Alderney's West Coast and Burhou Islands Ramsar Site and Other Sites Annual Ramsar Review 2022

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Executive Summary

1. The 2022 *Alderney's West Coast and Burhou Islands Ramsar Site and Other Sites* Annual Ramsar Review is the 16th annual review since the site's inception. This review documents the work set out in the 2022 Ramsar Action Plan. The work comprises a variety of ecological surveys, species monitoring, practical conservation work, education and advocacy that contribute vital oversight and outreach to help ensure that the Ramsar site's integrity can be maintained for the future.

2. Most of the seabird, terrestrial and marine monitoring programmes were successfully completed in 2022. The closure of seabird colonies due to the Highly Pathogenic Avian Influenza (HPAI) outbreak resulted in some projects being cancelled. Programmes which were not completed include: the Puffin AOB survey, bat monitoring on Burhou, and the greater part of the seabird ringing programme. The outreach and other educational programmes were delivered in full.

3. The seabird monitoring suggested that the Puffin population remained stable. Boat-based surveys estimated that 184 pairs probably bred (compared to 161 in 2021 and 167 in 2020). Productivity was consistent with previous years too, estimated to be 0.50 chicks per pair.

4. HPAI had a devastating impact on Alderney's Gannets in 2022. On Les Etacs and Ortac the Gannets had another unproductive year. Overall productivity (0.30 chicks per pair) was the lowest recorded since records began; productivity ranged from 0.18-0.44 across Les Etacs. HPAI probably caused both direct and indirect mortality (eg. through parents dying and chicks being abandoned). Across the colonies, this equates to ca.2000 additional chicks dying on Les Etacs and Ortac in 2022. Furthermore, a preliminary mortality estimate has indicated that between 20-33% of Alderney's adult Gannet population (estimated at 17078 breeding pairs in 2021) died during the outbreak, equating to 3500-5800 individuals. In total, this means that ca.5500-7800 additional Gannets died during the HPAI outbreak. It is imperative that the consequences of this outbreak are monitored in 2023.

5. Irrespective of HPAI, mean productivity since 2013 remains substantially lower than that recorded from UK gannetries. In particular, reduced availability of food as a result of increasing sea surface temperatures and overfishing is probably affecting breeding success; a factor already reducing Gannet numbers elsewhere in the English Channel.

6. Fewer Gannets were entangled in anthropogenic materials this year (16) after the high number (30) in 2021. Furthermore, the amount of nesting material brought to nests was 10-fold lower than in 2021. Although the number of birds dying from entanglements is low, given the pressures already faced by these seabirds, it is still a cause for concern.

7. The Fulmar population appears to be stable, with some range expansion, on Alderney. There has been no significant change in productivity (0.41 chicks per pair) or population size (29 pairs) within the Hanaine Bay to Troix Vaux survey area, whilst there was a record number of AOS identified around Alderney and surrounding islets during censuses (67).

8. Of the island's other seabirds: boat-based seabird surveys indicated more Shags nested around the main isle of Alderney and surrounding tidal islets this year (c.141) than last year (c.109), whilst there was a slight decrease in those seen on the outer islets. The numbers of nesting Great Black-backed gulls were similar to the previous two years. There were more Herring gull nests around Alderney in 2022 (142) compared to 2021 (119), whilst there were a similar number of Lesser Black-backed gull nests. The Lesser Black-backed gull colony on Burhou was not included in the census to limit disturbance. The Common Terns continued to nest on Fort Houmet Herbé and did so in greater numbers than in 2021, but avian and rodent predation resulted in a disastrous breeding year with only two chicks fledging compared to 22 in 2021. Between 100-110 Guillemots nested at four sites. Most did so on the

gannetries with the remainder divided between two south coast islets. Between 41-46 Razorbills nested on six tidal islets and on one nearshore island.

9. Ringed Plovers had a record season, with a productivity of 1.5 chick per pair and a record nine fledging. Beach cordons were deployed to reduce disturbance and appeared to be very successful, with clutches inside cordons surviving significantly longer than those outside cordons. Through proactive conservation such as this we can help save Alderney's Ringed Plover for future generations.

10. Ringing operations, run by the Alderney Bird Observatory, were unfortunately heavily impacted by the HPAI outbreak. Only the Cormorant ringing trip could be completed before the HPAI outbreak limited access to colonies.

11. The terrestrial programme comprised on-going rat control on the coastal islets to protect nesting seabirds, and bat surveys to contribute data for the Bailiwick Bat Survey. Rat control covers most of the major tidal islets where seabirds nest or formerly did so. It also affords biosecurity and surveillance to the offshore islets, notably Burhou where the breeding populations of Puffins and Storm Petrels could be devastated by an unwitting introduction of rodents. The level of monitoring was increased on these islands in 2022 to enable rapid detection and response to any incursions.

12. Marine monitoring included: a) an intertidal habitat biotope survey of Hanaine Bay; b) ongoing assessments of the Green Ormer population; c) ongoing assessments of crab species assemblages and population dynamics; d) assessment of biodiversity and non-native species through Shoresearch surveys; e) assessments of climate change indicators; f) Seasearch surveys; g) preliminary plankton surveys; h) Fish Intel acoustic monitoring for commercial fish and marine mammals and; i) Grey Seal surveys (including the maintenance of local ID records).

13. Furthermore, on request of GSC, the AWT and States Public Works department worked together to develop a programme of seawater quality testing. A proposal for this is being developed and will be submitted to GSC.

14. The education and outreach programme remained wide-reaching. An updated 'Puffincam' provided the public with a fantastic new insight into the seabird breeding season on Burhou, whilst 'Gannetcam' captured the Gannet landfall for the first time ever. Passenger boat tours on Sula were successful with 526 in total in addition to a free educational boat trip aboard Lady Maris II for St Anne's School. The wider programme of public engagement included marine foraging walks, public citizen science Shoresearch surveys, beach cleaning, the marine life tank sessions for the public and one for the local playgroup, as well as various extra walks and events throughout the year.

15. Support for advisory and legislative activities included: a) Ramsar Stakeholder forums; b) the expansion of the Alderney Ramsar Advisory Group to include the States Veterinary Officer; c) the continued support of the Channel Islands Ramsar website (http://www.ci-ramsar.com/); d) the deployment of signage for sensitive wildlife on beaches; e) the presentation of the Alderney Ramsar site at the Inter-Islands Environmental Meeting at which AWT hosted a pan-island Ramsar forum; e) collaboration with international bodies to respond to HPAI, with information from Alderney's Ramsar Programme contributing to a JNCC publication and f) responding alongside other key parties to the HPAI crisis.

16. Recommendations for future work are made throughout this document and tabulated in Appendix C. Key aspects to deliver in 2023 are: the continued monitoring of seabirds, with an enhanced programme of Gannet monitoring to respond to HPAI; the continued protection for beach-nesting Ringed Plovers; the continuation of terrestrial and marine work programmes with some updates to the latter; the continuation of the outreach programme with wildlife webcams and community events at the forefront; the development of a plan to measure community engagement for events within the Ramsar site (interactions and projects that we deliver within the community); the development of the Alderney Ramsar Strategy ARS4; the updating of the RIS for the Ramsar site and; to continue working with the HPAI working group to respond to the disease in 2023.

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List of Acronyms and Abbreviations

AAWS	Alderney Animal Welfare Society
ABO	Alderney Bird Observatory
AIA	Apparently Incubating Adults
AOB	Apparently Occupied Burrow
AON	Apparently Occupied Nest
AOS	Apparently Occupied Site
AOT	Apparently Occupied Territory
ARAG	Alderney Ramsar Advisory Group
ARS3	Alderney's Ramsar Strategy 2017-2021
ARS4	Alderney's Ramsar Strategy 2023-2027
AWT	Alderney Wildlife Trust
BRUV	Baited Remote Underwater Video
BTO	British Trust for Ornithology
CEO	Chief Executive Officer
CIBRS	Channel Islands Bird Ringing Scheme
CRRU	Campaign for Responsible Rodenticide Use
DPH	Dispersals per Hour
DSLR	Digital Single-Lens Reflex
GDPR	General Data Protection Regulation
GPS	Global Positioning System
GSC	General Services Committee
GSM	Global Systems for Mobiles
HPAI	Highly Pathogenic Avian Influenza
JNCC	Joint Nature Conservation Committee
NGO	Non-Governmental Organisation
NSIP	Nationally Significant Infrastructure Project
PFZ	Puffin Friendly Zone
PTZ	Pan Tilt Zoom
RSPB	Royal Society for the Protection of Birds
SoA	States of Alderney
TAG	Track-a-Gannet
ToR	Terms of Reference
UKBAP	UK Biodiversity Action Plan

1. Introduction

The document reviews the work objectives carried out in 2022 as detailed in the 2022 Ramsar Action Plan, reviewed by the Alderney Ramsar Advisory Group (ARAG) and Activity Organisations*, and approved by the States of Alderney (SoA) General Services Committee (GSC).

*Organisations which undertake the work described in this document

2. Background

On 25th August 2005, the Alderney West Coast and Burhou Islands Ramsar Site was designated and gained global recognition as a wetland of international importance under the Ramsar Convention being the first of its kind within the Bailiwick of Guernsey. The site covers 1,500 hectares of land and sea (Figure 1).

Figure 1. Island of Alderney with the West Coast and Burhou Islands Ramsar Site highlighted.

In 2006, on behalf of the SoA the GSC requested the support of the Alderney Wildlife Trust (AWT) in the preparation of a management strategy, as required under the commitments of the Ramsar Convention, and registered the AWT as the Alderney Ramsar administrators with the International Ramsar Secretariat in Geneva. The Alderney Ramsar site strategy outlines the need to monitor seabird and other marine life population trends, threats to these and to continue the management of the populations where necessary. The objectives of the strategy are assessed annually through various research projects and conservation management techniques.

Since 2007, the Ramsar site has been managed using Five-Year Management Strategies, with annual Action Plan and Review documents, prepared by the AWT on behalf of the SoA (all available online at (https://www.alderneywildlife.org/conservation-projects/ramsar).

All Alderney Ramsar reports are developed and reviewed in consultation with the ARAG. The group is made from experts (included individuals who work for the RSPB, BTO, States of Guernsey and States of Jersey). Established in 2006 as the Alderney Ramsar Steering Group; updated to ARAG in 2021 when GSC issued a Terms of Reference for members, to offer technical advice in regards the management of the site to the States of Alderney and the AWT as site administrators. ARAG assess proposals before their presentation to the SoA in the effort to create robust and vetted management strategies. The ARAG are involved in reviewing all five-year management strategies, annual action plans and annual review reports as well as meeting annually (prior to the COVID-19 pandemic) to discuss the work. The ARAG terms of reference were updated in 2022 following consultation with stakeholders.

While the Ramsar site has a clearly defined boundary (Figure 1), the site's five-year and annual management plans and review documents may include specific habitats and species which may occur outside of this defined area but have a degree of interdependence with the site. This has occurred to ensure that monitoring and conservation measures (often including projects and species which occur within the Ramsar site) are properly documented and reviewed by the SoA. This ensures a wider view is taken of species information (particularly important for those which are mobile and travel into the Ramsar Site) and conservation measures which protect species and habitats within the Ramsar site. Locations are clearly detailed within the report to ensure it is clear if a work item has occurred inside or outside of the defined Ramsar site. In April 2019, the GSC approved the updating of the current 2017-2021 Ramsar Management Strategy's title to include 'and other sites.' In 2021, the Alderney West Coast and Burhou Islands Ramsar site entered the fifth and final year of the 2017-2021 Management Strategy (Ferrar and Wieckowski, 2016).

All activities within Alderney's Ramsar site should be fully risk assessed and covered by the Activity Organisations' insurance and SoA issued licences where applicable.

The SoA GSC has ratified the existing position of the AWT as administrators of the site on behalf of the SoA and requested AWT to support the development of Alderney's Ramsar Strategy 2022-2026 (ARS4). Due to the high workload in responding to the HPAI outbreak taken on by AWT and in

particular the Ramsar Secretariat, among other commitments, development of the 2022-2026 Alderney Ramsar Strategy (ARS4) was delayed to 2023. This will also mean the SoA will have decided whether to pass the Alderney Biodiversity Strategy, and, if passed, ARS4 can be published under that document. This was reported to GSC in December 2022 and GSC ratified the delay on 17/02/23.

2022 was an exceptional year for the Ramsar site due to the Highly Pathogenic Avian Influenza panzootic which has caused considerable mortality in a range of seabirds including Northern Gannets, *Morrus bassanus*, over 1% of which breed within Alderney's Ramsar Site. Limits on access to colonies and changes in workload led to several changes to the work programme, these have been detailed in the relevant sections. At time of writing cases of HPAI have decreased but the disease is still present in Europe (ESFA 2023), and while there is hope that it may not return, every effort is being made to prepare for another potential outbreak.

3. Objectives

The objectives are detailed in the 2022 Ramsar Action Plan (Purdie et al. 2022a). These are set to achieve the objectives made in the 2017-2021 Ramsar Site Management Strategy (Ferrar & Wieckowski, 2016) with consideration of recommendations made in the 2021 Ramsar Review (Bush et al. 2021).

3.1 Seabirds and Shorebirds

1. Monitor the seabirds and shorebirds breeding on Alderney, Burhou and other islets including a census of their population sizes and estimates of productivity for a) Puffins; b) Gannets; c) Fulmar; d) Common Terns and; e) Ringed Plover.
2. Develop the use of 'citizen science' to allow timelier analysis of a greater proportion of remotely recorded productivity surveys.
3. Evaluate the validity of the Puffin 'end of season AOB count' alongside the ARAG and consider using video data from PuffinCam to validate the AOB data.
4. Investigate Gannet productivity at Ortac as well as Les Etacs.
5. Facilitate more frequent censusing of the Gannetries and explore the option of using drones instead of piloted aircraft.
6. Investigate the impact of anthropogenic materials on Northern Gannets including a) recording instances of entanglement and mortality; b) observations of material returned to the nest site and; c) opportunistic seabird necropsies (in collaboration with AAWS).
7. Resume the TAG project where it was left off in 2020. Principally, visit Ortac to retrieve the geolocators that still need to be recovered and collect re-sightings of colour-ringed birds. Consider setting up a PhD project to carry forward TAG.
8. Census the Lesser Black-backed Gulls on Burhou next during ARS4 but maintain oversight and consider doing additional counts if drastic reduction in numbers is apparent in the interim period.
9. Include rooftop nesting Herring Gulls in future censuses of the species.
10. Obtain counts of other breeding seabird species (not listed above) from around Alderney's coast and the south coast islets.
11. Seabird ringing (undertaken by the Alderney Bird Observatory) including a) Gannets; b) gulls; c) Storm Petrels; d) auks; e) Shag;
12. Monthly WeBS surveys.
13. Implement mitigation measures to improve Ringed Plover breeding success.
14. Reviewing contact with Groupe Ornithologique Nomand (GONm)
15. Encourage CIBRS/ABO ringers to collect more useful data on the Cormorants nesting on Little Burhou ad well as the Shags and auks nesting on Coque Lihou.
16. To request the collection of any additional data on Cormorants nesting on Little Burhou and Shags and auks on Coque Lihou before ringing activities are undertaken.
17. Request the CIBRS consider authorising colour ringing of nesting adult Ringed Plover and their chicks to aid monitoring and improve understanding of their demography and request ABO carry out this work.

3.2 Terrestrial

18. Rat control in collaboration with the SoA Public Works Department including maintenance of the bait stations on Burhou, Rousset, L'Etac de la Quoiré, Twin Sisters, Coque lihou, Hanaine Bay stack, Houmet de Pies, Houmet de Agneaux and Fort Houmet Herbé. The programme will be expanded to include any other accessible sites where historical records indicate previous use by nesting seabirds (e.g. Le Puits Jervais).
19. Deploy remote cameras at known auk nesting sites to investigate the potential impact of rats and other predators on their breeding performance.

20. Introduce and test an additional alternative trapping method that is immediately lethal, humane and non-toxic (e.g. Good Nature™ A24 traps).
21. Devise a bio-security plan for Burhou and Coque Lihou.
22. Continue monitoring bats on Burhou as part of the Bailiwick Bat Survey.

3.3 Marine

1. To complement the Burhou Intertidal Habitat Biotope Survey 2021, conduct a sub-littoral biotope survey and a quantitative intertidal species assessment within the survey area.
2. Conduct a Phase I habitat survey of Hanaine bay.
3. Continue Green Ormer population assessment with updated methodology.
4. Continue monitoring crab populations with updated methodology.
5. Create a photo-bank of crabs to monitor possible diseases.
6. Continue invasive species assessments.
7. Continue monitoring possible climate change indicators.
8. Continue marine mammal monitoring
9. Promote more Seasearch surveys within the Ramsar site and the training of more people on Alderney.
10. Monitor presence of Pink Sea-Fan through repeat dives.
11. Continue Baited Remote Underwater Video surveys.
12. Continue support for the new inshore plankton monitoring project
13. Support the new Fish-Intel project
14. Continue support for seawater quality testing.
15. Support more academic projects within the Ramsar site.

3.4 Education and Outreach

1. Install and maintain seabird monitoring cameras including 'PuffinCam' and 'GannetCam'.
2. Investigate the replacement of the aging cameras and hardware on Burhou.
3. Review the placement of PuffinCam cameras.
4. Consider using time-lapse photography, in a project with the 'Zooniverse' team alongside PuffinCam to monitor productivity.
5. Continue providing educational boat tours on 'Sula of Braye' (March – October).
6. Provide free educational boat tours for students at St Anne's School and offer a free boat tour of the Ramsar to everyone under the age of 16 on Alderney.
7. Continue public engagement and community awareness for the Ramsar site year-round

3.5 Advisory and Legislative

1. Roll ARS3 forward into 2022, with minor updates from contributors.
2. Draft the 2023-2027 five-year Ramsar management strategy for formal consultation.
3. Work with the Alderney Harbour Office and stakeholders to continue supporting the Puffin Friendly Zone (PFZ) off Burhou.
4. Reinstall signage and raise awareness for the PFZ.
5. Work with the Alderney Harbour Office and SoA to form a protocol to deal with vessels which purposefully enter the PFZ during the Puffin breeding season.
6. Reinstall temporary signage to alert public to sensitive wildlife such as breeding birds.
7. Maintain links and collaboration with other Channel Island Ramsar Sites.
8. Continue to host and maintain the Channel Island Ramsar Website.
9. Support marine management activities and the community led Marine Management Forum.

4. Review

4.1 Seabirds

4.1.1 Seabird Monitoring

Nationally and internationally important populations of seabirds nest around the coast of Alderney and throughout Alderney's West Coast and Burhou Islands Ramsar Site. They include some of the southernmost nesting colonies of Fulmars, Gannets and Puffins. The numbers of breeding seabirds, notably the Gannets, are of national and international significance and collectively they represent most of the key species listed under the Ramsar site's designation. Monitoring their population size and breeding performance provides a vital means of oversight and helps ensure the Ramsar site's integrity can be maintained for the future. The importance of this monitoring was brought into sharp focus by the HPAI panzootic. This section details the seabird monitoring which took place in 2022.

4.1.1.1 Atlantic Puffin

Atlantic Puffin, *Fratercula arctica*, henceforth referred to as Puffin, are charismatic seabirds. These small auks nest in burrows and dive to depths of over 200 ft to hunt fish such as Sand eels and pollack. They are a species of conservation priority and globally threatened with declining populations and were red listed in the Birds of Conservation Concern update (Eaton et al. 2015, BirdLife International 2023, JNCC 2023a).

As with several other species mentioned in this report, Alderney's Puffin colony is at the very edge of the species' breeding range, and one of the largest within the English Channel. This makes the colony ecologically important and exposes it to the pressures associated with a changing climate. As sea surface temperatures warm, the distribution of prey fish will change, potentially resulting in a spatiotemporal mismatch Puffin (Arnott and Ruxton 2002). Additionally, more frequent extreme weather events such as storms will place puffins at risk both during the breeding season and in winter. The seabird wreck in 2014 where thousands of auks died is a stark example of the damage such events can cause. Puffin are also exposed to threats from plastic waste through ingestion of microplastics, invasive predators and disturbance (Rodway et al. 1996, Provencher et al. 2014, Swinnerton et al. 2018). As with Alderney's other seabirds in 2022, the Puffins were also faced with the existential threat of HPAI.

AWT monitors the breeding performance and population of Alderney's Puffin colony, and also records instances of kleptoparasitism. Through this an understanding the colony and potential mitigation measures against threats are sought to safeguard this vulnerable colony for the future.

4.1.1.1.1 History of Puffin on Alderney

Puffins are of cultural and socio-economic importance to Alderney; they feature heavily in the island's marketing thereby helping to draw visitors to the island. The Puffins nesting on Burhou represent just a remnant of a once much larger and more widespread population that declined dramatically over the second half of the 20th century (Sanders 2007). This coincided with a similar decline in the colony on Les Sept Iles which was closely linked with major oil spills from Torrey Canyon (1967) and Amoco Cadiz (1978), (Harris and Wanless 2011). More recently the remaining numbers have become stable (Bush, Broadhurst-Allen & Hart, 2021b). However, with northward range shifts predicted in the future as a result of climate change (Pearce-Higgins 2021), the Puffins continued presence around Alderney cannot be taken for granted and, as a consequence their close monitoring and protection remains a priority to minimise the effects of other pressures on the population.

4.1.1.1.2 Alderney's Puffin in 2022

Alderney's Puffins (Figure 1.) returned in March with eight sighted rafting on the water off Burhou on 14/03/2022. The population was monitored throughout the season via boat-based surveys and through the review of video data captured using 'PuffinCam'. The first Puffin observed on land was recorded on 20/04/2022 by the new PuffinCam.

Figure 2. A Puffin at Sunset on Burhou on 03/07/22. This burrow was occupied throughout the season and successfully fledged a chick with the event captured by a Little Acorn A800 camera trap. Photo Credit: J Hart.

4.1.1.1.3 PuffinCam Update

Alderney's PuffinCam was initially redeployed on 14/03/22, however the aging equipment failed. An objective of the 2022 Alderney Ramsar Action Plan was to replace the camera equipment, as such a new PuffinCam was deployed on 11/04/22 following the failure of the old equipment, using an updated Axis Q6075-E camera. This has improved optics over the previous model which will increase scope for surveying Puffins on more distant burrow areas. To enable a secure foundation the camera was placed in a new location (Figure 3.). This is ca. 30 m to the east of the previous location, with a foundation built into a large boulder. This gives a slightly different view to the previous camera; observing the same burrow areas as the previous camera from a higher angle whilst bringing previously obscured burrow areas into the field of view (Figure 6.). This enables an expansion of the survey area which will give better information on the overall breeding performance of Burhou's Puffin colony.

Figure 3. Burhou's new PuffinCam, an axis Q6075-E. The mount is secured directly to a large boulder seen at the base of the central pole, with two support poles driven into the ground to stabilise the camera. Photo Credit: A Purdie.

The new PuffinCam installation faced some technical difficulties when initially deployed, caused by storms damaging PoE (Power over Ethernet) RJ45 connectors. These issues were rectified by changing to a more secure punch down connection, however this disrupted early season recordings, with consistent recording from 30/04/22.

A time-lapse camera was also deployed by a visiting PhD student from Oxford University, mounted alongside one of the Vivotek PuffinCams. This data can be used to assess the usefulness of time-lapse photography in monitoring Puffin productivity. This data will be published as part of a larger project investigating time lapse photography in seabird monitoring.

4.1.1.1.4 Puffin Population Estimate

4.1.1.1.4.1 Methodology

The population size of Burhou's Puffin colony is estimated annually through the collection of two long term data sets: early season raft counts, and from the post-season AOB survey (Figure 4.). Due to the closure of Burhou due to HPAI post-season ABOApparently occupied burrows (AOB) counts were impossible in 2022. Whilst this is unfortunate, early season raft counts likely provide the most reliable measure of Burhou's breeding population due to high uncertainty in the post season AOB count. A validation of the post season AOB count using PuffinCam data was scheduled for 2022, this will be conducted in 2023.

Raft counts are restricted to the bay directly under the main colony, the Puffin Friendly Zone. Puffins shelter here at peak tidal flow i.e. high tide, as such a count at this time is likely representative of the actual number of Puffins rafting around Burhou. Counts were taken throughout April and May using the new PuffinCam. During this period Puffins are incubating eggs within their burrows so each Puffin rafting on the water likely represents a pair of breeding birds within the colony. At this time, non-breeding Puffins will not have arrived in Alderney's waters.

4.1.1.1.4.2 Results

The maximum early season raft count in 2022 was 184 on 01.05.22 (Figure 4.). This is representative of a maximum 184 breeding pairs, with 368 individuals. This is slightly higher than 2021 (161) and is in fact the highest raft count recorded since records began (next highest 175 in 2012). A Poisson GLM indicates that there has been a very slight increase in the number of Puffin observed rafting off Burhou since 2005 (Figure 4. Poisson GLM, Count ~ Date, Estimate = 0.0176, $P < 1 \times 10^{-5}$).

Figure 4. Puffin Apparently Occupied Burrows and Highest Early Season Raft Counts between 2005 – 2022.

High numbers of birds rafting in the late season (when immature birds are present) in previous years (e.g. 206 in 2021, 207 in 2022) indicates healthy recruitment to the colony. In 2022 a slightly lower late season count of 184 was recorded, however, a limited number of surveys were carried out and anecdotal evidence (e.g. Figure 5.) indicates that higher numbers were present, in line with previous years.

Figure 5. Puffin and razorbill in flight adjacent to the PFZ on 29/06/22.

4.1.1.1.4.3 Discussion

Burhou's Puffin population appears to be stable, with population estimates slightly higher than previous years (Figure 4). Due to the low precision of raft counts as a census method, and the lack of AOB data due to HPAI restrictions, a slight increase should not be treated as evidence for population change. To be more certain of population change a more precise survey method would be required. With the new PuffinCam location there is more potential for counting the number of Puffin loafing on the colony during raft count censuses, which may give more information. Furthermore, there is potential for validation of the late season AOB census through comparison of known AOBs identified in the early season productivity observations (Section 4.1.1.1.5.1). The new camera location will allow validation across in both the central and eastern areas of Burhou.

4.1.1.1.5 Puffin Productivity Assessment

4.1.1.1.5.1 Methodology

Video footage from the new PuffinCam (see section 4.1.1.1.2) was reviewed to establish productivity. The new PuffinCam is in a new location (Figure 6.). From this new vantage point three areas were monitored within the region which had been previously observed, and one area was monitored on the eastern end of Burhou in an area which had not previously been monitored for productivity by remote cameras (Area 4, Figure 6.).

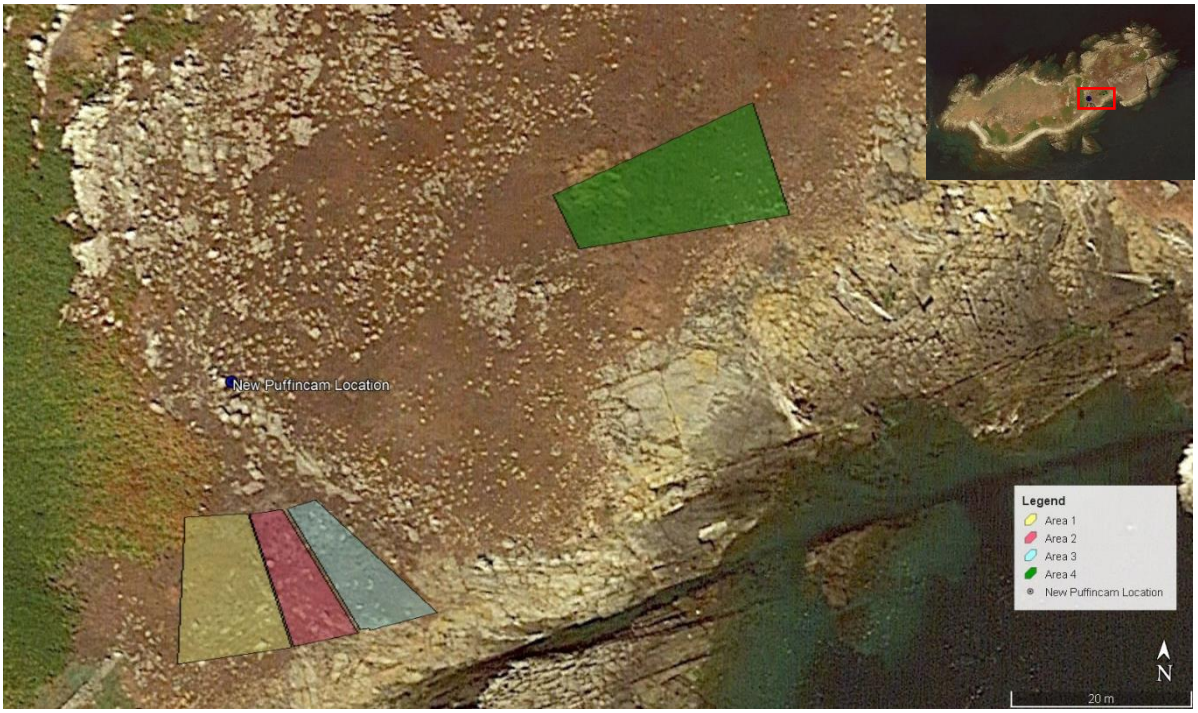

Figure 6. Location of the new PuffinCam PTZ camera and the locations of puffin productivity survey plots in 2022. General location shown by inlay of Burhou in top right. Made with Google Earth.

AOBs were identified in the early season (April-mid May) and successful burrows verified in the late season (late June-early July). Following methodology from Walsh et al., (1995), a burrow was deemed occupied if Puffin were seen entering it on two separate dates, and a burrow was treated as 'successful' if fish are returned to the burrow during the late season which would indicate a large chick likely to fledge was present. Any instances of kleptoparasitism or predation were also noted. Four hours of survey footage were reviewed for each area during the early season, with footage reviewed every few days (April-Mid May) and daily review of survey footage equating to six hours during the late season, which in combination with 23 hours of supplementary footage in which kleptoparasitism and census data were collected, equated to 63 hours of footage. Puffin productivity was calculated by dividing the number of burrows believed to have been successful by the number of AOBs in the sample (Walsh et al. 1995).

4.1.1.1.5.2 Citizen Science

The use of citizen science to review video footage was trialled with volunteers. Volunteers were asked to review specific videos during the survey window and record activity around marked Puffin burrows. This included fish returns, Puffin activity, and predator activity. Activity was also recorded for burrows not included in the productivity survey (i.e. not identified as AOBs in the early season). The lead ecologist then reviewed the reports of activity to validate the results. Over 15 hours of footage was reviewed by volunteers.

4.1.1.1.5.3 Results

During early season observations 34 burrows were assigned as AOBs, representing an estimated 18% of the Burhou colony. 17 of these were still feeding chicks in the late season, indicating that they were successful. Across the four sites there was a weighted mean productivity of 0.5 ± 0.132. This mean is slightly lower than previous years (Table 1.) but the standard deviation places the estimate within previous productivity estimates* and there has not been a significant change (Quasibinomial GLM, Productivity ~ Year, estimate = -0.01, P=0.4).

Productivity across areas surveyed ranged from 0.29 in area 2 to 0.67 in area 3 (Figure 7.). Productivity in the newly surveyed eastern burrow area (area 4) was in line with other areas (0.50, Figure 7.).

Two 'pufflings' were observed, with good evidence that at least one fledged, however, both of these were from burrows not within the productivity survey areas.

**The years 2014 and 2019 were excluded from the model due to multiple productivity estimates being given (Table 1.).*

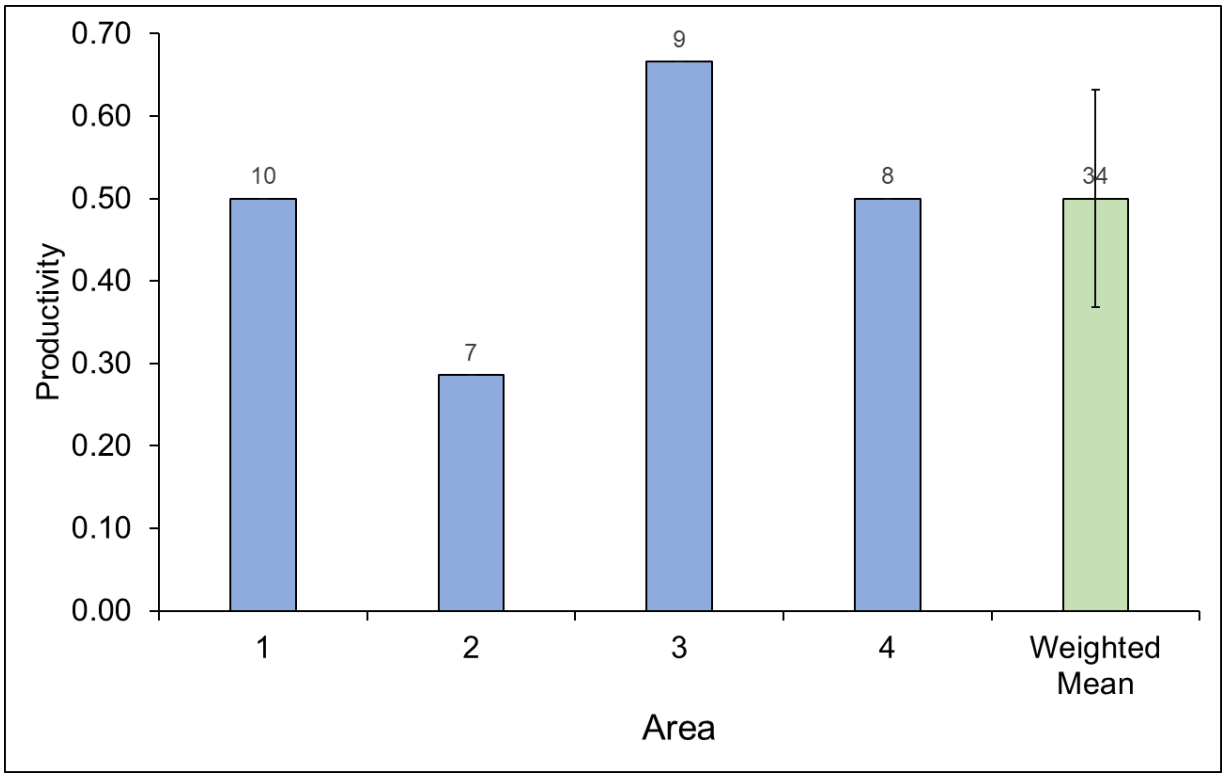

Figure 7. Puffin productivity in surveyed areas in 2022. Productivity is measured as the proportion of AOBs which were still being returned to with fish in the late season.

Table 1. Puffin Productivity Data for the Burhou colony 2005 – 2022.

Year	2005	2006	2007	2008	2010	2011	2014	2105	2019	2020	2021	2022
Puffin Productivity	0.64	0.61	0.63	0.65	0.66	0.66	0.36-0.60	0.71	0.60-0.88	0.63	0.65	0.5 ± 0.132

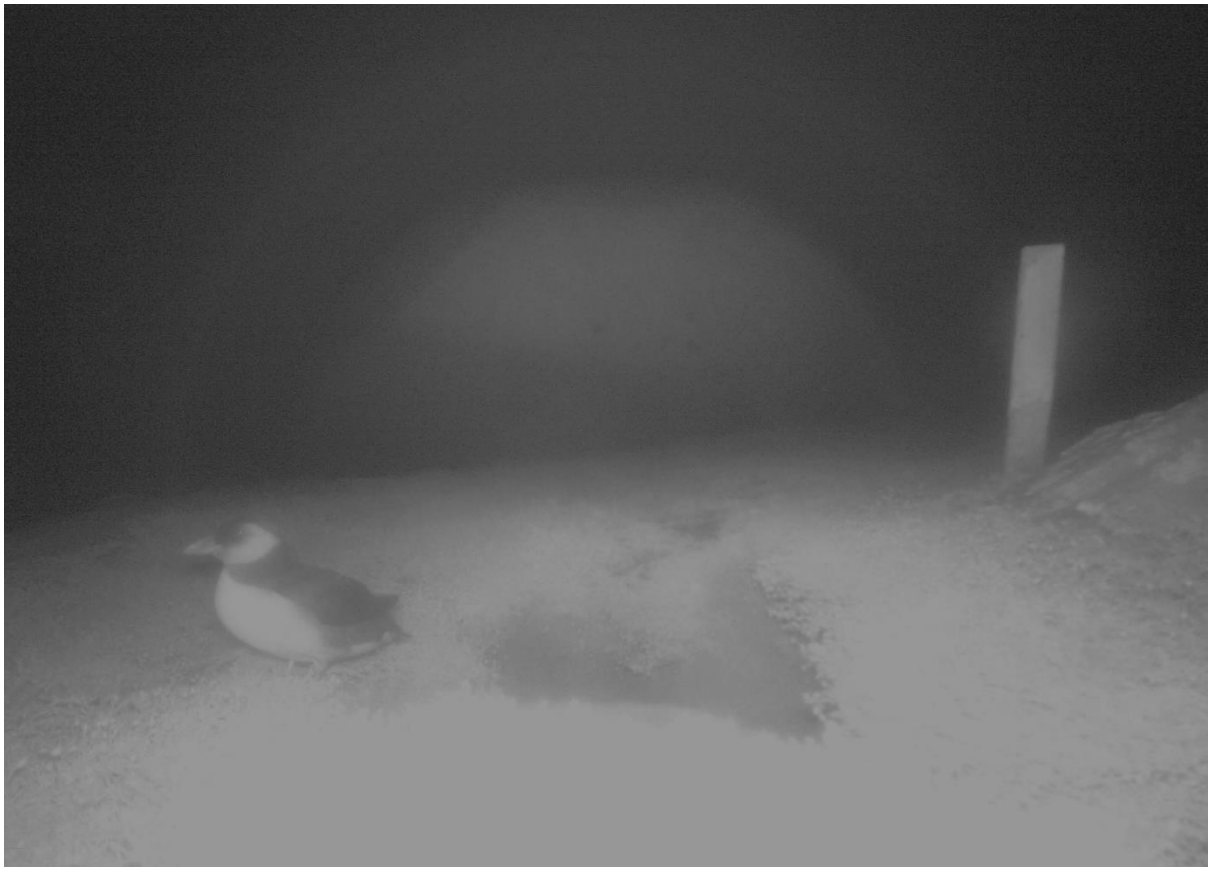

Figure 8. A Puffling emerges from its burrow on Burhou on 24/06/22. Photo taken with Little Acorn A800 camera trap. Photo Credit: J Hart.

4.1.1.1.5.4 Discussion

Mean productivity was slightly lower than overall productivity reported in previous years, however, taking into account the high variation across areas surveyed, and the low sample size, it is likely this is not representative of a decline in productivity. Furthermore, the mean productivity (Table 1.), given the high standard deviation, is in line with the average in UK colonies of 0.617 ± 0.151, (Horswill and Robinson 2015). However, the possibility of a decline in productivity should not be disregarded. Increasing the survey effort both in previously surveyed and eastern burrow areas should be a priority.

These areas are adjacent and it is not clear if an unknown factor affected the success or if the variation is due to random chance combined with the low sample size.

Productivity in the new eastern survey area was in line with the previously surveyed region (Figures 6. & 7.), although due to the low sample size conclusions should not be drawn from this initial observation. This does prove the feasibility of recording productivity in previously unrecorded areas and the survey should be developed in 2023 and through ARS4.

4.1.1.1.6 Kleptoparasitism, Avian Interactions and Predation

Burhou is also home to a large colony of Lesser Black-backed gulls and several pairs of Great Black-backed gulls. Gulls kleptoparisatise Puffins, stealing food as they return fish to their burrows (Purdie et al. 2022a). Great Black-backed gulls in particular are also known to predate upon Puffin on Burhou (Purdie et al. 2022a). Instances of kleptoparasitism and predation are recorded when observed during Puffin productivity surveys.

4.1.1.1.6.1 Kleptoparasitism

Within the observed area no instances of kleptoparasitism were noted, however thee attempts were observed so it is highly likely that there were successful kleptoparasitism events outside of survey windows. Both burrows which were affected are believed to have successfully fledged chicks.

4.1.1.1.6.2 Avian Interactions

Gulls, both Lesser Black-backed and Great Black-backed, and crows were often seen patrolling burrow areas or simply loafing nearby. Notably, a pair of Great Black-backed gulls were observed nesting within the puffin burrow areas. This resulted in near consistent presence of Great Black-backeds overlooking burrow areas A to C. Anecdotally, far fewer fish returns are observed whilst these birds are present. In addition, when a gull flies near the burrow area puffins which were loafing would invariably flush or quickly run into burrows. This is likely to disrupt feeding of chicks.

4.1.1.1.6.2 Predation

In 2021 numerous carcasses (six in the end of season AOB and 27 by a member of the public) were reported (Purdie et al. 2022a). If these were the carcasses of breeding birds it could have a serious effect on the Burhou population. No decline was observed in population estimates; however, these have a large margin of error. There was intent to investigate carcasses in 2022, however, with access limited due to HPAI a thorough survey could not be completed before 20/10/22 by which time many may have been scavenged.

In 2022, no instances of puffin predation were observed during surveys. However, one unsuccessful predation by a Peregrine falcon, *Falco peregrinus*, was observed during a boat trip. A post season survey for carcasses was conducted on 20/10/22, during this a single Puffin carcase was found below a known Peregrine falcon perch. Importantly, the post season visit was delayed relative to 2021 (02/08/21) due to HPAI, thus providing a greater window for carcases to be scavenged or washed away.

4.1.1.1.6.2 Discussion

Kleptoparasitism, avian disturbance and predation are still a concern and likely place pressures on Burhou's small breeding colony, whilst observed kleptoparasitism did appear to impact the targeted burrows, the pressure placed on other burrows by unwitnessed kleptoparasitism may have affected breeding success. At current survey effort, the population level effect of kleptoparasitism, predation and disturbance is unknown and we must still rely on productivity and census data to investigate change. Due to the small size of the Burhou population, they are nevertheless a cause for concern. There may be potential for increasing remote survey effort through citizen science, with gull interactions being far easier to identify than fish returns.

4.1.1.1.7 Puffins and HPAI

There were a few (n=10) cases of HPAI identified in Puffin across the UK (Pearce-Higgins et al. 2022). Highly Pathogenic Avian Influenza appears to have reached Alderney in late June, which may have risked the Puffin (which depart mid-late July) becoming exposed, however, this was later than in other colonies. If the Puffin were impacted we may expect to see a drop in productivity and potentially an unusually high number of carcasses on the island. However, there was neither a significant drop in productivity (Table 1.) nor a high number of Puffin carcasses on Burhou when it was surveyed on 20/10/22. Therefore there is no evidence that the Burhou Puffin colony was impacted by the outbreak. Puffin may be at less risk from HPAI due to their feeding (active predators, not scavengers) and breeding habits (burrow nesting, as opposed to nesting in dense colonies) which would have limited the risk of disease transmission.

Recommendations

- Continue to monitor Puffins in 2023 including productivity, raft counts and AOB surveys. Expand the puffin monitoring on the eastern side of Burhou to ensure a representative sample of the population is monitored there.
- Develop the use of 'citizen science' to allow a timelier analysis of a greater proportion of remotely recorded productivity surveys.
- Validate the accuracy of AOB surveyors by comparing their results with known occupied and un-occupied burrows identified by PuffinCam during the breeding season.
- Continue to review footage for evidence of predation, avian disturbance and kleptoparisitism on Puffins. Noting the potential for the impact predation and kleptoparasitism could have on the relatively small Puffin colony, a dedicated survey to quantify predation and kleptoparisitism and their effect on the colony should be considered. This may be a good opportunity to develop a citizen science project.

4.1.1.2 Northern Gannets

Northern Gannet (Figure 9.), *Morus bassanus*, are the largest breeding seabird in the northern hemisphere. These apex predators breed on large colonies from which they forage hundreds of miles in search of food (Warwick-Evans et al. 2016a). They are henceforth referred to as Gannets.

Figure 9. Gannets on Les Etacs in July 2022. Photo credit: A Purdie.

Gannets have seen a range and population expanse in the last hundred years (Chardine et al. 2013, JNCC 2023b), however, there is increasing pressure on this species from threats such as decreasing prey abundance (Bot et al. 2019, d'Entremont et al. 2021), offshore wind development (Peschko et al. 2021), plastic pollution (Purdie et al. 2022a), bycatch (Calado et al. 2021), changes in fisheries practices (Votier et al. 2013) and acute threats such as oil pollution events (Haney et al. 2014, Champoux et al. 2020) and disease outbreaks (Falchieri et al. 2022). In 2022 Gannet populations were devastated by HPAI with many thousands reported dead (European Food Safety Authority et al. 2022). How well the species recover from this trauma is likely to depend on how we manage the other pressures they are exposed to.

4.1.1.2.1 Alderney's Gannets

Alderney's two Gannet colonies make up over 1% of the global breeding population (BirdLife International 2023). The larger colony Les Etacs is made up of several smaller rocks (Figure 11.) and supports 5841.6 ± 316.0 breeding pairs whilst Ortac is a single islet which supports 2697.6 ± 154.2 breeding pairs (Purdie et al. 2022a).

These fall within the Ramsar site (Figure 11) and their presence was a key designating feature of the protected area (JNCC et al. 2005). Alderney's Gannets are on the southern edge of their breeding range, with only one colony, at Rouzic in France, being further south. This southern location makes Alderney's gannets acutely vulnerable changes in climate. An increase in sea surface temperatures has driven declining prey availability for North American Gannet colonies resulting in reduced Gannet productivity (d'Entremont et al. 2021). Similar declines in productivity are seen in Les Etacs (Purdie et al. 2022a) and the nearby Rouzic colony, the latter of which has seen a population decline (Grémillet et al. 2020). AWT aims to monitor the status of the Ortac (census) and Les Etacs gannetries

Figure 10. The locations of Alderney's Gannetries, marked by red crosses, and the Alderney Ramsar site boundary, shown in striped blue. Land shown in green, and intertidal zone in dotted white.

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4.1.1.2.2 Assessment of Gannet Productivity on Les Etacs

Productivity data goes back to 2007 and has been collected year-on-year since 2013. This long-term dataset gives us an excellent insight into the performance of the Les Etacs Gannet colony. In 2022 it also provided insight into the HPAI outbreak on Les Etacs.

4.1.1.2.2.1 Methodology – Productivity Assessment

The Gannets returned on 16.02.22, slightly later than their recent date of Valentine's day. As in previous years, the productivity of Les Etacs' Gannets was measured following the methodology outlined by Walsh et al., (1995) as recommended by JNCC guidelines. A representative random sample of nests were selected from each colony area, the cumulative sample being representative of the colony as a whole. In 2022, a total of 350 nests were selected across the Les Etacs Gannetry, ca. 6% of the breeding population. This total comprised 50 apparently occupied sites (AOS) from Pyramid Rock; 50 from North Stack High; 50 from North Stack Low; 100 from West Rock Plateau; 50 from West Rock Gulley and 50 from West Rock West End (Figure 11.).

Nest sites were observed weekly from mid-March until the final chicks fledged in early-October. Observations were made from vantage points on the cliffs adjacent to the Les Etacs Gannetry. Nest contents and outcome were recorded at each visit either by direct observations using a telescope, or through the review of photographic evidence using a telephoto lens. Productivity was assessed for each distinct nesting area by dividing the total number of AOS that successfully fledged a chick by the number of AOS under observation minus any nest where laying did not occur. Productivity of the whole colony was then calculated from the means of each area in line with JNCC guidelines (Walsh et al., 1995).

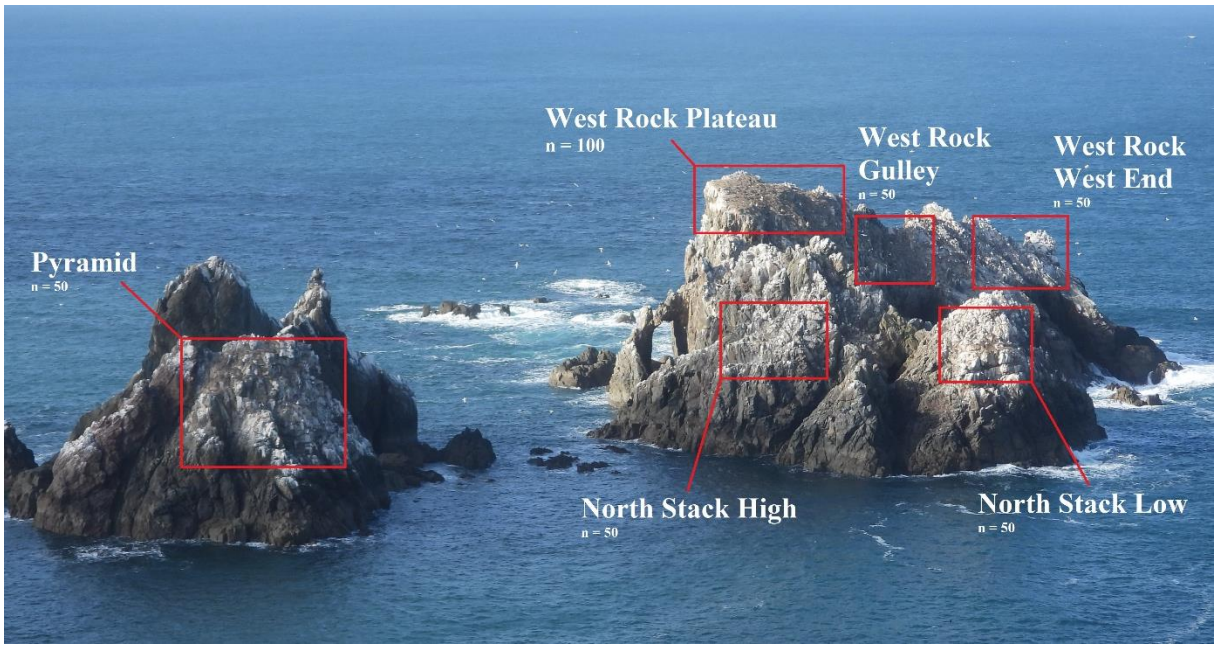

Figure 11. The colony areas surveyed for productivity within the Les Etacs Gannetry, 49° 42' 16.9308"N, 2° 14' 21.3288"W. "n" refers to the number of AOS randomly selected within each area for productivity monitoring. Photo credit: A Purdie

4.1.1.2.2.2 Results - Productivity Assessment

Of the 350 AOS observed, 316 AOS were used to calculate productivity as the occupants of 34 AOS did not lay an egg. Mean productivity adjusted for non-breeders across the sample plots was 0.33 ± 0.09. There was variation across the sample plots; the highest productivity was recorded at North Stack Low (0.47) and the lowest at North Stack High (0.22) (Table 2.). Overall, 0.098 ± 0.052 of the AOS were non-breeders. When non-breeders were included in productivity calculations, overall productivity was 0.30.

Table 2. AOS, non-breeders, successful AOS, productivity and productivity adjusted to remove non-breeders across the surveyed areas on Les Etacs, with the overall number of AOS, Non-breeders and successful AOS and the mean productivity and adjusted productivity for the colony ± standard deviation.

Area	AOS	Non-breeders	Successful AOS	Productivity	Productivity ADJ
West Rock Plateau	100	9	36	0.36	0.40
West Rock Gulley	50	7	15	0.30	0.35
West Rock West End	50	4	15	0.30	0.33
North Stack Low	50	3	22	0.44	0.47
North Stack High	50	9	9	0.18	0.22
Pyramid	50	2	12	0.24	0.25
Overall	350	34	182	**0.30 ± 0.09**	**0.33 ± 0.09**

Productivity in 2022 was the lowest on record for Les Etacs (Figure 12.), and the adjusted productivity was 20% lower than 2021 (0.50). Excluding this year, there has been consistently low productivity in recent years (Figure 12.) with a mean productivity of 0.500 ± 0.0779 from 2018-2021 against 0.676 ± 0.139 from 2007-2017. See section 4.1.1.2.4 – 'HPAI in Alderney's Gannets' for further detail on this study in 2022.

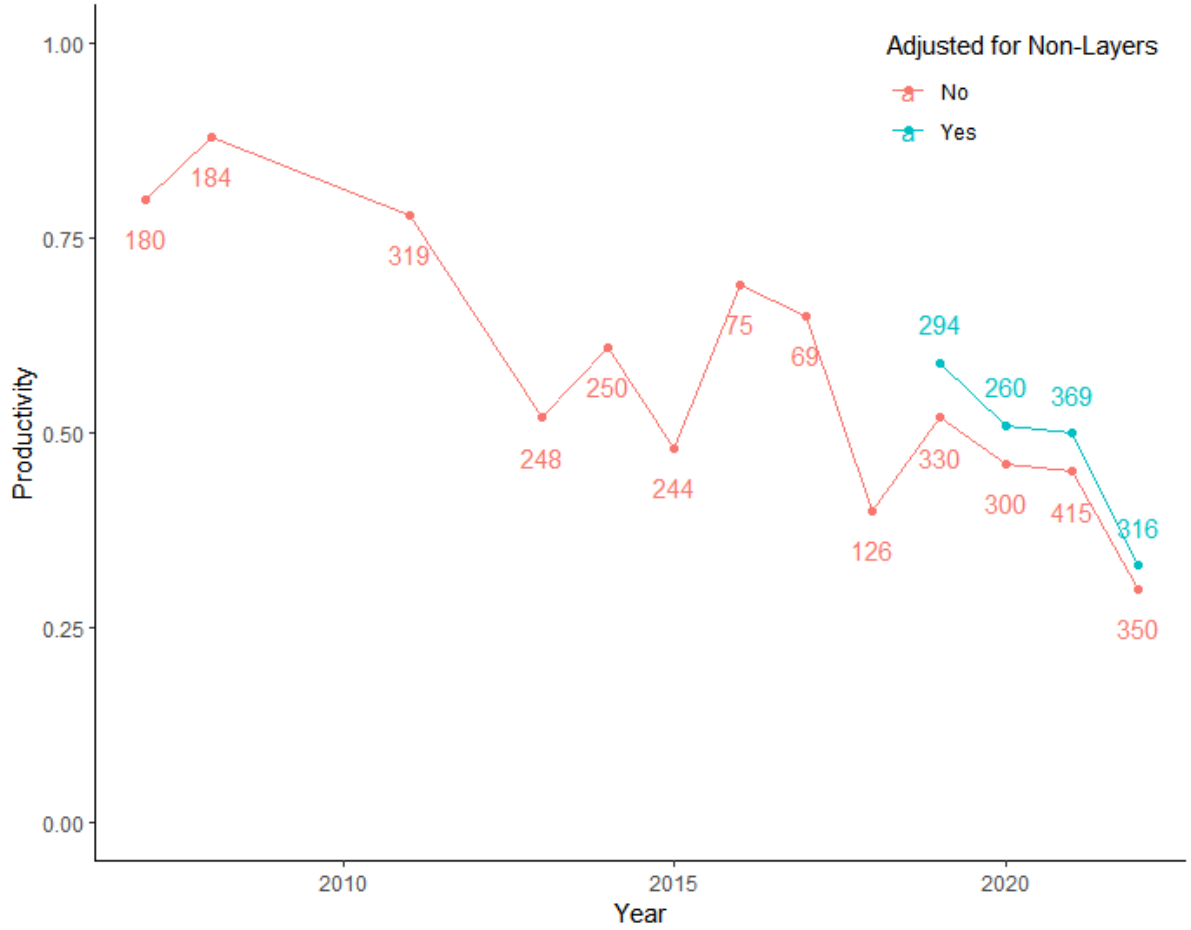

Figure 12. The productivity of the Les Etacs gannetry since 2007 with the number of AOSs observed displayed above data points. Since 2019 non-breeders have been accounted for in productivity estimates, indicated here by colour.

4.1.1.2.2.2 Discussion - Productivity Assessment

There was a dramatic drop in productivity in 2022 relative to 2021 (Figure 12.). This is likely a result of the HPAI outbreak on the colony (See section 4.1.1.2.4 for more information). Irrespective of this drop in productivity, the last few years has seen consistently low productivity (Figure 13, Purdie et al. 2022a), and a corresponding plateau in population size (Purdie et al. 2022a). The 2018-2021 productivity of 0.500 ± 00779 is lower that the UK average of 0.700 ± 0.082 (Horswill and Robinson 2015), but is comparable other colonies on the southern range of the species, including the nearby colony of Rouzic in France, and the North America colonies such as Cape St. Mary's (Grémillet et al. 2020, Montevecchi et al. 2021, d'Entremont et al. 2021). In these colonies the poor breeding performance and stagnation (followed by decline in the case of Rouzic, see Grémillet et al. 2020)) have been linked to low prey abundance caused by a combination of overfishing and spatiotemporal predator-prey mismatch induced by changes in climate (d'Entremont et al. 2021). It is likely that the Gannets on Les Etacs are exposed to similar conditions. Other factors, such as offshore wind (Peschko et al. 2021), will also impact breeding performance of Alderney's gannetries, and these should be accounted for when considering mitigation strategies to offset poor breeding performance.

4.1.1.2.3 Assessment of Gannet Demography on Les Etacs.

Since 2020, reoccurring annual assessments of AOS productivity have been carried out on the same 100 nests located on the 'Pyramid' stack (Figure 13., Purdie et al. 2022a). Reoccurring assessments facilitate investigation of variation in the timing of breeding, causes of nesting success or failure and site use at each AOS between years. These data can then be used to help better monitor trends in the colony's overall size, as well as make forecast possible future e future, particularly in the context of HPAI. (see section 4.1.1.2.4).

Figure 13. The sample of 100 Gannet nests located on the Pyramid stack of Les Etacs that were selected for year-on-year monitoring. Photo credit: J Hart.

4.1.1.2.3.1 Methodology

The Pyramid comprises the eastern most stack of the three largest rocky outcrops that make up the Gannetry at Les Etacs (Figure 11.). A sample of AOS from the Pyramid were chosen for this case study because that part of the Gannetry lies (closest to the mainland (320 m) where it can be observed most easily and provide the most accurate data. However, its position at the periphery of the colony may also be helpful early indication of any changes early that cause the colony to contract in size in the future. It has historically had productivity in line with other surveyed areas (Table 3).

In 2022 data collection began from as soon as the Gannets settled at their nests (16/02/2022) and continued until the departure of the adults following the fledging of their last chick (02 to 06/10/2022). Observations were made from a vantage point on the mainland of Alderney that overlooked the stack. The observations were undertaken at regular intervals (usually every 3 to 4 days). Data were recorded either in situ using a telescope or via photographs taken using a camera with a long telephoto lens.

Productivity was assessed following the methodology outlined in section 4.1.1.2.2.1. All observations were undertaken with great diligence through the laying period so any AOS where the occupants did not lay an egg were identified correctly. Laying dates were estimated assuming a mean incubation period of 44 days period (see British Trust For Ornithology, BTO, bird facts, https://bto.org/understanding-birds/birdfacts) and when not observed where back calculated from chicks aged according to their size and appearance (Nelson 2002) or the date a change in the sitting behaviour of the adults began.

In addition, any days with wind speeds of seven or higher on the Beaufort scale and/or high rainfall were recorded so that the timings of any high chick or clutch loss could be examined in relation to extreme weather events.

4.1.1.2.3.2 Results

Of the 100 nests monitored in this study, one site was not in use (the same site was also not in use in 2021) and 19 were non-layers leaving 80 nests. Of these 20 successfully fledged a chick, giving a productivity of 0.25. This is in line with the productivity calculated from the random selection of nests monitored on Pyramid Stack (0.25, Table 2.) but is lower than previous years, and lower than the productivity across Les Etacs in 2022 (Table 3.).

Table 3. Gannet productivity recorded on the Pyramid stack and over the whole of Les Etacs from 2019-2022.

Year	Pyramid		Les Etacs	
	n	productivity	n	productivity
2019	86	0.66	330	0.59
2020	100	0.52	300	0.51
2021	100	0.45	415	0.50
2022	100	0.25	350	0.33

n = sample size.

There were 1.9 times the number of non-layers in 2022 compared to 2021, with three not-laying in both years (Table 4.). As in 2020 and 2021 (Bush et al. 2021), the spatial distributions of non-layers in each

year did not appear to show any consistent topographic pattern; non-layers were not clustered together or located more prevalently in the upper or lower parts of the stack (Figure 14.). Of non-laying chicks in 2022 only two had successfully fledged chicks in 2021. When non-breeders are not taken into account, productivity on Pyramid stack was 0.2.

Of the 100 nests investigated only 10 successfully fledged chicks in 2021 and 2022 whilst 28 nests laid but failed to raise a chick in both years (Table 4.). Causes and timing of nest loss is discussed in section 4.1.1.2.4.2.

Table 4. Nest outcomes of the 100 nests under observation on the Pyramid in 2021 and 2022, and the number of nests that had the same outcome in both years.

Outcomes	2021	2022	2021 and 2022
Successful	40	18	10
Failed	49	60	28
Non-layers	10	19	3
Re-layers	4	0	0

Figure 14. Location of the sampled nests on the Pyramid where no eggs were laid in 2021 (light blue), 2022 (yellow) and in both years (green).

4.1.1.2.3.3 Discussion

Productivity on Pyramid Rock was much lower than a general year (Table 3.), as with the rest of Les Etacs in 2022 (Table 2.). As in 2021 (Purdie et al. 2022a) productivity was substantially lower than the average reported from UK colonies (0.700 ± 0.082, see Horswill and Robinson 2015).

Decreased productivity is likely a result of the HPAI outbreak (see section 4.1.1.2.4). The productivity was lower on Pyramid than across Les Etacs, this may be due to a more severe HPAI outbreak on Pyramid compared to some areas (e.g. North Stack Low, see section 4.1.1.2.4.1.).

Notably, there was a higher proportion of non-breeders on Pyramid compared to previous years (Table 4). This would result in a lower production of chicks irrespective of the disease and may be linked to underlaying pressures such as poor prey abundance (d'Entremont et al. 2021). Only two of the non-breeding pairs in 2022 fledged a chick in 2021, indicating these non-breeders were struggling to provide enough food to raise a chick prior to 2022 as well.

4.1.1.2.4 Highly Pathogenic Avian Influenza on Alderneys Gannet Colonies

Northern Gannet colonies have been dramatically affected by HPAI in 2022, with the disease reaching them ca. 10 weeks earlier than southerly Northern Gannet colonies (Pearce-Higgins et al. 2022).

4.1.1.2.4.1 The Spread of HPAI to Alderney's Gannetries

Alderney's southerly location resulted in the disease reaching Les Etacs and Ortac later than most other colonies. The disease was first detected in the Bailiwick of Guernsey on 12/07/22 in a Herring gull and high numbers of Gannets begun to be seen dead at sea around this time (Figure 15.), however, some of these carcasses were probably from the Rouzic colony which was saw high (ca. 20,000) mortality (P Provost 2023, personal communication, 16 February). Presence of HPAI in Alderney's Gannets was confirmed on 01/08/22 when a ca. 8-week-old chick tested positive for the disease, however, the disease likely reached Les Etacs and Ortac at least a month earlier, with an increase in ring recovery rate indicating increased mortality brought about by the disease.

Figure 15. Many dead Gannets were reported at sea and on beaches in the Channel Islands, France and UK during the HPAI outbreak. This individual, ring number F38201, was originally ringed on Les Etacs in June 2009 and was recovered August 2022 at sea north of Alderney (49°46'02"N, 002°20'06"W) ageing it at 13 years and two months. Photo credit: E Coles.

4.1.1.2.4.2 Monitoring HPAI in Alderney's Gannetries

Impact of HPAI on Breeding Performance on Les Etacs

Productivity monitoring (see Sections 4.1.1.2.2-3) gave AWT ecologists an excellent insight into the spread and impact of HPAI on Les Etacs. Productivity was a good metric for HPAI impact within Les Etacs because Gannets generally have low adult mortality (Warwick-Evans et al. 2016b), and low rates of nest failure post-hatching (Nelson 2002). Therefore, the majority of excess failures can be attributed to HPAI.

The random productivity plots (for methodology see section 4.1.1.2.2.1) can inform how the disease impacted breeding success over the entire colony, whilst the demography study (for methodology see section 4.1.1.2.3.1) gives detailed insight as to how HPAI affected gannets breeding there. These enabled the impact of the disease to be monitored in real time, and the early detection of unusual mortality on the colony.

Several photographic surveys were also conducted on Ortac to enable it to be compared to Les Etacs.

Gannet pullis on Les Etacs and Ortac have been rung historically and this enabled an estimation of adult mortality based on ring recoveries. The data analysis was performed by Dr Phil Atkinson, ARAG Chair, and data was courtesy of the Channel Island Bird Ringing Scheme (CIBRS).

Results

Nest losses in 2021 began to plateau on around 09/06/21, whilst in 2022 nest losses continued at a consistent rate until 02/09/22 (Figure 16.).

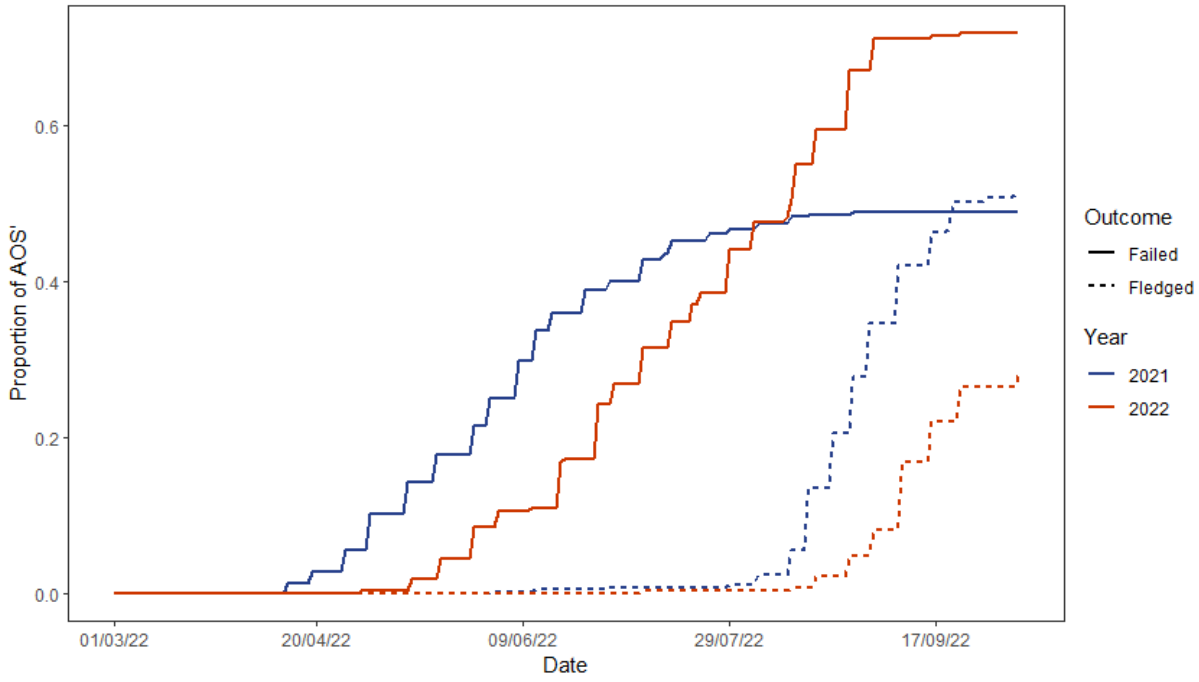

Figure 16. Cumulative proportion over time of AOS which fledged (dashed line) and failed (solid line) in 2021 (blue) and 2022 (red) in the Les Etacs productivity sample plots.

There was variation in the timing of nest losses across the different areas of Les Etacs in 2022. Three areas had very high rates of nest loss at different times; North-Stack High had a spike in nest losses in the latter half of June, with 33% failing in two-weeks, whilst Pyramid (45% AOS failed in two-weeks) and West-Rock Plateau (36% AOS failed in three-weeks) had spikes in August (Figure 17.). West-Rock Gully and West-Rock Gully did not experience such high rates of nest loss, but nest losses continued late into the season before plateauing at around the end of August (Figure 17.). In contrast, nest losses in North-Stack Low began to plateau at the start of August (Figure 17.).

The three areas which experienced very high nest loss rates also experienced the lowest productivity (Table 2., Figure 18.), whilst North-Stack Low showed a similar trend to previous years, albeit with slightly more nest losses late in the season (Figures 16. & 17.).

The proportion of AOS which failed post-hatching was higher in all areas in 2022 compared to 2021 and was over three-times higher overall on Les Etacs in 2022 (Figure 17.). Plateau and Pyramid rock had the highest proportion of nests fail post hatching (Figure 18.).

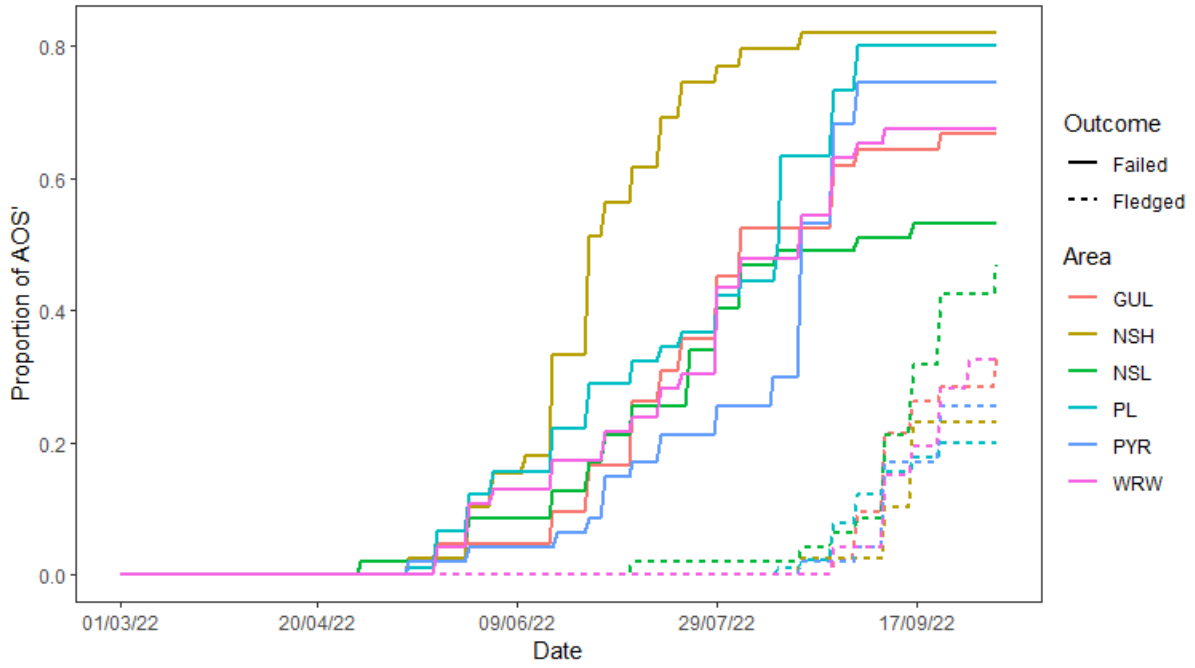

Figure 17. Cumulative proportion over time of AOS which fledged (dashed line) and failed (solid line) in each area of Les Etacs monitored for productivity in 2022. GUL = West-Rock Gully (Red), NSH = North Stack High (Yellow), NSL = North Stack Low (Green), PL = West-Rock Plateau (Light Blue), PYR = Pyramid (Dark Blue), WRW = West-Rock West (Pink). Dates at 50-day intervals from the 1st of March

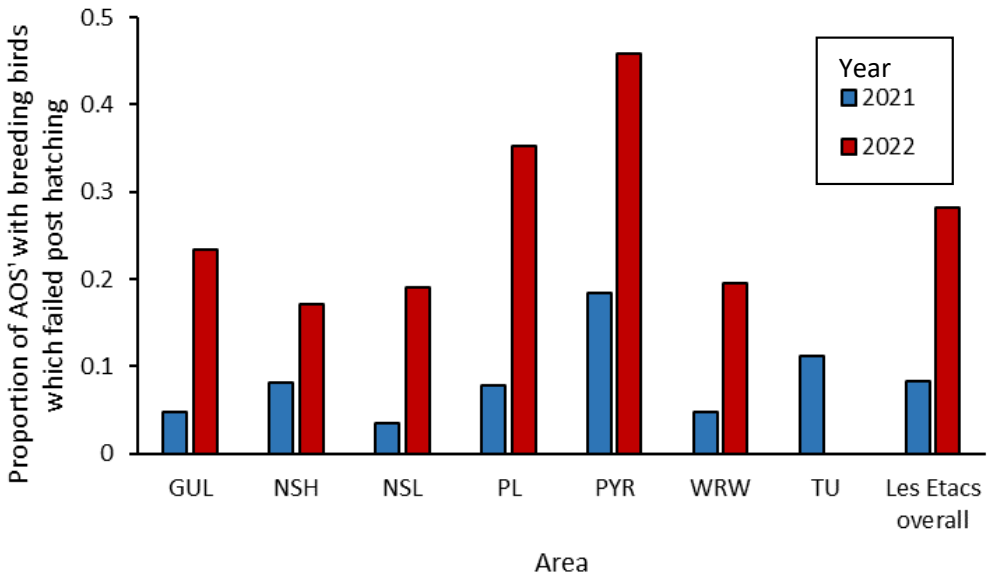

Figure 18. The proportion of AOS which failed post hatching in each area of Les Etacs monitored for productivity in 2021 (blue) and 2022 (red). GUL = West-Rock Gully, NSH = North Stack High, NSL = North Stack Low, PL = West-Rock Plateau, PYR = Pyramid, WRW = West-Rock West, TU = Turtle Rock (TU was not monitored in 2022). Non-breeding birds were excluded.

Impact of HPAI on Pyramid Stack and Responses of Gannets to HPAI

The number of the 100 AOS monitored as part of the Gannet Demography Study (Section 4.1.1.2.3) with chicks present began to fall at the start of August (Figure 19.).

The number of AOS with adults absent rose until 03/09/22 (76 AOS unoccupied by adults), after which many of these sites became occupied again (40 AOS unoccupied by adults on 10/09/22). When left alone without adults present, chicks would often eventually roam around the colony, presumably in search of food. Many of these chicks unfortunately starved to death or were killed by other Gannets, however, some were adopted by new pairs (Figure 19.). These included pairs which had lost a chick and some which still had a chick present. Many adopted chicks did not survive but two fledged successfully.

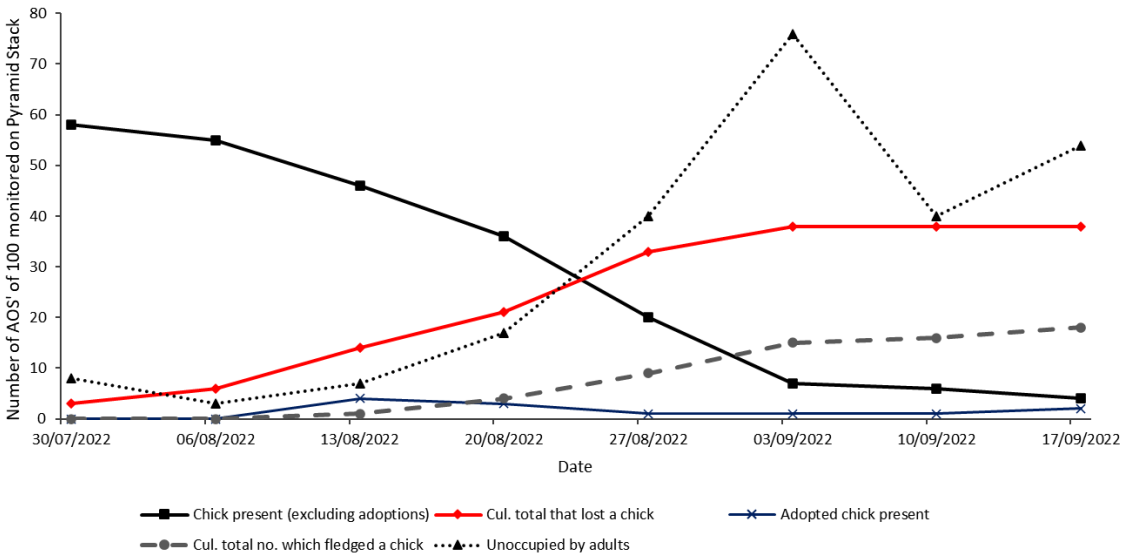

Figure 19. The number of AOS against date which had a chick present (black, square marker), an adopted chick present (blue, cross marker), or were unoccupied by adults (dotted-black, triangle marker), and the cumulative (cul.) number of nests which lost (red, diamond marker) and fledged (dashed-grey, circle marker) a chick between 30/07/22-17/09/22 of the 100 AOS monitored on Pyramid stack.

HPAI Mortality Estimate

A high historic ringing effort by CIBRS ringers on Les Etacs and Ortac has enabled a preliminary estimate of adult mortality during the HPAI outbreak. During the outbreak birds which were ringed on Alderney's Gannetries were recovered and reported to the CIBRS. The ARAG chair was provided these data up to 01/10/22 by the CIBRS and conducted a preliminary estimate of mortality. The analysis excluded birds under four years because they may not have returned to breeding colonies yet, and past data was cleaned to remove dead adults which were found entangled in the colonies.

The number of ringed birds from each age cohort still present in the population could be calculated based on adult survival rates (Warwick-Evans et al. 2016b). Furthermore, the reporting rate of Gannets

from Alderney is 6-12% (Warwick-Evans et al. 2016b). This information allows the proportion of the ringed population which died in 2022 to be calculated.

Over 80 recoveries were reported by 01/10/22. The majority of these were within the foraging ranges of Alderney's Gannets (Warwick-Evans et al. 2016a), however, some were also recovered near the colonies of Helgoland and Orkney, which Alderney's Gannets recruit into. The recoveries in 2022 followed a similar trajectory to an average year until 22/07/22 at which point there was a dramatic linear increase in recoveries over time (Figure 20.).

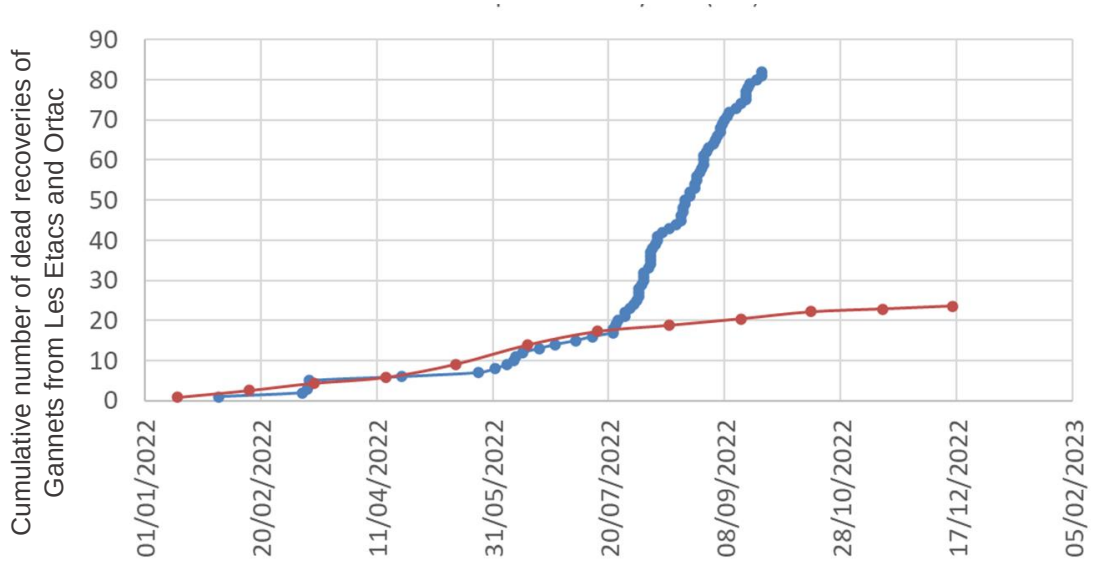

Figure 20. Cumulative number of dead recoveries against date in 2022 (blue) compared to the mean.

By plotting the number of birds predicted to be alive in each age cohort against the number recovered dead from each age cohort the proportion of the ringed population which were recovered dead can be estimated from the gradient of the graph. The gradient is 0.0212 (Figure 21.), informing us that an estimated 2.1% of the ringed population has been recovered dead in 2022. The R^2 of 0.8411 indicates that there is relatively high confidence in this model.

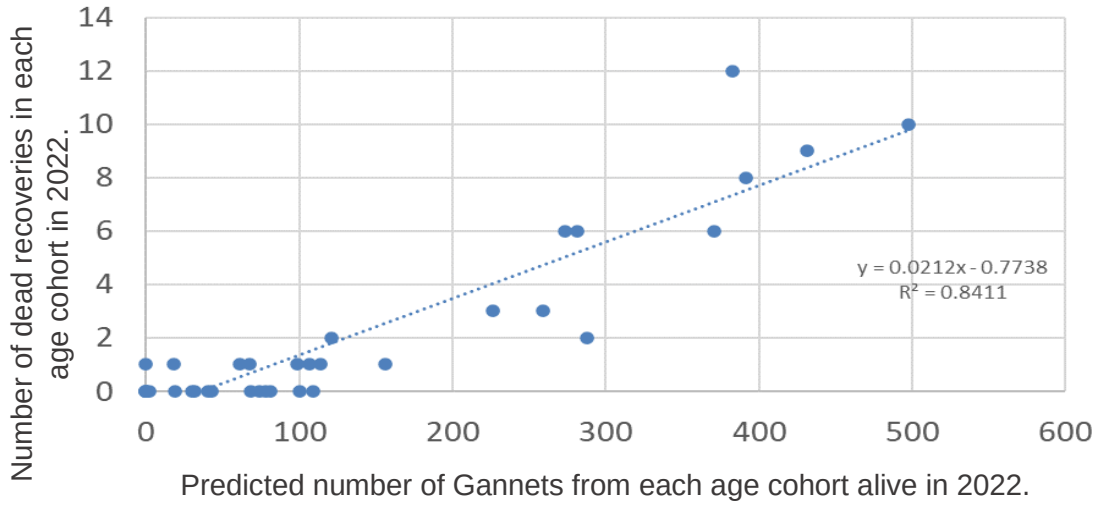

Figure 21. Number of dead birds reported in each age cohort in 2022 on the y-axis against the predicted number of each cohort alive in 2022 on the x-axis.

Based on the recovery rate of 6-12% (Warwick-Evans et al. 2016b) the proportion of birds which died can be calculated. A 6% reporting rate would mean that 43% of the population died, and a 12% reporting rate would mean 22% of the population died. This gives a range of 22-43% mortality for Alderney's Gannets in 2022. Excluding the baseline mortality, an additional 20-30% are estimated to have died, equating to an additional ca. 3500-5800 adult Gannets from Les Etacs and Ortac dying during the 2022 HPAI outbreak.

4.1.1.2.4.3 The Impact of HPAI on Alderney's Gannets

HPAI had a devastating impact on the productivity of the already under-performing colonies in Alderney, with overall productivity of 0.33 compared to 0.53 ± 0.095 over the last five years (See section 4.1.1.2.2.2). Unlike an average year, where the majority of mortality occurs around the egg stage (Nelson 2002), mortality remained high throughout the season (Figure 16.), with many chicks being lost .

HPAI caused both direct and indirect mortality in chicks. Chicks were seen dead on the nest, indicating they died as a direct result of HPAI; however, there were some cases where a pair adopted the chick of another pair which had ceased feeding, and many chicks were seen wondering the colony and eventually starving to death. This indicates that many chicks died due to their parents dying or having a reduced ability to provide food following HPAI infection. The adoption of Gannet chicks by pairs in Alderney this year is the first case of this known to the authors, although Gannets have been observed adopting Guillemot chicks (Fairhurst 1976).

Despite substantial losses to the colonies, Les Etacs and Ortac appear to have escaped the worst of HPAI. For example, Rouzic, the nearest gannetry saw near 50% mortality (P Provost 2023, personal communication, 16 February). This may be linked to the disease reaching Ortac and Les Etacs late in the season compared to other gannetries, however, the very high rate of nest loss in some areas of Les Etacs (Figure 17.) indicates that a high level of mortality could have been reached in Alderneys colonies. There is historically a high number of non-breeders on Les Etacs (Purdie et al. 2022a). The refilling of abandoned AOS (Figure 19.) was likely a result of non-breeding birds and single birds which had lost partners filling AOS. This will likely result in a decrease in productivity over the colony in 2023, with many AOS filled by birds with limited experience, and single birds which will not breed. The proportion of non-breeding and single birds must be factored in when conducting the census in 2023.

Geographic structure of the colony may have protected Les Etacs, and potentially Ortac. With the majority of disease transmission likely occurring on the colonies, the separation induced by the distinctive stacks of Les Etacs can be assumed to have inhibited the spread of the disease across the colony. This is supported by the difference in timings of peak nest loss, which indicates they were infected with HPAI at different times. (Table 2., Figure 17.) One area, North-Stack Low, shows little evidence of HPAI infection, with a similar trend in nest losses to an average year (Figure 16. & 17.). It is unclear if Ortac experienced similar rates and timing of nest loss to Les Etacs, Although Ortac is a single stack its population is roughly between that of Pyramid Stack and West-rock on Les Etacs, so it may have had a similar likelihood of infection. Furthermore, there are distinct geographic areas on Ortac, notably Gannets breeding below ledges on the west and south faces. No evidence of HPAI was found on Ortac on 02/07/22 (Section 4.1.1.2.5) indicating the disease was not present at an observable level at this time. A further analysis of ring returns factoring in location may give some indication as to mortality between the two colonies. Additionally, there is scope for comparing the proportion of birds which were infected with HPAI by recording the number of birds with black eyes – a symptom which has been noted in affected birds.

A census is of Les Etacs and Ortac is of high priority in 2023 to measure the impact of HPAI. In 2022 the use of drones was investigated, and initial findings indicates they will be a powerful tool for censusing Gannetries in a more sustainable manner whilst potentially reducing disturbance. Several protocols on drone use around seabird colonies are in development.

4.1.1.2.4 The Impact of Plastics on Gannets

The use of plastics as nest material and its impact on the Gannets were monitored for the 4th year in a row. Observations of material used for nests were undertaken between 02/03/22 and 29/03/22 when nest building activity among established pairs was prevalent. Observations were undertaken from vantage points overlooking the Gannetry on Les Etacs. About 70% of the occupied part of the colony was visible from the vantage points and assessment was possible of Gannets arriving from both the north and south.

Using binoculars (8x30) all nest material seen brought back to the colony was recorded and then categorised as either natural or man-made. The man-made material was also sub-divided according to the material; designated either netting, rope or other if it was discernible. Each observation period lasted one hour and ten observations were undertaken.

The colony was searched every 3-4 days throughout the breeding season for entangled birds too. The result of an entanglement was noted and all outcomes that caused death were compared between years.

The proportion of man-made material brought to the Gannetry in 2022 was more in line with 2019-2020 following a ten-fold increase in 2021 (Table 5.). This equated to a tiny percentage, 0.25%, of the total material observed. The man-made material primarily comprised primarily netting (Table 6.).

Table 5. The mean number per hour of natural material (seaweed) and man-made material (netting and rope) brought to Les Etacs as nest material by Gannets. n = number of hours of observation.

Year	n	Mean no. per hour	
		Natural	Man-made
2019	16	116.8	0.25
2020	10	101.8	0.3
2021	10	225.5	3.5
2022	14	274 ± 131	0.7 ± 0.82

Table 6. Field observations of nest material brought to the Gannetry on Les Etacs in 2022.

Observations			Nest material			
Date	Start	End	Seaweed	Netting	Rope	Other
2022-03-02	10:15	11:15	402	0	0	0
2022-03-08	09:45	10:45	151	1	0	0
2022-03-12	08:50	09:50	434	0	0	0
2022-03-15	08:40	09:40	262	0	0	0
2022-03-17	10:00	11:00	463	1	0	0
2022-03-20	09:25	10:25	361	2	0	0

2022-03-23	08:40	09:40	139	0	0	0
2022-03-25	10:35	11:35	237	1	0	0
2022-03-26	09:10	10:10	182	1	0	1
2022-03-29	10:35	11:35	112	0	0	0

Fewer Gannets were seen entangled in 2022 than previous years (Table 7.) Taking into account the 30% of the colony not visible to the observer and assuming the risk of entanglement is on average equal across the whole colony the likely total number of entanglements on Les Etacs each year between 2019-2022 were 29, 23, 33, and 21, respectively.

The risk of entanglement was biased towards the first half of the breeding season although to a lesser extent than in previous years (Figure 22.). This supports the anecdotal observations that prospecting birds rather than established breeders were most at risk (Bush et al. 2021).

During the HPAI outbreak, entanglements were at similar levels to the same period in previous years, despite the reduction in colony attendance and loss of chicks due to HPAI (Section 4.1.1.2.4). The number of entanglements identified in this period are generally low, therefore, it is difficult to draw conclusions. It is possible the neurological and physical impairments (European Food Safety Authority et al. 2022) caused by the disease increase the risk of Gannets becoming entangled, offsetting any reduction in number of entanglements. Reviewing information from other colonies (e.g. Rouzic, Bass Rock) with higher sample sizes may inform this.

Table 7. The number of adults and chicks seen killed each year on Les Etacs due to entanglement in netting or rope used as nest lining material.

Year	Adults	Chicks
2019	20	2
2020	16	4
2021	23	7
2022	14	2

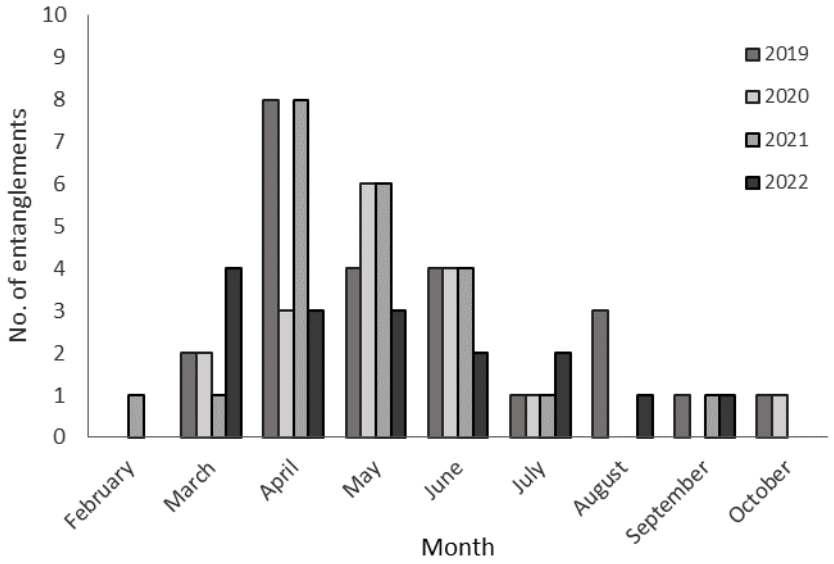

Figure 22. The number of Gannet entanglements recorded each month between 2019-2022.

The amount of plastic material in nests is a concern but the proportion of birds suffering lethal entanglement was low. Given that the colony has continued to grow only until recently (see Gannet census section 4.1.2.2.2) it does not likely have an impact on the population.

4.1.1.2.5 Track-a-Gannet (TAG) Project

4.1.1.2.5.1 TAG Background

The objective of TAG is to monitor the movement and migratory behaviour of Gannets using GSM GPS tags and geolocators. In brief, the GSM GPS tags are taped to the birds' tail feathers and transmit location data multiple times a day via the mobile phone network, before then dropping off the bird after a few weeks. In comparison, geolocators are attached to a plastic colour ring placed around the bird's leg and provide fewer data transmissions per day for up to one year. Unlike GSM GPS tags, geolocators must be retrieved directly by recapturing the bird and downloading the data.

Both tracking methods provide invaluable information related to Alderney's Gannets. GSM GPS tags assist with monitoring foraging during the breeding season (e.g. Figure 23.) and have been used to further our understanding of vulnerability to offshore wind farms, as well as insights into species ecology (Soanes et al. 2013, Warwick-Evans et al. 2015, Warwick-Evans et al. 2016a, 2016b, 2018). Geolocator data provide further invaluable long-term information related to Gannet wintering behaviour.

In addition, the project provides an opportunity to fit colour rings to adult Gannets and use the re-sighting of these birds to help study their survival (Warwick-Evans et al. 2016b). This is important because at present there is some uncertainty in our understanding of Gannet demographics. According to existing life history information the British Gannet population is predicted to decline 59% over the next 25 years (JNCC 2023b) yet in actual fact, it continues to grow. It is therefore likely current assessments underestimate survival and it is therefore important that further data are gathered.

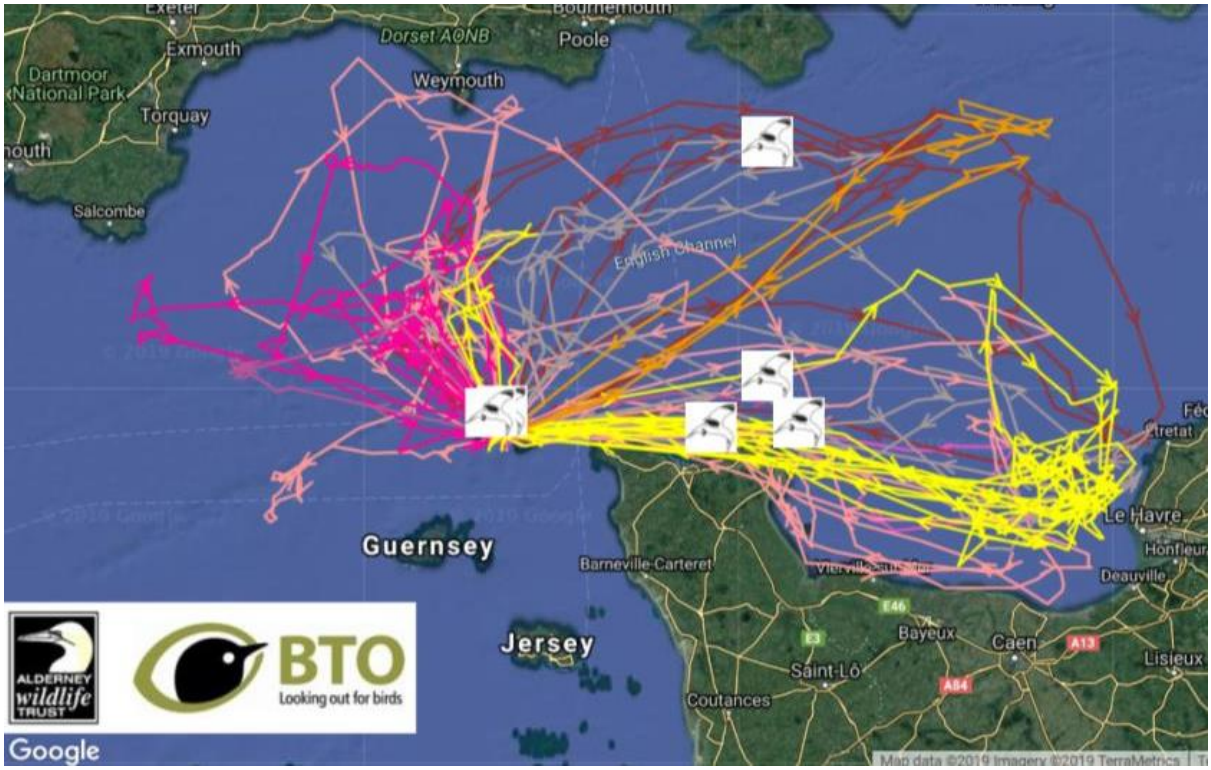

Figure 23. GSM GPS logs from the TaG project in 2019 showing Gannets movements during the breeding season.

4.1.1.2.5.2 TAG in 2022

In 2022 a single trip was made to Ortac on 02/07/22 (Table 8.) to recover geolocators and resight colour-ringed birds. Biosecurity protocols (e.g. hazmat suit, gloves and goggles on colony, disinfection with Virkon S (https://virkon.us) of boots, clothing and equipment before and after landing) as recommended in HPAI risk assessments reviewed and accepted by the States Vet were followed. This included having a 'biosecurity officer' onboard the vessel who ensured all measures were followed. The trip also provided an opportunity to monitor the colony for any signs of HPAI, and it was agreed if any were sighted the trip would cease "immediately. The ringing team included a lead ringer (Justin Hart) and assistant (Daniel Whitelegg) (see appendix D for copies of SoA and BTO licence). Birds were resighted with binoculars and recaptured using a noose by a licenced ringer. The loci of each resighting were recorded using GPS and marked on a field map.

No geolocators were recovered, although five colour-ringed birds were resighted, with the red engraved colour ring codes: A118, A054, A058, A062, A153. A118 was seen at the top of the bowl area, the remainder were all resighted on top of the stack. A153 had a geolocator but it was not recaptured; tragically, it was later recovered having washed up dead in Colleville, France, on 09/08/22 during the HPAI epizootic; the data from this is currently being analysed. 3 birds with CIBRS metal ring were recaptured: F25654, F36117, F36408. These were reported to the CIBRS. The re-sightings will be added to data from a wider program of colour ringing undertaken at other UK gannetries. Its contribution to our understanding of adult survival will be reported elsewhere when more data have been obtained.

Anecdotal observations of the survey lead indicated the adults may have become flightier and flushed much more easily than on previous trips. This was especially so around the north-east side of the colony, but also on the top (Figure 24.) and may indicate the adults have become more wary as a result of previous attempts to catch them. Nonetheless, at least on top of the stack, it was possible to move among the gannets with limited disturbance.

No signs of HPAI (e.g. unusual mortalities or absences, lethargic Gannets) were noted during the trip.

Table 8. Details of geolocator retrieval survey to Ortac.

Date	02/07/22
Species	Northern Gannet *Morrus bassanus*
Location	Ortac
Number of people involved in ringing	1 lead, 1 helper (licenced ringers)
Time on Island	14:50-16:15
Time Spent Ringing	Ca. 40 minutes
Capture method	Noose-pole
Number of Birds Caught	3
Number of controls/retraps/injuries/casualties/ resightings	5 resightings, 3 controls
Weather conditions	Wind: W 13 mph, Relative Humidity: 89%, Temperature 17°C, dry conditions, sunny.

Figure 24. The top of Ortac Gannet colony photographed during the survey.

4.1.1.2.5.3 TAG Going Forward

Given the decline in our Gannet's breeding performance in recent years (see productivity section 4.1.1.2.2), and the HPAI outbreak, there is a recognised need to undertake further research into the breeding season movements of our Gannets using GSM GPS tags. The requirement for new data is threefold a) to better understand the drivers of population level changes identified from the existing monitoring programme, b) understand what effect the HPAI outbreak will have on the movement ecology of Alderney's Gannetries and c) ensure meaningful, robust data is available for evidence-based due consideration of Alderney's Gannet population by the appropriate competent authority with regards to offshore developments e.g. windfarms through Environmental Impact Assessment.

Wind farms pose a significant threat to Gannets within UK waters, where the current array of wind farms is expanding rapidly. Within the foraging ranges of Alderney's Gannets there are several offshore wind developments, which may have a significant impact on Alderney's already struggling Gannets (Purdie et al. 2022a). For appropriate recognition and consideration to be made, it is imperative that research should be scheduled to ensure data considered to be representative of the foraging range of Alderney's Gannets is no more than six years old. It should be emphasised that data older than six years old may be more readily rebutted by a developer and our Gannet populations may not be given the due consideration they require. Data should be gathered and made available that informs sufficient and proportionate consideration.

In the UK, Ramsar sites are afforded the same protection whereby appropriate assessment of populations would be made through Habitats Regulation Assessments and Environmental Risk Assessments. If our Gannets are to be afforded due consideration on the international stage, this information is imperative. Additional funding may be required to undertake this research where data should be made freely available to better understand the movement of Alderney's Gannets. Funding for such work might be sought from external developers who need data on Alderney's populations to respond to development obligations under the EU Environmental Impact Directive 2014 (The European Parliament And The Council Of The European Union, 2014).

Recommendations

- Work with stakeholders to develop a response to HPAI in 2023
- Continue to monitor productivity on Les Etacs ensuring a minimum sample size is achieved to adequately represent the total breeding population.
- Continue to closely monitor the sample of 100 nests on the Pyramid year-on-year to build a long-term dataset of demographic value but also help identify future trends in productivity or changes in nest site distribution and colony size over time.
- Monitor another sample of 100 nests from across the colony (20 nests from each of the areas sampled on North-Stack and West-rock).
- Investigate productivity at Ortac and establish methodology and resources to repeat regularly thereafter (e.g. annually, bi-annually).
- Conduct the planned census of Gannet populations on Les Etacs and Ortac in 2023 and continue to monitor frequently (e.g. biannually) to ensure any changes can be monitored more closely in the future.
- To facilitate more frequent censusing of the Gannetries, explore the option of using drones instead of piloted aircraft.
- Continue to monitor the use of plastics as nest material and its impact through entanglement.
- Visit Ortac to retrieve the geolocators that still need to be recovered but also collect re-sightings of colour-ringed birds to help study adult survival.
- Review the need for the TaG project in light of proposed offshore developments, low productivity, population plateau, and HPAI outbreak.

- Investigate relationship between ‘black-eye’ HPAI symptoms and productivity (e.g. through boat-based productivity surveys) and survival (e.g. through colour ringing programme).
- Renew colour ringing programme on Les Etacs and Ortac to enable accurate estimates of adult survival in light of HPAI outbreak. Colour ring Gannets with and without the ‘black-eye’ HPAI symptom to establish its impact of this on adult survival.

On behalf of the States Veterinary Officer:

- Sample Gannets for HPAI antibodies
- Collect tissue samples from dead Gannets with the black-eye symptom.

4.1.1.3 Northern Fulmar

Northern Fulmar, *Fulmarus glacialis*, henceforth referred to as Fulmar, are a pelagic scavenger which nest on cliffs and islands. Once perceived as an Arctic seabird with one outpost in St Kilda, Fulmar have experienced a dramatic range expansion in the past two centuries (Fisher and Waterston 1941). This has been linked to an initial reduction in hunting on St Kilda and, notably, to increases in fisheries discards (Fisher and Waterston 1941, Phillips et al. 1999).

Fulmar productivity now generally low at 0.419 ± 0.127 across the UK and with some populations showing signs of decline such as in the North-West Atlantic there is concern for the species (Horswill and Robinson 2015, Mallory et al. 2020). Productivity varies dramatically across UK populatons, with a range from 0.160 – 0.740. Fulmar's reliance on fisheries discards may have become a pitfall with fisheries reform reducing the quantity of discards available (Bicknell et al. 2013). They are also highly susceptible to bycatch such as in gillnet and long line fisheries; both of these are present in local waters and with a foraging range of near 600 km Fulmar are also exposed to international fisheries (Žydelis et al. 2013, Fangel et al. 2017, Baetscher et al. 2022). Plastic ingestion poses another threat to Fulmar and birds within the English Channel may be consuming higher quantities of plastics than those in other regions (Franeker et al. 2011). Plastic ingestion in seabirds can result in a range of impacts such as physical blockages, organ scarring and increased exposure to persistent organic pollutants (Puskic et al. 2020, Charlton-Howard et al. 2023). There is also the potential for conflict with recent offshore wind developments, with Fulmar identified as a species most at risk for collision risk and high risk for displacement by a review of the cumulative effects of French offshore wind developments (Brignon et al. 2022). As with other wild birds in 2022, Fulmar were also faced with the HPAI outbreak. A clear understanding of Alderney's Fulmar will help inform the management, knowledge gaps and potential mitigations against such threats. To achieve this AWT monitors the productivity and population size of Fulmars nesting here.

4.1.1.3.1 Fulmar on Alderney

Alderney's Fulmar (Figure 25.) breed in several inaccessible locations along the west and south cliffs and on Coque-Lihou, with a particular concentration on the west cliffs between Hanaine Bay and Troix Vaux, adjacent to the Les Etacs Gannet colony (Figure 10.). Since 2007 there have been 34.5 ± 4.79 AOS around Alderney (Appendices A), and productivity (monitored from a sample between Hanaine Bay and Troix Vaux) has varied between 0.56 in 2012 and 0.3 in 2018, with a mean of 0.45 ± 0.086 since 2012 (Appendix A; (Purdie et al. 2022a). This is generally in keeping with UK populations (Horswill and Robinson 2015).

Figure 25. An adult (left) and chick (right) Fulmar on the productivity survey area between Hanaine Bay to Troix Vaux, photo taken 03/08/22 during weekly observations, credit; A. Purdie.

4.1.1.3.2 Monitoring Fulmar in 2022

In 2022 Fulmar were monitored in line with previous years (Purdie et al. 2022a). Three separate methods of data collection included 1) censuses through AOS counts on three round island boat surveys (16/05/22, 27/05/22 and 03/06/22), 2) censuses through six vantage point surveys from 21/05/22 – 10/06/22, and 3) productivity monitoring via weekly observations of observable AOSs between Hanaine Bay and Troix Vaux (Figure 26.) between May – September.

Productivity monitoring was performed using both a telescope and through review of photos taken using a telephoto lens, from vantage points on adjacent clifftops. Of an initial 51 perch points identified within the survey area, 30 were identified as AOS and monitored weekly through the breeding season. One of these sites became obstructed by vegetation and so could not be monitored. Productivity was calculated by dividing the number of successful AOS against those identified within the survey area (Figure 26.) at the beginning of the season.

Census data was analysed using a GLM with a Poisson distribution and productivity data using a GLM with a binomial distribution.

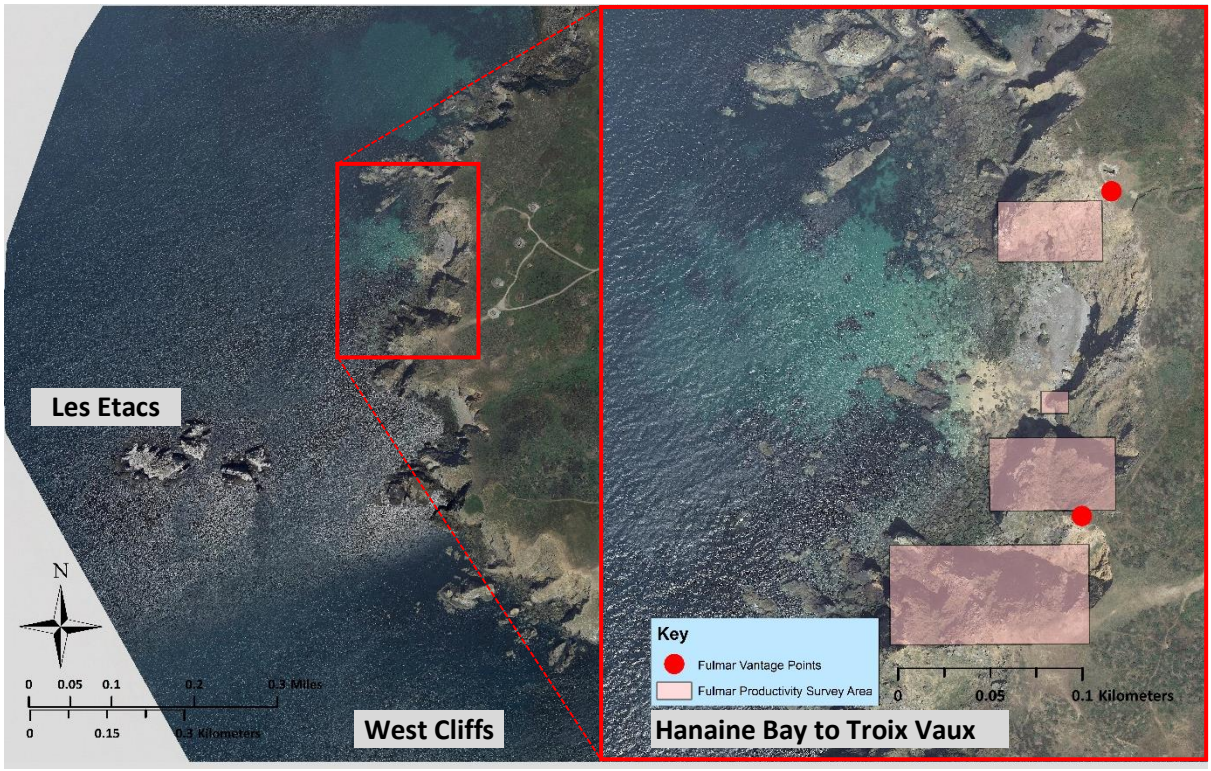

Figure 26. West cliffs (left) and the Hanaine Bay to Troix Vaux area (right). The Fulmar productivity survey area is indicated by pink transparent areas. Vantage points are shown by red circles.

4.1.1.3.3 Fulmar Census Results

A mean of 58 ± 7.0 AOS were identified around Alderney in 2022, with a maximum count of 67 AOS. The highest concentration of nests is between Hanaine Bay and Troix Vaux (Table .), with small numbers breeding elsewhere around Alderney and on several islets (Table 9.). This is slightly higher than in 2021 (Table 9.).

Table 9. AOS of Fulmar by location on Alderney from round island censuses in 2021 and 2022. Max counts are highlighted in bold. Le Puits Jervais was counted as part of the mainland in 2021.

	Number of AOSs				
Survey Date	**Mainland**	**Le Puits Jervais**	**Twin Sisters**	**Coque Lihou**	**Overall**
16/05/2022	48	0	1	0	49
27/05/2022	56	0	1	2	59
03/06/2022	**62**	**1**	**2**	**2**	**67**
27/05/2021	52		0	1	53
02/06/2021	**58**		1	**2**	**61**
Mean 2021	55		0.5	1.5	57
SD 2021	4.2		0.71	0.71	5.7
Mean 2022	55	0.33	1.3	1.3	58
SD 2022	7.0	0.58	0.58	1.2	9.0

4.1.1.3.4 Fulmar Productivity Results

Of the 29 AOS, three failed to lay and 14 failed at the egg stage. Overall 14 fledged, giving a productivity of 0.41. On Coque Lihou, despite not being within the productivity monitoring area, incidental observations recorded that of two pairs nesting one fledged and one failed.

Productivity has not significantly varied from 2012 to 2022 (Binomial GLM, Estimate = -0.0572, P = 0.118, Figure 27.). The number of AOS within the survey area has also not significantly varied (Poisson GLM, Estimate = 0.00435, P = 0.798, Figure 28.). Mean productivity since 2012 is now 0.44 ± 0.082.

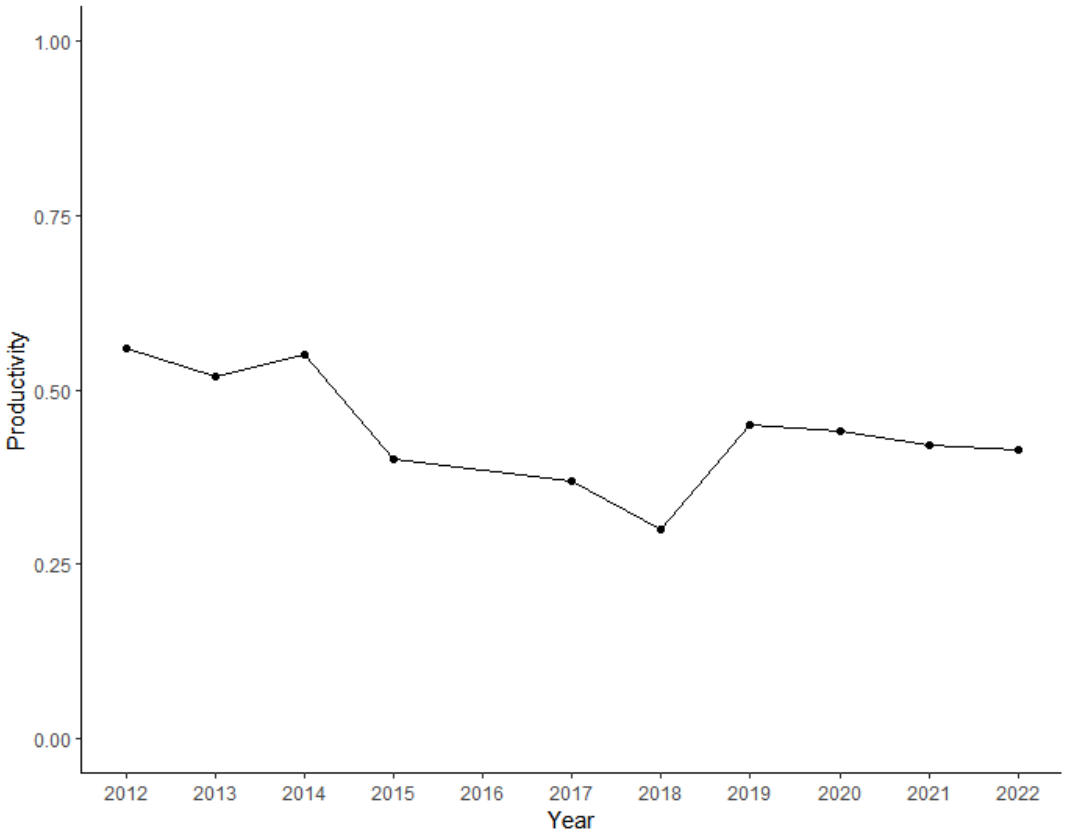

Figure 27. Productivity of Fulmar observed nesting on Alderney from 2012 to 2022. A trendline is shown in blue. Data from 2016 is non-comparable so was excluded.

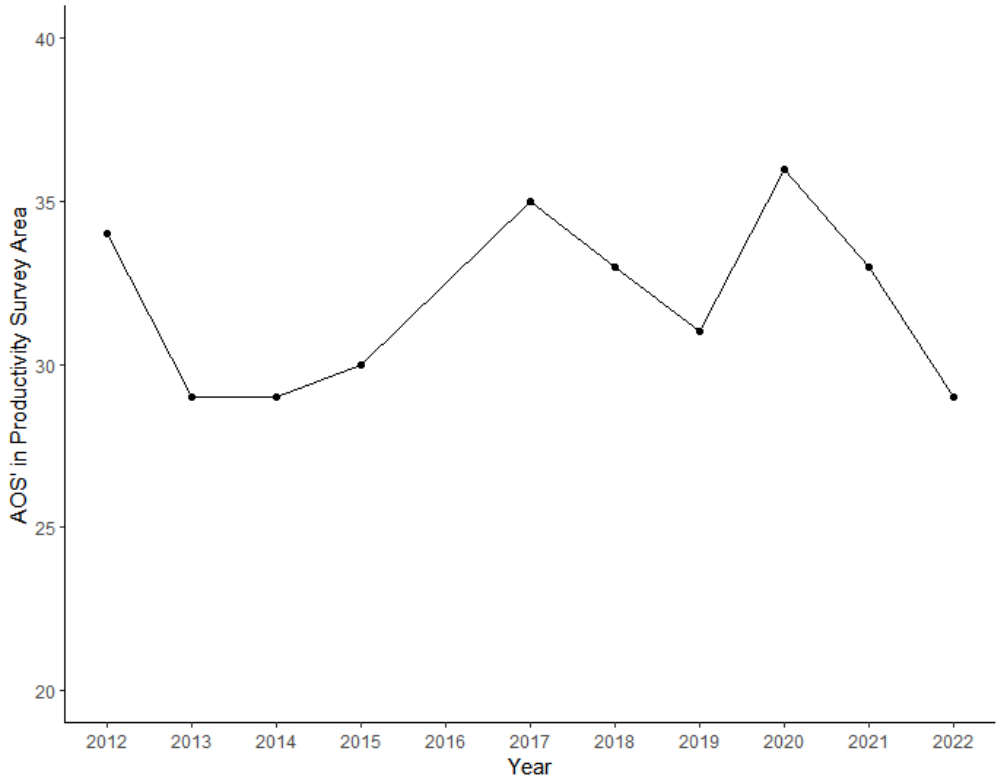

Figure 28. Number of AOS identified within the Hanaine Bay to Troix Vaux productivity survey area from 2012 to 2022. A trendline is given in blue. Data from 2016 is non-comparable so was excluded.

4.1.1.3.5 Fulmar Discussion

The Fulmar population appears to be stable, with some range expansion, on Alderney. There has been no significant change in productivity or population size within the Hanaine Bay to Troix Vaux survey area (Figure 28. & 29.), whilst there was a record number of AOS identified around Alderney and surrounding islets during the census (Table 9.). There was no drop in productivity associated HPAI, indicating that it had little effect, in line with reports from Fulmar across the UK (Pearce-Higgins et al. 2022). This may be due to the distance between individual Fulmar AOS reducing the likelihood of transmission at the breeding site.

Despite its stability, productivity is still concerningly low, albeit in line with the UK (Horswill and Robinson 2015), and while the long lifespan of these seabirds may mask the impacts of this for the time being there is a potential for population declines in the future. Ascertaining the causes of this low productivity may be essential to secure the long-term future of the species. On Alderney, a continued effort to monitor the breeding success and population size is necessary to inform management should they begin to decline here, as is ascertaining likely causes of low productivity within the region, be they plastic ingestion, bycatch, reduced food availability from fisheries discards, reduced fish stocks, conflict with offshore wind developments or other factors (Phillips et al. 1999, Franeker et al. 2011, Žydelis et al. 2013, Fangel et al. 2017, Brignon et al. 2022).

4.1.1.3.6 Recommendations

- Continue monitoring Fulmar productivity and population size in 2023
- Consider investigating causes of low productivity in next five years strategy

4.1.1.5 Other Seabirds and Shorebirds

Three round-island boat surveys were carried out on 16/05/22, 27/05/22 and 03/06/22 to estimate the numbers of Shag *Gulosus aristotelis*, gulls, terns and auks nesting on Alderney's south coast cliffs and islets (Table v.). The number and location of nesting Fulmars were also noted during these surveys to help inform the land-based counts reported in section 4.1.1.3. Additional counts from shore were made to help assess the breeding numbers of auks and Common Terns, *Sterna hirundo*, too.

The number of Cormorants and Shags nesting on Burhou, Little Burhou, Renoquet and the Nannels were estimated from three boat surveys on 18/05/22. 27/05/22 and 01/06/22. A count of nest sites was also provided by the ABO/CIBRS who visited these sites to ring seabirds on 29/04/22 (see section 4.1.2).

4.1.1.4.1 Manx Shearwater

Manx Shearwater, *Puffinus puffinus,* are frequently seen passing through the swinge, however their presence on Burhou is unknown. In 2021 A sound recording device was deployed to monitor for their presence, however, over a period of 11 nights between 4-15/06/2021 no evidence of their presence was found. Monitoring was scheduled for August 2022, but none took place due to HPAI.

4.1.1.4.2 Shag

Shags nest throughout the archipelago except along the northern coastline of the mainland between Fort Clonque in Clonque Bay and Fort Raz in Longis Bay. The highest count from around the mainland of Alderney and the south coast islets was obtained during the second boat trip (on 27/05/202) when 141 apparently occupied nests (AON) were seen, Table V.

The highest concentrations of nests occurred around the south-western end of the mainland between Hanaine bay and Telegraph bay and on Coque Lihou (Table 14.). More Shags attempted to nest than in 2021 and 2022. The total count (141 AON') was substantially higher than counts in 2019 (109 AON'), 2020 (86 AON') and 2021 (103 AON'), and was more in line with counts from Alderney in 1999-2000 (160 AON'), (Appendix A).

On Burhou and its surrounding islets only one AON was discovered, on the Nannels. This is lower than in 2021 (22 AON') and the historical records (Appendix A). This drop and the increase in numbers breeding on the mainland and inshore islets may indicate a range shift towards the latter. These results highlight the importance of maintaining boat-based surveys for monitoring changes in the breeding populations of seabirds around Alderney.

4.1.1.4.3 Great Cormorant

All the island's breeding Great Cormorants nested in a small colony on Little Burhou. On 29/04/2022 the colony was visited by CIBRS bird ringers (see section 4.1.2) and nine AON were found present, two of which had no chicks. Of these, data were provided from eight nests, of which one was still incubating a clutch of 2 eggs and the remainder had chicks with mean brood size of 2.14 ± 0.690, range 1-3 (Figure 36.). The total number of nests was the same as in 2021 (Appendix A).

4.1.1.4.4 Great Black-backed Gull

Great Black-backed Gull, *Larus marinus*, breed in small numbers throughout the archipelago. This year nine apparently occupied nests (AON) were present around Alderney and the south coast islets (Table 14), one more than in 2021. A maximum of six AON' were located on mainland Alderney, one* on the Twin-sister stacks, one on Queslingue stack, and two** on Houmet de Pies
**Only present on 27/05/22 survey **Only one present on 27/05/22 survey.*

Since 2005 the numbers of Great Black-backed gulls reported breeding each year has varied markedly, probably depending on the level of persecution, and ranged from 23 in 2010 and 2011 to just one in 2013, (Appendix A).

Due to HPAI restrictions Burhou was not visited to check for AONs and territories during the breeding season. In 2021 four territories occupied on Burhou with three nests found east of the warden's hut on the north shore and a fourth pair occupying the western end of the island. In 2022 a pair moved into the area directly below the new PuffinCam (Figure 6.) placing them within one of the Puffin burrow areas. The adults were seen on several occasions attempting to kleptoparasatise or predate Puffin and although none of the observed events were successful it is likely that there were successful events outside of the survey window (See Section 4.1.1.6 for more information on kleptoparasitism by gulls).

No empirical data were collected on productivity by AWT or reported by CIBRS/ABO ringing activities.

4.1.1.4.5 Lesser Black-Backed Gull

Internationally important numbers and the majority of Alderney's Lesser Black-backed gulls, *Larus fuscus*, nest within the Ramsar site in a large colony on Burhou (Purdie et al. 2022a). The 2021 census estimated a population of 716 AON', a 32% decline compared to the last census in 2016 (1051 AON', Appendix A). This follows a similar decline seen elsewhere in the British Isles (Robinson 2005, Nager and O'Hanlon 2016), and may be amplified by the closure of landfill sites in Guernsey and France.

Due to this decline it was decided to skip the census of nesting Lesser Black-backed Gulls nesting on Burhou until 2024 to minimise potential disturbance agreed in the 2021 Alderney Ramsar Action Plan (Purdie et al. 2022b). The census would have been impossible given HPAI restrictions despite this. The remainder of nests elsewhere were counted either from vantage points on the mainland or via the boat-based surveys, with a maximum count of 37 AON' (Table 14.) which is in line with counts from 2021 (35 AON', Appendix A).

Burhou was surveyed for carcasses on 20.10.22. Ecologists walked 50-m East-West transects counting the number of carcasses to their north to cover the whole island. In total 49 bird carcasses were sighted and the vast majority of these were immature gulls (likely Lesser Black-backed gulls) with only one confirmed Puffin carcass. There were a few instances of adult gulls seen dead on the nest. Following consultation with the ARAG, ABO and local experts it was agreed that this number of carcasses was not exceptional, although it does not rule out the potential of HPAI affecting the colony.

Purdie et al. (2022) also recommended to maintain oversight and consider doing another count if drastic reductions of numbers become apparent in the interim period. Despite little evidence of an increase in gull mortality during the 2022 HPAI epizootic, a census in 2023 would confirm if there has been further colony declines, possibly as a result of HPAI. However, it is still recommended to withhold the census to 2024, to reduce disturbance.

4.1.1.4.6 Herring Gull

Nesting Herring gulls, *Larus argentatus,* are widespread around the coast of mainland Alderney with smaller numbers also occupying the south coast islets and the Lesser Black-backed Gull colony on Burhou. Many are widely dispersed around the island, particularly the south coast cliffs but distinct colonies occur in Hanaine bay, on L'Etac de la Quoire and in Godfreys Bay. AONs were counted from vantage point and boat surveys, whilst those on the Burhou colony could not be counted this year due to HPAI restrictions.

A total of 142 AONs were counted around Alderney and the southern islets (Table 14.). This figure was higher than that recorded in 2021 (119 AON') and 2020 (71 AON') but still well below the previous counts of 285 and 315 AON' reported in 2000 and 2014, respectively, (Appendix A). In 2022 an additional count of birds nesting on rooftops in Alderney was conducted and found between 6 and 13 AON' (Table 14.).

4.1.1.4.7 Common Tern

Common Terns, *Sterna hirundo*, had their most productive in many years in 2021 with 22 chicks fledging (Purdie et al. 2022a). This year the terns returned to nest for a third consecutive season on Fort

Houmet Herbé and did so in greater numbers than previous years with 21 Apparently Occupied Territories (AOT') compared to 13 AOT' in 2021 and three AOT' in 2020 (Table 14.). The colonisation of Fort Houmet Herbé follows many years of poor breeding success on Houmet de Pies where rat predation had been an on-going problem until some effective control measures were implemented by the AWT and SoA in 2018. Following this, there has been a marked improvement in the Common Terns chances of breeding success. Regular baiting of Houmet de Pies, Houmet de Agneaux (the east Saye bay promontory) and Fort Houmet Herbé have ensured all these preferred nesting sites are free of rats when the birds return each May. In 2022 Good NatureTM A24 traps were deployed during the breeding season instead of toxic bait as these can be left without resetting or clearing carcasses and do not use poison, reducing potential for bycatch All baiting was covered by risk assessments and approval was issued for the use of Good NatureTM A24 traps by the States Vet.

As Fort Houmet Herbé occupies a tidal islet and is accessible to people as well as rats at low water, measures to reduce disturbance were also imposed once the birds had returned by working with the States Public Works department to set up temporary signs on the foreshore that warned potential visitors of their presence. The fort is privately owned and the landowner is supportive of these control measures.

To monitor the terns without causing excessive disturbance observations were made periodically from high ground on the foreshore overlooking the fort. The first returning terns began prospecting the fort in late May and by the end of the month 9 AOS and 9 apparently incubating adults (AIA') were present. Most pairs chose to nest on top of the ramparts and inner walls making their observation from the foreshore easier. A maximum of 15 AIA' were observed (on 03/06/22) with one AOS which had not yet laid, two with birds present, and one which was not visible. An additional two sites were later identified on 04/07/22 and 12/07/22. Of these 23 sites (Figure 29.), 19 laid, three did not, and one was not visible.

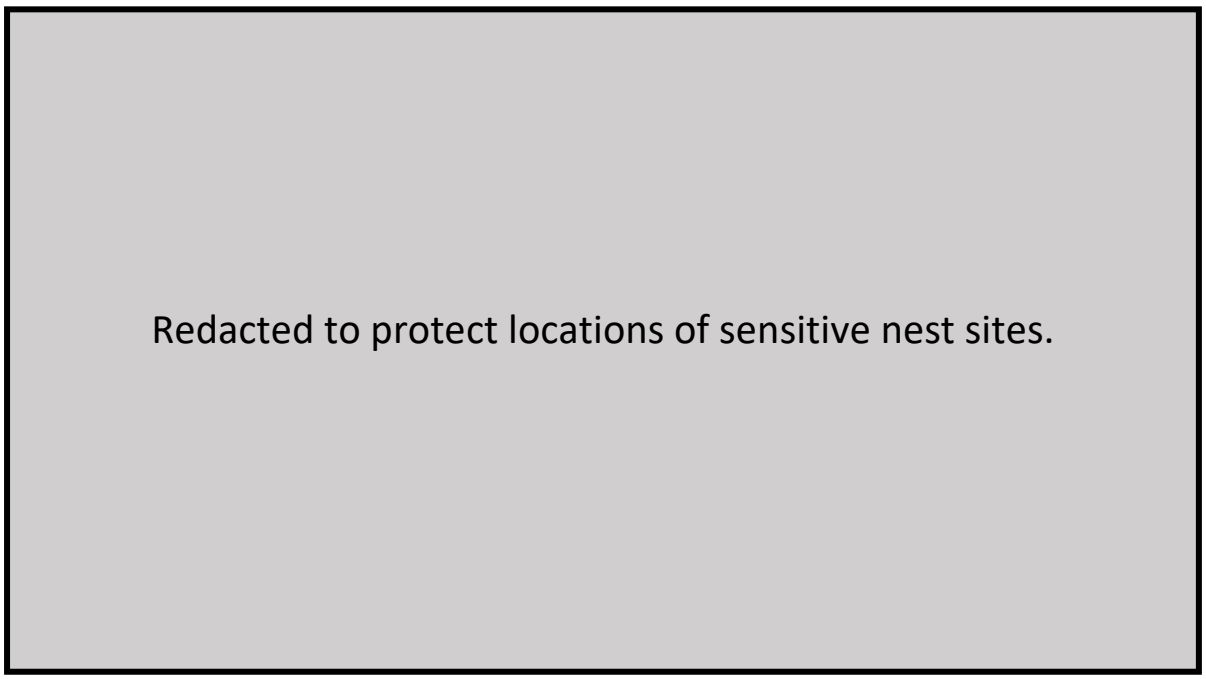

Figure 29. Locations of Common Tern nest sites on Fort Houmet Herbe in 2022. This figure will be redacted in the public version of this document to protect sensitive breeding birds.

The first clutches hatched by 27/06/22 and five nests had downy chicks less than a week old. Overall chicks were seen in 17 nests, with adults seen carrying food to one additional nest (CN17, Figure 29.). However, unlike in 2021, when the terns were able to breed unmolested until early August (when there was an incursion by rats), chicks were lost from 14 of the then 15 nests with chicks between 27/06/22 and 21/08/22. It is believed that rats were not sufficiently suppressed, and so predated nests. Furthermore a Sparrowhawk, Accipiter *nisus*, was seen patrolling reef around fort on 18/07/22 and Carrion crows, *Corvus corone*, were often seen foraging inside fort ramparts and being mobbed by

terns. On 18/07/22 a crow seen eating tern egg near nest CN19 (Figure 29.). After this loss at least four pairs re-laid (CN3, 5, 6 & 7, Figure 29.), and a pair in a late-established nest site (CN22, established ca. 05/07/22) hatched chicks between 21-25/07/22, however, these were not present three days later on 28/05/22. Overall, only one pair successfully fledged chicks, CN1, with two fledged chicks seen being fed on the outer reef on 21/07/22 with CN1 being the most likely source due to the presence of two chicks with one-two thirds emerged wing feathers on 12/07/22.

This year's poor productivity is in stark contrast to the excellent breeding season of 2021, and is likely a result of unsuccessful elimination of rats on Houmet Herbe and avian predation, in particular by Sparrowhawk. Additionally anecdotal evidence suggests the Fort was visited by the public on numerous occasions despite signage, which likely disturbed the breeding terns. This information can be used to inform actions in 2023 and highlights the importance of high quality monitoring to advise management in maintaining healthy breeding populations of these seabirds on Alderney.

4.1.1.4.8 Guillemot and Razorbill

2022 saw a significant increase in effort to monitor the breeding populations of Guillemot, *Urea aalge*, and Razorbill, *Alca torda*, on Alderney and surrounding islets, due to the Hornsea Four Alderney Predator Eradication project. This project began in September 2021 and was incorpozrated into AWT's existing objectives which aimed to identify the threats posed by rodents to Alderney's nesting seabirds and where possible minimising it. The work was undertaken under contract with Orsted Power (UK) and within the auspices of the Alderney Ramsar Site Monitoring programme.

In particular, the project has been set up to help establish how it may be possible to boost the abundance of the local Guillemot and Razorbill populations. It aims to achieve this establishing the impact of rats on the key seabird breeding sites and mechanism through which they might be eliminated in these areas and then their re-establishment controlled, thereby reducing disturbance and improving breeding success but also opening new nesting habitat for colony expansion.

To assess the outcome of the project, a schedule of monitoring was undertaken to identify any changes likely brought about to the birds' abundances and distribution over time. To do this, data on three breeding parameters was sought, including the size, productivities and distribution of the nesting Guillemot and Razorbill populations. Where possible data from these parameters will then be compared across sites and seasons in future in the presence or absence of rats.

It should be noted that obtaining accurate assessments of these parameters for both Guillemots and Razorbills, particularly their breeding numbers and productivity, is notoriously difficult (Walsh et al. 1995). On Alderney the task is exacerbated by the habit of both species mostly nesting out of sight in crevices or under large boulders. Even where the Guillemots nest on open ledges their habit of crowding together and hiding their eggs or young between themselves and the rock-face makes judging breeders from non-breeders difficult. Observing their breeding success is equally difficult for similar reasons and may not be possible even with intensive diligent observation.

Nevertheless, some quantification of each parameter will be sought using the monitoring methods outlined in the JNCC *Seabird Monitoring Handbook* (Walsh *et al.* 1995) and adapted to each nesting site based on its habitat, topography and observability. The aim will be to achieve a level of precision for each site that can be repeated each season and allow fair comparison over time so that where change occurs it can be identified in the future.

4.1.1.5.1.1 Monitoring Guillemot and Razorbill breeding populations – Methodology

Data will be sought from seven sites where either or both species nest. These sites include, Ortac, Les Etacs, the west cliffs of Alderney, La Nache and Fourquie of the Twin Sister stacks, Coque Lihou and L'Etac de la Quoire (Figure 30.). Additional data was sought from sites where breeding has been recorded in the past or may occur in the future should new nesting activity be found. These sites include

the outer islands of Burhou, Renonquet and the Nannels as well as the small tidal islets of Le Puits Jervais and Rousset on the south coast.

All these nesting sites, except Ortac and the outer islands, are observable from vantage points on mainland Alderney (Figure 30.) and were monitored throughout the breeding season. Boat surveys were used to collect data from Ortac and the outer islands but also additional data from the other sites as opportunity allows.

Figure 30. Vantage points (labelled) for monitoring Guillemot and Razorbill nesting areas around Alderney's south and west coast, marked by colour (see legend).

Whole colony counts were undertaken of the Guillemots that nest on open cliff-faces among the Gannets on Ortac and Les Etacs. Elsewhere, at the sites lying off the south coast of Alderney, where both guillemots and/or razorbills nest in concealed nesting areas, colony abundances were estimated from early season counts of birds gathered on the sea nearby.

Productivity of Guillemots nesting at observable sites on open cliff-faces was estimated using the number of chicks seen at least 15 days old which disappear (assumed fledged) from each nest site divided by the number of apparently incubating adults counted earlier in the season. Productivity of Guillemots and Razorbills nesting in concealed sites was estimated by using the number of nesting sites still being provisioned by adults in mid-June divided by the number of nest sites regularly attended by birds during the incubation period in May. Productivity for these sites will be reported as the number of apparently successful sites divided by the number of sites occupied early in the season.

The distribution of each species breeding range was established using photography and field sketch maps. All sites where each species can be seen nesting or inferred to be doing so was marked on photographs and field sketch maps. These photographs/maps and the number of sites tallied for each species will be kept on record so that any losses or gains that emerge can be identified in the future.

4.1.1.5.1.1 Monitoring Guillemot and Razorbill breeding populations – Results

Between 100-110 Guillemots nested at four sites. Most did so on the gannetries, 55 on Les Etacs and 24 on Ortac (Figure 31.), with the remainder divided between one rat-free nearshore island and one tidal islet with rats (Table 10.). Mean productivity was 58% but highly skewed between sites and only

successful on the gannetries, with a maximum of 69% on Les Etacs. Between 41-46 razorbills nested on six tidal islets and one nearshore island (Table 11.).

Away from the gannetries, counts of all the birds present of either species far exceeded the actual numbers that bred and were not an accurate measure of colony size. However, they could indicate the islands potential for population expansion as many birds of breeding age were unable to do so due to predation pressure and limitations of space at preferred nesting sites. If these excess birds bred it was estimated the number nesting could expand 50-100% for guillemots and up to 50% for razorbill.

Figure 31. A late hatched guillemot chick found on Ortac on 2nd July during TAG Geolocator recovery survey (Section 4.1.1.2.5).

Table 10. Guillemot counts, nesting numbers and breeding success at each site. Pre-season and in-season counts were undertaken in April and between 10th May and 10th June (the earliest date chicks departed), respectively.

	Counts								Breeding success		
	Pre-season[1]			In-season[2]				Peak[4]	No. of nests	No. monitored[5]	Productivity	Quality[6]
Site	Mean	StDev	*n*	Mean	StDev	*n*	*diff*[3]					
Les Etacs	67.4	25.3	11	78.4	8.8	10	*ns*	98	55	55	0.69	Acc
Ortac	20.0	0	1	41.5	12.0	2		55	22	*Insufficent data*		
Renonquet	0	0	2	0	0	2		0	0	No breeding		
Nannels	0	0	2	0	0	2		0	0	No breeding		
Burhou	0	0	2	0	0	2		2	0	No breeding		
Haniane Bay stack	0	0	3	no count				0	0	No breeding		
West Cliffs	0	0	10	1.9	5.3	8		15	0	No breeding		
Le Puits Jervais	0	0	7	0	0	18		0	0	No breeding		
Little Sister stack	0	0	2	9.3	7.5	10		19	0	No breeding		
La Nache	50.5	24.5	13	17.0	16.6	10	**	74	8-15	8	0	Acc
Fourquie	5.8	5.9	8	0.1	0.4	8		16	0	No breeding		
Coque Lihou	62.3	42.5	11	129.9	56.2	11	*ns*	247	15-20	3	0	Est
L'Etac de la Quoire	0	0	7	0.3	0.8	7		5	0	No breeding		
Rousset	0	0	0	0	0	0		0	0	No breeding		
								Sum	100-110	66	*0.58*	*Mean*

[1]Counts of all birds present undertaken in April; [2]Counts of all birds present undertaken between 10th May and 10th June; [3]*t-test* difference between means, *ns* = not significant, * p<0.05, **p<0.01; [4]Highest recorded count; [5]Number of nests that could be monitored for productivity; [6]Acc = accurate, Est = estimate, e.g. based more on observations of food provisioning rather than chick sightig

Table 11. Razorbill counts, nesting numbers and breeding success at each site. Pre-season and in-season counts were undertaken in April and June, respectively.

Site	Counts									Breeding success		
	Pre-season[1]			In-season[2]				Peak[4]	No. of nests	No. monitored[5]	Productivity	Quality[6]
	Mean	StDev	*n*	Mean	StDev	*n*	*diff*[3]					
Les Etacs	1.3	0.4	11	0	0	10		2	0		no breeding	
Ortac	0	0	2	0	0	2		0	0		no breeding	
Renonquet	0	0	2	0	0	2		0	0		no breeding	
Nannels	0	0	2	0	0	2		0	0		no breeding	
Burhou	0	0	2	0	0	2		5	0		no breeding	
Haniane Bay stack	2	0	3	no count				4	1		*Insufficient data*	
West Cliffs	6.0	3.9	10	7	3.02	12	*ns*	13	4	2	0	Acc
Le Puits Jervais	0	0	7	0	0	18		2	0		no breeding	
Little Sister stack	11.5	3.5	2	6.5	4.6	11		15	3	3	0	Acc
La Nache	24.5	19.3	13	5.3	5.9	11	*	68	6	2	0	Acc
Fourquie	33.5	19.4	8	17.4	7.3	12	*ns*	64	8	8	0.5	Est
Coque Lihou	49.9	20.3	11	29.5	11.3	13	**	72	15-20	10	0.3	Est
L'Etac de la Quoire	8.0	4.9	7	9.1	5.4	12	*ns*	17	4	2	1	Acc
Rousset	0	0	4	0	0	4		0	0		no breeding	
								Sum	41-46	27	*0.33*	*Mean*

[1]Counts of all birds present undertaken in April; [2]Counts of all birds present undertaken between 10th May and 10th June; [3]*t-test* difference between means, *ns* = not significant, * $p<0.05$, ** $p<0.01$; [4]Highest recorded count; [5]Number of nests that could be monitored for productivity; [6]Acc = accurate, Est = estimate, e.g. based more on observations of food provisioning rather than chick sightings.

4.1.1.4.10 Eurasian Oystercatcher

Eurasian Oystercatchers, *Haematopus ostralegus*, nest all around the coastline of Alderney. This year 42 pairs were observed holding territory and attempting to nest across Alderney, of which data was collected from 29 pairs located predominantly on the north, east and west coast, including 12 nests from within the Ramsar site. For the 26 nests where eggs were observed, mean clutch size was 2.65. Hatching success was 54.54%, and 10 nests failed at the egg stage due to predation or flooding. This is a slight improvement on 2021 with hatching success of 43.75% in observed nests (n=12) (Purdie et al. 2022a). Overall breeding success was unclear as not all chicks were observed until fledging, however, 11 recently fledged chicks were seen at six locations. Fledging success was particularly poor from the Ramsar site area where no chicks were observed past the 1st week of hatching. In contrast, all the fledged chicks were from nests between Braye Bay and Fort Houmet Herbe. One inland nest was observed at Corblets Quarry, a first since detailed nest recording began.

4.1.1.4.11 Ringed Plover

4.1.1.4.11.1 Background

Ringed Plover (*Charadrius hiaticula*) are beach nesting shorebirds. They are a species of conservation concern and remain on the UK red list due to their breeding population halving between 1984 and 2007 (Conway et al., 2007). Once found across Guernsey, Herm and Jersey, Ringed Plover have not bred on Jersey since 2007, and are only an infrequent breeder on Guernsey. As a result, the few pairs nesting on Alderney's beaches are the last regularly breeding population left in the Channel Islands (Young et al., 2021).

To ensure the long-term sustainability of a breeding population of Ringed Plover, a pair on average should fledge at least 1.24 chicks (Brennan, 2021). However, since 2017, Alderney's productivity has been an average of only 0.99 chicks fledged per pair (Purdie et al. 2022) and therefore requires targeted conservation action to improve their breeding success and reduce the risk of local extinction.

The cause of Ringed Plover decline is not known, but disturbance from people and dogs is known to affect nest survival and is therefore a tangible target for conservation action. Previous work has reviewed physically protecting wader nests with barriers as one action that is 'likely to be beneficial' (Williams et al., 2020) for similar species. On the recommendation of the 2021 Ramsar Annual Review (Purdie et al. 2022a), work was therefore undertaken to determine the extent of disturbance from people and dogs across Platte Saline, Clonque, and Saye throughout the breeding season, and to assess whether rope cordons installed around Ringed Plover nests were effective at increasing clutch survival. Specifically, we assessed:

(a) Whether nest outcome differed between cordoned and non-cordoned nests
(b) What caused nest failure for unsuccessful breeding attempts
(c) How disturbance from people and dogs differed between sites

4.1.1.4.11.2 Methodology

Nest Cordons

We identified probable nest sites ahead of the breeding season from locations that had been previously occupied, and which were located above the high water mark and in suitable habitat. We placed rope cordons around three probable areas on Platte Saline (Figure 32.), creating relatively large cordoned areas, unless an existing barrier (such as the wall to the East of the sand works) already limited potential disturbance. We constructed and installed these cordons in the third week of March by siting metal rebar poles at four-metre intervals to create a rectangle with a shortest side of approximately 20 m down the shoreline. We then attached two lines of manila rope to the top and middle of the poles. We chose these heights to allow birds underneath the rope while still acting as a deterrent to people and dogs entering. Public information signs were displayed alongside the cordons. Once a nest at Saye had been identified, we placed another rope cordon around this nest as well. Nesting attempts outside of cordons at Platte Saline, Saye, and Clonque were followed throughout the season without any further cordoning.

Figure 32. The locations of nest cordons on Platte Saline in 2022. The central cordon is shorter in the West to East direction due to existing barriers limiting disturbance on either side. A scale bar and North arrow are shown. Base map from Google Earth satellite imagery.

Nest Monitoring

Nests on all three beaches were located as soon as possible once laying had begun and put under 24-hour observation using trail cameras. We placed Ltl Acorn™ trail cameras with wide angle and close focus capabilities two to three metres from each nest and camouflaged them using nearby flotsam to minimise disturbance to the birds. Each trail camera was set to take three photos once triggered with a minimum three-minute interval between triggering events. This set up conserved battery life and memory space whilst ensuring each camera remained operational long enough to detect events around the nest. We replaced memory cards weekly during nest inspections. Additional observations of the nests were taken from vantage points four times per week, incorporating a morning, midday, afternoon, and high tide period on separate days, with visits lasting one to two hours. During these observations, we made brief visits to the nests to check and document egg progress. We identified cause of nest failure using evidence from the cameras and the in-person observations.

Disturbance Monitoring

We further used vantage-point observations to record disturbance throughout the nesting season. These observations included: the longevity and type of beach use by people, and the birds' responses to humans and/or dogs within the nesting areas. Footage from the trail cameras was also used to determine the frequency of disturbance at each nest by calculating the mean number of nest departures per hour recorded by camera traps (DPH) and then comparing this between beaches.

4.1.1.4.11.3 Results

Nest Outcome

In 2022, six pairs of Ringed Plover nested on Alderney's beaches. These comprised one pair in Saye Bay, two pairs in Clonque Bay, and three pairs on Platte Saline beach. Overall, 15 nesting attempts were made (five within cordons; Figure 33.) with three separate pairs successfully fledging chicks (two of these within cordons). In total, nine chicks were successfully fledged (five from nests within cordons), giving an island-wide mean of 1.5 chicks fledged per pair.

Overall, nests within cordons survived for longer on average than those outside of cordons (Figure 34.). All nests within cordons across the island manged to survive until at least the hatching date, with four out of five nests that hatched sited within cordons, although one nest on Clonque did successfully hatch and fledge four chicks with no cordon present.

Clutch survival in 2022 (31%) was below the yearly average for 2017 to 2021 (35.8%), the period with comparably detailed recording. However, this was nonetheless the third best clutch survival on record, and concurrent with the highest recorded chick survival (54%) (Table 12.). Both represent an increase from 2021.

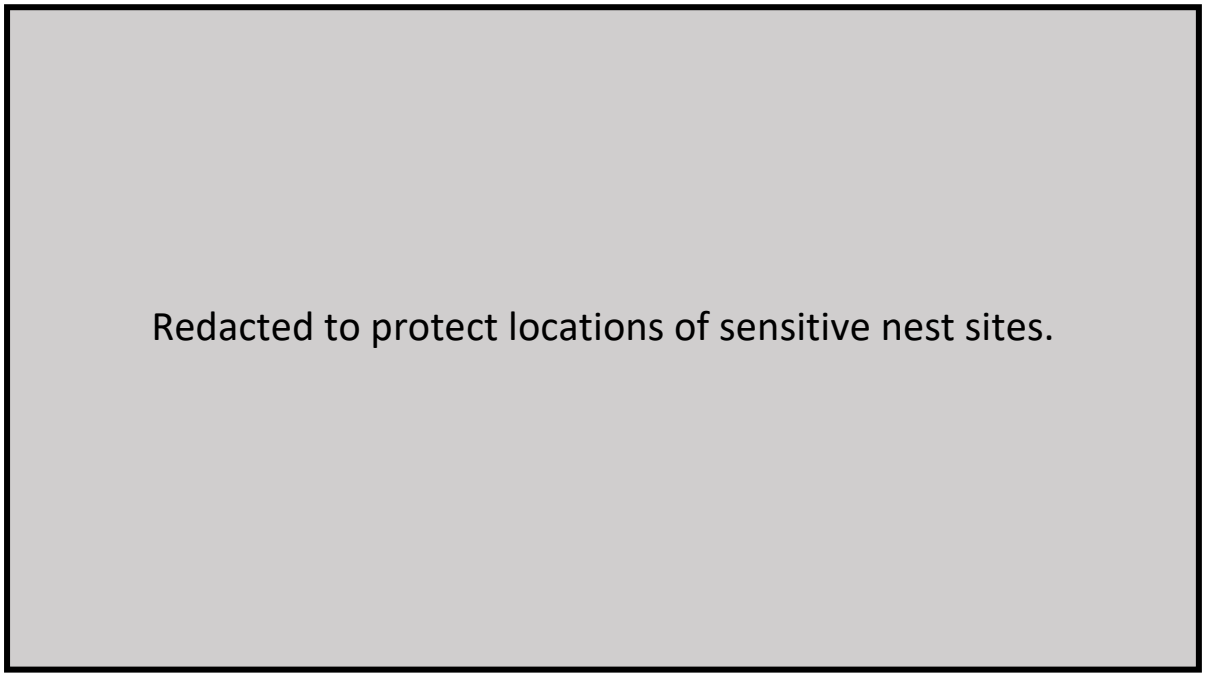

Figure 33. Nest outcome on Platte Saline (panel A), Saye (B) and Clonque (C). Successful nests are those that fledged chicks (cyan circles), failed nests are shown in dark blue circles. White borders have been added to circles where locations were otherwise hard to distinguish against the base map. Cordons are shown as red polygons. A scale bar is shown in each panel. Base map from Esri World Imagery. This figure will be redacted in the public version of this document to protect sensitive breeding birds.

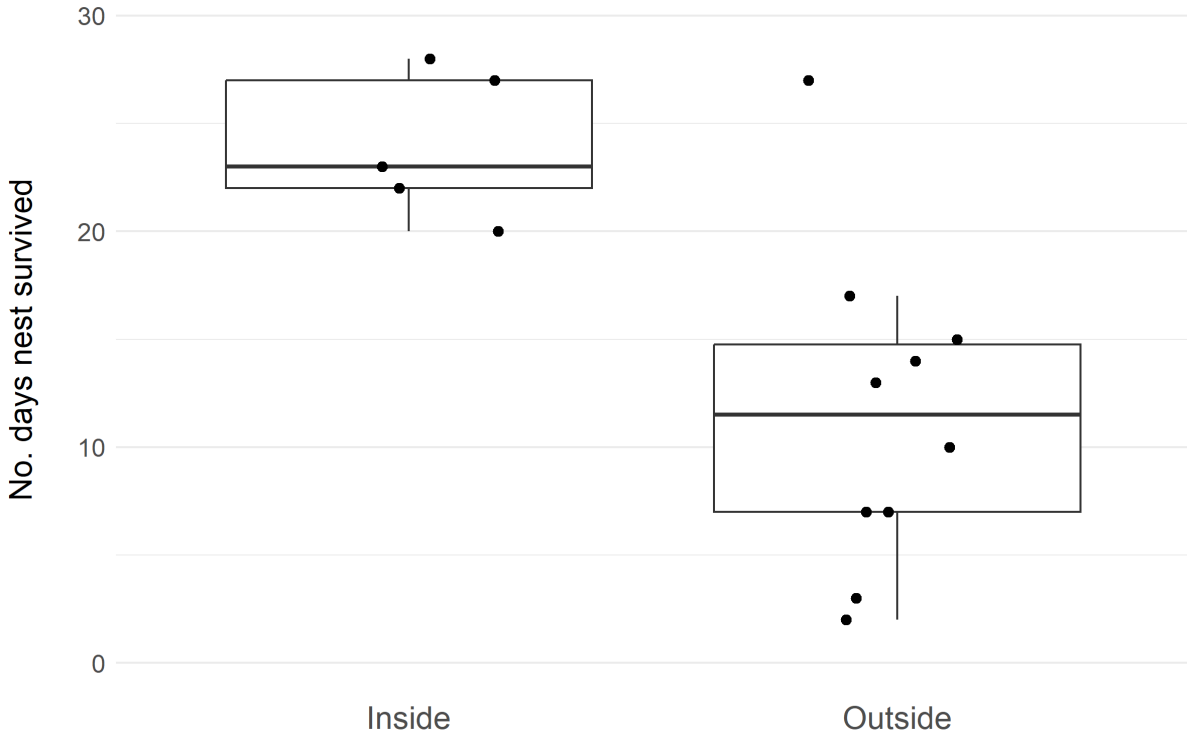

Figure 34. The number of days that Ringed Plover nests survived if they were sited inside or outside of cordons. The boxes represent the first and third quartiles of the data, with the whiskers representing a maximum of 1.5 times the interquartile range. The mean is shown as a thick black line. Every point is shown, with a small amount of horizontal jittering to ensure that each point can be seen.

Causes of nest failure

Exceptional weather events, including high spring tides flooding nests were the main cause of nest loss (Table 12.) and accounted for over half of all nest failures. Predation by carrion crows (*Corvus corone*) was the next most frequent cause of nest loss.

Table 12: Causes of Ringed Plover nest loss in 2022. The table is sorted by nest outcome, then cause of nest loss in order of frequency, and lastly alphabetically by site. n.a. = not applicable.

Site	Nest ID	Cordon	Nest outcome	Cause of loss
Clonque Bay	4_ P3_CLQ	Outside	Failed	Flooded
Clonque Bay	5_P4_CLQ	Outside	Failed	Flooded
Platte Saline	6_P5_PS	Outside	Failed	Flooded
Platte Saline	7_ P6_PS	Outside	Failed	Flooded
Platte Saline	8_P1_PS	Outside	Failed	Flooded
Saye Bay	15_P2_SY	Outside	Failed	Flooded
Clonque Bay	3_P3_CLQ	Outside	Failed	Predation - Crow
Saye Bay	9_P2_SY	Inside	Failed	Predation - Crow
Clonque Bay	13_P3_CLQ	Outside	Failed	Abandoned
Platte Saline	10_P5_PS	Outside	Failed	Predation - Unknown
Saye Bay	2_P2_SY	Inside	Hatched	Predation - Crow
Platte Saline	1_P1_PS	Inside	Hatched	Predation - Crow/Kestrel
Platte Saline	11_P6_PS	Inside	Part Fledged	Partial predation – Crow/Kestrel
Clonque Bay	14_P4_CLQ	Outside	Fledged	*n.a.*
Platte Saline	12_P1_PS	Inside	Fledged	*n.a.*

Causes of nest failure

Observed disturbance comprised people, dogs, rabbits, hedgehogs, rats and many avian species including predators like crows and gulls. An event of partial nest failure occurred when a female Mallard (*Anas platyrhynchos*) damaged an egg in a nest at Clonque. Nests at Clonque were also disturbed by Oystercatchers (*Haematopus ostralegus*).

Due to the presence of the nest cordons, disturbance by people was qualitatively lower than in 2021, although some pairs were observed responding to dog walkers and runners/walkers on the beach. There also appeared to be inter-pair differences in disturbance response, with the pair at Saye Bay appearing more habituated to the presence of people, with less severe responses than pairs on Platte Saline.

Disturbance

Observed disturbance comprised people, dogs, hedgehogs, rabbits and various avian predators such as crows and gulls. Disturbance by people entailed a variety of activities such as dog walking, angling, swimming, sun-bathing and beach sports. Anecdotal observations of beach use by people indicated that Platte Saline and Saye Bay were the busiest of the three beaches used by the plovers whilst Clonque Bay was the quietest. This pattern of beach use was reflected by the nest departure rates. The lowest rates of nest departures were in Clonque Bay, whereas nest departure rates in Saye Bay and at Platte Saline were higher (Table 13.).

Table 13. Mean incidences of nest departure per hour plus/minus standard deviation

Beach	Mean nest departures per hour (+/- SD)
Saye Bay	0.52 (+/- 0.19)
Platte Saline	0.44 (+/- 0.24)
Clonque	0.27 (+/- 0.05)

4.1.1.4.11.3 Discussion

The increased productivity (1.5 chicks per pair fledged, +50% compared to 2021), clutch survival (31%, +9% compared to 2021), and chick survival (54%, +7% compared to 2021) all represent positive steps for the future of the breeding population of Ringed Plover on Alderney. Part of these successes may result from the use of cordons dissuading people and dogs from encroaching too closely on the nests, with promising indications from how long nests inside of cordons lasted relative to those outside of cordons, and the qualitative reduction in human disturbance of nests. Further work is nonetheless needed to establish the extent to which the cordons are responsible for the changes to productivity and mortality. In particular, colour ringing of adult birds would enable pairs to be followed across years, so allowing for individual differences in reproductive success due to, for instance, genetic quality to be disentangled.

Most nests failed because of the extreme spring tides causing flooding, but four others failed due to predation involving crows, with another nest's success limited by crow depredation. This suggests that, while part of the rationale for implementing the cordons was to limit the frequency with which adult birds are flushed from a nest, and so limiting the likelihood of crows and other predators of locating the nest, further action limiting nest depredation may be beneficial for the Ringed Plovers. A potential option for this would be to control crow reproduction around Saye Bay (e.g. by addling eggs).

4.1.1.4.12 Wetland Bird Survey (WeBs)

The Wetland Bird Survey (WeBS) Is the BTO's scheme to monitor non-breeding wetland birds in the British Isles. The main aim of WeBs is to identify population sizes, determine trends in numbers and distribution, and identify important sites for wetland birds. WeBS core counts are carried out on prioritised dates each month at designated sites throughout the British Isles. Ideally core counts are undertaken at high tide when most wetland birds are least dispersed and easiest to count. The value of WeBs lies in its consistency, wide distribution, and the long-running dataset it contributes towards. This means any changes detected in these data represent real national trends and not just local changes of differences between sites.

In the Ramsar site, WeBS were carried out in Clonque Bay and Platte Saline throughout 2022. All these data were submitted to WeBS online and data is available through: (https://www.bto.org/our-science/projects/wetland-bird-survey/data/submit-data-request).

31 species were observed between these two sites, with Herring Gull, Oystercatcher, Black Headed Gull, *Chroicocephalus Ridibundus*, Ringed Plover and Eurasian Curlew, *Numenius arquata***,** being recorded the most in that order. High counts for these species were 206 Herring Gull in March, 196 Oystercatcher in November, 55 Black Headed Gull in September, 46 Ringed Plover in November and September, and 37 Eurasian Curlew in December. As a proportion of the total island count for these species this year, the Ramsar site held 74% of the Curlew, 67% of the Ringed Plover, 46% of the Oystercatcher, 46% of the Herring Gull and 32% of the Black Headed Gull, signifying the sites importance migratory birds in addition to those breeding.

Table 14. Counts of breeding seabirds conducted in 2022 during boat-based and vantage point surveys around Alderney's coastline and near shore islets and in town.

		Alderney mainland			Hanaine bay stack			Le Puits Jervais			Twin sisters			Coque Lihou			L'Etac de la Quoire			Rousset			Queslingue			Fort Herbe			Houmet Agneaux			Houmet de Pies			**Totals**		
Species	Count	16/05/22	27/05/22	03/06/22	16/05/22	27/05/22	03/06/22	16/05/22	27/05/22	03/06/22	16/05/22	27/05/22	03/06/22	16/05/22	27/05/22	03/06/22	16/05/22	27/05/22	03/06/22	16/05/22	27/05/22	03/06/22	16/05/22	27/05/22	03/06/22	16/05/22	27/05/22	03/06/22	16/05/22	27/05/22	03/06/22	16/05/22	27/05/22	03/06/22	16/05/22	27/05/22	03/06/22
Cormorant	AON	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-	0	0	nc
Shag	AON/AOT	65	71	-	2	3	-	5	5	-	8	10	-	41	45	-	11	7	-	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-	132	141	nc
Fulmar	AOS	48	56	62	0	0	0	0	0	1	1	1	2	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	59	67
Great Black-backeded Gull	AON	6	6	-	0	0	-	0	0	-	0	1	-	0	0	-	0	0	-	0	0	-	1	1	-	0	0	-	0	0	-	2	1	-	9	9	nc
Lesser Black-backed Gull	AON	16	18	-	0	0	-	0	0	-	7	7	-	9	9	-	1	2	-	0	0	-	0	0	-	0	0	-	0	0	-	1	1	-	34	37	nc
Herring Gull	AON	95	117	-	0	1	-	0	1	-	5	5	-	1	2	-	13	13	-	0	0	-	0	0	-	0	0	-	2	1	-	1	2	-	117	142	nc
Herring Gull (roof top)	AON	6(13)*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6(13)*		
Common Tern	AOT	0	18	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18 ***	21	0	0	0	0	0	0	0	18	21
Guillemot	IND	0	0	0	0	0	0	0	0	0	0 ***	17	10 **** , †	30	247 (144, *103*) **	83 (43, *40*) **	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Refer to land-based counts for more accurate data		
Razorbill	IND	1	3	3	0	1	1	0	0	0	16	7	18 ‡	10	26 (18, *8*) **	42 (27, *15*) **	5	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Puffin	IND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Key: nc = not counted, * = Six confirmed in New Town, another seven potential AOS in Old Town and Le Petit Blaye. **count in brackets is from shore in the morning with standard font = on the islet & italic font = on the sea. ***count from 31/05/22.**** La Nache abandoned in afternoons. † = All birds on Little Sister. ‡ = 10 birds on Little Sister, two on the sea.

Recommendations

- Maintain the current programme of monitoring, including Ortac, Burhou and the outer islands when feasible, and ensure a sufficient number of round island boat surveys are scheduled between mid-May and mid-June.
- Continue to deploy temporary signage close to the accessible tidal islets to inform the public of the presence of ground nesting birds and encourage them not to cause any disturbance. Consider updating signage and expanding outreach to ensure it is effective in reducing disturbance.
- Skip the census of nesting Lesser Black-backed Gulls nesting on Burhou until 2024
- Continue roof-top census of Herring Gulls
- Continue programme of Razorbill and Guillemot monitoring, improving coverage where possible
- Continue to monitor the numbers of nesting Ringed Plover and their breeding success.
- Work with the State's Public Works department to redeploy Ringed Plover nest cordons and temporary signage.
- Consider control of crows at Saye bay (e.g. through egg addling), consulting with the ARAG including the States Vet.
- Propose the colour-ring adult and chick Ringed Plovers to help study their survival, recruitment, site fidelity and movements. Correspond with the CIBRS & ABO to develop this.
- Continue monthly WeBs counts.

4.1.2 Seabird Ringing

The seabird ringing programme on Alderney is undertaken on behalf of the GSC by the Alderney Bird Observatory (ABO). The AWT was provided with a report on this by the ABO which has been appended below, with some minor edits (e.g. insertion of links to relevant sections in this report, formatting of data from a table into a figure (Figure 36.)).

4.1.1.1 The 2022 Alderney Bird Observatory Seabird Ringing return - contributing to the Ramsar program.

The 2022 seabird ringing program was all but wiped out due to the avian flu virus. The ABO worked closely with the States veterinary officer and The Channel Islands Bird Ringing Scheme monitoring the progress of the virus as it spread to southern England and parts of the French coastline. By mid-June there were no confirmed cases of the disease locally, but the ABO adopted a precautionary approach cancelling its visit to Coque Lihou. By month end, in the interests of avoiding potentially spreading the disease amongst nesting birds via footwear and for public health/safety reasons the Channel Islands ringing scheme advised its members they could not visit any offshore seabird colonies across the Channel Islands until further notice, this ban remained in place to year end. Thanks to the longevity of the annual Gannet chick ringing program in Alderney (since 1948) it was possible to measure the increase of reported dead ringed Gannets against previous years and against 'average' year mortality rates enabling some viable estimates of the losses to be measured (see section 4.1.1.2.4). Ahead of a memorable seabird season for all the wrong reasons the ABO were at least able to continue the Cormorant chick colour ringing at the end of April (see section 4.1.1.4.3), this proved to be the only part of the program completed for 2022.

Cormorants have made a significant transition over the last 40 years with marine colonies depleting by more than 10% in favour of birds taking advantage of semi-urban inland reservoir and fishing lake habitats as locations for breeding. There are only around 9000 breeding pairs across the British Isles and whilst they are protected under UK legislation they could be considered as 'not popular' and subject to persecution at locations where they are thought to impact on private fish stocks. The colour ringing of these birds will help us understand if birds hatching at our marine colonies are remaining in Alderney waters, moving on to join other breeding colonies in the wider Bailiwick and Channel Islands or if indeed these birds are choosing inland locations in the UK or on the nearby continent at which to raise the next generation.

This year's Cormorant research was completed on the same day as it was in 2021, the 29th of April. The Risk assessment was delivered to the harbour office prior to departure and as with previous years we used Avante Boat Trips with experienced boat skipper Dave Venn for our nautical transport and transfers. The ringer in charge made some changes to the methodology and delivery of this year's data collection program benefitting the operation on a number of levels, firstly, a new landing location (Figure 35.) was decided upon, this year landing directly on Little Burhou itself replacing the traditional landing below the Burhou accommodation hut, a process that necessitated walking the team west along Burhou to Little Burhou during the window when it is accessible at low tide. The new landing location was a great success proving very easy for the researchers to get ashore it also completely negated the necessity of walking more than half the length of the island to get to Little Burhou, avoiding the tricky climb across to Little Burhou reducing risk of injury to team members, saving a lot of time, and greatly reducing disturbance on the island in general. Further, landing on the south side of Little Burhou on the blind side of the colony enabled very quick access to and exit from the nesting colony, the team not being visible to the birds from this new approach location (unlike in previous years) also reduced

disturbance and allowed the birds to quickly settle down after the research work was completed given we were out of sight of the birds within a minute of completing the work

Figure 35. ABO seabird ringing team member Matt Scragg (ABO Asst. Warden) awaiting extraction from Little Burhou, the Cormorant colony situated just a few meters beyond the ridge above him (Credit ABO).

A further change, subtle but proving significant in terms of the birds welfare was to alter the method of securing the birds for ringing. Instead of chicks being 'corralled' and then individually placed inside large soft cotton bags prior to being ringed, this year our team members quickly placed a large cotton bag over the top of each nest and chicks. This proved extremely beneficial, the chicks were likely much calmer having been able to remain on their respective nests with their siblings, once covered they were unaware of the movement of the team, the bags also served to shelter the birds from sunlight in the absence of their parents. Using this method, the team were able to move methodically and efficiently between nests, the provision of the new bird management process also reduced the time the team were at the nesting colony.

There were 15 chicks from 9 nests in total, 5 chicks that were too small to ring and one chick had perished (Figure 36.). The colony nested again at the same location as last year having moved here in 2021, this site being further to the west of the area utilised 2016-2020, the new location facilitates a larger number of nests and is more easily accessible to our team. The Cormorants have historically used the current location prior to 2016 but there do not appear to be any detailed historic records documenting any movements. Each chick was fitted with a Channel Islands Bird Ringing Scheme metal ring size 'G' on its left leg and on the right leg a single black plastic darvic type ring with white digits sourced by Alderney Bird Observatory that may be read by observations in the field.

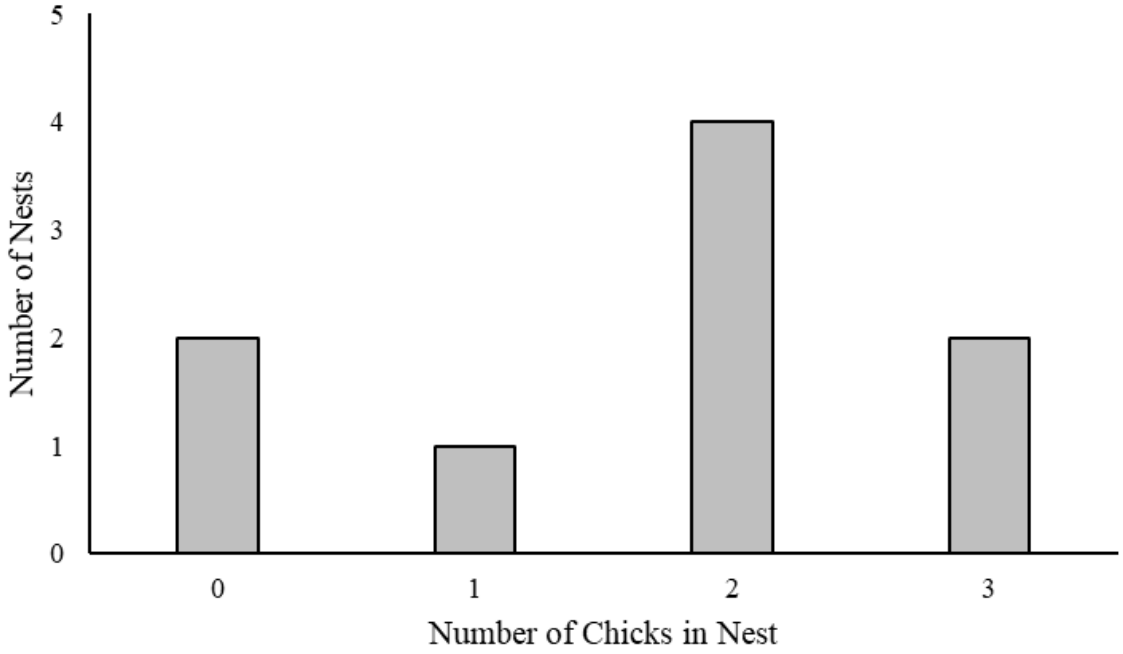

Figure 36. – Number of Cormorant nests with against the number of chicks found in the nests in 2022 during the ABO/CIBRS Cormorant Ringing Trip.

Table 15 – Information from the ringing trip to Little Burhou.

Date	29/04/22
Species	Great Cormorant *Phalacrocorax carbo*
Location	Little Burhou Island
Number of people involved in ringing	4 (licenced ringers)
Time on Island	13:40-14:25
Time Spent Ringing	20 minutes
Capture method	By hand
Number of Birds Caught	9
Number of controls/retraps/injuries/casualties	0
Weather conditions	Wind ENE 13-15mph, Relative Humidity 76%, Temperature 12C, sunny light cloud.

Recommendations

- From Section 4.1.1.2: *Renew colour ringing programme on Les Etacs and Ortac to enable accurate estimates of adult survival in light of HPAI outbreak. Colour ring Gannets with and without the 'black-eye' HPAI symptom to establish its impact of this on adult survival.*
- From Section 4.1.1.4: *Propose the colour-ring adult and chick Ringed Plovers to help study their survival, recruitment, site fidelity and movements. Correspond with the CIBRS & ABO to develop this.*

4.2 Terrestrial

4.2.1 Rat Control

4.1.1.4 Rat Control in 2022

In 2022 the implementation of a rat eradication scheme was investigated to determine if it could contribute towards improving the local Guillemot and Razorbill breeding populations, in addition to the control of rats on Fort Houmet Herbe to improve Common Tern breeding success. The rat management programme sought to eliminate rats from the tidal islets of Hanaine Stack, the Twin Sister Stacks, L'Etac de la Quoire, Rousset and Fort Houmet Herbe (Figure 37.) using a combination of toxic baiting in winter and trapping over the nesting season. The toxic baiting was confined to the islets and comprised wax bait blocks with 0.005% bromadiolone deployed in tamper proof bait boxes. The trapping was undertaken using Good NatureTM A24 traps and replaced the baiting on the islets over the nesting season to help maintain biosecurity while the birds were present but access to the islets was prohibited to prevent disturbance. Some traps were also deployed on the shore opposite the islets to limit incursions from the mainland.

Figure 37. Location of rat baiting and monitoring stations around Alderney and its outer islands.

Information obtained from the rat management effort was used to determine which islets were rat free prior to and during the nesting season but also gain insight to what practices might work best. Trail cameras were deployed at bait boxes, traps and nesting areas to identify the rat species present, any predation or disturbance of nests and which species were responsible. A thermal imaging camera was also used to detect rats and observe their behaviour on islets in the nesting season. Causes of nest loss were identified from observations, trail camera footage or signs found posthumously during post-season site visits.

Rats were found on all the tidal islets and attempts to eliminate them were undertaken on five that were accessible but were only successful at one of these. Evidence indicated that toxic baiting over winter and A24 trapping over summer only temporarily eliminated or suppressed rat presence on the islets because the rats were able to repopulate them from the mainland. The Common Terns on Fort Houmet Herbe had a catastrophic breeding season (Section 4.1.1.4.8). A potential failure to successfully

eradicate rats from here may have contributed to this. Control on the mainland using A24 traps may have helped prevent these incursions at the one tidal islet that remained rat-free over the nesting season but not at the other sites. Black rats were identified on all the baited islets and at the birds' nesting sites that weren't rat free. Brown rats were present on one islet without nesting auks. Both species occupied the mainland. Continued exploration of rat management strategies has the potential to benefit breeding seabirds within the control areas. Further investigation is required to determine the scope of potential effect.

4.1.1.5 Biosecurity on Burhou and Coque Lihou

In late 2022 an enhanced monitoring programme was implemented on Burhou and Coque Lihou. Bait boxes were placed at 25 m intervals in a 75 m x 100 m grid around the Burhou hut (the most likely incursion point), and one station at either end of the island, and at 25 m intervals across Coque Lihou. These boxes are checked monthly outside of the seabird breeding season and a supply of toxic bait is maintained to enable a rapid response to any incursion by rodents.

Recommendations

- Closely monitor the arrival of the Common Terns and where they choose to settle each year. Be prepared to introduce rat control to new sites at short notice if necessary.
- Consider using a 'pulse-baiting' strategy on Houmet Herbe to reduce the amount of toxin entering the environment whilst maintaining effective control.
- Deploy non-toxic bait on tidal islets and adjacent shoreline to monitor for the presence of rodents. Monitor the impact of rodents without suppression on breeding Razorbills and Guillemots.
- Develop the bio-security plans for Burhou and Coque Lihou to help ensure any incursions by rodents are treated effectively and in a timely manner. This may include remote monitoring e.g. through audio recording or camera trapping and should include an eradication plan and public education.

4.2.2 Bat Surveys

Four bat detectors were installed at sites within the Ramsar site as part of the Bailiwick Bat Survey for both the survey periods (April – July and July - October). Species detected include six bats: Serotine (*Eptesicus serotinus*), Natterer's (*Myotis nattereri*), Kuhl's pipistrelle (*Pipistrellus kuhlii*), Common pipistrelle (*Pipistrellus pipistrellus*), Grey (*Plecotus austriacus*) and Brown (*Plecotus auritus*) Long Eared bats; two other mammals: Greater White-toothed shrew (*Crocidura russula*) and Brown rat; and 4 insects: Long Winged Conehead (*Conocephalus fuscus*), Speckled Bush cricket (*Leptophyes punctatissima*), Grey Bush cricket (*Platycleis albopunctata*), Great Green Bush cricket (*Tettigonia viridissima*)

Due to the HPAI outbreak Burhou was off limits during the Bailiwick Bat Survey 2022, as such no recordings were taken there.

Data can be accessed at: https://www.biologicalrecordscentre.gov.gg/our-projects/bbs/. The Bailiwick bat survey will continue for another two-years.

Recommendations

- Continue monitoring Bats within the Ramsar site as part of the Bailiwick Bat Survey.

4.3. Marine

4.3.1. Rocky Intertidal Surveying

4.3.1.1 Intertidal Habitat Biotope Survey of Hanaine Bay

A marine habitat biotope mapping survey was undertaken at Hanaine Bay in 2022, with the aim to record the presence, location and extent of the marine habitat biotopes within the bay. This survey method is completed at selected bays across Alderney every five years, including the bays within the Ramsar Site. A total number of 22 different habitat biotopes and 7 target notes were recorded within Hanaine Bay (survey area: 34,844 m²), (Figure 38.). This included lichen, seaweed and barnacle dominated habitat biotopes, which were associated with strong wave action/tidal conditions (Figure HAB.). Of notable interest was the presence of the habitat biotope titled: '*Corallina officinalis* on exposed to moderately exposed lower eulittoral rock', found at the lower shore section of the bay (Figure 38.). This habitat biotope can be considered rare on Alderney (in terms of its frequency compared to other surveyed bays).

In general, the results differ to previous years (2017; 2012), in terms of habitat biotope type presence, location/distribution and extent (Figure 38.) (OTHER CITATION, Copping et al. 2018)). Throughout the bay, large quantities of sand/gravel substrate were observed, compared to none recorded in previous surveys. As such, several recorded habitat biotopes and species associated with sands/gravel/mixed substrate were recorded, such as the 'Ephemeral green and red seaweeds on variable salinity and/or disturbed eulittoral mixed substrata' habitat biotope (JNCC habitat code: LR.FLR.Eph.EphX) and the Sandbinder red seaweed: *Rhodothamniella floridula* (Figure 38.). This may potentially be due to the increased frequency of storms/strong tides and wave exposure over the last couple of years, enabling more sand/gravel to accumulate within the bay.

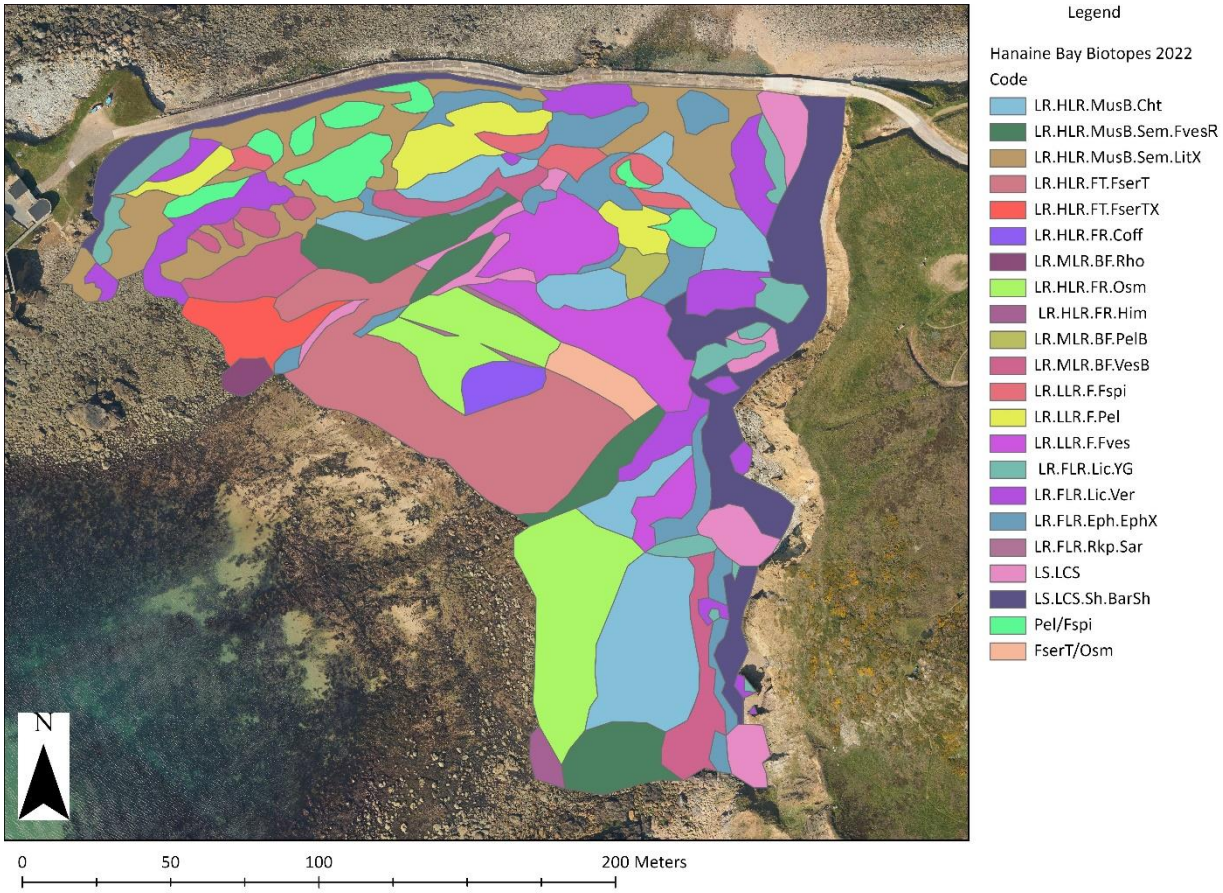

Figure 38. Presence, location and extent of intertidal habitat biotopes recorded on Hanaine Bay in 2022. A scale bar is shown at the bottom of the map.

There was also quantitative intertidal species survey of Burhou scheduled, to assess habitats which were not accurately identified in the 2021 biotope survey, however, due to HPAI restrictions on Burhou, this could not be completed within the survey window.

Recommendations

- Repeat the Hanaine Bay intertidal habitat biotope survey in 2027, as per JNCC recommendations (Davies et al. 2001).
- Conduct intertidal habitat biotope survey of the offshore islets in 2023.
- Conduct quantitative intertidal species assessments on Burhou and Hanaine Bay in 2023.

4.3.1.2. Green Ormer

The Green Ormer, *Haliotis tuberculata*, (henceforth referred to as "Ormer") survey methodology was updated in 2022 to enable assessment of their abundance and movements. 10 m x 10 m 'Ormer Squares' were designated in Clonque, Longis and Braye Bay. On a survey all the rocks/ small boulders within these squares were turned over. The number of Ormer found was recorded, their shell length and width measured with a micrometer, and they were tagged following methodology described in Bush et al. (2021).

Seven Green Ormer (*Haliotis tuberculata*) surveys were completed in 2022, primarily within Clonque Bay and also Hanaine Bay. These surveys recorded a total number of 55 Green Ormer individuals, with several fitted with small tags (to assess population movements). Shell lengths ranged from 20 – 115 mm long and shell widths from 10 – 85 mm.

Recommendations

- Continue conducting updated Ormer surveys
- Schedule programme of surveys to ensure sufficient data is collected to estimate abundance
- Consider revisiting sites sooner to resight tagged Ormer

4.3.1.3 Intertidal Crabs

Anecdotal evidence from AWT staff and members of the public has raised concerns there has been change in crab species compositions found around Alderney. This evidence suggests that the Furrowed Crab, *Xantho sp*, is colonising the shoreline, whilst initial observations imply that the Chancre population, *Cancer pagurus,* (called an Edible Crab in the UK) has declined. Furthermore, relatively high parasite loads have been noted on Chancre individuals, especially at Longis Bay. To verify if there is a species composition shift occurring a programme of intertidal crab surveys targeted at populations of Chancre and Furrowed crabs was started in 2020. The survey Methodology was updated in 2022 to improve quality of long-term data collection.

Three parallel 20 m transects were placed 10 meters apart, to create a 20 m x 20 m survey area. Surveyors walked along each transect and turned over the nearest rock (between 30-60 cm diameter) at two-meter intervals. The number and species of crabs found were recorded, and the following information and measurements taken of any Furrowed crab and Chancre found; sex; presence of eggs; carapace width (mm); carapace length (mm); crusher width (mm); crusher length (mm); width of second segment of abdomen flap (mm); width of abdomen flap between back legs (mm); moult index and pathologies identified. Additionally, a photograph was taken of Furrowed Crabs and Chancre.

Three intertidal crab population surveys were completed in 2022, primarily within Clonque Bay (two surveys recorded on the same day in different locations across the bay). From these three surveys, a total number of 57 crab individuals were recorded. This included 19 Montagu/Furrowed crab (*Xantho species*), 9 Chancre crab (*Cancer pagurus*), 1 Green Shore crab (*Carcinus maenas*), 4 Velvet Swimming crab (*Necora puber*), 17 Long-Clawed Porclain crab (*Pisidia longicornis*) and 7 Broad-clawed Porclain crab (*Porcellana platycheles*). The surveys also recorded crab sex, shell size and quality. Several crabs were also recorded with eggs.

Recommendations

- Continue crab surveys in 2023
- Schedule programme of surveys to ensure sufficient data is collected to estimate relative abundance of Chancre and Furrowed crabs.

4.3.1.4 Shoresearch

Four Shoresearch walkover surveys completed in 2022 on Hanaine Bay, Clonque Bay (x2 surveys) and Platte Saline Bay. A total number of 83 species recorded across the bays, with Clonque Bay comprising the highest number of species during one survey (n = 55). Recorded species included seaweeds, sea-anemones, sea-slugs, sponges, crustaceans, molluscs and fish, included a sea-spider. These surveys also recorded presence of any invasive species, such as Harpoon Weed, *Asparagopsis armarta*. Data from Shoresearch surveys are publicly available on the National Biodiversity Network, NBN, Atlas: (https://nbn.org.uk).

Recommendations

- Continue conducting Shoresearch walkover surveys with an updated survey programme to ensure sufficient data is collected.

- Continue recording invasive species through Shoresearch walkover surveys
- Consider carrying out other Shoresearch surveys (e.g. sediment, quadrate) to improve data collection.

4.3.1.5 Climate Change Indicator Assessment

Tuning fork Algae, *Bifiucaria bifurcata,* is a climate change indicator species. Annual surveys of the rockpool habitat: '*Bifurcaria bifurcata in shallow eulittoral rockpools'* (JNCC habitat code: LR.FLR.Rkp.Cor.Bif) was completed successfully within Clonque Bay. This comprised of sampling physical parameters (rockpool size, depth and substrate type) and marine species (flora and fauna species) within ten pre-selected rockpools. This year, survey results showed variable rockpool size, depth and substrate type (such as bedrock, rocks, cobbles and gravel). A total number of 18 seaweeds and nine faunal species were found within the rockpools, including two invasive seaweeds; Oyster Thief (*Colpomenia peregrina*) and Japweed (*Sargassum muticum*). A full report will be published in the review of ARS3.

Reccomendations

- Review schedule of Cor.bif surveys, consider repeating every three-years as opposed to annually.

4.3.2 Benthic Ecology and Topography

4.3.2.1 Seasearch

Limited Seasearch (dive/snorkel-based ecology surveys undertaken by trained Seasearch volunteers) surveys were completed within the Ramsar Site in 2022. Results will be provided by Seasearch in spring 2023. No pink sea fan surveys were conducted in 2022 due to resourcing.

Recommendations

- The Ramsar site has the potential for unique benthic ecosystems, especially noting the unusually strong tides. It is therefore recommended that Seasearch surveys are conducted in the site in 2023, possibly by facilitating more Seasearch training for people on Alderney.
- Add to the growing baseline of marine life records by extending the programme of Seasearch diving around the south and west coast islets.

4.3.2.2 BRUV

No baited recorded underwater video (BRUV) surveys were conducted within the Ramsar site in 2022, due to equipment failure and resourcing.

Recommendations

- Replace BRUV camera equipment.
- Update BRUV survey schedule and methodology to ensure an adequate number of surveys are completed and there are repeats of surveys in the same location.

4.3.3 Pelagic Surveying

4.3.3.1 Plankton

In collaboration with The Wildlife Trusts (TWT) and University of Southampton, the AWT were gifted a Planktoscope, with the aim to identify inshore plankton species. Several trials of the equipment were completed within Clonque Bay, with initial samples added the EcoTaxa website. Trials are ongoing.

Recommendations

- Continue to work with TWT to develop a survey programme for the Planktoscope in 2023.

4.3.3.2 Fish Intel Project

The FishIntel Project is a cross-channel partnership (EU, UK and Channel Islands) using a number of novel techniques to accurately record marine species movements and identify how they utilise marine habitats. During 2022, eight FishIntel acoustic receivers were deployed across the Channel Islands. Two were deployed within Alderney's territorial waters; one within the Ramsar Site (spring – autumn adjacent to Burhou then Hanaine Bay during the winter) and one within Longis Bay. The deployed receivers comprise a C-POD; to detect acoustic signatures from Cetaceans and a fish receiver; to detect electronic tags attached to selected fish/shellfish species, such as Blue Fin Tuna (*Thunnus thynnus*).

The project was sponsored in Alderney's waters independently by the AWT in 2022, and through the Ramsar programme by the SoA in 2023-24.

Preliminary results comprise a small number of signatures from Bottlenose dolphins (*Tursiops truncatus*), a potential tagged fish and seawater temperature information. Further results are expected in 2023.

- Support the continuation of the FishIntel project in 2023.

4.3.3.3 Seawater Quality Testing

The SoA requested AWT and the States Public Works department work together to develop a programme of seawater quality testing. A proposal for this is being developed and will be submitted to GSC.

Recommendations

- Begin the programme of seawater quality testing in 2023.

4.3.4 Marine Mammal Surveying

Several marine mammal species surveys and recording strategies have been undertaken throughout 2022 within the Ramsar Site. This includes: Boat-based Grey Seal surveys; Grey Seal photographic identification catalogue; public sightings and stranding information.

4.3.4.1 Effort Based Grey Seal Surveying

A total number of eight marine mammal boat-based surveys were completed across the Ramsar Site, throughout 2022 (primarily late spring – winter). These surveys aimed to record Grey Seal (*Halichoerus grypus*) abundance and population information on and around the islets behind Burhou. A total number of 256 Grey Seal individuals were recorded this year, which included male (26% present) and female (70% present) individuals (4% unknown). This information has been submitted to the Chargée de mission Mammifères marins, Groupe Mammalogique Normand (GMN), with an annual Channel Island Grey Seal abundance summary report to be written by them in due course.

Following a delayed changeover in staff at GMN which resulted in a cessation in guidance on survey dates, AWT contacted stakeholders across the Channel Islands and scheduled survey dates. In early 2023 GMN were able to resume their administrative role.

Recommendations

- Continue to conduct effort-based Grey Seal surveys in 2023.
- Support an MSc project in 2023 to review Grey Seal survey data and methodology.

4.3.4.2 Grey Seal Identification

Photographs of the individual Grey Seals were taken during effort-based surveys and opportunistically. This helps identify their age (e.g. adult or juvenile life stages) and any other observations (such as injury). These photographs were then used to help populate the Grey Seal photograph identification catalogue (Figure 39.), which aims to identify individuals. The catalogue now comprises 62 Grey Seal individuals, for which five new individuals were added from this year's surveys.

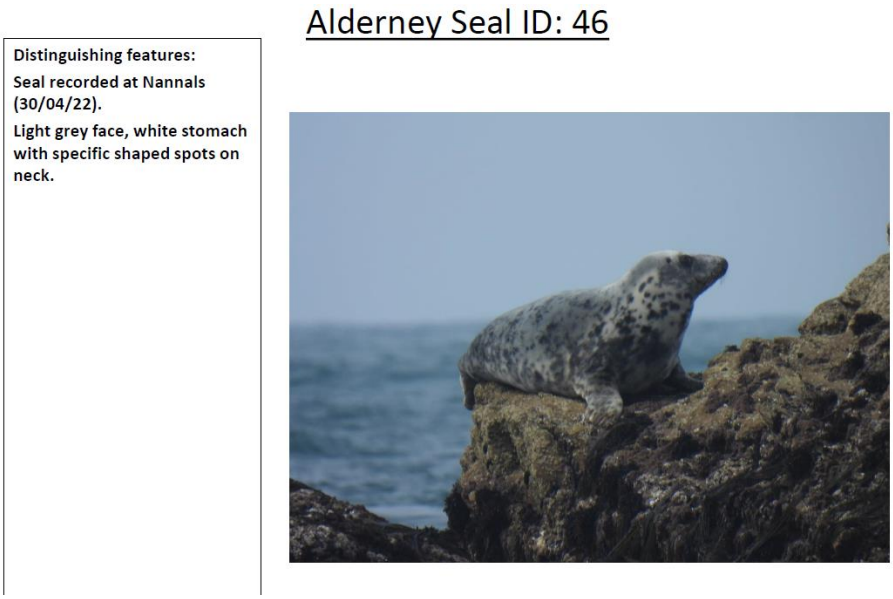

Figure 39. An example of the Grey Seal ID catalogue. This female Grey Seal (#46) was first identified on the 30/04/22 seal survey and can be distinguished by the pattern of spots on her neck.

Recommendations

- Continue to photograph Grey Seals to create a more comprehensive catalogue in 2023.
- Share the Grey Seal catalogue with stakeholders across the Channel Islands to investigate movements of individuals between the islands.

4.3.4.4 Cetaceans

A number of marine mammal sightings spotted by the public and AWT ecologists within the Ramsar Site were collated by the AWT during 2022 This included several sightings of Bottlenose dolphin pods throughout the year. Adjacent to the Ramsar site there were also sightings of Common dolphin, *Delphinus delphis*, Minke whale, *Balaenoptera acutorostrata*, and a large pod (ca. 50) of Long-Finned Pilot whale, *Globicephala melas*. The Fish Intel project provided data on the use of the Ramsar site by toothed whales in 2022, with the calls of Bottlenose dolphin being detected (See section 4.3.3.2). Once analysed, these data can inform of the behaviour of these cetaceans within the Alderney Ramsar site.

Recommendations

- Continue to opportunistically record cetacean sightings in 2022.
- Continue to be supportive of the FishIntel project in 2023.

4.3.4.5 Marine Mammal Strandings

Live and dead strandings of marine mammals (Pinnipeds and Cetaceans) upon Alderney are recorded by the AWT. Dead strandings of marine mammals are removed from beaches/bays by SWD if considered a risk to the public. Trained British Marine Life Rescue Divers volunteers (BDMLR) on Alderney coordinate activities (with AWT and SWD) when a live marine mammal strands upon a beach/bay, such as cordoning off areas to the public to allow seals to rest.

During 2022, no live or dead marine mammal strandings were found within the Ramsar site.

Recommendations

- Support will continue to be given to local British Marine Life Rescue Divers (BMLRD) if a marine mammal stranding occurs in 2023. The management of marine mammals on our shores (those subject to human disturbance) will be coordinated through BMLRD trained staff.

4.3.5 Academic Projects

No marine academic projects were conducted within the Ramsar site in 2022. Contact was made with Exeter University and two projects have been developed for 2023.

Recommendations

- Support academic projects within the Ramsar site in 2023.

4.4 Education and Outreach

Education and outreach are a pillar of AWT's work within the Ramsar site. AWT aims to enable the public of Alderney and the wider world to both experience the internationally important are and learn about the habitats and species of Alderney's Ramsar Site. This is achieved through a large programme of events, public engagement by staff and volunteers, and a suite of online information and webcams.

4.4.1 Wildlife Webcams

Each year the AWT stream live wildlife webcams online through the 'LIVE: Teaching Through Nature' website and on the Live: Teaching Through Nature Facebook page. Three cameras have streamed the Puffin breeding season (mid-March to late-July) since 2018 and includes 'Colony Cam', a pan tilt zoom (PTZ) style camera that can be controlled remotely. In 2022 the Colony Cam PTZ was updated to a new Axis Q6075-E PTZ camera (See Section 4.1.1.1.3). This not only enabled enhanced monitoring of Alderney's Puffin colony, it gave the public a much improved view of the wildlife on Burhou, with highlights including baby Puffin, Peregrine Falcon, Grey Seal, Shelducks, and a host of other wildlife and interactions the public could observe through the camera.

'GannetCam' is another PTZ camera (funded directly by the AWT through private donations) and streams from the western cliffs of mainland Alderney overlooking the Les Etacs Gannetry. Despite being stationed over 350 m from the colony, the camera's powerful zoom allows viewers to follow birds throughout the breeding season. 'GannetCam' continued to stream over winter and was able to capture the incredible moment of landfall, on 16.02.22. This event was livestreamed for the first time, and timelapse recordings of the event provided the public with a new insight into the spectacle.

The cameras under both 'PuffinCam' and 'GannetCam' rely on a complex network of solar charging equipment, batteries, data transmitters and cabling. In the case of 'PuffinCam', installation was made on 11/04/22 following the failure of the old PuffinCam and it was taken down in October following the lifting of HPAI (Section 4.1.1.1.3), whilst GannetCam was redeployed prior to the landfall and continued streaming after the end of the season.

When not undertaking survey work, cameras were positioned to best show off Alderney's natural history through pre-programmed tours and live controlling by the public via the AWT's Wildlife Information Centre, often with virtual guided tours from AWT ecologists.

Video recorded from PuffinCam was livestreamed consistently from 30/04/22 until 20/10/22, and GannetCam continued to stream throughout the year from 31/01/22 via the LIVE: Teaching Through Nature website and Facebook page. Livestreams of both PuffinCam or GannetCam were interchangeably displayed at the Wildlife Information Centre on Victoria Street, where GannetCam and Colony Cam could be controlled remotely by visitors. Highlights of this included a UK school group and the Youth Commission for Guernsey and Alderney being given a tour of Burhou via PuffinCam and Les Etacs via GannetCam by the AWT Ramsar officer.

The cameras were very successful in 2022, providing an online resource sharing an insight into life on a seabird colony The AWT, in collaboration with Visit Alderney worked to promote the video feeds throughout the season. Both PuffinCam and GannetCam automatically panned to observe seabird interactions in different areas of the colonies and the surrounding water.

In 2021, 212,480 users accessed the AWT page on LIVE: Teaching Through Nature, with 148,992 unique page views (Purdie et al. 2022a). Unfortunately, following the closure of the website hosting company the viewership for 2022 was lost, but traffic was likely similar to previous years. There was an additional 15-20,000 video views from the Facebook page.

The local community have supported the implementation of the Wildlife cameras and have to date engaged with this project very positively. The main benefit for the local community has been improving accessibility and enabling more people to connect with the Gannets and Puffins, particularly for over 65's. We have seen increase in numbers in the shop due to the live stream screen, enabling those to view who may not have digital access or confidence. We are sure there are more specific benefits and we are keen to tap into these insights in more detail. We will be developing a plan to measure the relationship Alderney has with its local surroundings and the wildlife that co-habit this island, which will include PuffinCam and GannetCam, helping us identify how our local community interacts and benefits from the yearly arrival or the Puffins and Gannets.

Recommendations

- Reinstall 'PuffinCam' in 2023.
- Update the mountings for both PuffinCam and GannetCam to ensure longevity and stability of the cameras during high winds.
- Consider moving one of the Vivotec static puffin cameras to give a different view as their outreach and scientific value are currently limited due to crossover between the three cameras.
- Review community impact and how we measure this, particularly for the local Alderney community

4.4.2 Boat Tours

Alderney Wildlife Trust provides educational boat tours to the public with professional ecologists as guides (Figure 40.). These give the public high-quality insight into the species and habitats of the Alderney Ramsar site and the work which drives into monitoring and protecting these. Despite unusually poor weather in August and September, the boat tours were very successful in 2022. total of 526 passengers were given boat tours of the Ramsar Site between the 14/4/22 and 03/10/22. The income from the boat tours helped fund the extensive survey and management work detailed in this review.

Recommendations

- Continue providing boat tours in 2023.
- Deploy BRUV surveys (See section 4.3.2.2) on some boat tours to increase survey effort and educational value of the tours to the public.

4.4.3 Free Educational Boat Tours for Students at St Anne's School

Two free boat tours were conducted. One on a Challenger 70 Racing Yacht in partnership with the Youth Commission for Guernsey and Alderney, and the Tall Ships Youth Trust. On the second trip more students and teachers wanted to attend than ten (the limit for passengers on Sula of Braye) so the Lady Maris II was chartered with Darren Machon as skipper and proved an excellent vessel for the tour.

Recommendations

- Continue to provide free educational boat tours to students at St Anne's School and aim to complete more tours to give more students the opportunity to view the Ramsar site.
- In addition, for those not able to access this provision through the school, provide one free ticket to all resident under 16s to visit the Ramsar site.
- Gather feedback regarding outcomes and impact from these tours to highlight the benefits of running free tours.

4.4.4 Community Engagement and Public Awareness Events

A wide range of community engagement and educational events were run in 2022 (Figure 40.). Highlights included a successful foraging event at Clonque Bay in Wildlife Week, public Shoresearch surveys (See section 4.3.2.1) in summer, and the marine tank sessions open to the public and in the local playgroup. Throughout the year additional events such were also carried out including beach cleans and rock-pooling and arts and craft sessions with local children.

Figure 40. A wide range of educational events and activities brought the Ramsar Site's wildlife to the public in 2022.

Recommendations

- Continue to provide public engagement and community awareness events and activities for the Ramsar site year round
- Promote opportunities for local people to get involved in citizen science projects on the Ramsar site in 2023
- Develop a plan to measure community engagement for events within the Ramsar site, interactions, and projects that we deliver for the community.

4.5 Advisory and Legislative

4.5.1 Alderney Ramsar Stakeholder Forum

Several Alderney Ramsar stakeholder forums were held in 2022, these later developed into HPAI meetings. They were convened by the GSC chair and were attended by a range of stakeholders including commercial ferry operators, recreational anglers, States Veterinary Officers, and representatives from Alderney Animal Welfare Society, Alderney Wildlife Trust, Alderney Bird Observatory, Alderney Sailing Club, the Channel Islands Bird Ringing Scheme, the Harbour Authority and States Public Works department.

Recommendations

- Hold regular Ramsar stakeholder forums (ca. 3 per year) and as necessary to respond to HPAI

4.5.1 ARS4

The five-year Alderney Ramsar Strategy (2017-2021) (ARS3) has come to a close. It was delayed in 2021 due to a delay in responses to the first Alderney Ramsar Stakeholder Forum. Due to the high workload in responding to the HPAI outbreak taken on by AWT and in particular the Ramsar Secretariat, among other commitments, development of the 2022-2026 Alderney Ramsar Strategy (ARS4) was delayed to 2023. This will also mean the SoA will have decided whether to pass the Alderney Biodiversity Strategy and, if passed, ARS4 can be published under that document. This was reported to GSC in December 2022 and GSC ratified this delay on (17/02/23).

Recommendations

- Roll ARS3 forward into 2023.
- Develop ARS4 on the newly agreed timeline.

4.5.2 Scientific Advisory

In 2022 the Alderney Ramsar Advisory Group (ARAG) was expanded to include the States Veterinary Officer at the request of the CIBRS. In addition to this, following the confirmation of the ARAG Terms of Reference by GSC in 2021, an updated version was produced based on feedback from GSC, Alderney Ramsar Stakeholders and ARAG members. The advice of ARAG members proved invaluable in responding to HPAI in 2022.

In the GSC meeting (17/02/2023) the Committee agreed to accept the support of Jim Robinson (Head of Natural Environment Department SoG) and the AWT to review the developing status of French windfarms and the potential impacts that they might have on Alderney's Waters. They will seek advice from the ARAG and report to GSC with updates and guidance which may affect the future management and monitoring of the site.

Recommendation

- Work with the ARAG to deliver an effective programme of scientific work on the Ramsar site in 2023 and prepare ARS4, including consideration of the renewable energy developments and their potential impacts.

4.5.3 Puffin Friendly Zone

Following decline in Alderney's Puffin population, in part likely due to human disturbance, the AWT, in collaboration with the SoA, the Alderney Marine Management Forum, Alderney Harbour Office and local fishermen, designated a 'Puffin Friendly Zone' (PFZ) in 2018. The zone is in place during the Puffin breeding season during which Puffins are at greatest risk of disturbance from passing visiting or passing vessels. Disturbance can have impact on breeding success.

Posters detailing the PFZ were displayed at public locations around the island for the attention of local and visiting boat owners. The zone further had the support of the Alderney Harbour Office. There was agreement to erect more informative signage and investigate how to develop a protocol to deal with vessels which purposefully enter the PTZ in 202; however, this has not been undertaken.

No vessels were observed entering the PFZ in 2022.

Recommendations

- Continue to publicise the PFZ in 2023.
- The SoA should work with the Alderney Harbour Office to form a protocol to deal with vessels that purposefully enter the PFZ during the Puffin breeding season. It is recommended to potentially include the avoidance of the PFZ as a condition for commercial vessel licences issued by the Alderney Harbour Office.

4.5.4 Ramsar Signage

Signage was not updated in 2022 due to resourcing and will require updating as soon as possible.

Recommendations

- Update signage around Ramsar site.

4.5.5 Sensitive Wildlife Signage

Signage alerting the public to the presence of breeding Ringed Plover and Common Tern were erected. Laminated boards were produced to advice the public of the plover nests as recommended in Purdie et al. 2022a. These will be redeployed in 2023. Signage informing the public of the presence of HPAI and giving key information were deployed. Updated versions of these will be redeployed if there is a new HPAI outbreak in 2023.

The SoA has given notice that it is appropriate that permission to deploy interim signs where there is an urgent need to prevent harm to breeding wildlife may be actioned through Richard Phelan, Head of States Works, who has standing permission from the SoA to erect signage necessary for the operations of the States.

Recommendations

- Liase with the States Public Works department to redeploy signage around Common Tern and Ringed Plover nests and Ringed Plover cordons.
- Deploy updated HPAI signage in collaboration with the Ramsar Stakeholder Forum in the event of an outbreak or a high risk of an outbreak occurring.

4.4.6 Networking with Other Channel Island Ramsar Sites

AWT hosted the Inter-Islands Environment Meeting (IIEM) in 2022, with the Georgian House and Island Hall hosting events. This meeting provided a platform for a pan-island Ramsar meeting and included a presentation on the impact of HPAI on Gannets breeding within Alderney's Ramsar Site. AWT hosts the Channel Islands Ramsar website, which was launched in 2021 (http://www.ci-ramsar.com/). A list of surveys being carried out across all Ramsar sites in the Channel Islands is being developed to be published on the website, allowing information sharing across the islands.

Recommendations

- Attend future pan-island Ramsar meetings to ensure Alderney's Ramsar site is represented.
- AWT will attend the IIEM 2023 at which a pan Channel Islands' Ramsar meeting will be held.

4.5.7 Networking Internationally

The impacts of HPAI on Gannets within Alderney's Ramsar site, represented by the AWT as the Ramsar Secretariate, were presented at a series of conferences hosted by the JNCC and BTO and attended by hundreds of experts from the Channel Islands, UK, and abroad. It aimed to develop a response to the HPAI outbreak, and the report has recently been published (Figure 41, Pearce-Higgins et al. 2022). Data collected by AWT on the productivity of Gannets during the HPAI outbreak was presented at these conferences. Data based on CIBRS ring returns and analysed by the ARAG Chair was also presented at this conference. Maintaining good communication with the international community on the issue of HPAI will help ensure that best possible practice is followed when responding to the disease and monitoring its impacts on species withing the Alderney Ramsar Site.

Figure 41. A photograph taken by an AWT volunteer of a Gannet from Les Etacs which died during the 2022 HPAI outbreak was used as the cover image for the report (Pearce-Higgins et al. 2022).

Recommendations

- Maintain links with the international community regarding HPAI and other issues which may arise.

4.5.8 Ramsar Information Sheet (RIS) Update

An updated Alderney RIS sheet was submitted in 2017, however, admin errors within the UK administration resulted in these documents not being progressed in the UK for all Channel Islands Ramsar sites. In 2022 AWT began the process of updating the Alderney RIS sheet and is in communication with the JNCC regarding this.

Recommendations

- Complete the RIS update in 2023.

4.5.8 Highly Pathogenic Avian Influenza Response

HPAI posed a unique threat to Alderney, posing combined threats to wildlife (e.g. Section 4.1.1.2.4), poultry, and human health. A huge collaborative effort, both on Alderney and across the Channel Islands and wider region, was put in to responding to this crisis, and helped ensure that Alderney was best placed to respond to HPAI. Here the timeline of HPAI on Alderney and responses to it are detailed.

HPAI spread southwards through seabird colonies in early summer. AWT raised the issue in early June with the ARAG and SoA. Initial discussions were led by the States Veterinary Officers, ARAG Chair, and AWT. This was the beginning of a collaborative effort to respond to the crisis. From these initial discussions HPAI testing kits were ordered. The GSC Chair suggested discussion should be led by the States Veterinary Officer rather than ARAG, with the disease affecting the entire island not just the Ramsar site

On 23.06.22 a strategy meeting was hosted by GSC with key parties including the States Veterinary Officer, States Public Works, AAWS, AWT and the ARAG Chair. The ABO and CIBRS were invited but unable to attend. Given the rapid spread internationally at this point it was presumed to be very likely that HPAI would reach Alderney. This meeting aimed to lay out the strategy for preventing HPAI reaching Alderney's wild and domestic birds, what action would be taken should in the event of an outbreak, and public messaging.

Key outcomes included strict biosecurity measures for anyone working on seabird colonies and that should evidence appear of HPAI on Alderney all access to colonies would cease. Additionally, a protocol for collection and testing of carcasses and live birds was developed. Key responsibilities were assigned including: Testing – AAWS/ States Vet with AWT assistance, recovery of carcasses – States Public Works with AWT assistance, monitoring Gannet colonies for signs of HPAI – AWT, monitoring international spread – AWT & ARAG. A SoA press release was prepared by the Alderney Ramsar Secretariat (AWT Ramsar Officer) following this meeting advising the public to avoid offshore islets, avoid coming into direct contact with wild birds or carcasses, and how and when to report dead or sick birds. A poster was also prepared ready to be deployed in the event of an outbreak (Figure 42.). A HPAI working group was formed of those present to allow for quick and effective information sharing. Representatives of the CIBRS and ABO were later included in this group.

On 12.07.22 the States Vet informed the working group that HPAI had been detected in a Herring gull in Guernsey. Hundreds of Gannets were seen dead at sea following this. Following this, the GSC elected to close access to all seabird breeding areas including closure to scientific access and deploy signage

(Figure 43.) at key locations (e.g. beaches, harbour) to advise the public of how to avoid spreading or catching the disease and how they could help control the outbreak by reporting dead and sick birds. Press releases were also published to inform the public. AWT developed an online form to collect records of dead seabirds and disseminated recording sheets to ferry operators. The GSC also put out public advice regarding reducing the risk of spreading the disease to poultry through responsible husbandry (e.g. covered food).

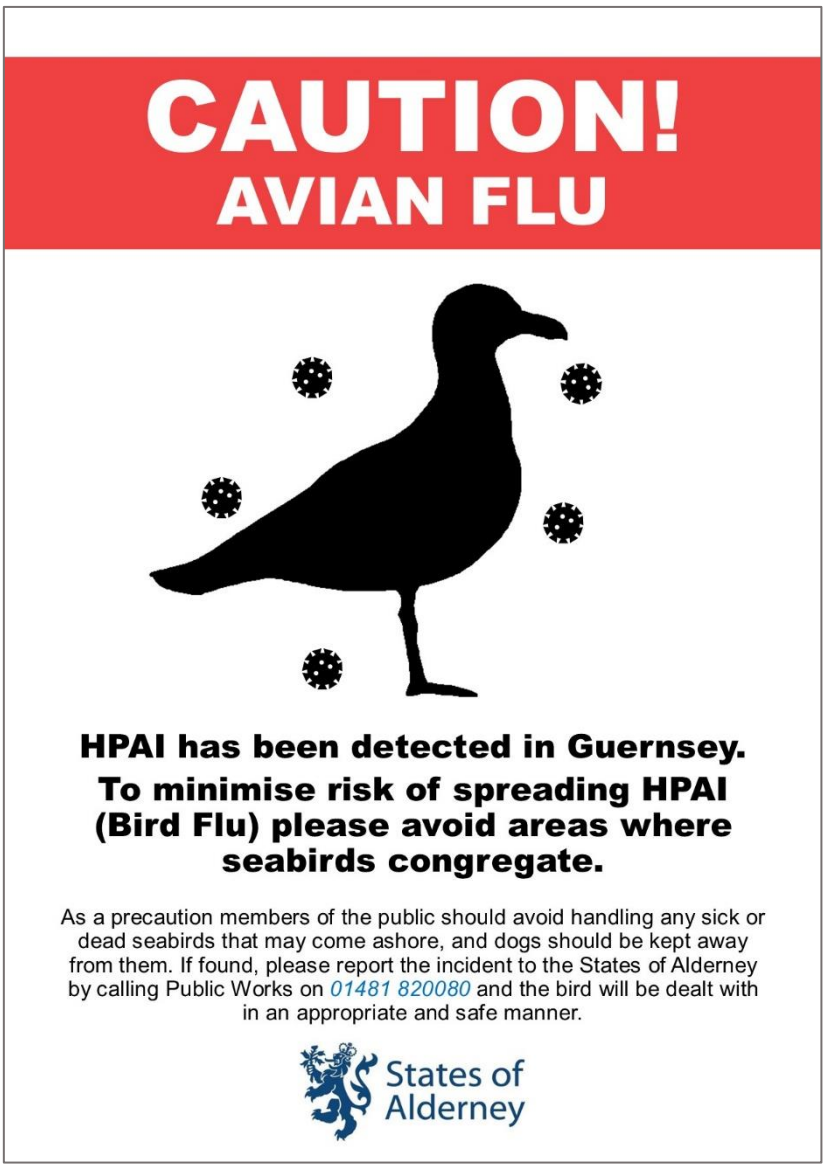

Figure 42. A public information poster advising of the risks of HPAI and advising the public to avoid congregations of wild birds how to respond to dead or sick birds.

During the outbreak sick or dead birds were rapidly collected by the States Public Works with assistance from AWT and AAWS, any sick birds were euthanised as a precaution on advice of the States Vet and AAWS. Photographs of birds were taken when possible, and ring numbers if present were recorded. Any novel species (those which had not already tested positive) were tested by AAWS with cloacal and pharyngeal swabs and samples sent to the States Vet. Carcasses were incinerated. The strategy behind these actions was to minimise the spread of the disease both to humans, but also to wild birds through scavenging, whilst gathering as much information as possible. In addition to this, AWT provided weekly updates of the impact of HPAI on Les Etacs and Ortac Gannet colonies to the working group.

Only one case was detected in poultry on Alderney in 2022. This isolated case, while tragic for the flock and keeper involved, is representative of a successful response. Excluding some minor incidents, the dedication of those responding meant that carcasses were cleared rapidly without incident. This is likely to have contributed to the relatively low incidence of HPAI outside of seabirds on Alderney.

Restrictions on access to seabird colonies remained in place until the breeding seabirds had left. In the case of Burhou, which is more accessible to and popular with the public than other sites, the GSC asked AWT to survey Burhou for seabird carcasses and assessassess the impact there. The results of this survey were reported to the ARAG, who then advised the GSC that it would be safe to reopen Burhou.

Recommendations

- Continue to work with the HPAI working group to respond to HPAI in 2023.
- Develop the carcass reporting form.

4. Acknowledgements

We would like to give special thanks to the AWT staff and volunteers who donated their time to gather data and achieve the outcomes of this report without which the works described would not be possible. We are particularly grateful to David Sumner and Grant Le Marchant for their continued support of the remote webcams. We would further like to express our special thanks to Lou Collings for her invaluable assistance and enthusiasm in marine data collection, to Neil Collings for keeping both Sula of Braye and 'PuffinCam' operational through expertise and hard work, also to Andy Mileham for engineering oversight and assistance. We would like to thank 'Bugsy' (David McAllister) for skippering the AWT's boat 'Sula of Braye' and Victoria McAllister for crewing her. We would like to thank all volunteers who analysed footage from PuffinCam. We would like to extend a special thanks to supporters who made the continued operation of both GannetCam and Sula of Braye possible.

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6. Appendices

6.1 Appendix A Historical counts of the breeding seabirds from around Alderney's coast and outer islands.

Historical seabird counts			SCR	Seabird 2000			-	Burhou Project		Ramsar ARS1					Ramsar ARS2					Ramsar ARS3					
Location	Species	Method	1987	1999	2000	2002	2003	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Alderney	Fulmar	AOS	53	50	-	-	-	-	-	26	20[2]	38	34	16[2]	34	29	29	32	13	35	43	35	39	40	67
Burhou		Ind.[7]		-	-	-	-	-	-	-	2,800	-	-	-	-	-	-	3000	-	-	-	-	-	-	-
	Storm Petrel	Rung[8]	35	-	204	-	300	465	317	-	171	-	-	-	-	-	433	483	-	-	-	324	513	-	-
Les Etacs	Gannet	AOS	2391	3450[9]	-	-	-	4862[9]	-	-	-	-	-	5765[9]	-	-	-	5960[9]	-	-	-	-	-	5842[9]	-
Ortac			1985	2500[9]	-	-	-	2547[9]	-	-	-	-	-	2120[9]	-	-	-	2777[9]	-	-	-	-	-	2698[9]	-
Coque Lihou	Shag	AON	80	-		-	-	-	-	-	-	-	-	-	-	77	66	-	-	-	26	19	31	32	45
Little Burhou			8	-		-	-	-	-	-	-	-	-	-	-	35	36	43	-	-	-	-	-	13[1]	-
Burhou			6	47		-	-	-	-	19	21	19	24	23	20	21	14	16	-	-	-	-	-	9[2]	-
Alderney			31	160		-	-	-	-	-	-	-	-	-	-	18[2]	51	13	-	-	74	90	55	70	96
Little Burhou	Cormorant	AON	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-	-	11[9]	5
Alderney	Ringed Plover	AOS	-	-		-	-	-	-	-	1	3	5	3	2	2	6	7	1	5	4	4	4-6	5	
Burhou	Herring Gull	AON	70	125[4]		-	-	202	110	148	164	52[2]	85	73	5	18	32	182[9]	55[9]	-	-	-	-	8	-
		Chicks		-		-	16	-	3	-	1	8	17	6	4	12	(18)[5]	-	-	-	-	1	2	-	-
Alderney		AON	96	285[4]		-	-	-	-	-	-	-	-	-	-	-	315[6]	-	-	-	-	81	71	119	142

Historical seabird counts			SCR	Seabird 2000			-	Burhou Project		Ramsar ARS1					Ramsar ARS2					Ramsar ARS3					
Location	Species	Method	1987	1999	2000	2002	2003	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Burhou	Lesser Black-backed Gull	AON	105	313[4]		-	-	1103	936	994	1001	640[2]	1074	1236	991[4]	-	1392[9]	1176 [9]	1051 [9]	-	-	-	-	716[9]	-
		Chicks	-	232			308	386	140	-	3	281	335	11	202	28	276	-	-	-	-	164	-	-	-
Alderney		AON	13	70[4]		-	-	-	-	-	-	-	-	-	-	-	315[6]	-	-	-	-	34	26	35	37
Burhou	Great Black-backeded Gull	AON	22	27[4]		-	-	18	18	16	17	-	23	23	4	1	6	13 [9]	-	-	-	-	-	4	-
		Chicks	-	-		-	-	-	-	-	0	5	0	1	4	1	2[5]	-	-	-	-	2	-	-	-
Alderney		AON	5	21[4]		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	7	8	9
Houmet des Pies	Common Tern	AON	18	20[4]		-	-	15	-	11	-	-	-	-	5	14	25	-	-	4	21	-	-	-	-
		ind.	-	-		-	-	-	-	64	-	-	-	-	24	43	28	-	53	48	40	-	-	-	-
Alderney		AON	-	-	-	-	-	-	-	-	-	-	-	-	5	14	25	32	-	-	-	2	9	14	23
		ind.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36	max. 42	-
Burhou	Puffin	AOB	210[3]	180[3]		-	-	-	127	114	132	-	153	160	176	168	143	112	97	93	101	186	157	225	-
		Raft		-		-	-	-	92	127	134	131	157	174	175	96	58	114	168	167	140	150	167	161	184
Coque Lihou	Guillemot	Max (EBN)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	134	194	164	-
La Nache		Max (EBN)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	11	37	-
Fourquie		Max (EBN)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				0
Little Sister		Max (AIA)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
La Nache		Max (AIA)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15(8)
Coque Lihou		Max (AIA)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20(15)
Les Etacs		Max (AIA)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63 (28)	98 (22)	86 (24)	55

Historical seabird counts			SCR	Seabird 2000			-	Burhou Project		Ramsar ARS1					Ramsar ARS2					Ramsar ARS3					
Location	Species	Method	1987	1999	2000	2002	2003	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Ortac		Max (AIA)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33	22
Coque Lihou		Max (AOS)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43	18	40	20(15)
La Nache		Max (AOS)		-	#VALUE!	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	73	52	44	6
Fourquie		Max (AOS)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				8
Little Sister		Max (AOS)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Les Etacs		Max (AOS)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3	2	0
Ortac	Razorbill	Max (AOS)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0
Quoire		Max (AOS)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	8	13	4
Le Puits Jervais		Max (AOS)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	0	0
Hanaine bay		Max (AOS)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
West Cliffs		Max (AOS)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	4

*estimated number, p present, Max = highest count of individuals, EBN = estimated breeding number, AOS = apparently occupied site, AON = apparently occupied nest, (1) post-season count of used nest sites; (2) partial colony count only; (3) individuals on land; (4) AOS not AON; (5) inc. Little Burhou; (6) All gull spp.; (7) PVA calc. via ringing; (8) inc. re-traps; (9) whole colony count.

6.2 Appendix B Historical assessments of productivity from the seabirds nesting around Alderney's coast and outer islands.

Historical seabird data up to 2021 - productivity

Species	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gannet*	-	-	0.8	0.88	-	-	0.78	-	0.52	0.61	0.48	0.69	0.65	0.40	0.52	0.46	0.45	0.3
Number of Gannet nests observed			180	184			319		248	250	244	75	69	126	330	300	415	350
Shag (Coque Lihou)	-	-	-	-	-	-	-	-	0.69	0.62	-	-	-	-	-	-	-	-
Shag (Little Burhou)	-	-	-	-	-	-	-	-	0.74	0.61	-	-	-	-	-	-	-	-
Shag (Burhou)	-	-	-	0.14	0.21	-	-	1.24	0.57	0.21	-	-	-	-	-	-	-	-
Shag (Alderney)	-	-	-	-	-	-	-	-	1	0.41	0.93	-	-	0.6	-	-	-	-
Puffin	0.64	0.61	0.63	0.65	-	0.66	0.66	-	-	0.36 – 0.60	0.71	-	-	0.53-0.94	0.60-0.88**	0.63	0.65	0.5
Fulmar	-	-	-	-	0.47	0.53	-	0.56	0.52	0.55	0.4	0.92	0.37	0.33	0.45	0.44	0.42	0.41
Ringed Plover#	-	-	-	-	0.66[ps]	0.2[ps]	0[ps]	0[ps]	1.5[ps]	1[ps]	-	1[ps]	0.44	0.66	0.75	0.11	0.42	0.6
Common Tern	-	-	-	-	-	-	-	-	0.57	0.44	-	0	0	0.14-0.29	-	-	-	† 0.095
Guillemot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.58
Razorbill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.33

Key

* chicks fledged per pair

** see annual Ramsar Review report for details

[ps] productivity data from Platte Saline beach only

productivity = mean no. chicks fledged per nesting attempt

† productivity = mean no. chicks fledged per AOS

6.3 Appendix C Recommendations

Section	Title	Recommendations
4.1.1.1	Atlantic Puffin	Continue to monitor Puffins in 2023 including productivity, raft counts and AOB surveys. Expand the puffin monitoring on the eastern side of Burhou to ensure a representative sample of the population is monitored there.
		Develop the use of 'citizen science' to allow a timelier analysis of a greater proportion of remotely recorded productivity surveys.
		Validate the accuracy of AOB surveyors by comparing their results with known occupied and un-occupied burrows identified by PuffinCam during the breeding season.
		Continue to review footage for evidence of predation, avian disturbance and kleptoparisitism on Puffins. Noting the potential for the impact predation and kleptoparasitism could have on the relatively small Puffin colony, a dedicated survey to quantify predation and kleptoparisitism and their effect on the colony should be considered. This may be a good opportunity to develop a citizen science project.
4.1.1.2	Northern Gannet	Work with stakeholders to develop a response to HPAI in 2023
		Continue to monitor productivity on Les Etacs ensuring a minimum sample size is achieved to adequately represent the total breeding population.
		Continue to closely monitor the sample of 100 nests on the Pyramid year-on-year to build a long-term dataset of demographic value but also help identify future trends in productivity or changes in nest site distribution and colony size over time.
		Monitor another sample of 100 nests from across the colony (20 nests from each of the areas sampled on North-Stack and West-rock).
		Investigate productivity at Ortac and establish methodology and resources to repeat regularly thereafter (e.g. annually, bi-annually).
		Conduct the planned census of Gannet populations on Les Etacs and Ortac in 2023 and continue to monitor frequently (e.g. biannually) to ensure any changes can be monitored more closely in the future.

		To facilitate more frequent censusing of the Gannetries, explore the option of using drones instead of piloted aircraft.
		Continue to monitor the use of plastics as nest material and its impact through entanglement.
		Visit Ortac to retrieve the geolocators that still need to be recovered but also collect re-sightings of colour-ringed birds to help study adult survival.
		Review the need for the TaG project in light of proposed offshore developments, low productivity, population plateau, and HPAI outbreak.
		Investigate relationship between 'black-eye' HPAI symptoms and productivity (e.g. through boat-based productivity surveys) and survival (e.g. through colour ringing programme).
		Renew colour ringing programme on Les Etacs and Ortac to enable accurate estimates of adult survival in light of HPAI outbreak. Colour ring Gannets with and without the 'black-eye' HPAI symptom to establish its impact of this on adult survival.
		Sample Gannets for HPAI antibodies
		Collect tissue samples from dead Gannets with the black-eye symptom.
4.1.1.3	Northern Fulmar	Continue monitoring Fulmar productivity and population size in 2023
		Consider investigating causes of low productivity in next five years strategy
4.1.1.5	Other Seabirds and Shorebirds	Maintain the current programme of monitoring, including Ortac, Burhou and the outer islands when feasible, and ensure a sufficient number of round island boat surveys are scheduled between mid-May and mid-June.
		Continue to deploy temporary signage close to the accessible tidal islets to inform the public of the presence of ground nesting birds and encourage them not to cause any disturbance. Consider updating signage and expanding outreach to ensure it is effective in reducing disturbance.
		Skip the census of nesting Lesser Black-Backed Gulls nesting on Burhou until 2024
		Continue roof-top census of Herring Gulls
		Continue programme of Razorbill and Guillemot monitoring, improving coverage where possible
		Continue to monitor the numbers of nesting Ringed plover and their breeding success.
		Work with the State's Public works department to redeploy Ringed Plover nest cordons and temporary signage.
		Consider control of crows at Saye bay (e.g. through egg addling), consulting with the ARAG including the States Vet.
		Propose the colour-ring adult and chick Ringed Plovers to help study their survival, recruitment, site fidelity and movements. Correspond with the CIBRS & ABO to develop this.
		Continue monthly WeBs counts.

4.1.2	Seabird Ringing	From Section 4.1.1.2: *Renew colour ringing programme on Les Etacs and Ortac to enable accurate estimates of adult survival in light of HPAI outbreak. Colour ring Gannets with and without the 'black-eye' HPAI symptom to establish its impact of this on adult survival.*
		From Section 4.1.1.4: *Propose the colour-ring adult and chick Ringed Plovers to help study their survival, recruitment, site fidelity and movements. Correspond with the CIBRS & ABO to develop this.*
4.2.1	Rat Control	Closely monitor the arrival of the Common Terns and where they choose to settle each year. Be prepared to introduce rat control to new sites at short notice if necessary.
		Consider using a 'pulse-baiting' strategy on Houmet Herbe to reduce the amount of toxin entering the environment whilst maintaining effective control.
		Deploy non-toxic bait on tidal islets and adjacent shoreline to monitor for the presence of rodents. Monitor the impact of rodents without suppression on breeding Razorbills and Guillemots.
		Develop the bio-security plans for Burhou and Coque Lihou to help ensure any incursions by rodents are treated effectively and in a timely manner. This may include remote monitoring e.g. through audio recording or camera trapping and should include an eradication plan and public education.
4.2.2	Bat Surveys	Continue monitoring Bats within the Ramsar site as part of the Bailiwick Bat Survey.
4.3.1.1	Intertidal Habitat Biotope Survey of Hanaine Bay	Repeat the Hanaine Bay intertidal habitat biotope survey in 2027, as per JNCC recommendations (Davies et al. 2001).
		Conduct intertidal habitat biotope survey of the offshore islets in 2023.
		Conduct quantitative intertidal species assessments on Burhou and Hanaine Bay in 2023.
4.3.1.2	Green Ormer	Continue conducting updated Ormer surveys
		Schedule programme of surveys to ensure sufficient data is collected to estimate abundance
		Consider revisiting sites sooner to resight tagged Ormer
4.3.1.3	Intertidal Crabs	Continue crab surveys in 2023
		Schedule programme of surveys to ensure sufficient data is collected to estimate relative abundance of Chancre and Furrowed crabs.
4.3.1.4	Shoresearch	Continue conducting Shoresearch walkover surveys with an updated survey programme to ensure sufficient data is collected.
		Continue recording invasive species through Shoresearch walkover surveys
		Consider carrying out other Shoresearch surveys (e.g. sediment, quadrate) to improve data collection.

4.3.1.5	Climate Change Indicator Assessment	Review schedule of Cor.bif surveys, consider repeating every three-years as opposed to annually.
4.3.2.1	Seasearch	The Ramsar site has the potential for unique benthic ecosystems, especially noting the unusually strong tides. It is therefore recommended that Seasearch surveys are conducted in the site in 2023, possibly by facilitating more Seasearch training for people on Alderney.
		Add to the growing baseline of marine life records by extending the programme of Seasearch diving around the south and west coast islets.
4.3.2.2	BRUV	Replace BRUV camera equipment.
		Update BRUV survey schedule and methodology to ensure an adequate number of surveys are completed and there are repeats of surveys in the same location.
4.3.3.1	Plankton	Continue to work with TWT to develop a survey programme for the Planktoscope in 2023.
4.3.3.2	Fish Intel Project	Support the continuation of the FishIntel project in 2023.
4.3.3.3	Seawater Quality Testing	Begin the programme of seawater quality testing in 2023.
4.3.4.1	Effort Based Grey Seal Surveying	Continue to conduct effort-based Grey Seal surveys in 2023.
		Support an MSc project in 2023 to review Grey Seal survey data and methodology.
4.3.4.2	Grey Seal Identification	Continue to photograph Grey Seals to create a more comprehensive catalogue in 2023.
		Share the Grey Seal catalogue with stakeholders across the Channel Islands to investigate movements of individuals between the islands.
4.3.4.4	Cetaceans	Continue to opportunistically record cetacean sightings in 2022.
		Continue to be supportive of the FishIntel project in 2023.
4.3.4.5	Marine Mammal Strandings	Support will continue to be given to local British Marine Life Rescue Divers (BMLRD) if a marine mammal stranding occurs in 2023. The management of marine mammals on our shores (those subject to human disturbance) will be coordinated through BMLRD trained staff.
4.3.5	Academic Projects	Support academic projects within the Ramsar site in 2023
4.4.1		Reinstall 'PuffinCam' in 2023.

	Wildlife Webcams	Update the mountings for both PuffinCam and GannetCam to ensure longevity and stability of the cameras during high winds.
		Consider moving one of the Vivotec static puffin cameras to give a different view as their outreach and scientific value are currently limited due to crossover between the three cameras.
		Review community impact and how we measure this, particularly for the local Alderney community
4.4.2	Boat Tours	Continue providing boat tours in 2023.
		Deploy BRUV surveys (See section 4.3.2.2) on some boat tours to increase survey effort and educational value of the tours to the public.
4.4.3	Free Educational Boat Tours for Students at St Anne's School	Continue to provide free educational boat tours to students at St Anne's School and aim to complete more tours to give more students the opportunity to view the Ramsar site.
		In addition, for those not able to access this provision through the school, provide one free ticket to all resident under 16s to visit the Ramsar site.
		Gather feedback regarding outcomes and impact from these tours to highlight the benefits of running free tours.
4.4.4	Community Engagement and Public Awareness Events	Continue to provide public engagement and community awareness events and activities for the Ramsar site year round
		Promote opportunities for local people to get involved in citizen science projects on the Ramsar site in 2023
		Develop a plan to measure community engagement for events within the Ramsar site, interactions and projects that we deliver within the community.
4.5.1	Alderney Ramsar Stakeholder Forum	Hold regular Ramsar Stakeholders forums (ca. 3 per year) and as necessary to respond to HPAI
4.5.1	ARS4	Roll ARS3 forward into 2023.
		Develop ARS4 on the newly agreed timeline.
4.5.2	Scientific Advisory	Work with the ARAG to deliver an effective programme of scientific work on the Ramsar site in 2023 and prepare ARS4, including consideration of the renewable energy developments and their potential impacts.
4.5.3	Puffin Friendly Zone	Continue to publicise the PFZ in 2023.
		The SoA should work with the Alderney Harbour Office to form a protocol to deal with vessels that purposefully enter the PFZ during the Puffin breeding season. It is recommended to potentially include the avoidance of the PFZ as a condition for commercial vessel licenses issued by the Alderney Harbour Office.

4.5.4	Ramsar Signage	Update signage around the Ramsar Site
4.5.5	Sensitive Wildlife Signage	Liase with the States Public Works department to redeploy signage around Common Tern and Ringed Plover nests & Ringed Plover cordons.
		Deploy updated HPAI signage in collaboration with the Ramsar Stakeholders forum in the event of an outbreak or a high risk of an outbreak occurring.
4.5.6	Networking with Other Channel Islands Ramsar Sites	Attend future pan-island Ramsar meetings to ensure Alderney's Ramsar suite is represented.
		AWT will attend the IIEM 2023 at which a pan Channel Island's Ramsar meeting will be held.
4.5.7	Networking Internationally	Maintain links with the international community regarding HPAI and other issues which may arise.
4.5.8	Ramsar Information Sheet (RIS) Update	Complete RIS update in 2023.
4.5.9	Highly Pathogenic Avinan Influenza Response	Continue to work with the HPAI working group to respond to HPAI in 2023.
		Follow best practice based on international (primarily UK) standards.
		Develop the recording form to enable its use across the region.

6.4 Appendix D Licences

This section will be removed prior to publishing in line with AWT GDPR policy.

6.5 Appendix E ARAG Feedback

Comment	Document	Reviewer	Page	Section	Text	Comment	Final Text
1	Action Plan	PB	4	Objectives	consider doing additional counts if drastic reduction in numbers is apparent in the interim period	I think this could be rephrased - its only next year now	but consider doing additional counts if drastic reduction in numbers is apparent in 2023.
2	Action Plan	PB	4	Objectives	NA	I think it would be interesting to check for manx shearwaters - calling in June or chicks in august/sept if resources and AI allows	Included acoustic monitoring, subject to landing permissions and HPAI. Will contact CIBRS/ABO regarding checking for chicks: Deploy acoustic monitoring devices in June to monitor for presence of Manx Shearwaters on Burhou.
3	Action Plan	PB	5	Objectives	Devise a bio-security plan for Burhou and Coque Lihou.	Let us know if you need any input to this	Will action.
4	Action Plan	PB	12	4.1.5 – Ringed Plover	(Control of predators)	Interesting to see the outcome of this no easy answers - maybe look at additional ways to protect the	Will include consideration of additional control measures. See comment #18.

Comment	Document	Reviewer	Page	Section	Text	Comment	Final Text
						breeding pair as well	
5	Action Plan	CM	8	4.1.2.3 Impact of 'black-eye' on productivity	HPAI can cause the iris of Gannets to turn black.	Has it been shown that only the iris is turned black? If so, a "black eye" does not necessarily mean a defect in vision. This would obviously not be true if it were the the cornea, lens or aqueous or vitreous humors or involved damage to the retina. I would have thought this question might have been investigated in post-mortem specimens.	Will review literature. Hopefully necroscopies will confirm this in 2023.

Comment	Document	Reviewer	Page	Section	Text	Comment	Final Text
6	Review	CM	1	Executive Summary, point 4	Alderney's adult Gannet population	These figures don't appear to be internally consistent. Having said that 20-30% of the population died, what was the figure you were taking to be the total gannet population in May 2022? I think you should state this figure.	Inserted. Also double checked other mortality extimate figures for typos etc: Alderney's adult Gannet population (estimated at 17078 breeding pairs in 2021)
7	Review	CM	1	Executive Summary, point 8	nested around the main isle of Alderney and surrounding tidal islets this year	Presumably, mainland - Alderney: would " main island (of Alderney)" be less ambiguous?	Adjusted: nested around the main isle of Alderney and surrounding tidal islets this year
8	Review	CM	13	Background	, there is hope that it may not return by every effort is being made to prepare for another potential outbreak.	I suggest there should be a full stop after the bracket followed by the new sentence	Adjusted: There is hope that it may not return but every effort is being made to prepare for another potential outbreak.

Comment	Document	Reviewer	Page	Section	Text	Comment	Final Text
						"There is hope that it may not return but every..... (delete "by").	
9	Review	CM	26	Kleptoparasitism, Avian Interactions and Predation	In 2021 numerous carcasses (6 in the end of season AOB and 27 by a member of the public) were reported	If the 27 carcasses were breeding puffins, this could have a serious effect on on the Burhou puffin population.	The island was searched for carcasses in October 2022. An earlier search could not be completed due to HPAI. Have now included a recommendation to search Burhou for carcasses alongside the end of season AOB: In 2021 numerous carcasses (six in the end of season AOB and 27 by a member of the public) were reported (Purdie et al. 2022a). If these were the carcasses of breeding birds it could have a serious effect on the Burhou population. No decline was observed in population estimates, however, these have a large margin of error. There was intent to investigate carcasses in 2022, however, with access limited due to HPAI
10	Review	CM	34	Assessment of Gannet Demography on Les Etacs	leaving 78 nests	I may be missing something here but 100-(1+19) makes 80 to	Typo, corrected: leaving 80 nests

Comment	Document	Reviewer	Page	Section	Text	Comment	Final Text
						me. I don't understand how these figures lead to 78 nest.	
11	Review	CM	35	Assessment of Gannet Demography on Les Etacs	Figure 14	I have had problems trying to check the consistency of the figures in Table 4h the coloured discs in Figure 14.	Corrected error in figure 14.
12	Review	PB	10	Background	In 2022, the Alderney West Coast and Burhou Islands Ramsar site entered the fifth and final year of the 2017-2021 Management Strategy (Ferrar and Wieckowski, 2016).	This needs updating	To be updated in 2023. Text has been adjusted for clarity: In 2022, the Alderney West Coast and Burhou Islands Ramsar site 2017-2021 Management Strategy was extended to 2017-2022 (Ferrar and Wieckowski, 2016).
13	Review	PB	11	Background	This will also mean the SoA will have decided whether to pass the Alderney Biodiversity Strategy. If passed, ARS4 can be	Not sure what this means - have they passed the strategy or is it still to come	Strategy is currently with the SoA for consideration. Slightly reworded for clarity: This will also mean the SoA will have decided whether to pass the Alderney Biodiversity Strategy and, if passed, ARS4 can be published under that document.

Comment	Document	Reviewer	Page	Section	Text	Comment	Final Text
					published under that document		
14	Review	PB	NA	General	NA	Just an observation that the numbering system in these reports is quite tortuous - not sure if this could be reviewed in future years to make them slightly less long!	To be reviewed in future reports
15	Review	PB	45	Northern Gannet Recommendations		Huge amount of information here - I assume that some of this will be published? Either Alderney specific or parts	Some parts have been published, hoping to get more published this year.

Comment	Document	Reviewer	Page	Section	Text	Comment	Final Text
						of wider British Isles work?	
16	Review	PB	54	4.1.1.4.5 Lesser Black-backed Gull	Despite little evidence of an increase in gull mortality during the 2022 HPAI epizootic, a census in 2023 would confirm if there has been further colony declines, possibly as a result of HPAI. However, it is still recommended to withhold the census to 2024, to reduce disturbance.	Agree - leave to 2024	No change
17	Review	PB	56	4.1.1.4.7 Common Tern	This year's poor productivity is in stark contrast to the excellent breeding season of 2021, and is likely a result of unsuccessful elimination of rats on Houmet Herbe and avian	Good to think about what else to do Seems rat control not enough - are good natures working well enough? Prevention of avian predators is very time	Good natures appeared to work, but potentially need onshore control also. Will attempt supplementary feeding and control of crows if necessary and have resources: *Action Plan page 11*: Consider deployment of A24 lethal traps on the onshore area adjacent to the tern breeding area to reduce the likelihood of an incursion.

Comment	Document	Reviewer	Page	Section	Text	Comment	Final Text
					predation, in particular by Sparrowhawk.	consuming but could look at diversionary feeding of sparrowhawks or control of crows if specific individuals seem to be a problem.	
18	Review	PB	68	4.1.1.4.11 Ringed Plover	In particular, colour ringing of adult birds would enable pairs to be followed across years, so allowing for individual differences in reproductive success due to, for instance, genetic quality to be disentangled.	I wouldn't spend too long assessing impact of cordons Just use them! - They should help, but probably need extra stuff like working out what to do with crows - have you looked at using milk crate type covers that keep crows out? I am not sure if this is till considered a good idea but I	Noted - will incorporate review of nest protection as part of the predator control review in the action plan: *Action Plan, page 12:* We have conducted a preliminary review of four options: (a) lethal control of the breeding pair of crows, (b) reducing the breeding output of the breeding pair of crows, (c) conditioned food aversion (CFA) to discourage predation of eggs, and (d) nest enclosures

Comment	Document	Reviewer	Page	Section	Text	Comment	Final Text
						know it can work..	
19	Review	PB	74	4.1.2 Seabird ringing	*Propose the colour-ring adult and chick Ringed Plovers to help study their survival, recruitment, site fidelity and movements. Correspond with the CIBRS & ABO to develop this.*	I think we have previously discussed this?	Yes this was reviewed by ARAG and the ABO in 2022, and has been carried over into 2023: No change
20	Review	PB	75	4.2.1 - Rat Control	rat eradication scheme	Any conclusion to this or is still confidential?	Currently unclear - 2023's monitoring should give more information: No change
21	Review	PB	76	4.2.1 - Rat Control	Develop the bio-security plans for Burhou and Coque Lihou	Is there an existing biosecurity plan if not we	This would be useful, will enquire: No change

Comment	Document	Reviewer	Page	Section	Text	Comment	Final Text
						(Karen) can probably provide templates and guidance and maybe limited direct advice	
22	Review	PB	89	4.5.1 - ARS4	This will also mean the SoA will have decided whether to pass the Alderney Biodiversity Strategy.	Again this is not clear to me	See comment #12

Comment	Document	Reviewer	Page	Section	Text	Comment	Final Text
23	Action Plan	DC	2, 3	General	NA	Some time ago I requested that all Ramsar Plans were referenced to the central philosophy of Ramsar so we never loose sight of that. The information below is something that I penned in 2020! I think this could work very well for the 2023 plans following HPAI. a) I am grateful for the additional information that you have provided that establishes the context of Ramsar. While you may find it repetitive, I	"The centre of the Ramsar philosophy is the wise and sustainable use of wetlands. To ensure that wetlands are sustained (conserved) they must be benchmarked and monitored. Where populations and environmental conditions are stable, no further action beyond monitoring is required. Where populations are unstable, additional studies with a targeted remit may be created. In practical terms, the Ramsar convention requires that management plans for each Ramsar site are developed by its stakeholders. The Annual Ramsar Action Plan sets out the objectives for the year ahead based upon verified monitoring techniques. This will identify any changes in populations and environmental conditions within the site. Annual Reports compiled at the end of each monitoring period will provide robust evidence for any trends in populations or environmental conditions. In 2006, on behalf of the SoA, the GSC requested the support of the Alderney Wildlife Trust (AWT) in the preparation of a management strategy, as required under the commitments of the Ramsar Convention, and registered the AWT as the Alderney Ramsar administrators with the International Ramsar Secretariat in Geneva. The States of Alderney (SoA) have appointed, and part fund, the Alderney Wildlife Trust (AWT) and other 'activity organisations' to devise and implement monitoring and maintenance of the designated Ramsar site in compliance with international legislation." "All Ramsar reports are developed and reviewed in consultation with the Alderney Ramsar Advisory Group (ARAG). Thereby, the SoA have established

Comment	Document	Reviewer	Page	Section	Text	Comment	Final Text
						think it is beneficial to include a short paragraph in every Ramsar 'Action Plan' or 'Report' to ensure understanding and allow each document to be understood without having to have knowledge of previous documents. My interpretation, having read you additional information, is as follows: If I have misinterpreted your notes, misunderstood reference or if you can improve this 'introduction' please do.	a process whereby Ramsar documents are reviewed by independent, non-conflicted, suitably qualified persons to ensure compliance with Ramsar principles and local animal welfare legislation. Established in 2006"

Comment	Document	Reviewer	Page	Section	Text	Comment	Final Text
24	Action Plan	DC	General	General & page 2	NA	b) A new point that has arisen in the additional information is the citing of one aim and two objectives of this work. It would improve clarity if the aim and objectives were included in the Action Plan and referred to appropriately throughout the document. In this way you are referring back to the compliance with Ramsar.	To help maintain or enhance the current conservation value of the site the AWT (on behalf of the SoA) will (a) monitor the key species and habitats (b) promote the site to a wider audience. *Page 6 "* This monitoring will enable us to measure baselines for these populations, in line with the aims of the Ramsar convention." *Page 15* "The marine survey programme is designed to track any changes over time in populations and habitats in the Ramsar site, in line with the aims of the Ramsar convention."*Page 17, Section 4.4 "*The events and outreach programme aims to promote and make the Ramsar site accessible to a wide range of people, especially residents, in line with the aims of the Ramsar convention. Education forms a cornerstone of this and is common feature for all objectives detailed below. "

Comment	Document	Reviewer	Page	Section	Text	Comment	Final Text
25	Report	DC	General	NA	NA	Overall this is a report which should be most useful for future Ramsar officers and particularly any future scientists investigating the population ecology of Alderney seabirds. Overall this is a report which should be most useful for future Ramsar officers and particularly any future scientists investigating the population ecology of Alderney seabirds. The executive summary is most important, for members of the GSC and attention should paid to consistency of references in the document to its	NA

Comment	Document	Reviewer	Page	Section	Text	Comment	Final Text
						pagination (e.g list of contents, Figures and Tables.)	
26	Action Plan	PA			If feasible, auks and Shags on Coqué Lihou will also be rung.	Use 'ringed' rather than rung.	If feasible, auks and Shags on Coqué Lihou will also be ringed.
27	Action Plan	PA	NA	Executive Summary	Continue to postpone the Lesser Black-backed Gull census but maintain oversight and consider doing additional counts if a drastic reduction in numbers is apparent in the interim period.	Why postpone?	No change
28	Action Plan & Review	FB	General	*Review* &*Action Plan* 4.3 Marine	NA	Marine bit looks good to me.	No change

Comment	Document	Reviewer	Page	Section	Text	Comment	Final Text
29	Action Plan	FB	15-18	4.3 Marine	NA	How are you young to do the sublittoral habitat survey?	No change

6.6 Appendix F Document History

Version	Date	Contributors (**bold**), Reviewers (standard font), sent for review but no feedback received by submission date (*italics*)
1	01.02.23	**Alex Purdie, Dr Mel Boradhurst-Allen, Daniel Whitelegg, John Horton, Justin Hart**
2	10.03.23	**Matt Lewis**, Dr Tara Cox, Roland Gauvain
3	20.03.23	*John Horton, Kathy Kissik*
4	03.04.23	Dr Phil Atkinson, Paul Buckley, Francis Binney, David Chamberlain, Prof Charles Michel
5	06.04.23	Alex Purdie, Lindsay Pyne (Submitted to GSC)
	14.04.23	Noted by General Services Committee: Mrs L Maurice (Chair), Mr B Woodhead (Deputy), Mr S Roberts, Mr I Carter, Mr W Able, Mr D Smithurst