Recognising trends in waterbird distribution over the tidal cycle on the Stour Estuary – a Pilot Study

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Abstract

This short paper explores the importance and use of intertidal mudflats by Black-tailed Godwits (*Limosa limosa islandica*), Redshank (*Tringa totanus*) and Shelduck (*Tadorna tadorna*) between low and high tides on the Stour Estuary. Surveys were conducted in a set study site during a rising or falling tide, observing bird species present on the mudflat. It was found that there were a range of species using the mudflats during the rising or falling of the tide, with the greatest presence occurring when there was a higher percentage exposure of mud, as well as when there was freshly exposed mud.

Background

Most non-breeding waterbird data in the UK is collected by the Wetland Bird Survey (WeBS). This is a systematic count which in 2017/18 was undertaken at 2,847 sites (Frost et al., 2018). At coastal locations these surveys are conducted at high tide when mudflats are inundated. Sites are normally counted from September to March, but on the Stour estuary these counts are conducted between August and April as internationally important numbers of Black-tailed Godwits (*Limosa limosa islandica*) and Redshank (*Tringa totanus*) are present at the extremes of this period. This important information demonstrates where waterbirds roost – normally saltmarshes or inside the seawall on arable or grazing marshes. WeBS counts do not demonstrate the importance of intertidal mudflats.

The Stour Estuary is part of the Stour and Orwell Estuaries Special Protection Area (SPA); it is the 24th most important site in the UK for wintering waterbirds. The most recent data shows that it supports a five year mean of 47,251 birds (2013/14 - 2017/18; Frost et al., 2018).

Intertidal mudflats are of critical importance for waterbirds, which includes SPA (Special Protected Area) species. Importance is highlighted around the feeding benefits that mudflats provide for Black-tailed Godwits and Dunlin (*Calidris alpina*; Kelsey and Hassall, 1989; Gill et al., 2007). These areas are increasingly becoming more important for feeding with the loss of salt marshes and land use changes within hinterlands (Luis et al., 2002; Ausden et al., 2010), it is therefore important that we do not lose these areas that a large number of species rely upon. It has been found that in areas where mudflats have been disturbed (e.g. an increase in water depth) waterbird densities decreased due to the drop in prey density (Smith, 1975; Goss-Custard et al., 1977; Bryant and Leng, 1975). Some SPA species have very fixed feeding ecology, including Shelduck (*Tadorna tadorna*), making them highly vulnerable to any habitat disturbance (Olney, 1965). Disturbance towards these species and their habitats would most likely have a severe detrimental effect (Burton et al., 2002; dit Durell et al., 2006), making intertidal mudflat regions areas that should be prioritised more. It has been found that even small amounts of recreational pressure can cause localised disturbance of birds (Lake, 2010); this disturbance could be as small as dog walkers on a beach scaring the birds into flight, which could take away from the birds vital feeding time during certain tidal times (i.e. when the tidal waters have exposed fresh mud). An increasing pressure from tourism and public presence along the margins of intertidal feeding grounds has the potential to cause a large amount of disturbance if not taken into account and managed suitably.

In addition to WeBS counts, important sites across the country are also periodically counted at low water. The Stour estuary has received more low water coverage than many sites since the early-2000s as part of a mitigation and monitoring package following a capital dredge of the main shipping channel in the late 1990s.

There is an absence of any meaningful data that shows how mudflats are used by waterbirds between low and high water. The findings of this survey will provide useful information on the importance of mudflats through the tidal cycle and promote further study.

Methodology

Study Area and Times

The area surveyed during this pilot study was at Mistley Walls (51.946435°N, 1.076836°E), during November and December 2018. Each survey was conducted in the same area of mudflat along the shoreline (Figure A1), to allow for accurate identification and counting of species. Only those species within the allocated study area were counted within the sightline of observers from within the designated location of the shelter.

Surveys were conducted either on a rising or falling tide. Only those tides situated during daylight hours were used to ensure constant visibility over the entire study site. Surveys started two hours after high or low tide and were carried out for three hours with counts occurring every 30 minutes; a total of seven counts per survey period.

Data Collection

At the start of a count every bird within the study area, excluding gulls (*Laridae*), were identified and counted. Binoculars and a telescope were used to aid in the accuracy of identification and counts. All counts were conducted in the same location in front of the shelter, using a standardised survey form (Table A1).

Results

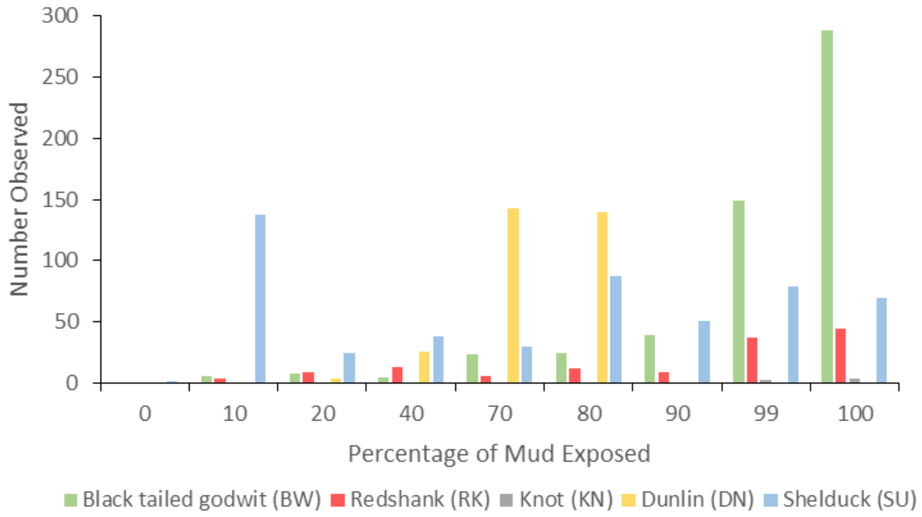

Figure 1. The total number of individual birds observed for the species of interest (Black-tailed Godwit [*Limosa limosa islandica*], Redshank [*Tringa totanus*], Knot [*Calidris canutus*], Dunlin [*Calidris alpina*], Shelduck [*Tadorna tadorna*]) in this pilot study, during the rising (N = 1) and falling (N = 3) tide along the Stour Estuary. The percentage of mud exposed across the study area at the start of each count (0 = 0%; 10 = 1%-10%; 20 = 11%-20%; 40 = 31%-40%; 70 = 61%-70%; 80 = 71%-80%; 90 = 81%-90%; 99 = 91%-99%; 100 = 100%).

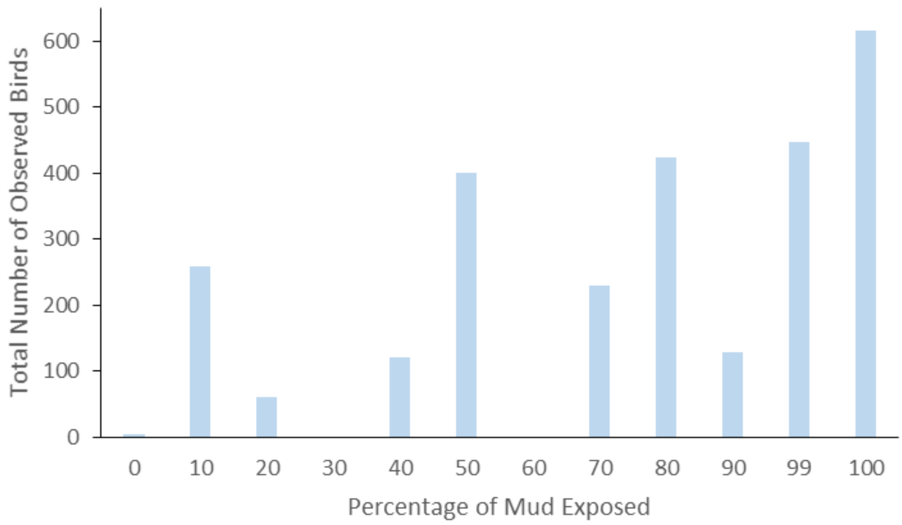

Figure 2. The total number of individual birds observed for all species during the pilot study, during the rising (N = 1) and falling (N = 3) tide along the Stour Estuary. The percentage of mud exposed across the study area at the start of each count (0 = 0%; 10 = 1%-10%; 20 = 11%-20%; 30 = 21%-30%; 40 = 31%-40%; 50 = 41%-50%; 60 = 51%-60%; 70 = 61%-70%; 80 = 71%-80%; 90 = 81%-90%; 99 = 91%-99%; 100 = 100%). For those percentages of mud exposure where no observations are present (30 and 60) the timings of counts did not coincide with that amount of exposure.

Discussion

The results found in this study indicate the importance of mudflats during the rising or falling of a tide, with high numbers of birds across a range of species using the mudflats to feed (Table A2). The largest activity of species on the mudflats generally occurred when there was a higher percentage of mud exposure, with birds following the fall/rise of the tide. There were generally constant large numbers of waterfowl, whilst the numbers of waders were dictated by the water levels (Figure 2). This demonstrates the importance of rising/falling tides on water bird assemblages on mud flats, in that high numbers of birds are frequenting them regularly in order to find sufficient food to survive.

Dunlin were clearly observed in this study to be using the intertidal regions of mudflats in large numbers as the tide fell in order to feed on the freshly exposed mud (Figure 1). Redshank and Black-tailed Godwit followed this general trend as well, except that they generally stayed on the freshly exposed mudflats longer due to their difference in feeding compared to Dunlin.

Shelduck were generally consistently observed in the study area, which differs to that of other SPA species observed. This difference could be because of the channel located in the study site (used as one of the borders), providing a constant source of water, with the Shelduck, being waterfowl, located in the general vicinity of that channel. Although, Shelduck are honorary waders as they feed on *hydrobia* like Dunlin and Knot (Bryant and Leng, 1975), they might be using this area of mudflat during the rise/fall of the tide for other purposes than feeding. Further surveys should be carried out in other areas to determine the full influences of intertidal areas on Shelduck.

During the data collection of this study it was observed several times that whenever a person, or dog, went on the small shingle beach at the forefront of the study site that a large majority of the birds (even those next to the far channel, Figure A1) would be disturbed and take flight. This demonstrates the effects that recreational pressure could be having on waterbirds, however, studies need to be conducted in order to quantify and fully investigate these effects.

Overall, this pilot study has found the beginnings of trends in waterbirds, including those on the SPA list, using freshly exposed mudflats in intertidal regions; demonstrating their importance in the survival of those species. Further data should be collected, to build upon this pilot study to accurately determine the importance that the tidal cycle has on waterbird distribution.

Study Limitations

Information was only gathered from four surveys on a readily accessible site with an easily distinguished border. At extremes of the tide inaccuracy in counts could have occurred, with birds potentially being out of site on the sloping mudflat at low tide; or at high tide the edge of the study site was harder to define when determining if a bird was within or outside of the study site.

Recommendations

For future studies building upon this pilot, we recommend a two or more person observer team to ensure accuracy of counts (especially during high traffic times), as well as the need for a telescope to ensure all birds are correctly identified and counted. It should also be noted that the freshwater outlet area attracts a high quantity of birds that cannot always be seen from the observer position, so the observer should ensure they check the edge of the channel where it meets the shore.

For small scale data collection the study site and methodology for data collection is adequate, and trends of bird movement and usage of the intertidal mudflats can be observed. However, to accurately determine and use the project at a large scale, either a larger study site or multiple sites of the same size should be implemented to get an accurate picture of how the mudflats are being used across the Stour.

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Appendix

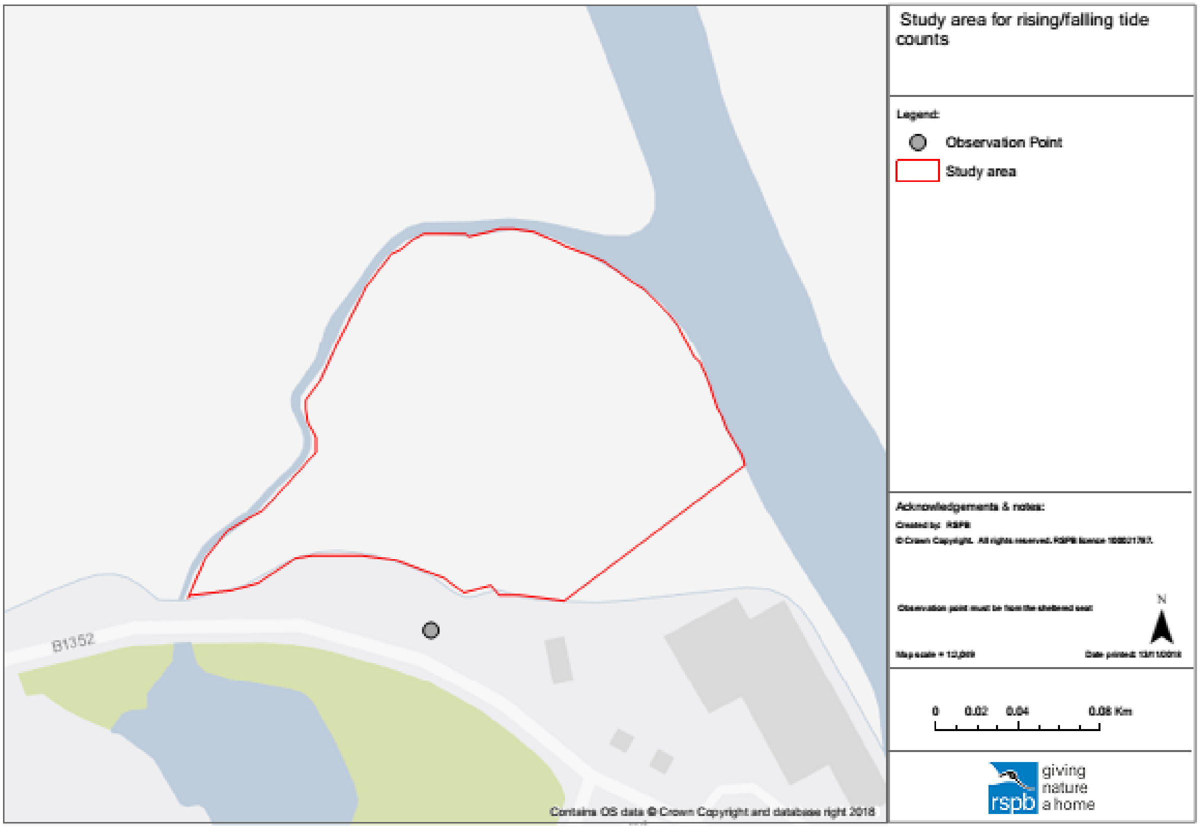

Figure A1. Study area of the inter-tidal mudflat counts at Mistley Walls. Counts were conducted from the same location of the shelter, with a barrier on the eastern side of the study area ensuring consistency.

Table A1. Standardised survey form to be used for each data collection period.

Date (dd/mm/yy):	Time of low / high water at Mistley:	Surveyor name(s):
Start time:	Rising / falling tide (delete as appropriate)	
End time:	Weather conditions: (rain, wind speed & direction, visibility)	
Additional Information:		

	Count 1	Count 2	Count 3	Count 4	Count 5	Count 6	Count 7
Time:							
Estimate % Mud Exposed							
Mute Swan							
Dark-bellied Brent Goose							
Shelduck							
Little Egret							
Wigeon							
Pintail							
Black tailed Godwit							
Redshank							
Knot							
Dunlin							
Oystercatcher							
Curlew							
Cormorant							
Canada Goose							
Greylag Goose							

Table A2. The total number of individual birds observed across all species during the pilot study, during the rising (N = 1) and falling (N = 3) tide along the Stour Estuary. The percentage of mud exposed across the study area at the start of each count (0 = 0%; 10 = 1%-10%; 20 = 11%-20%; 30 = 21%-30%; 40 = 31%-40%; 50 = 41%-50%; 60 = 51%-60%; 70 = 61%-70%; 80 = 71%-80%; 90 = 81%-90%; 99 = 91%-99%; 100 = 100%). For those percentages of mud exposure where no observations are present (30 and 60) the timings of counts did not coincide with that amount of exposure.

	Percentage of Mud Exposed											
Species	0	10	20	30	40	50	60	70	80	90	99	100
Mute Swan (*Cygnus olor*)	2	65	0	0	11	24	0	3	7	2	92	117
Dark-bellied Brent Goose (*Branta bernicla*)	0	8	0	0	0	0	0	1	0	0	0	4
Shelduck (*Tadorna tadorna*)	2	138	25	0	38	0	0	30	87	51	79	70
Little Egret (*Egretta garzetta*)	0	0	0	0	0	0	0	0	1	1	4	2
Wigeon (*Anas Penelope*)	0	16	11	0	24	9	0	13	126	16	43	39
Pintail (*Anas acuta*)	0	18	0	0	2	6	0	0	12	7	8	6
Black-tailed godwit (*Limosa limosa islandica*)	1	6	8	0	5	192	0	24	25	39	149	288
Redshank (*Tringa totanus*)	0	4	9	0	13	55	0	6	12	9	37	44
Knot (*Calidris canutus*)	0	0	0	0	1	4	0	0	0	0	3	4
Dunlin (*Calidris alpina*)	0	0	4	0	26	108	0	143	140	0	0	0
Cormorant (*Phalacrocorax carbo*)	0	0	0	0	0	0	0	0	0	0	4	6
Greylag Goose (*Anser anser*)	0	0	0	0	0	0	0	0	0	0	2	0
Oystercatcher (*Haematopus ostralegus*)	0	0	3	0	1	1	0	7	3	0	3	1
Curlew (*Numenius arquata*)	0	0	0	0	0	0	0	0	2	0	2	8
Grey Plover (*Pluvialis squatarola*)	0	0	0	0	0	0	0	0	2	0	0	1
Canada Goose (*Branta canadensis*)	0	3	0	0	0	1	0	2	0	0	13	17
Avocet (*Recurvirostra avosetta*)	0	0	0	0	0	0	0	0	0	0	8	3
Little Grebe (*Tachybaptus ruficollis*)	0	0	0	0	0	0	0	0	0	2	1	7
Lapwing (*Vanellus vanellus*)	0	0	0	0	0	1	0	0	0	0	0	0
Great Crested Grebe (*Podiceps cristatus*)	0	0	0	0	0	0	0	0	2	1	0	0
Red-Breasted Merganser (*Mergus serrator*)	0	0	0	0	0	0	0	0	6	0	0	0