The demography of Swallows nesting on Alderney (2017-2019)

Justin Hart

Summary

Demographic data from swallows nesting on Alderney are presented from three years between 2017 and 2019. These data were collected as potentially useful bio-indicators of environmental change. Nests were located in disused concrete bunkers. These were periodically visited to determine laying dates and record clutch size as well as the number of chicks hatched and fledged. The number of nests monitored was initially small but increased over the study period and by 2019 comprised a more adequate sample of nests for year on year comparisons in the future. Mean laying dates for first broods were in late May and were about a week earlier than quoted for mainland U.K. Fewer second broods were raised than first broods. The mean number of days between first and second nesting attempts was consistent between years but the amount of variation warrants further investigation and maybe weather dependent. Mean clutch size, number of chicks hatched and fledged are quoted for 1st and 2nd broods in each year with productivity (number of chicks fledged per egg laid) and nest survival. Too few data were obtained for comparisons between years, however, productivity and nest survival were notably lower for second broods in 2019. This was likely due to a spell of cool, wet and windy weather in August that coincided with the incubation and early chick stage of many second nesting attempts. Further monitoring is recommended so that data can be submitted to the BTO records scheme and contribute to a wider understanding of the species demography at a national level whilst helping to identify any changes in phenology and productivity that may occur in the future. Data from Alderney may be especially useful in this regard as it's location lies at the southern end of the British Isles and therefore at the leading edge of any climate induced changes currently underway.

Introduction

The impact of climate change is measureable and much qualitative data has been presented that illustrates its affect on the environment (https://www.ipcc.ch/). However, on a local geographical scale the changes underway are often slight and/or occur at a rate that's not easily discenible by those of us not studying it. As a result engaging local communities with the issue and encouraging the general public to participate in activities to help mitigate the negative affects of global warming can be difficult when the need to do so is not immediately apparent in the surrounding environment. One way to engage local communities and encourage them to take action can be to demonstrate examples of environmatal changes that are underway on their doorstep. This could be done using a variety of bio-indicator species whose function, population, or status can reveal the qualitative status of the environment. On Alderney one such species could be the swallow *Hirundo rustica*.

For swallows recent climatic warming has lead to earlier breeding (Dolenec *et al.* 2009)

Phenological data has revealed that the arrival date of swallows to the UK in the spring advanced 15 days between 1960s and 2000s (Newson et al. 2016) and this has led to earlier laying (https://app.bto.org/birdtrends/species.jsp?&s=swall#productivity). Evidence suggests these changes have had some negative effects partly due to increased chick mortality in dry summers (Turner 2009) but also a mismatch between local and large-scale climatic changes that may mean earlier breeding in some regions was not sufficient to respond to climate change (Grimm *et al.* 2015).

On Alderney a long-term program of swallow nest monitoring could provide demographic data to help reveal both regional and international changes in the species fortunes as the climate warms up. Data from Alderney will likely be of particular value as they'd represent some of the southern most nest records from the British Isles. Furthermore, if these data exemplify environmental change underway on the island, they could also help remonstrate new policy necessary to better ameriolate the impacts of climate change on the local community.

This report illustrates an approach that could form the basis of a long-term study and reveals the findings from the last three years since nest monitoring began in 2017.

Methods

Swallows are a good species to obtain demographic data because the timing of their breeding (laying dates) and breeding success (number of eggs laid and chicks fledged) are easily measureable. Their nests are easy to locate too. On Alderney this is especially so as a large proportion of the swallow population nests within the concrete bunkers that were built during the 2nd world war and are now largely in disuse but accessible. In addition, many of the bunker nesting birds are habituated to occasional disturbance caused by people (typically tourists, entering the bunkers to explore) and can tolerate the examination of their nest contents every few days (usually every 10 days) without causing significant disturbance. On most occasions this was done unobtrusively using a telescopic inspection mirror with an LED light and completed in a matter of seconds.

Laying dates, if not observed, were estimated by assessing the age of chicks from their feather growth (Fernaz *et al.* 2012) and back-calculating the number of days to hatching and laying assuming i) a mean incubation period of 18 days (https://app.bto.org/birdfacts/), ii) an egg was laid one day at a time and iii) incubation began on the day the last egg was laid. Nest survival probabilities were calculated by recording the stage or fate of eggs/nestlings during each nest visit and counting 'nest exposure' days following the Mayfield (1975) method. All data from each nest visit were submitted online to the BTO nest record scheme.

Results

Demographic data were obtained from 11, 15 and 24 swallow nests in 2017, 2018 and 2019, respectively. , The number of nests increased over the three years as new occupied bunkers were found each year. By 2019 25 bunkers were found with swallow nests although not all of these were used for breeding in each year, Figs. 1 & 2.

So far the data from 2017-2019 indicates mean laying dates for 1st broods on Alderney were in late May and, for 2nd broods, around the end of the 3rd week in July. Table 1. Mean laying dates appeared to get earlier from 2017 to 2019 but the phenological data from 2019 was likely skewed

by one double-brooded pair of swallows that nested at Rose Farm (c.f. Fig 2.) and began laying two weeks before the next earliest pair.

First brood clutches were on average larger than second broods and produced more young Table 1. Fewer second broods were raised than first broods too although it was not known if some pairs were single brooded or raised second broods at different nest sites elsewhere. However, the incidence of second broods was likely affected by how early first broods were laid. and no second broods were attempted at nest sites where first brood clutches were laid later than the beginning of June, Table 2. Second broods also tended to be recorded from the same nest sites in each year and, as swallows are site faithful, were probably raised by pairs comprising the same individuals. These sites included the Nunnery bunker, Longis common bunker, bunkers 1.2.3,5 and 6 on the Mannez Garenne, Whitegates bunker, Rose farm and the Wildlife bunker, Figs 1 & 2. The average period of time between when first and second clutches were laid was consistent between years (around 60 days, Table 2) but the range of difference was particularly large in 2017 (see Table 2) and may have been affected by the weather.

Productivity showed a slight decline each year but was particularly low in second broods from 2019 where only 50% of eggs laid produced a fledged chick, Table 1. This was likely caused by a spell of cool, wet and windy weather in August that made several pairs abandon their eggs or small chicks. Interestingly nests active with larger chicks at this time were unaffected presumably because the adults were not required to spend time at the nest keeping them warm.

First brood nest survival was generally high with the number of nests surviving to fledge chicks increasing a little from 83% in 2017 to 88% in 2019. Second brood nests survival was also high in 2017 and 2018 but fell dramatically in 2019 reflecting the poor weather conditions noted above.

Conclusion

The mean laying dates for first broods in late May were earlier than the mean recorded in the UK (5th June, range 9th May - 31st July, see https://app.bto.org/birdtrends/species.jsp?&s=swall# productivity) and probably reflects Alderney's more southern location where breeding would be expected to occur earlier in the year. The incidence of second broods was likely affected by the arrival date and how quickly pairs got established at nest sites. Only pairs that laid first broods before June opted to raise second broods later in the year. The number of days between when first and second brood clutches were laid showed some variation between years and warrants further investigation as climatic changes may affect it.

Productivity (the number of chicks fledged from each egg laid) was always less than 1.0 mainly because one egg in each clutch was often infertile and did not hatch or there was a runt chick in the brood that did not survive to fledge. Some infanticide may also have occured by males competing for breeding rights (Møller 1988) and at least two nests lost their entire broods to an unknown predator. The timing of poor weather events in relation to the phase of nesting was likely crucial in determining breeding performance. In poor weather during 2019 some entire clutches or broods with small chicks were abandoned whilst others with larger chicks survived presumeably because their parents were not required to waste valuable foraging time keeping them warm.

The demographic data from each year are only described here. No statistical comparisons between years are presented due to too few data. If monitoring continues local trends in demography can be sought from subsequent years using the larger 2019 sample of nest sites as the base dataset for future comparisons. However, any comparisons of these data between years will require careful

consideration because swallows are often site faithful (Cramp & Simmons 1988) and a high but unknown proportion of nest sites were probably used by the same individuals in each year. Data from each year were therefore not independent or were only partially so and likely comprised an unknown proportion of matched pairs. Ringing all the adults and then re-trapping them each year could help elucidate which nest sites were being re-used by the same individuals in different years but this would require considerable additional input of time. Nevertheless without these data certain assumptions in the data may be broken during any statistcal comparisons between years.

Recommendations

1). Continue to monitor nests and submit all nest visit data to the BTO nest record scheme so that they can contribute to a wider understanding of the species demography at a national level whilst helping to identify any changes in phenology and productivity that may occur in the future.

2). Maintain the 2019 level of coverage so that a large enough set of data can be attained for statistical analyses that not only takes into account differences between years and brood number but also nest sites and local weather conditions.

References

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Table 1. Swallow demography, including productivity and nest survival on Alderney from 2017-2019.

Year	Brood	n#	Mean 1st egg date (r)	Mean clutch (r)	Mean hatched (r)	Mean fledged (r)	Productivity*	Survival**
2017	1st	11	31st May (17th May - 26th June)	4.5 (2-6)	4 (3-6)	4 (3-6)	0.9	83%
	2nd	6	22nd July (14th July - 26th July)	3.2 (2-4)	2.5 (2-3)	2.25 (2-3)	0.75	100%
2018	1st	13	26th May (15th May - 11th June)	4.6 (4-5)	4 (2-5)	3.7 (2-5)	0.8	84%
	2nd	10	19th July (4th July - 9th August)	3.9 (3-5)	3.3 (2-5)	2.9 (2-5)	0.74	87%
2019	1st	24	28th May (3rd May - 17th June)	4.3 (3-5)	4.0 (3-5)	3.7 (3-5)	0.79	88%
	2nd	15	17th July (3rd July - 28th July)	3.6 (2-4)	3.2 (2-4)	3.1 (2-4)	0.5	50%

n# = sample size, (r) = range, * Productivity = total no. of chicks fledged/eggs laid, ** Estimated nest survival (Mayfield 1975).

Table 2. The average difference in days between the first egg dates of first and second broods and the latest date first brood clutches were laid at nest sites where second broods were also laid.

Year	Mean difference (r)*	Latest date (dd/mm)	(n)**
2017	63 days (60-67)	27/06	3
2018	58 days (46-85)	02/06	9
2019	59 days (51-66)	28/05	10

*r = range. **n = sample size.

Fig. 1. The locations of bunkers used by nesting swallows on east Alderney. White spots = sites with unused nests, Light blue spots = sites with one nest, yellow spots = sites with two or more nests. Site abbreviations refer to bunkers 1-10 on the Mannez Garenne (B1-B10), bunkers 22 and 24 near the lighthouse (B22 aand B24), Bibette head bunker (BH), Whitegates bunker (WG), Coastguards bunker (CG), Nunnery anti-tank bunker (NB) and the Longis common anti-tank wall bunker (LC).

Fig. 2. The locations of bunkers used by nesting swallows on east Alderney. White spots = sites with unused nests, Light blue spots = sites with one nest, yellow spots = sites with two or more nests. Site abbreviations refer to Doyles battery (DB), Cambridge battery (CB), Tourgis hill bunker (TH), Rose farm glasshouse (RG) and sheep shed (RS) bunkers, the south cliffs bunker (SC), the Wildlife bunker (WB) and the Battery quarry bunker (BQ).