

Shetland Cattle: Breed Analysis Report; December 2016

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The first annual report appeared fifteen years ago and usually has followed a standard pattern. During that time some items have deviated very little. For example, the contributions of founder animals have shown very small variations and can be reviewed safely at longer intervals provided that a close watch is kept on any line or family that threatens to disappear. The previous two reports also dealt in some detail with explanations and evaluations of topics such as inbreeding, GCI, and diversity. Therefore this year the focus will be more on items that members are able to use in the development of breeding programmes taking into account not only decisions at an individual herd (or even animal) level, but also those that affect the ongoing genetic security of the breed.

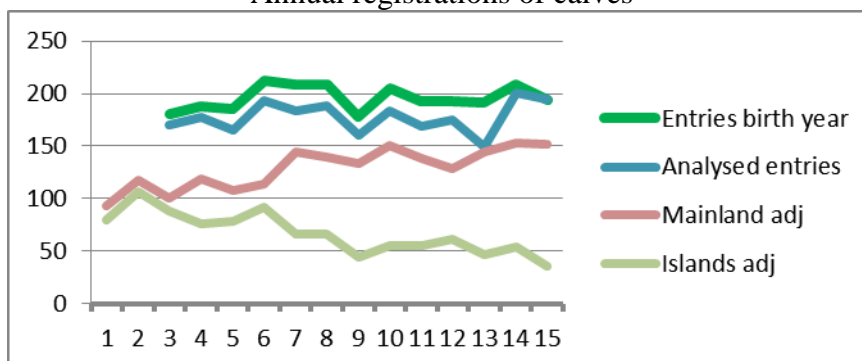
Once again I'm grateful for the input of all those who have assisted in providing the information necessary to prepare the report, especially Peter Hardman who does the initial number crunching. Information on bulls used in 2016 (and intended to use in 2017) is particularly helpful and the work of Paddy Zakaria in the northern areas and Alan Yarker and Barry Allen in England and Wales makes my task much easier.

The report follows the approximate format of previous years in order to enable easy comparison. The first (historical) section deals with population trends, genetic analyses and analysis of the 2015 calf crop. The second (future action) section deals with bull selection and calf crops from 2017 and onwards.

Population trends

Last year we reviewed the effect of late registrations and noted that they significantly affected the interpretation of population trends when animals were categorised by birth year rather than year of registration. The majority of late registrations were noted in Mainland herds (203) compared with only 69 in Islands herds during the period 2001-2015. This adjustment flattened some of the major fluctuations and it seemed that the population on both the Islands and the Mainland had stabilised in the last few years. There even were indications of a possible upturn last year, and the results this year confirm a steady trend (Figure 1). Registrations in Mainland herds continue to hover around the 150 mark. However, optimism has not been sustained in the Islands population where registrations have fallen to a new low unless more calves born in 2015 remain to be registered in future years.

Figure 1
Annual registrations of calves



Annual calf registrations are the best indicator of a breed's security and the results indicate a national herd of about 800 cows, but it is important that the breed retains a secure foothold in the Islands (its area of origin) where it can continue to adapt to its native environment.

Genetic analyses

Shetland cattle enjoy benefits flowing from the development of databases which facilitate useful genetic analyses of the breed, and the breed is fortunate to have members with expertise in this field. The SCBA website allows members to access data on inbreeding and coefficient of coancestry for individuals and groups under the heading of 'kinship analysis' (relationship between animals) and I referred to it regularly in the preparation of this report. Pointers assisting the selection of a preferred sire for a herd or for an individual mating are valuable aids. The SCHBS website also has a kinship analysis page which lists the relationship of each bull to all other extant bulls. This give a wider breed perspective, and it is interesting to note the very narrow range of scores from the most related at 9.11 (St Trinians Jock) to the lowest at 7.27 (Templeton Victor). This demonstrates clearly that the various lines have been spread widely through the breed and decreases the chance of losing a line, but it also limits its value as a tool for selecting a sire to maximise genetic diversity in the breed. It also gives a weighted figure for each bull based on the number of his registered progeny with advice that a bull should not be over-used. However, to put this in context, none of the bulls listed has a dangerous weighting – there is not one that is remotely comparable to, for example, Templeton Boris (see 'Rasmie and Boris' section below) – and therefore there is no justification at this point for limiting the use of a good bull on the lists. The proviso is that he must be a good bull!

This report addresses the issue from the widest perspective of assessing the ongoing genetic health of the breed. It is very easy to adopt the 'kinship' concept unconditionally and apply it as a priority to control inbreeding, but it is wise to keep its application in context and realise that too much focus on the control of inbreeding may be counter-productive. A recent sale advertisement for a bull placed great emphasis on his high ranking in the kinship analysis, but what is the significance of that information? As mentioned above the narrow range of scores for this measure reduces its value as a guide for selecting a suitable herd sire. An effective breeding programme will recognise the potential benefits of linebreeding (i.e. the acceptable method of inbreeding) and the value of using bulls of special value even if they have a relatively high kinship score.

From an overall breed point of view GCI remains the best method of measuring how successfully the range of founder genetics has been maintained (GCI was explained in the report last year), while the selection of a bull as herd sire or for an individual mating ideally needs to help to balance the founder lines as well as contribute his own quality to a breeding programme. Together they will ensure the ongoing improvement of the breed.

GCI (effective founder number):

GCI is the effective founder number and measures the contribution of founder animals to the current population. The greatest loss of founders occurred between 1981 (when the current herd book series was published) and 2001 when these reports began. GCI of the Shetland cattle breed has been measured since 2002 (Table 1) and, although gradually declining at 0.33% pa, it shows a relatively healthy state compared with many other rare breeds. The

decline should not cause alarm at this stage but it should be reviewed regularly to ensure that it does not continue or accelerate.

Table 1
Loss of Founders 1981-2014

Measure	1981	1999	2002-5	2006-9	2012-5
Active ancestors and founders		798	909	1056	1386
Active male founders*	28	25	25	25	25
Active female founders*	66	53	47	48	48
Total active founders*	94	78	72	73	73
GCI			32.63	31.59	31.57

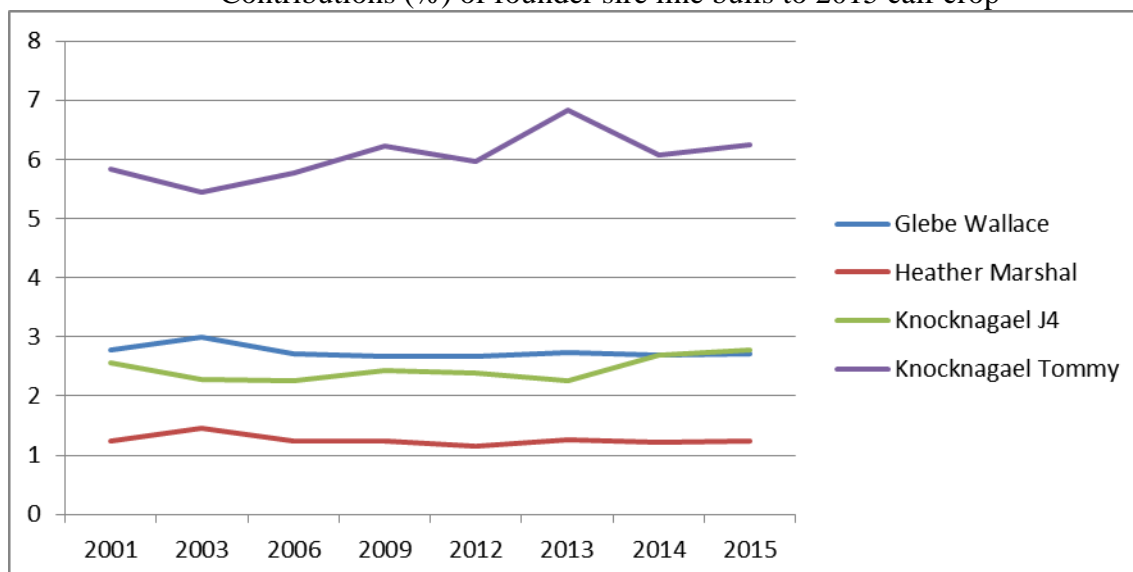
*figures may vary slightly from earlier versions as a result of recent update

Loss of contribution from a founder (i.e. extinction of that line) is a significant and irretrievable loss. No male line has been lost since 2001. We feared that one female family had been lost, but it is good to be able to report that Knocknagael Mary still is represented in the breed, although not in direct female descent. Research by Albin Smith shows a descent through Knocknagael Daisy (O22), Daisy II (C10) and Daisy V (81-957) that leads finally to Lincwold Lowden – 13 generations down the line from M8’s dam! Other families continue to be intermittently active, but all credit is due to breeders of Shetland cattle for the conservation of founder lines and families in the last 15 years. Other detective work by Steve Richards, Paddy Zakaria and Robert Ramsay has revealed that Ellister Becky is not a founder; she actually is Collafirth Becky (88-1179) a descendant of Fair Isle cow, and dam of Ellister Flipper and St Trinians Mansie, both by Troswick Beach.

These data are very positive. The breed’s GCI (Table 1) is superior to many other endangered cattle breeds in UK (e.g. White Park score is c.12) and comparable to some internationally popular breeds (e.g. TB horse), which indicates that it is not dominated by one or two founders. The largest founder contributions (Figure 2) come from Knocknagael Tommy (6.3%), founder of the Araclett sire line, and Knocknagael A1 (6.5%), dam of Knocknagael Rory. In comparison the main White Park founder contributes 24% and the main TB founder contributes 14% respectively to their breed.

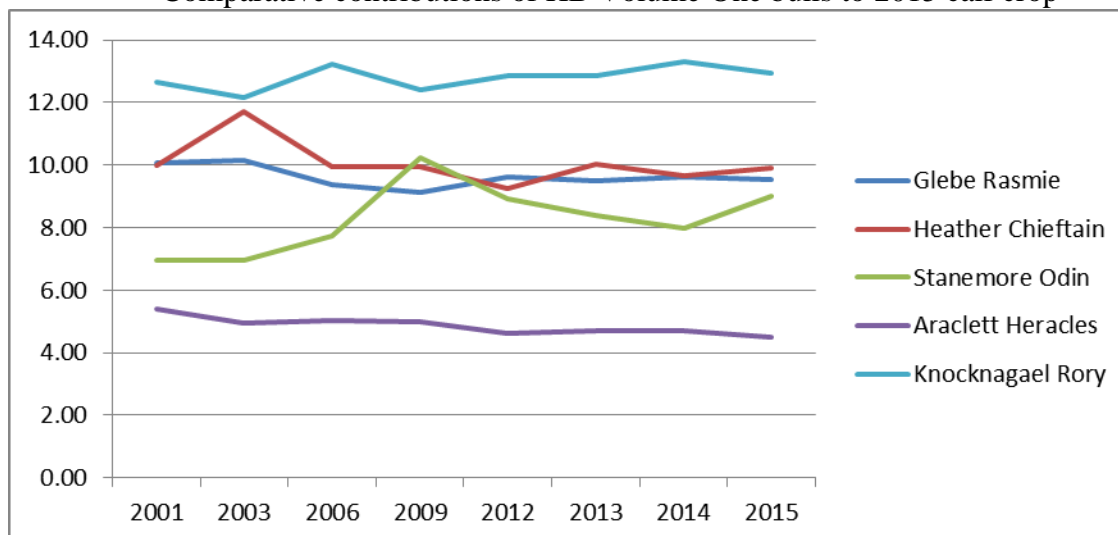
Bull line founders and HB Volume One representatives:

Figure 2
Contributions (%) of founder sire line bulls to 2015 calf crop



Previous reports have shown a relatively consistent pattern of influence of the four founders of the current bull lines, and of the main representatives of those lines in Volume One (1981) of the Herd Book and there is no need to comment further in this report. Figures 2 and 3 are included as a reference point.

Figure 3
Comparative contributions of HB Volume One bulls to 2015 calf crop



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

Rasmie and Boris

Dangers arising from the popularity and overuse of Collafirth Rasmie (92.1540) and Templeson Boris (93.1680) have been rehearsed in several previous reports and there is little to be gained by further repetition. I'm sure the message has been understood already by anyone who wishes to do so. Although the influence of these bulls still is higher in the Islands, their contribution there has fallen consistently during the last 4 years, while there has been a slight increase elsewhere (Table 2). The position will continue to be monitored but the improvement is significant.

Table 2
Changing influence of C. Rasmie and T. Boris 2012-2015

Bull	Location	2012	2013	2014	2015	%+/-
Collafirth Rasmie	Islands	8.13	7.83	6.96	5.09	-37.4
Collafirth Rasmie	Mainland	2.93	2.83	2.79	3.28	+11.9
Templeson Boris	Islands	8.28	8.76	6.56	5.39	-34.9
Templeson Boris	Mainland	3.39	2.90	2.97	3.27	-3.5

The lessons to be learned from the analyses of the danger of the bottleneck caused by the heavy influence of Boris and Rasmie are useful. Paramount is the need to warn members when such a situation is developing, which is a function of these reports. Some explanation for the frequent references to this problem may be helpful. For example, Boris had a very heavy weighting (as defined on the SCHBS website) more than twice as high as any of the bulls on the Society A.I. stud, and significantly higher than good contemporaries such as Waterloo Charlie or Troswick Beach - bulls which had a beneficial influence without causing a bottleneck. Boris also was inbred 26% which further accentuated and narrowed his ability to maintain essential diversity in the breed.

Influence of young bulls on 2015 crop of calves

Mainland

The young bulls most prominent as sires of the 2015 crop of calves in Mainland herds (Table 3) are notable for their relatively low ranking (i.e. number of progeny) compared to older bulls. It seems Mainland breeders are more cautious in the use of very young bulls. There has been a tendency for Mainland breeding to drift towards Islands lines from time to time and the 2015 crop illustrates it very well. The Heather and Glebe lines have dominated breeding policy in Islands herds in recent years, while Mainland herds have maintained a balance between all the main lines. The young bulls used in 2014 (Table 3) show a significant element of Heather, Glebe and Hillwell influence and this should set warning bells ringing. The pedigrees of Lyndthorpe Erik, Knockinnon Arran, Winterhills William and others are concentrated heavily on the Heather and Glebe lines. The latter bull also carries 16.5% contribution from Boris and Rasmie.

Table 3
Contribution of young bulls to 2015 crop of calves on the Mainland
(2014 figure in brackets)

Bull	Born	Contribution	Notes
Gillarunna Ollie	2010	2.80 (1.70)	Son of Gillarunna Nocturne
Carn Bhren Guga	2012	2.47 (0.68)	Son of Gillarunna Innes
St Trinians Jock	2011	2.30 (- - -)	Hillwell sire line
Balearn Rory	2010	1.81 (1.87)	
Lyndthorpe Erik	2010	1.64 (2.38)	Heavy concentration of Heather and Glebe
St Tudwals Tomos	2013	1.64 (- - -)	
Knockinnon Arran	2011	1.64 (0.34)	Heavy concentration of Heather and Glebe
Treetops McKenzie	2013	1.64 (- - -)	
Winterhills William	2012	1.64 (- - -)	Heavy concentration of Heather and Glebe

Islands

Islands herds make much heavier use of young sires (Table 4). The three most dominant - Raymond, Louis (son of Raymond) and Lulach – are particularly dominant and give some indication why the emphasis of breeding in Islands herds may be turning towards dominance of the Heather line rather than Boris and Rasmie.

Table 4
Contribution of young bulls to 2015 crop of calves on the Islands
(2014 figure in brackets)

Bull	Born	Contribution	Notes
L'thorpe Raymond	2010	16.43 (8.49)	Concentrated Heather influence
Collafirth Louis	2013	12.86 (- - -)	Son of Raymond; Hillwell on dam side
Gerraquoy Lulach	2010	12.86 (5.66)	Grandson of Hillwell Huxter
Geldron Aert	2012	4.29 (3.77)	Hillwell line; concentrated Boris and Rasmie
Minarvi Nicol	2012	2.86 (5.66)	Son of Raymond
Ustanes Thor	2011	2.86 (3.77)	Linebred to Kemelian Bilko
Geldron Blett	2013	2.86 (- - -)	Son of Lulach; Hillwell on dam side
North House Frosty	2013	1.43 (- - -)	Hillwell sire line; AI bull

Please note again: these contributions are for comparative purposes only between the animals in Tables 3 and 4. They can not be compared with the results in Figures 2 and 3.

Lyndthorpe Raymond has exerted a significant influence since the 2012 crop of calves – therefore now four years of heavy use. His pedigree is concentrated heavily on the Heather bloodline which already is over-represented in the Islands. Collafirth Louis and Minarvi Nicol are sons of Raymond. Gerraquoy Lulach is similar to Raymond in the level of his influence during the past three years, and is a grandson of Hillwell Huxter. The Boris/Rasmie syndrome is still lurking! Geldron Aert has a combined influence of more than 41.5% from them, Geldron Blett 19.5% and North House Frosty 16.8%.

Future Policy

The analyses above can be used to identify opportunities to improve the quality and value of Shetland cattle while maintaining the diversity necessary for ongoing health of the breed. A balanced approach is appropriate.

Recommended bulls used in 2016 or intended to use in 2017

I obtained information on 76 bulls that were used in 2016 or expect to be used in 2017, although there may have been a few that escaped notice. For example, among bulls registered in the herd book I noted with interest **Geldron Zeek** (11.6283) which is linebred to Waterloo Charlie in a herd that usually is noted for Boris and Hillwell influence, and **Windgates Zorro** (13.6739) which has a very good blend of lines. Maybe they were not used. The average inbreeding was 9.4% which is reasonable and not a cause for concern (cf. White Park 14.4%, TB 13%) although a few bulls reached much higher levels – Meadow Heron (bull on daughter mating) 29.6%, Geldron Aert 18.6%, St Trinians Agamemnon 19.1% and St Trinians Red Gust 18.5%. One or two bulls were duplicated in more than one region, but the distribution was roughly the same as last year – approximately half were based in the Islands and Scotland, and the others in England and Wales, plus an expanded number available through AI. There were significant regional variations.

Islands

Breeding policy on the Islands is concentrated heavily on Heather and Glebe genetics, so that Araclett and Knocknagael genetics are severely under-represented. There is limited opportunity to redress this imbalance from the bulls available, although Carn Bhren Halcyon has a better balance of lines and AI bulls offer some options. Two young bulls highlighted in the report last year still offer good credentials:

Collafirth Tyson (2013) was used in 2016 and hopefully will be kept in service in 2017 with a good son or sons kept entire to carry his quality forward. He belongs to the Heather sire line. His dam was 11 years old when he was born. He has Hjem Lowrie, Troswick Beach and Collafirth Jamie close up in his pedigree; he reduces the level of Knocknagael Rory; and Collafirth Rasmie and Templeton Boris are almost absent from his pedigree.

Trondra Einar (2015) has the potential to widen bloodlines in the Islands. He has a good balance of the four main lines plus some other elements. Boris is absent from his pedigree and the input of Collafirth Rasmie is negligible. His dam also was 11 years old when he was born; he comes from a quality Trondra cow family founded by Inga (1982) and reinforced by mating with Murrister bulls (Olympus and Pete) in the next two generations.

Scotland

On the mainland of Scotland there is a wider selection of bulls, although still dominated by Heather and Glebe genetics, which reflects the situation in the Islands. The use of 24 bulls in

Scotland is recorded in 2016 (or intended in 2017) and 12 of these are from the Glebe sire line. It would be prudent to look for bulls of Knocknagael breeding (both J4 and Araclett) to redress the balance and maintain diversity. There is opportunity to break out of this increasing imbalance by retaining good bull calves sired by a selection of highly recommended bulls, Carn Bhren Inuus, Carn Bhren Irish, St Trinians Balou, St Trinians Lucky Seven and Trondra Arrow, and by the continued use of these six bulls in 2017.

St Trinians Balou, apart from being an excellent specimen, represents the Araclett line and boosts J4 influence.

Trondra Arrow (J4 line) in particular has attracted favourable opinion in previous reports for his superb quality and temperament. He is by Collafirth Laxness and out of a cow from the same Trondra Inga family as Einar (see above). There is no Boris in his pedigree, and only very little Collafirth Rasmie.

Two younger bulls also deserve special attention. **Carn Bhren Inuus** (2014, Araclett line) is brown/brindle colour, while **Carn Bhren Irish** (2014, J4 line) is a red bull.

England/Wales

The selection of bulls is even wider in England and Wales. In general there is a fairly good balance between the main lines, and the Boris/Rasmie problem does not pose a serious problem currently. However, in view of the Heather/Glebe emphasis in leading sires of the 2015 crop (see above), it would be prudent to give attention to bulls with a stronger element of Araclett and Knocknagael. Breeders have the opportunity to select a bull suited to their particular purpose. The list is too long to make detailed evaluation, but I have noted a few bulls that caught my attention and I feel confident they will sire some very good sons.

Blazefield Rufus (2012), a red-and-white bull, has been on the radar from an early stage. His sire is a grandson of St Trinians Mansie (J4 line) and his dam is a daughter of Waterloo Charlie to whom he is linebred. His son, **Wharncliffe Kyle** (2014), also is red-and-white. Kyle is out of Wharncliffe Grace with only a slight infusion of Collafirth Rasmie and Templeton Boris through her grand-dam.

Lincwold Lowden (2011) is another bull worth noting, not only because he is a descendant of Knocknagael Mary (see above), but also because he has light linebreeding to Tivis Hill Keen and offers a good mix of lines.

Welland Down Flodden (2014) and his son, **Wild Meadows Charles** (2016), both are particularly interesting and valuable. The latter's carefully planned breeding is Welland Down both sides. Several lines trace back to J4 (Knocknagael), but Flodden's dam traces to Trondra Inga, a notable cow of mainly Araclett breeding.

St Trinians Hawthorn (2016), a b&w grey-flecked bull by St Trinians Grey Light out of a daughter of St Trinians Mansie, has a good balance of lines as have several other bulls including Cwrdu Morgan (son of St Trinians Lawrie), Broadacres Bruce (son of Gillarunna Innes), Oxmoor Dandy and Oxmoor Donn Carr, and Windgates Gingernut.

A.I. bulls

The options for effective breeding policies have been widened by the addition of several bulls to a Semen Bank maintained by SCHBS, in addition to bulls offered by RBST, and this is a very positive and welcome development. There are now 14 bulls available through A.I., 9 from SCHBS and 5 from RBST. The latter were discussed in the report last year and therefore this analysis focuses mainly on the SCHBS bulls. The 9 bulls in the stud have a very high concentration of Glebe and Heather ancestry; 6 are from the Glebe sire line, and the Heather influence is very high. The combined Heather/Glebe influence is almost twice as high as that of the combined Araclett/Knocknagael lines. There is a need to prioritise the use

of bulls that correct this imbalance, and therefore **St Trinians Balou** (SCHBS), **St Trinians Mansie** (RBST), **Stanemore Odin** (RBST) and **Trondra Arrow** (SCHBS) should be high on the agenda.

The other aspect of the A.I. stud that should be noted is that 5 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 and St Trinians Agamemnon should be used only after careful consideration of their impact on this problem.

Zetralia herd

This report would not be complete without mention of the remarkable creation of a breeding population of Shetland cattle in Australia. Apart from the increased security of a widespread geographical distribution, the Australian group has captured an amazing range of genetics in a small number of animals and traces to 1298 ancestors and founders (93% of maximum). It even includes descendants of Knocknagael Mary, Collafirth Rhona and Malvern Anna, families which are only spasmodically evident in Britain. There were 7 calves in 2015 and Paddy Zakaria must be congratulated on the success of her project. Long may it prosper.

Summary

The breed continues to generate a sense of optimism. There remains some concern regarding the fall in numbers on the Islands and the potential danger of increasing dominance of Heather genetics has been noted, but otherwise a positive outlook is justified. Annual registrations have been maintained at circa 200, the Boris/Rasmie problem is receding, no lines/families have been lost in the last 15 years, and there are some quality bulls available which allow a good balance of lines. Careful selection of herd sires will continue to secure the future of the breed. Bulls highlighted in this report are calculated to contribute primarily to sustainable long-term breeding policies, and it is hoped owners will find sufficient choice among them to pursue their preferred breeding objectives.