Peregrine

Figure 1: Juvenile Peregrines in South Ayrshire (Photo: Angus Hogg, South Strathclyde RSG).

Peregrine is one of the most comprehensively monitored raptor species in Scotland, with around 65-76% of the estimated breeding population surveyed each year. Monitoring coverage is not consistent across Scotland however. Despite much monitoring information being collected across the large Highland Region, which supports a substantial part of the Scottish population, the lack of consistency of coverage and effort across years in that region currently limits the production of representative national trends.

Peregrine has also been subject to periodic national survey via The Statutory Conservation Agency/RSPB Annual Breeding Bird Scheme (SCARABBS) programme. Scottish population estimates since the 1960s are available from six national surveys in: 1961/62 (Ratcliffe 1963) 388 pairs; 1971 (Ratcliffe 1972) 366 pairs; 1981 (Ratcliffe 1984) 442 pairs; 1991 (Crick & Ratcliffe 1995) 626 pairs; 2002 (Banks *et al.* 2010) 571 pairs; and 2014 (Wilson *et al.* 2018) 523 pairs.

Our latest analysis of SRMS Peregrine data for the period 2009-2018 has produced no national trends in breeding numbers or productivity, but has produced trends for eight of the 12 SRMS regions (Table 1) and for ten of the 21 NHZ regions (Table 2) for which the SRMS holds Peregrine records.

When interpreting the published trends, users should be aware that records for trends in breeding numbers are mostly drawn from upland areas, with lowland (and, particularly, urban areas) perhaps somewhat under-represented in comparison (Figure 12).

National trends

No SRMS trends in breeding numbers or breeding productivity are available for Peregrine at a national level.

SRMS regional trends

Breeding numbers of Peregrine decreased in two regions (Argyll and Tayside & Fife) and did not change significantly in the remaining six regions (Central, Dumfries & Galloway, Lothian & Borders, North-east Scotland, Orkney and South Strathclyde) (Table 1, Figure 2).

Breeding success of Peregrine decreased in Lothian & Borders and Orkney, increased in North East Scotland, did not change significantly in Argyll, Central Scotland, Dumfries & Galloway or Tayside & Fife), and showed non-linear variation in South Strathclyde (Table 1, Figure 3).

Clutch and brood size did not change significantly in either Dumfries & Galloway or Lothian & Borders (Table 1, Figures 4-5). Number of fledglings decreased in Dumfries & Galloway, but did not change significantly in Central, Dumfries & Galloway, Lothian & Borders, South Strathclyde or Tayside & Fife (Table 1, Figure 6).

Trends for this species are not yet available for Highland, Lewis & Harris, Shetland or Uist.

NHZ regional trends

Breeding numbers of Peregrine decreased in three regions (NHZs 11, 14 and 15) and did not change significantly in the remaining seven regions (NHZs 02, 12 and 16-20) (Table 2, Figure 7).

Breeding success of Peregrine decreased in NHZs 02 and 16, did not change significantly in NHZs 12, 14, 15 and 17-20, and showed non-linear variation in NHZ 11 (Table 2, Figure 8).

Clutch size, brood size and number of fledglings of Peregrine did not change significantly in NHZs 16 and 20 (Table 2, Figures 9-11). Number of fledglings did not change significantly in a further three regions (NHZs 17-19) (Table 2, Figure 11).

Trends for this species are not yet available for NHZs 01, 03-10, 13 and 21.

Details of contributing records

6,625 (534 to 1,072 per year, mean: 663 records per year) from 2009-2018 contributed to this trends analysis (Table 5).

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Alexander N. Banks, Humphrey Q.P. Crick, Rachel Coombes, Stuart Benn, Derek A. Ratcliffe & Elizabeth M. Humphreys (2010) The breeding status of Peregrine Falcons *Falco peregrinus* in the UK and Isle of Man in 2002, Bird Study, 57:4, 421-436, DOI: 10.1080/00063657.2010.511148

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M. W. Wilson, D. E. Balmer, K. Jones, V. A. King, D. Raw, C. J. Rollie, E. Rooney, M. Ruddock, G. D. Smith, A. Stevenson, P. K. Stirling-Aird, C. V. Wernham, J. M. Weston & D. G. Noble (2018) The breeding population of Peregrine Falcon *Falco peregrinus* in the United Kingdom, Isle of Man and Channel Islands in 2014, Bird Study, 65:1, 1-19, DOI: 10.1080/00063657.2017.1421610

Table 1: Summary of SRMS regional trends for Peregrine during 2009-2018. Figures in parentheses indicate the annual change, with significant increases highlighted in green, significant decreases highlighted in blue and non-significant changes highlighted in grey. 'Non-linear' indicates non-linear trends. '—' indicates where the species occurs but no trend is available. 'No SRMS data' indicates where the SRMS does not hold any records for the region of interest. 'Absent' indicates where the species is not known to breed.

SRMS Region	Pairs	Success	Clutch size	Brood size	Number of fledglings
Argyll	**Decrease [s] (-11%)**	Not significant [s]	—	—	—
Central	Not significant [s]	Not significant [s]	—	—	Not significant [s]
Dumfries & Galloway	Not significant	Not significant	Not significant [s]	Not significant [s]	**Decrease (-2.4%)**
Highland	—	—	—	—	—
Lewis & Harris	—	—	—	—	—
Lothian & Borders	Not significant	**Decrease (-2.1%)**	Not significant	Not significant [s]	Not significant
North East Scotland	Not significant	**Increase (8.3%)**	—	—	—
Orkney	Not significant [s]	**Decrease [s] (-2.4%)**	—	—	—
Shetland	—	—	—	—	—
South Strathclyde	Not significant	Non-linear	—	—	Not significant
Tayside & Fife	**Decrease (-4.1%)**	Not significant	—	—	Not significant
Uist	—	—	—	—	—

[s] *Sample sizes small.*

Table 2: Summary of NHZ regional trends for Peregrine during 2009-2018. Figures in parentheses indicate the annual change, with significant decreases highlighted in blue and non-significant changes highlighted in grey. 'Non-linear' indicates non-linear trends. '—' indicates where the species occurs but no trend is available. 'No SRMS data' indicates where the SRMS does not hold any records for the region of interest. 'Absent' indicates where the species is not known to breed.

NHZ Region	Pairs	Success	Clutch size	Brood size	Number of fledglings
01. Shetland	—	—	—	—	—
02. North Caithness and Orkney	Not significant [s]	**Decrease [s] (-2.4%)**	—	—	—
03. Coll, Tiree and the Western Isles	—	—	—	—	—
04. North West Seaboard	—	—	—	—	—
05. The Peatlands of Caithness and Sutherland	—	—	—	—	—
06. Western Seaboard	—	—	—	—	—
07. Northern Highlands	—	—	—	—	—
08. Western Highlands	—	—	—	—	—
09. North East Coastal Plain	—	—	—	—	—
10. Central Highlands	—	—	—	—	—
11. Cairngorm Massif	**Decrease (-6.7%)**	Non-linear	—	—	—
12. North East Glens	Not significant [s]	Not significant [s]	—	—	—
13. East Lochaber	—	—	—	—	—
14. Argyll West and Islands	**Decrease [s] (-11%)**	Not significant [s]	—	—	—
15. Loch Lomond, The Trossachs and Breadalbane	**Decrease (-11.1%)**	Not significant [rs]	—	—	—
16. Eastern Lowlands	Not significant	**Decrease (-1.3%)**	Not significant [rs]	Not significant [rs]	Not significant
17. West Central Belt	Not significant	Not significant	—	—	Not significant [rs]
18. Wigtown Machairs and Outer Solway Coast	Not significant	Not significant [s]	—	—	Not significant
19. Western Southern Uplands and Inner Solway	Not significant	Not significant	—	—	Not significant [r]
20. Border Hills	Not significant	Not significant	Not significant [rs]	Not significant [rs]	Not significant [rs]
21. Moray Firth	—	—	—	—	—

[r] No home range random effect, [s] Sample sizes small.

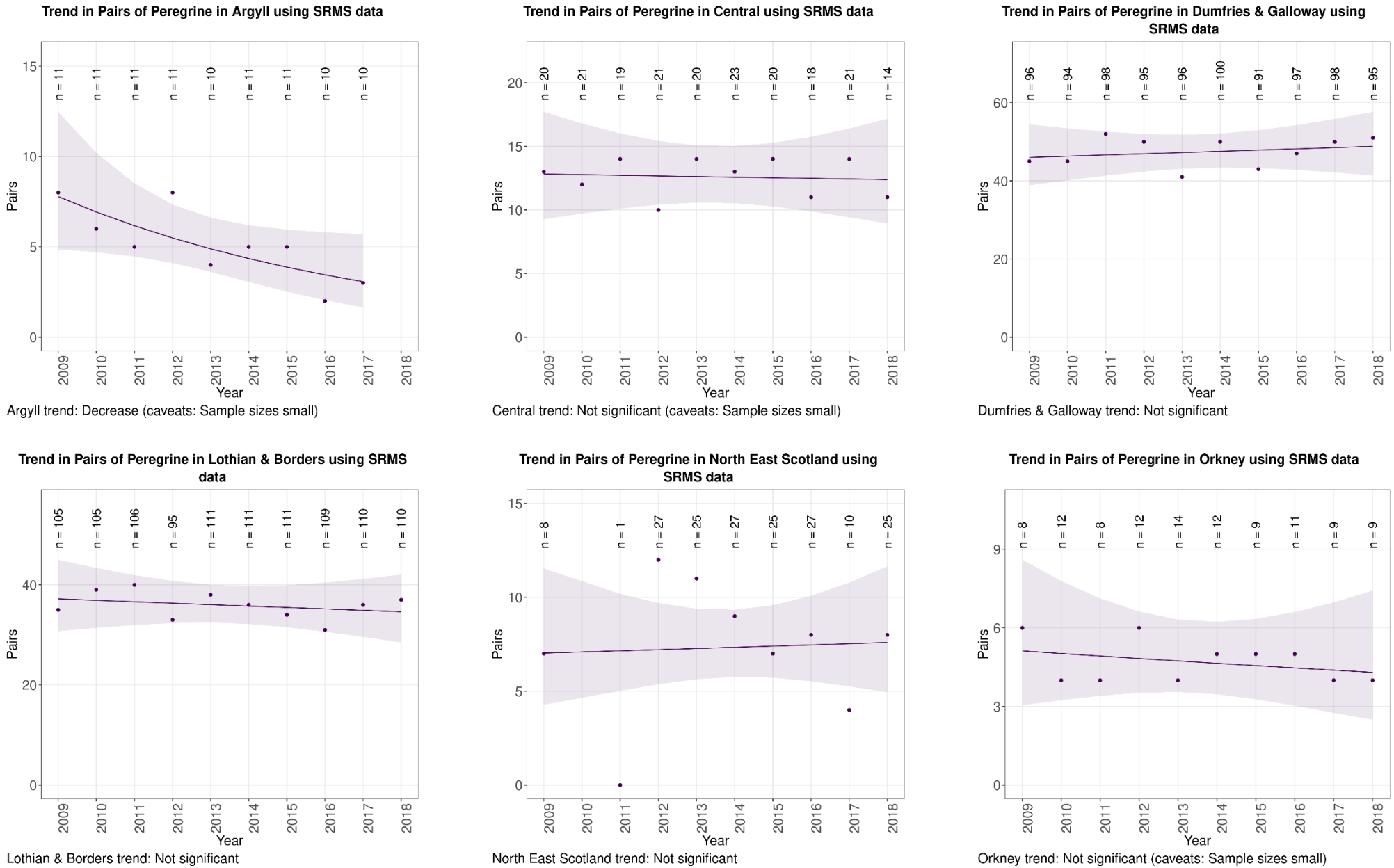
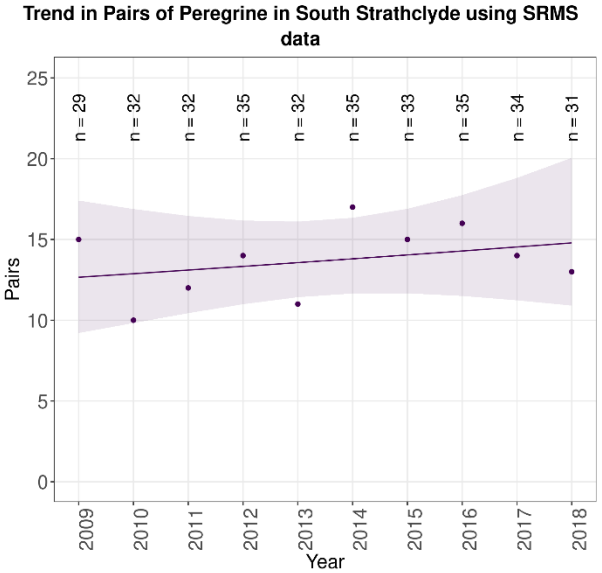


Figure 2: Trends in numbers of breeding pairs of Peregrine by SRMS region during 2009-2018.



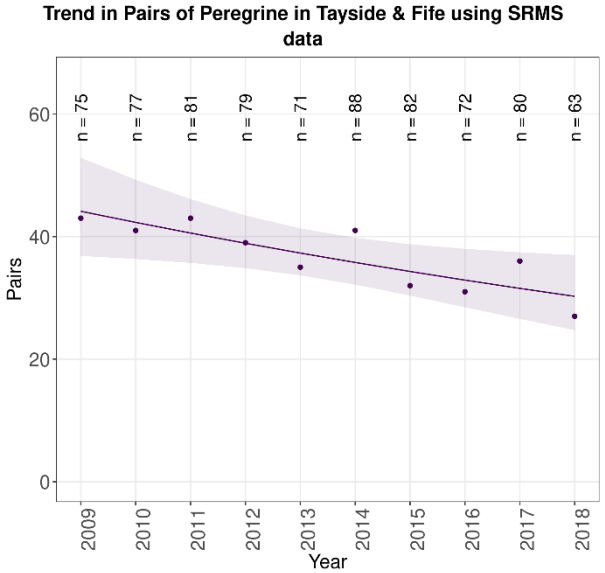


Figure 2 continued: Trends in numbers of breeding pairs of Peregrine by SRMS region during 2009-2018.

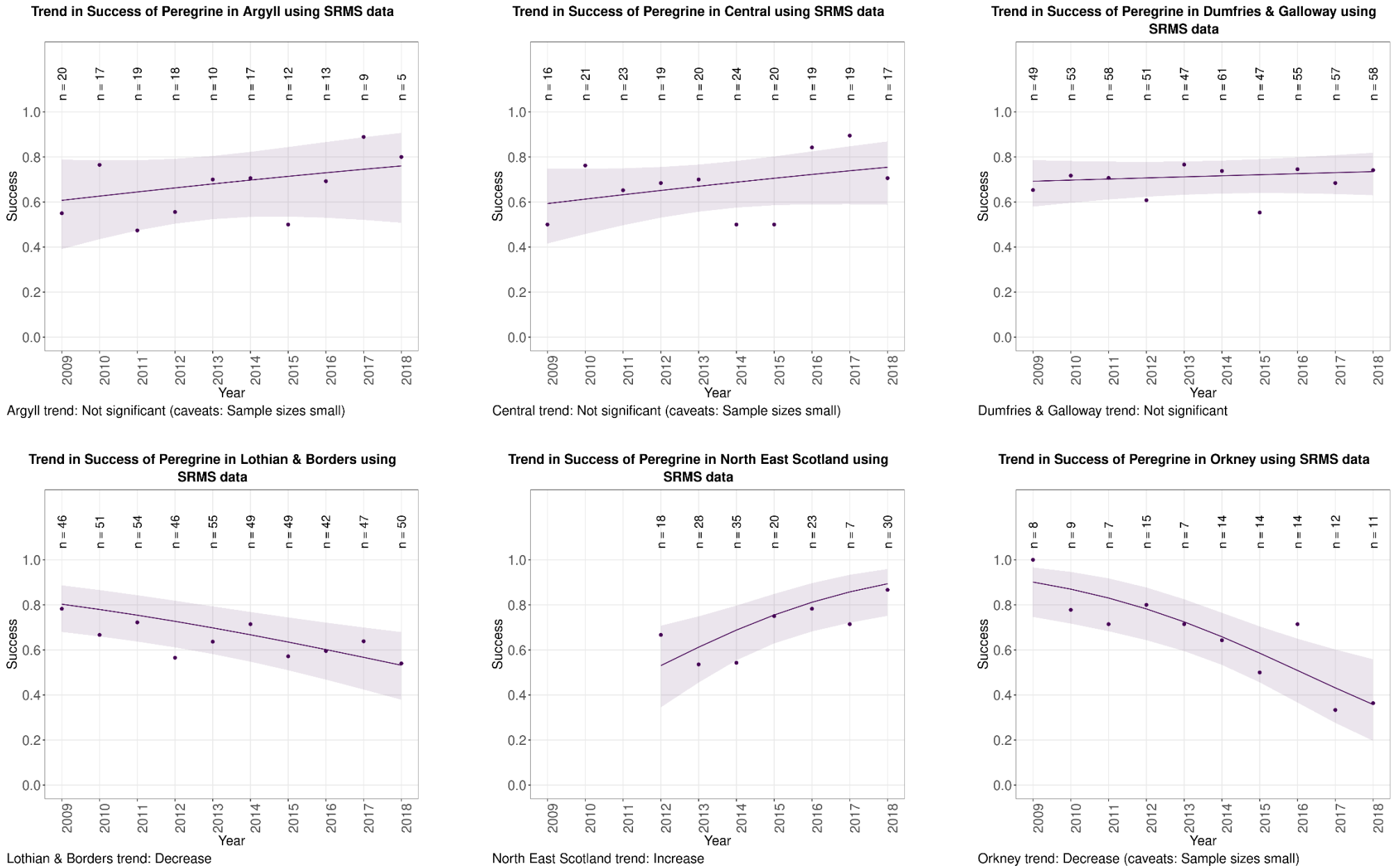
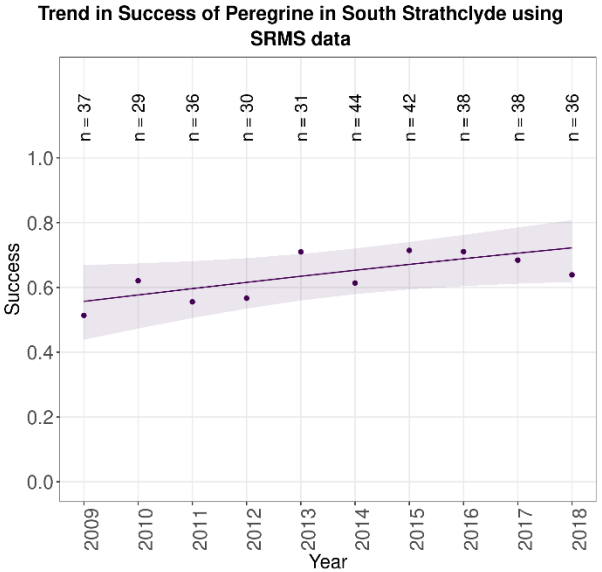
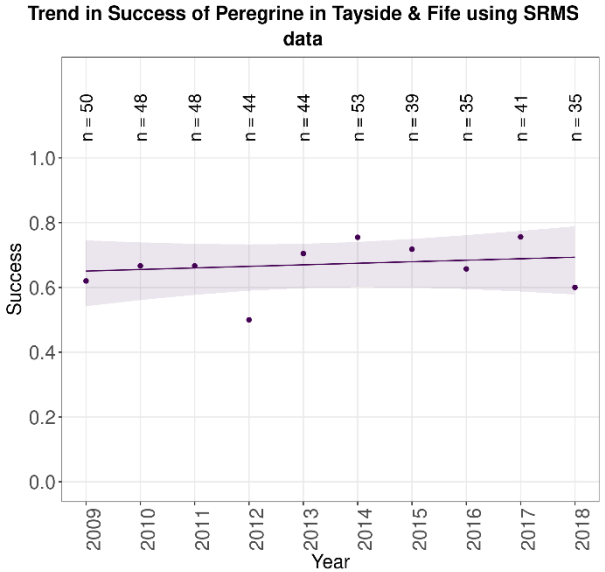


Figure 3: Trends in breeding success of Peregrine by SRMS region during 2009-2018.

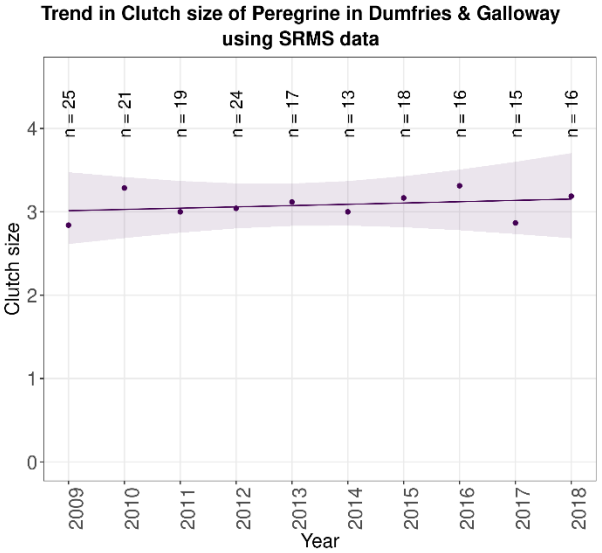


South Strathclyde trend: Non-linear

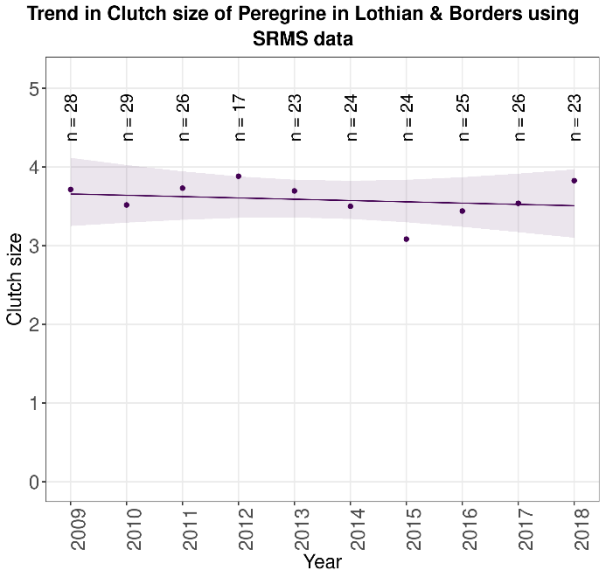


Tayside & Fife trend: Not significant

Figure 3 continued: Trends in breeding success of Peregrine by SRMS region during 2009-2018.

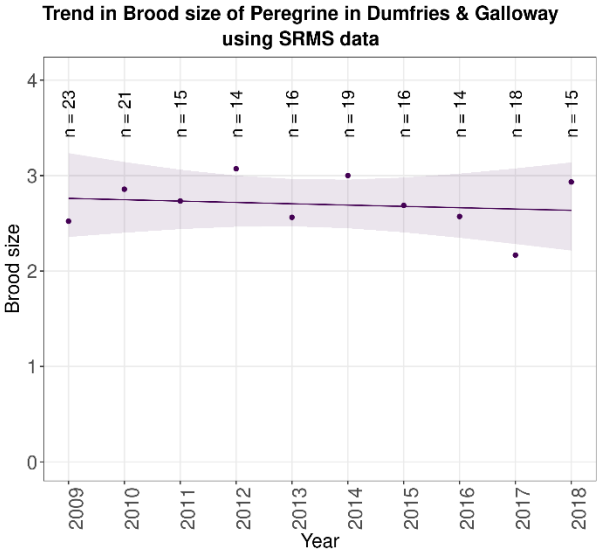


Dumfries & Galloway trend: Not significant (caveats: Sample sizes small)

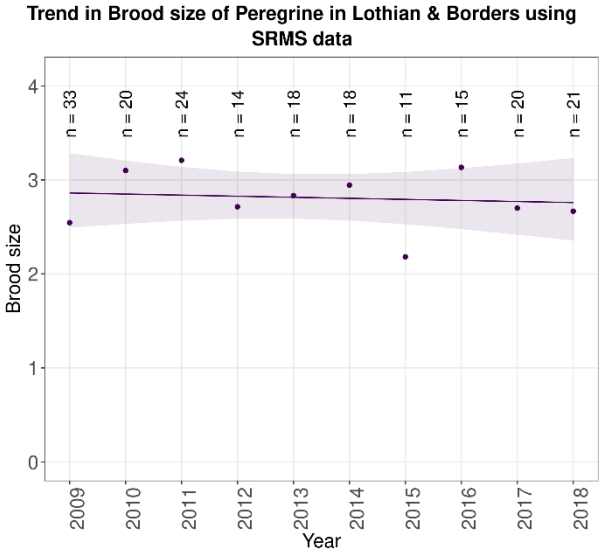


Lothian & Borders trend: Not significant

Figure 4: Trends in clutch size of Peregrine by SRMS region during 2009-2018.



Dumfries & Galloway trend: Not significant (caveats: Sample sizes small)



Lothian & Borders trend: Not significant (caveats: Sample sizes small)

Figure 5: Trends in brood size of Peregrine by SRMS region during 2009-2018.

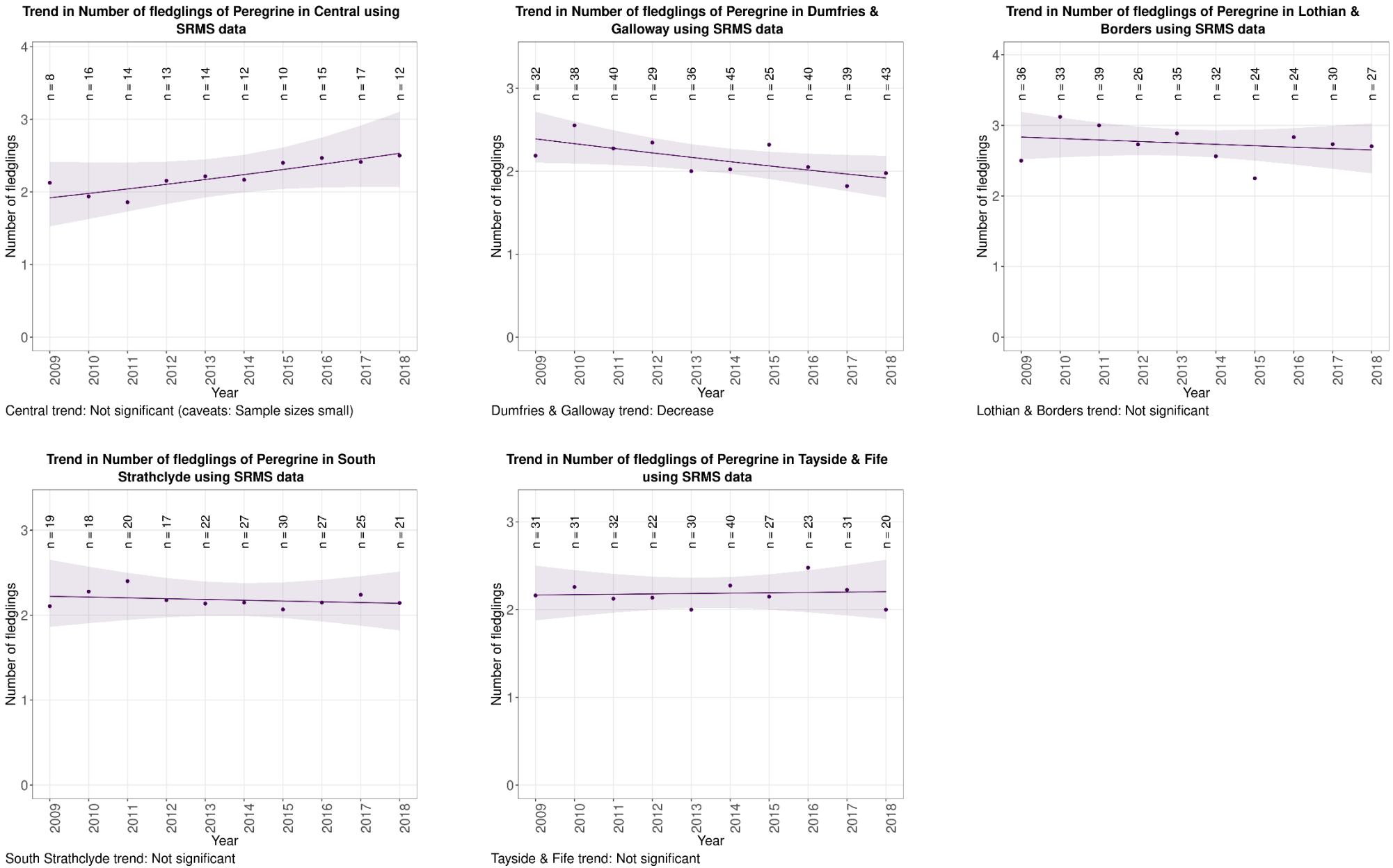
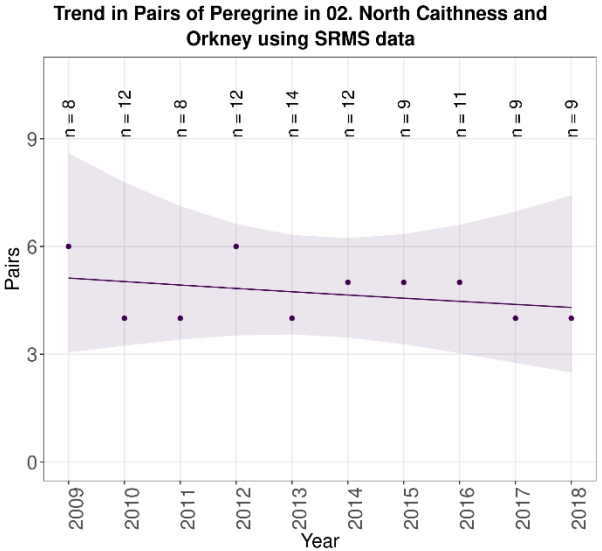
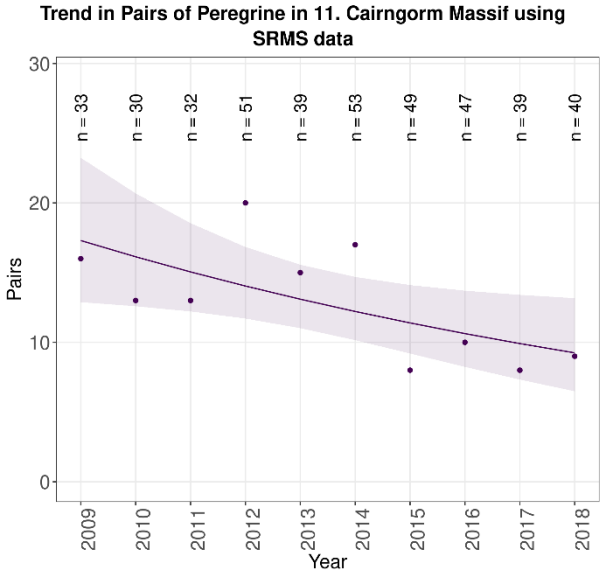


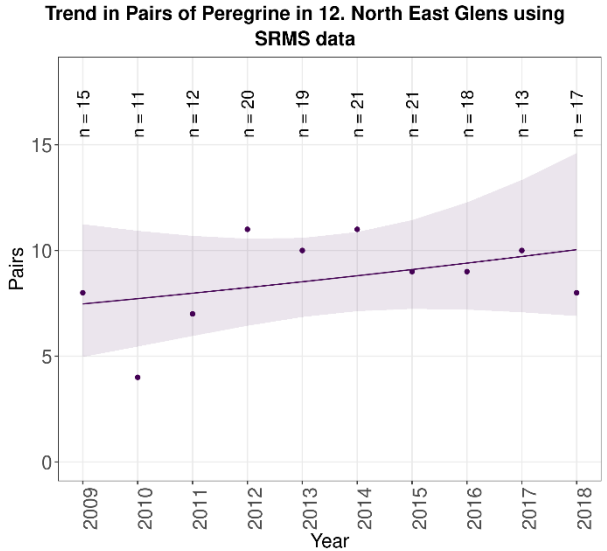
Figure 6: Trends in numbers of fledglings of Peregrine by SRMS region during 2009-2018.



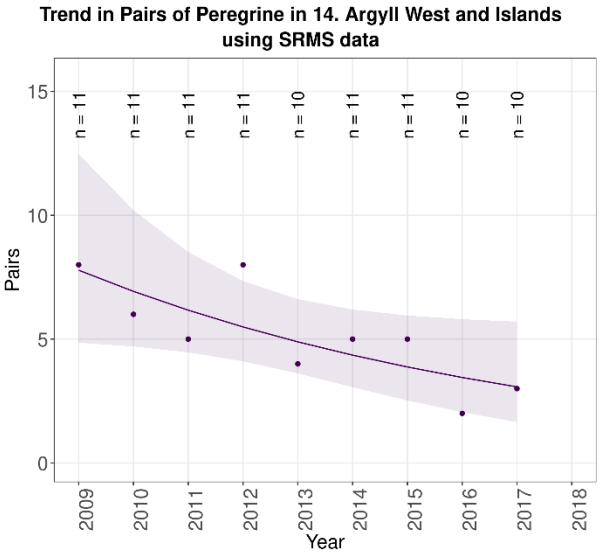
02. North Caithness and Orkney trend: Not significant (caveats: Sample sizes small)



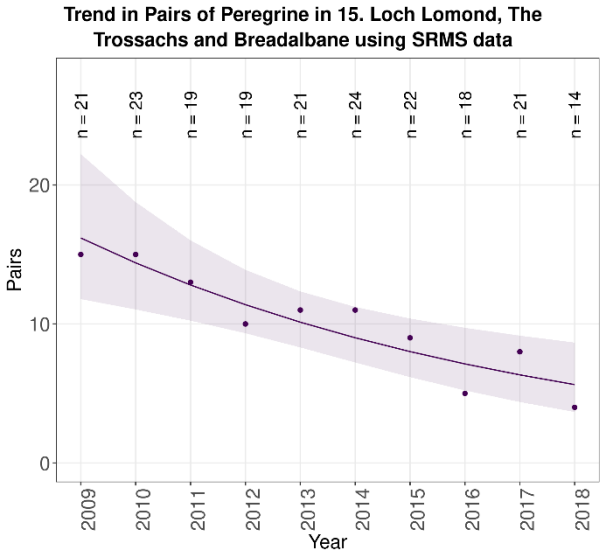
11. Cairngorm Massif trend: Decrease



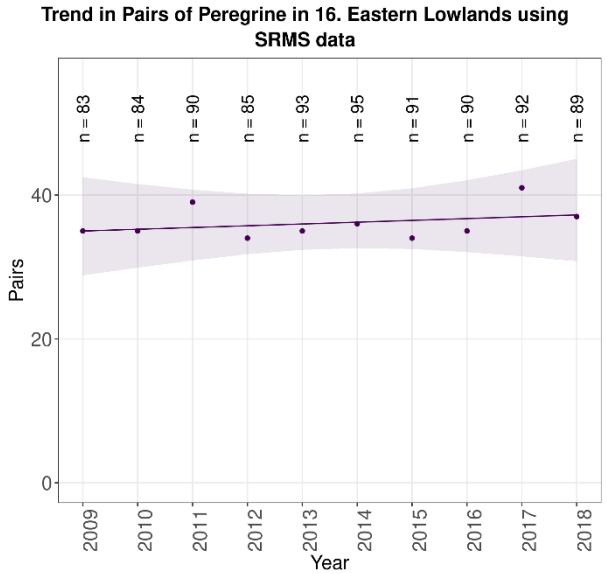
12. North East Glens trend: Not significant (caveats: Sample sizes small)



14. Argyll West and Islands trend: Decrease (caveats: Sample sizes small)

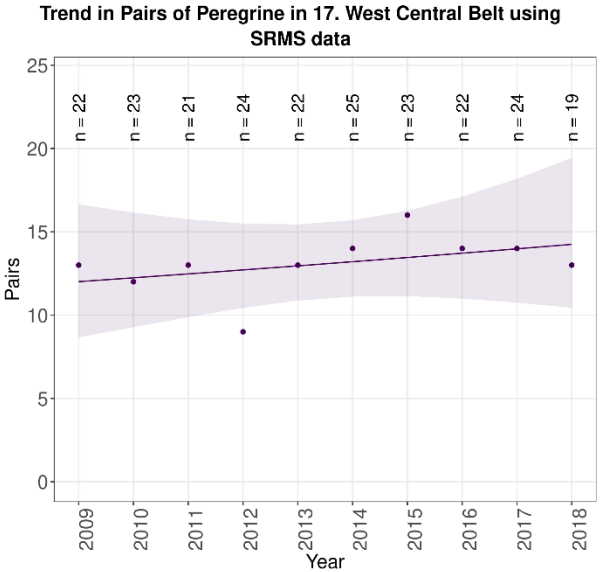


15. Loch Lomond, The Trossachs and Breadalbane trend: Decrease

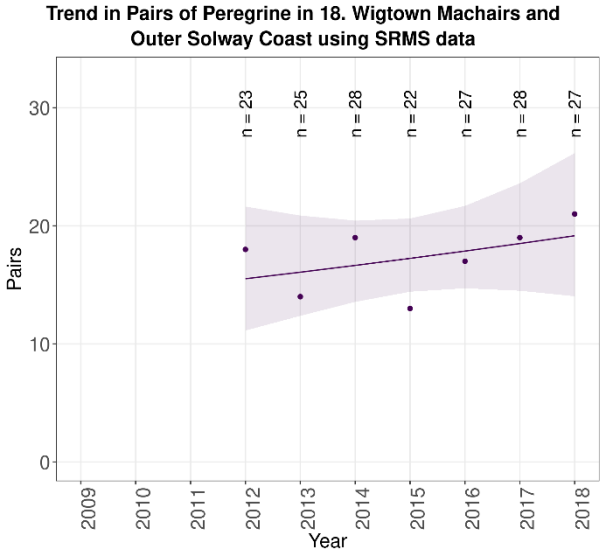


16. Eastern Lowlands trend: Not significant

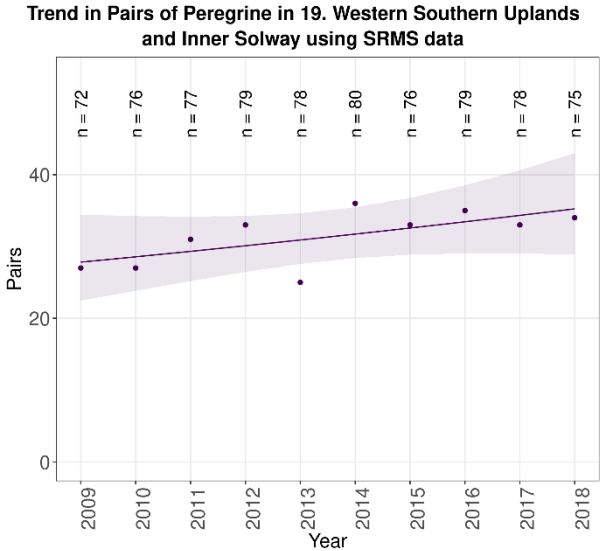
Figure 7: Trends in numbers of breeding pairs of Peregrine by NHZ region during 2009-2018.



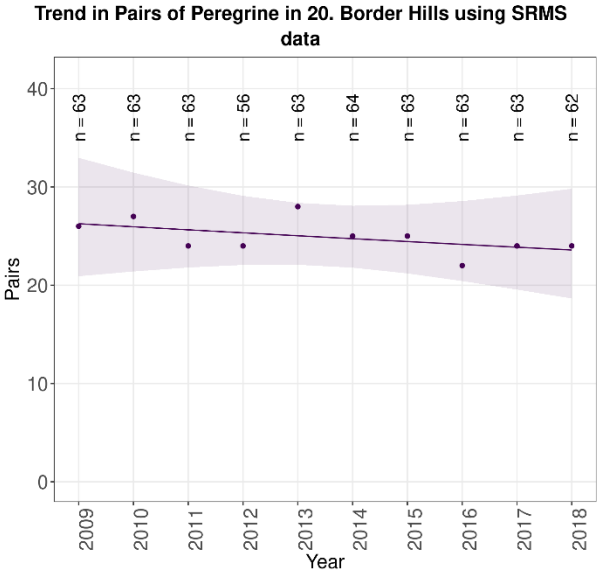
17. West Central Belt trend: Not significant



18. Wigtown Machairs and Outer Solway Coast trend: Not significant

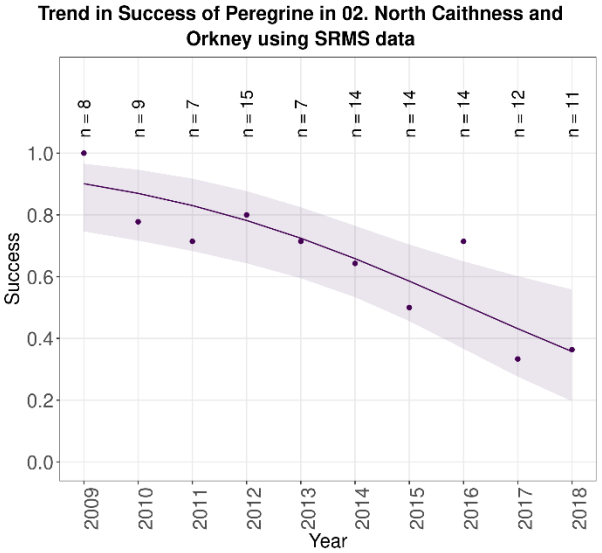


19. Western Southern Uplands and Inner Solway trend: Not significant

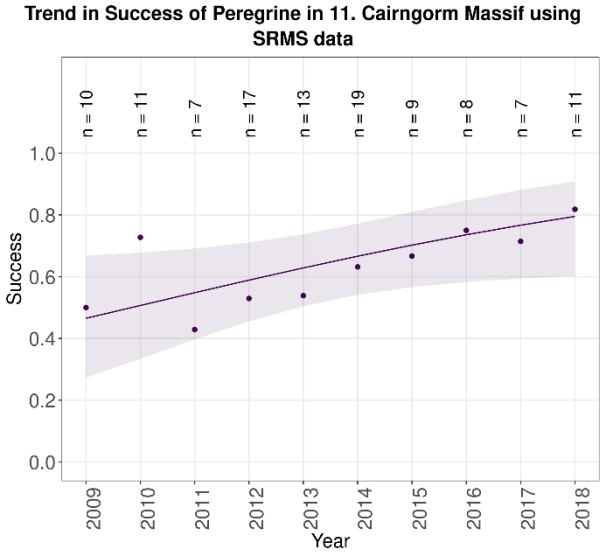


20. Border Hills trend: Not significant

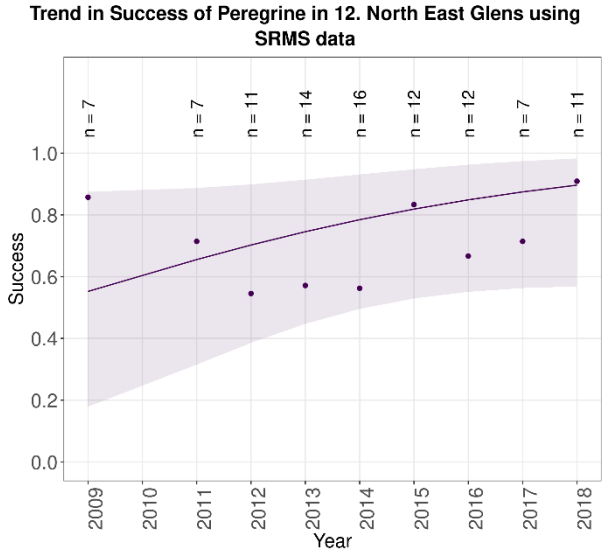
Figure 7 continued: Trends in numbers of breeding pairs of Peregrine by NHZ region during 2009-2018.



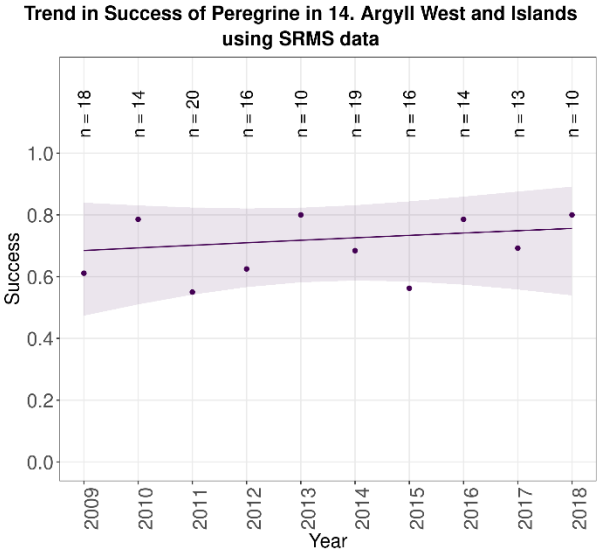
02. North Caithness and Orkney trend: Decrease (caveats: Sample sizes small)



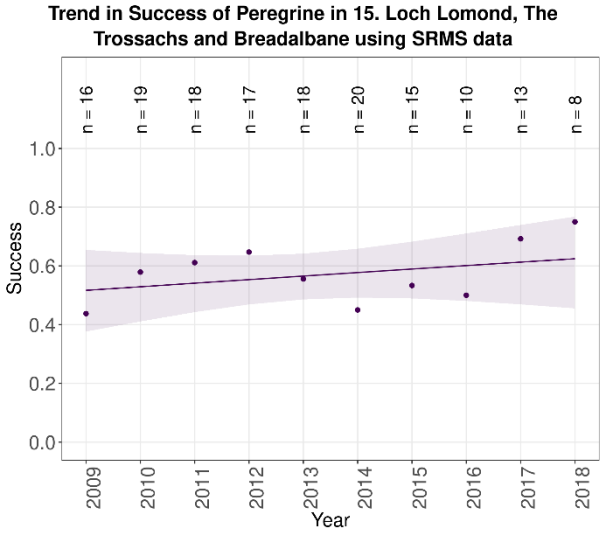
11. Cairngorm Massif trend: Non-linear (caveats: Sample sizes small)



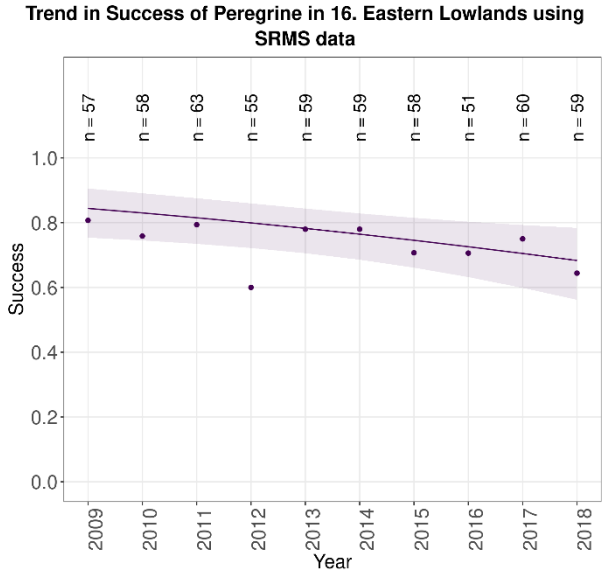
12. North East Glens trend: Not significant (caveats: Sample sizes small)



14. Argyll West and Islands trend: Not significant (caveats: Sample sizes small)

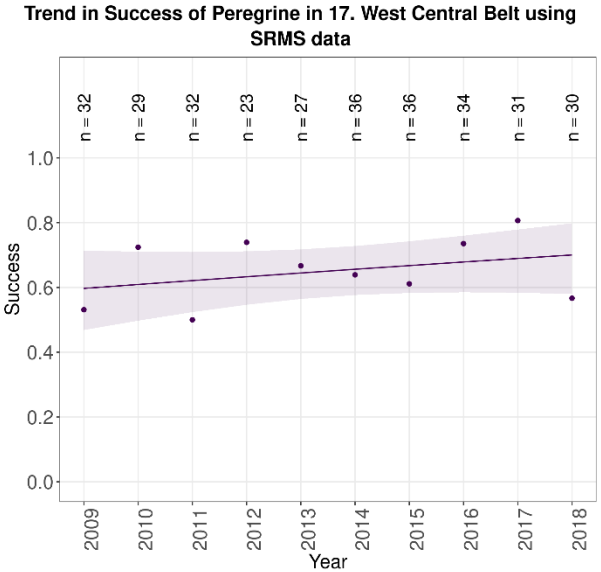


15. Loch Lomond, The Trossachs and Breadalbane trend: Not significant (caveats: Sample sizes small; No home range random effect)

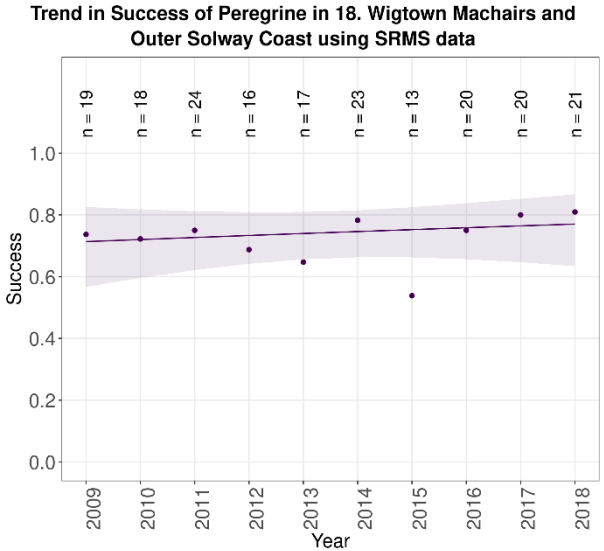


16. Eastern Lowlands trend: Decrease

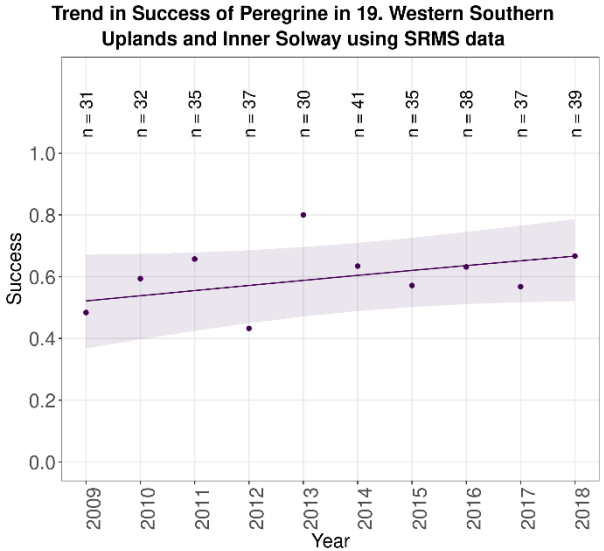
Figure 8: Trends in breeding success of Peregrine by NHZ region during 2009-2018.



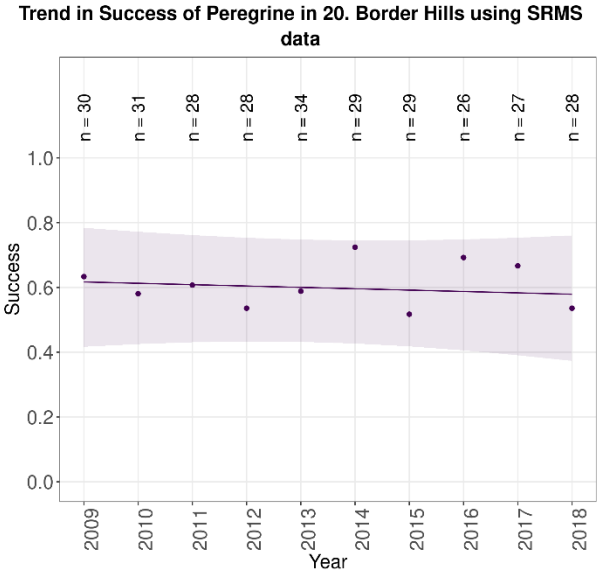
17. West Central Belt trend: Not significant



18. Wigtown Machairs and Outer Solway Coast trend: Not significant (caveats: Sample sizes small)

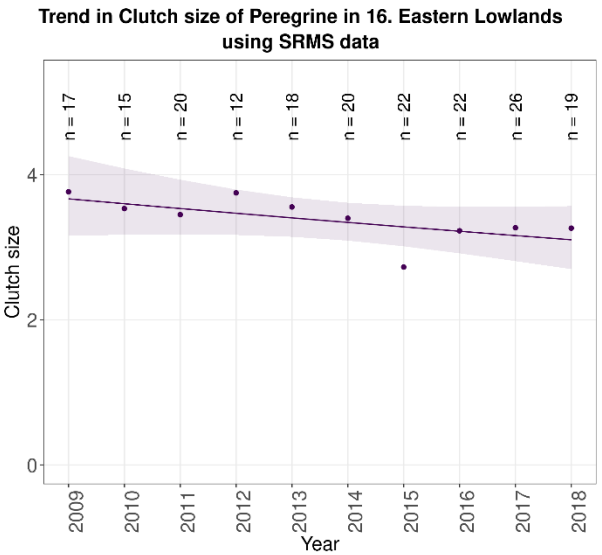


19. Western Southern Uplands and Inner Solway trend: Not significant

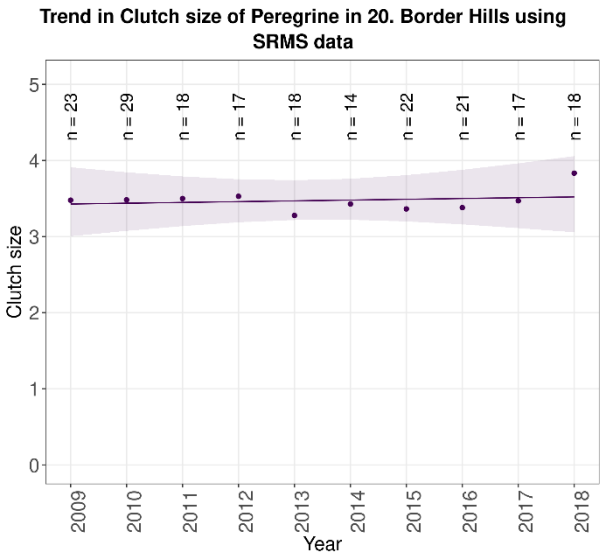


20. Border Hills trend: Not significant

Figure 8 continued: Trends in breeding success of Peregrine by NHZ region during 2009-2018.

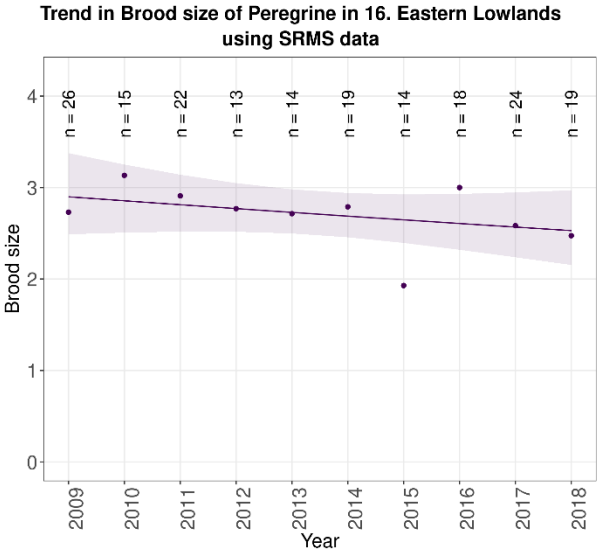


16. Eastern Lowlands trend: Not significant (caveats: Sample sizes small; No home range random effect)

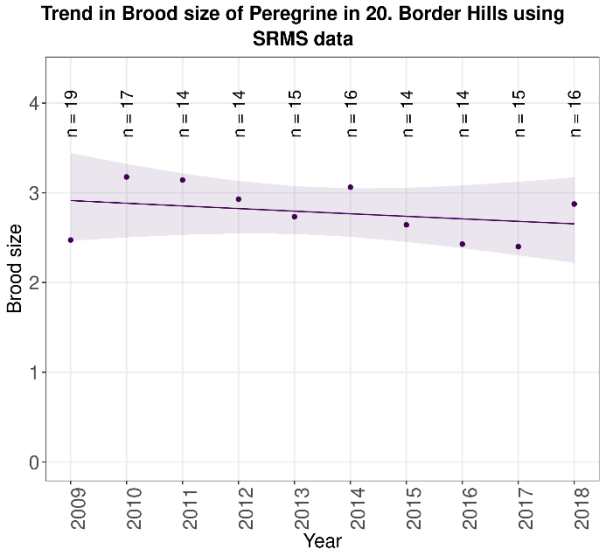


20. Border Hills trend: Not significant (caveats: Sample sizes small; No home range random effect)

Figure 9: Trends in clutch size of Peregrine by NHZ region during 2009-2018.

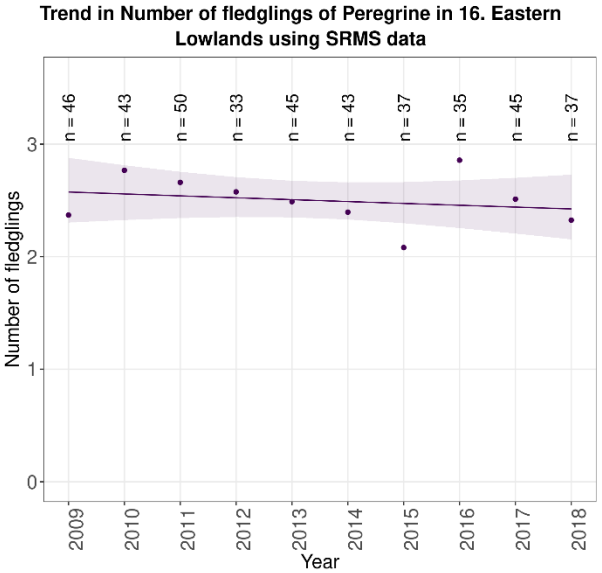


16. Eastern Lowlands trend: Not significant (caveats: Sample sizes small; No home range random effect)

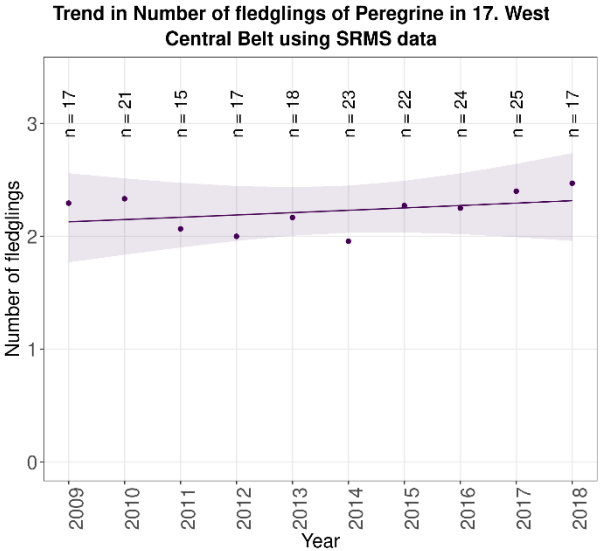


20. Border Hills trend: Not significant (caveats: Sample sizes small; No home range random effect)

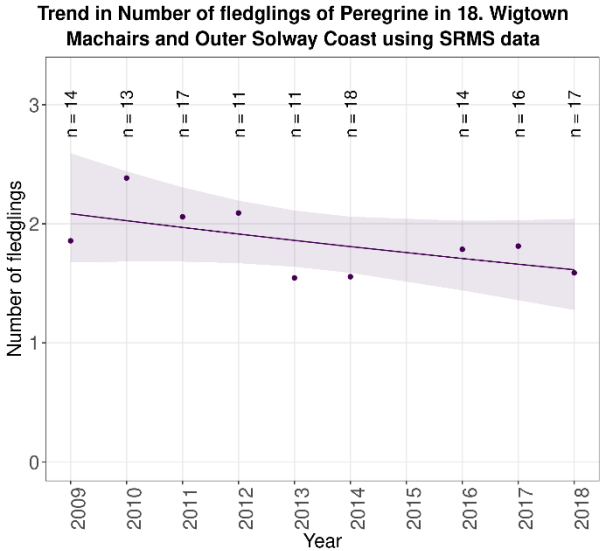
Figure 10: Trends in brood size of Peregrine by NHZ region during 2009-2018.



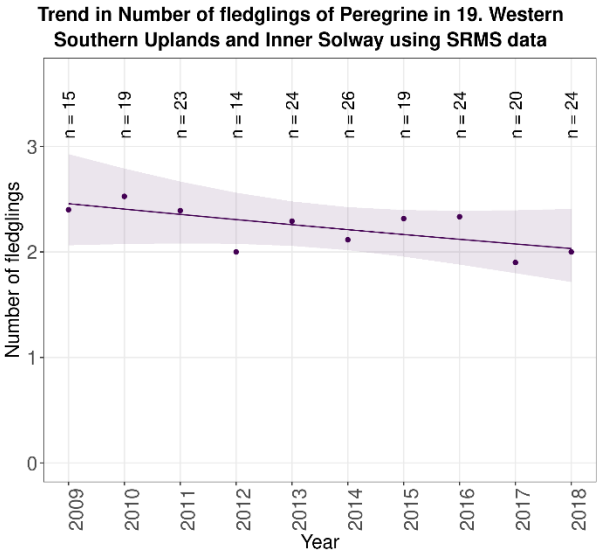
16. Eastern Lowlands trend: Not significant



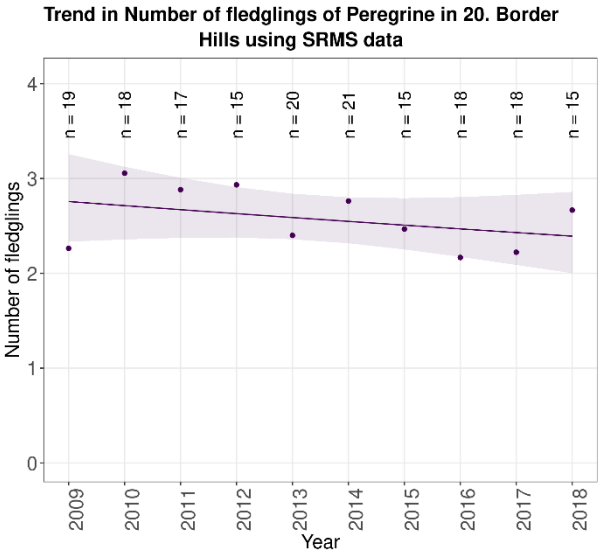
17. West Central Belt trend: Not significant (caveats: Sample sizes small; No home range random effect)



18. Wigtown Machairs and Outer Solway Coast trend: Not significant



19. Western Southern Uplands and Inner Solway trend: Not significant (caveats: No home range random effect)



20. Border Hills trend: Not significant (caveats: Sample sizes small; No home range random effect)

Figure 11: Trends in numbers of fledglings of Peregrine by NHZ region during 2009-2018.

Table 3: Details of SRMS Regional trends for Peregrine.

Parameter	Region	First year of trend	Last year of trend	Number of years	Mean number of home ranges across years	Mean parameter value (and 95% confidence limits)	Trend during the period	Caveats	Estimated % annual change (and 95% confidence limits)
Pairs	Argyll	2009	2017	9	10.7	5.1 (3.6 to 6.7)	Decrease	Sample sizes small	-11.0 (-20.6 to -0.1)
	Central	2009	2018	10	19.7	12.6 (11.5 to 13.7)	Not significant	Sample sizes small	-0.4 (-6.3 to 5.9)
	Dumfries & Galloway	2009	2018	10	96.0	47.4 (44.7 to 50.1)	Not significant		0.7 (-2.4 to 3.9)
	Lothian & Borders	2009	2018	10	107.3	35.9 (33.9 to 37.9)	Not significant		-0.8 (-4.3 to 2.8)
	North East Scotland	2009	2018	9	19.4	7.3 (4.6 to 10.1)	Not significant		0.9 (-7.6 to 10.1)
	Orkney	2009	2018	10	10.4	4.7 (4.1 to 5.3)	Not significant	Sample sizes small	-1.9 (-11.2 to 8.4)
	South Strathclyde	2009	2018	10	32.8	13.7 (12.1 to 15.3)	Not significant		1.7 (-4.0 to 7.9)
	Tayside & Fife	2009	2018	10	76.8	36.8 (32.9 to 40.7)	Decrease		-4.1 (-7.5 to -0.6)
Success	Argyll	2009	2018	10	14.0	0.6 (0.5 to 0.7)	Not significant	Sample sizes small	1.9 (-2.1 to 5.8)
	Central	2009	2018	10	19.8	0.7 (0.6 to 0.7)	Not significant	Sample sizes small	2.0 (-1.1 to 5.0)
	Dumfries & Galloway	2009	2018	10	53.6	0.7 (0.7 to 0.7)	Not significant		0.5 (-1.1 to 2.0)
	Lothian & Borders	2009	2018	10	48.9	0.6 (0.6 to 0.7)	Decrease		-2.1 (-3.6 to -0.8)
	North East Scotland	2012	2018	7	23.0	0.7 (0.6 to 0.8)	Increase		8.3 (2.7 to 13.9)
	Orkney	2009	2018	10	11.1	0.6 (0.5 to 0.7)	Decrease	Sample sizes small	-2.4 (-4.2 to -0.9)
	South Strathclyde	2009	2018	10	36.1	0.6 (0.6 to 0.7)	Non-linear		Non-linear
Success	Tayside & Fife	2009	2018	10	43.7	0.7 (0.6 to 0.7)	Not significant		0.5 (-1.4 to 2.3)
Clutch size	Dumfries & Galloway	2009	2018	10	18.4	3.1 (3.0 to 3.2)	Not significant	Sample sizes small	0.5 (-2.3 to 3.4)
	Lothian & Borders	2009	2018	10	24.5	3.6 (3.5 to 3.7)	Not significant		-0.5 (-2.7 to 1.8)
Brood size	Dumfries & Galloway	2009	2018	10	17.1	2.7 (2.6 to 2.8)	Not significant	Sample sizes small	-0.5 (-3.5 to 2.6)
	Lothian & Borders	2009	2018	10	19.4	2.8 (2.7 to 2.9)	Not significant	Sample sizes small	-0.4 (-3.1 to 2.3)
Number of fledglings	Central	2009	2018	10	13.1	2.2 (2.1 to 2.4)	Not significant	Sample sizes small	3.1 (-1.0 to 7.4)
	Dumfries & Galloway	2009	2018	10	36.7	2.1 (2.1 to 2.2)	Decrease		-2.4 (-4.7 to 0.0)

Parameter	Region	First year of trend	Last year of trend	Number of years	Mean number of home ranges across years	Mean parameter value (and 95% confidence limits)	Trend during the period	Caveats	Estimated % annual change (and 95% confidence limits)
	Lothian & Borders	2009	2018	10	30.6	2.7 (2.6 to 2.9)	Not significant		-0.7 (-3.0 to 1.6)
	South Strathclyde	2009	2018	10	22.6	2.2 (2.1 to 2.3)	Not significant		-0.4 (-3.6 to 2.8)
	Tayside & Fife	2009	2018	10	28.7	2.2 (2.1 to 2.3)	Not significant		0.2 (-2.6 to 3.0)

Table 4: Details of NHZ Regional trends for Peregrine.

Parameter	Region	First year of trend	Last year of trend	Number of years	Mean number of home ranges across years	Mean parameter value (and 95% confidence limits)	Trend during the period	Caveats	Estimated % annual change (and 95% confidence limits)
Pairs	02. North Caithness and Orkney	2009	2018	10	10.4	4.7 (4.1 to 5.3)	Not significant	Sample sizes small	-1.9 (-11.2 to 8.4)
	11. Cairngorm Massif	2009	2018	10	41.3	12.9 (10.0 to 15.8)	Decrease		-6.7 (-12.2 to -0.9)
	12. North East Glens	2009	2018	10	16.7	8.7 (7.2 to 10.2)	Not significant	Sample sizes small	3.3 (-4.0 to 11.2)
	14. Argyll West and Islands	2009	2017	9	10.667	5.1 (3.6 to 6.7)	Decrease	Sample sizes small	-11.0 (-20.6 to -0.1)
	15. Loch Lomond, The Trossachs and Breadalbane	2009	2018	10	20.2	10.1 (7.4 to 12.8)	Decrease		-11.1 (-17.1 to -4.6)
	16. Eastern Lowlands	2009	2018	10	89.2	36.1 (34.5 to 37.7)	Not significant		0.7 (-2.9 to 4.4)
	17. West Central Belt	2009	2018	10	22.5	13.1 (11.8 to 14.4)	Not significant		1.9 (-4.0 to 8.2)
	18. Wigtown Machairs and Outer Solway Coast	2012	2018	7	25.714	17.3 (14.6 to 19.9)	Not significant		3.6 (-5.3 to 13.2)
	19. Western Southern Uplands and Inner Solway	2009	2018	10	77	31.4 (28.7 to 34.1)	Not significant		2.7 (-1.2 to 6.7)
	20. Border Hills	2009	2018	10	62.3	24.9 (23.7 to 26.1)	Not significant		-1.2 (-5.4 to 3.2)
Success	02. North Caithness and Orkney	2009	2018	10	11.1	0.6 (0.5 to 0.7)	Decrease	Sample sizes small	-2.4 (-4.2 to -0.9)
	11. Cairngorm Massif	2009	2018	10	11.2	0.6 (0.5 to 0.7)	Non-linear	Sample sizes small	Non-linear
	12. North East Glens	2009	2018	9	10.778	0.7 (0.6 to 0.8)	Not significant	Sample sizes small	5.4 (-1.6 to 12.2)
	14. Argyll West and Islands	2009	2018	10	15	0.7 (0.6 to 0.7)	Not significant	Sample sizes small	0.9 (-2.6 to 4.1)
	15. Loch Lomond, The	2009	2018	10	15.4	0.6 (0.5 to 0.6)	Not significant	Sample sizes small; No home range random effect	1.2 (-1.8 to 4.2)

Parameter	Region	First year of trend	Last year of trend	Number of years	Mean number of home ranges across years	Mean parameter value (and 95% confidence limits)	Trend during the period	Caveats	Estimated % annual change (and 95% confidence limits)
	Trossachs and Breadalbane								
	16. Eastern Lowlands	2009	2018	10	57.9	0.7 (0.7 to 0.8)	Decrease		-1.3 (-2.4 to -0.2)
	17. West Central Belt	2009	2018	10	31	0.6 (0.6 to 0.7)	Not significant		1.2 (-0.9 to 3.3)
	18. Wigtown Machairs and Outer Solway Coast	2009	2018	10	19.1	0.7 (0.7 to 0.8)	Not significant	Sample sizes small	0.7 (-1.7 to 3.0)
	19. Western Southern Uplands and Inner Solway	2009	2018	10	35.5	0.6 (0.5 to 0.7)	Not significant		1.7 (-0.6 to 3.9)
	20. Border Hills	2009	2018	10	29	0.6 (0.5 to 0.7)	Not significant		-0.4 (-2.9 to 2.0)
Clutch size	16. Eastern Lowlands	2009	2018	10	19.1	3.4 (3.2 to 3.5)	Not significant	Sample sizes small; No home range random effect	-1.8 (-4.5 to 0.8)
	20. Border Hills	2009	2018	10	19.7	3.5 (3.4 to 3.6)	Not significant	Sample sizes small; No home range random effect	0.3 (-2.2 to 2.9)
Brood size	16. Eastern Lowlands	2009	2018	10	18.4	2.7 (2.6 to 2.8)	Not significant	Sample sizes small; No home range random effect	-1.5 (-4.3 to 1.4)
	20. Border Hills	2009	2018	10	15.4	2.8 (2.7 to 2.9)	Not significant	Sample sizes small; No home range random effect	-1.0 (-4.2 to 2.2)
Number of fledglings	16. Eastern Lowlands	2009	2018	10	41.4	2.5 (2.4 to 2.6)	Not significant		-0.7 (-2.7 to 1.5)
	17. West Central Belt	2009	2018	10	19.9	2.2 (2.1 to 2.3)	Not significant	Sample sizes small; No home range random effect	0.9 (-2.3 to 4.3)
	18. Wigtown Machairs and Outer Solway Coast	2009	2018	9	14.556	1.8 (1.7 to 2.0)	Not significant		-2.8 (-6.8 to 1.3)
	19. Western Southern Uplands and Inner Solway	2009	2018	10	20.8	2.2 (2.1 to 2.3)	Not significant	No home range random effect	-2.1 (-5.2 to 1.1)

Parameter	Region	First year of trend	Last year of trend	Number of years	Mean number of home ranges across years	Mean parameter value (and 95% confidence limits)	Trend during the period	Caveats	Estimated % annual change (and 95% confidence limits)
	20. Border Hills	2009	2018	10	17.6	2.6 (2.4 to 2.7)	Not significant	Sample sizes small; No home range random effect	-1.6 (-4.7 to 1.7)

Table 5: Number of Peregrine home range checks for occupancy reported to the SRMS during 2009-2018, in each of the 12 SRMS Regions, with approximate proportion of estimated population monitored. At the bottom of the table, row A is the mean number of home range checks over the most recent five years. Row B gives the estimated proportion of the national population in each region, based on Bird Atlas Timed Tetrad Visit (TTV) data. The depth of red shading indicates the relative importance of each region for this species. If survey effort was spread evenly across the whole population, the ratio of A:B would not vary much between regions.

Year	ARGYLL	CENTRAL SCOTLAND	DUMFRIES & GALLOWAY	HIGHLAND	LEWIS & HARRIS	LOTHIAN & BORDERS	NORTH EAST SCOTLAND	ORKNEY	SHETLAND	SOUTH STRATHCLYDE	TAYSIDE & FIFE	UIST	Total
2009	27	33	116	23	1	132	15	20	0	58	101	8	534
2010	30	38	109	31	5	133	0	28	0	63	101	2	540
2011	30	37	111	21	3	134	1	12	0	67	113	5	534
2012	33	41	108	23	0	122	64	30	0	66	104	5	596
2013	35	34	111	31	1	141	76	33	0	68	98	5	633
2014	68	59	119	121	4	142	165	38	76	86	188	6	1072
2015	34	41	109	18	0	140	85	28	14	77	117	4	667
2016	40	38	115	20	3	138	99	35	11	78	103	4	684
2017	33	44	117	54	5	142	20	32	20	80	107	6	660
2018	19	28	112	88	2	143	86	29	20	75	99	4	705
A: Mean home range checks	**38.8**	**42.0**	**114.4**	**60.2**	**2.8**	**141.0**	**91.0**	**32.4**	**28.2**	**79.2**	**122.8**	**4.8**	**757.6**
B: Proportion of estimated Scottish population	18	3	14	17	0	11	17	3	0	4	9	1	100

Figure 12: Areas corresponding to the clusters of home ranges from which sufficient data were reported to attempt to derive population trends for Peregrine between 2009 and 2018 (a) together with maps showing variation in the number of Peregrine records reported to SRMS during 2009-2013 (b) and 2014-2018 (c), in the context of the known Peregrine breeding distribution taken from the 2007-2011 Bird Atlas. SRMS data are depicted as grey squares with darker shading indicating more records while Bird Atlas data are depicted as red dots with the size of dot positively related to probability of breeding.