

Genetic Preservation and Development of "Newfoundland Local" Sheep as a Breed: Interim Report #2

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Background

"Local Newfoundland" Sheep Characteristics

There have been several articles published and reports written on the subject of "Local Newfoundland Sheep". Most of these reports were authored by Dr. M.H. Fahmy. As well, there was the 1955 Royal Commission Report on Agriculture which reported on the early history of the Local Newfoundland Sheep. The author found no discrepancies in the description of the Newfoundland Sheep with these published articles. Dr. Fahmy reported the Local Newfoundland sheep as hardy, long and narrow heads, long legs - well developed bodies resembling North Country Cheviots with long and coarse wool - mostly white sheep with a 20% black sheep. He discussed their hardiness, longevity and that they were expected to twin and if they did not twin they were culled and used as meat.

The 1955 Royal Commission Report on Agriculture described the Local Newfoundland sheep in the following way: "A careful study of the general appearance, type and fleece of sheep flocks of Newfoundland would lead to the conclusion in that the Border Cheviot must have been the breed first introduced. Although the admixture blood of other breeds has masked or hidden or changed some of the original characteristics of the Border Cheviot, nevertheless there is unmistakable evidence of Border Cheviot breeding in sheep of scores of flocks examined all the way from Port aux Basques up the west coast to the Bay of Islands, Flower's Cove to St. Anthony, White Bay and down the Northeast coast to St. John's, and the south shore at Trepassey and St. Shott's. The same evidence was found in other parts as well, particularly in the flocks examined on the Avalon and Burin Peninsulas".

Through personal contact with the producers, there was an observation made that these sheep were late maturing which is a characteristic that is indicative of Hill Sheep. (Hammond, John, Animal Breeding, 1963)

The Local Newfoundland Sheep were referred to as "mongrels" on the Northern Peninsula while in other areas of the province as "old fashioned" sheep.

DNA Blood Sampling

DNA fingerprinting is the process of identifying genetic distance between the various breeds using microsatellite markers on all of the chromosomes. To do this, blood samples are collected in EDTA vacutainers and diluted with whole blood isolation buffer. The DNA is then subjected to protein degradation and several extractions followed by precipitation of the isolated DNA. The extracted DNA is next subjected to the Polymerase Chain Reaction using primers for specific microsatellite markers. High resolution gel electrophoresis followed by autoradiography are used to visualize the bands. Genetic distance can then be calculated. Genetic distance is used to identify how closely related the animals are related. (Dr. J.N.B. Shrestha, 1995)

Sheep Breed Registration

The registration of Sheep as a Breed is the responsibility of Agriculture and Agri-Food Canada through the Canadian Livestock Records Corporation. The following steps must be taken:

- The formation of an association for those who are breeding "Local" Newfoundland Sheep true to the breed;
- The setting of breed standards - Breed standards are intended to be used as a general guide in assessing true type for the major breeds in Canada;
- Having records of three generations from foundation stock (Note - minimum of 200 animals of F3 generation is required - F3 is the third generation of animals of a family.);
- One of the following of three options: -
 1. The Association sets up a record book to keep and maintain it's pedigree record;
 2. Seek services of Canadian Livestock Records Corporation to set up a record book; and,
 3. Contact the services of another association with the consent of Agriculture Canada.

(See Appendices 1-11-111 - Notes from Rosser Lloyd, Animal Registration Officer - Forming an Association under the Animal Pedigree Act - Establishing of a New Breed of Animals in Canada - Animal Pedigree Act.)

It is important to note that though DNA fingerprinting is not compulsory for the registration of animals, it would be a great asset.

Objective

To determine the feasibility of establishing the "Local" Newfoundland Sheep as a breed.

Methods

As stated previously in the first interim report, there was a list of producers of "Local" Newfoundland Sheep provided by the Research Station compiled by Anne-Marie Gregory. This list was the basis of the farm visits by region and by community. Agricultural departmental staff assisted with listing owners of "Local" Newfoundland Sheep, as well as the farms contacted added additional names to the list. There were a total of 92 farms contacted and surveyed with data collected and recorded on 37 farms that had "Local" Newfoundland Sheep.

1. Visit #1

The first farm visits and contacts occurred during the period of September 12, 1994 to May 5, 1995.

These visits were made to identify where specifically the farms were located, identify correct names, mailing addresses, phone numbers for possible future contacts, a brief history of the farm and the breed of sheep being used and the number of sheep on the farm. A copy of the initial survey form is attached in Appendix IV. On the first visit to the farms, there was a brief explanation on the purpose of the project and a brief discussion on the intent of the project.

2. Visit #2

A second visit was made to the farms that were breeding "Local" Newfoundland sheep true for data collection first. If time permitted, it was planned to collect data on "Local" Newfoundland sheep that were crossbred later. A brief explanation of the intent of the project was given. Permission was requested to double tag the animals and to do the physical measurements.

Data Collection:

To record the various traits and characteristics of sheep a form was created. This was done by reviewing the available literature and by personal contact with three geneticists to see what measurements for traits are commonly used. The geneticists were as follows: -

1. Dr. Hossain Farid - Nova Scotia Agricultural College, Truro, Nova Scotia;
2. Dr. J.N.B. Shrestha - Agriculture and Agri-Food Canada, Ottawa, Ontario; and,
3. Dr. M.H. Fahmy - Agriculture and Agri-Food Canada, Lennoxville, Quebec.

A copy of the form used is attached as Appendix V. There was a trial use of the new form on sheep at the Salmonier Correctional Institute where the form was found to be a workable tool.

The equipment used for data collection were as listed:

- Allflex ear tag pliers and ear tags;
- Walk-in animal weigh scales (metric);
- Animal weigh tape (for beef cattle);
- Meter stick; and,
- 36 mm instant camera and film.

The following characteristics were measured (with related descriptions):

- Animal identification, animal owner and address;
- Body weight - the animals were run into a walk-in weigh scales; and.
- Color - overall body color appearance (white-black-spotted).

Head:

- **Head size** - distance from top of the nostrils to the pole of the head and taken with a livestock measuring tape.
- **Wool on Face** - as a clear face or wool on the face - (physical appearance) (1 - Wool, 2 - No Wool).
- **Horns** - (1 - Horned, 2 - Polled) - (physical appearance).
- **Ears** - (1 - Erect, 2 - Floppy Ears) - was recorded as increased documented information referred to these animals as having erect ears.

- **Neck Length** - this measurement was taken from the pole of the head to the (withers) shoulders ensuring that the animal was standing properly.

Body Size:

- **Height at Shoulders** - this measurement was taken at the (withers) shoulders down the front leg to the foot with a meter stick ensuring that the animal was standing properly.
- **Chest - Heart Girth** - this measurement could be of significance for several reasons which were to measure body size, to measure the capacity for the intake and to digest food. This measurement was taken by wrapping a livestock measuring tape around the chest of the animal, a few inches behind the front legs and drawing the measuring tape tight.
- **Loin Strength** - (1 - Straightback, 2 - Swayback) this was recorded to document body confirmation.
- **Loin Length** - this measurement was taken at the shoulders joints of the front legs along the back to the hook or the ball joints of the back legs - this measurement was taken with a livestock measuring tape.
- **Body Condition Score** - (1 - 5, 1 - Emaciated, 5 - Obese) was recorded to document the animal's body condition. This is a standard measure used by shepherds.
- **Rump to Dock** - this measurement was taken from the hook to the head of the tail. This measurement was taken with a livestock measuring tape.
- **Leg Length** - this measurement was taken at the hook down the rear leg to the foot with a meter stick, ensuring that the animals were standing properly.

Physical Appearance:

- **Wool on Legs (1 - Wool, 2 - No Wool)** - this trait may indicate the breed or the parent breed.
- **Pasterns** - short (scale 1-2-3) this trait may be of significance in the animals adaptability.
- (1 - means short pasterns, 2 - means medium length pasterns, 3 - means long length pasterns).
- **Pasterns - strong (scale 1-2-3)** - this trait may be significant in measuring longevity as a sound breeder. (1 - strong pasterns, 2 - average strength, 3 - weak pasterns).
- **Hooves** - (1 - white , 2 - dark) this trait may indicate the breed or the parent breed.
- **Other Distinguishing Comments** - allowed a space to record any trait or marking not previously noted.
- **Lambing Date** - allowed to document the animal's recent productivity.
- **Temperament** (scale 1-2-3-4-5) - was used to document the animal's temperament in the view of the animal owner - the intent of using a scale 1-good or docile 5 - bad as wild to flighty.
- **Age** - was used to document how old the animal was, this fact may have some bearing on other traits measured.
- **Age First Lambing** - was used to document sexual maturity of the animal (Note: it was found that farmers did not always record this fact).
- **Gestation Length** (147 d) - was used to document the number of days of gestation period (Note: it was found that farmers did not always record this fact).

- **Fertility %** - was used to document the percentage of animal's bred, this was not recorded in fact.
- **Prolificacy rate # Born** - was used to document the number of lambs born to the sheep.
- **Number weaned** - was used to document the number of lambs weaned.
- **Lamb Mortality** - was used to document the number of animals died. This may be of significance as an environmental effect more so than genetic.
- **Birth Weights** - was used to document the actual birth weight of the lambs born.
- **Weaning weight** - was used to document the actual weaning weights (as previously stated the lambs were not weaned at the time of data collection).
- **Market Weight** - was used to document the market weights, however due to the time of data collection this was not recorded.

The data collected has been recorded on computer and sorted on a provincial, regional, farm and sex basis. The data is attached to this report. (Appendix VI)

There was a short interview given to the CBC Evening News Program, "Here and Now" which gave the project some publicity. This was an attempt to inform people a little about the Preservation of the Local Newfoundland Sheep Project.

Results and Discussion

The author found that the NLS sheep are generally white with a white face and orange mottle coloring, and a small head. A percentage (10.4%) of these sheep are black with brown coloring intermixed. Generally, "Local" Newfoundland sheep are small, narrow chested animals with a small body frame and are straight in the back with strong short legs and strong pasterns and black hooves. The late maturing trait was particularly noted in the flock of Richard Wells, Exploits Island. This was also observed in a flock on the Northern Peninsula where sheep and lambs were released on the commons in early May and were prepared for market in late November allowing for approximately 240 days to market. It was also noted that there was little information documented on the productivity of "Local" Newfoundland Sheep. This may be a result of farmers being cautious of providing information to government.

In recognizing that there has been an effort made to find what the physical phenotypic characteristics of the "Local" Newfoundland breed of sheep are (by weighing, measuring and recording of these measurements) it is the author's opinion that there are some similarities and differences in the flock of sheep across the province.

The most noticeable differences are usually tall sheep (76 cm at the shoulders) in certain areas versus short sheep (54 cm at the shoulders) which for the most part made up the greater population. The tall sheep resemble the Border Leicester Breed and/or the North Country Cheviot Breed while the short sheep resemble the Border Cheviots or Welsh Mountain Sheep. There were sheep with clean faces (98%) versus sheep with some wool covering on the face (2%) and over the poll. The clean faces resemble the Border Cheviots while wool face may have a resemblance to the Dorset. In the general appearance of the face, the bulk of the animals resemble Border Cheviots while there are a minority group with some resemblance to Finnsheep or Romanov which would be very new to North America.

The similarities observed in the flocks across the island are the high percentage of black sheep and lambs in 10.4% of the flocks. These sheep may be indicative of the black faced Highland sheep breed as referred to in the 1955 Royal Commission Report on Agriculture. There were a percentage of the sheep with horns (54% of rams, 4% of ewes) and though at the time of data collection there were 13 rams, many of these rams had horns which would resemble the Dorset horn. The overall body

conformation of the sheep resemble the Border Cheviots more so than any other breed. A number of these sheep have been reported to be continuous breeders or out of season breeders.

Newfoundland Sheep Project

	Regional Females				Regional Males			
	Central	Western	Province	Eastern	Central	Western	Province	Eastern
Number of Animals	309	114	129	66	13	7	5	1
Number of Farms	37	13	18	6	12	6	5	1
Body Weight (kg)	46.15	54.85	44.31	47.78	55.28	58.1	50	62
Blackface	32	8	12	12	0	0	0	0
Head size (cm)	21.84	22.17	21.36	22.15	24.13	24.87	23.37	22.86
Wool / No Wool	1.98	1.96	1.98	2	1.92	1.86	2	2
Horned	1.96	1.99	1.9	2	1.46	1.57	1.4	1
Horned **	12	1	11	0	7	3	3	1
Ears	1	1	1	1	1	1	1	1
Neck Length (cm)	33.63	33.48	32	34.85	35.36	35.2	33.02	48.26
Height at Shoulders (cm)	63.77	66.01	61.91	65.04	70.04	70.65	68.4	74
Chest - Heart. Girth (cm)	87.25	87.1	85.6	92.48	92.76	92.35	86.87	92.06
Back	0.97	0.98	0.97	1	0.85	0.86	0.8	1
Loin (cm)	46	46.79	43.97	48.49	48.36	47.44	47.75	50.8
Condition Score	1.47	1.59	1.39	1.39	2.31	2.36	2.1	3
Rump to Dock	23.47	21.01	22.83	29.31	23.93	23.77	22.86	30.48
Leg-Length (cm)	64.91	65.64	63.63	66.7	70.43	70.51	70.2	71
Total Body Length (cm)	124.94	123.44	120.14	134.8	131.78	132.26	127	152.4
Wool / Free From Legs	1.91	1.93	1.93	2	1.85	1.86	1.8	2
Short Pasterns	1.08	1.05	1	1.04	1.23	1.29	1	2
Strong Pasterns	1.16	1.07	1.12	1.04	1.31	1.43	1	2
Hooves	1.92	1.9	1.94	1.78	1.85	1.86	1.8	2

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These sheep are recommended to carry on as they are being kept currently. This is best described as an extensive management system (i.e. no management - low input low output). It has been reported that they produce a satisfactory carcass of fair market size (35 - 40 lbs). The animals have proven to be able to utilize low productive grasses and sedges. They have also proven to be relatively hardy sheep capable of surviving very adverse weather conditions often in no or very inadequate housing. Sheep productivity should improve by providing a better feeding regime and convert to semi-intensive management system. These sheep have a lot to offer in a commercial flock or cross breeding program for their valuable traits such as continuous breeder, good mothering, hardiness and foraging ability on poor terrain.

To date, there has been an effort to identify most of the producers of "Local" Newfoundland Sheep (37) and to double tag 336 sheep. In some instances while taking the physical measurements of the sheep, the parentage and relationship of the sheep tagged, was identified. In reviewing the information collected it is necessary to identify additional information required on each specific animal. The question then arises - what form of contact is required? -

- Phone;
- Letter; or,
- Personal visit.

In comparing the data, there are 9 flocks with sheep closer to the average, or the mean. However, based on history, observation and, a little experience in what the breed should be, there were 24 flocks of the total 37 examined to date that are worthy of consideration for future work. In the author's opinion, this data should be turned over to a qualified geneticist for proper appraisal and recommendations.

Is there a real Local Newfoundland Sheep Breed? The answer to this question is yes. The difference for example, between a Local Newfoundland Sheep and an Arcot sheep is that the parentage of an Arcot has been recorded and documented while that of the Local Newfoundland Sheep has not. The Arcot has developed by selective breeding while the Local Newfoundland has evolved by natural selection.

The feasibility of establishing "Local" Newfoundland sheep as a breed is dependent on a number of factors. These factors will be decided by the market place for sheep products such as meat and wool. In the past few years producers have been getting reasonable returns for their lamb encouraging them to continue production. The local lamb market has recently been affected by cheap imported New Zealand lamb that is offered for sale by a large chain store at the larger centers.

This is a different situation in rural Newfoundland where lamb prices have traditionally been lower due to less demand. Local Newfoundland sheep will compete and maintain their current markets but whether expansion occurs depends on a number of factors. These factors are:

- Demand for lamb;
- Breeding - ease of lambing and mothering ability ; and,
- Local Newfoundland sheep fit well into a low management extensive system.

There is some demand for Local Newfoundland Sheep as breeding stock on the mainland and Newfoundland because of their ease of lambing and good mothering traits. Given the fact that the Feed Freight Assistance program, is to be reduced in the province, the Local Newfoundland Sheep offers the most promise of survival in an extensive sheep management system.

In regards to the issue of registering the "Local" Newfoundland Sheep as a breed and in establishing a pedigree book, new financial costs will be incurred by the producers for this service. In the author's opinion, this will not come to be as this will defeat the factor of low input for most producers. There may be a few producers who will sell breeding stock to the mainland that may be in a financial position to offset the required registration fees. However, every effort should be made to encourage producers to invest the extra few dollars in registering their animals.

Recommendations and Conclusions

In the short term, the following is planned:

- DNA fingerprinting
- Prepare a breeding program to maintain the flocks currently in existence by reviewing the inventory of stock and ram population, hopefully in consultation with a geneticist;

- To work with the producers to suggest such things as the exchange of rams from farm to farm within the region and within the province;
- To encourage producers to breed Local Newfoundland sheep true to the breed;
- Where records of related animals exist and are available to start a simple basic record book for the purpose of documenting the current parentage of the provincial flock, especially with emphasis on the flocks showing the most promise;
- To compile data collection on lambs retained for future breeding stock, October to mid-November (The same procedure as outlined for the adult flock will be followed.);
- Establish a Newfoundland Sheep Association;
- Establish foundation stock; and,
- Continue to add information on flocks and their locations as in Visit #1.

In the long term, the following needs to be completed:

- To document the productivity of the Local Newfoundland sheep by having the data collected on the adult sheep and it's lambs analyzed by a qualified geneticist;
- To introduce a simple on-farm production record system whereby the producers will be advised of the benefits and the necessity of record keeping;
- To maintain a herd record book as a register of the number of animals in the provincial flock (Though government personnel can initiate this, it should be maintained by a breed association comprised of farmers.); and,
- To investigate the marketing of breeding stock of Local Newfoundland Sheep, with breeders on the mainland and within the province.

To develop the Local Newfoundland Sheep as a breed it is felt by the author that the services of a practical animal geneticist needs to be retained to review the data collected, to assist in the preparation of the breeding plan and, to guide the development of these sheep as a breed.

The DNA fingerprinting is a new area of science that is a proven technology which is not understood by many people including the author. To understand this science, there is a need to be proficient in biochemistry and genetics. To identify the DNA fingerprints of sheep the blood must be taken and kept in proper vacutainers to be compared with the DNA fingerprints of known suspect parent breeds to measure genetic distance. This method will be the most scientific way to identify the make up of the Local Newfoundland breed of sheep in the various areas of the province.

In discussions with most of the farmers across the island it was suggested that DNA fingerprinting maybe considered, with a response from the farmers that was very positive. It is surprising to note the amount of interest the farmers have in DNA fingerprinting. In the author's sincere opinion, DNA fingerprinting is the next step in solving the problem of whether there is, indeed, a separate breed of "Local" Newfoundland sheep and also, whether this breed is uniform across the province.

Summary

There has been little information documented on the Local Newfoundland Sheep. Of the information that is documented, the author has concluded that the Border Cheviot characteristics were the most prominent breed while Blackface Highland were also present.

These sheep have survived through extensive management and natural selection and have been recorded to be continuous breeders, easy lambers, good mothers and late maturing lambs. A breed association is required to set the standards of Local Newfoundland Sheep and a breed registry book needs to be maintained. There has been a decent effort made to collect data on the Local Newfoundland sheep. This data needs to be analyzed by a competent animal geneticist. A breeding

program needs to be set up to guide the producers into preserving the Local Newfoundland sheep. The DNA fingerprinting, though not compulsory for breed registration, will be a great asset. There has been 37 farms in which data was collected on 336 animals, there are an additional 6 or 7 farms where the animals have been let go for the summer which need to be revisited when the animals are home from summer pasture.