



Plate 2. Guillemots on the Isle of May, 21 October 1982 showing a range of plumages from full winter (extreme left) to almost full summer (extreme right). © Mike Harris.

The use of webcams to monitor the prolonged autumn attendance of Guillemots on the Isle of May in 2015

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Although Guillemots at the southern edge of the range are known to return to the colonies in autumn, usually only opportunistic observations of this behaviour are available. In the autumn of 2015 we took advantage of the live interactive cameras on the Isle of May, Fife to make systematic checks of Guillemot colony attendance. Birds were recorded at dawn on 59 consecutive mornings between 23 October and 20 December after which webcam images ceased due to lack of power on the island. This prolonged period of attendance covered several periods of stormy weather and appears unprecedented at this colony. Presumably local feeding conditions must have been extremely favourable to enable the birds to spend so much time ashore.

Introduction

Individuals of many species of pelagic seabird spend a relatively small proportion of the year at the breeding colony and are often said to 'only visit land to breed'. The Guillemot *Uria aalge* is therefore unusual in having a very variable pattern of colony attendance. Whereas in most populations Guillemots do not return to the breeding ledges until March or April, at the extreme southern end of the range in both the east Atlantic and east Pacific, birds start to come back to the colonies from October onwards (Taylor & Reid 1981, Mudge *et al.* 1987, Boekelheide *et al.* 1990). Indeed the earliest individuals return immediately after they have completed the main moult of the year, during which they are flightless, and are in full winter plumage with white faces and throats (Plates 2–4) (Harris & Wanless 1990a).

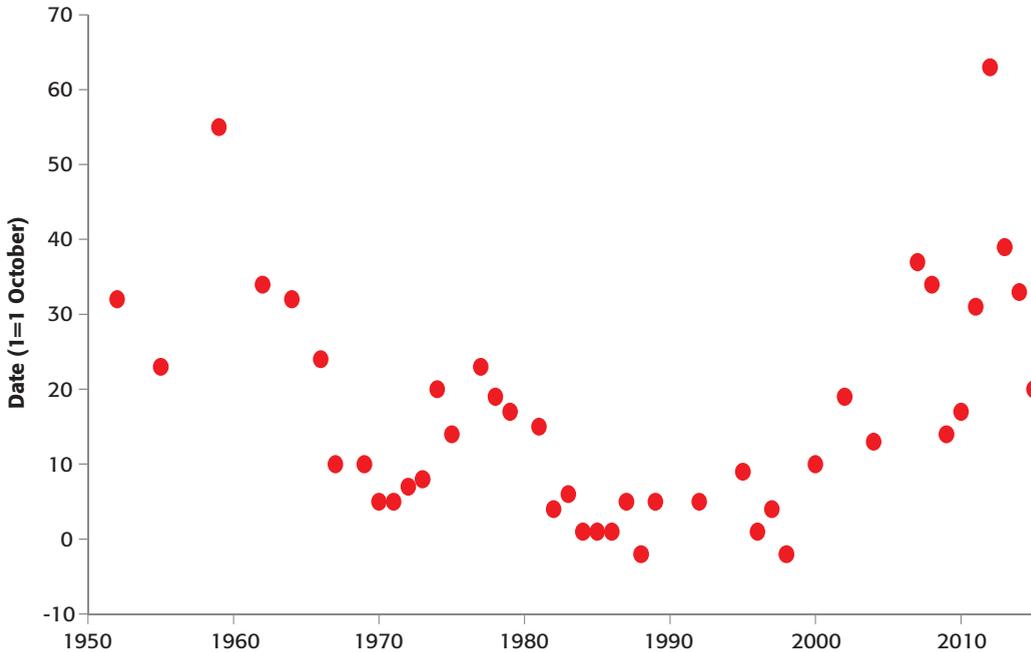


Figure 1. The dates that Guillemots were first recorded ashore on the Isle of May, 1952–2015. Data are from Taylor & Reid (1981), Harris *et al.* (2006) and personal records.

From the 1960s to the 1990s Guillemots returned to the Isle of May National Nature Reserve, Fife progressively earlier such that arrival dates advanced from early November to the late September or early October (Figure 1). However, since around 2000 this trend has been reversed so that in recent years return dates have again been in early November (Sea Mammal Research Unit (SMRU) personal communication). During the 1980s, birds were sometimes present for many days in October but later in the autumn and in the middle of winter attendance became erratic with birds often absent for several weeks (personal observations). However, it was clear that levels of attendance at the Isle of May and other colonies in eastern Scotland varied considerably between years (Harris 1984, Mudge *et al.* 1987). Attendance also showed a clear daily pattern with birds starting to come ashore just prior to dawn and numbers peaking soon after. The time that the ledges were occupied each day varied greatly from less than an hour to 3–4 hours and generally attendance time was positively correlated with the number of birds ashore. Observations of colour-ringed individuals indicated that the birds were adults attending sites where they had bred the previous summer and that the most frequently occupied sites were those where birds had successfully reared a chick and those with many neighbours (Harris & Wanless 1989, 1990b). Thus autumn attendance appeared to be due to competition for the best breeding sites and/or birds returning to maintain their pair bond (Plate 3).

All these observations were made by observers present on the Isle of May for research on the seabirds or seals, or visitors to the Isle of May Bird Observatory. However, the advent of new technology has meant that it is now possible to monitor autumn attendance from the mainland.

Methods

The Scottish Seabird Centre, North Berwick, has live interactive cameras positioned at Pilgrim's Haven on the Isle of May that are linked to the internet (www.seabird.org/wildlife/webcams/isle-of-may-cliff/). In spring and summer the cameras are mainly trained on Shags *Phalacrocorax aristotelis* and Puffins *Fratercula arctica* while in the autumn and winter the main interest is the

Grey Seals *Halichoerus grypus* and their pups. However, one camera includes views of two sections of the Guillemot colony and staff at the Scottish Seabird Centre arranged for these to be monitored from first light until well into the day during autumn 2015. The images were refreshed every few minutes and this allowed us to check if Guillemots were ashore each morning from 16 October until 20 December.

A Guillemot in non-breeding plumage has a white throat and sides of the head which together with its white underparts makes it stand out against the dark cliffs even in very poor light. These features are particularly evident in the autumn when Guillemots are far less 'relaxed' than they are in the summer with the result that they spend a considerable amount of time facing outwards (Plates 2, 4 & 5). Although the quality of some of the images downloaded from the internet was poor, they were still adequate to identify when birds were ashore. Thus each morning from well before dawn we checked the website every 15–20 minutes and saved the images. We later counted the birds visible in the main area just to the north of Pilgrim's Haven (Plate 4) using Paint Shop Pro software. The counts of individual birds on the images were probably underestimates since individuals facing towards the cliffs and those in dense groups may have been overlooked but we considered that the counts were adequate to provide a reliable index of the numbers present. In 2014, some 200–400 pairs breed in this view. The other view showed just the edge of a breeding group of c. 100 pairs and was used to determine when birds were present when there were problems with the images of the main area.

Checks were made throughout the day to determine when the birds finally departed. Although the camera and the system for transmitting signals to the Scottish Seabird Centre are very robust, winter conditions can cause problems. Thus, during autumn 2015 occasional power and equipment failures resulted in a few breaks in transmission, spray from gale-driven waves reduced the clarity



Plate 3. Guillemots in winter plumage mating at a nest-site on the Isle of May, 21 October 1982. © Mike Harris



Plate 4. Guillemots ashore in the area monitored by the Scottish Seabird Centre's webcam at 06:55 hr on 29 October 2015. © Maggie Sheddan.

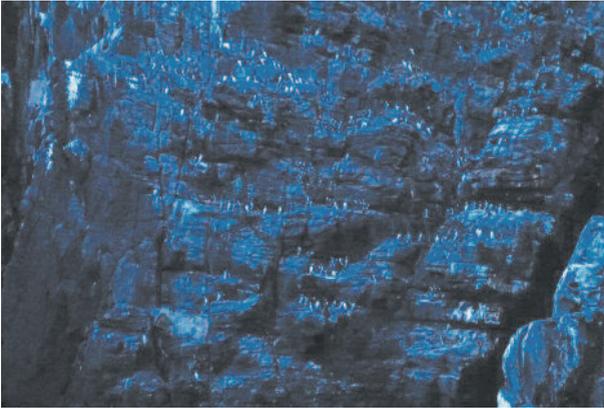


Plate 5. Guillemots still ashore on the Isle of May at 08:10 hr on 31 October 2015. © Maggie Sheddan.



Plate 6. Guillemots at the secondary monitoring site as seen via the webcam on the Isle of May at 10:00 hr on 8 December 2015. © Scottish Seabird Centre.

of the images and on a few days thick haar prevented anything being seen. Fortunately, staff from the Centre for Ecology & Hydrology and Scottish Natural Heritage (SNH) and visitors to the Isle of May Bird Observatory were on the island when these problems occurred and were able to check if Guillemots were ashore. However, on these occasions we could not obtain an index of the numbers present nor an estimate of when the birds departed. Observations ceased on 20 December when the power supply on the island failed and there was nobody present to make direct observations.

Hourly meteorological data for Leuchars, 30 km from the Isle of May (downloaded from www.ogimet.com/gsocdc.phtml.en) were used to calculate the mean daily wind speed for the day of each observation and the previous day.

Results and Discussion

Guillemots were first recorded ashore on the Isle of May in autumn 2015 on 20 October when three individuals were visible via the camera at 06:30 GMT. Numbers peaked at 10 individuals at 06:35 but the ledges were empty by 06:42, 11 minutes before official sunrise at Edinburgh, 30 km to the west of the Isle of May. We cannot discount the possibility that a few birds had been ashore on the Isle of May before this date but none was reported by observers present on the island. On 21 October five birds were present at 06:30 and these remained until 07:45. The following day was stormy with driving rain, rough seas and local wind speeds reached 82 km/hr. Viewing conditions were therefore extremely difficult, but no birds appeared to be ashore. However, birds were definitely present the following day and the colony was occupied every day until 20 December when the camera ceased to function (Figure 2). Comparing the frequency of Guillemot attendance in autumn 2015

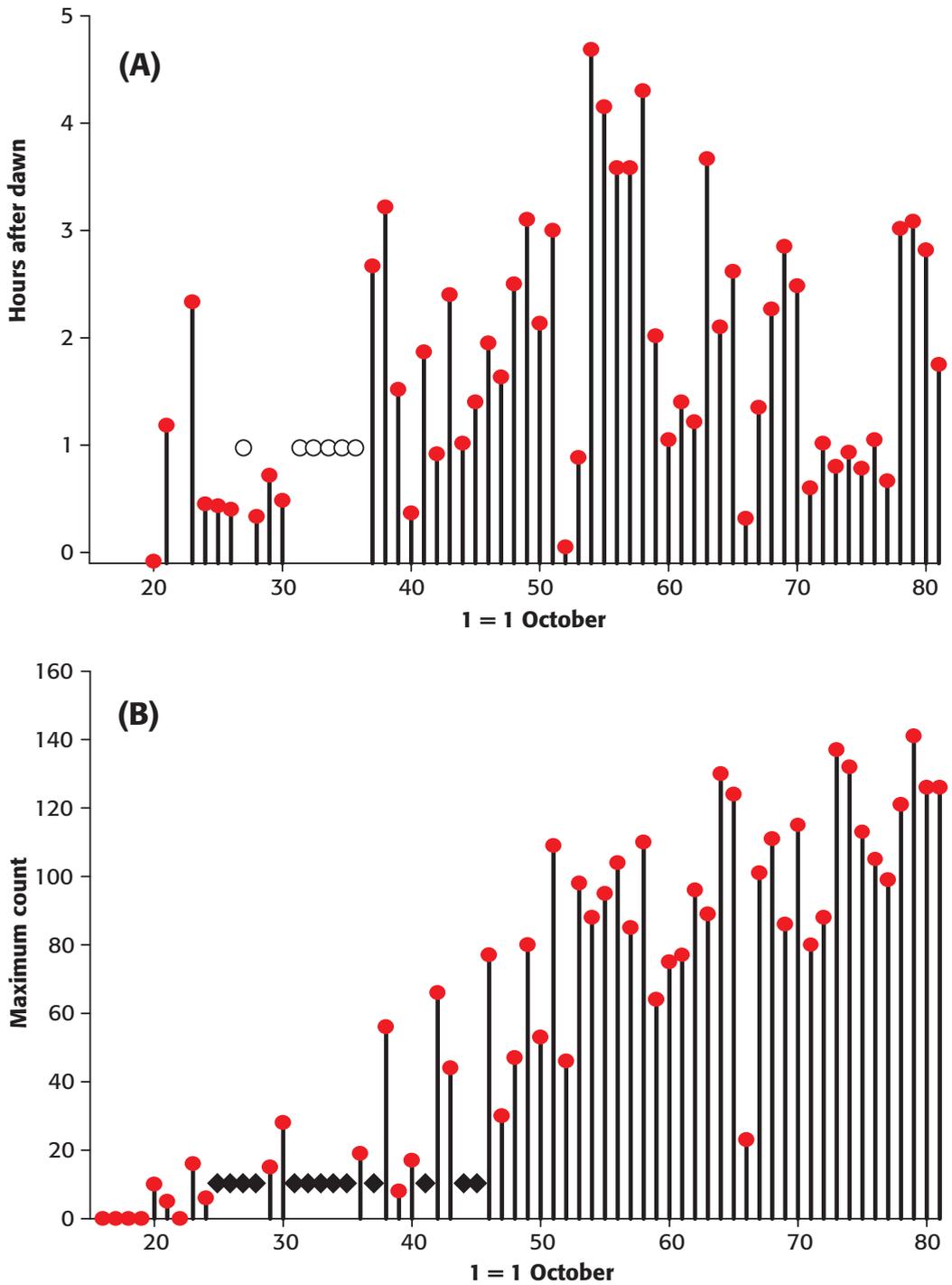


Figure 2. Guillemot attendance on the Isle of May in autumn 2015 as monitored by the Scottish Seabird Centre's webcams. (a) The length of time after dawn that birds were present on the ledges; open circles indicate days when departure times were not known. (b) Maximum counts of birds in the field of view of one camera; diamonds indicate days when birds were present but not counted.

with other records indicates that the presence of birds on 59 consecutive mornings is unprecedented. Staff from SMRU are usually present on the Isle of May throughout November. Their opportunistic records indicate that overall Guillemots were ashore on 19 of 57 (33.3%) of early morning checks in November in 1995, 2008 and 2011. In 1981–83, we deployed time-lapse cameras at the Guillemot colony at Fowlsheugh (85 km north of the Isle of May) and recorded birds ashore on 16 of 72 (22%) of days in November.

Data from the webcam indicated that the more Guillemots that were ashore, the later in the day they remained on the ledges. Thus by the last week in November when over 100 birds were present in the area covered by the camera, birds were sometimes ashore for almost four hours. The time spent ashore then declined somewhat but overall there was a highly significant positive correlation between the maximum number of Guillemots counted in a day and the length of time birds were ashore ($r = 0.38$, $P = 0.008$, $n = 47$ days). The relationship was apparent despite the fact that in some instances Guillemot numbers suddenly declined and a Herring Gull *Larus argentatus* or Great Black-backed Gull *L. marinus* could be seen standing in the area. In other cases where birds stayed for much shorter periods than anticipated, they could well have been disturbed by researchers or birdwatchers or by fishing boats close in under the cliffs. Using hide-based observations in the 1980s we had previously found a similar positive correlation between maximum numbers and length of time ashore when attendance levels were lower.

A previous study in Caithness in the 1980s suggested that periods of attendance in autumn always started when wind speed was low or declining (Mudge *et al.* 1987). However, conditions on the Isle of May in autumn 2015 were not unusually calm, indeed on the day prior to Guillemots starting to come ashore every day, local wind speeds reached 82 km/hr. Furthermore, during the sustained period of attendance there was no significant correlation between the maximum count and either mean wind speed on the current or previous day ($r = -0.15$, $P = 0.43$, and $r = 0.093$, $P = 0.62$, respectively, $n = 62$). Similarly, data from Fowlsheugh over the 1980/81 winter found no evidence of a direct link with weather (Harris 1984).

Favourable local feeding conditions have also been suggested to be associated with autumn attendance. Thus in California, in years when food availability was high or average Guillemots returned to the cliffs in October whereas when feeding conditions were less good and/or winters were especially stormy as a result of El Niño, arrival was delayed until the spring (Boekelheide *et al.* 1990, Ainley *et al.* 2002). We have no information on feeding conditions for Guillemots around the Isle of May in autumn 2015 but the birds' behaviour suggests that they must have had access to a plentiful supply of food within commuting distance of the colony to enable them to visit their breeding sites when foraging time was limited due to relatively short days.

The Scottish Seabird Centre webcam did not allow us to follow individual birds to determine what factors influenced individual-level attendance because none of the birds in the viewing area were colour-ringed and in any case the quality of images would not have been good enough to facilitate this. However, breeding success of Guillemots on the Isle of May in 2015 (0.79 chicks fledged per pair laying) was very similar to the mean value for 1982–87 ($0.78 \pm \text{SE } 0.01$) when hide-based observations indicated that the sites which were occupied most frequently were those where breeding success was higher (Harris & Wanless 1989).

Data from the webcam therefore indicated that Guillemots on the Isle of May in autumn 2015 returned when we expected but the frequency of colony attendance was the highest recorded at this colony, or indeed at any other colony in Scotland. Breeding success in 2015 was not exceptionally high nor were autumn weather conditions exceptionally benign, so the most likely reason why Guillemots were ashore so much is that local feeding conditions must have been extremely favourable.

Webcams are increasingly being used to record biological data and our observations highlight their potential to record colony attendance outside the breeding season. Although our interest was initially simple curiosity, plans for offshore wind and tidal energy generation mean that how much time pelagic seabirds spend close to the colony is highly relevant to marine spatial planning.

Acknowledgements

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