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Solent Disturbance Study 2020/21

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Summary

This report provides the results from bird disturbance fieldwork, undertaken by the Bird Aware Solent Ranger Team during winter 2020/21, at five sites across The Solent. It compares visitor activities and behaviour, and bird numbers and responses, across the five sites (namely, East Head, Hurst Spit, Newtown, Hayling Oysterbeds, and Portchester).

The 2020/21 study was originally planned to form a component of the baseline data for monitoring mitigation around the Solent, as part of the Bird Aware Solent Initiative. However, ramifications of the Covid-19 pandemic (including Hampshire County Council's internal Covid-related working practices) prevented the Ranger Team from being able to complete the survey work. This meant that the study was curtailed halfway through, with this report providing analyses of data collected between October and December 2020 only.

Each of the five sites was surveyed once per month during the study period. During each survey visit the rangers undertook continuous recording for one hour and forty-five minutes, logging all human activity within a set recording area surrounding the survey point, as well as the number of birds present and any interactions between people and birds.

Key findings included:

Number of people and activities

- A total of 764 individual activity events were recorded within 19 categories across the survey period, equating to 749 human activity (with the other 15 events centred around non-human causes, such as aircraft noise and birds of prey) involving at least 1,602 individuals;
- Walking with and without a dog were the two most commonly recorded activities, each accounting for 40% of observations. Cycling (6% of observations), bird/wildlife watching (4%), and jogging (4%) were the next most frequently recorded;
- The majority (86%) of activity events occurred on or above the shoreline, and this was the case at each individual survey location;
- East Head was the busiest survey location, with Hurst Spit in second place. The three other localities were of a similar (lower) level of busyness;
- Walking and dog walking were the most frequently recorded activities at all of the survey locations;
- 458 dogs were recorded in total, with animals observed at every survey location, and the largest number of dogs were recorded at East Head (48% of all observations);
- The majority of dogs (78% overall) were recorded off lead across the survey locations, although the majority of dogs at Hurst Spit were on lead;
- A larger than average ratio of dogs to dog walkers was recorded at Portchester, which is potentially indicative of use of the site by commercial dog walkers;

- Very few activity events (15%) took place on the intertidal area and/or on the water, with wind-surfing the most commonly recorded activity (although still only comprising 3% of all activity records), and;
- The largest proportion of water-based activities were recorded at Newtown and Hayling Oysterbeds.

Bird numbers and distribution

- A total of 27 species, excluding gulls, were recorded during the bird counts carried out at the 5 survey locations over the entire survey period, comprising 11 species of wader, 10 species of wildfowl, and 6 other waterbird species;
- Newtown recorded the largest species totals (23), with the smallest number (11 species) recorded at Portchester;
- The largest numbers of waders were found at Hayling Oysterbeds, whilst Portchester generally supported the largest number of wildfowl, and;
- Survey locations which exhibited a larger number of activity events generally supported a lower number of wildfowl.

Bird responses to disturbance

- Of the 764 individual activity events recorded across the entire survey period, 678 (89%) comprised potential disturbance events (i.e. they took place when birds were also present in the recording area);
- 17% of potential disturbance events generated a behavioural response in the birds present, with 3% leading to a major flight;
- The 678 potential disturbance events generated a total of 796 behavioural observations, of which 657 (83%) resulted in no visible change to the birds' behaviour or any direct response;
- On average, 25.8 potential disturbance events/hour occurred across all survey locations over the entire survey period. These events caused, on average, a response 5.3 times/hour during the same period, with a flight response (short or major, i.e. birds flew more than 50m) occurring approximately 3 times an hour;
- The majority of the most frequently recorded activities (i.e. walking and dog walking) led to proportionately relatively few disturbance events. However, the larger number of dog walking events means that more responses occurred as a result of that activity overall;
- Water-based activities, and those that included loud noises (e.g. aircraft), generally led to a larger proportional disturbance response, with wind-surfing in particular causing birds to fly, and;
- A greater number of proportional behavioural responses were noted at Newtown than at the other sites, although the number of actual behavourial responses was higher at East Head and Hurst Spit.

Recommendations and implications

It is recommended that the surveys are repeated across the entire winter of 2021/22 in order to fully inform the ongoing monitoring of the Solent mitigation package. It is also

recommended that the full methodology, previously utilised on site by Footprint Ecology in the winter of 2016/17, is used to allow a direct comparison between the two datasets.

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Cover image: Walking along the top of Hurst Spit. Photo © David Martin (cc-by-sa/2.0)

1. Introduction

1.1 The Solent shoreline between Hurst Castle and Chichester Harbour, including the northern coast of the Isle of Wight, measures some 250km in length. The wintering bird interest includes three Special Protection Areas (SPAs): the Solent & Southampton Water SPA, Chichester and Langstone Harbours SPA and Portsmouth Harbour SPA. The Bird Aware Solent initiative, including the deployment of rangers to engage with members of the public, was established as part of the mitigation package for increasing housing development along the already heavily populated shoreline.

1.2 This report provides the results from bird disturbance fieldwork, undertaken by the Bird Aware Solent Ranger Team during winter 2020/21, at five sites across The Solent. It compares visitor activities and behaviour, and bird numbers and responses, across the five sites. The 2020/21 study was originally planned to form a component of the baseline data for monitoring mitigation around the Solent, as part of the Bird Aware Solent Initiative.

1.3 However, ramifications of the Covid-19 pandemic (including Hampshire County Council's internal Covid-related working practices) prevented the Ranger Team from being able to complete the survey work. This meant that the study was curtailed halfway through, with this report providing analyses of data collected between October and December 2020 only.

1.4 Due to the reduced survey effort and simplified methodology used, no direct comparison is made with the results of the previous monitoring work carried out as part of the mitigation monitoring package.

2. Implications of the coronavirus pandemic

2.1 The coronavirus pandemic greatly affected the surveys, with a high peak in both cases and mortality in the UK during winter 2020/21. This led to restrictions being imposed upon non-local travel, which impacted access to the coast during the initial survey period. Subsequent restrictions ultimately removed the ability of surveyors to access the survey locations at all and led to the early cessation of the surveys.

2.2 The survey visits conducted during early winter 2020/21 were carried out in the wake of a number of earlier restrictions which were introduced and/or subsequently retracted (and occasionally reinstated) over time. The surveys followed the strengthened enforcement of the “rule of six” in mid-September (prior to this it was only a recommendation) and several, disparate, local lockdowns (although none of the latter affected areas local to the study sites). These restrictions were further refined following the introduction of the Tier system in mid-October.

2.3 Between the 5th of November and 2nd December, a short national lockdown was instituted. During the lockdown schools, colleges, and universities were allowed to remain open, but overnight stays were not permitted (unless for work) and non-essential retail, hospitality venues, and gyms were closed. Furthermore, individuals were only allowed to exercise 'in [their] local area'.

2.4 This will have had implications for recreational access - with hospitality venues and gyms closed, potentially more people will have accessed the countryside in their leisure time (plus individuals who were furloughed and/or not working)[1] . However, with individuals allowed to exercise only in their local area, visits from individuals from further afield may potentially have decreased.

2.5 Over the course of mid to late December 2020 a series of increasingly severe restrictions were imposed upon individual Local Authorities, based upon rises in cases and mortality within their areas of jurisdiction. By 31st

[1] The People and Nature survey results indicate two-fifths of the population are spending more time outside than before Covid-19 and around a third of adults have been exercising more in the outdoors :https://www.gov.uk/government/statistics/the-people-and-nature-survey-for-england-monthly-interim-indicators-for-december-2020-experimental-statistics/the-people-and-nature-survey-for-england-monthly-interim-indicators-for-december-2020-experimental-statistics. accessed 10/4/21.

December 2020, all of Hampshire, including the Isle of Wight, was in Tier 4 ('Stay at home') and by 4th January 2021 a national lockdown was imposed. It was therefore no longer possible to carry out the work, with the surveys carried out by the Bird Aware Solent Ranger Team not identified as comprising (exempt) essential work during the lockdown period. Hampshire County Council's internal Covid-related working practices further prevented the Ranger Team from being able to complete the survey work.

2.6 Figure 1 provides a timeline of the imposed coronavirus restrictions in England during the 2020/21 winter period.

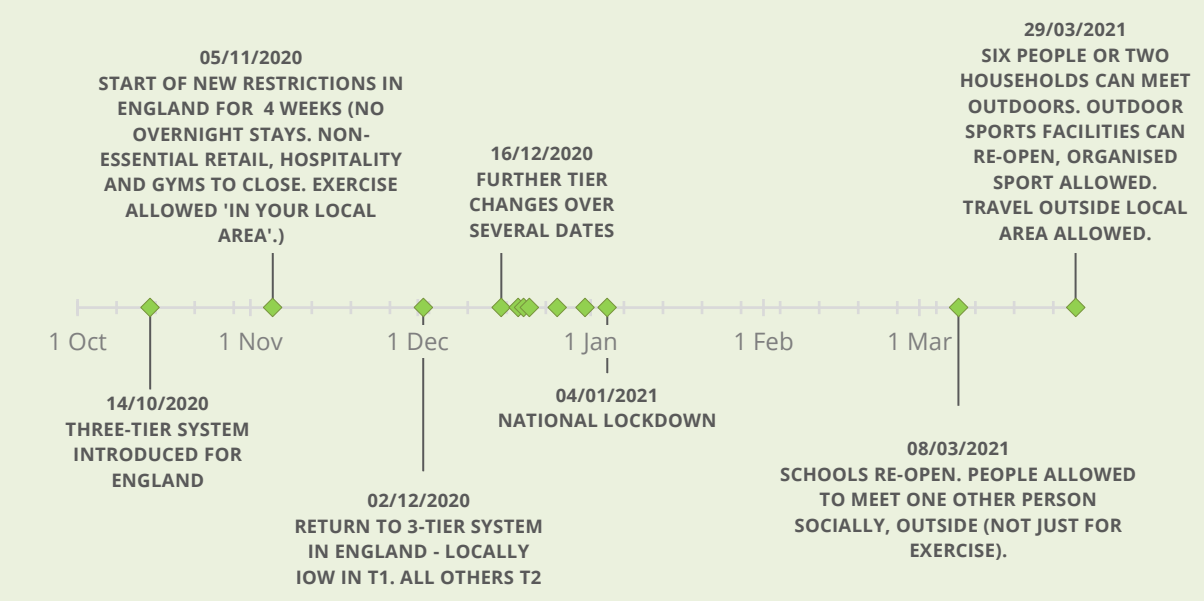


Figure 1: Timeline of imposed coronavirus pandemic restrictions in England over winter 2020/21

3. Methods

3.1 The proposed methodology follows on from the established disturbance survey methodology, as conducted in previous years. However, the surveying has been reduced in its scope, surveying effort and the information to be recorded simplified, to allow surveys to be conducted quickly and easily by the Bird Aware Solent Rangers. Ultimately, the surveys were also cut short by the implications of the pandemic.

Identification of survey sites

3.2 Five survey points were identified, namely East Head, Hurst Spit, Newtown (Isle of Wight), Hayling Oysterbeds, and Portchester (see Map 1). Four of these localities (all bar Hurst Spit) comprise a sample of the ten locations previously surveyed by Footprint Ecology during winter 2016/17, during the first year of mitigation package monitoring (Liley & Panter, 2017). They were also surveyed by Waterman during winter 2019/20 (Waterman Infrastructure and Environment Ltd, 2020). Further details on each of the survey locations can be found in Appendix 1.

Sampling approaches

3.3 The sampling approach during the 2020/21 surveys was based upon the methodology used by Footprint Ecology in the 2016/17 Solent surveys (and on numerous other disturbance studies elsewhere). However, in order to make data collection more straightforward for the Bird Aware Solent Ranger Team (who carried out all survey work) the methodology and recording forms used were simplified.

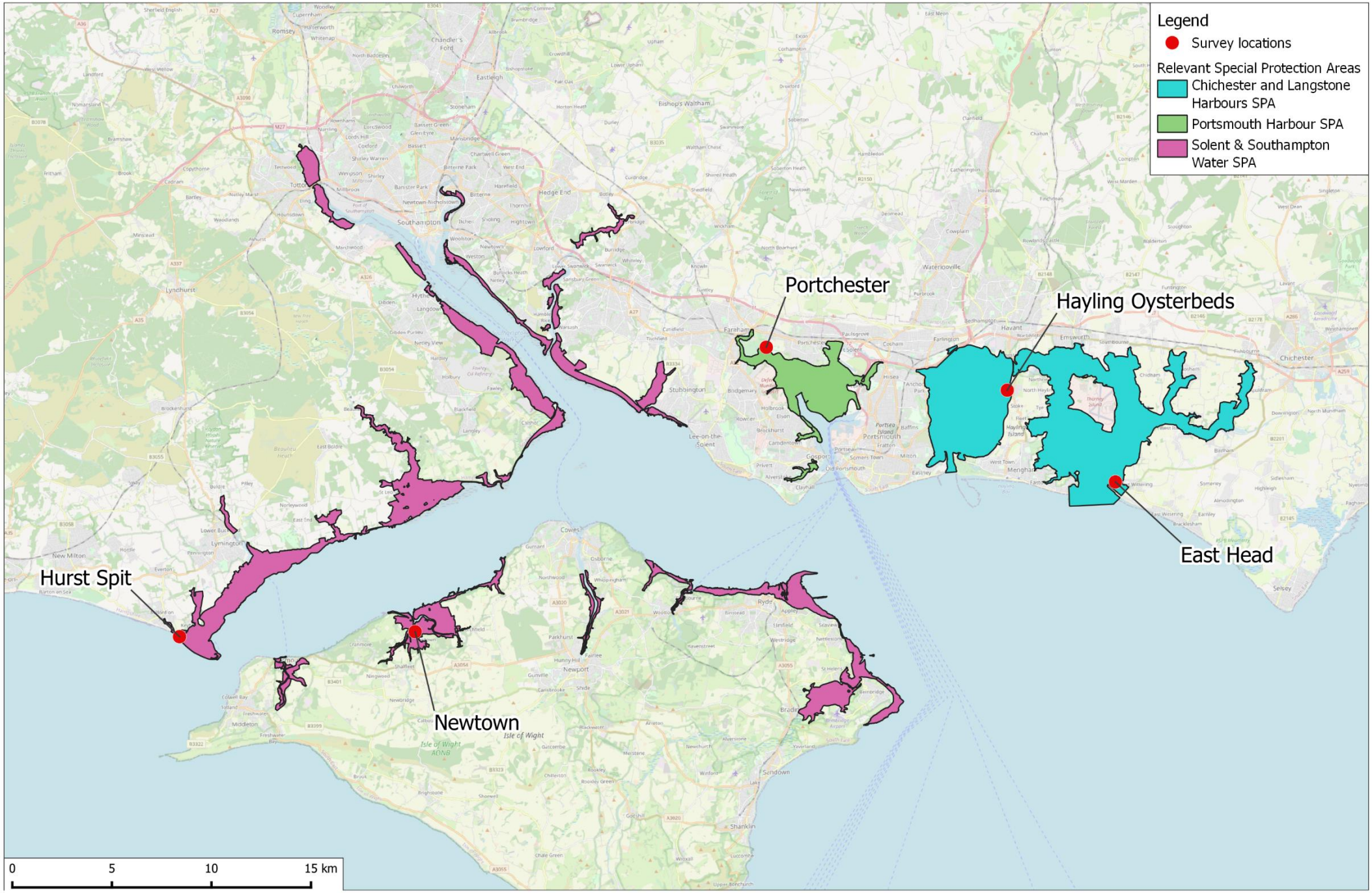
Recording elements

3.4 Each survey visit involved the following elements:

- Two counts of birds, one count at the start and one at the end of the survey period;
- A diary of all potential disturbance events observed during the 1 hour and 45 minutes following the first count;
- A record of the response of the birds present to each of the potential disturbance events recorded in the 'diary', including counts of birds present and the number of birds flushed, etc, and;
- Any additional information.

3.5 These different elements are described in more detail below, but in summary the bird counts provided a detailed level of use within the core area, the diary recorded the level of human activity, the response data detailed any behavioural response to disturbance shown by the birds present, and the additional information provided context and background.

Map 1: Survey locations



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Bird count

3.6 At the start of each survey visit, a count of the birds present was conducted, comprising all waders, terns, wildfowl, grebes, divers, and herons/egrets. The count only recorded the birds present within a pre-defined recording area that extended to a maximum of 500m from each of the survey points. This area was carefully mapped for each location prior to the first survey visit, using aerial photographs. Following subsequent completion of the diary/bird response component of each visit, the bird count was then repeated prior to completion of the survey.

3.7 All mapped areas had a clear line of sight, with their entire extent (within 500m) visible to the recorder from the fixed watch point. Each fixed watch point was selected to be at a point where any disturbance caused by the presence of the surveyor could be minimised/avoided, although the size of the recording area varied at each location due to differences in topography/hydrology, etc.

Diary and disturbance/bird response

3.8 All recreation events (and events which could disturb birds, such as aircraft, birds of prey, etc.) which occurred during the following 1 hour and 45 minutes were recorded in a diary format, on a combined "diary/disturbance" form (see Appendix 2). The diary element involved logging all observed events that could affect birds within the recording area, including those that occurred outside (but still in the vicinity of) the recording area. This was due to the fact that activities above the Mean High Water Mark (MHWM), and events outside the recording area, could still disturb birds. Regardless of whether birds were present or not, all events were recorded in the diary, allowing comparisons of the levels of human activity in different areas.

3.9 Each activity type was categorised using pre-determined activity codes (see Appendix 3). Each diary entry was assigned a unique identifier, indicating a single unique event, with details recorded including activity (categorised to standard codes), group size, zone (intertidal, on water, or above MHWM), and notes relating to behaviour. Any individuals exercising dogs were identified as 'dog walking', irrespective of any 'secondary' activity (e.g. jogging, birdwatching, etc).

3.10 Events in the diary were categorised as a 'potential disturbance event' if:

- They coincided with birds being present within the count area; and/or,
- They occured within 200m of birds within the recording area; and/or,
- There was a behavioural response recorded for birds within the recording area (i.e. seen to become alert, change position, or were flushed).

3.11 For each potential disturbance event, the response of the birds was recorded, even if no behavioural response was logged – i.e. if the birds were not visibly disturbed. The simplified recording form allowed the total number of birds within 200m of the potential source of disturbance to be recorded, split into the following groups: "waders", "wildfowl", and "others" (i.e. response observations were not recorded to species level, as in the previous survey work carried out by Footprint Ecology).

3.12 The response of the birds present was identified, using simple categories ('Alert', 'walk/swim', 'short flight (<50m)', 'Major Flight (>50m)', or 'No Response') and the number of birds overall falling into each response category was recorded (see Appendix 4). Note that the responses were not recorded separately at either the species or group level (i.e. all waders, wildfowl, and other species present which exhibited an (e.g.) "alert" response were recorded collectively). Nevertheless, a single disturbance event could still result in multiple responses (i.e. some of the birds present become alert whilst others walk away).

3.13 For each activity/event where disturbance occurred the maximum distance from all birds present (within all three groups) to the event was estimated. This was calculated as the approximate straight-line distance from the source of disturbance to the birds and recorded in one of five pre-determined distance category bands (0 to 10m, 10 to 50m, 50 to 100m, 100 to 200m, and 200m+). If there was no response from the birds, then the minimum distance from those present to the disturbance event was recorded (i.e. how close the disturbance event was to the birds). If the birds were in a tight flock, or only a single individual was involved, then this distance was relatively easy to measure.

3.14 In order to ensure consistency in recording distances the Bird Aware Solent Ranger Team surveyors used aerial photographs, with landmark distances pre-plotted, at each location. When blown up and printed on good quality

paper, these images allowed the location of creeks, buoys, marker posts, and landmarks to be clearly identified and assist with distance estimates.

Additional Information

3.15 Additional information provided context and background and included tide times, tide coverage, and weather. A free text box allowed any anecdotal information, such as particular events or activities taking place that might make the birds jumpy, to also be recorded.

Timing and logistics (including coverage of tide states, etc.)

3.16 It was planned that each survey point would be visited once per month between October 2020 and March 2021, with half of the visits to each undertaken on a weekday and half on a weekend, resulting in six visits to each survey point over the entire study period. However, surveys were ultimately only carried out between October and December 2020 at each of the survey locations prior to the covid restriction/Hampshire County Council working practice-induced cancellation of survey work.

3.17 The visits that did occur were spread over different days and times of day to ensure a range of conditions and circumstances were covered. As far as possible, visits included the following:

- A range of weather conditions, including some dates with strong winds when water sports and sailing are likely to take place at relevant sites;
- Any particular events that were known the be taking place, and;
- A range of tide states.

Data analyses and presentation

3.18 The data collected was analysed using R statistical software packages, with graphs and tables produced using both R and Microsoft Excel. The graphs include examples of stacked barplots, histograms, and box and whisker plots. The latter graph type depicts a range of information in a single plot, including the median value (represented by a thickened central line within the box), the interquartile range (the distribution of 25% to 75% of the data) of the dataset (the box itself), the range of the dataset (the 'whiskers'), and any outlier values (represented as standalone points).

3.19 Descriptive statistics (mean values within categories, etc) are used to summarise the dataset, but due to the relatively small amount of data collected during the study period no other statistical tests (e.g. Chi-squared and Mann-Whitney U tests) have been undertaken.

4. Results

Categories, levels, and distribution of human activities

4.1 A total of 764 individual activity events were recorded within 19 categories across the survey period, including aircraft and predator activity (see Table 1). Taking into account group size[2], and excluding predator activity, this gives a total of 749 human activity event observations involving at least 1,602 people. A total of 302 dog walking observations were made, comprising a minimum of 356 animals off lead and 102 on the lead. East Head was the busiest location overall (240 events), Hurst Spit the second busiest (180 events), and the remaining three localities approximately the same (114/115 events at each).

4.2 Walking with and without a dog were the two most commonly recorded activities, each accounting for 40% of observations overall. Cycling (6% of observations), bird/wildlife watching (4%), and jogging (4%) were the next most frequently recorded, with all other human activity types comprising 3% or less of overall observations. Amongst the recorded intertidal and/or water-based activity types, wind-surfing was the most common (although still comprising only 3% of all records).

4.3 Although dog walking and walking combined accounted for the majority of observations at each of the five survey locations (see Figure 2), there was some inter-site variation in the relative prevalence of the two activities. Dog walking comprised 62% of observations at East Head and 44% of observations at Portchester, but only a quarter of observations at each of the other three survey locations. There was less variation in the number of walkers observed, although more than half of the activity recorded at Hurst Spit comprised people walking without dogs. Wind-surfing was only recorded from Hayling Oysterbeds, whilst Newtown accounted for all RIB observations. Bird/wildlife watching also comprised >10% of all observations at the latter locality.

4.4 The majority (86%) of activity events occurred on or above the shoreline, with those carried out on the intertidal area comprising 7% of observations (see

[2] Note that aircraft, motor vehicles, and larger watercraft were automatically assigned a group size of 1 for the purposes of the analysis.

Figure 3). Water-based activities were more commonly recorded at Newtown and Hayling Oysterbeds than at the other three locations.

Table 1: Type and distribution of recorded activities across the five survey locations. Note that row/column percentages have been rounded up to the nearest whole number, and that predator activity is also included in the table. The largest value in each column is highlighted in dark grey, and the second largest in light grey.

Activity	East Head	Hurst Spit	Newtown	Hayling Oysterbeds	Portchester	Total
Airborne	0 (0%)	1 (1%)	1 (1%)	0 (0%)	0 (0%)	**2 (1%)**
Dog walking	148 (62%)	45 (25%)	28 (25%)	29 (26%)	50 (44%)	**300 (40%)**
Dog off lead	2 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	**2 (1%)**
Walking	69 (29%)	95 (53%)	44 (39%)	46 (40%)	50 (44%)	**304 (40%)**
Cycling	4 (2%)	18 (10%)	0 (0%)	12 (11%)	9 (8%)	**43 (6%)**
Jogging	10 (5%)	7 (4%)	2 (2%)	3 (3%)	5 (5%)	**27 (4%)**
Kids playing	1 (1%)	0 (0%)	10 (9%)	0 (0%)	0 (0%)	**11 (2%)**
Bird/wildlife watching	1 (1%)	5 (3%)	13 (12%)	6 (6%)	0 (0%)	**25 (4%)**
Fishing (from shore)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)	**1 (1%)**
Motor vehicle	1 (1%)	5 (3%)	0 (0%)	0 (0%)	0 (0%)	**6 (1%)**
Person accessing boat or water	0 (0%)	2 (2%)	0 (0%)	0 (0%)	0 (0%)	**2 (1%)**
Moderate to large sailing boat	0 (0%)	0 (0%)	2 (2%)	0 (0%)	0 (0%)	**2 (1%)**
RIB or similar small, fast, boat	0 (0%)	0 (0%)	13 (12%)	0 (0%)	0 (0%)	**13 (2%)**
Rowing boat	0 (0%)	0 (0%)	1 (1%)	0 (0%)	0 (0%)	**1 (1%)**
Person working on boat	0 (0%)	1 (1%)	1 (1%)	0 (0%)	0 (0%)	**2 (1%)**
Wind-surfing	0 (0%)	0 (0%)	0 (0%)	16 (14%)	0 (0%)	**16 (3%)**
Paddle-boarding	1 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	**1 (1%)**
Other	2 (1%)	1 (1%)	0 (0%)	2 (2%)	0 (0%)	**5 (1%)**
Predator	1 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	**1 (1%)**
Total	**240 (100%)**	**180 (100%)**	**115 (100%)**	**115 (100%)**	**114 (100%)**	**764 (100%)**

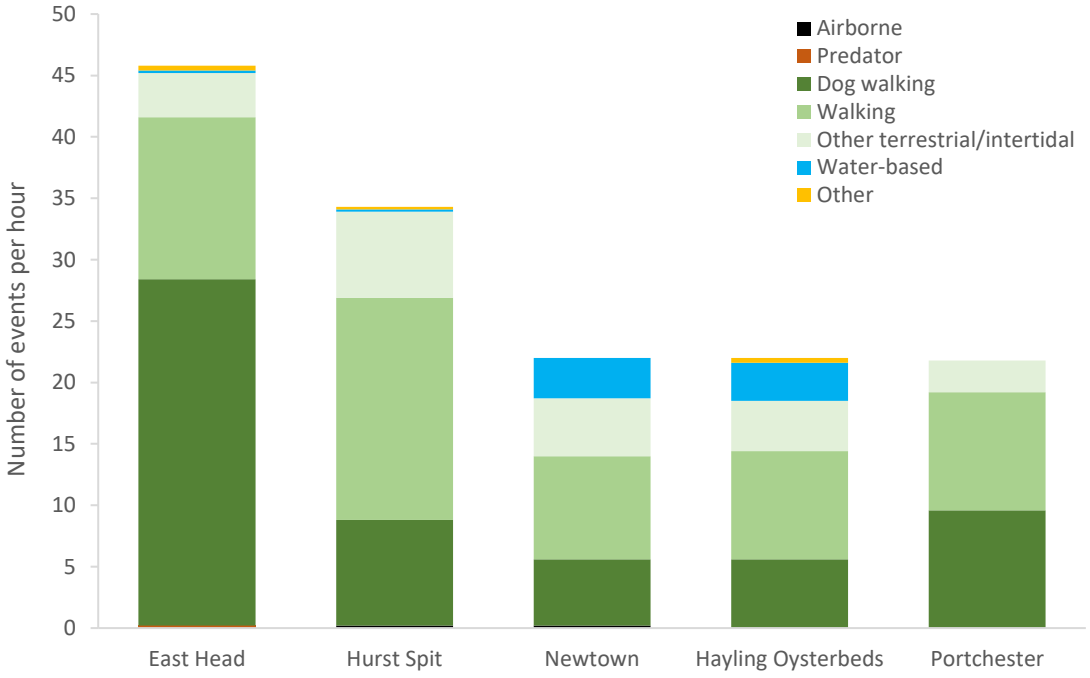

Figure 2: Diary data adjusted to depict events per hour, with terrestrial activities grouped in green.

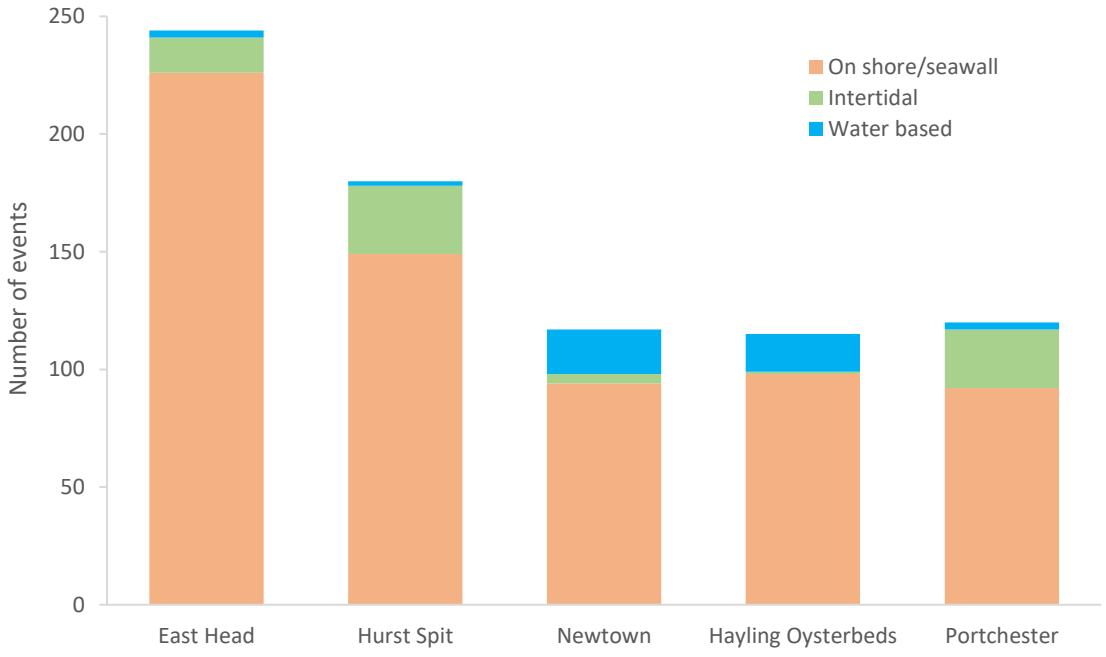

Figure 3: Distribution of recorded activities across the coastal gradient at the five survey locations. Note that a single activity event (e.g. a dog playing on the beach and then entering the water) could be recorded in multiple location categories.

4.5 458 dogs were recorded in total (see Table 2), with animals observed at every survey location. The largest number of dogs were recorded at East Head (48% of all observations), with the smallest number recorded at Hayling Oysterbeds (8% of all observations). A relatively large number of dogs were also recorded at Portchester (23% of all observations), with that locality also reporting a much larger ratio of dogs/dog walkers (2.1) than the other sites. The majority of dogs across all survey locations (78%) were recorded off the lead, although this trend was bucked at Hurst Spit (where 61% of dogs were on leads).

Table 2: Number (%) of dogs observed on and off lead at each survey location over the entire survey period, with the larger proportion per survey location highlighted in grey. Note that row percentages have been rounded up to the nearest whole number. The mean number of dogs per dog walker is also provided, with the largest value highlighted in grey.

Site	Number (%) dogs off lead	Number (%) dogs on lead	Total number (%) of dogs observed	Mean no. of dogs per dog walker
East Head	177 (81%)	44 (20%)	221 (100%)	1.5
Hurst Spit	20 (40%)	31 (61%)	51 (100%)	1.2
Newtown	32 (69%)	15 (32%)	47 (100%)	1.7
Hayling Oysterbeds	31 (92%)	3 (9%)	34 (100%)	1.2
Portchester	96 (92%)	9 (9%)	105 (100%)	2.1
Total	**356 (78%)**	**102 (23%)**	**458 (100%)**	**1.6**

4.6 The number of dogs observed per visit varied across all five survey locations (see Figure 4), although this was most apparent at East Head (with a range of 33 to 86 animals observed).

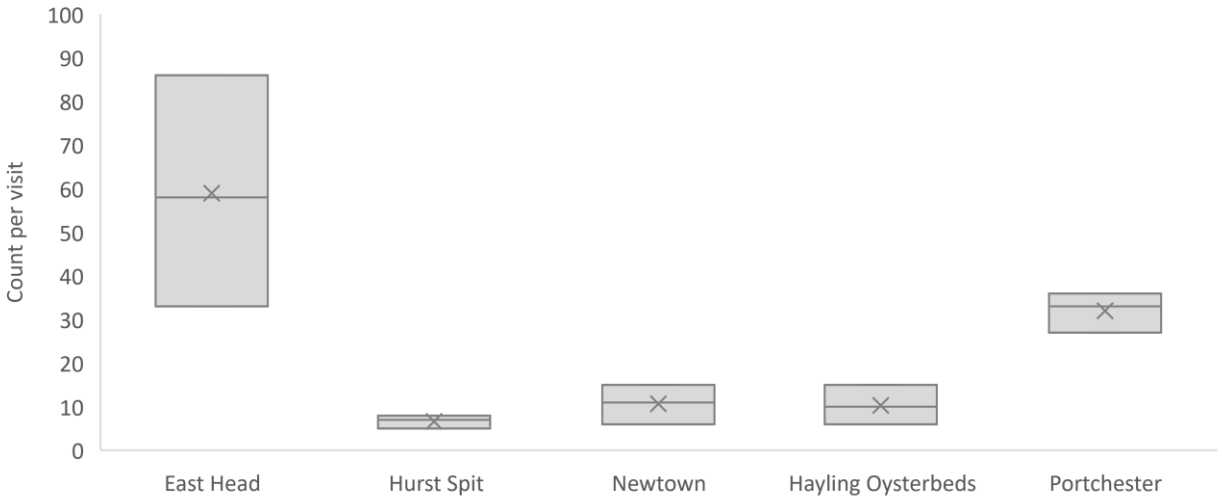

Figure 4: Variation in the number of dogs observed at each of the five survey locations across all survey visits.

Bird Counts

4.7 A total of 27 species, excluding gulls, were recorded from the five survey locations over the entire survey period (see Figure 5). These comprised 11 species of wader, 10 species of wildfowl, and 6 other waterbird species. Newtown exhibited the greatest species richness, with 23 species (excluding gulls) recorded across the survey visits, whilst Portchester had the lowest (11 species).

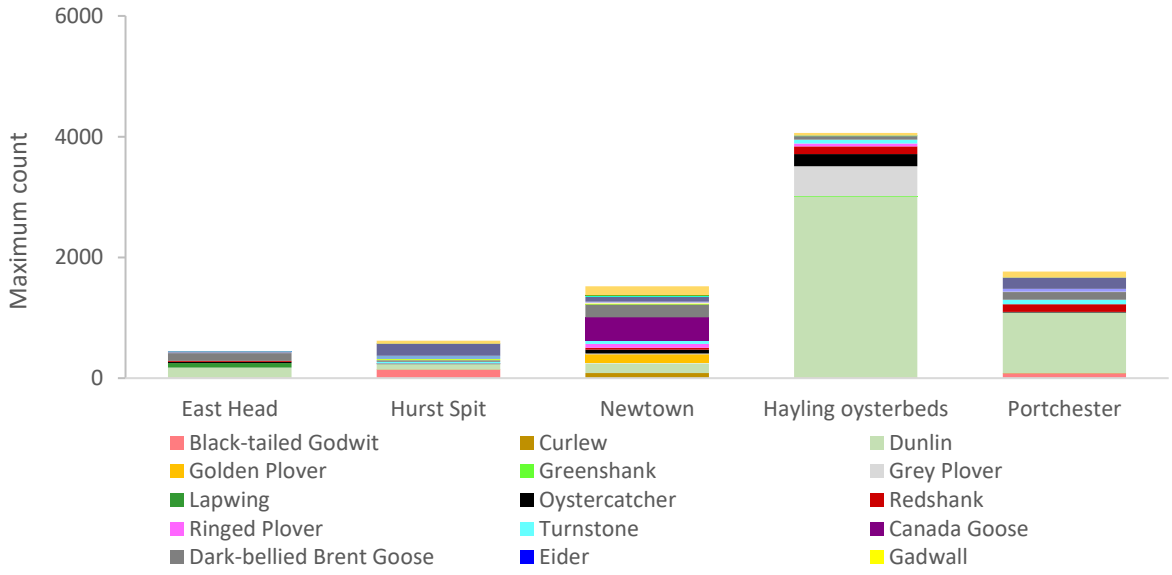

Figure 5: Maximum count of birds observed at each of the five survey locations across all survey visits.

4.8 The most widespread wader species were Curlew *Numenius arquata*, Dunlin *Calidris alpina*, Oystercatcher *Haematopus ostralegus*, and Redshank *Tringa totanus* (each recorded from all five survey locations), whilst Golden Plover *Pluvialis apricaria*, and Greenshank *T. nebularia*, were all recorded from single sites only.

4.9 Dark-bellied Brent Goose *Branta bernicla bernicla* was the most commonly recorded wildfowl species (all locations), with Canada Goose *B. canadensis*, Eider *Somateria mollissima*, and Gadwall *Mareca strepera* recorded from single sites. Amongst the other waterbird species, Little Egret *Egretta garzetta* was most widespread (recorded at all sites), whilst Grey Heron *Ardea cinerea* and Sandwich Tern *Sterna sanvicensis* were each only recorded at individual sites.

4.10 Hayling Oysterbeds recorded the largest number of birds overall (based upon maximum counts), with Portchester and Newtown recording less than half the number of birds recorded there. The maximum counts of wader and wildfowl species at each of the survey locations varied, with the largest number of waders recorded from Hayling Oysterbeds. That site recorded very high counts of Dunlin (max. count 3,000), Grey Plover *Pluvialis squatarola* (max. count 500), and Oystercatcher (max. count 200) relative to the other four survey locations. Portchester also recorded large numbers of Dunlin (max. count 1,000).

4.11 Portchester, Newtown, and East Head all recorded large numbers of Dark-bellied Brent Geese, with large numbers of Wigeon also recorded at the first of those sites and at Hurst Spit. Newtown recorded the largest numbers of wildfowl overall (combined max. count across species of 724) and also supported the greatest diversity of wildfowl species.

4.12 Conversely, when comparing the maximum number of birds left within the study area at the end of each survey visit (see Figure 6) it can be seen that Portchester generally recorded larger numbers of wildfowl than any of the other sites, whilst Hayling Oysterbeds consistently recorded far larger numbers of waders.

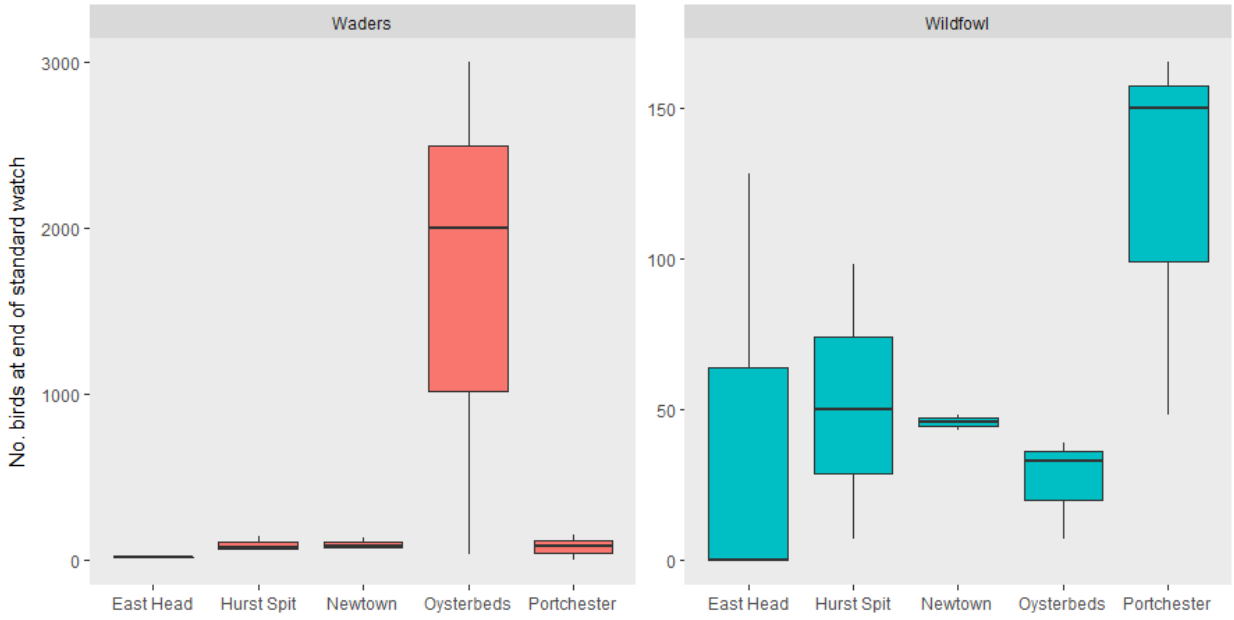

Figure 6: Maximum number of waders (left) and wildfowl (right) remaining with the study area at each survey location at the end of each survey visit.

Effect of people on bird numbers and distribution

4.13 A negative relationship was observed between both the number of activity events recorded in the diary and the number of dogs recorded off lead, and the number of wildfowl remaining at the end of the relevant survey visit (see Figure 7). Therefore, fewer wildfowl generally remained at the end of the diary session at sites where larger numbers of these potentially disturbing activities occurred. East Head generally recorded both the largest number of events and dogs off lead, and the fewest remaining wildfowl at the end of the session.

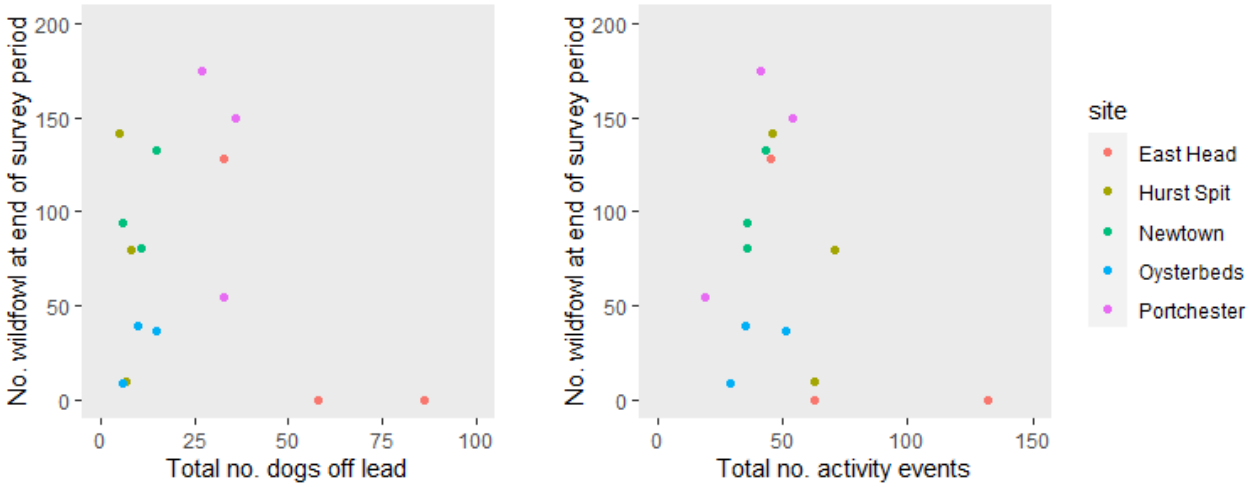

Figure 7: Number of wildfowl at end of each survey visit in relation to the total number of dogs off lead (left) and the total no. of diary events (right) during the relevant survey period.

4.14 The mean number of potential disturbance events per visit ranged between 25 (Portchester) and 74 (East Head) across the five survey locations (see Figure 8), although Newtown, Hayling Oysterbeds, and Portchester consistently recorded fewer such events than the other two sites. East Head showed the greatest variation in the number of potential disturbance events (30 to 132) and Newtown the least (32 to 42).

Figure 8: Number of potential disturbance events occurring within 200m of birds present during each survey visit.

4.15 There was a positive relationship between both the number of diary events per hour (and the number of potential disturbance events per hour) and the number of flushes per hour (short and major flights combined) observed across all five locations/survey visits (see Figure 9). This relationship was however less clear cut for the number of dogs recorded off lead per hour.

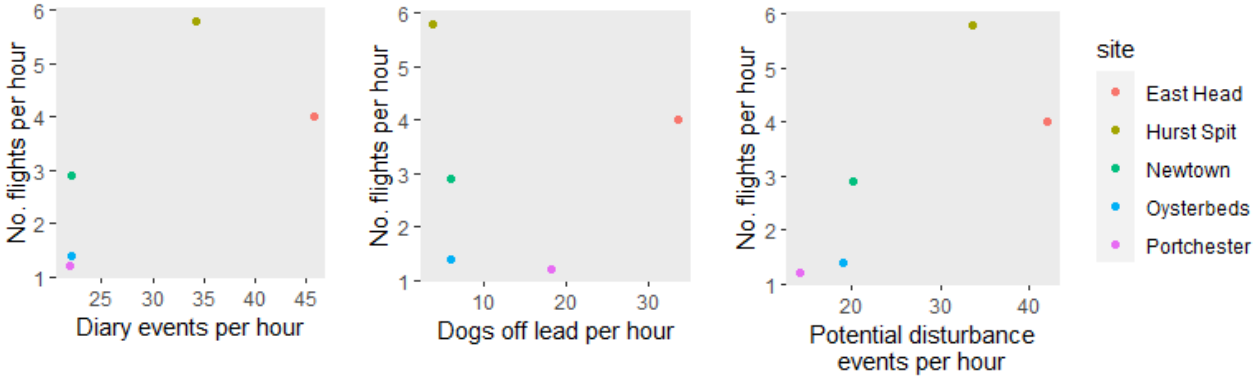

Figure 9: Number of times birds were flushed per hour (short and major flights combined) at each survey location across the entire survey period, in relation to the number of diary events per hour (left)

Behavioural responses

4.16 Of the 764 individual activity events recorded across the entire survey period, 678 (89%) comprised potential disturbance events. A potential disturbance event occurred when birds were present within the focal area during the diary period, and an activity was carried out within 200m of them (or when an activity was carried out >200m distant but had an obvious disturbance effect).

4.17 Across all survey locations, the 678 potential disturbance events observed generated a total of 796 behavioural observations (see Table 3). Of these, 657 (83%) resulted in no visible change to the birds' behaviour or any direct response. 17% of potential disturbance events therefore generated a behavioural response, with 3% leading to a major flight.

Table 3: Summary of response data across all survey locations. Note that each potential disturbance event within the diary is treated as a unique event, and any event resulting in >1 response type is allocated to the most extreme (e.g. an event causing some birds to become alert, and others to take a short flight, would be classified as inducing a short flight response). Note that percentages have been rounded up to the nearest whole number.

Response type	Number of responses recorded (%)
No response	657 (83%)
Alert	31 (4%)
Walk/Swim	29 (4%)
Short flight	63 (8%)
Major flight	16 (3%)
Total	**796 (100%)**

4.18 Using these figures, we can calculate that there were, on average, 25.8 potential disturbance events/hour across all survey locations over the entire survey period. These events caused, on average, a response 5.3 times/hour during the same period, with a flight response (short or major) occurring approximately 3 times/hour.

Responses to activity types

4.19 The 796 recorded response observations are summarised by activity type in Figure 10. Those activities with shorter green bars led to a higher proportion of disturbance responses, although the small sample size of many of the activities should nevertheless be noted.

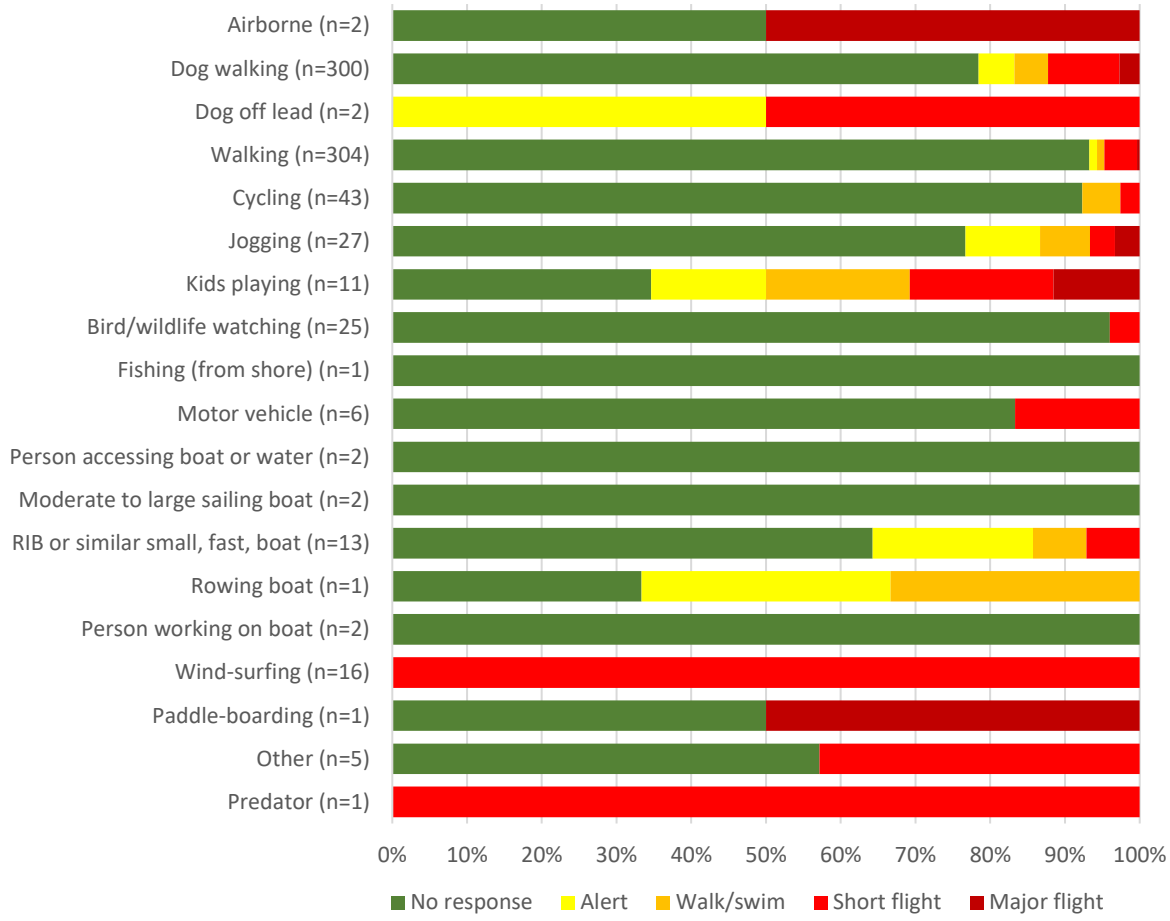

Figure 10: Responses of birds to differing activity types (all species across all locations). Activities are grouped into those which are predominantly based on the shoreline, then those on the intertidal area, water-based activities, airborne activities, and 'other'. The sample size of each activity type (i.e. number of events) is provided in parentheses.

4.20 For the most frequently recorded activities (dog walking and walking) a relatively small proportion of potential disturbance events triggered a response from the birds. It is nevertheless important to recognise that more than a fifth of dog walking observations still led to a behavioural response from the birds present. It is furthermore evident that water-based activities, and those that included loud noises (e.g. overflying aircraft), more frequently triggered a behavioural response from any birds present than most other activity types. Of those activities recorded on >10 occasions and causing an extreme behavioural response, wind-surfing is particularly noteworthy.

Variation between sites

4.21 The relative proportion of behavioural responses observed varied between the survey locations (see Figure 11). Of the 141 observations at Newtown, more than a quarter comprised a behavioural response. Hayling Oysterbeds recorded the smallest (relative) number of behavioural responses (approximately 10%). Nevertheless, due to the larger number of observations made at each of the two sites, the smaller overall proportions of behavioural responses observed at both East Head and Hurst Spit comprise a larger number of actual instances. Furthermore, Hurst Spit recorded a greater number of both actual and relative flight responses in comparison to the other four survey locations.

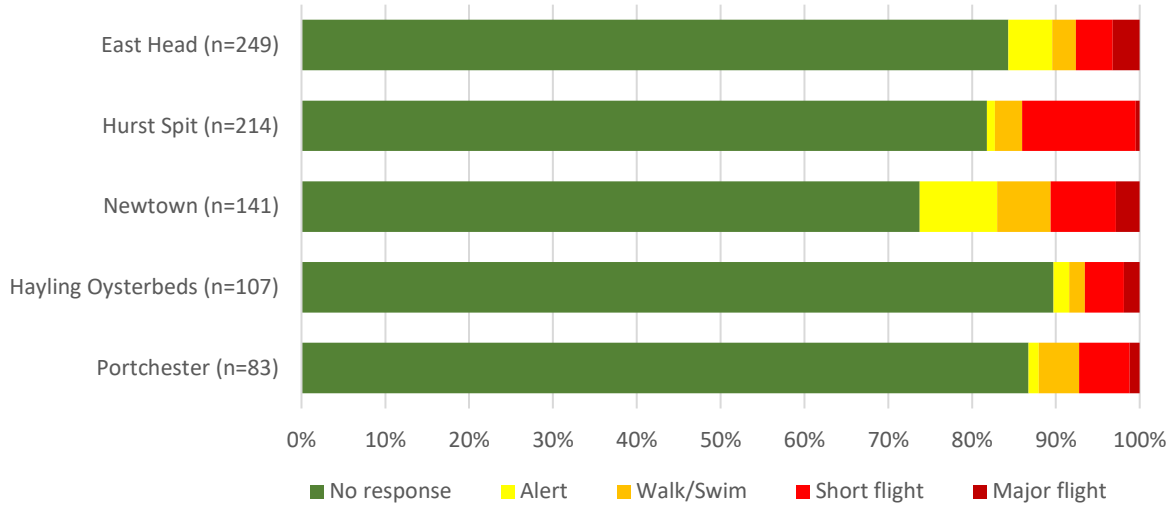

Figure 11: Responses of birds at each survey location (all species across all activity types). The total number of response observations at each survey location is identified in parentheses.

4.22 Figure 12 depicts the number of disturbance events observed within different distance bands from the potential disturbance event, for all survey locations and activities across the entire survey period. It shows that a similar number of overall observations were made when the disturbance was between 10m and 200m from the birds, with behavioural responses seen in less than a fifth of cases.

4.23 Fewer observations were made of disturbance events occurring within 0m to 10m of any birds present. Nevertheless, more than a quarter of the observations within this distance band resulted in a behavioural response, with 18% comprising an extreme response (short or major flight). A single

(short flight) response was also noted at >200m range to an overflying aircraft, with the bar too small to be seen in the figure but included for completeness.

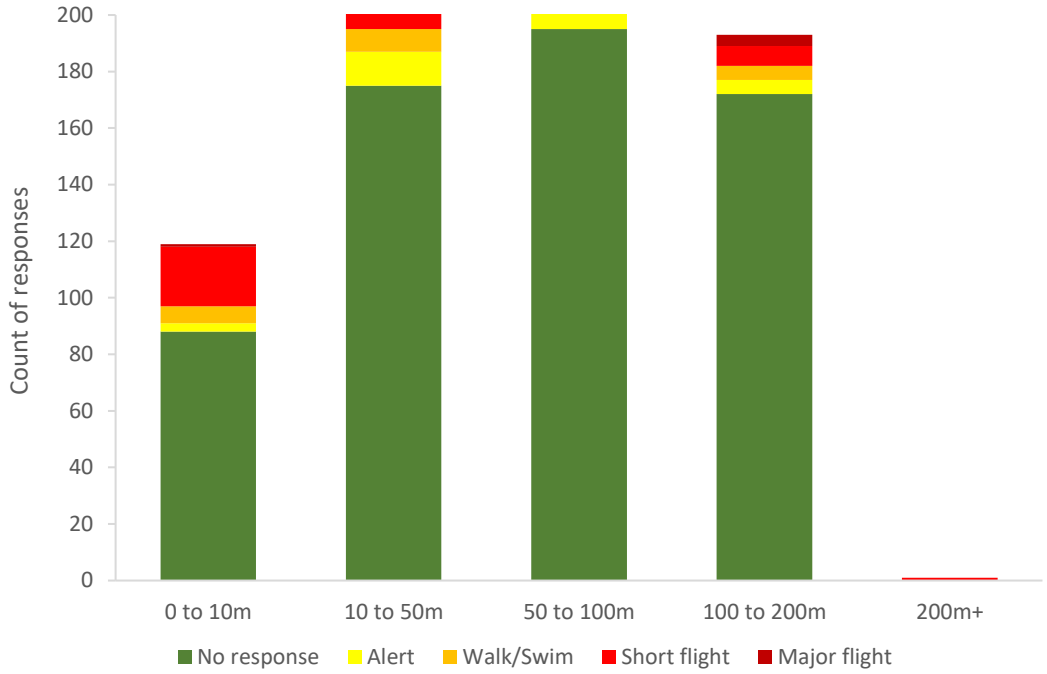

Figure 12: Counts of bird responses at different distances from the disturbance event across all survey locations (all species across all activity types).

5. Discussion

5.1 Conclusions made from the dataset presented in this report should be undertaken cautiously due to the small sample size (resulting from the early curtailment of the surveys) and the use of stream-lined recording methods devised to assist the ranger survey team. Nevertheless, the data collected is useful and various patterns can still be identified in the data.

5.2 A wide range of bird species were found to use the five survey locations, with Hayling Oysterbeds proving particularly important for waders and Portchester for wildfowl (potentially reflecting the smaller number of activities/disturbance events recorded at each of the two localities). The East Head and Hurst Spit survey locations were much more heavily used by people than the other three survey sites, with the number of diary events observed overall directly linked to the number of potential disturbance events recorded.

5.3 Dog walking and walking were the two most commonly recorded activities by far, with East Head in particular proving popular with dog walkers (accounting for nearly half of all observations of dog walking during the surveys). Dog walking was also particularly prevalent at Portchester, with the higher ratio of dogs to dog walkers noted at that site potentially indicative of use by commercial dog walkers. With the notable exception of Hurst Spit, the majority of dogs observed across the surveys were off lead. More than 20% of dog walking observations made in proximity to birds led to a behavioural response, with the prevalence of dog walking across sites meaning that a large number of birds were disturbed throughout the day.

5.4 The data indicates that the busier sites, with larger numbers of dogs observed off lead, tend to support fewer wildfowl. Furthermore, the birds at busier sites (exhibiting a greater number of potential disturbance events) are flushed more frequently across the day. Fewer observations were made across the five survey locations of birds within 10m of activity events, potentially indicative of avoidance. Nevertheless, observations made at that distance were more likely to result in a behavioural response than those occurring at a greater distance from any birds present.

5.5 Although much less commonly recorded, wind-surfing was also identified as a particularly disturbing activity, with all observations resulting in a flight response from the birds present. This activity was nevertheless restricted to

Hayling Oysterbeds during the survey period, and as such may be easier to mitigate on a site basis.

Recommendations

5.6 It is recommended that the surveys are repeated across the entire winter of 2021/22 in order to fully inform the ongoing monitoring of the Solent mitigation package.

5.7 It is also recommended that the full methodology, previously utilised by Footprint Ecology in the winter of 2016/17, is used so as to allow a direct comparison between the two datasets and cover the limitations from the scaled down methodology.

References

Liley, D., & Panter, C. (2017). *First year results of monitoring bird disturbance in the presence/absence of rangers on the Solent*. Unpublished report by Footprint Ecology for for Bird Aware Solent.

Waterman Infrastructure and Environment Ltd. (2020). *Solent Bird Disturbance Monitoring 2019-2020*. Report for Bird Aware Solent.

Appendix 1: Additional Survey Point information

Location	Habitat	Roost site?	Tide on which to target surveys
East Head	Mudflats, saltmarsh, sand dune	Yes	High/rising/falling
Hurst Spit	Mudflat, saltmarsh	No	Rising/falling
Newtown	Mudflat, lagoon, saltmarsh	No	Low/rising/falling
Hayling Oysterbeds	Mudflat, saltmarsh	Yes	High/rising/falling
Portchester	Mudflats	No	Low/rising/falling

Appendix 2: Combined diary and disturbance recording form

FOOTPRINT ECOLOGY
www.footprint-ecology.co.uk

Location:	Date:	Observer:

DIARY/DISTURBANCE: All potential sources of disturbance (trains, raptors, people etc) should be recorded, including when no birds present or when activity causes no response.

Response descriptions
Alert - heads up, no change in birds' position
Walk/Swim - birds walked/swam short distance and resumed previous behaviour
Short Flight - Birds flew short distance (<50m) and resumed previous behaviour in general area
Long Flight - Birds took flight and flew more than 50m

a) UNIQUE ID	b) Activity Code(s)	c) Time 1st seen	d) Within 200m of birds in 500m count area? (Y/N)	Zone (tick one or more)			h) Group size (Total people)	Total Dogs		k) Total no birds present within 200m			l) Distance of birds from activity (tick)					m) Response (breakdown of total across column *k* according to response)					n) Same as previous Unique ID?	o) Description/notes
				e) On Shore/ sea wall	f) On Intertidal	g) Water based		i) On lead	j) Off lead	Waders	Wildfowl	Others	0 to 10m	10 to 50m	50 to 100m	100 to 200m	200m+	NR	A	W/S	SF	LF		

a) Use unique letter code to allow cross-referencing if required b) Use activity code as provided in table on reverse of Summary sheet

Appendix 3: Activity codes

Activity type	Code	Activity type	Code
Airborne	AB	Motor vehicle	MV
Bird/wildlife watching	BR	Paddleboard	Pb
Canoe on water	Ca	Person accessing boat or water	BW
Cycling	C	Person working on boat	B
Dog walking	DW	Photography	Ph
Fishing (from shore)	F	Picnic	P
Horse riding	HR	Predator	PR
Jet ski on water	JS	RIB or similar fast small boat	SMb
Jogging (without dogs)	J	Rowing boat	RB
Kids playing	KP	Unaccompanied dog off lead	DX
Kitesurfer on water	KS	Walking/rambling (without dogs)	W
Large motorboat with inboard engine > 10m	LMb	Windsurfer on water	WS
Moderate to large sailing boat, not running motor	LS	Other	O

Appendix 4: Response codes

Response	Description	Code
No response	No change in behaviour/position	NR
Alert	Heads up/responsive, but no change in birds' position	A
Walk/Swim	Birds walked/swam a short distance prior to resuming previous behaviour	W
Short flight	Birds flew a short distance (<50m) and resumed previous behaviour in general area	f
Major flight	Birds took flight and flew >50m	F