ALASKA DEPARTMENT FISH AND GAME

Juneau, Alaska

STATE OF ALASKA
Bill Sheffield, Governor

DEPARTMENT OF FISH AND GAME
Don W. Collinsworth, Commissioner

DIVISION OF GAME
W. Lewis Pamplin, Jr., Director
Steven R. Peterson, Research Chief

WOLF-DEER-HABITAT RELATIONSHIPS IN SOUTHEAST ALASKA

By

Christian A. Smith
Robert E. Wood
LaVern Beier
and
Kent P. Bovee

Progress Report
Federal Aid in Wildlife Restoration
Project W-22-4, Job 14.13

(Printed June 1986)

PROGRESS REPORT (RESEARCH)

State: Alaska

Cooperators: USDA Forest Service

Project No.: W-22-4 Project Title: Big Game Investigations

Job No.: 14.13 Job Title: Wolf-Deer-Habitat Relationships in Southeast Alaska

Period Covered: 1 July 1984-30 June 1985

SUMMARY

Ten wolves (Canis lupus) were trapped 11 times between January and March 1985. Eight of these wolves were radio-collared and released. Two wolves died of starvation within 1 month of marking; the other 6 were monitored throughout the balance of the report period. The collared wolves were found to be members of 4 of the suspected 8 packs on Revillagigedo Island. The total population of wolves was estimated to be 29-51 in early winter and 26-37 in spring.

Wolf packs used distinct territories without significant overlap. Territory sizes varied widely and appeared to be related to food abundance. Availability of deer (Odocoileus hemionus sitkensis), beaver (Castor canadensis), and garbage differed among pack territories and these diet differences were reflected in the composition of scat collections.

Key words: Alaska, Canis lupus, Odocoileus spp., predator-prey relationships, home range, food habits.

CONTENTS

BACKGROUND

Over the past 2 decades, numerous investigations have been undertaken to evaluate aspects of the relationships between wolves (*Canis lupus*) and deer (*Odocoileus* spp.). Most of these studies have dealt with numerical relationships (Pimlott et al. 1969; Mech and Frenzel 1971; Mech 1975, 1977*a*; Mech and Karns 1977; Hebert 1981; Hebert et al. 1982; Jones and Mason 1983; Hatter 1984), predation rates, or wolf food habits (Kolenosky 1972, Van Ballenberghe et al. 1975, Mech 1977*b*) and behavioral adaptations of these species to each other (Mech 1972, Hoskinson and Mech 1976, Mech 1977*c*, Fritts and Mech 1981, Nelson and Mech 1981). Many other studies have dealt with relationships between wolves and other ungulate species (or groups of species) and we have begun to appreciate the complexity and variation in predator-prey systems. Little attention has been paid to the influence of habitat on the interactions between wolves and deer, with the exception of general comments on the role of deteriorating habitat quality due to forest succession on wolf-deer relationships in Minnesota (Mech and Karns 1977), or speculations on the effects of habitat alteration due to logging in coastal old-growth forests on wolf-deer relationships in Alaska (Van Ballenberghe and Hanley 1982) and British Columbia (Hebert et al. 1982, Hatter 1984).

Since no predator-prey system can function free of the influence of the primary trophic level, it is imperative that future analyses concentrate on the effects of habitat productivity and structure on wolf-deer relationships. This study is intended to meet that challenge by investigating the spatial and trophic relationships among wolves, deer, and other prey resources, with special regard to the influence of habitat structure on those relationships. Of particular concern is the influence of current timber management on deer (and therefore wolf) distribution and population dynamics.

Initially, it will be necessary to evaluate the basic parameters of the wolf populations, including pack sizes, distribution, and stability of the food base. Once this information is gained it will be possible to investigate deer distribution and dynamics relative to wolf activity and habitat conditions. Ultimately it should be feasible to incorporate the knowledge gained into a conceptual model of wolves, deer, and habitat; such a model may be useful in wildlife management and land-use decision making.

STUDY OBJECTIVE

To determine the spatial and trophic relationships of wolves and deer in natural and altered habitats in Southeast Alaska.

JOB OBJECTIVES

1. To determine size, distribution, and stability of wolf packs.

2. To determine activity areas, hunting patterns, and deer-killing rates for specific packs.

3. To determine habitat composition of wolf pack territories.

4. To determine food habits of selected packs and the overall wolf population.

5. To determine relative abundance of major prey species within selected pack territories.

6. To determine deer density relative to wolf pack territory borders and habitat characteristics.

7. To monitor deer population trends in various habitat areas and wolf pack territories.

STUDY AREA

The study area consists of Revillagigedo and associated islands and adjacent portions of the Cleveland Peninsula within Game Management Unit (GMU) 1 (Fig. 1). The terrain is part of the Coast Foothills geological formation, which is generally mountainous with narrow valleys and steep slopes. Elevations range from sea level to 1,500 m. Lowlands are dominated by old-growth hemlock (Tsuga heterophylla) - spruce (Picea sitchensis) forests with significant components of cedar (Chamaecyparis nootkatensis and Thuja plicata) in areas of poor drainage. Muskegs occur on many areas of level terrain. Logging of commercial-volume stands has been extensive in some watersheds on Revillagigedo Island, is continuing in other parts of the island, and is planned for the Cleveland Peninsula. Treeline occurs at approximately 700-800 m elevation; higher areas are dominated by alpine heaths, rock, and limited permanent snowfields.

METHODS

Objective 1 - Size, Distribution, and Stability of Wolf Packs

To permit assessment of wolf pack sizes and movements, wolves were captured for radio collaring using No. 4 Newhouse steel foot traps in tidepool and dry land sets baited with seal (Phoca vitulina) and beaver (Castor candensis) and with foot traps, foot snares, and neck snares in blind sets along trails. Sets were made in estuary or shoreline areas where

wolves or wolf sign were observed by project personnel or previous activity was reported by local residents. Sets were checked as often as possible (usually every 24 to 72 hours) given constraints of weather, tides, and vessel performance.

Captured wolves were sedated by injection of 2-4 cc of M-99 (etorphine hydrochloride, D-M Pharmaceuticals, Sellersville, Pa.) with a jabstick. Wolves were weighed, measured, sexed, tattooed, ear-tagged and fitted with radio collars (Telonics, Mesa, Az.). Trapped feet were examined for injuries and each wolf was injected with 2 cc of the antibiotic Lincocin (Lincomyocin hydrochloride, UpJohn Inc., Kalamazoo, Mi.). After marking, wolves were injected with 2-4 cc of the antagonist drug M50-50 (diprenorphine hydrochloride, D-M Pharmaceuticals, Sellersville, Pa.) and released.

Radio-collared wolves were located from the air using a PA-18-150 Super Cub, a Cessna 185, or a Cessna 207; wolves were located from the ground via triangulation. Aerial relocations were made every 5 to 15 days, weather permitting, except for 1 week in July 1985 when daily relocations were made. Ground relocations were obtained with greater frequency for wolves accessible via road system.

Size of wolf packs was based on observations of wolves at the time of the relocations, from tracking wolves from the air or on the ground, or from identification of individual voices during group howling. Because aerial observations of wolves and tracks, or differentiation of voices, could easily lead to underestimates of the actual number of wolves present, all pack size figures that are based strictly on aerial or howling data should be considered minimums.

Pack territories were mapped using the minimum convex polygon technique. In those cases where a single relocation occurred well beyond the range of a polygon based on all other movements, the single relocation was treated as a possible extra-territorial excursion (Messier 1985) and was excluded from analysis of territories. Because most wolves were located 20-30 times during this report period, this approach is similar to the use of the 95% of closest relocations for plotting the polygon (Harestad 1981, Bowen 1982, Messier 1985). Territory size was determined by polar planimeter.

Since this is the 1st year of the study, it is not yet possible to assess stability of pack territories. In future reports, movements of radio-collared wolves will be analyzed to determine whether seasonal or year-to-year changes occur in spatial-use patterns.

Objective 2 - Activity Areas, Hunting Patterns, Deer-Kill Rates

Radiolocations of each collared wolf were plotted on the territory-minimum convex polygon to identify activity areas

within the territory. Timing of relocations was used to interpret the significance of replicate relocations within 1 general area (i.e., use of potential den sites from late April through June). To date, data are limited and further analysis is unwarranted.

During this report period, collection of information on hunting patterns was limited to observing whether any potential food source was present in the vicinity of each relocation and noting anecdotal accounts of pack behavior based on tracks in the snow. No data were collected on deer-killing rates.

Objective 3 - Habitat Composition of Pack Territories

Because information on pack territories is still preliminary, no activities for this objective were planned or undertaken.

Objective 4 - Food Habits

Wolf scats were collected opportunistically from beaches and trails when encountered in the course of setting and checking wolf traps or relocating collared wolves. Rendezvous and den sites identified from the air or reported by other field personnel were located on the ground and searched for scats. Logging roads in the White River drainage, Revillagigedo Island, were also driven on a monthly basis, when accessible, to collect scats. Each scat was individually bagged in plastic and labeled with the date and location of collection and estimated date of deposition. When several piles of fecal matter were found in close proximity and it was uncertain how many separate defecations were represented, all the feces were placed in a single bag to reduce bias associated with frequency of occurrence analysis.

Superficial examinations of scats were made as they were collected, and general abundance of various prey species was noted when major collections were obtained (i.e., at den or rendezvous sites). Future reports will include detailed analysis of frequency of occurrence and relative frequency of various prey items in the scats.

In addition to scat collections, stomach contents were taken from wolves purchased from local trappers or incidentally killed by project activities. Contents were frozen for later analysis.

Objective 5 - Prey Species Abundance Within Pack Territories

Because information on pack territories is still preliminary, no activities for this objective were planned or undertaken.

Objective 6 - Deer Density Relative to Pack Borders and Habitat

Because information on pack territories is still preliminary, no activities for this objective were planned or undertaken.

Objective 7 - Deer Trends in Wolf Territories

Because information on pack territories is still preliminary, no activities for this objective were planned or undertaken.

RESULTS

Objective 1 - Size, Distribution, and Stability of Wolf Packs

Wolf traps were set in a total of 26 locations on Revillagigedo Island and the Cleveland Peninsula (Fig. 2) for various lengths of time from November 1984 through April 1985. To minimize conflicts with active recreational trappers and to provide the opportunity to live-capture wolves for sale to the State, efforts during this reporting period were concentrated primarily on Revillagigedo. Seven wolves were trapped a total of 8 times in steel foot traps, 2 wolves were trapped once each in neck snares, and 1 wolf was trapped once in a foot snare (Table 1). Of the 10 wolves trapped, 8 were successfully handled and released. One wolf trapped in a steel foot trap broke the trap chain and escaped with the trap. The wolf trapped in the foot snare pulled the drag to the edge of a stream where the snare became entangled in brush. Indications are that she died of hypothermia within 4 to 8 hours.

Two of the wolves caught in the steel foot traps apparently suffered debilitating injuries to the foot and 2 others were partially crippled. Juvenile female No. 1 was held by 2 toes of a forepaw for approximately 48 to 72 hours. She did not have any lacerations, but was believed to have a broken toe when released. Her tracks indicated that within 6 days of release her foot was bleeding. Her injured foot may have contributed to her inability to relocate the other pack members or to secure food on her own. She apparently starved to death 24 days after release and when her carcass was recovered, she had sloughed the toes that had been in the trap.

Adult female No. 9 was caught by a forepaw and was held in the trap for 48-96 hours before handling. The extent of injury to her foot was sufficient to require amputation of portions of the 3 trapped toes. This wolf apparently starved to death 4 weeks after capture and was found to be suffering from minor infection of the injured foot at the time of death.

Juvenile male No. 3 was caught by a hind foot and spent approximately 48 hours in the trap before handling. He was

suffering from a severe laceration and broken tarsal bone when released on 16 February 1985. This wound was inflamed and swollen when he was recaptured by a front foot on 22 February. When recaptured he spent less than 6 hours in the trap and suffered no evident damage. Tracking indicated that he was traveling on 3 feet and lagged behind other pack members for several weeks after his initial capture, but his injuries eventually healed. (See discussion of the Town Pack movements below for further details.)

Juvenile female No. 4 was caught by a forepaw and spent approximately 48 hours in the trap. She suffered severe lacerations and a broken toe, and tore off 1 claw. She managed to keep pace with the rest of the pack for 10 days, but then took a separate route back to the Ketchikan city dump. Tracking indicated she was not using the forepaw when traveling. Her injuries apparently healed within a few weeks as she resumed moving with the rest of the pack members. (See discussion of the Town Pack's movements below for details.)

Neither of the adult male wolves caught in neck snares suffered lacerations or other obvious neck injuries. Both wolves had been in the snare for over 48 hours when handled and had minor swelling of lips and gums from chewing on the cable. The foot-snared wolf did not appear to have suffered any injury from the snare and when skinned was not found to have any bruising at the site of the snare. However, the fact that she died relatively soon after capture may prevent drawing valid conclusions from this incident regarding the potential for injuries from foot snares.

Results of radio tracking, aerial searches for tracks, observations during trapping activities, and information from local wolf trappers indicated that wolf packs were distributed on Revillagigedo Island as shown in Fig 2. The total early winter population was estimated to be 39-51 wolves; the late winter population was estimated at 26-37 (Table 2). The pattern of distribution is unknown for wolves on the Cleveland Peninsula at this time. The only pack of any size known to be on the Cleveland Peninsula was found in the vicinity of Helm Bay in early November 1984. At that time, it appeared that there were 8 or 9 wolves in the pack. During the trapping season, recreational trappers caught and killed 5 members of that pack on the flats in Helm Bay. This trapping activity occurred over a period of 4 to 6 weeks when the pack concentrated its activity in the Helm Creek watershed. At least 4 of the 5 wolves were juveniles. All other sightings of wolves or wolf tracks on the Cleveland Peninsula were of singles or pairs.

Descriptions of known or suspected packs on Revillagigedo Island follow.

Alava Bay Pack

The Alava Bay (AB) pack is believed to have consisted of 3 or 4 wolves in fall 1984, including captured wolves No. 7 and No. 8. Following the death of No. 8 in the trap, wolf No. 7 rejoined at least 1 other wolf and moved over a territory of approximately 70 km² (Fig. 2). One suspected excursion in early summer added 25 km² to the total area used by this pack between February and August 1985.

Because wolf No. 8 was in estrus at the time of her death, it was not anticipated that this pack would produce pups in 1985, and circumstantial evidence indicates that this was the case. This means the pack should currently have 2 or 3 members. However, during July 1985 tracks of an unknown number, but probably more than 3 wolves, were found in the southwest corner of the AB pack's territory at a time when wolf No. 7 was found to be using an area 3 to 5 km to the east. Thus, our observations of wolf No. 7 may not reveal the true size of the AB pack, or wolf No. 7 and his companion(s) may be a social unit separate from the larger pack that covers a similar area. (For a similar situation see discussion of the Northeast Pack and Klu Bay Pair below.)

East Chuck Pack

In fall 1984, the East Chuck (EC) Pack is believed to have consisted of 3 to 5 wolves, including wolf No. 2. Based on the movements of wolf No. 2 from February through July 1985, it appears this pack covered a territory of about 175 km² (Fig. 2).

Movements of wolf No. 2 during May and June 1985 indicated that this pack was centering its activity at a den site. However, to date, no observations have been made of the pack to confirm the presence of pups; the current size of this pack is unknown.

Lake Grace Pack

The Lake Grace (LG) pack is believed to have consisted of 6 or 7 wolves in December 1984, based on a group howling session observed on the shore of Sargent Bay. By the time wolf No. 6 was captured south of Ella Creek, the pack had declined to 3 or 4 wolves, and by early March 1985 the pack consisted of 3 wolves. The LG pack produced pups in the spring of 1985, and its current minimum size is 5 wolves. Based on the movements of wolf No. 6, the LG pack ranges over a territory of approximately 400 km², including portions of Smeaton Island (Fig. 2). One possible excursion by wolf No. 6 in March 1985, into the area normally used by the AB pack, added an additional 150 km² to the pack's total use area.

Town Pack

The Town Pack (TP) is believed to have included a minimum of 8 and possibly as many as 11 members in December 1985, based on extensive tracking in fresh snow in the White River drainage. Subsequently, wolves No. 3, No. 4, and No. 5 were captured from this pack. No over-winter mortality was documented in this pack, but recent observations have only confirmed the presence of 7 adult wolves in the pack at this time. One pup was observed and the tracks of other pups were found at a rendezvous site near Ketchikan in July 1985, but the size of the litter and total size of the pack remain unknown.

Following their capture, wolves No. 3, No. 4, and No. 5 traveled over an area of approximately 155 km^2 (Fig. 2). The majority of their time was spent in proximity to the Ketchikan city landfill, but various pack members made regular movements throughout the territory.

Northeast Pack

The Northeast (NE) pack consisted of 6 wolves when first encountered at Portage Cove in January 1985. At that time wolf No. 1 was trapped and the rest of the pack moved on to the north. Wolf No. 1 was unable to relocate the pack in the Portage or Carroll Creek drainages, and subsequently starved.

The other 5 wolves in the NE pack spent the balance of the winter in the vicinity of Klu Bay, Orchard Lake, and western Behm Canal until 1 additional member was trapped at Klu Bay in April 1985. Unfortunately, the chain on the trap broke and the wolf escaped before it could be radio-collared. Following this incident the NE pack moved to the Neets Creek drainage and was not observed in the Klu Bay area again through the remainder of the trapping period. Whether or not this pack produced pups in 1985 is unknown.

Based on the above observations, it was estimated that the NE pack ranged over a territory of about 340 km^2. However, without having a radio-collared wolf in the pack it is impossible to accurately assess this pack's movements.

Klu Bay Pair

In addition to the NE pack, a pair of wolves made regular use of the Klu Bay area and other portions of the NE pack territory. These 2 wolves were tracked from the air along a route from the head of the Portage Creek drainage to Portage Cove, then north and west back to the Orchard Lake area. They were also observed on the flats at the mouth of Cow Creek. This pair was never seen interacting with the NE pack; in fact, their visits to the Klu Bay flats occurred at such a time that no contact was made with the NE wolves. Nevertheless, the areas used by the 2 groups overlapped substantially, and it is

possible that at some time in the past this pair was a part of the NE pack social unit.

One member of the pair, wolf No. 9, was trapped at Klu Bay in April 1985. From the condition of her teeth, it was determined that she was extremely old, and as a result of extended time in the trap, she suffered significant injury to her forepaw. Before her death (which occurred 4 weeks later), this female had moved to the vicinity of the mouth of Carroll Creek, a distance of about 20 km. A field autopsy indicated that starvation was the cause of death and that she was carrying a single, near-term male fetus. A single set of tracks along the creek adjacent to the location where the wolf was found indicated that wolf No. 9's mate remained in the area.

Naha River Pack

The Naha River (NR) pack is believed to have comprised at least 4 members in fall 1984, 2 of which were trapped by a local recreational trapper in Moser Bay (Fig. 2). The pack territory estimate for this group is based on observations by several local trappers and on tracks observed during telemetry flights.

Carroll Inlet Pack

The Carroll Inlet (CI) pack is believed to have been substantially reduced by recreational trapping during the 1983-84 season and may have consisted of only 2 to 4 wolves in early fall 1984. Two wolves were shot by a deer hunter within the suspected range of this pack in September 1984 and no subsequent observations of wolf tracks or scats were made along logging roads or in intertidal areas normally frequented by these wolves. In fact the only evidence that the Carroll Inlet pack has persisted is a single fresh deer kill found in the area of overlap between the CI pack and the LG pack. At this time the LG radio-collared wolf was 8 km distant and the tendency of the LG pack appeared to be to avoid the suspected CI pack territory in spite of higher deer densities than in the LG territory.

Objective 2 - Activity Areas, Hunting Patterns, Deer-Killing Patterns, and Deer-Killing Rates

Alava Bay Pack

During late winter, wolf No. 7 was found to be moving over most of the AB pack territory; this wolf did not concentrate its activities at any particular site. Most relocations occurred in areas of low- to mid-volume forest cover where deer were expected to be during this relatively mild winter. One relocation occurred in the vicinity of an active beaver colony.

In spring, No. 7's movements centered on an area near a stand of riparian spruce approximately 3 km inland from his point of capture. It was suspected that there might be a den at this location but a field examination of the area revealed only a well-used trail system and former rendezvous site (Fig. 2). Among the scats we found were some small diameter feces, apparently from a pup of the previous year.

In midsummer, wolf No. 7's activities were centered around a new rendezvous site to the west of Alava Bay. Feces collected from this site did not include any that were believed to be pup scats. During late summer this wolf resumed wide-ranging movements over the pack territory.

East Chuck Pack

Throughout the winter, wolf No. 2 ranged over most of the EC pack territory. Several relocations occurred near active beaver colonies, but most were in forested areas where deer could be found. In spring this wolf repeatedly returned to 2 locations in George Inlet where the pack may have had a natal den (Fig. 2); however, on-ground searches for a den were unsuccessful. In late summer, wolf No. 2 was located in the vicinity of several streams where wolves have previously been reported to be feeding on spawning salmon.

Lake Grace Pack

Throughout the winter, spring, and summer, wolf No. 6 ranged over a wide area, but over 70% of all relocations occurred in the vicinity of active beaver colonies. Although this pack made at least 1 of the 2 observed deer kills made during winter, it obviously relies extensively on beaver.

In spring, wolf No. 6 concentrated his movements on a stand of spruce timber in the upper Grace Creek valley. A search of this area in July revealed the location of a natal den and a larger rearing den nearby, both located beneath large spruce root systems. All but 2 of over 80 scats collected at the dens were dominated by beaver hair and bones, further emphasizing this pack's dependence on this prey source.

Late in the summer, however, several relocations were made in subalpine areas presumably being used by deer; 1 relocation was made on an alpine ridge at a spot where 12 deer had been observed 10 days earlier. It was not clear whether or not the pack had made a kill, but no deer remained in the vicinity.

Town Pack

Because of the Town Pack's proximity to Ketchikan, the presence of an accessible road system in its territory, and the presence of 3 radio-collared wolves in the pack, this group's movements were the most thoroughly documented.

Following their captures at Mahoney Lake, all 3 wolves moved to the mouth of the White River where wolf No. 3 was recaptured. Subsequently, this pack moved up the White River drainage and all except wolf No. 4 crossed into the Ward Creek drainage and moved to the vicinity of Connell Lake, and then to the Signal Creek campground. Wolf No. 4 took a "short cut" through the Ketchikan Lakes watershed and moved to the vicinity of the city landfill at Ketchikan. The rest of the pack reached the landfill within several days.

Throughout winter, spring, and early- to midsummer, this pack spent the majority of its time near the landfill. In fact, wolf No. 3, whose foot was broken at capture, remained within 0.5 km of the landfill for over 3 months. Periodically, other members of the pack, including the radio-collared adult female and radio-collared female pup, would retrace their route from the landfill to the White River, then to either Ward Creek and Carlanna Creek or through Ketchikan Lakes and back to the landfill. When away from the landfill they were found to be hunting both deer and beaver.

Prior to the denning period, the wolves spent most of their daylight hours resting in forested areas immediately east and south of the landfill. However, at denning, which coincided with the emergence of bears in the spring, the wolves shifted to an area approximately 1 km to the southeast of the dump. From the tone of the radio signal it appeared that the adult female spent much of her time in May and June underground, presumably in a den with new pups. She was observed with 2 other adults and at least 1 pup at a rendezvous site near the den in mid-July through mid-August; neither she nor the 2 radio-collared yearlings left the immediate vicinity of the den for more than 12-24 hours.

In late summer, the pack returned to the White River drainage and remained there for at least 3 weeks. During that time there were over 100,000 spawning pink salmon in the river. Many of the fish were vulnerable to predation in shallow riffles and literally tons of carcasses were washing up on bars and gravel banks during this time.

Objective 4 - To Determine Food Habits of Selected Packs and of the Overall Wolf Population

Approximately 400 wolf scats, about 60% of them fresh, have been collected to date. The source pack for most of these scats can be safely assumed from the time and location of collection. Detailed analysis of feces has not yet begun, but some major differences in diet are superficially evident.

Scats collected from the range of the Town Pack were clearly dominated by scraps of garbage and trash. The major natural prey item was deer, and beaver appeared to be relatively uncommon in the territory of this pack. Scats from the Alava

Bay pack contained predominantly deer remains, but beaver also occurred in several scats. Over 70 feces collected at the Lake Grace den site contained, almost exclusively, beaver hair, bones, and teeth; only 2 appeared to contain deer hair. Scats of the Northeast Pack and the Klu Bay pair also appeared to contain a substantial proportion of beaver remains. Goose, duck, and swan feathers were noted in several scats from the Lake Grace and Northeast packs.

DISCUSSION

During this initial year of the study we were successful in capturing and radio collaring wolves in several packs on Revillagigedo Island and we began to identify areas used by these wolves. Unfortunately, injuries associated with 1 capture method, steel foot traps, resulted in the loss of 2 wolves shortly after release. Future capture efforts will concentrate on alternative methods.

Preliminary results indicate that wolf packs on Revillagigedo conform to the pattern of using distinct territories with relatively little overlap. The size and configuration of the territories appear to be functions of prey abundance (or food, in the case of the Town pack). Continued telemetry efforts should clearly establish spatial-use patterns of the wolves in the study area.

The major difficulty encountered to date is the limited visibility of wolves and their prey due to the dense vegetation. This problem will continue to affect our ability to assess actual numbers, frequency of pack splitting, and predation rates, from the air. Some of the objectives of this study may not be attainable as they are presently stated.

ACKNOWLEDGMENTS

Gerry Downy's considerable local experience and expertise were valuable in capturing several of the wolves monitored in this study and in formulating overall population estimates and pack distributions. Dave Kelleyhouse and Dan Grangaard also contributed useful ideas to our capture efforts. Skipper Ron Rusher and assistant boat officer Kevin Perry provided immeasurable support for the project on the R/V Sundance and we are grateful for their good seamanship and great cooking. Dick Hamlin continued to be an enthusiastic participant in the study. His experience with local wolf habits and trapping and his skill as our pilot were essential to the progress made to date.

Additional financial support provided by the Ketchikan Area Office of the Tongass National Forest, USDA Forest Service,

through a cooperative agreement facilitated by Win Green and Greg Clevenger, is gratefully acknowledged.

LITERATURE CITED

Bowen, D. 1982. Home range and spatial organization of coyotes in Jasper National Park, Alberta. J. Wildl. Manage. 46: 201-216.

Fritts, S. H., and L. S. Mech. 1981. Dynamics, movements and feeding ecology of a newly protected wolf population in northwestern Minnesota. Wildl. Mono. 80. 79pp.

Harestad, A. S. 1981. Computer analysis of home range data. B. C. Fish and Wildl. Bull. No. B-11. Victoria, B. C. 25pp.

Hatter, I. W. 1984. Effects of wolf predation on recruitment of Vancouver Island black-tailed deer. M.Sc. Thesis. Univ. of Ida.

Hebert, D. M. 1981. Predator management for the benefit of prey species in a resource allocation system. B. C. Fish and Wildl. Branch, Nanaimo. 16pp.

_____, J. Youd, R. Davies, H. Langin, D. Janz, and G. W. Smith. 1982. Preliminary investigations of the Vancouver Island wolf (Canis lupus crassodon) prey relationships. Pages 54-70 in F. H. Harrington and P.C. Paquet, eds. Wolves of the world. Noyes Publications. Park Ridge, New Jersey. 474pp.

Hoskinson, R. L., and L. D. Mech. 1976. White-tailed deer migration and its role in wolf predation. J. Wildl. Manage. 40(3):429-441.

Jones, G. W., and B. Mason. 1983. Relationships among wolves, hunting and population trends of black-tailed deer in the Nimpkish valley on Vancouver Island. Fish and Wildlife Report, ISSN 0701-581x, No. R-7. B.C. Fish and Wildl. Branch. Victoria, B.C. 26pp.

Kolenosky, G. B. 1972. Wolf predation on wintering deer in east central Ontario. J. Wildl. Manage. 36:357-369.

Mech, L. D. 1972. Spacing and possible mechanisms of population regulations in wolves. (Abstract) Amer. Zool. 12:672.

_____. 1973. Wolf numbers in the Superior National Forest of Minnesota. USDA Forest Ser. Res. Pap. NC-97. N. Cent. For. Exp. Sta. St. Paul, Minn. 10pp.

_____. 1975. Disproportionate sex ratios of wolf pups. J. Wildl. Manage. 39:737-740.

_____. 1977a. Productivity, mortality, and population trend of wolves in northeastern Minnesota. J. Mammal. 58:559-574.

_____. 1977b. Population trend and winter deer consumption in a Minnesota wolf pack. Pages 55-83 in R. Phillips and C. Jonkel, eds. Proc. 1975 Pred. Symp., Bull. Montana For. and Cons. Exp. Sta., Univ. Mont., Missoula, Mont. 268pp.

_____. 1977c. Wolf pack buffer zones as prey reservoirs. Science 198:320-321.

_____, and L. D. Frenzel. 1971. Ecological studies of the timber wolf in northeastern Minnesota. USDA For. Serv. Res. Pap. NC-52 N. Cent. For. Exp. Sta., St. Paul, Minn. 52pp.

_____, and P. D. Karns. 1977. Role of the wolf in a deer decline in the Superior National Forest. USDA For. Serv. Res. Pap. NC-148. N. Cent. For. Exp. Sta., St. Paul, Minn. 23pp.

Messier, F. 1985. Social organization, spatial distribution, and population density of wolves in relation to moose density. Can. Jour. Zool. 63(5):1069-1077.

Nelson, M.E., and L. D. Mech. 1981. Deer social organization and wolf predation in northeastern Minnesota. Wildl. Mono. 77. 53pp.

Pimlott, D. H., J. A. Shannon, and G. B. Kolenosky. 1969. The ecology of the timber wolf in Algonquin Park. Ont. Dept. Lands For. Res. Rep. (Wildl.) 87:1-92.

Van Ballenberghe, V., A. W. Erickson, and D. Byman. 1975. Ecology of the timber wolf in northern Minnesota. Wildl. Monogr. 43:1-43.

_____, and T. A. Hanley. 1982. Predation on deer in relation to old-growth forest management in southeastern Alaska. Pages 291-296 in R. Meehan, T. R. Merrell, Jr., and T. A. Hanley, tech. eds. Proc. Symp. Fish and Wildl. Rel. in Old-growth Forests. Am. Inst. Fish. Res. Biol., Wash. D.C.

PREPARED BY:

Christian A. Smith
Game Biologist III

Robert E. Wood
Game Biologist III

LaVern Beier
Technician V

Kent P. Bovee
Technician III

SUBMITTED BY:

Steven R. Peterson
Acting Research Coordinator

APPROVED BY:

W. Lewis Pamplin, Jr.
Director, Division of Game

Steven R. Peterson
Research Chief, Division of Game

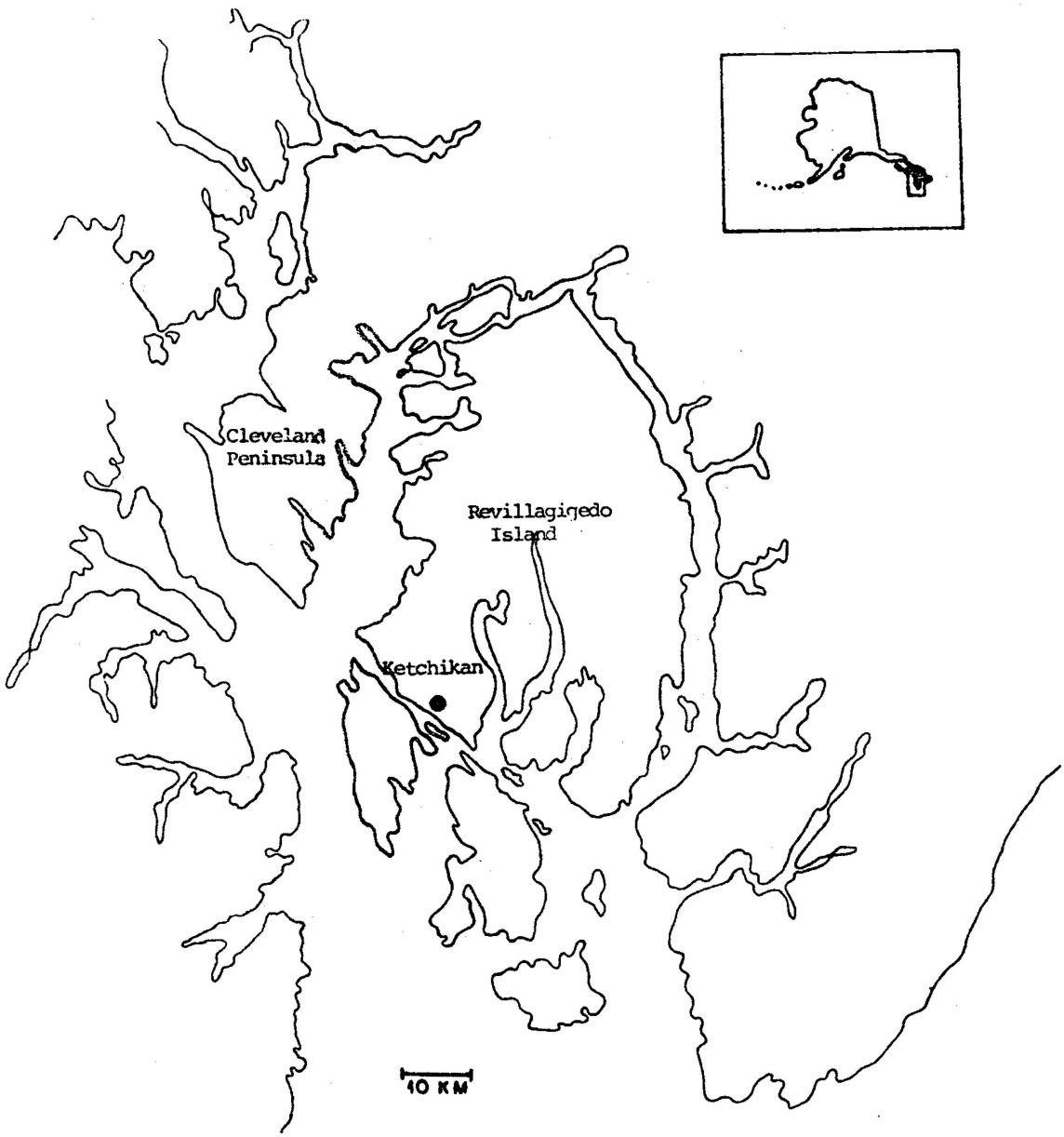

Fig. 1. Location of Revillagigedo Island and Cleveland Peninsula study areas in southeast Alaska.

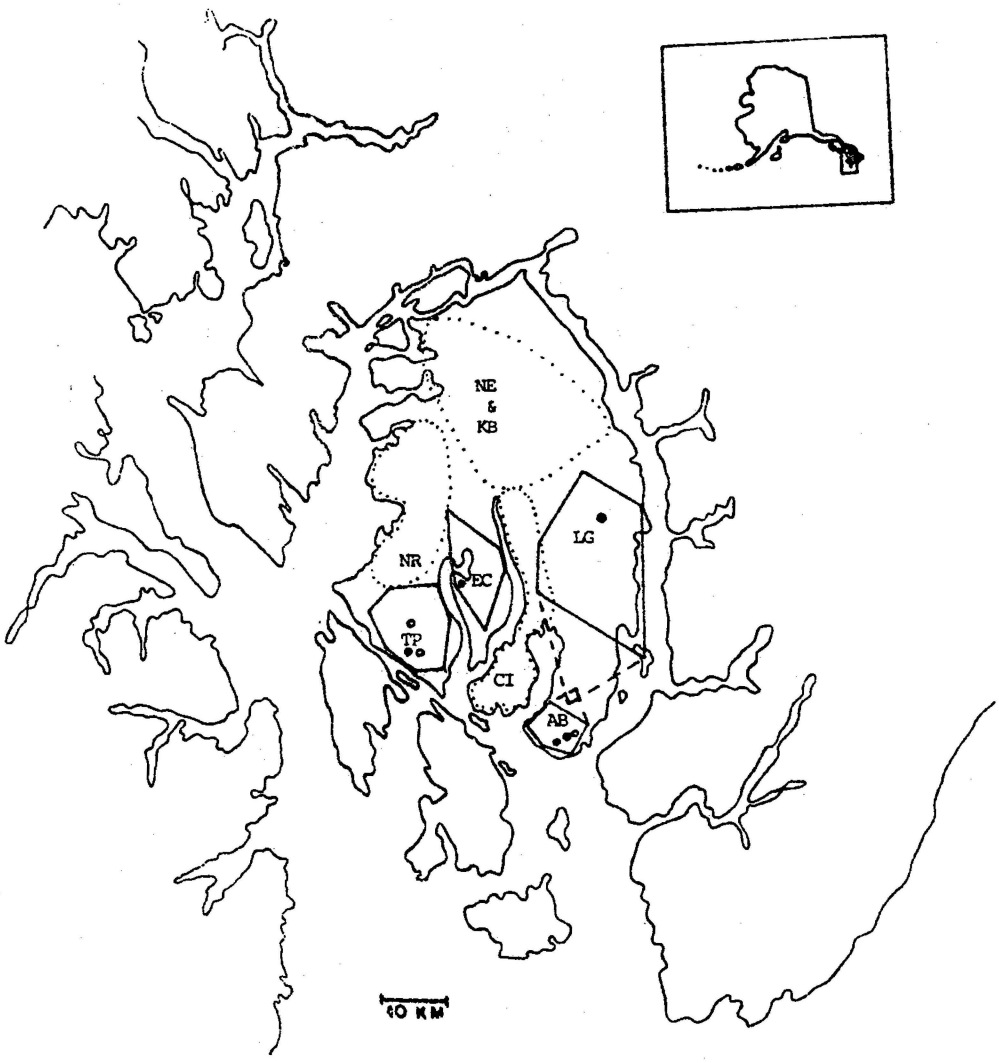

Fig. 2. Location of known (solid lines) and suspected (dotted lines) wolf pack territories on Revillagigedo Island, Alaska. Dashed lines indicate area included in possible extra-territorial excursions by wolves in the Lake Grace (LG) and Alava Bay (AB) packs. Solid circles represent den sites; open circles rendezvous sites.

Table 1. Results of wolf trapping near Ketchikan, Alaska, in late winter 1985.

Wolf No.	Age[a]/Sex	Date caught	Trap[b] type	Set type	Time in trap	Injuries	Current status
1	J/F	1-19-85	FT	Baited trail	48-72 hrs	Broken toe	Dead
2	J/M	2-13-85	FT	Baited tidepool	<0.5 hr	Minor lacerations	Live
3	J/M	2-16-85	FT	Baited tidepoool	36-50 hrs	Severe lacerations and broken tarsus	Live
4	J/F	2-16-85	FT	Baited tidepool	36-50 hrs	Broken toe, lost claw, severe lacerations	Live
5	A/F	2-16-85	FT	Baited tidepool	36-50 hrs	Moderate lacerations and swelling	Live
3	A/M	2-26-85	FT	Trail	6 hrs	None	Live
6	A/M	2-26-85	NS	Trail	24-48 hrs	None	Live
7	A/M	3-01-85	NS	Baited trail	47-72 hrs	None	Live
8	J/F	3-01-85	FS	Trail	48-72 hrs[c]	None	Dead
9	A/F	4-02-85	FT	Baited trail	48-96 hrs	Amputated 3 toes	Dead

[a] A = adult; J = juvenile.

[b] FT = No. 4 steel foot trap; NS = neck snare; FS = foot snare.

[c] Available evidence indicated wolf died of hypothermia within 4-8 hrs. of capture.

Table 2. Estimated size of Revillagigedo Island, Alaska, wolf population in early and late winter, 1984-85.

Pack	Number of wolves		Cause of losses
	Early winter	Late winter	
Alava Bay	3-4	2-3	Trap mortality
East Chuck	3-5	3-5	--
Lake Grace	6-7	3	Starvation
Town	8-11	8-11	--
Northeast	6	4	Trap injuries
Klu Bay	2	1	Trap injuries
Naha River	4-5	2-3	Trapped
Carroll Inlet	2-4	0-2	Shot
Other[a]	5-7	3-5	
Total	39-51	26-37	

[a] Single wolves or unknown pairs assumed to be approximately 10-15% of known pack total numbers.