

# RESTORING THE SLEIVE GULLION FERAL GOAT POPULATION TO ITS ORIGINAL OLD IRISH PHENOTYPE

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**SUMMARY.** *It is evident, and from local reporting, that the feral goat population of the Slieve Gullion Forest Park originated during a period when owned Old Irish goat stock free-ranged the mountain, and kids that were not rounded up with the adults were left to go feral.*

*Following a revival in goat keeping in Northern Ireland during the 1960's, goats of Improved Modern type were brought into the area, following on from which unwanted animals were subsequently 'dumped' to join the Old Irish feral goat population on the mountain. This led on to introgression between the two very different types of goat, and put the Old Irish foundation stock on the road towards extinction.*

*A recent survey of Slieve Gullion by members of the Old Irish Goat Society has found that introgression is still containable, meaning that it may well be possible to restore the feral goat population to an Old Irish phenotype.*

*The key to achieving this, it is suggested, lies in a study of the social organization of these goats, and in particular the importance of family groups. The approach adopted here is therefore to (1) consider the likely age structure and size of a typical family group on Slieve Gullion, (2) devise an idealized hypothetical model of how introgression could be halted initially, and then reduced systematically, and (3) compare this model to the population as it exists and the practicalities of putting it into practice.*

*The outcome was reassuring in that the model devised, although hypothetical and based upon the best and most doable outcome, turned out to be quite practical and workable in practice. Its key elements were (1) working with family groups as a base-line, and to reduce disruption to the social organization of the population as much as is possible, (2) concentrate on eliminating the introgression in the males, and so as to have a phenotypic Old Irish base in this respect, (3) deal with the issue of impure male kids born into family groups, and (4), and finally, deal with family groups based upon a Modern Improved founder.*

*Given that there is an unusually high proportion of males in the population, and that the females are not showing a worryingly high percentage of obviously introgressed animals, it is thought that the Slieve Gullion feral goat offers a very encouraging opportunity to carry out a piece of practical work that could well become the model for dealing with the issue of introgression across Ireland's feral goat population in general. In this respect, Slieve Gullion could lead the way.*

**KEY CONCEPTS.** *Slieve Gullion. Introgression. Founder population. Dumped goats. Family groups. Reducing, then halting, introgression. Idealized models for family groups and how introgression spreads throughout an Old Irish goat population.*

## **SOCIAL ORGANIZATION**

The basic structure of a feral goat population is a nanny and her offspring. Female kids coming into adulthood stay with their dam for life, and as their own kids do the same, a family group will develop that is generational. Two or more family groups will organize themselves into a nanny group, this being what is generally thought of as being a 'herd'.

Nanny groups, like sheep, are hefted onto a particular area- a home range- this providing variable food sources, shelter, and well-worn movement and escape routes. Males join nanny groups for the rut, and will stay with them into the winter, usually hiving off in the spring, this reflecting different seasonal food preferences. Males have no significant influence upon nanny group behaviour and routine, each family group being led by a 'matriarch', meaning the female with the most descendants. Thus, when a family group moves off at any speed, the seemingly collective movement is not so much this as each individual in the group following one other (my mum!), with the matriarch in the lead.

The dynamic of a family group is variable, and like an amoeba can quickly change shape. If a female lives long enough, and has enough female offspring, then it can involve several generations and show as an intricate family tree. When she dies, however, her daughters will then become the matriarchs of up to several family groups, with these then increasing in size over time.

If a female is 'dumped' into a nanny group, she will not join a family group as such, but may well become the founder of a new family group. This has implications for introgression, as will be discussed later.

The factors that dictate the optimum number for a family group are quite variable, meaning that there is no hard and fast rule as to size. Some of these variables are as follows:

- The age of the matriarch, and the number of female offspring she has. An eight or nine year old may have only two or as many as four or five female offspring of varying ages (eight to one) in her family group
- The proportion of female to male kids born into the family group. The ratio of male to female kids is about equal overall, although, and by way of example, the present writer has studied a feral goat population in which during one kidding season there were 16 male kids and only 1 female kid. With regard to the Old Irish Goat Society's breeding programme, in 2014 all the kids born (3) were females, in 2015 there was 1 female kid and 7 males, and in 2016 the sex ratio was equal, with 5 males and 5 females
- Multiple births. This has yet to be studied in the Old Irish goat in any detail, although our experience from the breeding programme to date is that there were no multiple births in 2014, 60% of births related to twins the following year, and 25% of births related to twins in 2016. It was our experience in this respect that twinning was more the norm in some goats, whilst others tended to have singles. Victorian goatkeepers avowed that a nanny usually had a single kid initially, following which she might have up to 4 kids, this starting a trend in that if her second kidding produced, say, triplets, then she would have triplets from then onwards. Later studies, however, would seem to suggest that the heritability of little size is 'very low'
- Good mothering and aberrant behaviour. When yearlings produce a kid, this being not untypical, they are generally less likely to rear it successfully. Good mothering is partly due to age and experience, and partly to aberrant behaviour. In the case of good mothering, a young or inexperienced dam may rotate away from the initial teat-seeking attempts, leading to a decline in the kid to attempt to suckle. Also, inexperienced dams may not recognize that they have twins, being happy if one is following. With aberrant behaviour, kids may rarely be deserted, butted away, or not allowed to suckle
- Predation. Kids may be preyed upon by corvids, foxes and eagles. Adults may be persecuted by man
- Weather conditions. Kidding may be influenced by the weather quite markedly. Damp, stormy, cold periods around kidding time may well lead to fatalities due to chills; and even cold weather could lead to a reduction in the kid seeking the teat
- Unpredictable events. Injury, mastitis, the unwanted attentions of males leading on to the dam not being able to lick, groom and bond with the kid, along with the first and vital suckling, are some of the many factors that can impede family group growth

- Collective wisdom. Dams pass on the knowledge needed to exploit the home range successfully and stay safe. Fragmentation of a family group can lead to difficulties relating to its success, even survival.

Given the foregoing, it becomes clear that so much that surrounds the development of a family group is down to the vagaries associated with the equivalent of repeatedly tossing a coin; the female that has significantly more surviving female offspring than another being in a position in which her family group will be significantly larger, by way of example.

In our initial study, it was found that the Slieve Gullion population appeared to comprise two nanny groups, one of which- the forest Road group- comprised 21 females of varying ages. Could this, even so, and theoretically, be a family group?

To test out this possibility, the present writer has constructed a model of how a family group might evolve, this being based upon the following, and in the hope that this might give a mid-point for likely numbers and age structure generally. The givens, in this case, were as follows:

- The matriarch is eight years old and kidded successfully as a yearling, her first kid being female
- The sex ratio of all subsequent kids was 1:1
- The incidence of twinning was one birth in four
- Incidence of twinning cancelled out other deleterious factors such as weather, accident, predation, etc.

The outcome was that this female had four surviving female offspring, age range being 7rs., 5 yrs., and 3yrs., plus a yearling. The 7-year-old had two daughters, these being 5yrs. old and a yearling. The 5-year-old had three female offspring- a 4-year-old, a 2-year-old, and a kid. The 4-year-old had a yearling, whilst the 2-year-old had a kid. Thus, this branch of the family group, headed by her first kid, comprised 8 females and 4 generations, there being 2 kids. Her second kid, aged 5, had two offspring, a 3-year-old and a yearling. The older animal had a yearling with her, and the yearling had a kid. This second sub-group therefore comprised 5 females and spanned 3 generations. Her 3<sup>rd</sup> kid, the 3-year-old, had only a yearling with no kid. This sub-group therefore comprised 2 animals spanning 2 generations. Her 4<sup>th</sup> kid, the yearling, had yet to kid successfully.

In summary, this 8-year-old matriarch headed a family group totalling 17 female animals spread over 5 generations, and with the following age structure:

Age class	number of females
0	3
1	6
2	1
3	2
4	1

5	2
6	0
7	1
8	1

In a wider context, 14 male kids had been born within this time frame, of which 4 had died. A total of 19 female kids had been born, of which 16 had survived. This means that with this model, and starting with a male and a female and five generations of breeding, the total number of goats would have been 33, 17 of which were females and 15 males.

Vitally, if the matriarch died suddenly, this one family group of 17 would have been replaced by 4 family groups, the numbers within which would have been 8, 5, 2 and a single animal yet to kid.

This model allows plenty of leeway for envisioning both larger and smaller family groups, which leads on to the conclusion that theoretically the Forest Road nanny group could comprise a single family group. However, their overall look would suggest otherwise, a close scrutiny of a nanny group being necessary before any conclusions can be made. By 'close scrutiny' is meant a study over time of the movement and feeding patterns of a nanny group, and so that the way in which animals bond or otherwise can be assessed.

### **AN IDEALIZED MODEL FOR HALTING, THEN REDUCING, THE INCIDENCE OF INTROGRESSION**

Restoring a feral goat population to an original Old Irish phenotype shouldn't be about culling/removing any and all goats that show signs of introgression. This may seem to be a 'quick fix', dramatic as it is, although the drawbacks are (1) disruption of group cohesion, and (2) a poor balance between removal in terms of time span and the continued effects of introgression.

The great advantage of devising an idealized model is that plausibility and implausibility have equal weighting in the initial stages, and when the perfect solution is arrived at, it can be adjusted to suit the practical needs of the exercise, rendering it as near perfect as reality will allow.

What was aimed at, therefore, was a means by which the effects of introgression could be decisively halted in the various family groups, following which not only would there be no further introgression, but a natural improvement in phenotype over time, and towards a typically Old Irish base.

With this as a guideline, it was reasoned that if all the males demonstrating introgression were removed prior to the rut, then the crop of kids born the following winter would show no introgression if their dams were Old Irish, or significantly less introgression if their dams were themselves not purebred. If, following this, the family groups were left in place, but any male kids showing introgression were removed, then over time the population would be moving in the direction of a resolve in terms of an Old Irish phenotype.

### **A COMPARISON BETWEEN THE IDEALIZED MODEL AND A PRACTICAL PROGRAMME BASED UPON THE SLIEVE GULLION POPULATION AS IT IS**

Fortunately, only one female was seen in the Forest Road vicinity that had a phenotype suggesting a Modern Improved type. Although a survey needs to be carried-out in greater depth, it is possible that if all introgressed males were removed in a short space of time, then this nanny group might need limited 'tweaking' to point it in the direction of an overall Old Irish phenotype.

More work needs to be carried out to gain a greater understanding of the composition of the nanny group that is hefted on to the abandoned farmland further to the north. It was casually noted, however, that there may be more Modern Improved bloodlines in this group, and this leads us on to a discussion with regard to how introgression starts, and then takes a grip, on an Old Irish population.

### HOW INTROGRESSION WORKS

At a point in time when the Slieve Gullion goats were still Old Irish, unwanted goats of Modern Improved type, and belonging largely to the British Swiss breeds, were let loose in the area. They may have been either males or females, this complicating the matter.

A dumped female would have joined a nanny group, have integrated into the behaviour and pattern and movement of the existing population, but remained on the fringe of the various family groups. When she kidded, she would have become the founder of a new family group, which would then and over time have become an integral part of the nanny group. Her first kid, if female, would have been half Old Irish, and this goat's kid, in turn, would have been three-quarters Old Irish, and so on. Thus, the family line of this new family group would have operated along the lines of 'grading up' in livestock terms. Within four or five generations, according to the stockman you consult, the youngest members of the family group would have been considered Old Irish, although some notable and dominant characteristics of the Modern Improved breeds may have lingered on, ears and coat being good examples. But, and it is a big but, the foregoing implies that kids are only sired by Old Irish males, which will not be the case.

Although a gradual return to 'Old Irishness' sounds encouraging in terms of phenotype, a positive outcome can be negated by two factors relating to introgression.

The first of these is that just as the generational aspect of a family group founded upon a Modern Improved female will produce offspring that are half and three-quarters Modern Improved, the same applies to male kids. Thus a half Modern Improved male kid, if going on to mate with an Old Irish female, will be responsible for a quarter-bred Modern Improved kid, whilst a male and a female that are both half Modern Improved, will result in a similarly half-bred Modern Improved kid. Here, then, we have the beginnings of a pot-pouri of type in a feral herd that reflects the sum total of combinations found in the Old Irish (primitive landrace) and British Swiss (Modern Improved) types of goat; the conduit being males of mixed type freely spreading their genes around the different family groups.

The second issue lies in the introduction of Modern Improved males. As with the kids of mixed origin, they will happily create continuing generations of half-bred Modern Improved kids across the whole population in a bid to outvie the existing Old Irish males in terms of genetic interchange.

By these means then, family groups can become increasingly mongrelized over time.

With regard to the Slieve Gullion goats, there is (1) a higher proportion of males compared to females than was expected, and (2) a female population that is less affected by introgression than was anticipated.

What is needed, therefore, is to halt introgression and to allow for a systematic return to an Old Irish phenotype by retaining only males that have an Old Irish phenotype, and monitoring male kids for signs of introgression. This conclusion, on practical grounds, fits in perfectly with the idealized theoretical model.

### **THE STEP BY STEP SOLUTION TO RESTORING THE POPULATION TO AN OLD IRISH PHENOTYPE**

Given that it might be possible to begin the process this summer, the actions and time-scale would logically be as follows:

- Make a more thorough study of the Forest Road goats, and a proper study of the Aughadanove nanny group. The time scale for this isn't critical in that it is not dictated by other events
- Use the time up to the rut to identify and remove all males that show introgression. Critical in relation to this is to concentrate on (1) white males in the main, (2) males with a short coat, (3) males that have Swiss markings or patterning, and (4) males with ears of Modern Improved type
- Monitor the kidding the following year to single out male kids that show introgression; follow progress, and remove males as yearlings that are not singularly of an Old Irish phenotype
- Use a critical study of the family groups to consider whether selected females need to be removed. As emphasised previously, if introgressed males are removed quickly, then any urgency to concentrate on the females is diminished by virtue of the fact that the process of introgression has been halted, and things will automatically improve, albeit at not a fast pace. Looking critically at the family groups and removing selected animals will inevitably speed up the process of restoration to an Old Irish phenotype, and can still be dealt with sympathetically.