the Seabird Group

NEWSLETTER 150

June 2022

Contents

News

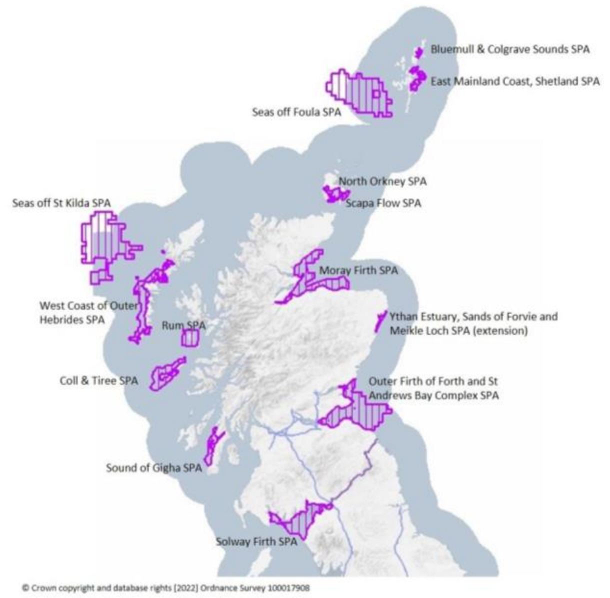
Marine Special Protection Area network classifications complete

Lucy Quinn, NatureScot

The designation of two Special Protection Areas (SPAs) in Orkney in February 2022 completes a network of 14 additional marine SPAs for marine birds in Scotland. The 14 SPAs were selected for: important areas for inshore wintering waterfowl – such as seaducks, divers and grebes; foraging areas for breeding terns, foraging areas for breeding **Red-throated Divers** (*Gavia stellata*), important areas for **European Shag** (*Gulosus aristotelis*); important aggregations of seabirds; and important marine roosting areas for wintering gulls. The SPAs protect both the birds themselves as well as the rich feeding grounds and waters on which they depend. These designations mark a significant step in what has been years of work for NatureScot, aided by JNCC and Natural England for joint sites.

A big thank you to those Seabird Group members who responded to the public consultations. Consultation responses were taken on board for our final advice and recommendations on the site designations. More information on the sites, their qualifying features, and their Conservation Objectives can be found on NatureScot's Sitelink webpage.

Figure 1 shows the new marine SPA network and includes sites such as the West Coast of the Outer Hebrides SPA, which has over 50% of the GB population of wintering **Great Northern Divers** (*Gavia immer*); to the Moray Firth SPA, which has the largest GB population of **Long-tailed Ducks** (*Clangula hyemalis*; approximately 46%) and **Velvet Scoter** (*Melanitta fusca;* approximately 60%); to the Bluemull & Colgrave Sounds SPA, which protects foraging areas for the second



Top: Velvet Scoter, John Dickenson.
Bottom: Figure 1: the new marine SPA network.

largest population of breeding Red-throated Divers in the UK at their most northerly site. We hope that people will be able to positively engage with and experience world-class wildlife at these sites.

The Scottish Marine Protected Area (MPA) network, which includes other designations such as nature conservation MPAs, now covers 37% of our seas, marking significant progress towards meeting global ambitions for marine conservation, including helping to build resilience in the face of climate change.

Seeking information to inform the management of colonial seabirds during the current Highly Pathogenic Avian Influenza Virus (HPAIV) outbreak

Greg Robertson, Stephanie Avery-Gomm, Jennifer Provencher, Wildlife and Landscape Science Directorate, Science and Technology Branch, Environment and Climate Change Canada
*Corresponding author: Stephanie.Avery-Gomm@ec.g.ca

Since emerging in 1996, a Highly Pathogenic Avian Influenza Virus (HPAIV) has produced many strains including the H5N1 strain that is currently causing significant mortality among poultry and wild birds. In recent years, a few outbreaks of HPAIV have been documented among colonial seabirds (e.g., African Penguin, Swift Tern, Cape Gannet, Great Skua[1]). In December 2021, this strain arrived in North America and was first detected in waterfowl. Since then, it has spread rapidly across the continent, is now found in all four North American flyways, and is causing an unusual mass mortality event among seabirds breeding throughout the North Atlantic (e.g., Canada, Scotland, Iceland).

To inform ongoing decisions about seabird conservation and management, we are urgently asking the global community to share information about the current outbreak (e.g., what species, location, and magnitude), and/or past large-scale mortality events in colonial breeding seabirds. We welcome information on outbreaks that are confirmed to be caused by HPAIV, and cases where HPAIV is suspected to be the cause.

This information will help managers make informed decisions about which species to monitor, the scale of the outbreak, potential population-level impacts, and what actions to take to manage this event. The current outbreak is an evolving situation, and we understand that any information provided will quickly become outdated.

We have put together a short questionnaire which we encourage you to fill out and share with anyone who may have relevant information.

Note from the Editor: please be alert to potential cases of avian influenza. If you find a bird you suspect may be affected do not touch or pick up the bird, but report it and the location by calling: GB – DEFRA (03459 33 55 77), NI – DAERA (0300 200 7840) or the relevant authority in your country.

Breeding season report

Rathlin Island – UK's largest Guillemot colony

Katherine Booth Jones, British Trust for Ornithology

If you have ever visited Northern Ireland, you will have undoubtedly gravitated towards its dramatic north coast and in particular stopped to wonder at the geological phenomenon of the Giant's Causeway. But only a stone's throw away across the sound north of Ballycastle, its cliffs and coastline challenging the sharp face of Fair Head on the mainland, lies a hidden gem: Rathlin Island.


Rathlin sea stacks. Photo by image_less_ordinary, Flickr

Rathlin is Northern Ireland's only inhabited offshore island, home to a community of around 150 people. However, the population soars

[1] Ramey, A.M., Hill, N.J., DeLiberto, T.J., Gibbs, S.E.J., Camille Hopkins, M., Lang, A.S., Poulson, R.L., Prosser, D.J., Sleeman, J.M., Stallknecht, D.E., & Wan, X.-F., (2022). Highly pathogenic avian influenza is an emerging disease threat to wild birds in North America. *The Journal of Wildlife Management* 86, e22171. https://doi.org/10.1002/jwmg.22171

in the summer with an influx of thousands of seabirds and tourists drawn to witness the spectacle of the seabird breeding season. Rathlin Island is designated a Special Protection Area for supporting internationally important breeding numbers of **Razorbill** (*Alca torda*), **Common Guillemot** (*Uria aalge*) and **Black-legged Kittiwake** (*Rissa tridactyla*), as well as a large population of other seabird species. This makes it a huge priority for seabird monitoring in Northern Ireland. However, due to the sheer scale of seabird numbers involved and the size and complexity of Rathlin's cliffs, its seabird residents are only monitored with any regularity in small study plots by the RSPB, while true censuses are rare but essential for quantifying changing abundance over time.

The opposing coastline of mainland Northern Ireland is less important in terms of seabird abundance but has historically represented a monitoring gap in Northern Ireland despite the thriving network of volunteer seabird surveyors in the region, since the islands and craggy cliffs require access to a boat for good views. Unfortunately, the outbreak of COVID-19 caused planned surveys to be abandoned in 2020, and as a result the 2021 season was the last opportunity to get up-to-date information on these sites into the Seabirds Count census.

With everything riding on 2021, it was a nail-biting start to the year with early lockdowns causing plans to hang in the balance, however thanks to the huge efforts of Dave Allen, his surveying team and funding provided by the Marine Protected Area Management and Monitoring Programme (MarPAMM), surveys went ahead as planned in late May and June 2021.

The field teams were kept busy counting over 150,000 Guillemots and around 23,000 Razorbills across Rathlin and the north Antrim coast. Considering Rathlin alone, the most recent counts of 149,510 Guillemots and 22,421 Razorbills made the island the UK's largest Guillemot colony, just pipping East Caithness for the title, and third largest Razorbill colony, after East Caithness and Bempton Cliffs. While Rathlin's Kittiwake numbers had declined between the Seabird 2000 count and the last full census in 2011 (when they reached a low of 7,962 Apparently Occupied Nests, AON), numbers have since bounced back and there are now ~13,700 pairs, 38% above the Seabird 2000 count. The picture was less rosy for **Atlantic Puffin** (*Fratercula arctica*), which has continued to decline on the island and only 407 individuals were counted.

Along key sites on the north coast, fewer seabirds were counted, and trends were mixed, for example Guillemots increased by 60% on Sheep Island, while their Razorbill neighbours declined by 77%. Worryingly, the nationally important breeding colony of **Great Cormorant** (*Phalacrocorax carbo*) for which Sheep Island is designated an SPA also declined by 60% to 139 AON. However, it was unclear how many of these were lost to the colony splitting between sites, highlighting the value of ringing studies in providing context to information on abundance change.

A full report on the results of these surveys is soon to be published as part of the MarPAMM project, which aims to use these abundance data to inform the management of a network of Marine Protected Areas in the INTERREG VA region, spanning marine environments in Northern Ireland, Western Scotland and the Republic of Ireland.

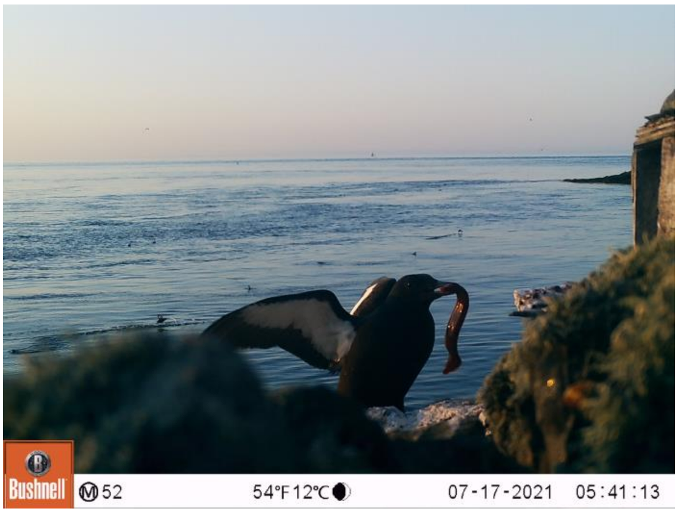
This project has been supported by the EU's INTERREG VA Programme, managed by the Special EU Programmes Body. Thanks to the incredible surveying effort of Dave Allen, Kendrew Colhoun, Kerry Leonard, Kerry Mackie, Kevin Mawhinney, Liam McFaul and Dennis Weir for counting such an extraordinary number of seabirds, and to AFBI's Davy Eccles, the skipper of the *Queen of Ulster* for facilitating coverage of the north Antrim coast. Thanks to Liz Humphreys and Niall Burton for providing senior management support.

Research grant reports

Thanks for all the Butterfish - Black Guillemot diet as revealed by camera traps on Lighthouse Island, Northern Ireland

Daniel Johnston, British Trust for Ornithology

"Black Guillemots eat Butterfish" is an observation I hear time and again when speaking to birders in Northern Ireland. And to skip to the end of this article, they very much do eat a lot of Butterfish (*Pholis gunnellus*). Previous observations of **Black Guillemot** (*Cepphus grylle*) diet across the Irish Sea in Scotland have shown me that prey provisioned to chicks can be much more varied than at first glance. Variation in diet may arise from individualistic foraging behaviour and habitat selection, with potential implications for chick growth and adult condition. Cross-border Marine Protected Areas (MPAs) under development within Northern Ireland and the Republic of Ireland for Black Guillemots will provide an important tool for protecting foraging habitat, but have also highlighted a fundamental gap of our knowledge regarding Black Guillemots prey within this region. Yes, it's Butterfish, which the few accounts that exist for Northern Ireland acknowledge. But no studies exist to interrogate this assumption. What's more is that Black Guillemot diet is a joy to study.



A camera trap photograph, displaying a chick provisioning Black Guillemot entering the nest with a Butterfish.

Chick provisioning Black Guillemots are single prey bill-loaders, making identification of diet observable through non-invasive visual methods. Camera traps provide a potential opportunity to identify prey items as adults enter the nest, and can monitor chick feedings 24 hours a day, across the entire provisioning stage of the breeding season. To carry out a trial study of Black Guillemot diet in Northern Ireland, I implemented this method on Lighthouse Island, a part of the Copeland Islands, home to a population of 60 Black Guillemots. Six motion sensor cameras traps (Bushnell CORE No-Glow) were attached to wooden stands, supported by rocks, and placed 1-1.5m from the nest entrances of a sample of nests. On Lighthouse Island, Black Guillemots predominately nest within boxes provided by the Copeland Bird Observatory, improving the likelihood of capturing images of birds entering and exiting from the single nest entrance. In addition to chick provisioning, camera traps may also record date of fledging, and potential causes of chick mortality though predation or adverse weather. We additionally carried out irregular visual observations of chick feeding adults, to gain a colony wide picture of diet.

Across the chick-feeding period, cameras were placed on seven nests, witnessing active provisioning between 19th June to 8th August for an average of 23 days (13-33 days). Butterfish was, surprise surprise, found to be the main prey component across the nests (Figure 1a). However, Gadiod spp., Flatfish spp. (potentially: Norwegian Topknot *Phrynorhombus norvegicus*, European Plaice *Pleuronectes platessa*, European Flounder *Platichthys flesus*), Sculpin spp. (potentially: Bull Rout *Myoxocephalus Scorpius,* Long-spined Sea Scorpion *Taurulus bubalis*) and Blenny spp. distinct from Butterfish (potentially: Yarrell's Blenny *Chirolophis ascanii*) were commonly consumed at each nest to varying extents. This prey composition was reflected in the visual observations of the entire colony. The provisioning of Flatfish or Sculpins was often attributed to a single individual made possible in some instances by the presence of colour rings. Overall, prey items which were not Butterfish made up a proportion of between 1-27% (mean = 13%) of each nest's chick diet.

At all the nests, provisioning began at 0500 and remained constant until 1700 after which feeding frequency declined until ceasing after 2200 (Figure 1b). Start and end time of feeding is likely related to the availability of light, as studies of colonies further north in Norway, which experience constant light during the summer months, have observed feeding around the clock. No variation in composition of diet was seen in relation to time of day (Figure 1c). However the reaction time of the cameras was often slower in the darker hours of the early morning (0500 - 0800) leading to fewer clear images of prey items as adult entered the nest. Observations of provisioning rate per day found, at the peak of the season, 29 feeds were made on a single day, after which the number of feeds tailed off to around five before the date of fledging.

The presence of **Herring Gulls** (*Larus argentatus*) was ubiqutious at each nest throughout each day (Figure 1c), with adults attempting to klepoparasite prey items. No other kleptoparasites were identified, however other potential predators were identified inspecting nest enterances, including a Peregrine Falcon (*Falco peregrinus*), Eurasian Otters (*Lutra lutra*), Magpies (*Pica pica*) and **Great Black-backed Gulls** (*Larus marinus*). No depredation of chicks or adults was recorded. Previously in Scotland and Sweden, chick and egg mortality in Black Guillemots has been linked to flooding of nests due to storm surges or rain. During the course of this study chick mortality, potentially due to temperature stress, was observed at a camera trapped nest when temperature reached 40 °C in full sun. While disconcerting, this highlights the value of constant recording of nests to identify causes of chick mortality and the value of additional instruments held within camera traps, in this instance the inbuilt thermometer.

This trial has reaffirmed the use of camera traps to both observe chick diet and influences on breeding success. However, improvements could be made through the colour ringing of adults to help monitor individual variation in diet. The shown findings here display that while other prey did contribute to a small proportion of chick diet, Butterfish was the main component. While it is apparent that Black Guillemots are capable of generalist foraging behaviour and forage on alternate prey, Butterfish is a lipid rich prey item, and may be of greater value. Previous studies in Scotland have shown increased growth in chicks where there was a larger proportion of Butterfish in their diet. Further study is required to understand the cost/benefits on Black Guillemot adult condition and breeding success related to varying diets. Further study of the ecology of Butterfish, particularly in the face of environmental change, is also required to better understand if we should be reassured or concerned by the reliance of Black Guillemots on Butterfish.

This study was part funded by a Seabird Group research grant. Fieldwork was carried out in concurrence with the EU's INNTREG VA supported Marine Protected Area Management and Monitoring Project project. Thanks to Copeland Bird Observatory for hosting me on Lighthouse Island. Thanks to Katherine Booth Jones for support in the field and retrieving the cameras.

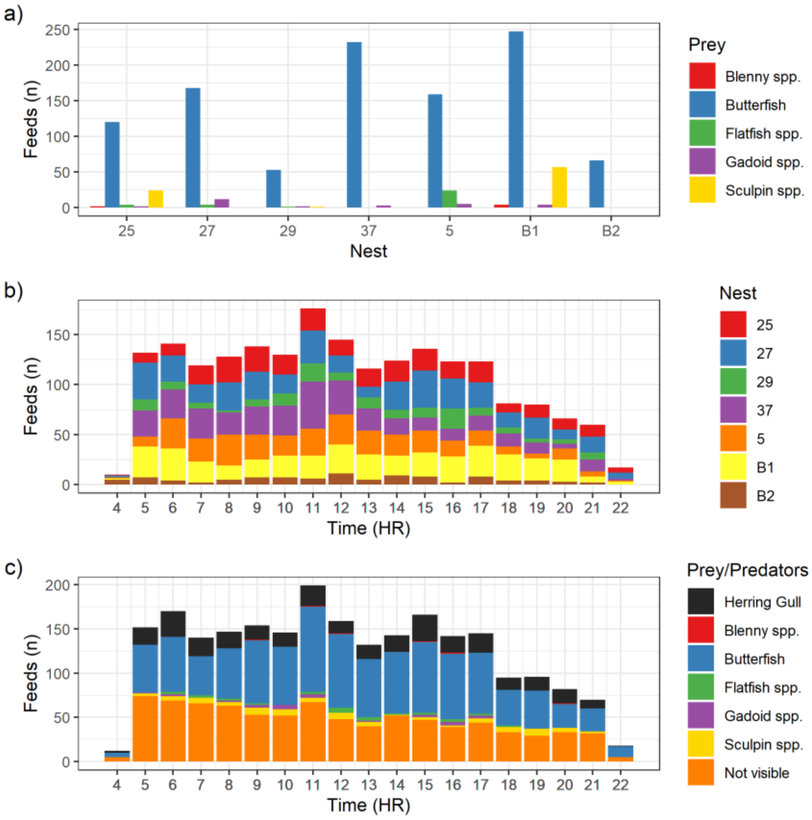


Figure 1: a) Black Guillemot diet composition in relation to study nests. b) The number of feeds per hour of the day in relation to study nest. c) Total chick diet composition in relation to hour of the day, and instances of Herring Gull presence.

Can acoustic indices reliably detect the migratory arrival of Short-tailed Shearwaters?

Harrison Talarico, University of Tasmania

Short-tailed Shearwaters (STSHs; *Ardenna tenuirostris*) are Australia's most numerous seabird, and they make an annual return migration from their wintering grounds in the North Pacific Ocean to their breeding colonies in south-eastern Australia. STSHs typically arrive at their breeding colonies in the last week of September[2], however, some reports have suggested that certain colonies have arrived late in recent years[3]. To validate such observations, a method that quantifies the migration timings of STSHs should be developed. Devising such a method may help researchers better understand how STSHs are responding to widespread environmental change. To address this, my study investigated whether the migratory arrival of STSHs could be detected with acoustic indices—i.e., mathematical summaries of the distribution of acoustic energy within a recording.

METHODOLOGY

To detect the migratory arrival of STSHs, nine Song Meter SM4 acoustic recorders were deployed at seven STSH breeding colonies in southern and eastern Tasmania between mid-September and mid-October 2021 (Figure 1). As STSHs are most vocally active upon their arrival to the colony after sunset, each recorder was scheduled to record continuously from one hour before sunset to two hours after sunset each night.

Overall, the recorders produced 228 raw data files, each three hours in length. To reduce the substantial computational cost when using acoustic indices to analyse recordings, fifteen second subsamples were taken every thirty minutes from the raw recordings. Each subsample was manually reviewed, and the number of STSH vocalisations per recording was documented.

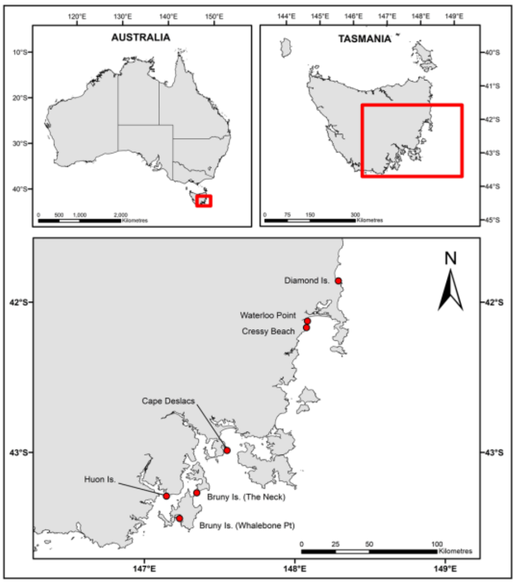
[2] Carey, M.J., Phillips, R.A., Silk, J.R.D. & Shaffer, S.A. (2014) Trans-equatorial migration of Short-tailed Shearwaters revealed by geolocators. *Emu - Austral Ornithology*, 114, 352-359.

[3] Glencross, J., Lavers, J. & Woehler, E. (2021) Breeding success of short-tailed shearwaters following extreme environmental conditions. *Marine Ecology Progress Series*, 672, 193-203.

Additionally, because many of the recordings were affected by wind, an automated high-cut wind-filter was applied to the subsamples to create two datasets—the raw dataset and the wind-filtered dataset.

Two acoustic indices were chosen to analyse the subsamples across the two datasets—The Acoustic Complexity Index (ACI) and the Normalised Difference Soundscape Index (NDSI). The ACI relies on the assumption that biotic sounds are characterised by an intrinsic variability of intensities. It is calculated as the difference in spectral amplitude within a frequency band from one time sample to the next, and averaged over all frequency bands for the duration of the recording[4]. The NDSI relies on a theoretical frequency split between non-biotic noise and biotic noise. It is calculated by computing the ratio of non-biotic noise and biotic noise in a recording on a range of -1 to +1 (with +1 indicating more biotic noise in the soundscape)[5].

To determine whether significant changes in index values corresponded with the migratory arrival of STSHs, we performed changepoint analyses (Figure 2). These analyses are used to compare abrupt changes in the means of time series data to represent transitions between different states. The day of the first significant change in average STSH vocalisations in the raw data was used as a proxy for true colony arrival. These results were subsequently compared against the first significant change in the average ACI and NDSI values on both the raw and wind-filtered dataset to determine whether acoustic indices could reliably detect the migratory arrival of STSH. The index was said to have detected the arrival of STSHs successfully if a change point occurred within one day of the vocalisation change point.



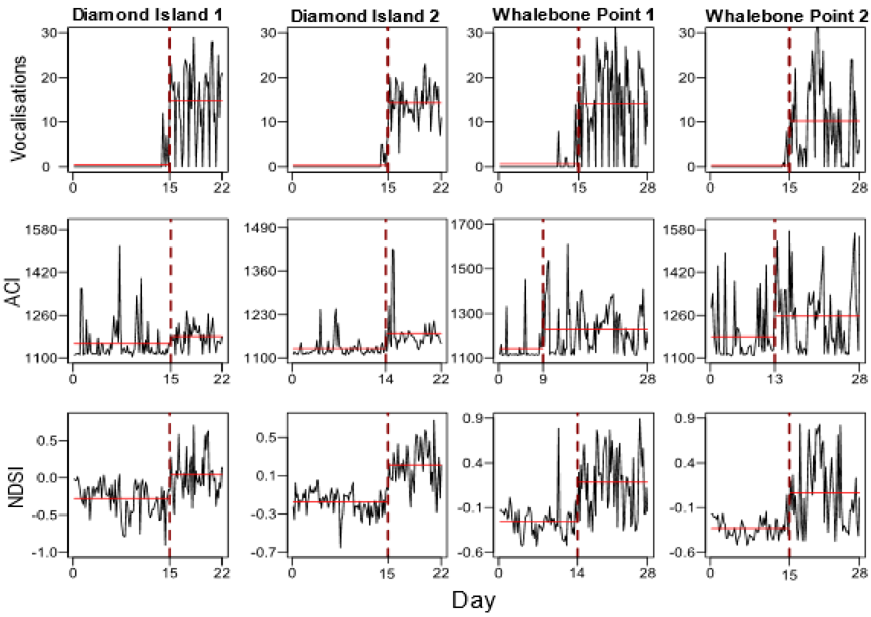


Figure 1 (left): A map of the Short-tailed Shearwater colonies monitored in our study in southern and eastern Tasmania. Two acoustic recorders were deployed at each of the Diamond Island and Whalebone Point colonies, whereas one recorder was deployed at each of the other colonies. Figure 2 (right): Changes in mean values (red dotted line) of the Acoustic Complexity Index (middle row; ACI) and the Difference Soundscape Index (bottom row; NDSI) in the raw data at four of the sites in the study. The index changepoints were compared against Short-tailed Shearwater (STSH) vocalisation change points (top row) in the raw dataset, which were used as a proxy for colony arrival. The index was said to have detected the arrival of STSH successfully if a change point occurred on the same day or within one day of the vocalisation change point. An index change point was classified as ‘early’ when it occurred before the first vocalisation of STSHs at that site. Early ACI change points were detected at both Whalebone Point sites.

RESULTS AND DISCUSSION

The ACI was most effective at detecting the proxy arrival of STSHs in the wind-filtered dataset—successfully identifying STSH arrival at five of the nine sites (Table 1). However, the NDSI was the better performing index in the raw dataset, where it also identified STSH arrival at five of the nine sites. Cumulatively, both indices captured the proxy arrival of STSHs at seven out of nine sites in our study.

[4] Pieretti, N., Farina, A. & Morri, D. (2011) A new methodology to infer the singing activity of an avian community: The Acoustic Complexity Index (ACI). *Ecological Indicators*, 11, 868-873.

[5] Kasten, E.P., Gage, S.H., Fox, J. & Joo, W. (2012) The remote environmental assessment laboratory's acoustic library: An archive for studying soundscape ecology. *Ecological Informatics,* 12, 50-67.

The results demonstrate that the NDSI may be the most effective index at quantifying the migration timings of STSHs. The ACI may also be appropriate when a wind-filter is applied, however, this method entails a certain amount of data loss and may therefore be inappropriate at particularly windy sites. Notwithstanding, the ACI was able to detect the proxy arrival of STSHs at two sites where the NDSI was unable to—The Neck and Huon Island.

As it is unlikely that a single index can describe the diverse soundscapes that exist within and between STSH colonies, a combination of indices should be used to monitor the migratory arrival of the birds. Selection should be based on a priori knowledge of the study site as well as an understanding of the soundscape patterns that underlie index values.

Evaluation of mercury levels in the endangered Black-capped Petrel

Yvan Satgé (South Carolina Cooperative Fish and Wildlife Research Unit), Sarah Janssen (U.S. Geological Survey Upper Midwest Water Science Center), Patrick Jodice (U.S. Geological Survey South Carolina Cooperative Fish and Wildlife Research Unit)

Through anthropogenic emissions, heavy metal contaminants such as mercury have become increasingly prevalent in the marine food chain[6]. Mercury has been shown to affect seabird physiology, fitness and development[7,8], and has rapid consequences at the population level[9]. Atmospheric mercury is deposited into open ocean systems, where it represents 90% of all mercury inputs into the surface ocean[10]. Mercury is naturally present in the environment, but human activities have increased natural atmospheric concentrations by ca. 450% since 1450[11,12]. Although occurring in all ocean basins, inputs of anthropogenic mercury are spatially variable and concentrations of mercury available to enter the food chain depend on biophysical oceanic transport and processes[9,10]. Once in aquatic ecosystems, inorganic mercury may be converted to methylmercury, the more toxic form that is assimilated into the marine food webs and biomagnifies through the food chain[13]. In seabirds, exposure to mercury thus depends on the location of foraging areas[14], and the type, size and ecology of prey[15].

Figure 1: Diablotin Black-capped Petrel *Pterodroma hasitata*. Photo: Kate Sutherland.

The **Diablotin** or **Black-capped Petrel** (*Pterodroma hasitata*) (Figure 1) is an endangered gadfly petrel endemic to the Caribbean and occurs in waters of the western North Atlantic Ocean, Caribbean Sea, and Gulf of Mexico[16]. The species is considered

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[6] Lamborg, C.H., Hammerschmidt, C.R., Bowman, K.L., Swarr, G.J., Munson, K.M., Ohnemus, D.C., Lam, P.J., Heimbürger, L.E., Rijkenberg, M.J. and Saito, M.A., 2014. A global ocean inventory of anthropogenic mercury based on water column measurements. *Nature*, 512(7512), pp.65-68.

[7] Evers, D.C., Kaplan, J.D., Meyer, M.W., Reaman, P.S., Braselton, W.E., Major, A., Burgess, N. and Scheuhammer, A.M., 1998. Geographic trend in mercury measured in common loon feathers and blood. *Environmental Toxicology and Chemistry: An International Journal*, 17(2), pp.173-183.

[8] Tartu, S., Goutte, A., Bustamante, P., Angelier, F., Moe, B., Clément-Chastel, C., Bech, C., Gabrielsen, G.W., Bustnes, J.O. and Chastel, O., 2013. To breed or not to breed: endocrine response to mercury contamination by an Arctic seabird. *Biology Letters*, 9(4), p.20130317.

[9] Bond, A.L., Hobson, K.A. and Branfireun, B.A., 2015. Rapidly increasing methyl mercury in endangered ivory gull (*Pagophila eburnea*) feathers over a 130 year record. *Proceedings of the Royal Society B: Biological Sciences*, 282(1805), p.20150032.

[10] Mason, R.P., Choi, A.L., Fitzgerald, W.F., Hammerschmidt, C.R., Lamborg, C.H., Soerensen, A.L. and Sunderland, E.M., 2012. Mercury biogeochemical cycling in the ocean and policy implications. *Environmental research* 119: 101-117.

[11] Zhang, Y., Jaeglé, L., Thompson, L. and Streets, D.G., 2014. Six centuries of changing oceanic mercury. *Global Biogeochemical Cycles* 28(11): 1251-1261.

[12] Outridge, P.M., Mason, R.P., Wang, F., Guerrero, S., and Heimburger-Boavida, L. E., 2018. Updated global and oceanic mercury budgets for the United Nations Global Mercury Assessment. *Environmental science & technology* 52(20): 11466-11477.

[13] Driscoll, C.T., Mason, R.P., Chan, H.M., Jacob, D.J. and Pirrone, N., 2013. Mercury as a global pollutant: sources, pathways, and effects. *Environmental science & technology,* 47(10), pp.4967-4983.

[14] Anderson, O.R.J., Phillips, R.A., McDonald, R.A., Shore, R.F., McGill, R.A.R. and Bearhop, S., 2009. Influence of trophic position and foraging range on mercury levels within a seabird community. *Marine Ecology Progress Series*, 375, pp.277-288.

[15] Becker, P.H., Goutner, V., Ryan, P.G. and González-Solís, J., 2016. Feather mercury concentrations in Southern Ocean seabirds: variation by species, site and time. *Environmental Pollution,* 216, pp.253-263.

[16] Jodice, P.G., Michael, P.E., Gleason, J.S., Haney, J.C. and Satgé, Y.G., 2021. Revising the marine range of the endangered black-capped petrel *Pterodroma hasitata*: occurrence in the northern Gulf of Mexico and exposure to conservation threats. *Endangered Species Research*, 46, pp.49-65.

Endangered throughout its range[17] and is being considered by the U.S. Fish and Wildlife Service for listing as Threatened under the Endangered Species Act[18]. There are an estimated 2,000 pairs of Black-capped Petrels nesting at five documented sites on the island of Hispaniola, in the Caribbean, although to date only 100 nests have been located. Two phenotypes have been described: a smaller dark form and a heavier light form, which are genetically distinct[19]. Our recent tracking of adults has shown an extensive use of the southern Caribbean Sea by breeding birds, in areas off Colombia and Venezuela where explorative drilling and active extraction of hydrocarbon are ongoing[20]. Although such activities do not occur in the western North Atlantic, global mercury models suggest a high prevalence of total mercury in the mixed layer of areas used by petrels in this basin[10,21]. The foraging ecology of the Black-capped Petrel is still under study but its diet is considered to be mainly composed of mesopelagic cephalopods[22,23]. Since high concentrations of mercury have been detected in pelagic seabirds that feed extensively on cephalopods [e.g. 24], we posit that Black-capped Petrels are exposed to high background concentrations of mercury throughout the annual cycle. The only previous analysis of mercury levels in the Black-capped Petrel was performed by Whaling et al[25,26] and suggested a mean Total Hg concentration of 18.0 ppm (n = 22) in feathers. However, these results were only summarised in a conference abstract, and the methods were never published. Therefore, the objective of this project was to measure contemporary mercury levels in Black-capped Petrel feathers.

During previous fieldwork, we collected four to five breast feathers from adult Black-capped Petrels captured at nesting sites in the Dominican Republic, and at sea offshore Cape Hatteras, North Carolina, USA. We collected breast feathers because they could be easily sampled without causing undue stress to captured birds, and because they are considered to be more representative of body metal levels than flight feathers[27]. We ringed petrels with individually numbered metal rings (U.S. Geological Survey Bird Banding Laboratory, Maryland, USA). Samples were individually identified and were stored in a cool and dry area. We washed one feather per individual with acetone and high purity water prior to shipment to the USGS Mercury Research Lab. Upon receipt, feather samples were digested in 4.5M HNO_3 at 60°C for eight hours to extract methylmercury. Extracts were treated with ultraviolet light for three to five days to destroy dissolved organic matter and then oxidized with bromine monochloride (BrCl) at 50°C for five days to convert methylmercury to the inorganic form (Hg(II)). Total mercury analysis was performed according to U.S. EPA Method 1631. All laboratory analyses were performed by the USGS Mercury Research Lab, Wisconsin, USA. All samples were collected under authorisation by and following guidelines from Clemson University IACUC (AUP2018-005 and AUP2019-033, respectively).

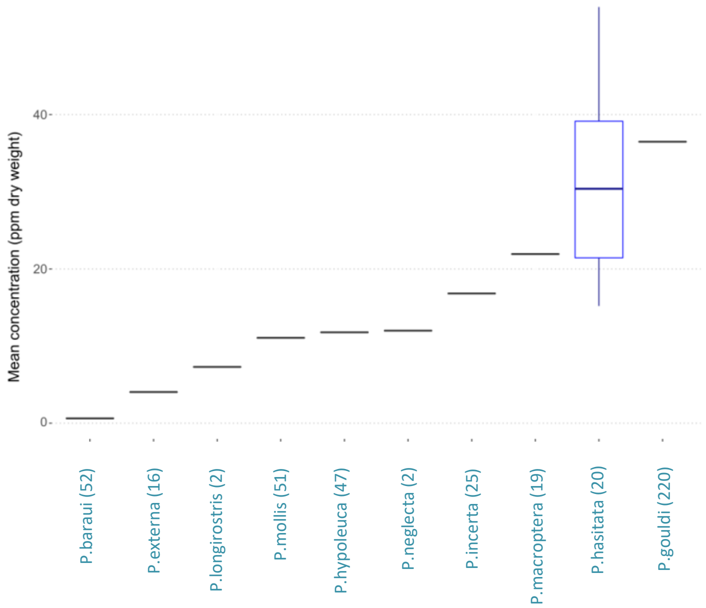

Figure 2: Mean Total Hg concentrations (dry weight) in breast feathers of *Pterodroma* species. Our results are shown as a boxplot to provide more details on the distribution of measured concentrations. Numbers in parentheses represent sample sizes. References for other species found in the footnotes (14, 23, 29 – 33).

[17] BirdLife International. 2018. *Pterodroma hasitata*. The IUCN Red List of Threatened Species 2018: e.T22698092A132624510. https://dx.doi.org/10.2305/IUCN.UK.2018-

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Of 10 adult Black-capped Petrels sampled at nesting sites in the Dominican Republic in April 2018, and 10 other adults sampled at sea offshore Cape Hatteras in May 2019, 15 individuals were of the dark phenotype and five of the light phenotype. Mean Total Hg concentration was 30.3 ppm dry weight (min. = 15.2, max. = 53.9, sd = 12.13) (Figure 2). There were no statistically significant differences in Total Hg concentrations in the dark phenotype compared to the light phenotype (t-test: $p = 0.56$).

Due to its high trophic position in the marine food chain of the western North Atlantic, Caribbean Sea and Gulf of Mexico, the Black-capped Petrel is highly susceptible to mercury bioaccumulation[28,24]. Our results are in the top tier of Total Hg concentrations measured in breast feathers of other *Pterodroma* species (Figure 2). The moulting process of the Black-capped Petrel is poorly known but it is assumed to follow a similar pattern to that of the **Bermuda Petrel** (*Pterodroma cahow*), in which body feathers are moulted after the breeding season[24]. We collected breast feathers in the spring during the breeding season, thus reflecting dietary intake related to the last moult (i.e., June-August of the previous year). After the breeding season, Black-capped Petrels appear to leave the Caribbean basin to spend the non-breeding period in the western North Atlantic[29,20]. Therefore, the burdens measured in our study seem to reflect mercury exposure in the western North Atlantic. Two parallel studies by our group provide new insight about mercury exposure as it relates to the trophic ecology of Black-capped Petrel and its exposure to marine threats. Firstly, our recent analysis of prey DNA in petrel faecal samples suggests that the species has a more diverse diet than previously thought, comprising more fish species, including mesopelagic species and species that perform diel migrations[20]. Secondly, our analysis of macro-scale exposure to marine threats suggests that Black-capped Petrel phenotypes have different distributions at sea and are differently exposed to modelled mercury concentrations in the oceanic mixed layer[20]. Our results do not support this difference but the limited sample sizes prevent any definite conclusion. Therefore, future research should focus on 1) increasing sample size for mercury analyses of breast feathers between phenotypes, 2) assessing exposure to mercury in the Caribbean basin by analysing blood samples from breeding adults, and 3) assessing impacts on the reproductive success.

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Census grant report

South Devon Coast and Rocks 2021

Alex Banks, Sophy Allen & Richard Berridge, Natural England

Mainland Devon has traditionally held small but locally significant abundances of nesting seabirds. Coverage of these sites for the latest UK seabird census, Seabirds Count, focused on coastal stretches accessible from land or protected sites requiring boat surveys. Several islets, rocks and areas not easily visible from the coast path remained between Plymouth and Salcombe in South Devon (Figure 1) which a Seabird Group grant enabled us to survey from a small vessel in 2021.

Alex Banks, Richard Berridge, Sophy Allen

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METHODS AND PERSONNEL

On a bright summer morning in May 2021, our team of experienced seabird surveyors (Alex, Sophy and Richard) departed Plymouth Harbour. All observations were completed from the deck, using 8 x 42 magnification binoculars. One surveyor scribed whilst the others performed independent counts of the seabird nests. These independent counts were compared; where similar (e.g. within approx. 10%), the maximum count was used. Where counts differed by a greater margin, surveyors described the nest locations whilst simultaneously surveying, until consensus was reached on a total. For larger sites, natural variation in e.g. vegetation and geology were used to divide count sections into manageable chunks. Units were species-specific, following definitions in Walsh et al. (1995). Weather was dry, partially cloudy, with minimal wind. The sea was calm throughout, with little swell and very small waves.

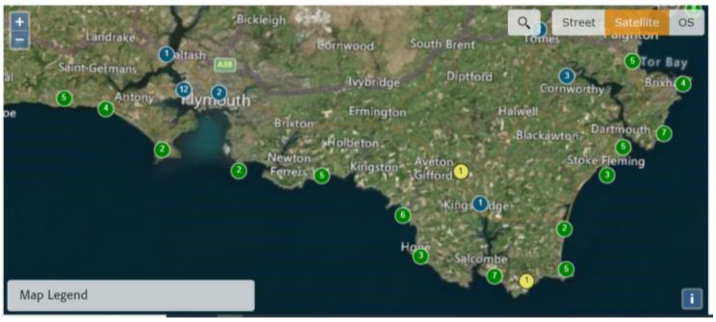

Figure 1: Survey area (from Seabird Monitoring Programme). Numbers show numbers of count sites within locale.

The three Seabird Monitoring Programme (SMP) Mastersites surveyed were:

- Great Mewstone – a small island off Wembury, owned and managed by the National Trust. Previously monitored by surveyors visiting the island, but as access is highly restricted and the south face is very steep, preferably visited by boat (as it was when last surveyed in 2007).
- Bigbury Bay – three coastal stretches and the small islet of Burgh Island (the location of a tidally isolated hotel famous for its Agatha Christie links). Previously monitored from land, likely for ease rather than accuracy – most suitable nest sites were on south-facing slopes more visible from the sea.
- Salcombe to Start Point (SSP) – five coastal stretches with very small offshore rocks. We checked The Bull, Shag Rock, Pig Nose, Gammon East and West Prawle; the remaining two sections, Raven's Cove and South Start Point, were checked from land in 2019, and time did not permit revisit from the sea. Previously, the Mastersite was entirely surveyed from land, again likely for convenience.

LAND SURVEYS

On 31st May 2021, Sophy Allen visited Gammon East from the land to check that our boat survey had not overlooked significant numbers of birds. Between 5th and 12th June, additional stretches of adjoining coast comprising the Noss Mayo to Erme Estuary (NMEE) SMP Mastersite were surveyed from land, which had not been surveyed during our boat survey because of time constraints, by Sophy Allen (5th June), Holly Niner and Nick Purdew (12th June).

RESULTS

Boat survey work proceeded from west to east, starting with the Great Mewstone (Table 1), which remains the most abundantly occupied colony in south Devon.

On the land-based check of Gammon East, no nests of any species were found – the same result as from the boat. Twenty-eight nests of three species were recorded from Noss Mayo to Erme Estuary (Table 1).

DISCUSSION

Comparisons are made between Seabirds Count (including boat and land counts in 2021, 2020 and 2019) and previous surveys dating back to 1986 (the oldest records within the SMP database). Conclusions from single point-counts in single years are made cautiously, especially where comparing land and boat surveys.

Fulmar: Across the four Mastersites surveyed, 30 Apparently Occupied Sites (AOS) were recorded. Twenty-two AOS were recorded on the Great Mewstone, compared with seven in 2007 and none prior to that. Previously, visits were land-based, but methodological differences would not account for 4 AOS newly recorded at Wadham Rocks to St Anchorites Rock. Four Fulmar AOS is typical for Bigbury Bay, with that number in 2000 and 1990, peaking with six on Burgh Island in 1987. The trend across Mastersites showed an apparent increase from 2000 (5 AON to 30 AON), possibly partly methodological.

Herring Gull: A total of 67 AON were recorded across the four Mastersites. All four Mastersites showed some level of decline from the patchy data available. Great Mewstone and Bigbury Bay show declines of 83% and 53% respectively between 1987 and

2021; NMEE and SSP show declines of 23% and 85% since 2000. The latter is particularly stark, holding only 22 AONs in 2019-2021 compared with 142 in 2000; three of the seven sub-sites are now abandoned, whereas all were occupied in 2000. The trend across Mastersites showed an apparent substantial decline from 1987 to 2000 (average 61%).

Great Black-backed Gull: Of the 38 AON recorded, 37 were on Great Mewstone and one was on Burgh Island. This distribution seems fairly typical, though NMEE and SSP have lost two and one AONs respectively since 2000. Burgh Island has never held more than two AONs (2000), whereas the peak on Great Mewstone was 60 in 2007 (cf. 35 in 1986, 29 in 1987, 25 in 2001). Across all Mastersites there was an apparently stable trend (e.g. 35 in 1986, 38 in 2021), with a possible outlier in 2007.

Lesser Black-backed Gull (*Larus fuscus*)**:** A single AON was recorded at South Start Point in 2019. This site also held 1 AON in 2000. The only other record from this area was from Burgh Island in 2000, but we saw no evidence of nesting in 2021.

Shag: The main strongholds for Shags have been Great Mewstone and Burgh Island, and both have witnessed apparent declines. In 2021, just one Shag nest was on Burgh Island, compared with 37 in 1986 – by 2000 this had decreased to 7 AON, implying a continuing decline. On the Great Mewstone, 37 AON in 1986 and 42 in 1987 had increased to 47 in 1999, peaking at 68 from the boat survey in 2007. In 2021, we recorded 16 AON. We did not suspect that our counts were substantial underestimates, as we could check all apparently suitable habitat (i.e. areas with no or only sparse vegetation), and the 2007 peak was recorded from the sea. Away from the main breeding sites, 7 AON within NMEE partially offset the absence of Shag AON in SSP, which supported 11 AON in 2000. The trend across Mastersites showed apparent declines in both main breeding sites since 1986 (average 77%).

Table 1. Results of seabird surveys, south Devon, 27th May 2021 (Great Mewstone, Salcombe to Start Point) and Noss Mayo to Erme Estuary (5th & 12th June). F. – Fulmar, Apparently Occupied Site (AOS); HG – Herring Gull, Apparently Occupied Nest (AON); GB – Great Black-backed Gull, AON; SA – Shag, AON; CA – Cormorant, AON.

	F.	HG	GB	SA	CA	start	end
GREAT MEWSTONE	22	9	37	16	20	08:41	09:20
BIGBURY BAY							
Burgh Island	2	14	1	1	0	09:55	10:10
Butter Cove	2	7	0	0	0	10:15	10:25
Woolman Point	0	4	0	0	0	10:30	10:42
Hope Cove	0	1	0	1	0	10:43	10:48
SALCOMBE TO START POINT							
The Bull	0	2	0	0	0	12:45	12:49
Shag Rock	0	0	0	0	0	12:05	12:10
Pig Nose	0	3	0	0	0	12:10	12:19
Gammon East	0	0	0	0	0	14:50	16:00
West Prawle	0	10	0	0	0	12:20	12:33
NOSS MAYO TO ERME ESTUARY							
Cunnimall Rocks to Wadham Rocks	0	0	0	0	0	15:15	16:00
Wadham Rocks to St. Anchorites Rock	4	7	0	7	0	11:05	12:15
St. Anchorites Rock to Bugle Hole	0	10	0	0	0	12:20	13:15

Cormorant: As with Shags, Cormorants in South Devon bred in greatest abundances on Burgh Island and Great Mewstone with almost annual counts 1990 - 2010. At the former, no breeding Cormorants were present from eight visits (including ours) since 5 AON in 2007, and we should be confident that the site is abandoned. The peak for Burgh Island was 18 AON in 2002. Greater than 95 AON have been recorded on Great Mewstone seven times between 1991 and 2004. Records then tail off, with one count of 79 in 2007. In 2021, we recorded just 20 AON. It is likely that our visits were not ideally timed for Cormorants, as previous surveys in South Devon have occurred from 13th April. This may explain some of the apparent declines we recorded for Great Mewstone. Away from these sites, the other two Mastersites have single records: 6 AON in 1987 from SSP and 8 AON in 2000 from NMEE. Both were deserted in 2021. There was a potential declining trend across Mastersites (e.g. Burgh Island), though chronological differences make wider comparisons difficult.

GENERAL CONCLUSIONS

From the available data, Herring Gull and Shag are following wider trends, declining substantially. Fulmars appear to be locally increasing, against national trends, whilst Great Black-backed Gulls seem stable. The data collected will fill an important gap in mainland Devon for Seabirds Count. However, more regular monitoring (especially on Burgh Island and Great Mewstone) would allow greater understanding of change, particularly relating to method and phenology. On the doorstep of Plymouth University, maybe these small but locally significant colonies in an under-watched corner of the UK's breeding seabird range could become the focus of research for students with an interest in marine ornithology?

Seabirder Spotlight

Seabirder Spotlight aims to illuminate the variety of career paths and roles available to aspiring seabirders. Contributors are asked a range of standard questions about their careers, for example on what their current job involves, what aspects they love about their work and what skills have been important to cultivate on their journey. In particular, we hope that the contributions from members of the seabird community will inspire and motivate people in their early careers to work with seabirds.

Kat Keogan – Marine Data Scientist, Environmental Consultancy

I currently work as a data scientist with an environmental consultancy based in Scotland. My job is to do the analyses that are used in the environmental impact assessments, and manage the large datasets that we collect on seabird distributions. Being able to use R is the most important skill for my role as I work with data so much. It's also very useful to have a working knowledge of the ecology of UK seabirds, as it enables me to sense check the outputs of different models are biologically meaningful. My favourite part of my job is that I feel like I'm contributing to renewable energy development while also giving a voice to the wildlife that will be affected. I work with a great team, and we advocate as best we can for the UK's seabirds.

The biggest challenge is that there's no fieldwork, and I go crazy sitting in front of a desk at times. Luckily, I am involved with a couple of different ringing groups and have managed to get out on a few seabird-y adventures. Working a 100% desk job isn't ideal for me so I make sure to maintain a very good work-life balance. I'm strict on only working my contracted hours and take all overtime back in lieu. I'm most productive first thing in the morning, so I don't do my job then – instead I keep that as personal time and log on later. This makes me feel happy in general, and ultimately I do a better job because of it.

I haven't always wanted to work with seabirds, but I have always wanted to work as a marine biologist because I grew up right beside the sea in Dublin. I love birds though, so seabirds were a natural progression. My degree is in Zoology and my MSc in Conservation and Biodiversity, but I spent many years working full time in hospitality thinking I'd never become an ecologist. Luckily a local branch of BirdWatch Ireland let me come along on seabird surveys and help warden at a tern colony and so I'd occasionally do that on my days off. That must have helped when I applied for a PhD studying the effects of climate change on seabird breeding biology in 2015. During my PhD I used R a lot and got involved with teaching stats and R workshops. Afterwards I worked briefly as an ornithologist with Marine Scotland Science before getting a permanent job where I work now.

I've never had a particular career goal in mind, I'm where I am now because of opportunities that were available when I happened to be looking. For people at the beginning of their career I'd say don't forgo an opportunity just because it might not be exactly what you envisaged for yourself. Some of the best experiences on my CV are things I didn't really plan but took an opportunity and ended up learning loads or really liking whatever it was. You never know who you might meet, and it's amazing how transferrable some skills can be!

Seabird Group notices

Update on the new grants

Lila Buckingham, Equality, Diversity and Inclusions Officer for the Seabird Group

This year, The Seabird Group trialled a new grant to support individuals to undertake voluntary seabird-focused activities. The process was successful, with 16 applicants and three grants of £250 awarded.

Our first grant was awarded to Lirayen Valencia, who is a Zoology graduate and has undertaken internships with BirdLife Malta and the London Wildlife Trust. Lirayan will be completing a placement on Skomer as one of their long-term volunteers this year. You can follow Lirayen on Instagram here: @liraloveswildlife

Secondly, to Emma Caulfield, who is completing an undergraduate degree and will be spending a month on the Calf of Man, censusing and monitoring **Manx Shearwaters** (*Puffinus puffinus*) and getting involved with other ringing activities with the bird observatory. You can follow Emma on Twitter here: @sweet_starling

Finally, to Lucy Williamson, who is a Biology graduate currently working as a research assistant with the University of Oxford. Lucy has recently arrived on Skokholm and will be completing a placement as a long-term volunteer. You can follow Lucy on Twitter here: @LucyWilliamsn

We will advertise our training grants again next year alongside our research grants, with an application deadline of the end of February. If you have any feedback about our grants or the application process, please get in touch with our EDI Officer, Lila Buckingham, on edi@seabirdgroup.org.uk.

Seabird Group membership benefits

Zoe Deakin and Kirsty Franklin, Seabird Group ExCom

We're pleased to offer additional benefits for The Seabird Group members on Pelagic Publishing, Poyser Monographs, Cotswold Outdoor, the Scottish Seabird Centre and Mooncup. Details and codes for these can be found on our members only page online. Please contact The Seabird Group Executive Committee member **Zoe Deakin** (deakinz@cardiff.ac.uk) if you have any problems using the discount codes or if you have suggestions for additional member benefits.

Events

Our Plastic Ocean

Scottish Seabird Centre

Our friends over at the Scottish Seabird Centre have a fantastic exhibition, Our Plastic Ocean, opening on 4th June running until 20th August. Our Plastic Ocean, by international award-winning photographer Mandy Barker, addresses the current global crisis of marine plastic pollution. Barker collects debris from shorelines across the world and transforms them into powerful and captivating images. More information can be found on their website.

15th International Seabird Group Conference

The 15th International Seabird Group Conference will be held 22-25th August 2022 in Cork, Ireland. The first day will be dedicated to registration, workshops and an Early Career Researcher event followed by an evening plenary address with scientific talks on the following days. We have three exciting plenary speakers; Prof Emily Shepard, Dr Alex Bond, and Dr Annette Fayet followed by a wide range of theme sessions to cover many aspects of seabird research. Full conference details including registration costs and information on workshops can be found at the conference website.

	Mon 22nd Aug	Tues 23rd Aug	Weds 24th Aug	Thurs 25th Aug
08:30			Registration	
09:00 - 10:00		**Plenary: Prof Emily Shepard**	**Plenary: Dr Alex Bond**	**Plenary: Dr Annette Fayet**
10:00 - 10:45		Session: Biologging	Session: Pollution and toxicology	Session: Multi-colony studies
10:45 - 11:15			BREAK	
11:15 - 12:45		Session: Fisheries	Session: Foraging ecology	Session: Movement and behaviour
12:45 - 13:45	**Registration Open**		LUNCH	
13:45 - 15:30	Workshops/ECR event	Session: Renewables	Session: Urbanisation, Invasives and Restoration	**Prizes and Closing**
15:30 - 16:00		BREAK		
16:00 - 17:30		Session: Monitoring	Session: Demography and climate	
17:30 - 18:00		**Poster Reception**		
18:00 - 19:00	**Opening Address**			
19:00 - 20:00			**Conference Dinner**	

The Seabird Group members get a discounted registration and Early Bird Registration ends 31st July.

Website: **www.seabirdgroup.org.uk**

Facebook: **www.facebook.com/pages/TheSeabirdGroup/**

Twitter: **www.twitter.com/TheSeabirdGroup (@TheSeabirdGroup)**

Registered charity No. 260907

The Seabird Group promotes and helps co-ordinate the study and conservation of seabirds. Members also receive the journal *Seabird*. The Group organises regular conferences and provides small grants towards research.

CURRENT SEABIRD GROUP COMMITTEE

Current membership rates

Ordinary	£30
Concession	£15
Institution	£50
Individual Life	£300
Institution Life	£500

The Newsletter is published three times a year. The Editor welcomes articles from both members and non-members on issues relating to seabird research and conservation. We aim to provide a forum for readers' views so that those provided in the Newsletter are not necessarily those of the Editor or Seabird Group.

Submissions for the newsletter should be emailed to the newsletter editor: newsletter@seabirdgroup.org.uk. We recommend a maximum of 1500 words and ask that photographs and figures are sent as separate files and with full credits, where appropriate. **Deadlines are: 15th January (February edition); 15th May (June edition); and, 15th September (October edition).** Every effort is made to check the content of the material that we publish. It is not, however, always possible to check thoroughly every piece of information back to its original source as well as keeping news timely. If you have any concerns about any of the information or contacts provided, please contact the Newsletter Editor.