carcasses than ravens did. Consequently, magpies were often captured first and in front of nearby ravens. The response of ravens toward captures of other species was similar to their response toward captures of conspecifics.

Ravens are commonly shot in our study area (U.S.D.I., F &W.S., unpubl. data) which may explain their apparent wariness toward trapping activities. Knight (1984) observed stronger avoidance behavior by ravens nesting in areas of high persecution than by those nesting in

areas with low persecution. Goodwin (1976) also observed exceptional corvid wariness toward changes in their environment in areas where they had been persecuted.

Ravens are also occasionally captured in leghold traps set around large carcasses intended for coyotes and are commonly flushed or shot at coyote bait stations (U.S.D.A., Anim. Damage Control pers. comm.). Given nearly a century of exposure to these activities, ravens may have learned to exercise caution toward large carcasses. Kilham (1985) also observed raven wariness toward baits in New Hampshire and attributed such behavior to prior experience with coyote trapping.

Characteristics of the food supply for ravens in our study area may partially account for the apparent disinterest ravens often showed toward baits. Agricultural and natural food sources together provide an abundant, perennial, food supply for ravens in our study area. Consequently, our study area supports both exceptionally large nesting (U.S.D.I. 1979) and year-round, roosting populations of ravens (Young and Engel 1988). We believe the continuous existence of a rich food supply decreased the odds of a raven selecting a bait for food.

There appear to exist area-specific differences in raven behavior (Knight 1984) that may prove crucial to meeting the objectives of a study which requires their capture. We recommend the use of padded leghold traps for capturing ravens in areas where they appear exceptionally wary of visible capture devices. Based on our study and the results of previous studies, we also recommend the use of carrion and live mice for baiting ravens, and suggest that trapping efforts for ravens be concentrated during the winter and spring when success is likely to be higher.

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