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## Feral Rabbits on San Juan Island, Washington

### Abstract

A survey of the rabbit distribution on San Juan Island, Washington, using several methods, showed a gradient from plentiful at the southern end to few or no rabbits at the northern end. This gradient is caused by a combination of vegetation, soils, and rainfall. A shot sample of rabbits showed their body and organ weights and litter size to be higher than those of rabbits from other feral populations around the world. There appear to be few predators, and land use patterns favor the continued existence of the rabbit on the Island.

The first report of feral rabbits, *Oryctolagus cuniculus*, on San Juan Island appears to be that of Couch (1929). There have been several other articles since, but they all have been in relation to the introduction of the "San Juan rabbit" to the U.S. mainland (e.g., Latham, 1955; Thompsen, 1955; Kirkpatrick, 1959).

The purpose of this note is to present contemporary data on the feral rabbits on San Juan Island.

San Juan Island lies adjacent to the U.S.A./Canadian border near Vancouver; it is approximately 22 km long and has a maximum width of 10 km near the center.

The Island has a temperate climate with cool, dry summers and mild, moist winters. Rainfall varies from 740 mm at Roche Harbor (northern end) to 48 mm per year at Cattle Point (southern end). The soils on San Juan are glaciated tills, varying from well-drained at Cattle Point to poorly drained in the middle and northern parts of the Island (data from Schlots *et al.*, 1962).

There is a distinct gradient from medium to dense stands of conifers, often with thick ground cover, at the northern end of San Juan to open pastures and grasslands with clumps of conifers and deciduous trees and hedgerows at the southern end.

A map of the Island showing areas of timber and open grassland was drawn from aerial photographs (Figure 1a).

*Distribution of rabbits.* The distribution of rabbits on the Island is shown in Figure 1b. The map is compiled from the results of a survey carried out in November, 1968, and May-June, 1969. Evidence of rabbits is based on the presence of burrows and indications of their current use (e.g., fresh digging), the presence of fresh feces on dung hills, and the numbers of rabbits, both alive and dead, observed on roads around the Island.

Rabbit numbers vary from plentiful at the southern end of the Island to none or very few at the northern end, and in general are restricted to the well-drained soils in areas cleared for farming. Burrows in these soils are dry in early summer and hence

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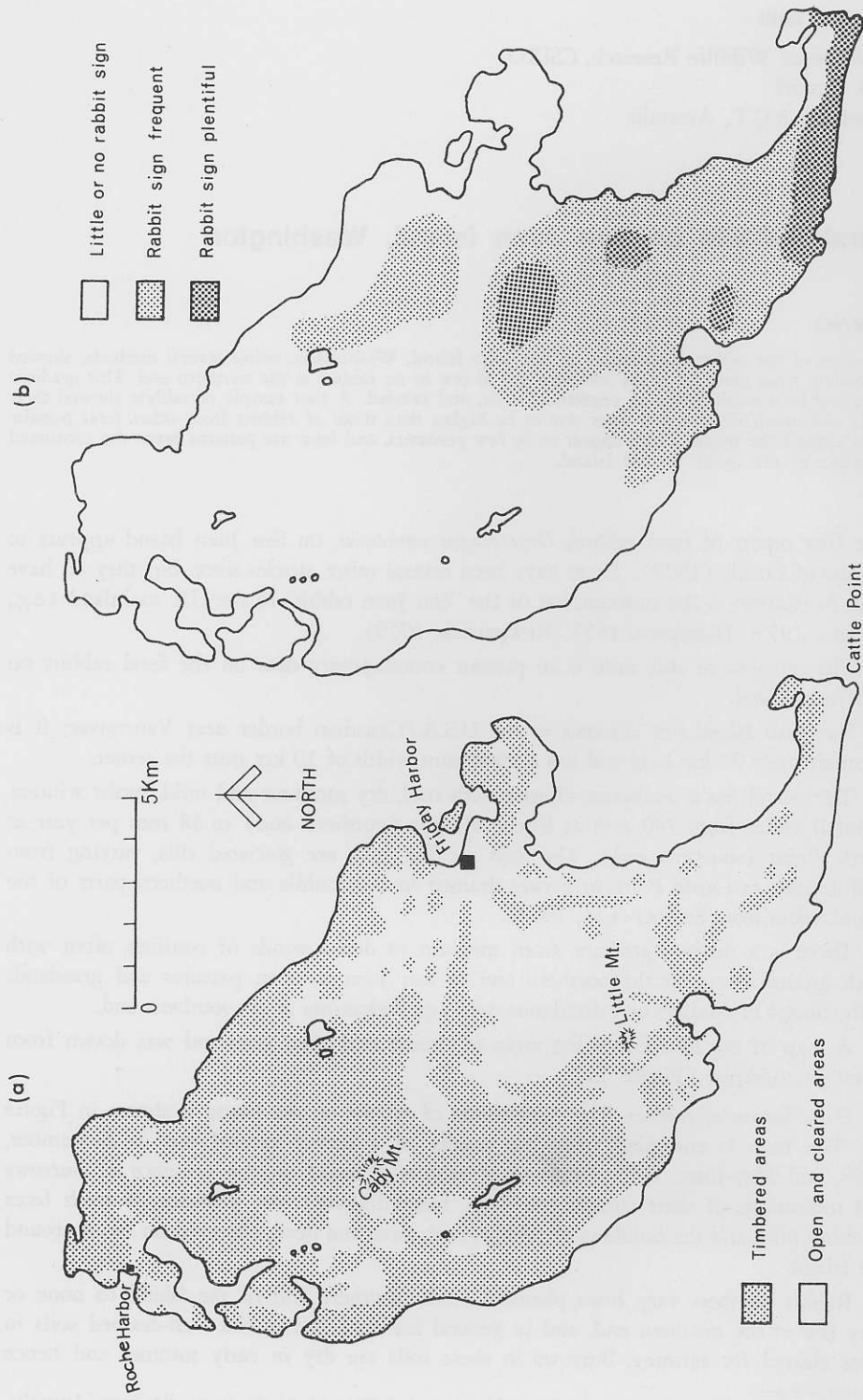


Figure 1. (a) Distribution of timbered, open, and cleared land on San Juan Island. (b) Rabbit distribution on San Juan Island.

favor the survival of nestling rabbits which are adversely affected by dampness (Myers and Poole, 1963).

Hedgerows and patches of brush in cleared areas are utilized by rabbits as shelter from predators, and as resting places during winter months when burrows are damp.

Areas that are heavily timbered or have poorly drained soils support very few rabbits.

*General biology.* A sample of 38 rabbits was collected at the southern end of the Island between June 19 and 28, 1969. Data on sex, body weight, ear length, weights of adrenal glands and reproductive organs were collected from each individual.

The sample was divided into two age-groups by plotting body weight against eye lens weight. Two groups were apparent, those with a heavy body weight/eye lens weight (adults), and a group with much lighter weights (juveniles) (Myers and Gilbert, 1968).

The mean adult body weight for both sexes is significantly larger than body weights of adult rabbits collected from several areas in Australia, England, and New Zealand (Table 1). The large body weight of the San Juan Island rabbit has been recorded

TABLE 1. Comparative body weights of rabbits from different localities.

Locality	Mean Body Weight (g)	
	Male	Female
San Juan Island	2162	2414
Australia*	1304	1540
New Zealand <sup>a</sup>	1559	1796
England <sup>b</sup>	1416-1465	1404-1453

\*Myers (1970, and unpubl.)

<sup>a</sup>Wodzicki and Darwin (1962).

<sup>b</sup>Stephens (1952).

previously (Latham, 1955; Thomsen and Evans, 1964). The ears of the sample rabbits are longer than those in Australian rabbits. Large ears are a characteristic of several domestic breeds, including the "Belgian hare," which was one of the first breeds of the domestic rabbit to have been released on San Juan (Couch, 1929).

The predominant coat color in the San Juan rabbits is agouti (36/38), suggesting that the rabbits may be reverting to wild type, but retaining the large body size and ears of domestic breeds.

The organ weights of the adults are also heavy when compared with Australian rabbits (Myers, 1970). Adult males have a particularly heavy spleen (mean 1.1 gm), indicating the possibility of some kind of physiological stress.

The smallest female to show reproductive activity weighed 1,500 gm. This figure contrasts with a body weight of 1,000 gm (3 months old) recorded in Australian rabbits by Myers and Poole (1962) and Dunsmore (1971).

The litter size as indicated by corpora lutea numbers had a mean of 7.3, which is much larger than that of any known wild rabbit population. In Australia, the mean litter size varies between 4.49 and 5.65 (Myers, 1970); in New Zealand, litters average 6.70 (Wodzicki and Darwin, 1962); and in Wales, 4.36 (Stephens, 1952). Two adult females in the sample showed evidence of resorbed embryos and no new ovulations, suggesting that their breeding season had ended.

The heavy body weights of the juvenile females indicate a fast growth rate, further evidence of their domestic ancestry.

*Predators.* The red fox, *Vulpes vulpes*, was released by local inhabitants on San Juan Island in 1963 and again in 1965, presumably to help control rabbits. Several fox scats found at Cattle Point contained claws of the horned lark, *Otocoris alpestris*, small mammal bones, and short fur (8 mm). On San Juan the fox does not appear to excavate rabbit burrows containing nestling young, as it does in Australia and Europe.

Both the golden eagle, *Aquila chrysaetos*, and bald eagle, *Haliaeetus leucocephalus*, were observed on numerous occasions feeding on rabbit carcasses. Apparently most of these rabbits had been killed by automobiles. Retfalvi (1970) points out that these dead rabbits are an important food source for the bald eagle on San Juan Island.

A sharp-shinned hawk, *Accipiter striatus*, was observed with part of a freshly killed rabbit kitten near Eagle Point in May, 1969.

Human activities constitute one of the main mortality factors for the rabbits on San Juan Island. Although the shipping of rabbits and their carcasses from San Juan Island has fallen off considerably in the last few years, there is still regular netting (catching) and shooting of rabbits on the Island. Attempts to control rabbit numbers by poisoning appear to have had little effect.

*Current situation.* The successful maintenance of numbers by the European rabbit on San Juan Island is probably attributable to several factors—(a) the Island has a Mediterranean-type climate and the well-drained soils at the southern end of the Island are suited for rabbit burrows; (b) the Island has cleared, well-grazed areas which provide favorable feeding areas for rabbits; (c) hedgerows and patches of brush provide protection from predators and additional cover for rabbits; and (d) there is no rabbit predator of any consequence on the Island.

#### Acknowledgments

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## Association News

The annual fall meeting of Officers and Trustees was held in Ellensburg, Washington, on October 22, 1977, with fourteen members in attendance. Reports of the Secretary and Treasurer indicate the business of the Association to be in order and the Association to be financially sound. The journal editor reported his plan to publish two double issues in 1978 to reduce the backlog of manuscripts which now exists.

President Otis Maloy announced the resignation of Vice President W. L. Barrett which was accepted with regret. Dr. Ronald J. Taylor was named his successor.

An important action taken by the Trustees was to prepare an amendment to the Constitution that establishes a method for replacement of officers when an office is vacated during a term. The amendment is included here for your information and will be voted on at the annual meeting in March, 1978.

The Trustees voted to put a dues increase before the Association at the March, 1978, meeting. The proposed schedule of dues is as follows:

Sustaining Individual Member	\$20.00	Institutions with 3000 and	
Regular Member	10.00	more students remain at	30.00
Student Member	5.00	Sustaining Corporation will	
Institutions with less than		remain at	50.00
3000 students	20.00		

These recommended increases are to fight inflation and cover part of the increased costs of the journal, particularly those costs involved with publishing 1978's extra issues. These dues would start in January, 1979.

President Maloy reported that the 1978 meeting plans for March 30, 31, and April 1 at Washington State University in Pullman are progressing on schedule. Bob Jonas is Local Arrangements Chairman and Dave Baumgartner is Program Chairman. A symposium on Science Education in Society is being planned by Glenn Crosby.

Section Chairpersons are as follows:

Botany	William R. Rayburn, WSU	Social Service	Nancy Hultquist, U of I
Forestry	Donald R. Satterlund, WSU	Soil & Water	Donald L. Johnstone, WSU
Geology	Joseph W. Mills, WSU	Zoology	John M. Larsen, Jr., WSU
Science Educ.,		Chemistry-Physics	A. Keith Dunker, WSU
Math	Glenn A. Crosby, WSU		

Proposed amendment to the Constitution which will become part of Article IV, entitled "Officers," is:

"Vacancy of the office of President is filled by advancement of the Vice-President. Replacements for vacancies in other offices shall be appointed by the President."

Milton M. Mosher, Secretary