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REPRODUCTIVE POTENTIAL OF SITKA BLACK-TAILED DEER IN SOUTHEAST ALASKA

By

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Progress Report
Federal Aid in Wildlife Restoration
Project W-22-4, Job 2.8R

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PROGRESS REPORT (RESEARCH)

State: Alaska

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

Job No.: 2.8R Job Title: Reproductive Potential of Sitka Black-Tailed Deer in Southeast Alaska

Period Covered: 1 July 1984-30 June 1985

SUMMARY

Sixty-two Sitka black-tailed deer (Odocoileus hemionus sitkensis), 54 does and 8 bucks, were collected during February 1985 from the Hoonah Sound area of Baranof and Chichagof Islands in southeastern Alaska, to provide specimen materials for reproductive studies. All meat from the deer collected was given to the Alaska Pioneers Home in Sitka.

In addition to collecting reproductive materials, jaws were collected for use in aging animals; weights, measurements, and fat deposits were recorded to quantify the overall condition of the animals. Analyses of specimens have been initiated. All of the 13 fawns (10 months of age) that were collected harbored heavy and probably fatal infections of lung worm (Dictyocaulus viviparous).

Key words: Odocoileus hemionus sitkensis, reproductive potential, collection, Southeast Alaska, lung worm.

CONTENTS

BACKGROUND

The range of Sitka black-tailed deer (Odocoileus hemionus sitkensis) includes the dense coastal forests of northern British Columbia, islands of southeastern Alaska (the Alexander Archipelago), and a narrow strip of forested habitat along the adjacent mainland. Transplants have extended the natural distribution northward to Yakutat, Prince William Sound, and westward to the Kodiak Island group (Elkins and Nelson 1954).

Sitka black-tails are the most important big game species in southeastern Alaska, with an annual estimated harvest of up to 15,000 animals (Alaska Department of Fish and Game records). Additionally, deer are used in a nonconsumptive way by people who enjoy viewing and photographing them.

Few quantitative physiological data are available for the species. This precludes establishing sound management goals and objectives. For instance, lack of knowledge of the reproductive potential of the species makes it impossible to assess and predict the ability of deer populations to rebound following winter die-offs which are known to occur periodically (Merriam 1970). Game managers are also unable to develop management goals that would allow manipulation of populations through hunter harvests because reproductive capabilities and subsequent annual increments are unknown. Additionally, biologists and land-use planners have had difficulties predicting the quantitative effects of habitat alterations on deer. These alterations include the extensive harvesting of old-growth

timber in southeastern Alaska. Recent research (see below) demonstrates that deer numbers decline as the carrying capacity of their range is reduced by large-scale cutting of old-growth forest.

Past research has focused on habitat use patterns by black-tailed deer (Klein 1965; Bloom 1978; Schoen 1978; Barrett 1979; Billings and Wheeler 1979; Schoen and Wallmo 1979; Schoen et al. 1979; Wallmo and Schoen 1980; Rose 1982; Schoen and Kirchhoff 1982; Schoen and Kirchhoff 1985). Results show that the deer of southeast Alaska are dependent upon uneven-aged, old-growth forests; logged, second-growth habitat has substantially fewer deer than does old-growth.

While the studies cited above have been extremely valuable for understanding the habitat requirements of deer in southeastern Alaska, objective and effective management requires additional information relating to the health, condition, and productivity of the deer population. These data have not yet been collected or published. Merriam (1963, 1966, 1968, 1970, 1971) looked at habitat requirements of black-tailed deer and proposed to examine the reproductive biology of the species (under Fed. Aid in Wildl. Res., Proj. W-6-R-3, 1963), but the results of that study apparently were not published. Klein (1964) correlated range condition with body size for black-tailed deer on 2 small islands in southeastern Alaska but offered no information pertaining to reproductive biology. Schoen et al. (1982) reported examining the reproductive tracts of 6 female deer collected in spring 1981 for diet, reproduction and condition studies, and noted in utero counts of 1.8 fawns per adult doe. No ovarian analyses were reported.

The reproductive biology of most mammals in North America is well understood and documented (see Chapman and Feldhamer 1982). Taber (1953), Golley (1957), Kistner et al. (1980), and Thomas (1983) have published important information on reproductive studies for the Columbian black-tailed deer (O. h. columbianus). However, an extensive review of the literature revealed only the limited and cursory data of Schoen et al. (1982) pertaining to the Sitka black-tailed subspecies.

Deer management in Alaska has been successful simply because the undisturbed habitat has produced an abundance of deer. Predictable severe winter weather cycles (Juday 1984) have caused natural fluctuations in deer numbers (see also Merriam 1970). Populations typically have rebounded when winter severity moderated. However, clear-cut logging of approximately 20,000 acres per year is causing massive alteration of productive wildlife habitat. Logged areas managed under 90- 120 year rotations will never again support deer densities comparable with those found in unaltered habitat. Managers must now have

a better understanding of the physiological responses of deer to natural and altered habitat conditions since human population and demands are increasing while the habitat base is shrinking.

OBJECTIVES

To determine the reproductive potential of Sitka black-tailed deer in southeastern Alaska; specifically:

1. To determine age-specific ovulation and fertilization rates.

2. To determine the importance of each of 4 age classes to population productivity.

3. To determine the age of 1st breeding and the age at which fertility begins to decline (reproductive senescence).

STUDY AREA

The study was conducted in the Hoonah Sound area of Baranof and Chichagof Islands in southeastern Alaska (Fig. 1). This area was selected because of its high deer population, its remoteness from high human-use areas, and because the habitat there is relatively pristine.

MATERIALS AND METHODS

Traditionally, deer have been aged by the tooth replacement and wear technique described by Severinghaus (1949). More recently, tooth sectioning has replaced the Severinghaus technique because sectioning provides more precise results (Thomas and Bandy 1973).

The breeding history of individual female deer can be determined through ovarian analyses (Thomas 1983). Information from such analyses, when correlated with different age-classes of a population, can be used to determine the reproductive potential of the population.

Limited attempts were made to solicit reproductive materials from hunter-killed animals. Failure to obtain a sufficient sample in this way required the collection of additional samples after the deer season ended. Deer were collected from the study area during February 1985 when deep snow caused deer to concentrate at low elevations.

Deer were collected by approaching from salt water in skiffs and shooting at close range. Attempts were made to locate bullet placement high through the shoulders to sever the spine and produce instantaneous death.

Each deer was immediately weighed whole and the sternum split, allowing access to the anterior vena cava, from which blood samples were collected. Blood samples were collected in 3-cc Vacutainers (Vacutainer Systems, Rutherford, N.J.). Two red-stoppered and 1 each purple-, green-, and gray- stoppered Vacutainers were filled, when possible, from each animal. The red-stoppered Vacutainers contain no additives and are used to collect whole blood. Purple-, green-, and gray-stoppered Vacutainers contain the anticoagulants Ethylenediamino-tetra-acetate (EDTA), Heparin, and Sodium- flouride, respectively, and are used to measure packed cell volume (PCV), electrolytes, and glucose levels, respectively. After blood samples were collected, the specimens were taken to the field camp aboard the M/V Polaris, a state-owned, 58-foot vessel. On the Polaris the following measurements were taken: total length, tail length, right hind foot, head length, head width, and chest girth. The deer was then eviscerated and the following specimens collected, labeled, and stored: complete reproductive tract, mandible, heart, liver, hair sample, rump muscle tissue, left femur, left kidney with fat naturally attached, rumen sample, and fecal sample. Eviscerated carcasses were weighed and examined carefully for ecto-parasites. The lungs, caecum, and small intestines were opened and examined for internal parasites. The subcutaneous fat was measured at its thickest place along the spine, approximately 10-cm anterior to the base of the tail. Skinned carcasses, with feet removed at tarsal and carpal joints, and head removed at atlantal-occipital articulation, were weighed. Finally, all edible flesh was removed and stored for later delivery to the Alaska Pioneers Home in Sitka. During this process careful observations were made for tapeworm cysticerci.

The whole blood was centrifuged and sera extracted and frozen. Blood samples containing anticoagulants were refrigerated. Organs were weighed on an Ohaus 2610 triple beam balance (Ohaus, Florham Park, N.J.) as follows: Hearts were trimmed to remove extraneous tissue, split longitudinally, rinsed to remove all blood from the auricles and ventricles, and weighed. Livers were rinsed and all extraneous tissue (congealed blood, diaphragm, kidney, blood vessels) was removed prior to weighing. The left kidney from each animal was weighed with and without adhering fat deposits. Kidney fat was cut off of both ends of the kidney, perpendicular to the long axis (Kirkpatrick 1980). Fat was also cut off the convex (top) side of each kidney. After the weight with fat had been obtained, the remaining fat was peeled off and the kidney reweighed. The

kidney fat index was calculated by dividing the fresh weight of the kidney fat by the fresh weight of the fat-free kidney from each deer and multiplying by 100 (Finger et al. 1981). Fetuses were sexed, weighed, and measured (forehead-rump length, left hind foot length). Ovaries were extracted and placed in 10% formalin. Mandible and femur bones were cleaned of extraneous tissue and frozen. Muscle samples approximately 10 cm^2 in size were taken from the biceps femoris of each deer and frozen. Rumen contents were mixed within each rumen, a sample taken, and stored in 10% formalin.

RESULTS AND DISCUSSION

General

The collecting crew assembled at the study area on 16 February 1985. Weather was extremely inclement, though it proved beneficial by concentrating large numbers of deer on beaches. During the ensuing 10-day collecting period, precipitation in the form of rain and/or snow was incessant. Working in two-man crews from open skiffs, 62 deer were collected. No deer were crippled and lost. The sample consisted of 54 does and 8 bucks.

We found it easy to distinguish adult bucks from adult does based on the low angle at which bucks hold their ears and on facial color patterns; bucks had noticeably whiter faces than does. Antler pedicels could frequently be observed.

The sex of fawns, on the other hand, could not be determined without physically checking. As a result, 6 of the 13 fawns collected were bucks. Two yearling bucks were mistakenly shot for does.

Our original intent was to collect 25 female deer from each of the fawn, yearling, 2-1/2- and 3-1/2+- year-old age- classes. Based on the tooth wear and replacement technique, the age composition of the does collected included: fawns, 7; yearlings, 4; 2-1/2 year olds, 10; 3-1/2 year olds, 11; 4-1/2 year olds, 6; and 5-1/2 year olds or older, 16.

Examination of the fawn reproductive tracts revealed no fetuses. Therefore, we concluded early in our collecting efforts that a sample of 7 female fawns would be sufficient and the likelihood of killing additional buck fawns could be eliminated, so no additional fawns were collected.

Age-Specific Ovulation and Fertilization Rates

Ovaries have been processed and read by Dr. Terry Spraker (Wildlife Laboratories, Inc., 1322 Webster Ave., Fort Collins,

CO 80524) following Thomas (1970, 1983). Incisiform teeth have been sent to Matson's (P.O. Box 308, Milltown, MT 59851) for aging purposes. Results of these analyses will be discussed in the final report.

Importance of Age-Classes to Population Productivity; and Age of 1st Breeding and the Age at Which Fertility Declines

These will be described when all analyses are completed.

Miscellaneous Specimen Analyses

Femur samples were analyzed for marrow fat content at the ADF&G lab in Anchorage following the dry-weight process (Neiland 1970).

Blood analyses have been completed by Medical Laboratories Network (1899 Palma Drive, Ventura, CA 93002) and Sitka Community Hospital (209 Moller Street, Sitka, AK 99835).

Rumen samples have been sent for analyses to Wildlife Habitat Lab, Washington State University (Pullman, WA 99164-4220).

Muscle, heart, liver, and kidney tissue samples are in storage at -62 C at the University of Alaska, Fairbanks. If funds become available, they can be subjected to electrophoretic analyses for determining genetic variability.

Hair and fecal samples are in storage in Sitka.

The above analyses, together with body measurements and the other data and observations recorded as noted above under MATERIALS AND METHODS, will be summarized in the final report.

Additional Findings

Only 4 animals tentatively assigned to the yearling age-class were collected. That sample size was not intentional. Rather, since deer identified as does were shot at random, we suspect that the small yearling sample may simply reflect limited numbers of individuals in that age-class. Whether this represents low fawn recruitment in 1984 or high fawn mortality between 1983 and 1984 is unknown. However, the fact that we observed numerous fawns in the field during February leads us to believe that high mortality prior to 1 year of age is probably the factor responsible for the low number of yearlings. Additionally, a trip to Hoonah Sound on 21 March 1985 provided us with a subsequent opportunity to observe deer on the beach. Although we observed 20-30 adult deer, we only saw 3 fawns, suggesting that many of the fawns seen during February may have died during the 1-month interim.

Fawn mortalities stem from 3 probable sources: nutritional stress (especially during winter), predation, or parasitism. The winter of 1983-84 was quite mild so nutritional stress is an unlikely cause of low yearling numbers in 1984-85. No major predators outside of man occur in the study area and hunters typically avoid harvesting fawns. Thus, parasitism may be a major cause of fawn mortality. All 13 fawns collected contained heavy lung worm (Dictyocaulus viviparous) infections.

According to W. M. Samuel (pers. commun.), lung worm is a parasite of the young; healthy adult deer either resist, get rid of, or are not influenced by this species. W. Foreyt (pers. commun.) believes the heavy lung worm infestations we found during this study could very likely be fatal, but only to fawns. Foreyt, like Samuel, indicated that adult deer have immunity to lung worm.

RECOMMENDATIONS

To fully understand the reproductive potential of a population, data on the contribution of primapara females is essential. This collection produced only 4 animals tentatively assigned to the yearling age-class. That is an insufficient sample size. Extensive efforts will be made to collect reproductive tracts from female deer taken by hunters during November and December 1985. These will be analyzed as outlined above. No other physiological measurements will be made. Additional collections by Department personnel are not recommended because of the difficulty in differentiating and selecting the desired age-class from live animals.

This study will provide an understanding of the reproductive potential of the Sitka black-tailed deer. Logically, the next research indicated is to translate this in utero and age-specific reproductive effort into survival through 1 year of age so that the actual annual increment into the herds will be known.

The significance of the lung worm infection needs to be addressed.

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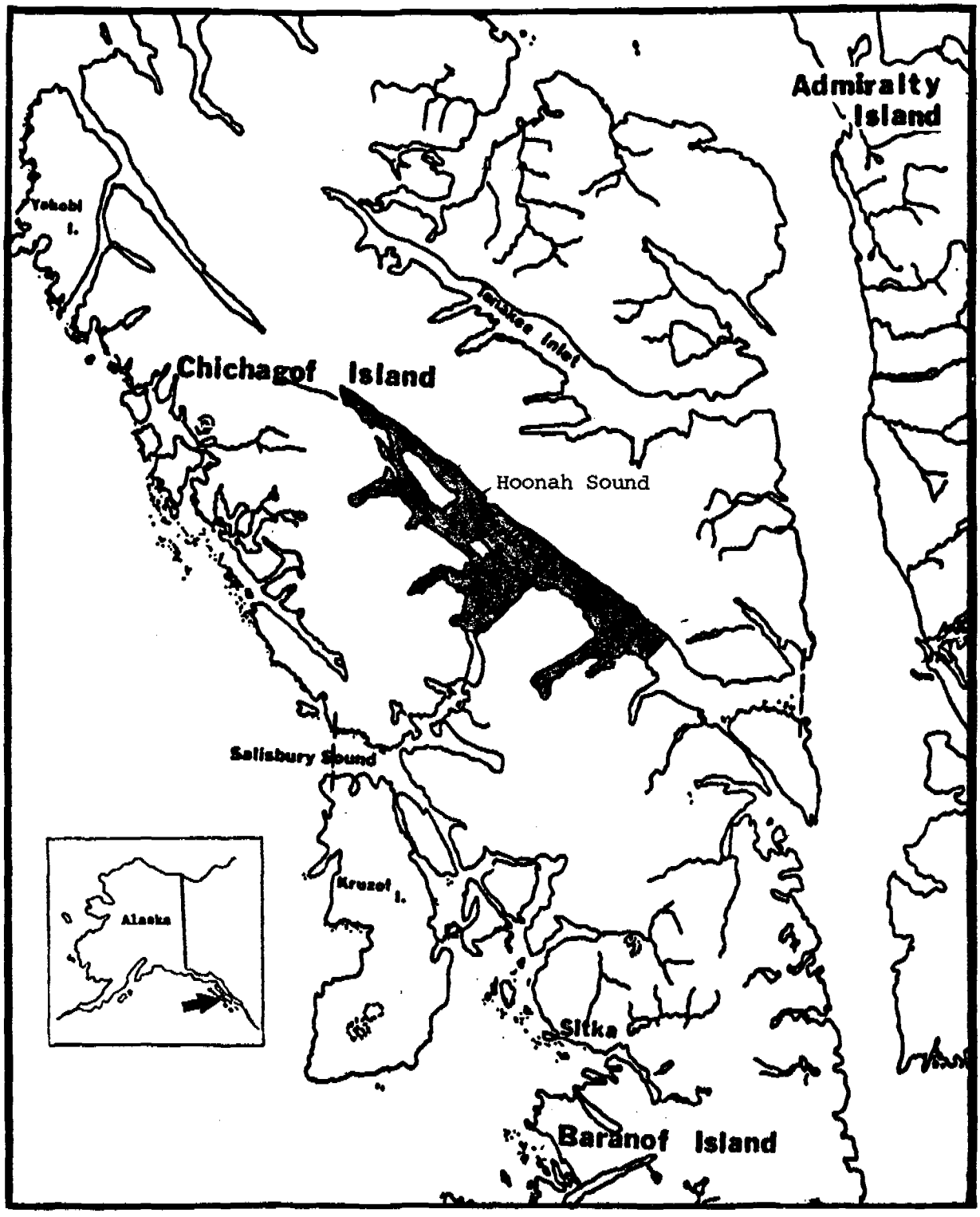

Fig. 1. Hoonah Sound study area and its location relative to Chichagof, Baranof, and Admiralty Islands, 1985. Hatched lines delineate the boundaries of the study area. All deer were collected within the shaded area.