Shetland Cattle: Breed Analysis Report; May 2021

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The feedback from members regarding this annual report encourages me to believe it is of value and assists breeders in making difficult choices for their herd improvement programme. At the same time it is clear that too often the advice they receive is too late as a recommended bull may already have been slaughtered or castrated. Already I see advertisements for bulls which must be sold and therefore there is some urgency to act in the hope we can overcome that problem. I am producing this report as early as possible, although I am aware it probably will not be in your hands before some useful bulls are sold and relevant calves are born. In a further attempt to avoid the problem I am attempting to develop a system of early notification of the birth of a bull calf and a rapid response to advise his likely value as a breeding bull. I owe Paddy Zakaria many thanks for her initiative in that process, and the many hours she spends ensuring that as many breeders as possible receive prompt advice regarding the potential of new calves. Her input must be appreciated particularly in the circumstances that she has been separated from the Zetralia herd during this time because of the Covid-19 lockdown. Steph Ede and Maggy George play an important and difficult role in their voluntary efforts to record deaths and disposals so that the current lists remain accurate and functional. I also rely heavily on Peter Hardman's computer expertise and have streamlined the process to accelerate the whole procedure. I hope these developments will make this report more timely and useful. Please feel free to contact me if you need any advice.

Summary of main items

In the last report I outlined the positive and negative items that appeared in the body of the report, and it is useful to repeat those items with updates as described in this report.

Positive:

- "The genetic health of the overall breed has improved as evidenced by an improving balance between lines to improve genetic diversity, and the judicious use of good bulls to improve quality". In general it is evident that good quality bulls have enjoyed useful patronage, although the Heather influence has become too heavy.
- "The population on the Islands seems to have stabilised, albeit at a relatively low level". Populations on both the Islands and Mainland have shown a positive trend.
- "There has been no further loss of bloodlines and GCI (founder effect) has remained fairly steady". Both of these positive effects continue.
- "Bulls available through AI offer a wide range of lines, although Heather still is too dominant". There has been a noticeable increase in the use of artificial insemination and this has served to increase further the Heather influence.

Negative:

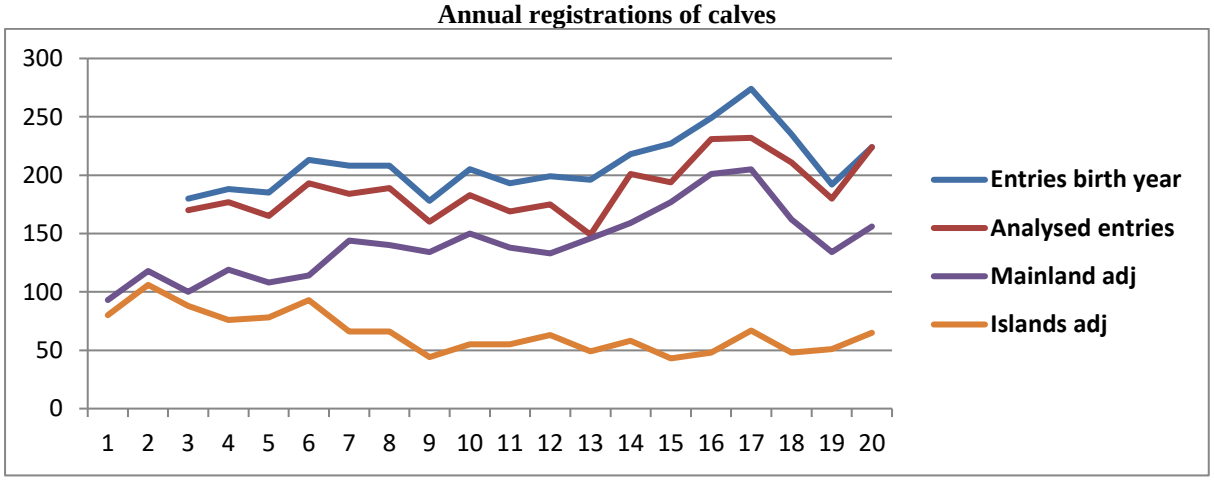
- "Breed numbers outside the Islands have declined". The 2020 calf crop indicates a welcome upturn in the Mainland population.
- "The Knocknagael Mary family remains in danger of extinction, and some other lines and families make a negligible contribution". Some cow families are vulnerable but generally are spread sufficiently widely not to be in danger of extinction.
- "The influence of bull lines remains unbalanced on the Islands with continuing heavy dominance of Heather genetics". This problem continues but also is affecting the population on the Mainland.

- "Factors outside our control; economic downturn, uncertainty surrounding Brexit, climate change and Covid-19". The evidence from the 2020 calf crop would suggest these factors had less impact than expected.

Population trends

Despite the depressing impact of factors outside our control (Covid-19, climate change, Brexit), which were mentioned in the last report, the outlook for Shetland cattle has bucked the trend and the results for 2020 show a very welcome upturn (Figure 1). The decline in number seen on the UK mainland in the past two years has been reversed with results for more than 150 calves analysed. Doubtless there will be further 2020-born calves not yet registered, which confuses the analysis somewhat, but it paints a rosier picture than last year. The Islands population provides even more cause for hopefulness with 65 calves analysed. Annual registrations have been modestly static at about 50 calves for more than a decade and we have to go back to 2008 (before the effects of the economic downturn) to match the optimism generated by the 2020 crop. A 3-year rolling average shows that the registered calf crop of the breed has exceeded 200 for the last seven years.

Figure 1
Annual registrations of calves



Genetic analyses

On a positive note the breed of Shetland cattle has been more successful than most other rare breeds in preventing the extinction of founder lines and families. The extent to which the founder effect is maintained is measured by GCI. It has declined minimally and has remained relatively stable during the last 20 years. No founder lines have been lost during that time (Table 1), although some are extremely vulnerable.

Table 1
Loss of Founders 1981-2018

Measure	1981	1999	2002-5	2006-9	2012-5	2016	2017	2018	2019	2020
Active ancestors		**798**	**909**	**1056**	**1386**	**1550**	**1567**	**1569**	**1526**	**1609**
Active male founders*	**28**	**25**	**25**	**25**	**25**	**24**	**24**	**24**	**25**	**24**
Active female founders*	**66**	**53**	**47**	**48**	**48**	**48**	**49**	**49**	**51**	**51**
Total active founders*	**94**	**78**	**72**	**73**	**73**	**72**	**73**	**73**	**76**	**75**
GCI			**32.63**	**31.59**	**31.57**	**30.67**	**31.21**	**30.96**	**30.84**	**30.74**

*figures may vary slightly from earlier versions as a result of recent update

It is worth bearing in mind that even if a family or line does not become extinct, genetic material (diversity) may be lost if descent through the pedigree is not in direct tail male or tail female. Mitochondrial DNA will be lost if the influence of a female founder at some point passes through a male; likewise there will be loss of Y-chromosome DNA if the influence of a male founder passes through a female. For example, Foula Dandy exerts almost as much influence as Knocknagael Tommy, but his line in direct tail male is extinct.

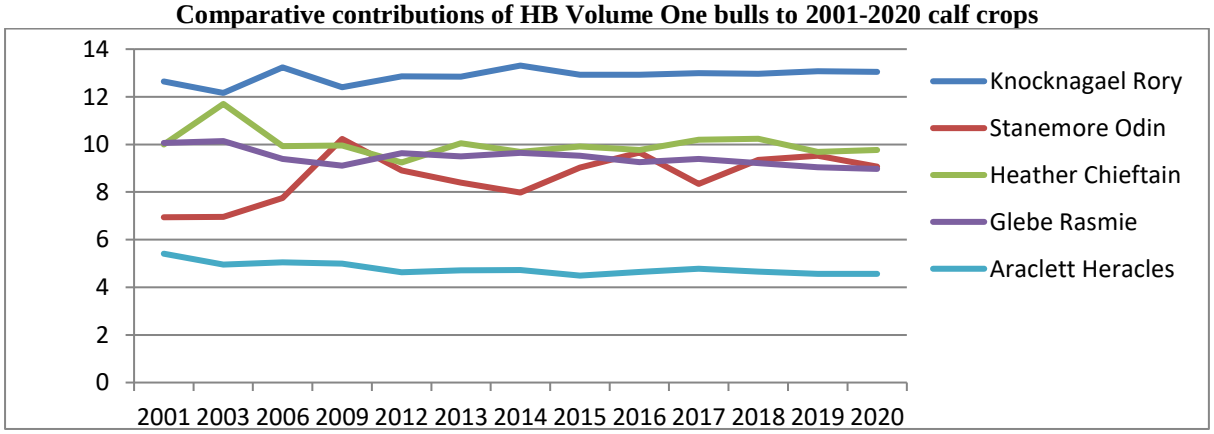
The GCI provides a powerful lesson in the importance of maintaining genetic diversity. However, the quality of a breeding animal is the most important factor. In an earlier report I criticised **the nonsense of trying to limit the use of a good bull** and I was encouraged by your supportive responses. **I wrote the original plans for RBST and others regarding maintenance of genetic diversity** in native and rare breeds and it concerns me now when I often see them misapplied. For example, it is fine in the right context to be aware of the effect of inbreeding, but it is a refinement not a fundamental primary factor. Kinship also is a factor of limited value. Kinship scores for live bulls on the website have an insignificant range of 7.27 to 9.29 and therefore cannot contribute to decision-making with any meaningful effect. Experienced breeders recognise a good animal when they see one, and **I recommend any breeder to use their judgement rather than arbitrary so-called 'golden rules'**. Hopefully the lists of recommended bulls in this report will prove helpful.

My recent annual reports have highlighted the potential danger of the dominance of the Heather line. I may have been too complacent last year, more in hope than expectation, when I said that it "is being contained for the time being". It has continued to increase its influence and has reached a new pitch in the calf crop of 2020. I strongly urge breeders to be aware of the need to reduce Heather influence when they retain bull calves for breeding or purchase a bull as a herd sire.

Bull line founders and HB Volume One representatives

Previous reports have included a graph showing the influence or contribution of the founders of the four remaining sire lines, namely Knocknagael Tommy, Knocknagael J4, Glebe Wallace and Heather Marshal, but they all have remained so stable during the last twenty years that the information does not assist decision-making by breeders. Therefore, I have discontinued that graph. In passing it should be noted that some founder cows such as Knocknagael A1, Knocknagael C1, Glebe Hebe and Setter Blackie also make significant contributions. The graph showing the pattern of influence of the main representative of each of the four sire lines which were registered in Vol One (1981) of the Herd Book (Fig 2) is more significant and valuable.

Figure 2
Comparative contributions of HB Volume One bulls to 2001-2020 calf crops



Note: The contributions shown in Figures 2 and 3 are for comparative purposes only between animals in each Figure. They cannot be compared with the % figures in other Tables.

It provides a useful guide to the balance of lines (genetic diversity) in the breed, and thereby an early warning of any imbalance or potential bottleneck. The ongoing influence of Heather Chieftain reinforces the concern regarding overall Heather influence in the breed. The high score for Knocknagael Rory does not indicate dominance of the Knocknagael line but arises from his tenure on the Islands when he was used widely at a time when few bulls were available and was associated more with Araclett lines.

Bull Selection

When selecting a new bull, or deciding whether to keep a bull calf entire, a prioritised sequence of steps is recommended:

a. Look first at **factors which improve the sustainability of the breed**. Currently it is important to avoid the dangers of a genetic bottleneck, such as threatened the breed when Collafirth Rasmie and Templeson Boris became fashionable, and now is seen again with the ongoing increase in Heather influence. Fashion is a dangerous driver of selection, and it is essential to maintain a good balance of the lines and families in the breed. Hence there is a need to control the Heather influence and strengthen the Araclett and Knocknagael influence. Descent of a bull in direct tail male is not necessarily correlated to his support for the founder of his line. Thus Boquhapple Kelvingrove (see Table 2) belongs to the Knocknagael sire line but his full pedigree is dominated by Heather with little evidence of Knocknagael or Araclett.
b. **Then ensure the bull possesses good characteristics**, and they also should be evident in his close relatives. These reports regularly describe the valuable traits of those bulls which are considered to have good potential as herd sires, but often insufficient attention is paid to their sire or dam. Breed type, good temperament and locomotion, and freedom from disease (e.g. Johne's, BVD, lepto, etc) are essential in both parents, but a cow that aspires to be the dam of a bull also should demonstrate good maternal credentials of regular breeding, a strong median suspensory ligament (long udder life), longevity and milk to rear a good calf. Too many cows are culled at a young age and we need to understand more why this is so. Temperament is critically important in bulls and a poor attitude has been noted in some lines.
c. Finally **check inbreeding status**, but do not allow an obsession with low inbreeding or kinship to distract you or allow you to sacrifice other factors. If you have located a bull with desirable qualities from an appropriate line, buy him. Only allow yourself to pause for thought if his inbreeding is more than 9% (the breed average) and even then there may be a good reason to use him. For example if you are using a measure of the coefficient of coancestry for your herd, do not choose the bull with the lowest score. Choose the best bull from among all those that give a result below 9%. If deliberately using linebreeding to concentrate the influence of a special animal, then inbreeding will be an integral part of your programme. Similar principles apply to the use of a bull – a good bull should be siring more progeny to improve the next generation

Using the above procedure I have devoted the most important part of this report to directing attention to bulls that I recommend to you as herd sires. I have separated them into three groups, Islands, Scotland, remainder of UK, as these are the areas within which most movement of bulls takes place. The bulls include a few calves born this year to watch, those that will be used as herd sires in 2021 and young bulls not yet used, all listed in order of age. Early action has already enabled advice to be relayed to many breeders but it is repeated below in 'Future Policy' for the record.

First we need to evaluate the evidence. What is the breeding of young bulls that have made the greatest impact on the 2020 crop of calves? It has been noted in recent reports that the influence on the breed of Heather genetics has been increasing. It has not reached a critical stage but is becoming embedded in pedigrees to a degree which may make it difficult to reverse the trend.

The increasing dominance of Heather genetics on the Mainland of UK is evident from the high proportion of young and AI bulls that made the highest contribution to the 2020 crop of calves (Table 2). Last year it seemed the increasingly urgent recommendation to curb that trend had been recognised and acknowledged as only one influential young sire carried a high level of Heather, but it proved to be blip not a trend. The list of recommended young bulls described later in this report will enable breeders to rectify the problem.

Table 2
Contribution of young bulls to 2020 crop of calves on the Mainland
(Bulls marked * now believed dead) (2019 figure in brackets)

Bull	Born	Contribution	Notes
Boquhapple Kelvingrove (AI)	2009	3.06 (2,50)	High level of Heather influence
Whinpot Red Adair	2016	2.85 (1.54)	
Renwick Renoir (AI)	2016	2.85 (2.12)	Very high level of Collafirth Rasmie
Whinpot Brume *	2015	2.85 (0.77)	
Ustaness Xerxes	2016	2.35 (1.15)	High level of Heather influence
Collafirth Viking (AI)	2010	2.35 (1.63)	
Hengae Fearsome (AI)	2015	1.93 (2.50)	Very high level of Heather influence
Windgates Gingernut	2015	1.93 (0.96)	High level of Heather influence

In the Islands the situation appears equally fraught, but in fact there has been significant change. In the report last year, and in the previous years, it was noted that Collafirth Odin seemed to be the only bull among the top young influential bulls used on the Islands that did not accentuate the Heather genetics imbalance. Collafirth Odin retains his status in the analysis this year, but is joined by four other bulls (Table 3) that are more neutral insofar as they do not exacerbate the problem, even if they do not do a great deal to improve it.

Table 3
Contribution of young bulls to 2020 crop of calves on the Islands
(Bulls marked * now believed dead) (2019 figure in brackets)

Bull	Born	Contribution	Notes
Littlester Laurence	2016	11.97 (nil)	
Ocraquoy Haldor (AI)	2014	7.75 (6.98)	Concentrated Heather and Templeson Boris influence
Collafirth Odin	2016	6.34 (6.98)	Son of Balou; Araclett sire line
Collafirth Bagheera *	2016	4.23 (5.81)	High level of Heather influence
Collafirth Hamish	2017	3.52 (2.33)	High level of Heather influence
Rockytoon Geordie	2018	2.82 (nil)	High level of Collafirth Rasmie
Ocraquoy Kendlin *	2018	2.82 (nil)	High level of Coll Rasmie and Temp Boris
Trondra Trump *	2017	2.11 (1.16)	
North House Weston	2017	2.11 (nil)	
Gillarunna Thor *	2016	2.11 (1.16)	

Please note again: these contributions are for comparative purposes only between the animals in Tables 2 and 3. They cannot be compared with the results in Figure 2.

Imbalance occurs not only when one line becomes too dominant (i.e. Heather) but also when an animal becomes ‘fashionable’. A fashion for a red coat saw a dramatic rise in the influence of **Collafirth Rasmie and Templeson Boris** with the danger of a genetic bottleneck. In the last report I optimistically declared that danger “now is largely only of historic interest”, but 2020 again proved me wrong. The influence of both bulls appears to have been contained on the Mainland, although the use of AI bulls may change that situation (Table 2), but there are definite signs of a significant resurgence on the Islands (Table 4) and the trend must be

monitored with care. Some bulls, including calves born 2020 and 2021, carry dangerously high levels of one or both of those bulls.

Table 4
Changing influence of Collafirth Rasmie and Templeson Boris 2012-2020

Bull	Location	2012	2013	2014	2015	2016	2017	2018	2019	2020	19-20
Collafirth Rasmie	Islands	8.13	7.83	6.96	5.09	6.57	7.33	6.22	6.22	6.49	+ 4.3
Collafirth Rasmie	Mainland	2.93	2.83	2.79	3.28	3.17	3.08	3.18	3.26	3.22	- 1.2
Templeson Boris	Islands	8.28	8.76	6.56	5.39	5.24	7.05	4.20	4.20	5.53	+31.7
Templeson Boris	Mainland	3.39	2.90	2.97	3.27	3.20	3.24	2.95	2.72	2.71	- 0.4

The final factor with the potential to change the genetic balance of the breed is increased use of **artificial insemination**. This has been particularly evident in the conception of calves in 2019 and that has had a noticeable effect on the genetics of the 2020 calf crop. Therefore, it is important to evaluate the team of AI bulls and follow the same decision-making procedures that are recommended for bulls used for natural service.

The combined Heather/Glebe influence in the pedigrees of AI bulls is almost twice as high as that of the combined Araclett/Knocknagael lines. Therefore, it is important to select those AI bulls which have the potential to improve the balance between lines, and use of the following should be prioritised to correct the imbalance:

St Trinians Balou (SCHBS), **St Trinians Mansie** (RBST), **Stanemore Odin** (RBST) and **Trondra Arrow** (SCHBS) should be high on the agenda.

Collafirth Viking has a decent balance of lines, his dam was the grand old cow, Collafirth Rowan, his daughters have good udders, and as a personal reflection from 2010 (I judged at Cunningsburgh Centenary Show) I made him champion as a calf.

On the other hand, a larger number AI of bulls exacerbate the problem of Heather dominance. They are Hengae Fearsome, Randolph Fergus, Boquhapple Kelvingrove, Carn Bhren James, Ocraquoy Haldor, North House Frosty and North House Victor. Additionally it should be noted that five of the bulls have a heavy input (13- 23%) from Collafirth Rasmie and Templeson Boris. Therefore North House Frosty, North House Victor, Ocraquoy Haldor, Renwick Renoir should be used only after careful consideration of their impact on this problem. Renoir in particular, although he had good type and temperament, owes 17.6% of his ancestry to Collafirth Rasmie.

Future Policy

Earlier sections of the report have described the historical situation beginning with **founders** of the bull lines and the role of their direct descendants which represent each line in the Herd Book. They also have commented on **subsequent bottlenecks** (Collafirth Rasmie/Templeson Boris) and dominance events (Heather line), and evaluated the **leading sires** of the 2020 crop of calves. They have drawn attention to the relative lack of importance of **inbreeding** and **kinship** measures. They all provide helpful lessons, but the immediate value of this report is to direct attention to bulls which already are herd sires or may become future herd sires in order to give breeders a guide to the selection of desirable animals.

Listed below are recommended bulls (shown with year of birth) which possess credentials that may prove beneficial in a herd sire. Hopefully this information will reach breeders before any castration or other incapacitating event takes place.

Recommended bulls

England, Wales and NI:

Little Detton Bertie (2021) black&white; by Trondra Arrow, a sire with well-established credentials; dam is a nice type with good udder and locomotion; Bertie has a good level of Knocknagael influence, a low level of Heather and very low level of Rasmie/Boris. Follow his progress with interest.

Plas Meini Arwel (2021) by Wild Meadows Charles (see below) out of St Tudwals Bron, a typical lighter-boned type with a good udder; he has a good level of Knocknagael influence and very low levels of Rasmie/Boris. Another bull calf, by W M Charles out of St Tudwals Ffion (full-sib to Bron) may also be kept entire. Promising prospects.

Emgee Rhodri (2021) black&white; by St Tudwals Madoc out of a sweet-natured cow; has a good level of Knocknagael influence and low level of Heather, Rasmie and Boris. Keep an eye on him.

Rowland Montrose (2020), by Broadacres Bruce (Heather sire line); dam good longevity (2010); good balance of lines; minimal level of Collafirth Rasmie and Templeson Boris.

Gurnardwight Albert (2020) black&white, by Little Wyld Davidson (see below), Knocknagael sire line; good balance of other lines with modest Heather influence and low Rasmie/Boris. He was born late in 2020.

Manod Llewelyn (2019) black&white, by Wild Meadows Charles (see below) out of a St Tudwals grand-daughter of Trondra Arrow (Knocknagael sire line); strong Knocknagael influence with good level of Glebe; negligible Rasmie and Boris. Good temperament.

Little Wyld Davey and **Little Wyld Davidson** (2019) both black&white, by Stanemore Odin (Knocknagael sire line); Davey's dam had good longevity (2009) and was a dairy type cow; a great opportunity to access early genetics; low levels of Heather, Rasmie and Boris.

Wild Meadows Charles (2016) black&white; interesting and valuable bull; carries the red factor; his carefully planned breeding is Welland Down both sides; several lines trace back to J4 (Knocknagael); Heather, Boris and Rasmie all have only a minimal influence. Excellent temperament. Has sired some good calves.

Lincwold Sonny (2016) black&white, although he is from the Glebe sire line, he is strong on Knocknagael and Araclett influence; dam had good longevity (11 years old when Sonny born)

Carn Bhren Fionn (2011) and **St Trinians Lucky Seven** (2012) are working in Northern Ireland

Scotland:

Stackyard Erik (2020) black&white; son of St Trinians Mansie, quality bull of the Knocknagael sire line; dam is dun and a nice lighter-boned type; strong Knocknagael influence and low level of Heather.

An Darach Anderson (2020), a dun bull, recommended despite not correcting the Heather influence as he has a level balance of lines, but because he is fine-boned with a good barrel and good feet. His grand-dam, Benston Elsie (1999) demonstrates great longevity.

Croic Bhein Hobbes (2019), striking brindle; by Carn Bhren Inuus (unfortunately culled recently), Araclett sire line; dam was a lovely type of cow; good balance of lines with low Rasmie and Boris.

Croic Bhein Brocair (2019) black&white; by Carn Bhren Inuus (now deceased), Araclett line; dam had good longevity (2007) and a very nice type with a good udder; good balance of lines with low Rasmie/Boris.

Fleecefaulds Hagar (2019), brindle, "carbon copy of his sire" St Trinians Balou (Araclett sire line); dam is a good bull-breeding cow; good balance of lines; Rasmie rather high, but Boris absent.

Rogiavi Hamelin (2017) brings some useful older lines into his pedigree; he is by Garths Adonis, one of the early AI bulls, and therefore belongs to the Araclett line; Rasmie and Boris are absent from his pedigree, and he has very little Heather genetics; a good proven breeding bull.

Stenscholl Paddy (2016) red&white; by Carn Bhren Irish (Knocknagael sire line) out of linebred Broadacres Zoe, is a worthy son of Irish; he reduces Heather influence and has negligible levels of Rasmie and Boris; he is a good smaller type with a placid temperament and deserves quality cows to breed good sons.

Islands:

Hjem Holyfield (2020) black&white; by Collafirth Tyson (see below); his dam, Trondra Christina, is a good smaller type of cow; although he is from the Heather sire line the level of Heather in his pedigree is low; Rasmie also is low and Boris is absent.

Collafirth Odin (2016), red brindle by St Trinians Balou (Araclett sire line); he is still available although working in Scotland in 2021; he is worthy of careful note as he has a good balance of lines and reduces Heather influence; he has worked in the Geldron and Rockytoon.

Collafirth Tyson (2013) black&white; son of Lyndthorpe Raymond (Heather sire line); dam (Collafirth Emma) had good longevity and was 11 years old when Tyson was born; he worked mainly in the Littlester herd, but also sired two bulls in the Hjem herd; he has high merit which was described fully in previous reports.

Summary

The threat of imbalances between lines, caused by the increasing impact of the Heather influence, and the signs of resurgence of the Collafirth Rasmie/Templeson Boris genetic bottleneck, were unwelcome negative aspects exposed by the analysis of the 2020 crop of calves. However, considerable encouragement can be taken from the increase in number of registrations in all parts of the UK, and also in the quality of animals being produced. There have been a few incidents where heifers have been caught by the bull too young, or by their sire, or where disease (TB, Johne's, BVD, etc) has disrupted some herds, but examples of indiscriminate breeding are outweighed by the positive programmes pursued by most breeders. There is clear cause for optimism if the current impetus can be maintained.