



## Voucher Specimens of Red Squirrels Introduced to Haida Gwaii (Queen Charlotte Islands), British Columbia

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### **Abstract**

Red Squirrels (*Tamiasciurus hudsonicus*) captured at a site near Campbell River, Vancouver Island, British Columbia, were introduced to southern Graham Island, Haida Gwaii, British Columbia, about 1950. Four specimens (three males, one female), collected on the Knox Peninsula in extreme northwest Graham Island, in 1971, bring the total number of voucher specimens of the Red Squirrel from Haida Gwaii, catalogued in museum collections, to 13 (10 males, two females, one undetermined sex) – seven specimens from Graham Island and six from Moresby Island (to which a later transplant apparently occurred). Red Squirrels apparently spread from southeastern to northwestern Graham Island within about 20 years.

### **Introduction**

Many of the world's islands have provided natural "laboratories" for research on the evolution of flora and fauna (Carlquist 1974, Lack 1976, Grant 1998). The archipelago of Haida Gwaii (formerly known as the Queen Charlotte Islands), British Columbia, is among those islands where researchers have studied the evolution of plants and animals, in this case against a backdrop of debate on the glacial history of the islands (e.g., Calder and Taylor 1968, Foster 1965, Scudder and Gessler 1989, Byun 1998, Topp and Winker 2008). As with many islands around the world, Haida Gwaii also has been the site of several deliberate and unintentional introductions of non-

native animals, particularly mammals, over the last 100 years (Carl and Guiguet 1972, Gaston et al. 2008). Studies have revealed that some of these introductions have wrought negative effects on native plants and animals on Haida Gwaii and mitigation programs have been recommended (Scudder and Gessler 1989, Gaston 1994, Taylor et al. 2000, Forest 2001, Martin and Joron 2003, Gaston et al. 2008), and in some cases are being implemented (e.g., Kaiser et al. 1997, Parks Canada 2012). Introductions on islands also provide unplanned "experiments" for the study of ecological interactions between native and non-native species of flora and fauna, and evolution of new adaptations (e.g., Benkman 1993, Martin and Joron 2003, Briskie 2006). Voucher specimens of individuals sampled at the time of, or soon after, introductions are therefore important. Ten species of non-native, non-feral mammals have been introduced to Haida Gwaii (Golumbia et al. 2008), one of which is the Red Squirrel (*Tamiasciurus hudsonicus*; Figure 1).

According to Cowan (1989:179), Red Squirrels were "... liberated on Graham Island in 1947 and have established and spread throughout the islands." In a letter addressed to me, Cowan (*in litt.*, 11 October 1972) remembered some of the details of the first introduction, but not the actual date of the release:

"The squirrels which were introduced to the Queen Charlotte Islands came from the area of Vancouver Island adjacent to Campbell River [Figure 2]. The first group was trapped by myself in the Sayward Forest about 10 miles from Campbell River. They were transported to the island by the Game Branch

and released there in late July or early August, I do not have the exact time-table. A number of additional specimens were trapped by Game Warden, Rex Hayes, of the Campbell River area, and were again transported by air to the Queen Charlotte Islands, and released.”

“To the best of my knowledge all releases were made in the area between Queen Charlotte City and Tlell. However, a colleague of mine who was working near the southern cape bordering Cumshewa Inlet, reported seeing a squirrel several times in the vicinity of his camp. If this is so, either squirrels crossed Skidegate Channel from the northern to the southern Maine Island [referring to Moresby Island] or, I expect more likely, there was a small transplant onto the southern island.”

“It is my memory that the transplant was made record of in the Annual Report of the provincial Department of Fish & Game ...”

Carl and Guiguet (1972:89) gave the date of the Red Squirrel release on Haida Gwaii as 1950 and other authors have followed suit (Foster 1989:283, Forest 2001:126, Nagorsen 2005:217, Golumbia et al. 2008:9). Regardless, the release occurred a little more than 60 years ago. Golumbia et al. (2008) provided the most



**Figure 1.** Red Squirrel was introduced to Haida Gwaii (formerly Queen Charlotte Islands), British Columbia, from native populations near Campbell River, on eastern Vancouver Island, BC, about 1950. Photo by R. Wayne Campbell.

comprehensive summary of the details of the first introduction, involving apparently six individuals, and later introductions of Red Squirrels to the islands, garnered chiefly from government archival records. The reasons given for the introduction of Red Squirrels to Haida Gwaii were to facilitate gathering of Sitka spruce (*Picea sitchensis*) seeds for tree nurseries and to provide additional prey for American Marten (*Mustela americana*), to increase trapping opportunities (Foster 1989, Nagorsen 2005, Martin and Joron 2003, Golumbia et al. 2008). As with many introductions of non-native mammals (de Vos et al. 1956), Red Squirrels have effected changes in the vegetation and are influential predators on songbird nests on Haida Gwaii (Martin and Joron 2003, Gaston et al. 2008).

### Voucher Specimens

I collected four Red Squirrels in a mixed forest of western hemlock (*Tsuga heterophylla*) and Sitka spruce, about one kilometre west of the former Haida village of Kiusta (see Gessler and Gessler 1978), on Knox Peninsula that extends to the northwest cape of Graham Island (54°18' N, 133°08' W; Figures 2 and 4 [collecting locality #3, inset]), between 17 June 1971 and 24 July 1971. The skins plus skulls were deposited in the collection of the Division of Mammals, University of Michigan Museum of Zoology (UMMZ), Ann Arbor, Michigan. External measurements and testes (mm) of males, and mass (g), of each specimen are given below in the following order: total length (length from tip of nose to last tail vertebra) – tail vertebrae length (length of tail measured from base to last vertebra) – hind foot length (length of hind foot measured from edge of heel to end of longest claw) – ear length (length from notch to tip of ear), followed by mass and relevant observations:

UMMZ #121066 – 17 June, ♂ (right testis 32.8 x 9.1), 305-120-45-23.7, 219.2; four additional individuals plus one “half-grown” young also were observed on this date; runways and many piles of chewed spruce cones, attributed to the activities of squirrels, were encountered almost to the extreme northwest tip of the peninsula, at Cape Knox





**Figure 3.** An inquisitive American Marten, a potential predator on Red Squirrels on Haida Gwaii, BC, watched while runways and chewed cone piles were examined on the Knox Peninsula, Haida Gwaii. *Photo by Spencer G. Sealy, 1 July 1971. BC Photo 3768 (see Campbell and Stirling 1971).*

Moresby Island (apparently originally transplanted there [see Golumbia et al. 2008]): RBCM #01022 (♂), 15 June 1974, Mosquito Lake (#4 in Figure 2); RBCM #013135 (♂), 23 January 1985, near Sandspit (#5 in Figure 2); RBCM #015795-6 (? , ♂), 4 June 1986, both taken at Sewell Inlet, as were also the last two specimens, RBCM #015797 (♀), 1 June 1986 and RBCM #015798 (♂), 3 June 1986 (#6 in Figure 2). These specimens, and the four collected in 1971, bring the total number of Red Squirrel specimens from Haida Gwaii, catalogued in museum collections, to 13 (10 males, two females, one undetermined sex) – seven from Graham Island and six from Moresby Island (Figure 2).

### Red Squirrels on Graham Island

The specimens and observations recorded here extend the known distribution of the Red Squirrel on Haida Gwaii to the extreme northwest tip of Graham Island. About nine years after the specimens reported here were collected, Rodway et al. (1994) recorded the presence of Red Squirrels on the west coast of Graham Island, along the beach from Peril Bay to Beehive Hill, about 28 km south of Cape Knox, on 9 July and 3 August 1981. These data suggest that Red Squirrels expanded their range from the original

site of introduction in 1950, on the southeast coast of Graham Island, to the west coast of Graham Island, then to the northwest coast of Graham Island, in about 20 years. Payne (1975) recorded a linear dispersal of 19 km within six years of the introduction of Red Squirrels to Newfoundland. Golumbia et al. (2008) mentioned that a request had been made to transplant Red Squirrels to the Masset area, in northern Graham Island, in 1956, but whether this transplant took place was not confirmed. Masset Inlet may have been the first of several barriers to westward dispersal of squirrels along the north coast of Graham Island, and apparently no transplants occurred along the north coast of Haida Gwaii (Golumbia et al. 2008), which could have facilitated movements along the north shore of Graham Island toward the Cape Knox region. If this had been the path of movement, I would have expected to have recorded squirrels or evidence of their activities during a hike a few kilometres inland along the Jalum River with K.R. Summers on 1 August 1971, a site about 21 km east of Cape Knox, but I did not. Squirrels apparently moved northward along the west coast.

Squirrels were not encountered on Langara Island (Figure 4) when I studied breeding seabirds there in 1970 and 1971. I also visited the smaller Lucy Island and Cox Island, which are separated from Langara Island by narrow channels, several times during those years but no evidence of squirrel presence was detected on either island. Researchers who have worked on Langara Island since 1971 also have not recorded squirrels there, in 1981 or 1988 (Rodway et al. 1994), or as recently as May and June, 2008 (H.L. Major *in litt.*, 1 April 2012), suggesting that squirrels, fortunately, have not been transplanted to any of these islands. (The strong currents of Parry Passage, between Graham Island and Langara Island, presumably would prohibit natural colonization of Langara Island.)

It is important to note that the source population of the introduced Red Squirrels is known with certainty – in this case, Campbell River area on Vancouver Island – because this provides a basis for comparison for future studies of possible evolutionary change in Red Squirrels on Haida Gwaii. In this regard, McCabe and Cowan (1945:164) reported that Red Squirrels taken on Vancouver Island and the mainland coast north of

Queen Charlotte Sound exhibited “great uniformity” in the morphological characters they measured; however, their study should be augmented by molecular genetic analyses. Several species of rodent that are isolated on islands off the mainland coast of British Columbia, including Vancouver Island and Haida Gwaii, are larger (Carl et al. 1951; Foster 1964, 1965); thus, studies of adaptations of Red Squirrels and other species introduced to Haida Gwaii over the short- and long-terms, currently being conducted under the auspices of Parks Canada, may eventually prove to be informative, as Reimchen (1991) noted for another vertebrate recently introduced to Haida

Gwaii, the Northern Pacific Treefrog (*Pseudacris regilla*). The effects of cone depredation by Red Squirrels on the ecology of Red Crossbills (*Loxia curvirostris*) on Haida Gwaii should be assessed, taking the lead from knowledge that the availability of mature cones was substantially reduced following introductions and transplants of Red Squirrels on Newfoundland (Payne 1976, West 1989, Benkman 1993). As far as any future introductions of flora or fauna, however, we should heed Foster’s (1989:283) advice: “Because of the unpredictableness of the outcome of introductions ... no new exotics should be released on the Charlottes.” †



**Figure 4.** Looking across Parry Passage from the upper beach of Beal Cove on Langara Island, BC, on the site of the deserted Haida village of Dadens. The tip of Village Point is at the left of the photograph; in the distance, across Parry Passage, is Knox Peninsula, leading to the northwest cape of Haida Gwaii. *Photo by Spencer G. Sealy, early April 1971. BC Photo 3765.*

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