

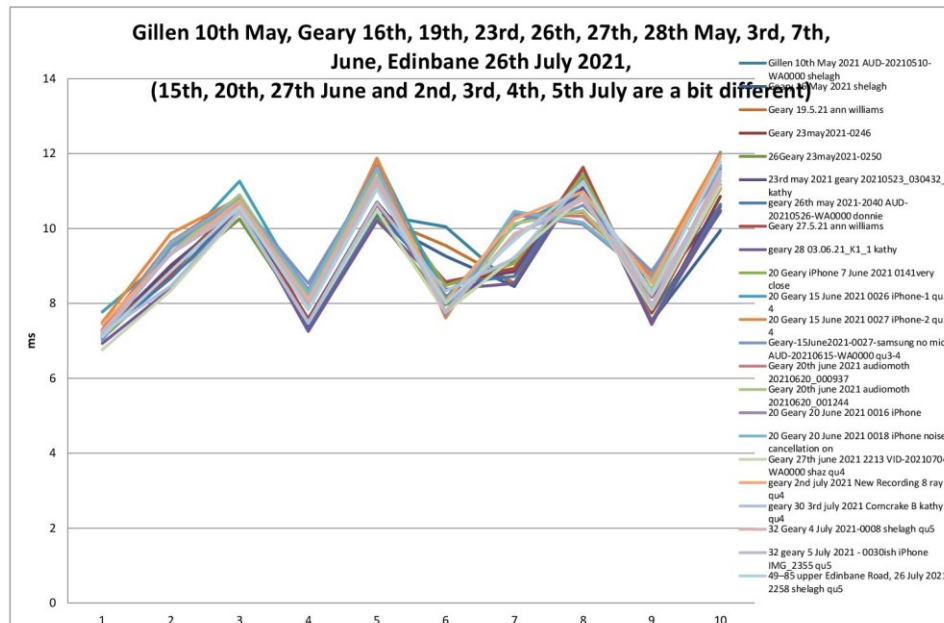
May - July 2021 Skye Corncrake call pattern summary (corrected 3/9/21)

Robert Arnold, Shelagh Parlane

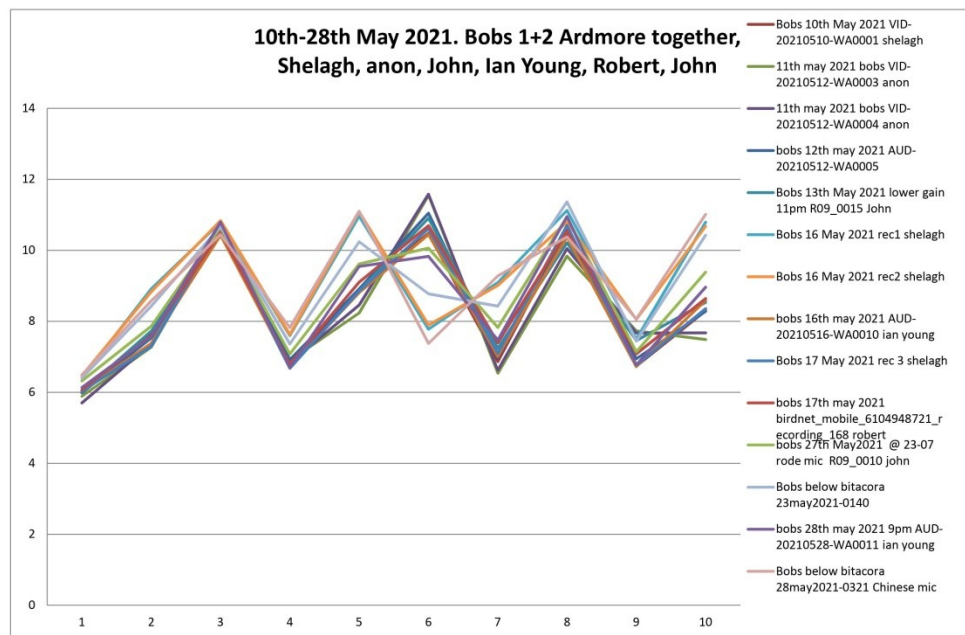
We have 70 recordings for 2021, from 11 different people, of 4-5 quality (5 calls averaged, a sharp rise at start of pulse, signal to noise moderately good, first pulse clear).

I think the 13 PPD patterns group together to be records (possible birds) as follows.

Record 1. May 10th – July 5th Gillen and Geary. Two patterns appearing but only one bird confirmed.



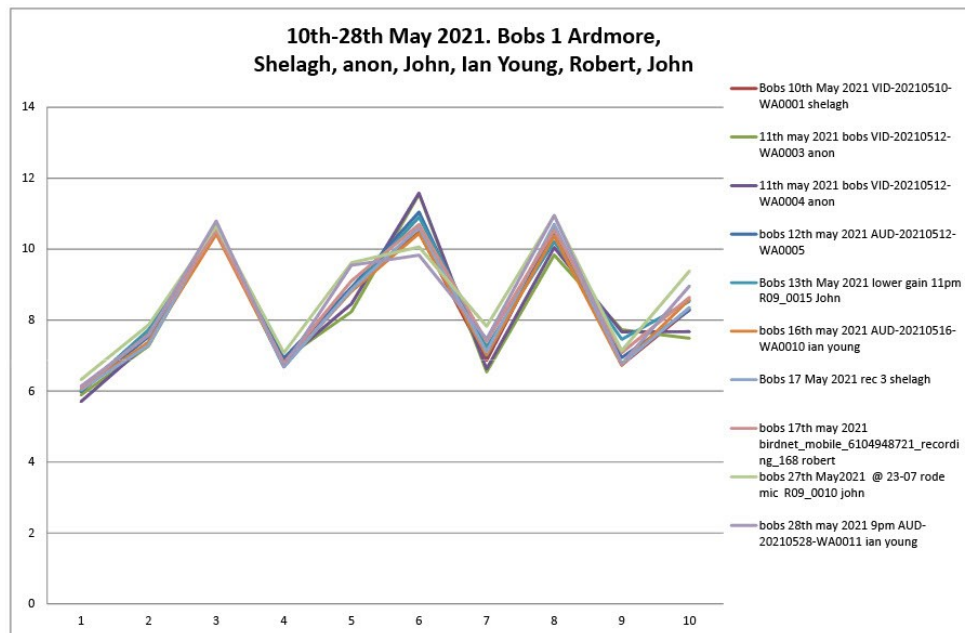
Record 2. May 10th – 28th Ardmore, and Audiomoth recording to 29th May 2021



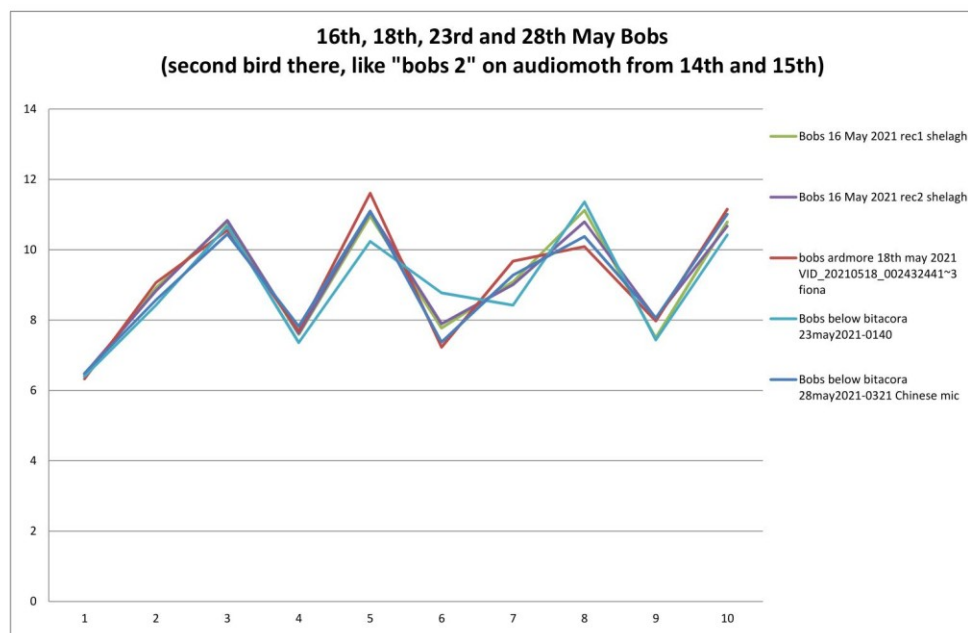
It appeared that there were two patterns but only one bird was heard calling at any one time. After we put out the Audiomoth recording device overnight for a few days it became clear that one bird can have two distinct PPD patterns and flip between them; a kind of harmonic or resonant effect perhaps.

The correlation coefficient is $r = 0.6$ for the two Ardmore PPD patterns in the charts below, which should suggest "definitely" two birds.

The two patterns from Ardmore separated, "bird 1"



The second pattern from Ardmore, "bird 2"



The 1998 paper (*Individuality in Corncrake *Crex crex* vocalizations. T.M.Peake et al. IBIS 1998*) only goes into this briefly. They looked at two birds over some of the night in a 24 hour period and noted a slight change in the PPD pattern of one in the section of PPDs 5-9 roughly (marked in red). Optimistically they hoped that this indicated a single pattern for a single bird.

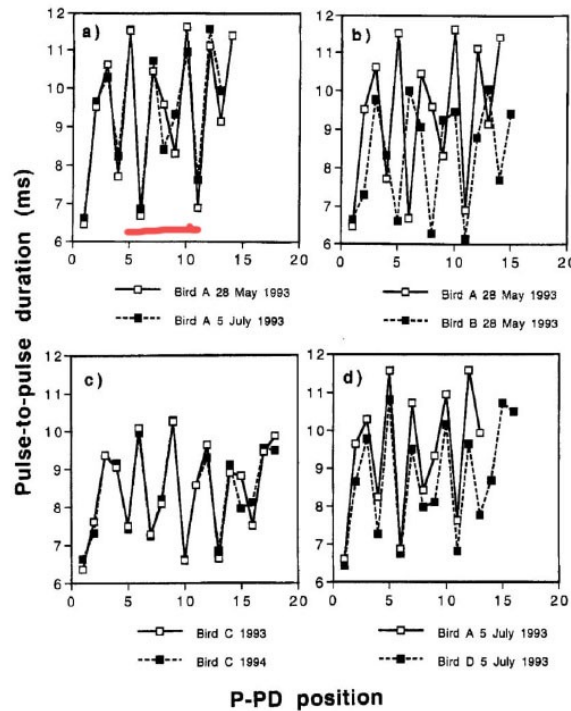


Figure 3. Graphic representations of P-PD distributions of syllable 1 of the calls of Corncrakes. Each graph plots two such distributions, either from the same bird on different nights (a, c) or from two different birds (b, d).

Within-year analyses

range of r for same-bird, between-night and within-year

They concluded that the vocalizations of a male Corncrake were stable and individual up to a point. Most studies after this have accepted this assertion uncritically.

DISCUSSION

We found that temporal features of the loud advertising vocalizations of male Corncrakes varied little within 24 h, within years and, to a lesser extent, between years.

It turns out, from our observations described in the next section, that one bird can make two distinctly different patterns within the same day-night period.

Audiomoth results at Ardmore

The next page is the list of one minute recordings made from the 13th to 15th of May 2021. They are marked in pink for "bird 1" pattern and in green for "bird 2" pattern. Blue marked recordings were too faint to classify.

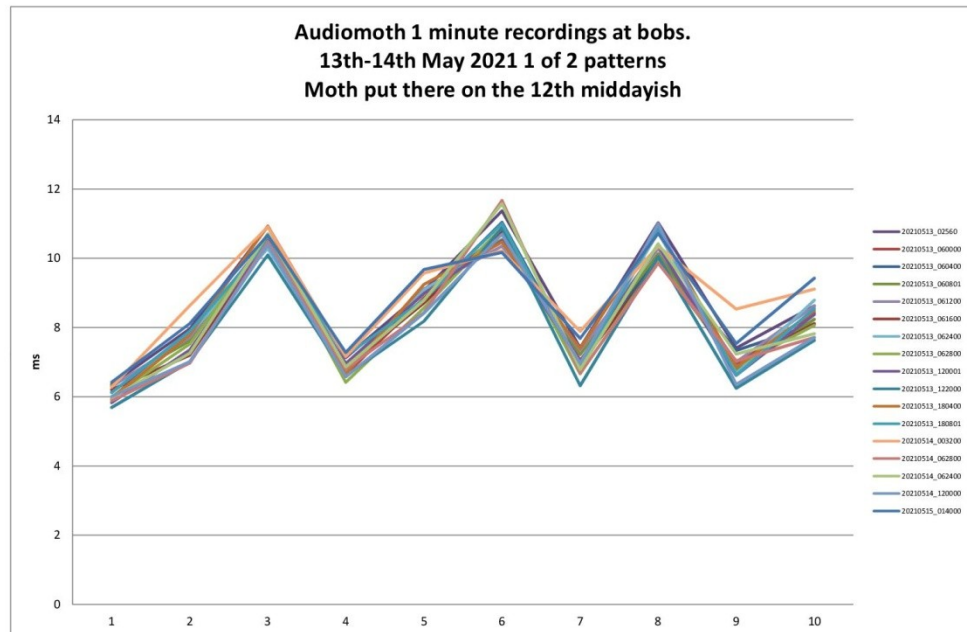
The night is at the top, 00.00 - 03.00 UTC (11pm - 2am BST), and the daylight periods are below, 06.00 - 06.30 UTC, 12.00 - 12.30 UTC and 18.00 - 18.30 UTC (5am - 5.30am, 11am - 12.30pm and 5pm - 5.30pm). The columns are days.

Audiomoth Bob's Ardmore. 12th - 15th May 2021							
Configured for bats and small mammals at 192kHz to test BTO pipeline. 1 minute recordings and 3 minute wait, from 00.00-03.00, 06.00-06.30, 12.00-12.30, 18.00-18.30 UTC (not BST, so -1hr							
13th May 2021				14th May 2021			
file name (date and time)	x = Crex			file name (date and time)	x = Crex		
00.00-03.00 UTC				00.00-03.00 UTC			
20210513_000000.WAV	0			20210514_000000.WAV	x	bird2	
20210513_000400.WAV	0			20210514_000400.WAV	x	bird2	
20210513_000800.WAV	0			20210514_000800.WAV	x		distant
20210513_001200.WAV	0			20210514_001200.WAV	x	bird2	
20210513_001600.WAV	0			20210514_001600.WAV	x	bird2	
20210513_002000.WAV	0			20210514_002000.WAV	x	bird2	faint
20210513_002400.WAV	0			20210514_002400.WAV	x	bird2	
20210513_002801.WAV	0			20210514_002800.WAV	x	bird2	faint
20210513_003200.WAV	0			20210514_003200.WAV	x	bird1	very faint
20210513_003601.WAV	0			20210514_003600.WAV	x	bird2	faint
20210513_004000.WAV	0			20210514_004000.WAV	x	bird2	faint
20210513_004400.WAV	0			20210514_004400.WAV	x		faint
20210513_004801.WAV	0			20210514_004801.WAV	x		very faint
20210513_005200.WAV	0			20210514_005200.WAV	x		very faint
20210513_005600.WAV	0			20210514_005600.WAV	x		very faint
20210513_010001.WAV	0			20210514_010000.WAV	x	bird2	
20210513_010400.WAV	0			20210514_010400.WAV	x		very faint
20210513_010800.WAV	0			20210514_010800.WAV	x	bird2	faint
20210513_011200.WAV	0			20210514_011200.WAV	0		
20210513_011600.WAV	0			20210514_011600.WAV	x	bird2	
20210513_012000.WAV	0			20210514_012000.WAV	x		faint
20210513_012400.WAV	x	bird3		20210514_012400.WAV	0		
20210513_012800.WAV	0			20210514_012800.WAV	0		
20210513_013200.WAV	0			20210514_013200.WAV	0		
20210513_013600.WAV	0			20210514_013600.WAV	x	bird2	
20210513_014000.WAV	0			20210514_014000.WAV	x		faint
20210513_014400.WAV	0			20210514_014400.WAV	x	bird2	
20210513_014800.WAV	0			20210514_014800.WAV	x		faint
20210513_015201.WAV	0			20210514_015201.WAV	x		very faint
20210513_015600.WAV	0			20210514_015600.WAV	x		very faint
20210513_020000.WAV	0			20210514_020000.WAV	x		faint
20210513_020401.WAV	0			20210514_020400.WAV	x		faint
20210513_020800.WAV	0			20210514_020800.WAV	x		faint
20210513_021200.WAV	0			20210514_021200.WAV	x		very faint
20210513_021600.WAV	0			20210514_021600.WAV	x		faint
20210513_022000.WAV	0			20210514_022000.WAV	x		very faint
20210513_022400.WAV	0			20210514_022400.WAV	x		very faint
20210513_022800.WAV	0			20210514_022800.WAV	x	bird2	
20210513_023200.WAV	0			20210514_023200.WAV	x		faint
20210513_023600.WAV	0			20210514_023600.WAV	x		faint
20210513_024000.WAV	0			20210514_024000.WAV	x		very faint
20210513_024400.WAV	0			20210514_024400.WAV	x		faint
20210513_024800.WAV	0			20210514_024800.WAV	x	bird2	
20210513_025200.WAV	0			20210514_025200.WAV	x	bird2	
20210513_025601.WAV	x	bird1		20210514_025601.WAV	x	bird2	
06.00-06.30 UTC				06.00-06.30 UTC			
20210513_060000.WAV	x	bird1		20210514_060000.WAV	0		
20210513_060400.WAV	x	bird1		20210514_060400.WAV	0		
20210513_060801.WAV	x	bird1		20210514_060800.WAV	0		
20210513_061200.WAV	x	bird1		20210514_061200.WAV	0		
20210513_061600.WAV	x	bird1		20210514_061600.WAV	0		
20210513_062000.WAV	x	bird2		20210514_062000.WAV	0		
20210513_062400.WAV	x	bird1		20210514_062400.WAV	x	bird1	
20210513_062800.WAV	x	bird1		20210514_062800.WAV	x	bird1	loud
12.00-12.30 UTC				12.00-12.30 UTC			
20210513_120001.WAV	x	bird1		20210514_120000.WAV	x	bird1	
20210513_120400.WAV	0			20210514_120400.WAV	0		
20210513_120800.WAV	0			20210514_120800.WAV	0		
20210513_121200.WAV	0			20210514_121200.WAV	0		
20210513_121601.WAV	0			20210514_121601.WAV	0		
20210513_122000.WAV	x	bird1	windy and	20210514_122000.WAV	0		tractor
20210513_122400.WAV	0			20210514_122400.WAV	0		
20210513_122801.WAV	0			20210514_122801.WAV	0		
18.00-18.30 UTC				18.00-18.30 UTC			
20210513_180000.WAV	0			20210514_180000.WAV	0		
20210513_180400.WAV	x	bird1		20210514_180400.WAV	0		
20210513_180801.WAV	x	bird1		20210514_180800.WAV	0		
20210513_181200.WAV	0			20210514_181200.WAV	0		small mammal 20kHz
20210513_181601.WAV	0			20210514_181600.WAV	0		
20210513_182000.WAV	0			20210514_182001.WAV	0		
20210513_182400.WAV	0			20210514_182400.WAV	x	bird1	loud
20210513_182800.WAV	0			20210514_182800.WAV	0		

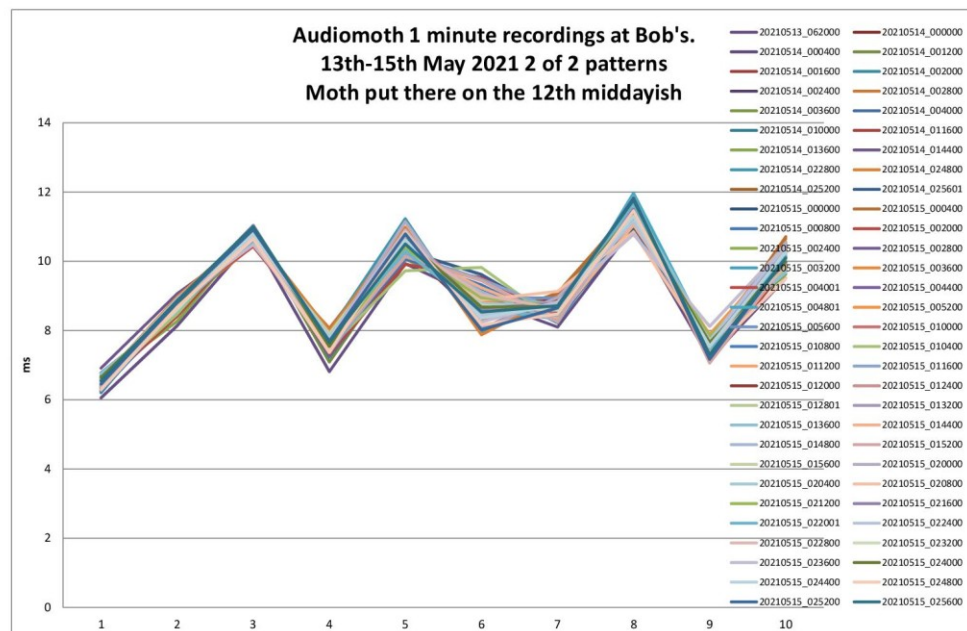
I think it is clear that one pattern, "bird 1", is more common in daytime and "bird 2" in the night. Most of the recordings done by people with phones which are in the PPD charts above were in the day and are also "bird 1".

These are the PPD charts for "bird 1" and "bird 2" recorded by the Audiomoth. They correlate at $r = 0.6$ which should mean a definitely different bird.

"bird 1"



"bird 2"

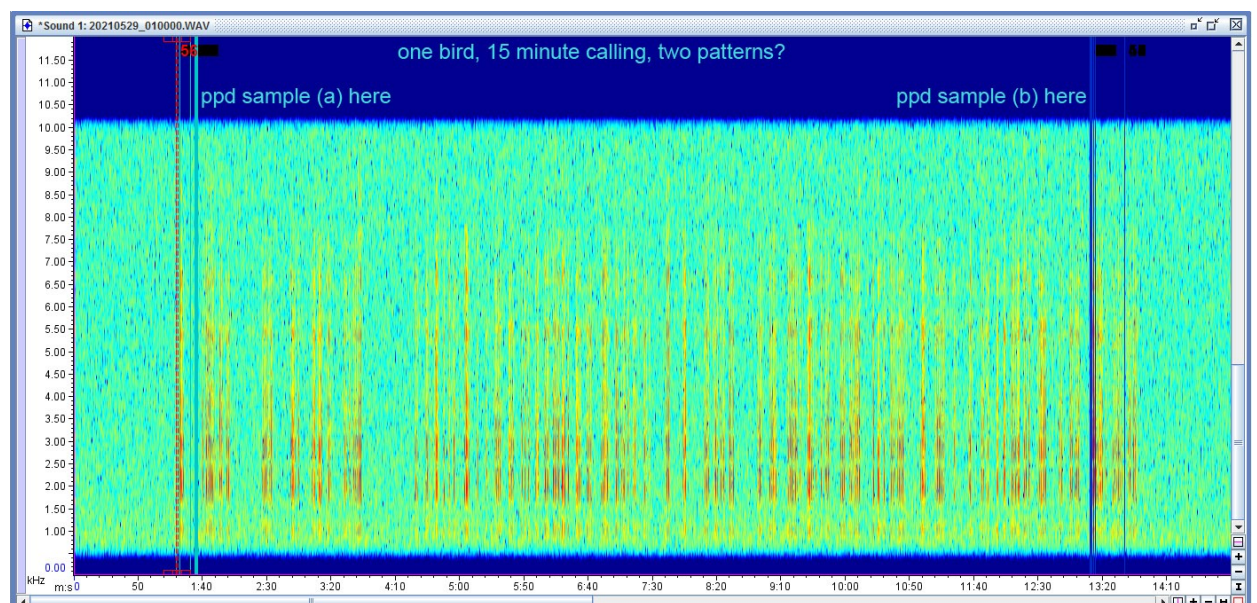


We put the Audiomoth out again from the 28th of May for a few days recording in 15 minute periods. We did PPD analysis at the start (a) and end (b) of each 15 minute recording. Interestingly the recording on the 29th May at 1am (corrected 3/9/21) seems to include PPD patterns for "bird 1" and "bird 2". The corncrake went silent after the 29th of May.

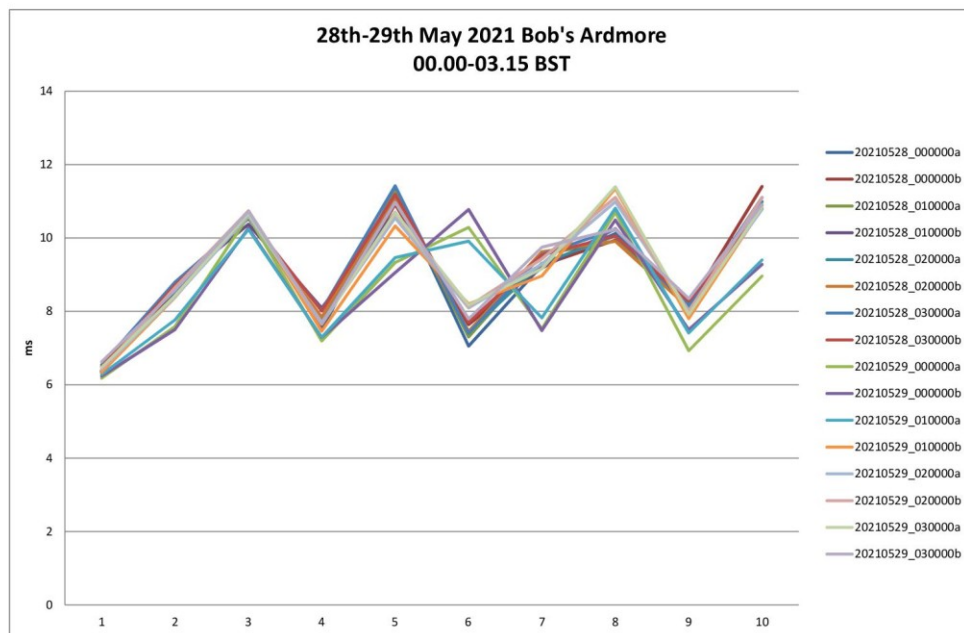
Audiomoth bobs Ardmore BST times, 28th, 29th, 30th, 31st May 2021					
Configured for birds at 44kHz. 15 minute recordings,					
from 00.00-00.15, 01.00-01.15, 02.00-02.15, 03.00-03.15 BST. Two PPD analyses per 15 minute recording					
	crex = x			analysed. bird2	
28th May					
20210528_000000.WAV	x	continuous	a	bird2	
			b	bird2	
20210528_010000.WAV	x	continuous	a	bird2	
			b	bird2	
20210528_020000.WAV	x	continuous	a	bird2	
			b	bird2	
20210528_030000.WAV	x	continuous	a	bird2	
			b	bird2	
29th May					
20210529_000000.WAV	x	faint continuous	a	bird1	
			b	bird1	
20210529_010000.WAV	x	faint 3/4 of record	a	bird1	
			b	bird2	
20210529_020000.WAV	x	continuous	a	bird2	
			b	bird2	
20210529_030000.WAV	x	faint continuous	a	bird2	
			b	bird2	
30th May					
20210530_000000.WAV	0				
20210530_010000.WAV	0				
20210530_020000.WAV	0				
20210530_030000.WAV	0	sedge warbler			

The spectrogram plot for the 15 minute period at 1am on the 29th of May (highlighted in red on the list, corrected 3/9/21), which shows two analysed areas one "bird 1" and one "bird 2" in a continuous craking recording of 15 minutes.

The vertical red lines are the syllables of the rasping corncrake call, spanning 0.7 to 7.8 kHz. The y axis is frequency of sound in kilohertz and the x axis is time in minutes.



The PPD chart of the samples, at the start and end of each 15 minute recording, for the 28th to 29th May between 00.00 to 03.15 BST shows the two patterns, "bird 1" and "bird 2" must have been made by one bird.



Conclusion from Ardmore recordings

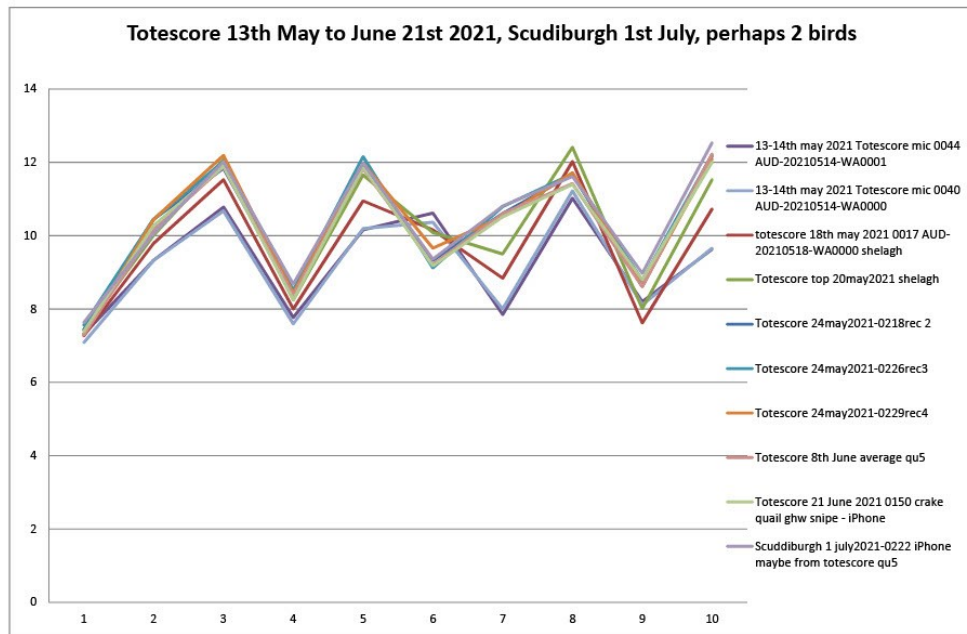
Our recordings and PPD analysis show that one bird can make two separate and distinct PPD patterns. The 1998 paper relied on the theory that one bird makes one PPD pattern and so can be recognised by this pattern.

The 1998 paper suggests a problem that two birds may share a pattern, which we have also noted in our recordings. This also adds to the difficulty of tracking male corncrakes by sound recording analysis.

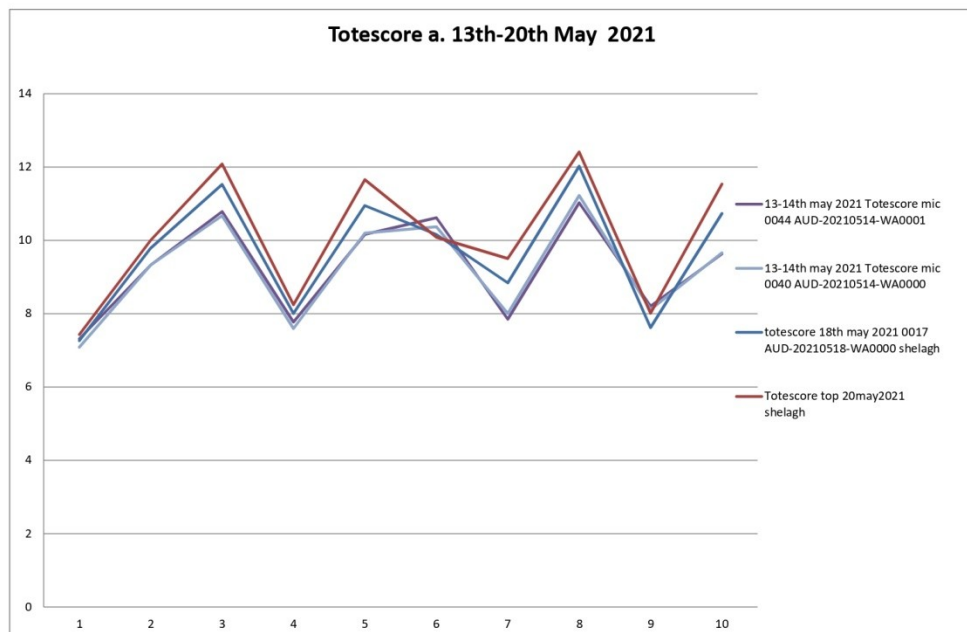
Prof. Rhys Green (ex RSPB Research Director and co-author of the 1998 paper) confirmed emphatically, by personal communication to Shelagh, that it is not possible to "identify" individuals because of such ambiguities.

Despite the additional problem of "one bird - two patterns" that we have found, there is still some benefit in attempting to match or distinguish PPD patterns to *cautiously* add information about movements and numbers of calling male corncrakes in a small population like the one on Skye.

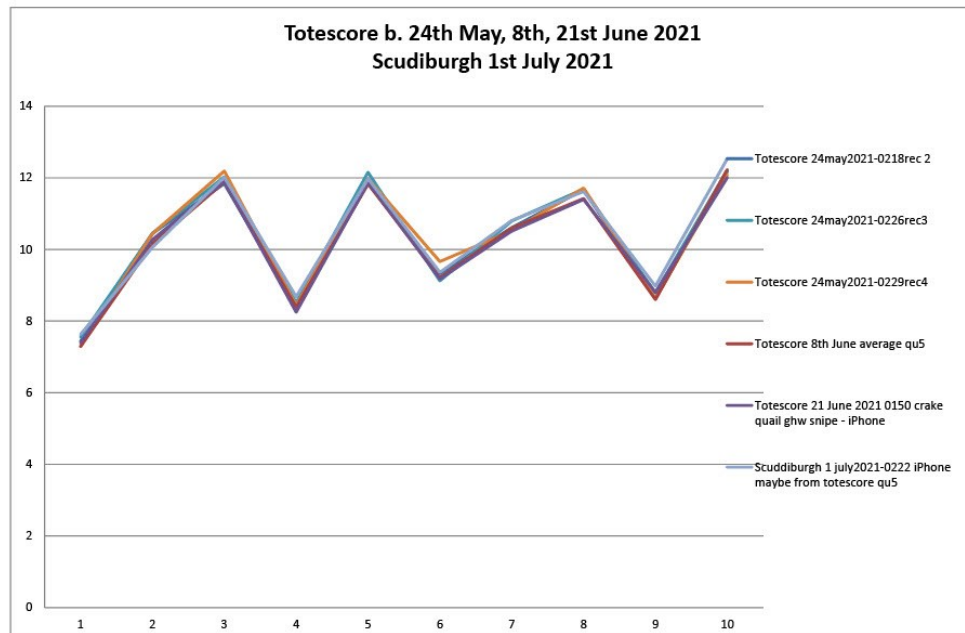
Record 3 and 4. May 13th - July 1st Totescore and Scudiburgh. Probably two birds



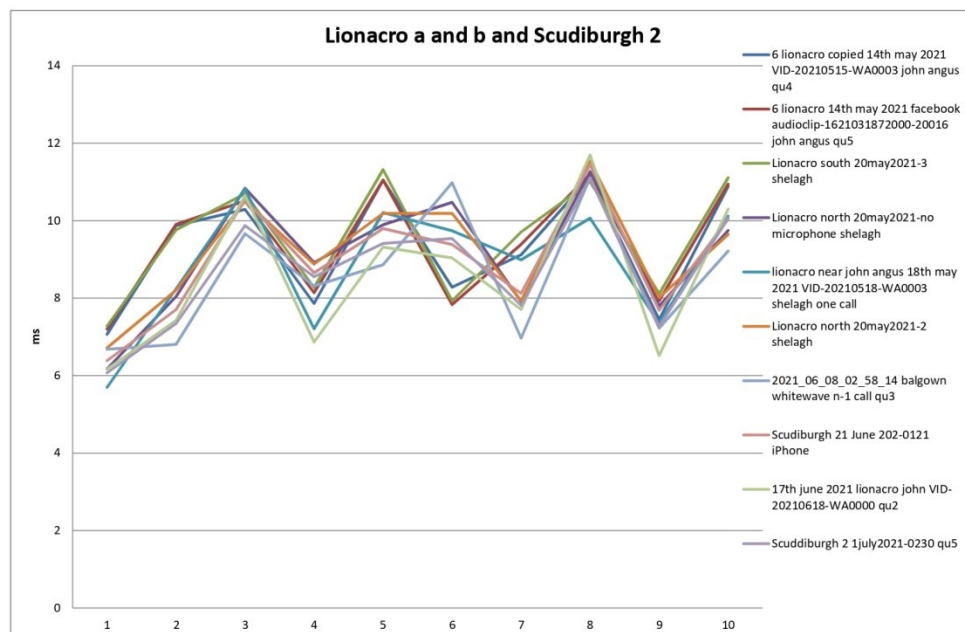
Record 3. Totescore patterns separated. Pattern a. 13th May - 20th May 2021



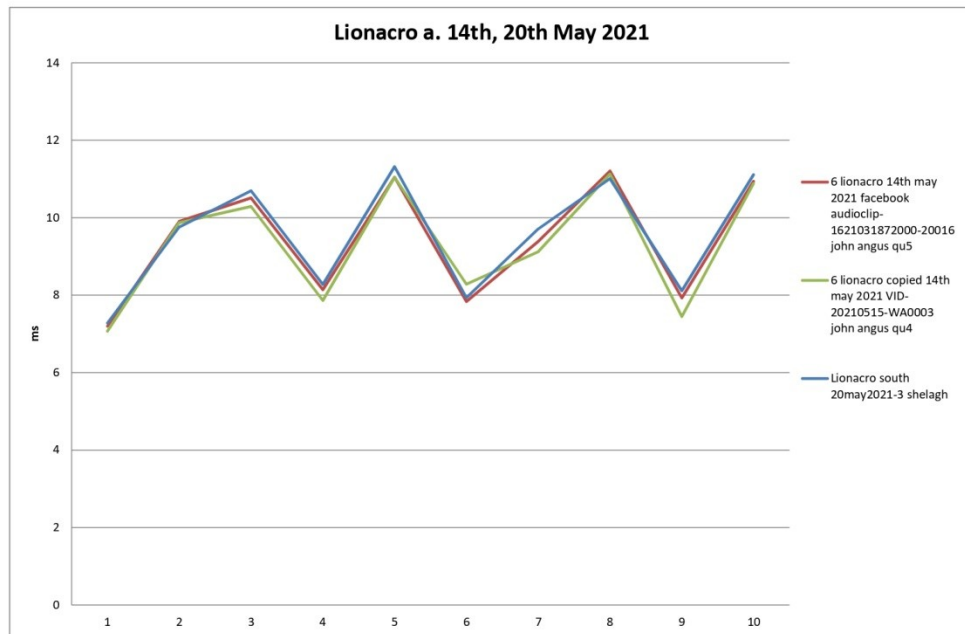
Record 4. Totescore patterns separated. Pattern b. 24th May - 21st June This one moved to Scudiburgh by the 1st of July 2021



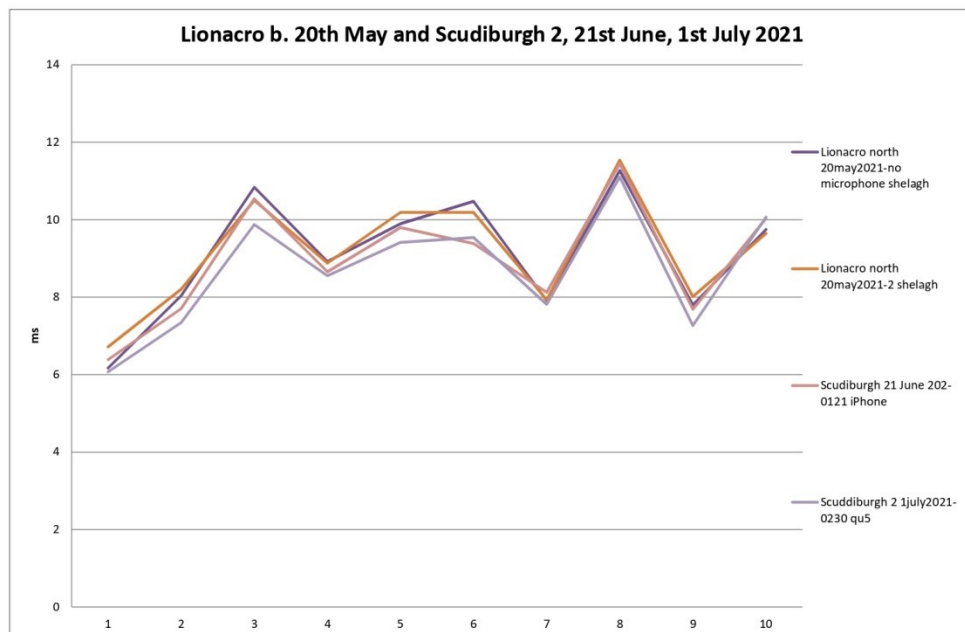
Record 5 and 6. Lionacro 14th May - 2nd July 2021. Two birds were heard at different times.



Record 5. Lionacro 14th - 20th May 2021



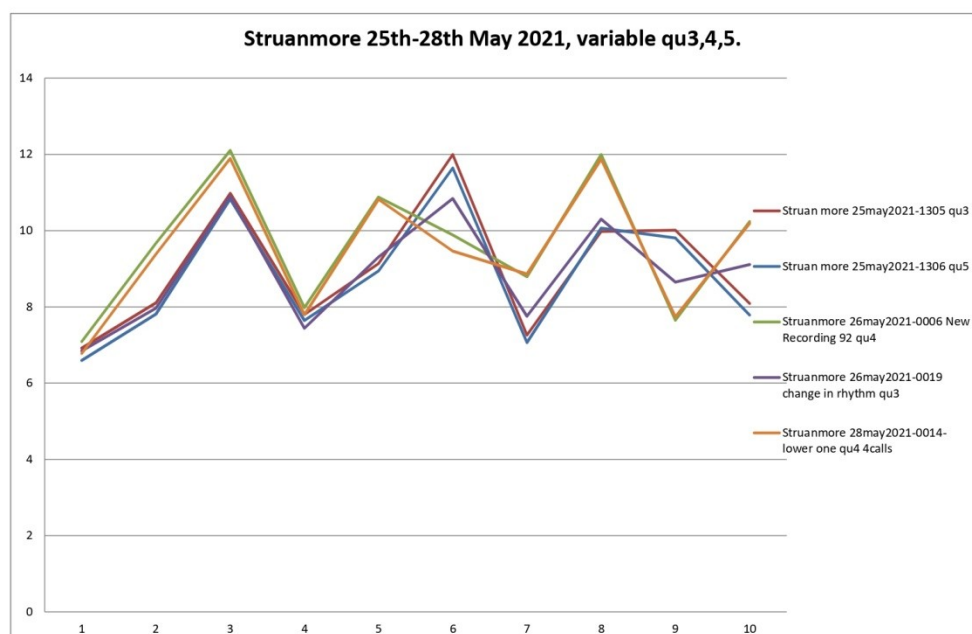
Record 6. Lionacro 20th May - 21st June then moved to Scudiburgh by 2nd July 2021



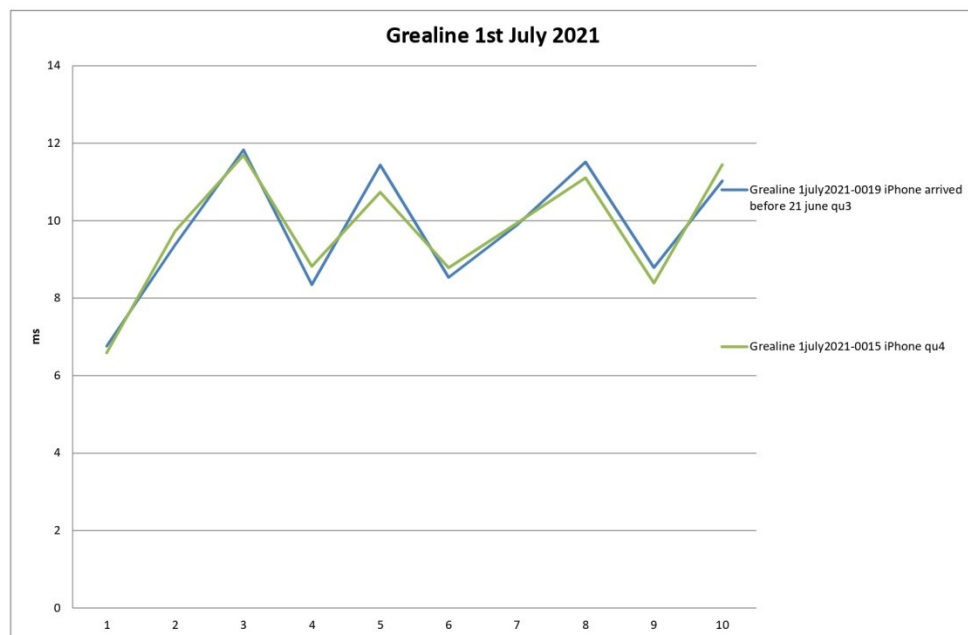
Record 7. Hallin Park 23rd May 2021. This bird was heard along the shore on several occasions but only successfully recorded once.



Record 8. Struanmore 25th – 28th May 2021. There are apparently two patterns, but the recordings were poor quality and Shelagh noticed a change in rhythm while recording on the 26th May. Two distinct patterns appear on this day which suggests it is another case of one bird being able to make two distinct PPD patterns although not as well documented as the Ardmore bird.



Record 9. Grealine 1st July 2021

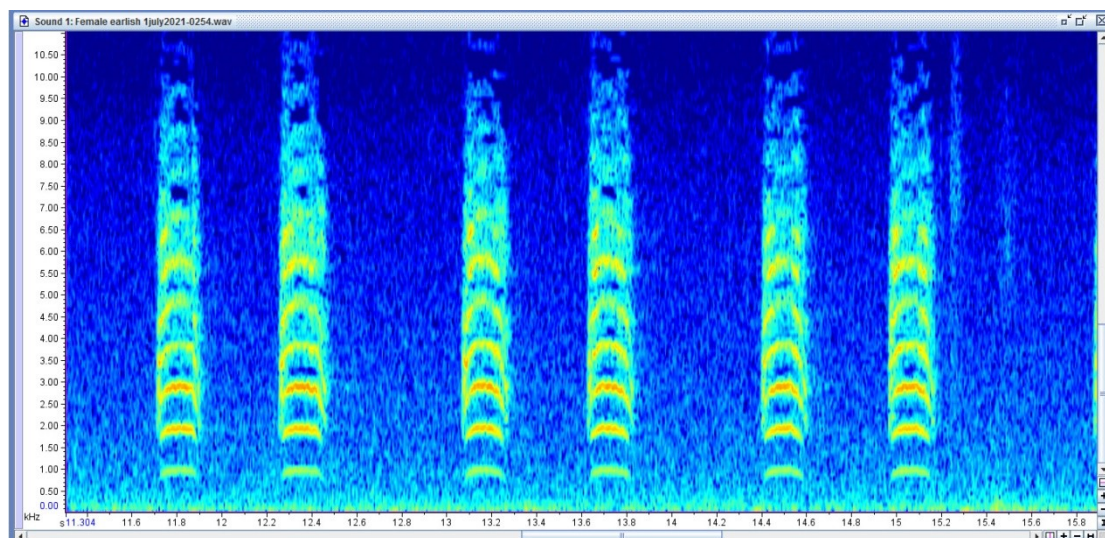


Summary

I think these 9 "records" represent 9 male individuals that have been recorded. The estimate from the PPD recordings for 2020 was 11 calling males.

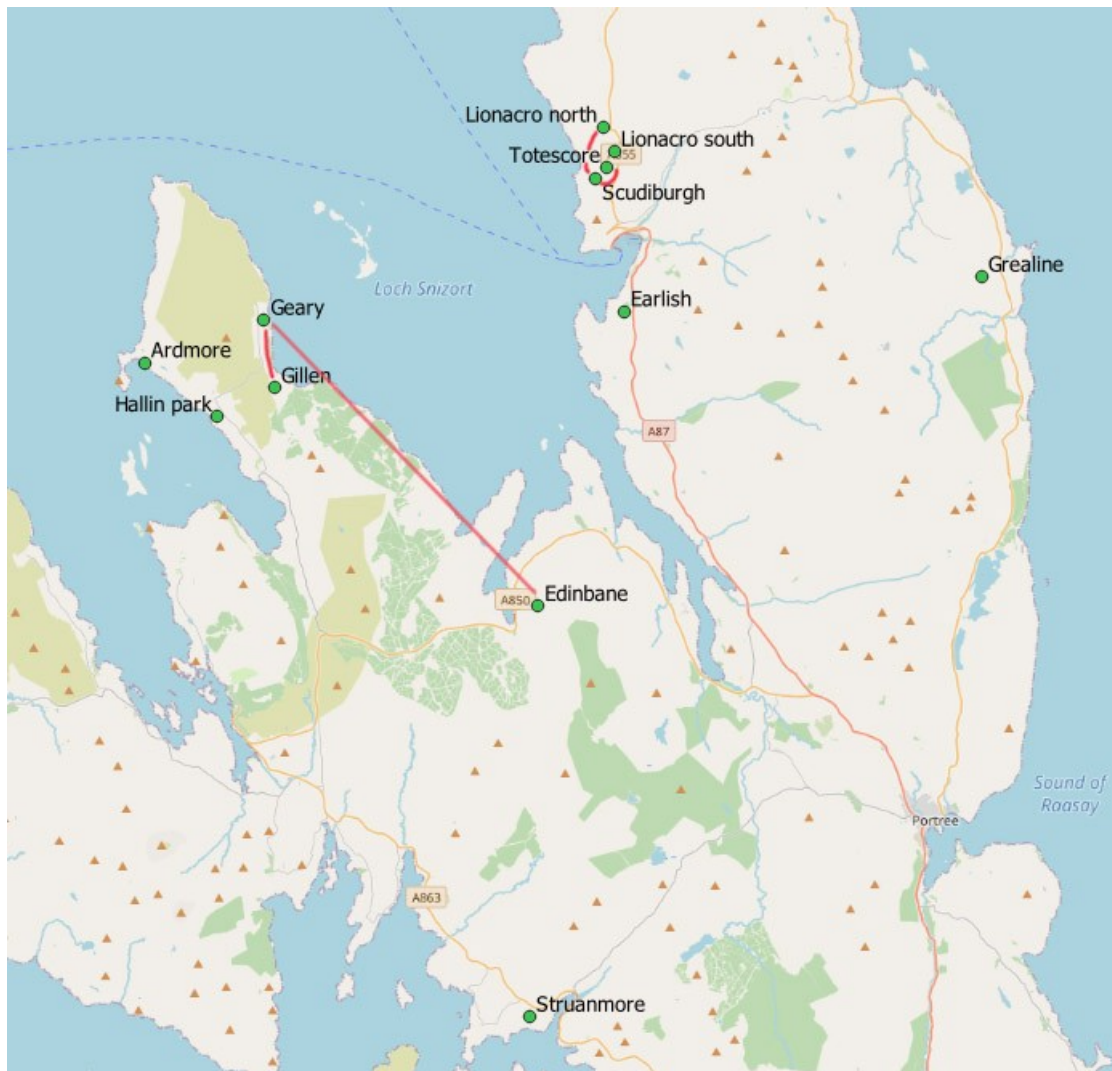
In addition there has been another female calling record. (Quite a rare occurrence. There were two recordings of females in 2020).

Female record. Earlish 1st July 2021.



Individuals and locations

Map of the locations of records in 2021



In 2021 there were a some small movements that were revealed by the analysis, marked in red.

Record 4 moved from Totescore to Scudiburgh,
Record 6 moved from Lionacro north to Scudiburgh,
Record 1 moved from Gillen to Geary and then along the crofts in Geary and then in July appeared in Edinbane briefly.

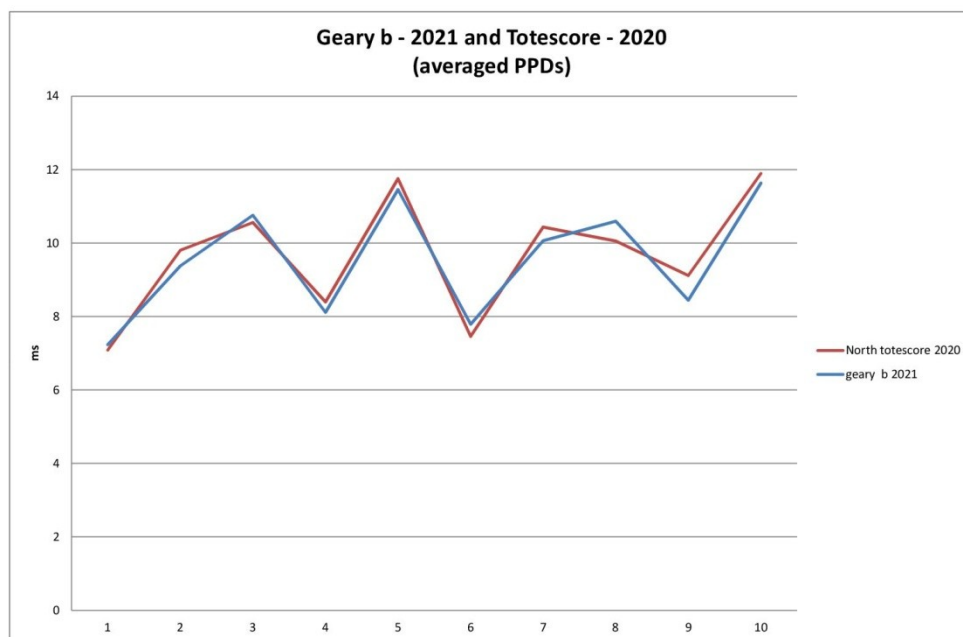
Comparison of quality 4-5 recordings from 2021 with 2020

The PPD measurements have been averaged for each recognisable pattern for 2020 and 2021 recordings. This becomes a matrix of comparisons between all pairs. There are 13 PPD patterns for 2021 and 9 from 2020.

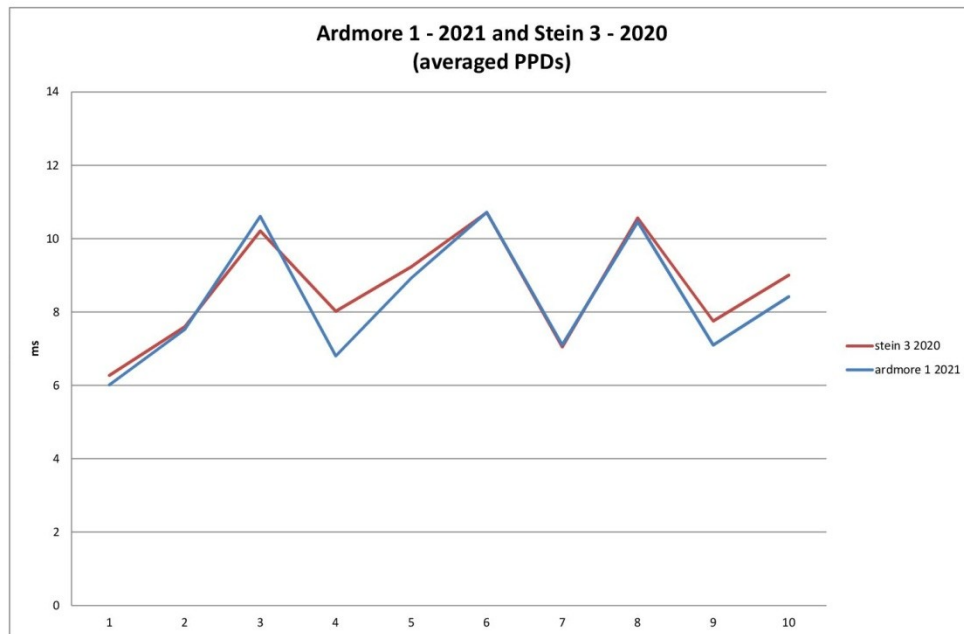
The pairs that match using the correlation coefficient ($r > 0.95$) have been plotted together and very similar patterns that could be significant are printed below.

They indicate possible returning birds.

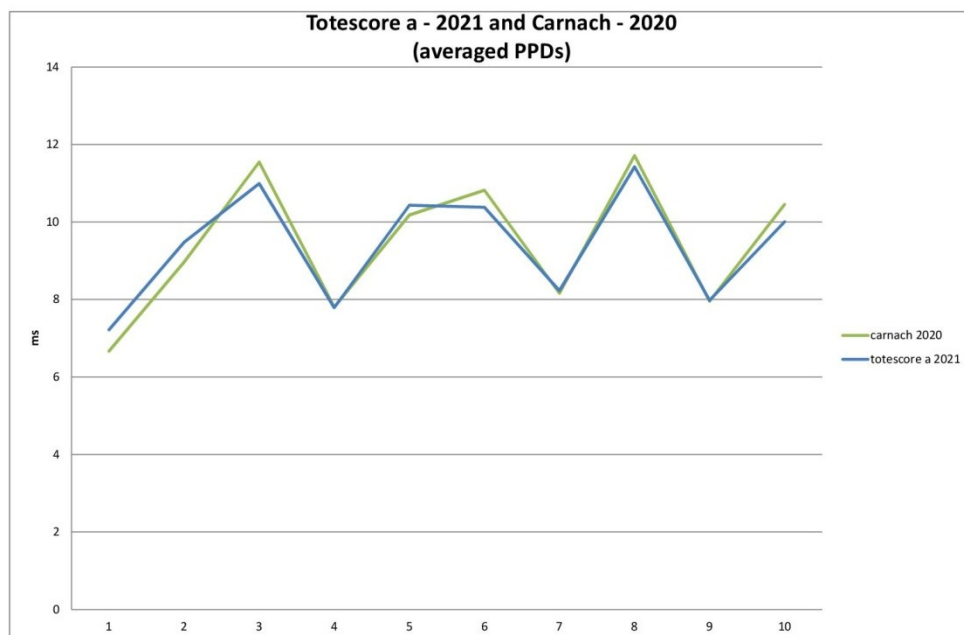
Record 1. The Geary bird may have been at Totescore in 2020



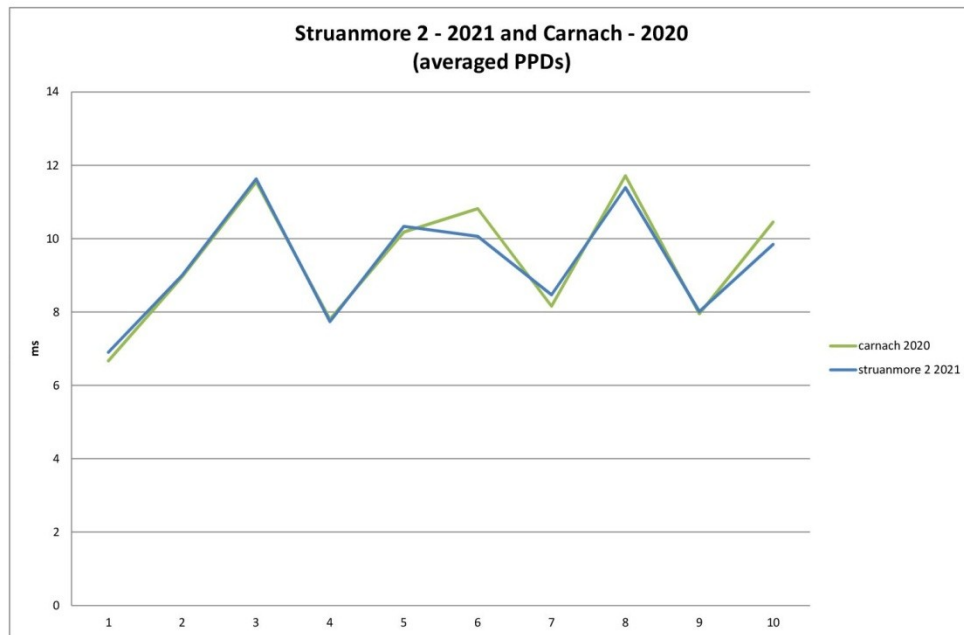
Record 2. The Ardmore bird may have been at Stein in 2020



Record 3. The Totescore a. bird may have been in Carnach in 2020



Record 8. The Struanmore bird may have been in Carnach in 2020



Record 9. The Grealine bird may have been in Grealine in 2020

