

# Genetic purity and phenotypic variation in Soay sheep in North America

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In North America there are two populations<sup>1</sup> of sheep that are all commonly referred to as ‘Soay sheep’. One population’s lineage can be traced back through an introduction into Canada in 1990, and are commonly referred to as British Soay. Since the credible pedigree is the distinguishing feature of this RBST-registered population, I will refer to them here as NA-RBST Soay<sup>2</sup>. The other population of Soay sheep in North America is *roughly* traceable, with far less complete records (mostly word-of-mouth and / or speculative) to an importation into Canada in 1974. This population today is far more variable in appearance, in fact sometimes what an individual offers for sale today as ‘Soay sheep’ have traits that do not appear in Soay on Hirta<sup>3</sup>. Many sheep from this population, in the ‘early years’ (mid-1980’s to mid-1990’s) in North America when Soay sheep were far more rare and ‘exotic’ were sold as ‘pure Soay’. This population is often called American Soay—I prefer the term North American Soay, (“NA Soay”) and will use that term here.

For varying reasons the discussions about which population is ‘more or less mixed’—which one is a ‘truer representation of the Soay found on Soay Island’, and even ‘which one is more valuable’ seem to be among the most frequently and passionately debated topics in Soay enthusiast forums in the U.S. When I started investigating Soay sheep a few years ago I did not readily understand the differences of opinion nor some of the contradictory information posted on the internet as ‘factual’ and seemingly ‘authoritative’. One would have to be somewhat naïve to think that there are never any underlying financial motives for people taking certain positions. Therefore I feel I should declare here at the outset that I have no particular financial motive for taking a position for favoring one group of sheep over the other (at least at this time!), so I will share what I have found in the hopes of helping other folks who may be new to the Soay breed better understand the choices they have and to have a truer picture of what is known about the history of ‘Soay sheep’ they might be offered.

The position taken by one ‘faction’ is that *both* populations of Soay in NA have had cross-breeding in the past, implying that both populations are therefore ‘equally impure’ (impure is used here to mean whether the **genotype** is more or less consistent with the **genotype** of Soay on Hirta). A second key position taken is that since the appearance (**phenotype**) of NA Soay is far more variable than it is for NA-RBST (e.g., neither self-colored, nor polled ewes, have been produced—yet, anyway—in NA-RBST Soay), the NA Soay is *more* representative of the **phenotype** of Soay on Hirta. Again, the novice Soay enthusiast reader might well take this to mean that NA Soay are somehow actually ‘purer’ representations of Soay on Hirta than are the NA-RBST Soay.

Literature citations are given for the assertions made above to support the positions taken, but there are, in my view, several major weaknesses in the positions taken. That is, there are either mis-interpretations (or, heaven forbid, outright mis-representation) of the content of some of these original sources. The information used here is based, wherever cited, upon careful reading and accurate representation of the original source materials. I will not give a point-by-point analysis of those mis-representations here, but would be happy to share specifics with anyone who would care to correspond with me.

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<sup>1</sup> I use the term ‘population’ here intentionally to differentiate from terms like “breeding lines” which have a different connotation, and from “a breed”. “Population” basically infers nothing more than a group with *something* in common.

<sup>2</sup> Obviously there are a lot of RBST-registered Soay sheep in the UK. For convenience in this article the term NA-RBST refers only to those RBST registered Soay in North America. To be registered with RBST requires documented pedigree back to Soay removed from the island of Hirta.

<sup>3</sup> “Soay on Hirta” is used here to mean the population of Soay sheep brought from Soay Island to Hirta in 1930, and all the descendants from those ever observed on, or still living on the island of Hirta.

First, the very definition of what constitutes a ‘breed’ has an unavoidable, but very important element of *time* (or **generations**) related to any discussion of purity. One dictionary defines ‘purebred’ as having a relatively uniform appearance derived from breeding within a population of individuals *for many generations*. For simplicity here let’s make the simplifying assumption that most Soays will lamb every year, thus years equals generations. The Soay sheep on Soay Island are believed to have been there for something between 8,000 to possibly as little as 1,000 years (most commonly assumed to be about 5,000). So after 5,000 years / generations, I think Soay Island Soay<sup>4</sup> could fairly be called at least a primitive breed<sup>5</sup> (or purebred). To assess how pure any existing population is, one needs to take into consideration how many generations have passed since any reliably documented cross-breeding. If in one case cross-breeding *may* (emphasis on *may*) have happened over 100 years ago, but for certain happened less than 20 years ago in another case, the current offspring of those simply are not ‘equally mixed-breed’. But I am getting ahead of my story line.

Second, inferences about the ‘purity’ and mixing of Soay sheep in today’s flocks is very dependent on certainty or **reliability** of the records tracing pedigrees. We must face the fact that virtually without exception no buyer of ‘pure Soay sheep’ can be absolutely guaranteed of the parentage. The word of the breeder *must* be trusted. Given at best breeders with no interest in record-keeping, or at worst some motives for mis-representation, the potential for uncertainty is unfortunately large. I will show, via a side-by-side compilation diagram, that in my view there are substantial differences in the quantity and / or reliability<sup>6</sup> of the data supporting the relative purity of the two current populations, as well at the number of generations relevant to the ‘purity’ discussion. The written breeding records of early years of NA Soay are virtually non-existent. Most of it is derived from memories and recollections of people who have been out of the Soay business for some time. Even without the motives that some *may* have had to misrepresent purity when actively selling ‘rare and exotic’ animals, one finds that the recollections about what transpired years ago are not always consistent with each subsequent re-telling. People simply can’t remember all the details too well if they are not written down—and seemingly very little was written down about NA Soay in the early days.

Third, it seems logical to me that the potential genetic variation that can result in a current population is somewhat dependent on how small a ‘funnel’ the group has been squeezed in producing the next group. In other words, a current population started from, at it’s lowest point, very few animals will have less opportunity for carrying forward all the genetic variations than one with a much larger ‘smallest number ever’. For example, when 107 Soay were removed from Soay Island, to Hirta in 1932, those sheep had a very high probability of including a very wide range of the genetic variation that existed on Soay Island (variously estimated to have a dynamic equilibrium population of somewhere between 200 and 500 Soay sheep). By high probability I mean both from the sheer number of individual sheep, but also the very large proportion of the population from which they were removed. Compare that to the 6 Soay sheep imported into Canada in 1990 which were the origins of the NA-RBST Soay group—there simply cannot be as much likelihood that those 6 contained all the genetic variations that existed in either UK-RBST or Soay on Hirta. The worst extreme of a ‘small funnel’ would be when one single animal (like the reported one Soay ram Dean Lewis imported from Canada in about 1985 as the origin of most of today’s PNW NA Soay) is the starting point for a large set of the population. One sheep almost certainly *cannot* have all the genetic variation that exists in the feral population.

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<sup>4</sup> The question of whether the Soay sheep on Soay Island, at the time they were captured in 1932 to re-populate Hirta, are ‘pure’ is discussed in a separate article.

<sup>5</sup> Recognized world experts on the subject of sheep domestication (M. L. Ryder, Juliet Clutton-Brock) call the Soay sheep (as defined by the feral sheep on Soay Island) a primitive breed—that’s good enough for me.

<sup>6</sup> By ‘reliability’ here I do not refer to the character of any particular seller, but instead to the distinction between 1) prompt and thorough written records and photographs, kept at the time of breeding and lambing, and 2) simple memories and recollections of what happened many years ago—memories that often seem to change with subsequent re-tellings.

To make a clearer comparison of these two populations in my own mind I utilize mostly the excellent *History of Soay in North America* compiled by Kathie Miller and posted on her web site, ([The History of Soay Sheep in North America](#))<sup>7</sup> and then confirmation of verifiable key printed references where possible. I like pictorial representations and therefore drew a diagram in which I have attempted to portray the three key elements listed above, simultaneously:

- The relative **time-scale** of major events, since this represents numbers of generations that have been involved.
- The relative **population size** from which individuals were selected, as well as the ‘narrowness’ of the selection from that group to start the next group.
- Some comments about the **veracity of the records** documenting the genetic purity of the animals, as compared to Soay on Hirta.

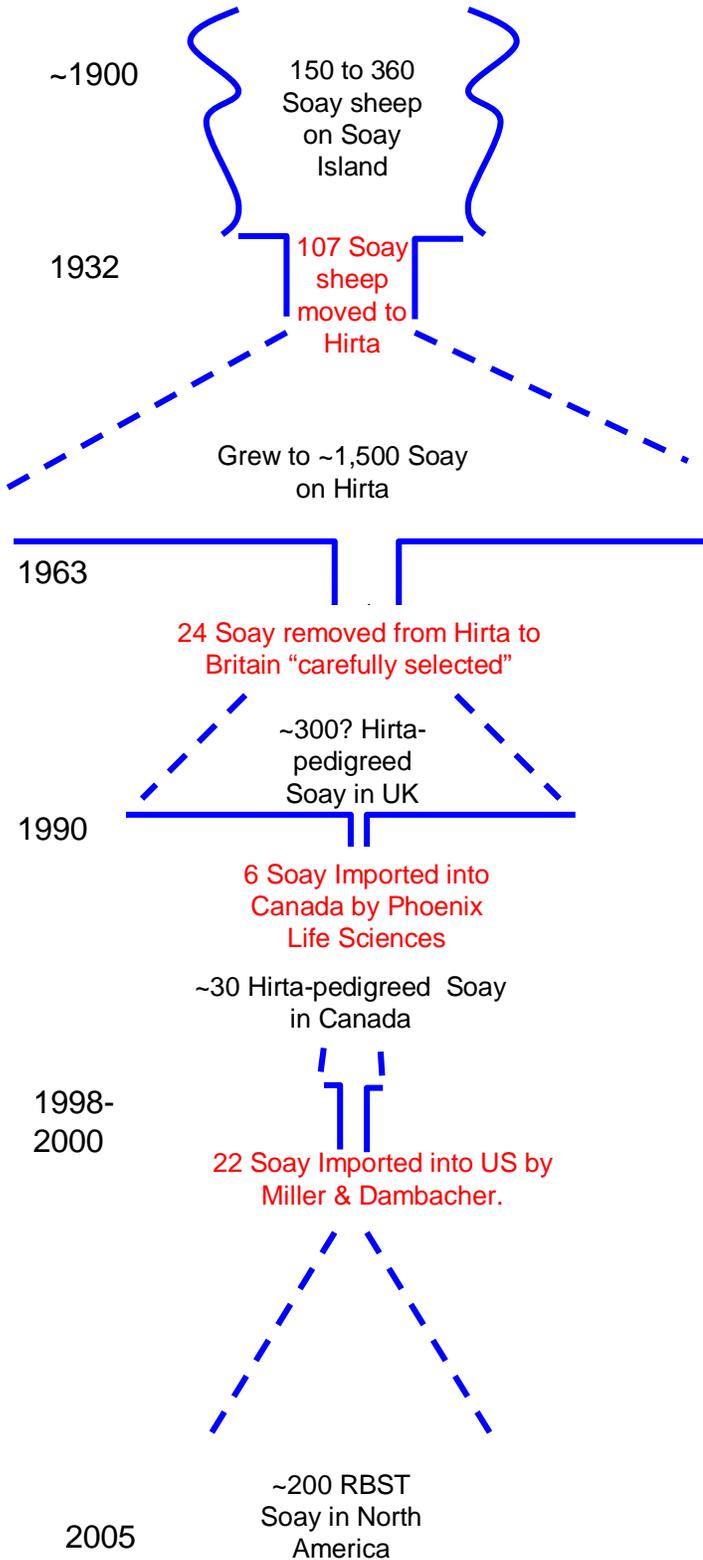
This diagrammatic representation, shown below, leads me to believe there *is* a very clear and distinct difference between the likely ‘genetic purity’ of the NA-RBST Soay and the North American Soay populations.

Any discussion of ‘purity’ of Soay seems to inevitably lead to questions of ‘value’. I might as well specify here that my conclusions say nothing about the inherent *value* of Soay from these different populations. The value of a Soay sheep will be, in my view, set by what buyers are willing to pay, not by what the seller *says* they are worth. Likewise any enthusiast is free to value any particular Soay as they may wish—but they should not be misled as to ‘purity’. At this time I own only NA Soay and I value them for their individual characteristics. I intend to represent them to potential new owners as exactly what they are—no more or less ‘pure’ than is actually known—but wonderful sheep nonetheless.

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<sup>7</sup> I would like to thank Kathie Miller for her review of this article for accuracy in capturing her records of Soay history. But the final *opinions* and conclusions expressed in *this* article are mine.

## RBST Soay in North America



## North American Soay

